

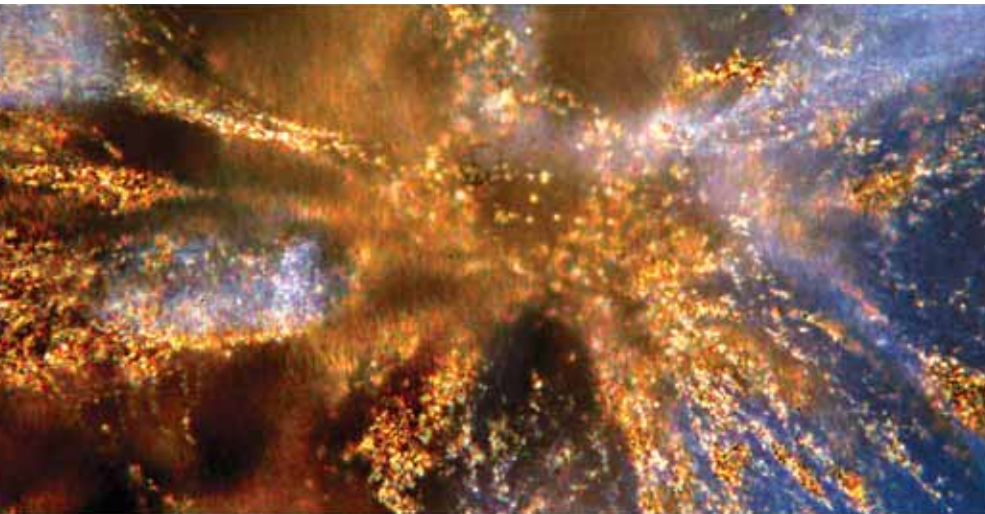
Technical Program

SPIE Optics+Photonics

Conferences + Courses: 2–6 August 2009

Exhibition: 4–6 August 2009

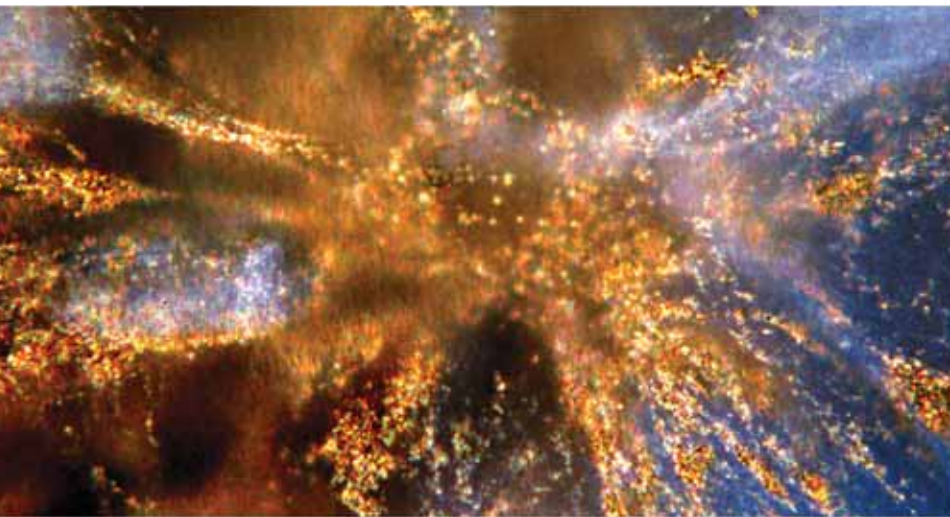
San Diego Convention Center
San Diego, California, USA



SPIE

Connecting minds. Advancing light.

Welcome to



Conferences + Courses: 2–6 August 2009

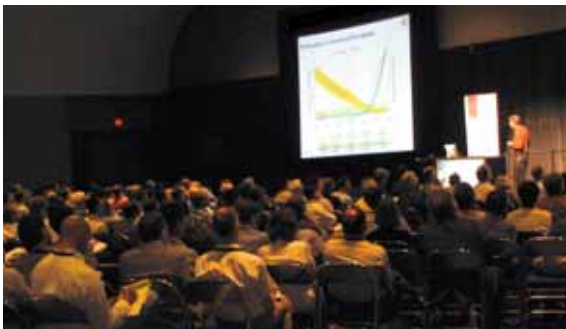
Exhibition: 4–6 August 2009

San Diego Convention Center
San Diego, California, USA

SPIE would like to express its deepest appreciation to the program chairs, conference chairs, cochairs, program committees, and session chairs who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members.

This program is based on commitments received up to the time of publication and is subject to change without notice.

Left image: The USC Nanocenter. Courtesy of National Science Foundation. "Light Scattered by Gold Nanorods" This image shows gold nanorods, embedded in a cell-populated collagen gel, scatter light as viewed under a darkfield microscope. The collective excitation of electrons in the conduction band of gold nanoparticles arising from resonance with incident visible radiation is referred to as localized surface plasmon resonance. This image is part of a proof-of-concept experiment for an interdisciplinary project between engineers, chemists, cell biologists and artists from three schools at the University of South Carolina, the College of Arts and Sciences, the College of Engineering and Information Technology and the School of Medicine.



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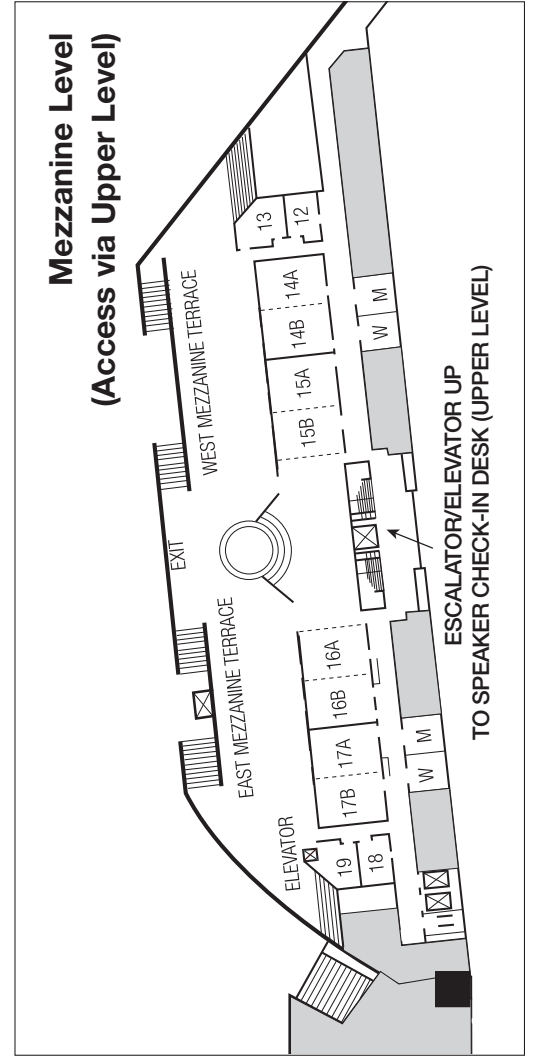
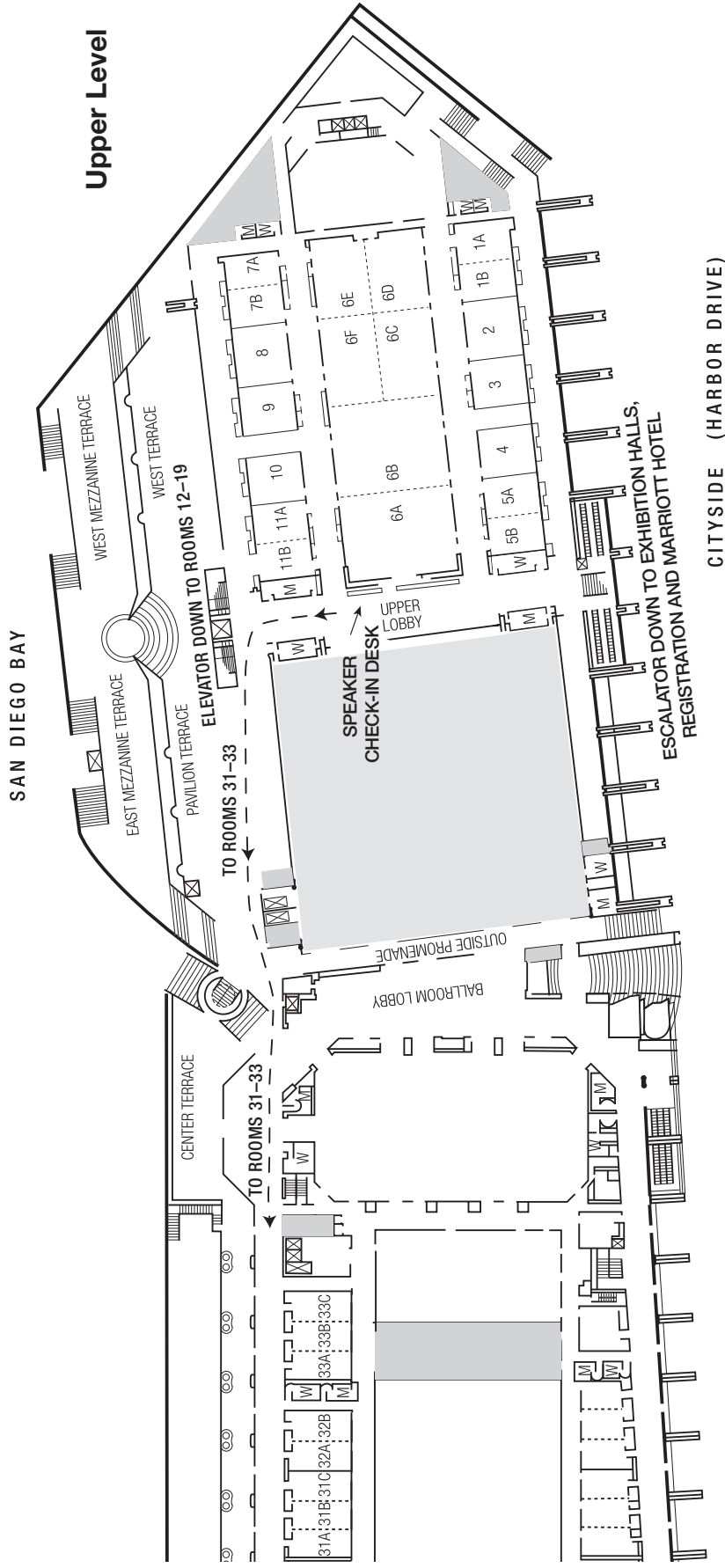
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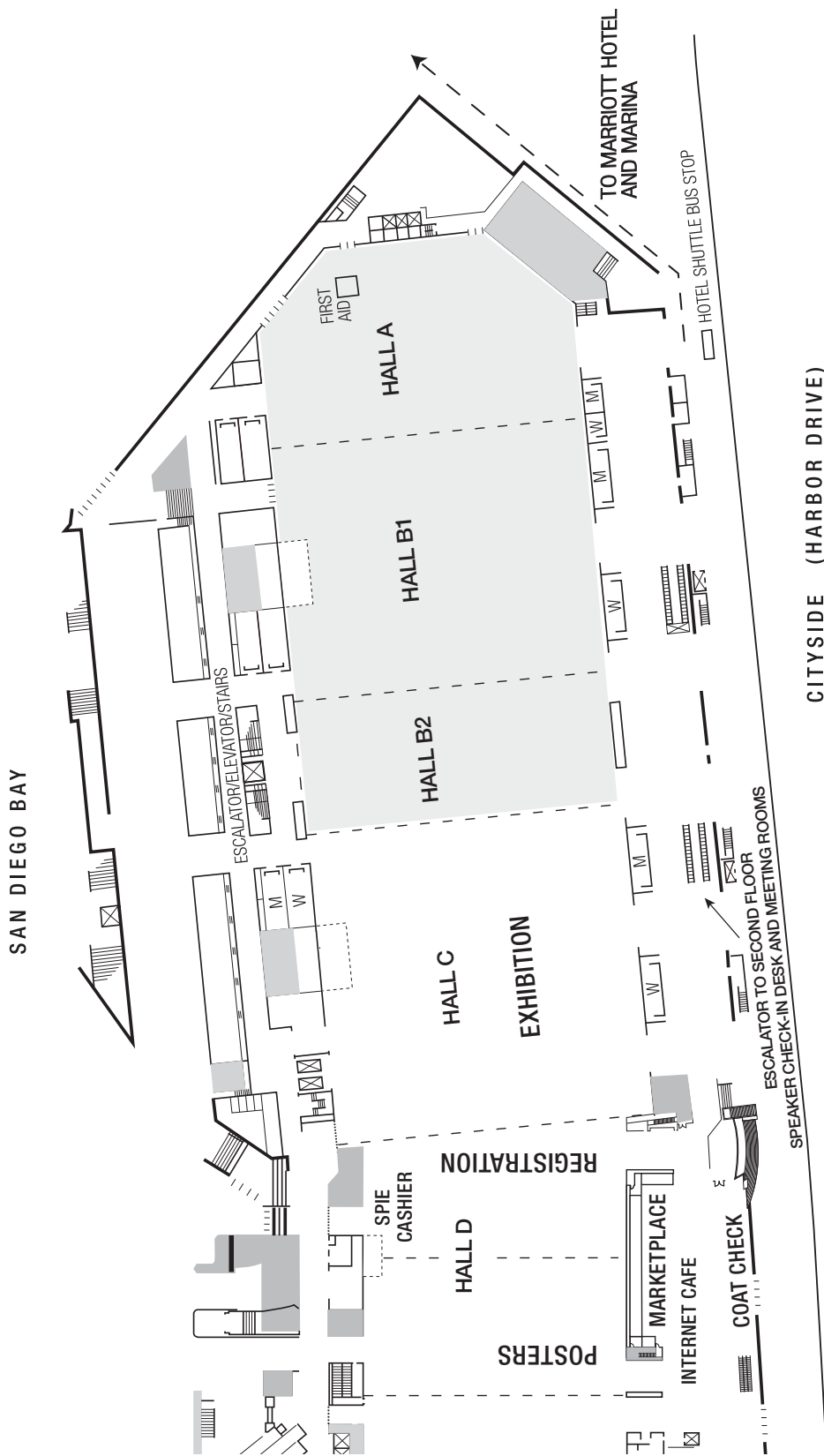
San Diego Convention Center, Second Level and Mezzanine

Audio Visual Desk and Meeting Rooms

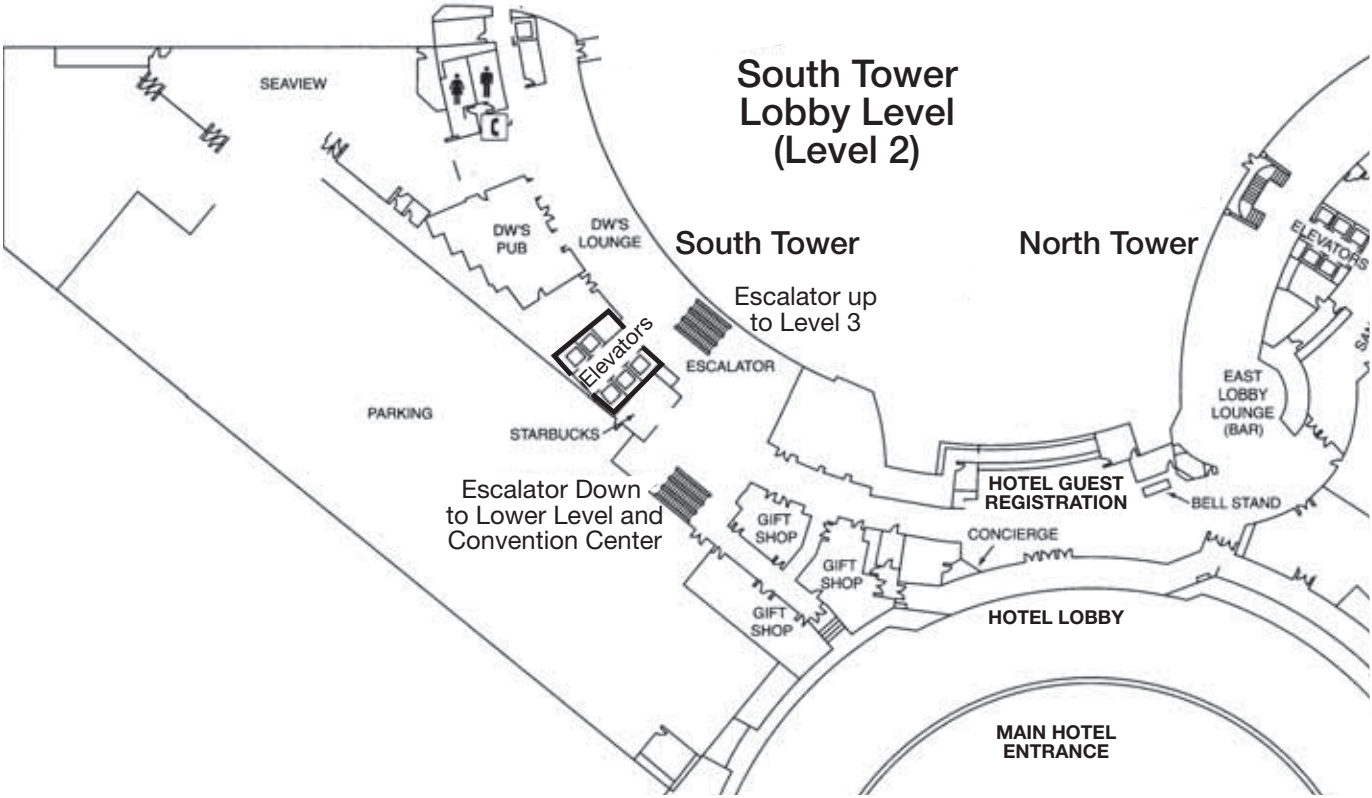
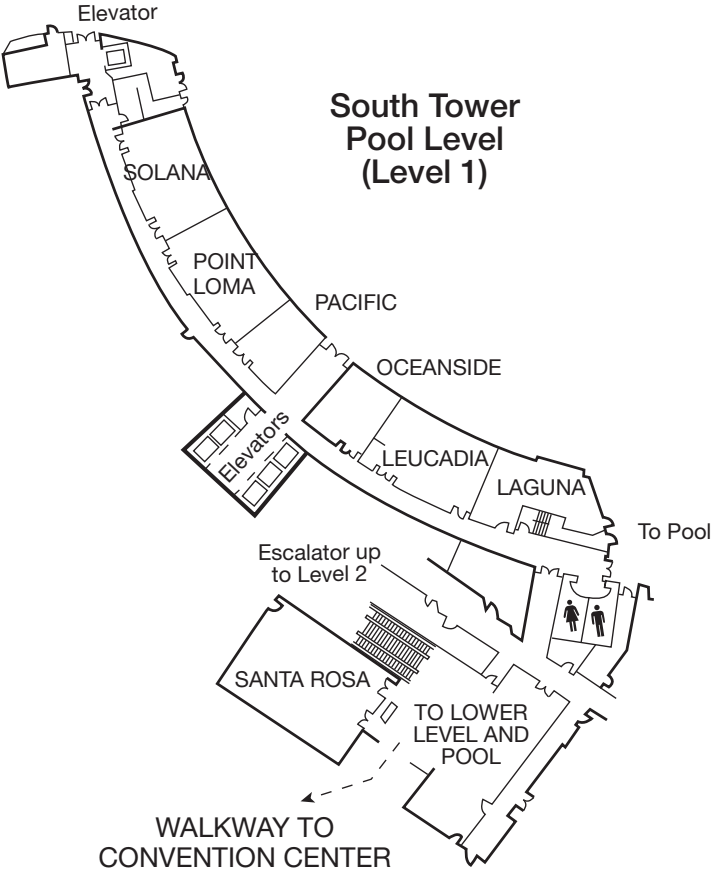


San Diego Convention Center, Ground Level

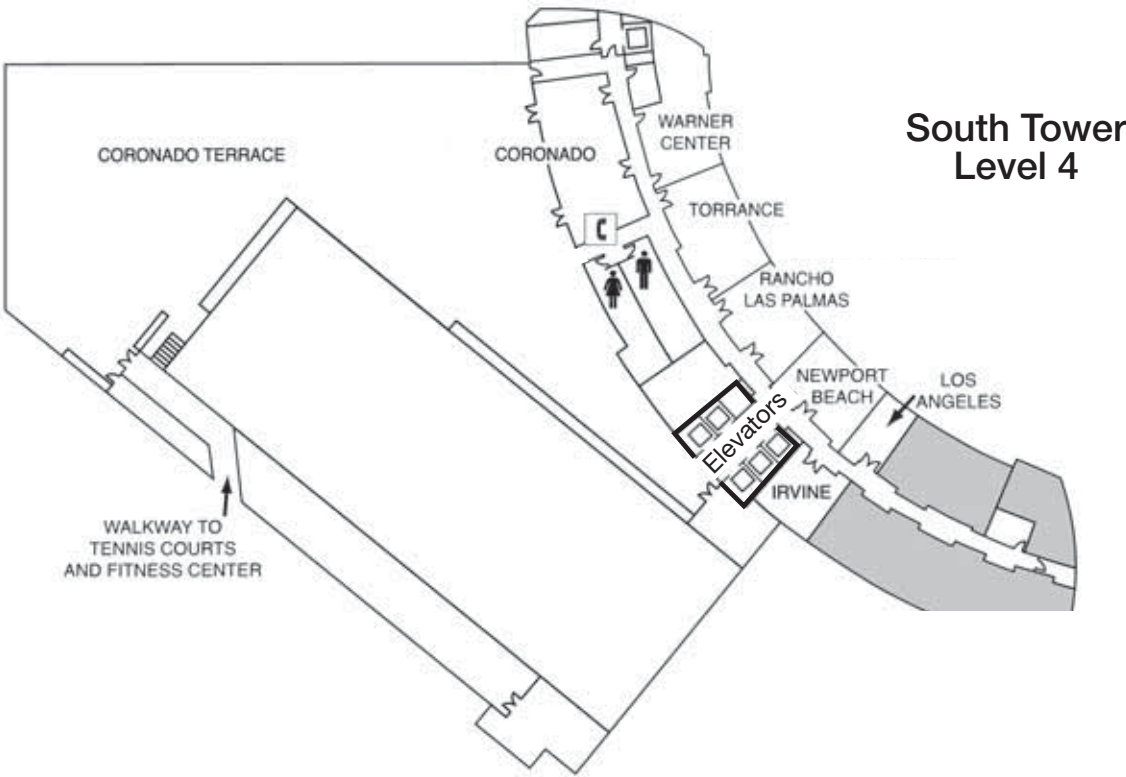
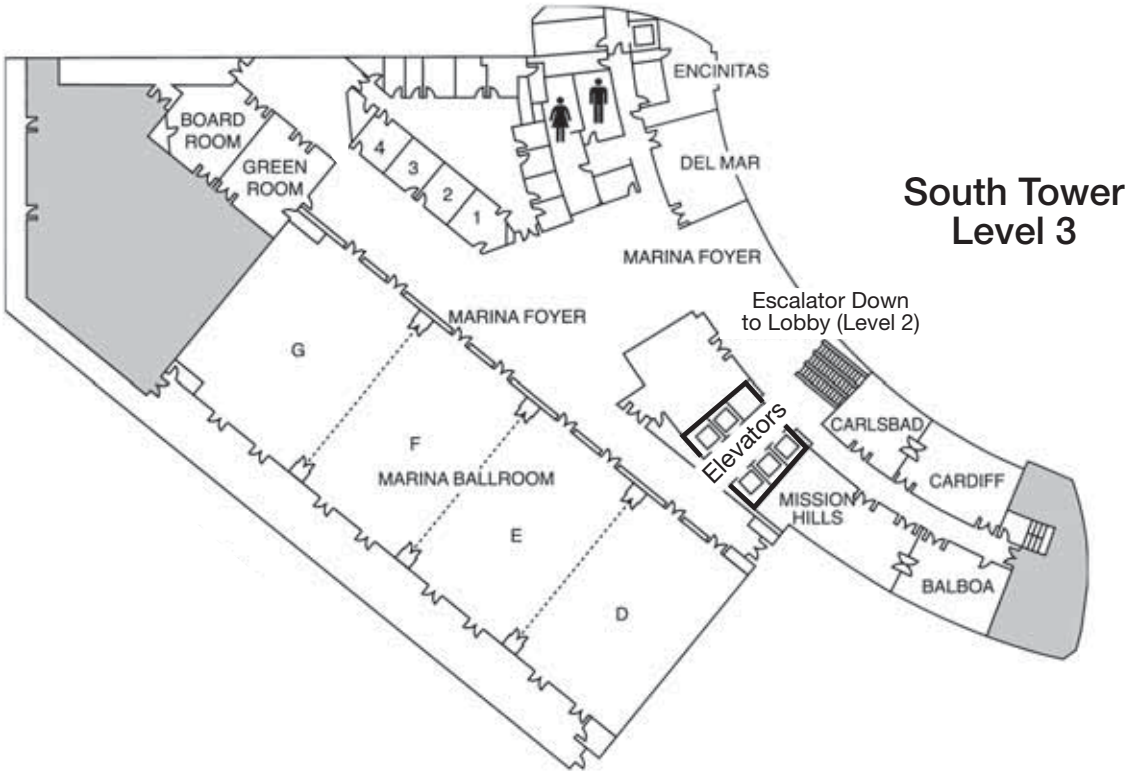
Registration and Exhibition Hall



San Diego Marriott Hotel and Marina Meeting Rooms



San Diego Marriott Hotel and Marina Meeting Rooms



Technical Conference Index

NanoScience +Engineering

Part of SPIE Optics+Photonics



Symposium Chairs

David L. Andrews, Univ. of East Anglia Norwich (United Kingdom)



James G. Grote, Air Force Research Lab. (United States)

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Solar Energy +Technology

Part of SPIE Optics+Photonics



Symposium Chair:

Martha Symko-Davies, National Renewable Energy Lab. (United States)

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Part of SPIE Optics+Photonics



Symposium Chair:
Zakya H. Kafafi, National Science Foundation (United States)

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Optical Engineering + Applications

Part of SPIE Optics+Photonics

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Program Chair: **Ian T. Ferguson**, Georgia Institute of Technology (United States)

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Optical Engineering +Applications

Part of SPIE Optics+Photonics

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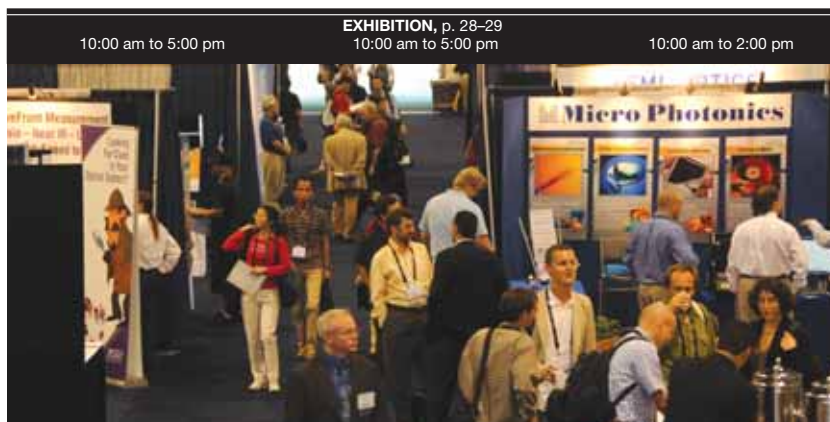
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Program Chairs: **Stephen M. Hammel**, Space and Naval Warfare Systems Ctr., San Diego (United States); **Alexander M. J. van Eijk**, TNO Defense, Security and Safety (Netherlands)

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Early Career Professionals Keynote Luncheon , 12:30 to 1:30 pm, p.31	<i>Plenary Session: Sub-Nanometer Resolution for the Inspection of Specular Surfaces using White Light</i> (Jüptner, Bothe), 9:15 to 10:00 am, p. 16	<i>Plenary Session: High Performance OLEDs for General Lighting</i> (Kido), 9:15 to 10:00 am, p. 19	<i>Plenary Session: Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry</i> (Marks), 9:00 to 9:30 am, p. 21	
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<i>Plenary Session: TMT and Segmented Mirror Telescopes</i> (Nelson), 4:00 to 4:30 pm, p. 12	<i>Plenary Session: Nanophotonics: Dressed Photon Science and its Applications</i> (Yatsui), 11:15 am to 12:00 pm, p. 17	SPIE Fellows Luncheon , 12:00 to 1:30 pm, p. 10	Photonic Devices + Applications Best Student Paper Award Announcement , 10:00 am, p. 11	
<i>Plenary Session: Prospects for direct imaging and characterization of exoplanets from space</i> (Shaklan), 4:30 to 5:00 pm, p. 12	Lunch with the Experts - A Student Networking Event , 12:30 to 1:30 pm, p. 31	<i>Plenary Session: Virtual Dimensionality for Hyperspectral Imagery</i> (Chang), 1:30 to 2:10 pm, p. 20	<i>Plenary Session: WISE: the Widefield Infrared Survey Explorer</i> (Wright), 10:30 to 11:00 am, p. 22	
Early Career Networking Social , 6:00 to 7:30 pm, p. 31	<i>Plenary Session: Progress in Organic Photovoltaics toward Low Cost PV</i> (Ginley, Shaheen, Berry, White, Reece, Olson), 1:30 to 2:00 pm, p. 17	<i>Plenary Session: Satellite Data Assimilation: Traditional and Innovative Applications</i> (Zou), 2:10 to 2:50 pm, p. 20	<i>Plenary Session: N/MEMS: Building the Future from the Inside Out</i> (Polla), 11:00 to 11:30 am, p. 22	
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All-Conference Welcome Reception , 7:00 to 8:30 pm, p. 10	<i>Plenary Session: Photovoltaic-Reliability R&D toward a Solar-Powered World</i> (Kurtz/Granata), 3:30 to 4:00 pm, p. 18	<i>Panel Discussion: Is Indivisible Single Photon Really Essential for Quantum Communications Computing, and Encryption</i> , 3:40 to 5:40 pm, p. 26	<i>Plenary Session: Coherence and X-ray Imaging</i> (Nugent), 2:15 to 3:00 pm, p. 23	
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	Women in Optics Presentation and Reception , 5:00 to 6:30 pm, p.11	Annual General Meeting of the SPIE Corporation , 6:00 to 7:00 pm, p. 10	<i>Plenary Session: Compact soft x-ray lasers: a doorway to coherent soft x-ray science on a table-top</i> (Rocca), 4:15 to 5:00 pm, p. 24	
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	Illumination Technical Event , 8:00 to 10:00 pm, p. 26	<i>Workshop: X-Ray Mirror Optics</i> , (Khounsary), 8:00 to 9:00 pm, p. 26	SPIE 2009 Annual Awards Banquet , 7:30 pm, p. 11	
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		Optomechanical/Instrument Technical Event , 8:00 to 10:00 pm, p. 27		
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		Poster/Demo Session , 8:00 to 10:00 pm, p. 11		



Special Events



All-Conference Welcome Reception

Convention Center Upper Level Terrace

Monday 3 August 7:00 to 8:30 pm

All registered attendees are invited to relax, socialize, and enjoy refreshments.

Please remember to wear your conference registration badges (required). Dress is casual. Guest badge may be purchased at the cashiers desk.

“Star Gazing” Social

Convention Center Upper Level Terrace

Monday 3 August 8:30 to 10:00 pm

Stay out a little later and see the magic of the San Diego sky. Volunteers from the San Diego Astronomy Club will set up a variety of telescopes. It’s open to all registered attendees who want to view the wonders of the night sky, learn about different telescopes, and share their interest in astronomy. Bring a jacket!



SPIE Members Reception

Marriott Hotel, Coronado Terrace

Tuesday 4 August 7:00 to 8:30 pm

SPIE Members Only (Membership will be checked at the entrance for admission)

All SPIE Members are invited to this reception in their honor. Come relax and talk with your colleagues. Refreshments will be served. If you join SPIE onsite, please bring your registration receipt. Dress is casual or business attire.

SPIE Fellows Luncheon

Marriott Hotel, Marina Ballroom G

Tuesday 4 August 12:00 to 1:30 pm

All SPIE Fellows are invited to join your colleagues for this SPIE-hosted luncheon. The new Optics and Photonics Fellows will be introduced and receive their Fellow pins. Please join us for this informal gathering and a chance to interact with other Fellows.



Annual General Meeting of the SPIE Corporation

The Society of Photo-Optical Instrumentation Engineers (SPIE)

*San Diego Marriott Hotel and Marina
Marina Ballroom E*

Tuesday 4 August 6:00 to 7:00 pm

Agenda

1. 2009 Election Results
2. Report on the “State of the Society”
3. Treasurer’s Report
4. Q & A with SPIE Officers

This is the general business meeting of the Society. All SPIE Members are welcome and encouraged to attend. This is your forum for expressing your ideas about the Society. Results of the 2009 election will be announced and the President and Executive Director will report on the “State of the Society.”



SPIE 2009 Annual Awards Banquet

Wednesday 5 August 2009 7:30 to 10:00 pm
SPIE President **María J. Yzuel** presiding
Tickets \$75.00

Banquet and Awards presentations

SPIE President María J. Yzuel will preside over the 2009 Awards Banquet that will include the presentation of the 2009 Society awards, scholarship awards, and new Fellows of the Society.



Dr. Charles M. Vest, President of the U.S. National Academy of Engineering (NAE)

Join us for this gala event and enjoy a presentation by the 2009 recipient of the first Chandra S. Vikram Award in Optical Metrology, Dr. Charles M. Vest, President of the U.S. National Academy of Engineering (NAE), and President Emeritus of the Massachusetts Institute of Technology, titled, "Why Science and Engineering Matter in the 21st Century."

Tickets for the banquet are not included in the registration fee but may be ordered on the registration form or purchased onsite at the SPIE Registration Desk until 12 noon on Tuesday 4 August.

Early Career Networking Social

Marriott Hotel, Poolside

Sunday 2 August 6:00 to 7:30 pm
Open to all Early Career Professionals

Enjoy a casual outdoor networking event while getting connected with the larger optics and photonics community. Distinguished guests include technical experts and members of the SPIE Board of Directors.

Poster Sessions

Convention Center, Exhibition Hall D

Monday 3 August 6:00 to 7:30 pm
Tuesday 4 August 8:00 to 10:00 pm
Wednesday 5 August 5:30 to 7:00 pm

Conference attendees are invited to attend the poster sessions on Monday, Tuesday, and Wednesday evening. Each evening will represent a different set of conferences. Come view the posters, ask questions, and enjoy the refreshments. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions.

Tuesday night will include demonstrations of prototype devices.

Photonic Devices + Applications Best Student Paper Award Announcement

Convention Center, Room 6A

Wednesday 5 August 10:00 am

SPIE Women in Optics Presentation and Reception

Convention Center, Room 11B

Monday 3 August 5:00 to 6:30 pm
Open to all conference attendees.

Empowering Refugee Women Through Solar Cooking

Join us for an evening of networking and inspiration. Connect with others in our industry while enjoying wine and cheese refreshments.



Speaker: Tzivia Schwartz-Getzug, Executive Director, Jewish World Watch

Tzivia Schwartz-Getzug recently went to Chad to bear witness to the genocide in Darfur and the atrocities committed against women as they left relative safety of the refugee camps to collect firewood. Through the introduction of solar cooking, not only have the women been able to stay protected in the refugee camps, but the environment and the local economy are being saved as well.



Industry Events

Panel Discussion:

Getting Hired in 2009 and Beyond

Convention Center, Exhibition Hall C

Tuesday 4 August 2:30 to 3:30 pm

Learn about the corporate hiring process directly from professionals in the optics and photonics sector.

Student Chapter Exhibit Mixer

Convention Center, Exhibition Center

Tuesday 4 August 4:00 to 5:00 pm

Exhibitors, join us for a late-afternoon mixer in the Student Chapter section of the Exhibition Hall. Meet our amazing students and learn about the innovative activities of some of the best and brightest Student Chapters across the globe!

Plenary Sessions

Astronomical Optics and Instrumentation

Convention Center, Room 6A

Sunday 2 August 3:30 to 5:00 pm

3:30 to 4:00 pm:

10% of the Telescope: 40 Years of Adaptive Optics



Robert K. Tyson, The Univ. of North Carolina at Charlotte (United States)

Abstract: The great promise of large ground-based telescopes is only realizable with the implementation of adaptive optics to compensate for the turbulent atmosphere. This presentation will be a brief overview of the history of adaptive optics technology and then outline the goals and challenges of the next few decades.

Biography: **Robert K. Tyson** is an Associate Professor of Physics and Optical Science at the University of North Carolina at Charlotte. He has been working in the field of adaptive optics for over 25 years. He is author of Principles of Adaptive Optics, Introduction to Adaptive Optics, and co-author of Field Guide to Adaptive Optics.

4:00 to 4:30 pm:

TMT and Segmented Mirror Telescopes



Jerry Nelson, Univ. of California, Santa Cruz (United States)

Biography: **Dr. Jerry Nelson** is Professor of Astronomy and Astrophysics at the University of California, Santa Cruz, and Astronomer, UC Observatories/Lick Observatory. His research interests include the CfAO, which is concerned with using adaptive optics to do astronomical science and vision science, and with spreading the appropriate observing techniques to the

broad community. Dr. Nelson is actively involved in the design of future giant telescopes.

4:30 to 5:00 pm:

Prospects for Direct Imaging and Characterization of Exoplanets from Space



Stuart Shaklan, Jet Propulsion Lab (United States)

Abstract: Sensing the visible light reflected from an Earth-like planet orbiting a Sun-like star is akin to detecting a bump 1/100 as thick as a human hair on the slopes of Mount Everest. That's one part in 10 billion and not long ago it seemed like an insurmountable challenge. However, high-contrast coronagraph laboratory experiments are remarkably within a factor of 5 of this goal thanks to advances

in coronagraph mask design and manufacturing, deformable mirror technology, and wavefront sensing and control algorithms. There are several viable coronagraph designs including band limited and vector vortex masks, shaped pupils and pupil remapping optics, as well as a nulling interferometric approach. An interesting alternative to a coronagraph is an external occulter that blocks and diffracts starlight while allowing the light of the exoplanet to enter the telescope. All of these approaches were evaluated in the recently completed NASA Astrophysics Strategic Mission Concept Studies. These studies have laid out technology development roadmaps and mission development plans for direct imaging missions that could be launched within the next decade.

Biography: **Stuart Shaklan** is a Principal Member of the Technical Staff at the Jet Propulsion Laboratory, California Institute of Technology, where he has worked since 1991. He has contributed to stellar coronagraph technology and algorithm development and numerous exoplanet mission studies, and he served as architect of the Terrestrial Planet Finder Coronagraph Mission study from 2002-2007. He is also the Space Interferometry Mission Instrument Scientist. He received his Ph.D. degree from the Optical Sciences Center, University of Arizona, in 1989.

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Plenary Sessions

Symposium-wide Plenary Session

Convention Center, Room 6A

Sunday 2 August 6:00 to 7:30 pm

6:00 to 6:45 pm:

Four Hundred Years Through the Eye of the Telescope



Jerry Nelson, Univ. of California, Santa Cruz (United States)

Abstract: Not since the time of Copernicus and Galileo has our view of the Universe and physics in general been so challenged by the discoveries of modern telescopes. In the year we celebrate the four hundredth anniversary of the filing of the patent for the telescope, and having just passed the 50th anniversary of the space program, this talk

will attempt to reflect on how telescopes have changed science and society. How the great telescope quest like few others has brought together scientists, engineers, philanthropists, governments and the public around the globe, unified by an over-arching curiosity to see deeper and further. What are the lessons from the last four hundred years, and where do we go next? Somewhat dangerously, given we are on the cusp of asking some of the most profound questions a sentient species is probably ever confronted with, I will attempt to give some pointers, cautioned by Martin Harwit's words that "astronomy is a luxury that society can afford only when it has provided people with life's primary needs - food, shelter, security."

Biography: **Dr. Jerry Nelson** is Professor of Astronomy and Astrophysics at the University of California, Santa Cruz, and Astronomer, UC Observatories/Lick Observatory. He received his B.S. at the California Institute of Technology and his Ph.D. at the University of California, Berkeley. His research interests include the CfAO, which is concerned with using adaptive optics to do astronomical science and vision science, and with spreading the appropriate observing techniques to the broad community. The Center also supports the development of new scientific instrumentation that uses adaptive optics. In addition, advanced AO technology is supported, with the aim of producing more capable AO systems in the future, both for giant telescopes where AO is particularly effective, and in vision science, where more compact and user/patient friendly AO systems will help the study of the human retina.

Dr. Nelson is actively involved in the design of future giant telescopes. He is the Keck Observatory Scientist, having been involved with the design of the two Keck telescopes. He is also involved in the adaptive optics system being used and developed at Keck. The Keck AO system can make diffraction limited images at wavelengths as short as 1 micron, producing image resolution as good as 0.02 arc seconds. When complete, the Keck AO system will use a Na laser guide star to dramatically increase sky coverage over that available with natural guide stars.

6:45 to 7:30 pm:

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae



Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (United States)

Abstract: Supernovae deposit enormous amounts of energy into their surroundings. They play a key role in the heating of their host galaxies and in the enrichment of the interstellar medium with heavy elements that form the building blocks of life. Yet, the actual explosion mechanism is not known.

One way to understand the explosion is to study the dynamics of the stellar debris that comprise supernova remnants such as Cassiopeia A. Cas A is the 2nd youngest known supernova remnant in the Galaxy (approximately 340 years old, neglecting light travel time) and is also among the brightest. It is well studied at radio, X-ray, infrared, and optical wavelengths and is known to have two oppositely directed jets of ejecta with expansion velocities as high as 15,000 km/s. We have used the Spitzer Space Telescope, the Chandra X-ray Observatory, and existing ground-based optical data to create a 3-dimensional representation of the remnant that we can use to peer into the explosion that caused Cas A.

Biography: **Dr. Tracey DeLaney** received her Ph.D. in 2004 from the University of Minnesota where she studied Cassiopeia A and Kepler's supernova remnant. She is currently a post-doctoral researcher working on supernova remnants at the MIT Kavli Institute for Astrophysics and Space Research in Cambridge, MA.

"Star Gazing" Social

Convention Center, Upper Level Lobby
Monday 3 August · 8:30 to 10:00 pm

Stay out a little later and see the magic of the San Diego sky. Volunteers from the San Diego Astronomy Club will set up a variety of telescopes. It's open to all registered attendees who want to view the wonders of the night sky, learn about different telescopes, and share their interest in astronomy. Bring a jacket!





SPIE proudly supports the International Year of Astronomy 2009



Photos courtesy of NASA.

The International Year of Astronomy 2009 is an initiative of the International Astronomical Union and UNESCO. It celebrates the first astronomical use of the telescope by Galileo – a momentous event that initiated 400 years of astronomical discoveries and triggered a scientific revolution which profoundly affected our worldview.

SPIE is recognizing 400 years of the telescope.

Celebration Events

- Antique Telescope Display: Rare collection of 60 telescopes from 1700s to 1900s
- Astro-Photo Wall: Award winning photos of our fascinating universe
- Astro-Photo Workshops: 30 minute workshops—“Astronomical Imaging: The point when art breaks through science”
- Galileoscope Project: Demonstrations of a high-quality, easy-to-assemble, 50-mm diameter, 25- to 50-power achromatic refractor, telescope kit
- Live Data Feed from Australian Observatory
- New Carbon Truss 24-inch f/7.8 Ritchey-Chrétien telescopes on display
- “Star Gazing” at the Monday Welcome Reception

Astronomy 2009 Events Open During Exhibition Hours

Exhibition Hall, SPIE Booth

Tuesday 4 August 10:00 am to 5:00 pm
Wednesday 5 August 10:00 am to 5:00 pm
Thursday 6 August 10:00 am to 2:00 pm

“Star Gazing” Social

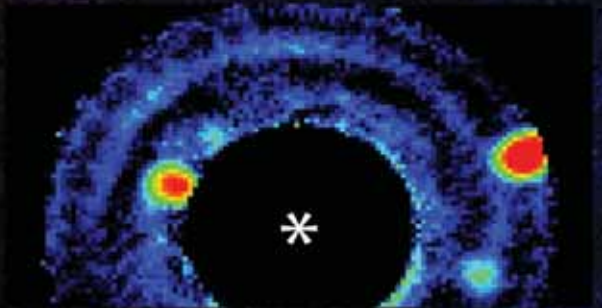
Convention Center, Upper Level Lobby

Monday 3 August 8:30 to 10:00 pm

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Courtesy of Bisque Software.



Plenary Sessions

Nanoscience + Engineering

Convention Center, Room 6A

Monday 3 August 8:30 am to 12:00 pm

8:30 to 9:15 am:

Taming the Light with Metamaterials



Nader Engheta, Univ. of Pennsylvania (United States)

Abstract: Metamaterials are engineered composite media with unconventional electromagnetic and optical properties. They have exciting characteristics in tailoring, manipulating and processing RF, microwave, IR and optical information. Devices and components formed by these media may be ultracompact and subwavelength, while supporting resonant and propagating modes. This implies that in such structures electromagnetic signals can be controlled and reshaped beyond the diffraction limits, leading to the possibility of miniaturization of elements and components, and design and control of optical devices at the nanoscale. This field is witnessing unprecedented development in recent years due to numerous potential applications that such materials may offer. There has also been significant interest and development in the field of plasmonic optics in recent years due to the numerous breakthroughs in the areas of nanotechnology, nanooptics and exciting potentials for merging of nanooptics and nanoelectronics. Owing to some of the fascinating features that are common in both fields of metamaterials and plasmonics, the two fields are merging into a new topic that may be called “metaplasmonics”. Negative-permittivity plasmonic media, such as noble metals in the infrared and optical frequencies, and epsilon-near-zero (ENZ) metamaterials can be exploited as the building blocks for synthesis of plasmonic metamaterials. Numerous fundamental concepts and various potential applications of metamaterials and plasmonic materials, for which these unconventional parameter values may play important roles, are being explored. In this talk, I present an overview of the concepts, salient features, recent developments, and some of the potential applications of metamaterials and nanoplasmonic structures, and will forecast some future ideas and directions in these areas.

Biography: **Nader Engheta** is the H. Nedwill Ramsey Professor of Electrical and Systems Engineering, and Professor of Bioengineering, at the University of Pennsylvania. He received his B.S. degree in Electrical Engineering from University of Tehran, and his M.S and Ph.D. degrees in Electrical Engineering from California Institute of Technology. Selected as one of the Scientific American Magazine 50 Leaders in Science and Technology in 2006 for developing the concept of optical lumped nanocircuits, he is a Guggenheim Fellow, an IEEE Third Millennium Medalist, IEEE Fellow, American Physical Society Fellow, Optical Society of America Fellow, and the recipient of the 2008 George H. Heilmeyer Award for Excellence in Research, the Fulbright Naples Chair Award, NSF Presidential Young Investigator award, the UPS Foundation Distinguished Educator term Chair, and several teaching awards including the Christian F. and Mary R. Lindback Foundation Award and S. Reid Warren, Jr. Award. His current research activities span a broad range of areas including metamaterials and plasmonics, nanooptics and nanophotonics, biologically-inspired sensing and imaging, miniaturized antennas and nanoantennas, physics and reverse-engineering of polarization vision in nature, mathematics of fractional operators, and physics of fields and waves phenomena. He has authored and coauthored numerous papers, and has given many invited, keynote, and plenary talks on these topics. He and his group have been developing the field of ‘metatronics’, i.e., metamaterial-inspired optical nanocircuitry, which was featured in his article on ‘Circuits with Light at Nanoscales » in September 21, 2007 of Science. He is the Chair of the Commission B (Fields and Waves) of the US National Committee (USNC) of The International Union of Radio Science (URSI), and he has been elected to be the Vice-Chair of the Gordon Research Conference on Plasmonics in 2010, and its Chair in 2012. He has co-edited the book entitled “Metamaterials: Physics and Engineering Explorations” by Wiley-IEEE Press, 2006.

9:15 to 10:00 am:

Sub-Nanometer Resolution for the Inspection of Specular Surfaces Using White Light



Werner Jüptner (pictured), and **Thorsten Bothe**, Bremer Institut für angewandte Strahltechnik (Germany)

Abstract: The quality control of highly reflective surfaces requires measurement method which is able to resolve the surface shape in the nanometer range. Different methods have been developed in the past, e.g. based on interferometry or by tactile coordinate measurement machines. However, most of them do

not match the industrial need for a fast method which is insensitive to environmental disturbance.

The newly developed method using the reflection of fringe pattern by the surface under test, and therefore called “Fringe Reflection Technique (FRT)”, overcomes the difficulties of known measurement methods. In this method a pattern of straight fringes is generated by a monitor. The mirrored pattern is observed by a camera via the object surface under test. Any deviation of the surface against the ideal, i.e. the mathematically accurate surface will yield a distortion of the pattern. This distortion is analyzed by an image processing system, called the Fringe Processor. The surface topology is delivered by local surface gradients which can be further integrated to object shape or differentiated to local curvature. The resolution of the system can be adapted to the measurement requirements in a wide range from micrometer down to sub-nanometer. Nevertheless, the system is stable against environmental disturbances. It works without vibration isolation in rooms without any climate control.

The measurement of a silicon mirror surface produced by diamond turning in a high precision tool machine serves as an example. The surface shape could be determined with a resolution below one nanometer. The measurements match the results of an interferometer and were better in certain areas.

Biography: **Werner Jüptner**, born in Breslau 1941, received his diploma (Master degree) in physics from the University of Hanover, Germany. During his studies he worked on the spectral emission of solid state laser as a function of time.

In 1970 he joint for eight years FhG-IFAM, Fraunhofer Institute for Applied Materials Research, During this time he received his PhD in mechanical engineering for research work on electron beam interactions with materials. Beside this work he managed one of the largest projects on NDE of glass fiber reinforced plastic tubes with about fifteen partners.

In 1978 Werner Jüptner founded the BIAS – Bremer Institut für angewandte Strahltechnik. BIAS was the first institute for the industrial application of lasers in material processing and metrology. He was responsible for the research work in optical metrology with special emphasis to the application of interferometry on mechanical and industrial problems.

In 1989 he was appointed as Adjunct Professor of Mechanical Engineering in WPI – Worcester Polytechnic Institute, Worcester, Massachusetts. Lateron he became a member of the Advisory Board of the Faculty of Mechanical Engineering of WPI.

In 1989 he was appointed as University Professor at the University of Bremen, Faculty for Physics and Electro-technology. His special field of teaching and research was “Applied Optics”.

In 2007 Werner Jüptner was appointed by the University of Aberdeen as “6th Century Chair for Laser Engineering”.

Werner Jüptner is a member of a number of national and international societies as EOS, being the first chair of the Fellows committee WLT, being the treasurer from 1996- 2006 SPIE, being a director from 2007 – 2009 VDI, DGaO, OSA to name some of them. In 2003 he received the SPIE Gabor Award for his significant developments in coherent optics.

10:00 to 10:30 am: Coffee Break

10:30 to 11:15 am:

Adapting to the Nanoscale Era of Technology



Nils Petersen (pictured), National Institute for Nanotechnology, NRC (Canada) and **Lori Sheremeta**, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

Abstract: Mankind distinguishes itself from other species through the continual adoption and refinement of technology to reach new frontiers and satisfy ever increasing demands for improvement in quality of life. We now face the next frontier in which we will

use our knowledge of molecular properties of matter, our increasing understanding of the biological world, and our phenomenal skills at design and engineering at the nanoscale to improve our existing products, create new ones, and invent novel and transformative technologies. As scientists we get inspired to drive towards the new frontiers without reservations, but there is the danger that we get too far ahead of the public for them to accept the changing world at face value. We have seen significant resistance to adoption of some forms of biotechnology and must learn from the underlying concerns. Since the nanotechnology era is still emerging, we have a unique opportunity to try to develop the technologies in tandem with the understanding needed to introduce these technologies in responsible, safe, and acceptable manners.

Biography: **Nils Petersen** received his B.Sc. Honours in Chemistry from The University of Western Ontario in 1972. He went on to receive his PhD in Chemistry from the California Institute of Technology in 1978, where he won the Herbert Newby McCoy Award for best Chemistry PhD thesis.

After positions at Cornell University and Washington University Medical School, he returned to The University of Western Ontario's Department of Chemistry as a faculty member in 1981. He was Chair of the department from 1995 to 1999. From 1993 to 1995, he was Associate Dean of the Faculty of Graduate Studies; from 1999 to 2000 he was Associate Vice-President (Research); and from January 2002 to November 2004, he was Western's Vice-President (Research).

Among his distinguished awards and honours, Dr. Petersen has received the Faculty Association Alumni Award, the Edward G. Pleva Award for Excellence in Teaching, the Lieutenant-Governor's Laurel Award for Teaching, and a teaching award from the Ontario Confederation of University Faculty Associations. In 2001, he was named a Fellow of the Chemical Institute of Canada and was honoured with a Distinguished Research Professorship from UWO's Faculty of Science.

Dr. Petersen served as the first Board Chair of SHARCNET (Shared Hierarchical Academic Research Computing Network), a network of high-performance Beowulf computer clusters in Southwestern Ontario. He currently serves on the Boards at the Canadian Light Source and the California NanoSystems Institute and on the Institute Advisory Board of the CIHR Institute of Genetics. He Chairs the Board of the BiopSys NSERC Network Grant at the University of Toronto.

Dr. Petersen's current research focuses on intermolecular interactions in biological membranes, particularly the study of the dynamics and distribution of molecules within the membrane as a means of understanding cell-cell communication, signal transduction, adhesion and locomotion of cells. In addition to being Director General for the National Institute for Nanotechnology, Dr. Petersen continues to participate fully in academic pursuits at the University of Alberta as a Professor in the Department of Chemistry.

11:15 am to 12:00 pm:

Nanophotonics: Dressed Photon Science and its Applications



Takashi Yatsui, The Univ. of Tokyo (Japan)

Abstract: Nanophotonics, a novel optical technology, utilizes the local interaction between nanometric particles via optical near fields. The optical near fields are the elementary surface excitations on nanometric particles, that is, dressed photons that carry material energy. Of the variety of qualitative innovations in optical technology realized by nanophotonics, this talk focuses on devices and fabrication. The principles of

device operation are reviewed considering the excitation energy transfer via the optical near-field interaction and subsequent dissipation. As representative examples, the principles of a nanophotonic AND-gate, NOT-gate, and optical nanofountain are described. Experimental results for operating devices using CuCl quantum dots, InAlAs quantum dots, and nanorod ZnO double-quantum wells are described. To fabricate nanophotonic devices with nanometer-scale controllability in size and position, we developed a self-assembly method for size- and position-controlled ultra-long nanodot chains using a novel effect of near-field optical desorption. A novel deposition scheme under nonresonant conditions is also demonstrated and its origin is discussed.

Biography: **Takashi Yatsui** received a B. Eng. degree from Keio University, Tokyo, Japan, in 1995, and M. Eng. and Ph. D. degrees from the Tokyo Institute of Technology, Tokyo, Japan, in 1997 and 2000, respectively. Following his postdoctoral research at the Japan Science and Technology Agency, he joined the faculty of the University of Tokyo.

Solar Energy

Convention Center, Room 6A

Monday 3 August 1:30 to 5:00 pm

1:30 to 2:00 pm:

Progress in Organic Photovoltaics toward Low Cost PV



David S. Ginley (pictured), **Sean E. Shaheen**, **Joseph J. Berry**, **Matthew S. White**, **Matthew Reece**, and **Dana C. Olson**, National Renewable Energy Lab. (United States)

Abstract: The talk will focus on the emerging area of organic photovoltaics. OPV offers the potential for large area low cost PV. The field has shown significant improvements in efficiency, stability and large area processing over the last year. One of the

most interesting aspects of OPV is that it combines polymers, small molecules, transparent conducting oxides, and metals to produce a scalable device. Success for depends on developing an understanding about the nature of the diverse interfaces; chemical, optical and physical. As such understanding emerges it will be increasingly possible to tailor the materials to optimize the interfacial properties. We will present data showing that the interfaces can be modified to improve device performance and stability.

Biography: **Dr. David S. Ginley** is currently a Research Fellow and Group Manager in Process Technology and Advanced Concepts at the National Renewable Energy Laboratory in the National Center for Photovoltaics. Current work focuses on transparent conducting oxides, organic electronics and application of nano-materials and the development of process technology for materials and device development including; combinatorial methods, direct write materials, composite materials and non-vacuum processing.

Plenary Sessions

Solar Energy

Monday 3 August continued.

2:00 to 2:30 pm:

Thin-Film Silicon PV Modules: Status and Prospects



Arvind Shah, Institute of Microtechnology, Univ. of Neuchâtel (Switzerland)

Abstract: After 20 years of stagnation, amorphous silicon modules are right now in the process of gaining a substantial market share. This is due to: (1) suitability for Building-integration (2) ongoing cost reduction and (3) recent (minor) advances in efficiency. Module types presently available on the Market OR tested in Pilot Lines and Laboratories will be reviewed. R&D

trends will then be outlined and critically commented. These include microcrystalline silicon, micro-morph tandems and re-crystallized silicon. Bottlenecks in efficiency improvement and cost reduction will be analyzed. A speculative vision for the future thin-film silicon module types will be given.

Biography: **Arvind Shah** was born in Bombay (1940). He studied at ETH Zurich. 1975: founded CEDT (Ctr. for Electronics Design and Technology), Indian Institute of Science, Bangalore. 1979: joined Institute of Microtechnology (IMT) at Univ. of Neuchâtel. There, he founded PV Lab Neuchâtel (1985) and directed it until 2005. This lab pioneered high-rate deposition of amorphous silicon by VHF Plasma (1987), introduced the first high-efficiency microcrystalline solar cells (1996), and established low-cost production methods for solar cells and zinc oxide transparent conductors (2002). Main thrust of PV Lab is since centred on "Micro-Morph" tandem solar cells, double-junction solar cells combining amorphous and microcrystalline silicon.

2:30 to 3:00 pm:

Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy



Kazunari Domen, The Univ. of Tokyo (Japan)

Abstract: The photocatalytic overall water splitting is promised to lead to a sustainable energy system based on hydrogen energy for large scale production using solar light, and great attention has been paid in the development of photocatalysts. The modification with cocatalysts for the hydrogen and oxygen evolution sites on photocatalysts drastically improves the efficiency, indicating the importance of control

of surface active sites. Oxynitride photocatalysts modified with the nano-scale structure of cocatalysts shows the performance for overall water splitting with visible light. This presentation demonstrates our recent research progress in the development of visible-light-driven photocatalysts for overall water splitting.

Biography: **Kazunari Domen** is a Professor at the School of Engineering, The Univ. of Tokyo. He received a Ph.D. in Science from The Univ. of Tokyo in 1982. He became an Associate Researcher at Tokyo Institute of Technology, Professor. Then he became a Professor at The Univ. of Tokyo. Major Fields: Physical Chemistry, Heterogeneous Catalysis, Photocatalysis, Surface Chemistry, Functional Materials

3:00 to 3:30 pm: Coffee Break

3:30 to 4:00 pm:

Photovoltaic-Reliability R&D toward a Solar-Powered World



Sarah R. Kurtz (pictured), National Renewable Energy Lab. (United States) and **Jennifer E. Granata**, Sandia National Labs. (United States)

Abstract: Explosive growth of photovoltaic technologies as a power generation source world-wide has created demands for lower costs, higher reliability, and high performance. Increasingly astute utilities, financiers, home-owners and planners want information addressing system power production

over time, O&M costs, and financial risk; effectively scientifically based predictions. Predictions require detailed understanding of potential failures at all levels, effects on system availability, O&M cost, and mitigation required to optimize system reliability. The National Labs work with the PV community, industry and users, to identify and study failures, develop tests that identify potential for failure, and collect and analyze data to predict system reliability. This abstract is subject to government rights.

Biography: **Sarah Kurtz** is managing the Reliability Group at the National Renewable Energy Laboratory. She has worked at NREL since 1985 and is best known for her work with multijunction solar cells and the concentrator industry. Currently, she and her coworkers at NREL and Sandia National Labs are working to support industry's efforts to improve the long-term reliability of PV technologies.

4:00 to 4:30 pm:

Thin Film PV: The Pathway to Grid Parity



David Eaglesham, First Solar, LLC (United States)

Abstract: First Solar is the current benchmark for low-cost PV module manufacturing, with a cost that is well below c-Si PV. The company is growing quickly using Copy Smart replication of production lines to bring up new capacity very rapidly, leveraging the high manufacturability of the CdTe platform. Because of its excellent EPBT, the TF product is a more effective solution to global warming than conventional PV

In 2008 FSLR announced the achievement of the long-standing \$1/W milestone, with a Q4 production cost all-in of \$0.98/W.

However, even for First Solar considerable challenges remain in the drive to cost parity with electricity from the fossil-fuel grid. Grid parity will require a module cost/W that is almost 50% lower than First Solar's current benchmark, and a further 30% reduction in the BoS. This talk will outline the current status, the issues around managing rapid growth and rapid technology change, and the pathway to further reductions in cost. This cost/W roadmap is focused on ongoing efficiency improvements and on leveraging high-volume supply chain and low-cost manufacturing regions.

Biography: **David Eaglesham** is VP technology at First Solar. He has a PhD in Physics from the University of Bristol and achieved tenure as a Lecturer at Liverpool University before joining Bell Labs in 1988. At Bell Labs he worked on semiconductor deposition techniques and doping and became Director of Electronic Device Research. He worked at Lawrence Livermore as Chief Technologist and at Applied Materials as Director of Advanced Technologies before joining First Solar. He is a Fellow of the American Physical Society, was named Outstanding Young Investigator by the Materials Research Society in 1994, and was MRS President in 2005.

4:30 to 5:00 pm:

Concentrating Solar Power for Utility Scale Applications



Raed Sherif, eSolar Inc. (United States)

Abstract: This paper discusses the merits of using concentrated solar power (CSP) to produce electricity whether through the use of concentrated photovoltaic (CPV) or concentrated solar thermal (CST) technologies. CPV is viewed as the most efficient CSP technology, and cost reduction in the case of CPV is sought primarily by increasing the module conversion efficiency. In the case of CST,

the most proven system is the trough technology with over 350 MW installed and in operation for over 20 years. Recently, however, the use of power tower technology, where a field of tracking mirrors (heliostats) focuses the light on receivers that are mounted on top of the towers, has been gaining more popularity. The use of power towers enables achieving higher plant efficiencies by virtue of allowing for higher operating temperatures. Power tower technologies, however, have had limited commercialization path because of the need to deploy large-scale projects (> 200 MW) for them to be commercially feasible. This has been a market entry barrier for some time. This paper presents an innovative modular and scalable approach to power tower technology that has addressed the traditional barriers to market entry.

Biography: **Raed Sherif** is currently the Vice President of International Market Development at eSolar, a concentrating solar thermal company based in Pasadena, California. Prior to eSolar, Raed has been the General Manager of the CPV product line at Boeing-Spectrolab, where he initiated and led the development and commercialization efforts of the company's CPV activities. Raed has received a Ph.D. in Theoretical and Applied Mechanics and a M.S. degree in Heat transfer from the University of Illinois at Urbana-Champaign. Raed holds 30 patents in the fields of semiconductor packaging and photovoltaic and has been a member of the NREL-Spectrolab team that received the Top 100 R&D Award in 2007 for demonstrating concentrator solar cell efficiency above 40%.

Solid State Lighting and OLEDs

Convention Center, Room 6A

Tuesday 4 August. 8:30 am to 10:00 am

8:30 to 9:15 am:

Recent Progress and Future Prospect of High Performance Near-UV Based White LEDs: from ECO Lighting to Medical Application



Tsunemasa Taguchi, Yamaguchi Univ. (Japan)

Abstract: Near ultraviolet (n-UV) based white LEDs can provide the excellent illuminant properties which have high luminous efficacy (>90 lm/W) and high color rendering (~100). Recent progress and future advantage of n-UV white LED science and technology will be described on the basis of our recent results. Practically, low correlated color temperature (Tcc~3000K) white LED with a high flux (~500 lm/

PKG) will be introduced for its lighting and medical applications, such as ecological street lighting and digestive endoscope. The high performance of n-UV white LED lighting system compared to that of the conventional blue-YAG will be clarified.

Biography: **Tsunemasa Taguchi** received his Ph D in electrical engineering from Osaka University in Japan in 1974. After becoming a senior lecture at his alma mater, he went to Britain, where he spent 1981 and 1982 as a visiting research scientist at the physics division of Sussex University (Brighton, England). He became a full professor of the department of electrical and electronic engineering at Yamaguchi University in Japan in 1994. He was a project leader of "The Light for the 21st Century" from of METI/NEDO, MEXT and NIBIO/MHLW in Japan. He acted as conference chairman in the First International Conference on White LEDs and Solid State Lighting (2007).

9:15 to 10:00 am:

High Performance OLEDs for General Lighting



Junji Kido, Yamagata Univ. (Japan)

Abstract: The performance of white-light-emitting OLEDs have been steadily improved and, today, they are considered to be the light source of the next generation. High quantum efficiencies can be obtained by using phosphorescent emitters such as iridium complexes. External quantum efficiency (QE) of 25-30% was achieved for blue, green and red OLEDs, which correspond to the internal QE of nearly

100%. Device lifetime has been significantly improved by using the multiphoton structure. By combining the above techniques, OLEDs can be extremely efficient and possess extremely long lifetime. Luminaires using high performance white OLEDs have been developed.

Biography: **Junji Kido** has received his Ph. D. degree in polymer chemistry from Polytechnic University, New York in 1989. He is a full professor in the Department of Organic Device Engineering at Yamagata University. He has also been the General Director for Research Institute for Organic Electronics founded by the Yamagata prefectural government since 2003. His current research activities are focused on OLEDs. He invented white-light-emitting OLEDs in 1993 for the first time and continuously working on developing high performance OLEDs. His work has been recognized by awards from the Society of Polymer Science, Japan, and Society for Information Display, U.S.A. (2002).

Plenary Sessions

Remote Sensing

Convention Center, Room 6A

Tuesday 4 August. 1:30 to 3:30 pm

1:30 to 2:10 pm:

Virtual Dimensionality for Hyperspectral Imagery



Chein-I Chang, Univ. of Maryland, Baltimore County (United States)

Abstract: Virtual Dimensionality (VD) was recently developed to address the issue of how many spectrally distinct signatures in hyperspectral data. It originates from the pigeon-hole principle where each pigeon-hole is supposed to accommodate a pigeon. If a signal source is interpreted as a pigeon and a band as a pigeon-hole, then a spectral channel/band can

be used to accommodate one signal source. To materialize this idea it is formatted as a binary composite hypothesis testing problem where the Neyman-Pearson detector is designed to determine the VD. This talk discusses the design rationale of VD and its utility in hyperspectral analysis.

Biography: **Prof. Chein-I Chang** is a professor at the University of Maryland, Baltimore County and has published more than 100 refereed journal articles. He also has authored a book, *Hyperspectral Imaging*, edited two books, *Recent Advances in Hyperspectral Signal and Image Processing and Hyperspectral Data Exploitation: Theory and Applications*, and co-edited the book *High Performance Computing in Remote Sensing*. He is an SPIE fellow.

2:10 to 2:50 pm:

Satellite Data Assimilation: Traditional and Innovative Applications



Xiaolei Zou, Florida State Univ. (United States)

Abstract: Satellite data assimilation aims to use satellite data to improve the modeling of the Earth's atmosphere. I will first review a few advanced data assimilation methods to clarify the assumptions that are made in different data assimilation systems with regard to their inputs (e.g., data, model, errors). I will also provide a list of other things, along with data itself, required for satellite data assimilation. Several

real-data examples are then provided to illustrate both traditional and innovative applications of satellite data. Finally, I will discuss the areas that allow for more effective and efficient usage of existing and emerging satellite data as well as the need for engaging more scientists and graduate students in data assimilation.

Biography: **Dr. Xiaolei Zou** received her Ph.D. of Meteorology in 1988. She was an NCAR scientist II before she joined Florida State University in 1997 as an associate professor and in 2001 became a full professor. She was named Charney professor in 2003. She has published 65 journal articles and was recently elected an AMS fellow.

2:50 to 3:30 pm:

The Accomplishments and Future Direction of the Global Space-based InterCalibration System (GSICS)



Mitchell D. Goldberg, NOAA/NESDIS/STAR (United States)

Abstract: The Global Space-based Inter-Calibration System (GSICS) is a new international program to assure the comparability of satellite measurements taken at different times and locations by different instruments operated by different satellite agencies. Sponsored by the World Meteorological Organization and the Coordination Group for Meteorological

Satellites, GSICS will inter-calibrate the instruments of the international constellation of operational low-earth-orbiting (LEO) and geostationary (GEO) environmental satellites and tie these to common reference standards. The inter-comparability of the observations will result in more accurate measurements for assimilation in numerical weather prediction models, construction of more reliable climate data records, and progress toward achieving the societal goals of the Global Earth Observation System of Systems. GSICS includes globally coordinated activities for pre-launch instrument characterization, on-board routine calibration, sensor inter-comparison of near-simultaneous observations of individual scenes or overlapping time series, vicarious calibration using Earth-based or celestial references, and field campaigns. The GSICS program currently includes participation from the United States (NOAA, NASA, NIST), Europe (CNES, EUMETSAT), China (CMA), Japan (JMA) and Korea (KMA).

Biography: **Dr. Mitchell D. Goldberg** is the Chief of the Satellite Meteorology and Climatology Division located in the NOAA/NESDIS Center for Satellite Applications and Research. He is the Program Manager of the GOES-R Algorithm Working Group and the Chair of the WMO Global Space-based InterCalibration System (GSICS). He has received seven Department of Commerce awards for his contributions to remote sensing.

Optical Engineering

Convention Center, Room 6A

Tuesday 4 August. 4:15 to 5:00 pm

4:15 to 5:00 pm:

Optical Design Dependence on Technology Development



Iain A. Neil, ScotOptix (Switzerland)

Abstract: Specific developments in optical technology over the past thirty years including refractive materials, thin film coatings and surface profiles will be discussed. A large variety of optical designs which depend on some of these developments will be described. The optical design examples presented will cover the infrared, visible, ultraviolet and combinations of these wavebands. A novel multi-waveband optical system

that utilizes many of these developments will be illustrated in several possible configurations to meet different application requirements. A summary of the technologies employed in all of the optical design examples will indicate whether or not there may be trends in optical technology development. Most of the optical design examples will be taken from published Patents and hence their optical prescriptions will be available for detailed analysis after the presentation.

Biography: **Dr. Iain A. Neil** is an Optical Consultant based out of Massagno (Lugano), Switzerland and his company, ScotOptix, contracts globally with optical technology companies; providing technical, business and intellectual property expertise with specialization in zoom lenses, multi-configuration optical systems and new technology implementation. Previously, he was employed as Executive Vice

President of Research and Development and Chief Technical Officer at Panavision Inc., Manager Systems Engineering at Ernst Leitz Canada Ltd. (now Raytheon) and Head of Optical Design at Barr & Stroud Ltd (now Thales). He has over 150 worldwide optically related patents issued and applied for, has published and edited 30+ papers and books and has garnered 11 Academy Awards, 2 Emmy's and the Fuji Gold Medal. In 2003, he was awarded Alumnus of the Year from the University of Strathclyde in Scotland, and in 2004 became Visiting Professor of their Department of Physics. He has been active in the optics industry for over 30 years and is currently a member of SPIE, OSA, SMPTE, ASC and ©A.M.P.A.S.®

Photonic Devices and Applications

Convention Center, Room 6A

Wednesday 5 August 8:30 am to 12:00 pm

8:30 to 9:00 am:

“Plastic” Solar cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation



Alan J. Heeger, Univ. of California, Santa Barbara (United States)

Abstract: I will summarize recent progress on the nano-structure and performance of bulk heterojunction (BHJ) solar cells fabricated from semiconducting polymers.

(a) Transmission electron microscopy (TEM) through thin sections cut from films of the bulk heterojunction (BHJ) material comprising *rr*-poly(3-hexylthiophene), *rr*P3HT, and [6,6]-Phenyl-C61 butyric acid methyl ester (PCBM) provides information on the cross-sectional nano-morphology. “Column-like” structures are observed in the defocused cross-sectional TEM images. These “column-like” heterojunction structures (nano-scale solar cells) lead to photoinduced charge separation and provide the required pathways for charge transport across the film thickness. Calculations of the power spectral density and the autocorrelation function of the vertical pathways yield the average domain sizes; 11 nm for PCBM and 14 nm for P3HT.

(b) I will describe the fabrication and measurement of solar cells with 6% power conversion efficiency using the alternating co-polymer, poly[N-9'-hepta-decanyl-2,7-carbazole-alt-5,5-(4',7'-di-2-thienyl-2',1',3' benzothiadiazole), PCDTBT, in bulk heterojunction (BHJ) composites with the fullerene derivative [6,6]-phenyl C₇₀-butyric acid methyl ester (PC₇₀BM). The PCDTBT/PC₇₀BM solar cells exhibit the best performance of any BHJ system studied to date; $J_{sc} = 10.6$ mA/cm², $V_{oc} = 0.88$ V, $FF = 0.66$ and $\eta_e = 6.1\%$ under air mass 1.5 global (AM 1.5G) illumination of 100 mW/cm². The internal quantum efficiency (IQE) is close to 100%, implying that essentially every absorbed photon results in a separated pair of charge carriers and that all photogenerated carriers are collected at the electrodes.

Biography: **Prof. Alan J. Heeger** serves as Professor of Physics and Professor of Materials at the University of California, Santa Barbara and also heads a research group at the university's Center for Polymers and Organic Solids. He was awarded the Nobel Prize in Chemistry (2000) for his pioneering research in and the co-founding of the field of semiconducting and metallic polymers; his research efforts continue to focus on the science and technology of semiconducting and metallic polymers. Current interests include studies of bio-specific sensors for DNA and proteins.

9:00 to 9:30 am:

Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry



Tobin Marks, Northwestern Univ. (United States)

Abstract: Chemists are exceptionally skilled in the design and construction of individual molecules with the goal of imbuing them with engineered chemical and physical properties. However, the task of rationally assembling them into organized, functional supramolecular structures with precise, nanometer-level control of electronic and photonic properties is a daunting challenge. In this lecture,

approaches to addressing these challenges are described in which the ultimate goal is the fabrication of unconventional organic, inorganic, and organometallic electronic circuitry by high-throughput, large area printing techniques. Issues here include not only the rational design and realization of high-mobility p- and n-type organic and non-organic semiconductors for CMOS electronics, but also the rational design and realization of modular high- dielectrics with ultra-large capacitance, low leakage, high breakdown fields, and radiation hardness. It is seen that these approaches, combined with new processing strategies can be successfully applied to afford high-performance electronic circuits and devices for diverse applications.

Biography: **Tobin J. Marks** is the Vladimir N. Ipatieff Professor of Chemistry and Professor of Materials Science and Engineering at Northwestern University. He received his B.S. from the University of Maryland (1966) and Ph.D. from MIT (1971), and came to Northwestern immediately thereafter. Of his 65 named lectureships and awards, he has received American Chemical Society Awards in Polymer Materials, 1983; Organometallic Chemistry, 1989; Inorganic Chemistry, 1994; the Chemistry of Materials, 2001; and for Distinguished Service in the Advancement of Inorganic Chemistry, 2008. He was awarded the 2000 F. Albert Cotton Medal, Texas A&M American Chemical Society Section; 2001 Willard Gibbs Medal, Chicago American Chemical Society Section; 2001 North American Catalysis Society Burwell Award; 2001 Linus Pauling Medal, Pacific Northwest American Chemical Society Sections; 2002 American Institute of Chemists Gold Medal; 2003 German Chemical Society Karl Ziegler Prize; 2003 Ohio State University Evans Medal; 2004 Royal Society of Chemistry Frankland Medal, 2005 Bailar Medal, Champaign-Urbana Section of the American Chemical Society, Fellow, American Academy of Arts and Sciences, 1993; Member, U. S. National Academy of Sciences, 1993; Member, Leopoldina German Academy of Natural Sciences, 2005; Fellow, Royal Society of Chemistry, 2005. In 2005, he was awarded the National Medal of Science, the highest scientific honour bestowed by the United States Government. In 2008, he was awarded the Principe de Asturias Prize for Technical and Scientific Research in Materials, and was made an Honorary Fellow of the Chemical Research Society of India. Marks is on the editorial boards of 9 major journals, has published 920 research articles, and holds 93 U.S. patents.

Plenary Sessions

Photonic Devices and Applications

Wednesday 5 August continued.

9:30 to 10:00 am:

Photonic Metamaterials: Optics Starts Walking on Two Feet



Martin Wegener, Institut für Angewandte Physik and DFG-Ctr. for Functional Nanostructures (CFN), Univ. Karlsruhe (Germany) and Institut für Nanotechnologie, Forschungszentrum Karlsruhe GmbH (Germany)

Abstract: Metamaterials are composed of tailored subwavelength functional building blocks (photonic atoms) that are densely packed into an effective material. Along these lines, optical material properties can be achieved that simply do not occur in natural

substances. Examples are magnetism at optical frequencies, negative phase velocities, giant circular dichroism via chirality, and enhanced optical nonlinearities. For realizing photonic metamaterials, 2D and 3D nanofabrication approaches are required. In this talk, I give an introduction into this emerging field, review recent progress, and highlight remaining challenges.

Biography: After completing his PhD in physics in 1987 at Johann Wolfgang Goethe-Universität Frankfurt (Germany), **Martin Wegener** spent two years as a postdoc at AT&T Bell Laboratories in Holmdel (USA). From 1990-1995 he was C3-Professor at Universität Dortmund (Germany), since 1995 he is C4-Professor at Universität Karlsruhe (TH). Since 2001 he has a joint appointment at Institut für Nanotechnologie of Forschungszentrum Karlsruhe GmbH. Since 2001 he is also the coordinator of the DFG-Center for Functional Nanostructures (CFN) in Karlsruhe. His research interests comprise ultrafast optics, (extreme) nonlinear optics, near-field optics, photonic crystals, and photonic metamaterials. This research has led to various awards and honors, among which are the Alfred Krupp von Bohlen und Halbach Research Award 1993, the Baden-Württemberg Teaching Award 1998, the DFG Leibniz Award 2000, the European Union René Descartes Prize 2005, the Baden-Württemberg Research Award 2005, and the Carl Zeiss Research Award 2006. Since 2006, he is also a member of Leopoldina, the German Academy of Sciences and, since 2008, Fellow of the Optical Society of America (OSA) and Fellow of the Hector Foundation.

10:30 to 11:00 am:

WISE: the Widefield Infrared Survey Explorer



Edward L. Wright, Univ. of California, Los Angeles (United States)

Abstract: WISE is a NASA Medium Explorer (MIDEX) which will survey the entire sky in 4 mid-infrared bands at 3.3, 4.7, 12 and 23 microns with vastly greater sensitivity than previous all-sky surveys at these wavelengths. WISE should detect the most luminous galaxies in the Universe, the nearest brown dwarfs to the Sun and measure the radiometric diameters

of about 250,000 asteroids. WISE uses a 40 cm cryogenic telescope, 1024x1024 arrays, a scan mirror to freeze images on the arrays while the spacecraft moves continuously, and will take 47"x47" images every 11 seconds. WISE is expected to launch in late 2009.

Biography: **Ned Wright** was a student at Harvard, and then a Junior Fellow in the Harvard Society of Fellows. He then taught at MIT before moving to UCLA. He was a co-I on COBE, is a co-I on WMAP and an inter-disciplinary scientist on the Spitzer Space Telescope, and the PI on WISE. He is currently the David Saxon Presidential Chair in Physics at the UCLA Department of Physics and Astronomy.

11:00 to 11:30 am:

N/MEMS: Building the Future from the Inside Out



Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

Abstract: DARPA is pleased to have been part of the creation of many diverse technologies, new materials, and the processing and manufacturing methodologies that go into microsystems. In many areas of both physical and chemical microsystems, key principles of multi-domain scaling and hybrid integration of sub-components have represented successful strategies.

NEMS includes the integration of sensors, actuators, electronics, photonics, energy, fluidics, chemistry, and biology into a meaningful system enabled by nanotechnologies, sub-micrometer science, and engineering precision. This talk will describe some selected examples of DARPA MEMS particularly where opportunities for new capabilities and significantly enhanced performance over macroscale sensor approaches have been demonstrated.

DARPA's experience in MEMS over the past decade has brought out six important themes: 1) MEMS and nanotechnology enable performance, 2) "smaller is better" is a consequence of multi-domain scaling; 3) simple is better, 4) MEMS technology commitment drives systems integration and innovation, 5) MEMS are reliable, and 6) a national MEMS basic research infrastructure is important to continued U.S. leadership. These valuable lessons have brought not only useful commercial and defense microsystems components, but are also showing the way to the beginning of the next technological revolution - NEMS, or nanoelectromechanical systems.

Biography: **Dennis L. Polla** joined the Defense Advanced Research Projects Agency (DARPA) Microsystems Technology Office in 2004. He received S.B. degrees in electrical engineering and physics, the S.M. degree in electrical engineering, and the electrical engineering (E.E.) degree from the Massachusetts Institute of Technology, Cambridge. He received the Ph.D. degree in electrical engineering and the M.B.A. degree from the University of California, Berkeley. Dr. Polla currently manages DARPA programs in nanotechnology and MEMS.

11:30 am to 12:00 pm:

Talking Between Quantum Dots and a Quantum Well



Gregory J. Salamo, Univ. of Arkansas (United States)

Abstract: We present experimental results and corresponding discussion of coupling between a photo-excited quantum-dot layer and quantum well. The coupling is understood by investigating the dependence of quantum-dot photoluminescence as a function of dot-well barrier thickness. For small thickness of the dot-well barrier, the signal shows an

anomalous low intensity behavior. This behavior is explained by sub-picosecond tunneling between the quantum dot layer and quantum well. As the barrier thickness increases the quantum-dot photoluminescence signal increases at first but then again decreases. This and other unusual behavior of the communication between a quantum-dot layer and quantum well will be discussed.

Biography: **Gregory J. Salamo** received the Ph.D. in physics from City University of New York while he also worked as an intern student at Bell Laboratories. His postdoctoral work was at the Institute of Optics at the University of Rochester. He is now Distinguished Professor of Physics and the Basore Professor in Nanotechnology and Innovation at the University of Arkansas. He has carried out research on optical solitons and the optical properties of semiconductors and has published over 200 papers in referred journals.

X-Ray, Gamma-Ray, and Particle Technologies

Convention Center, Room 6A

Wednesday 5 August 1:30 to 5:00 pm

1:30 to 2:15 pm:

Material Properties Limiting the Performance of Cadmium Zinc Telluride X-Ray and Gamma-Ray Detectors



Ralph B. James, Brookhaven National Lab. (United States)

Abstract: Cadmium zinc telluride (CZT) is one of the most promising materials for the production of large-volume gamma-ray spectrometers and imaging arrays operable at room temperature. The performance of CZT devices, the global capacity for growth of detector-grade crystals, and the size of the commercial market have progressed steadily over the past 5-10 years.

Because of deficiencies in the quality of the material, commercial high-resolution CZT spectrometers are still limited to relatively small dimensions (<3 cm³), which makes them inefficient at detecting high photon energies (> 1 MeV) and somewhat ineffective for weak radiation signals except in proximity to the source. The detectors are very attractive for a much broader range of spectroscopic and imaging applications; however, increases in their efficiency are needed without sacrificing the ability to spectrally resolve gamma energies. Achieving the goal of low-cost efficient CZT detectors requires progress in the following areas: better uniformity of detector response, growth of large uniform single crystals, and improved device fabrication procedures. Despite the current material constraints, several types of electron-transport-only detectors have been developed: pixel, coplanar-grid, cross-strip, drift-strip, orthogonal coplanar strip, and virtual Frisch-grid, some of which are now addressing important applications. This talk summarizes the material factors limiting performance of CZT detectors and provides new insight into the critical role of small-scale defects on the energy resolution and efficiency of detectors.

Biography: **Dr. Ralph James** is the 2009 SPIE President Elect. He served as the Associate Laboratory Director for the Energy, Environment and National Security Directorate with the U.S. Department of Energy's Brookhaven National Laboratory from 2001-2008. He is currently a Program Manager and Senior Scientist at BNL, where he manages a range of basic and applied research devoted to materials, electronic and imaging devices, and integrated circuits. Over his career Dr. James has managed over \$1 billion of funds devoted to R&D in energy, environment, medical imaging, space, national security and defense. He has authored more than 430 scientific publications, served as editor of 17 books, and holds 11 patents. He is a Fellow of the SPIE, IEEE, AAAS, OSA, and APS, and he has received numerous prestigious international honors in recognition of his scientific accomplishments.

2:15 to 3:00 pm:

Coherence and X-ray Imaging



Keith A. Nugent, Univ. of Melbourne (Australia)

Abstract: The coherent output of X-ray sources is increasing at a fantastic rate, exceeding, by some measures, even that of Moore's law [1]. Methods that use the coherent output are evolving alongside the sources to enable the maximum use of this capacity. In this talk I will explore the development and applications of coherence-based X-ray imaging methods, including phase-contrast imaging and

coherent diffractive imaging (CDI). After describing the methods and some applications of phase-contrast imaging, I will concentrate on the ideas underpinning CDI. In large part, the development of CDI is motivated by the prospect of the imaging of single biomolecules using highly intense pulses from X-ray free-electron lasers. However it is also showing signs of becoming an important technique for high-resolution lensless imaging at third-generation synchrotron sources. I review progress in the methodology, exploring how it can be applied to general extended objects using the ptychographical [2] and keyhole [3] approaches. I will also discuss methods that incorporate and can use the less than perfect spatial coherence available from third-generation synchrotron sources.

[1]. Frahm R, Williams G: Twenty Years of Synchrotron Radiation. Synchrotron Radiation News 2007, 20(1):2.

[2]. Thibault P, Dierolf M, Menzel A, Bunk O, David C, Pfeiffer F: High-resolution scanning x-ray diffraction microscopy. Science 2008, 321(5887):379-382.

[3]. Abbey B, Nugent KA, Williams GJ, Clark JN, Peele AG, Pfeifer MA, De Jonge M, McNulty I: Keyhole coherent diffractive imaging. Nature Physics 2008, 4(5):394-398.

Biography: **Keith A. Nugent** is Laureate Professor of Physics and Research Director of the Australian Research Council Centre of Excellence for Coherent X-ray Science at the University of Melbourne. His research explores methods that use the coherence properties of X-rays, including the development of phase-contrast and diffractive imaging. He has received a number of awards for his work, including the 2004 Victoria Prize from the Victorian State Government in Australia for excellence in science, engineering and technology, and two RD100 awards for innovation. He is a Fellow of the Australian Academy of Science and a Director of the company latia Ltd.

3:00 to 3:30 pm: Coffee Break

Plenary Sessions

X-Ray, Gamma-Ray, and Particle Technologies

Wednesday 5 August continued.

3:30 to 4:15 pm:

Sources and Optics for Laboratory X-Ray Micro Imaging



Hans Hertz, Royal Institute of Technology (Sweden)

Abstract: We describe new compact x-ray sources and efficient x-ray optics that open up new possibilities for laboratory x-ray imaging in both the soft and hard x-ray regimes. In the soft x-ray region (<kV) we combine our high-brightness liquid-jet laser plasma source with state-of-the-art normal-incidence multilayer optics and 20-nm zone-plate optics to demonstrate the first laboratory water-window x-ray microscope. Recent

developments involve 15-nm zone width optics, diffractive optical elements for DIC and Zernike microscopy, 25-nm resolution imaging, tomography and applications in soil science. In the hard x-ray regime (>10 kV) we show that our electron-impact liquid-metal-jet-anodes x-ray tube has potential for >100× higher x-ray brightness than present laboratory sources while still operating at high power levels. The present e-beam power density is >2 MW/mm². This source provides the necessary spatial coherence for high-resolution phase-contrast imaging, ultimately with attractive exposure times. We report in-line holographic phase imaging with excellent contrast and few-μm detail and initial tests towards biomedical applications

Biography: **Hans M. Hertz** received his Ph.D. in optical physics 1988. Since 1997 he is professor at the Royal Inst. of Technol. (KTH), Stockholm, where his team primarily works on x-rays and ultrasonics for biomedical and materials applications. His group pioneered liquid-jet laser-plasma sources for soft x-ray and EUV applications and demonstrated the first compact water-window x-ray microscope with sub-optical resolution. Present work on soft x-rays is focused on high-resolution diffractive optics and applications of microscopy. The last few years he extended his imaging interests to the hard x-ray regime, based on the invention of the electron-impact liquid-metal-jet anode x-ray tube. This new laboratory source has potential for several orders of magnitude higher brightness than present small-spot x-ray tubes, thus allowing laboratory phase imaging with very high spatial resolution. In acoustics, he pursues biomedical applications of ultrasonic radiation pressure, especially single-cell manipulation in micro-fluidics systems. Hertz leads a research group of approx. 25 people and is also head of the Dept of Applied Physics at KTH. He is a fellow of the Swedish Royal Academy of Sciences and the Swedish Royal Academy of Engineering Sciences.

4:15 to 5:00 pm:

Compact Soft X-ray Lasers: a Doorway to Coherent Soft X-ray Science on a Table-top



Jorge J. Rocca, Colorado State Univ. (United States)

Abstract: There is keen interest in generating intense, coherent, soft x-ray beams for scientific and technology applications. Advances in plasma-based amplifiers allow the generation of very bright, highly coherent, soft x-ray laser beams on a table-top. Collisional electron impact excitation of highly charged ions in plasmas heated by a table-top short pulse optical laser have resulted in saturated 5 Hz repetition rate lasers at

wavelengths down to 13.2 nm, and in lasing down to 10.9 nm. Injection seeding of these plasma amplifiers with high harmonic pulses results in essentially fully coherent pulses soft x-ray laser pulses of 1 picosecond duration. At longer wavelengths extremely compact desk-top size lasers can generate high average power using fast discharge excitation of a capillary channel. These lasers are allowing new experiments with intense soft x-ray light in small laboratory environments, including the demonstration of broad area microscopes with resolution down to 38 nm, mask-less patterning of nano-scale devices, single photon ionization spectroscopy of molecules and nanoclusters, and the interferometric diagnostics of dense plasmas.

Biography: **Prof. Jorge J. Rocca** is a University Distinguished Professor in the Department of Electrical and Computer Engineering and Department of Physics at Colorado State University. He serves as the Director of the National Science Foundation Engineering Research Center for Extreme Ultraviolet Science and Technology, a collaboration between Colorado State University, the University of Colorado, and the University of California Berkeley. He has made significant contributions to the development, physics, and application of compact Soft X-ray lasers, and to the study of plasmas. He has published 200 peer review journal articles and given more than 100 invited talks in these topics. He has also co-chaired several international conferences on the subject of short wavelength coherent radiation generation and applications. Prof. Rocca is a Fellow of the American Physical Society, the Optical Society of America, and the Institute of Electrical and Electronic Engineers. For 2007-2008 he was an IEEE LEOS Distinguished Lecturer. He was an NSF Presidential Young Investigator.

Technical Special Events

Illumination Technical Event

Marriott Hotel, Marina F

Monday 3 August 8:00 to 10:00 pm

Chair: **Jake Jacobsen**, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: **Prof. Roland Winston**, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Panel Discussion:

Commercialization of Next Generation Solar Technologies

Convention Center, Room 6A

Tuesday 4 August 10:30 am to 12:00 pm

Moderators:

Loucas Tsakalacos, GE Global Research (United States) and

Sean E. Shaheen, Univ. of Denver (United States)

Panelists:

Harry A. Atwater, Jr., California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Panel Discussion:

Is Indivisible Single Photon Really Essential for Quantum Communications, Computing and Encryption?

Convention Center, Room 11A

Tuesday 4 August 3:40 to 5:40 pm

Moderators: **Chandrasekhar Roychoudhuri**, Univ. of Connecticut (United States) and **Selim M. Shahriar**, Northwestern Univ. (United States)

Panelists:

Juliana H. J. Brooks, General Resonance (United States)

John E. Carroll, Univ. of Cambridge (United Kingdom)

Andrei Yu. Khrennikov, Växjö Univ. (Sweden)

Al F. Kracklauer, Bauhaus Univ. Weimar (Germany)

Chary Rangacharyulu, Univ. of Saskatchewan (Canada)

Presentations:

Interdependence of quantization of massive particles and electromagnetic fields and the need for photons in quantum computing (Keynote Presentation), Selim M. Shahriar, Northwestern Univ. (United States)

Information in a photon: further considerations, Subhash C. Kak, Oklahoma State Univ. (United States)

Penetrating Radiation Technical Event

Marriott Hotel, Balboa

Tuesday 4 August 8:00 to 10:00 pm

Chair: **Warnick J. Kernan**, Pacific Northwest National Labs.

Panel Discussion:

Alternatives to the use of helium-3 for neutron detection

Alan Janos (Department of Homeland Security/Domestic Nuclear Detection Office) will give the introductory comments for the group discussion. The panelists are Zane Bell (Oak Ridge National Laboratory), Richard Kouzes (Pacific Northwest National Laboratory), Douglas McGregor (Kansas State University) and Stephen Payne (Lawrence Livermore National Laboratory). Warnick Kernan (Pacific Northwest National Laboratory) will be the moderator.

Workshop:

X-Ray Mirror Optics

Marriott Cardiff

Tuesday 4 August 8:00 to 9:00 pm

Chair: **Ali M. Khounsary**, Argonne National Lab.

This workshop is an informal meeting of colleagues interested in the fabrication, metrology, and implementation of advanced mirrors for x-ray, laser, and related applications.

Panel Discussion:

Life in the Cosmos

Marriott Hotel, Marina F

Tuesday 4 August 8:00 to 10:00 pm

Moderators: **Richard B. Hoover**, NASA/MSFC/NSSTC and **David S. McKay**, NASA/JSC

Panelists:

Asim K. Bej, Univ. of Alabama, Birmingham

Michael H. Engel, Univ. of Oklahoma

Victor A. Gallardo, Univ. of Concepción, Chile

Gilbert V. Levin, Arizona State Univ.

Nilton O. Renno, Univ. of Michigan

Michael C. Storrie-Lombardi, Kinohi Institute

Water appears to be essential to all life on Earth. For this reason, "Follow the Water" has been adopted as a mantra for the search for Life in the Cosmos. Expeditions have helped to establish the limits and biodiversity of life in the most extreme environments on Earth. Microbial extremophiles inhabit acidic streams, hypersaline and hyperalkaline lakes; the cold deep sea floor and sulfurous sediments of oxygen deficient ecosystems; and the high mountain glaciers and the permafrost and perennially ice-covered lakes of the polar regions. Thermophilic microorganisms thrive in deep-sea hydrothermal vents and hot rocks deep within the Earth's crust.

The ESA Venus Express Spacecraft entered Venusian Orbit in 2006 and has shown that Venus is much more similar to Earth and Mars than previously thought. The Venus Express Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) detected hydroxyl in the atmosphere of Venus. It has found huge hurricane-like vortices above the poles of the planet and mysterious dark bands in the upper atmosphere from as yet unidentified UV absorbers. At 70 km and below, water vapor and sulfur dioxide combine to form sulfuric acid droplets that create a haze above the cloud tops. Thermophilic acidophiles, such as have recently been discovered on Earth, could possibly survive in the hot sulfuric acid droplets that exist in the upper atmosphere of Venus. In order to understand how to search for life elsewhere in the Solar System, over forty VIRTIS images of Earth from Venus have been obtained seeking to detect evidence of life on Earth. The signatures of water and molecular Oxygen were detected in the Earth's atmosphere, but the atmosphere of Venus also exhibits these signatures.

Technical Special Events

The water and water ice are far more abundant on comet, the polar caps and permafrost of Mars and the icy moons of Jupiter and Saturn. These “frozen worlds” of our Solar System, are promising environments where extant or extinct microbial life may exist. The ESA Mars Advanced Radar for Subsurface and Ionospheric Sounding (MARSIS) probe has found that both the North and South Polar Caps of Mars are approximately 3.5 km thick and are composed almost entirely of water ice. In winter, a thin dry ice layer covers the caps, but it sublimates directly to the atmosphere in the spring. The ESA Mars Express Orbiter images reveal Rupes Tenuis to be a vast snow-laden region on the southern edge of the Martian North Polar Cap. The Mars Exploration Rover Spirit found alkaline volcanic rocks in the Gusev Crater and the Phoenix Mars Lander has shown that the soil of Mars is much more alkaline than previously expected. The Phoenix Mars Lander has also made direct observations of frozen and liquid water on Mars. Expeditions to Alaska, Siberia, and Antarctica have shown that viable microorganisms can remain frozen in permafrost or ice for long periods of time. These discoveries increase the possibility that the Labeled Release Experiment may have discovered life on Mars during the Viking Mission. They provide strong impetus for the return of life detection experiments to Mars and new missions to search for life on comets icy moons of the Solar System. The Russian/ESA Phobos-Grunt Mission is planned (October, 2009 Launch) is planned to land on the Mars moon, Phobos, and return samples to Earth.

The NASA Deep Impact probe found the temperature of most of the surface of comet 9P/Tempel 1 at 1.5 AU was 273 - 280 K. This is just above the ice/water phase change temperature, suggesting the possibility of water ice thawing near the comet's surface. A spectrometer on board the spacecraft detected a mixture of clay and carbonate minerals (that form in the presence of liquid water) streaming off the comet after the collision with the impactor. The study of chemical and mineral biomarkers, chiral amino acids and possible indigenous microfossils in SNC and carbonaceous meteorites continues. These results suggest that comets should be considered prime targets in the search for Life in the Cosmos. The ESA Rosetta mission is on track to rendezvous with comet 67P/Churyumov-Gerasimenko.

Changes in the spin rate of Saturn's moon Titan indicate that it may also harbor a 300 km thick liquid water ocean beneath its icy crust. The NASA/ESA/Italian Space Agency Cassini Spacecraft has imaged geysers containing water vapor, methane, carbon dioxide and organics erupting from the “tiger stripe” regions near the South Pole of Saturn's moon Enceladus. The high temperatures observed, the water vapor and large number of ice particles expelled suggest that a liquid water lake may exist beneath the “tiger stripe” ice cracks of Enceladus. The potential for life on Jupiter's icy moons is so great that NASA and ESA are planning a twenty-year mission to search for life elsewhere in the Solar System. The NASA Jupiter Europa Orbiter and the ESA Jupiter Ganymede Orbiter missions are being planned for launch in 2020 with arrival at the Jupiter System in 2025. Recent space observations combined with new information about the ability of microorganisms to inhabit extreme environments suggest that life may be far more widely distributed in the Cosmos than previously thought possible.

The Panelists will review recent discoveries and provide their own insights about Life in the Cosmos -- followed by a question and answer session with the audience.

Optomechanical/Instrument Technical Event

Marriott Hotel, Mission Hills

Tuesday 4 August. 8:00 to 10:00 pm

Chair: Alson E. Hatheway, Alson E. Hatheway Inc.

This is the annual meeting of the premier group of optomechanical engineers that design and analyze the world's optical instruments and systems.

Our feature speaker will be Scott Texter, the manager of the JWST Telescope for Northrop Grumman Aerospace Systems. He will review the progress on the development of the James Webb Space Telescope for us.

The James Webb Space Telescope (JWST) is a large, infrared-optimized space telescope, scheduled for launch in 2013. JWST will find the first galaxies that formed in the early Universe, connecting the

Big Bang to our own Milky Way Galaxy. JWST will peer through dusty clouds to see stars forming planetary systems, connecting the Milky Way to our own Solar System. JWST's instruments will be designed to work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range. JWST will have a large mirror, 6.5 meters (21.3 feet) in diameter and a sunshield the size of a tennis court. Both the mirror and sunshade won't fit onto the rocket fully open, so both will fold up and open only once JWST is in outer space. JWST will reside in an orbit about 1.5 million km (1 million miles) from the Earth.

This gathering is open to all attendants to the Optics and Photonics Symposium. Anyone who wishes to put an item on the agenda should contact the Chair, Al Hatheway, at aeh@aehinc.com.

Following the speakers and other agenda items the floor will be open for our traditional 'Problems and Solutions Workshop' session so bring some challenges before the group.

Lens Design Technical Event

Marriott Hotel, Marina D

Tuesday 4 August. 8:00 to 10:00 pm

Chairs: Rich Pfisterer, Photon Engineering, LLC; Mary Turner, Braelut Research Organization, Inc.; Steve Johnston, Photon Engineering, LLC

“Let's Give 'Em Something to Talk About!”

Join us for our yearly gathering of experienced, “recognized” professional lens designers as we meet and discuss...lens design! We will hear about what they're designing, how they're going about doing it (what materials, software, techniques, etc.), and what problems they're encountering. We will also explore current technical and commercial trends in the marketplace.

Featured speaker this year will be Ren Ng, Refocus Imaging, Inc., giving a talk on Digital Light Field Photography. Digital light field photography begins with recording the radiance along all rays (the 4D light field) flowing into the image sensor. By processing the light field, we can implement the physical functions of the camera as software. This transformation eliminates physical constraints and enables features we thought were impossible. One of the revolutionary features enabled by this platform is refocusing photographs after taking the picture. Light field imaging also enables reduction of lens aberrations in software after exposure, which enables the design of lighter, cheaper lenses with more powerful zoom and aperture.

Ren Ng is Founder and CEO of Refocus Imaging, a startup company in the emerging area of computational photography. Dr. Ng graduated with his PhD from the Computer Science department at Stanford, where his dissertation on light field photography won the Arthur Samuel Thesis Award for the best dissertation in Stanford Computer Science, and went on to win the Association of Computing Machinery's Doctoral Dissertation Award for the best PhD in computer science and engineering judged against PhDs from around the world.

Panel Discussion:

Issues with Mid-Frequency Surface Errors for Metrology and Fabrication

Convention Center, Room 32A

Wednesday 5 August. 3:30 to 4:30 pm

Moderator:

James H. Burge, College of Optical Sciences, The Univ. of Arizona

Panelists:

Leslie L. Deck, Zygo Corp.

James E. Harvey, CREOL, The College of Optics and Photonics, Univ. of Central Florida

Jay Kumler, Coastal Optical Systems, Inc.

Paul E. Murphy, QED Technologies, Inc.

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Convention Center, Hall C

Tuesday 4 August 10:00 am to 5:00 pm
 Wednesday 5 August 10:00 am to 5:00 pm
 Thursday 6 August 10:00 am to 2:00 pm

See these companies!

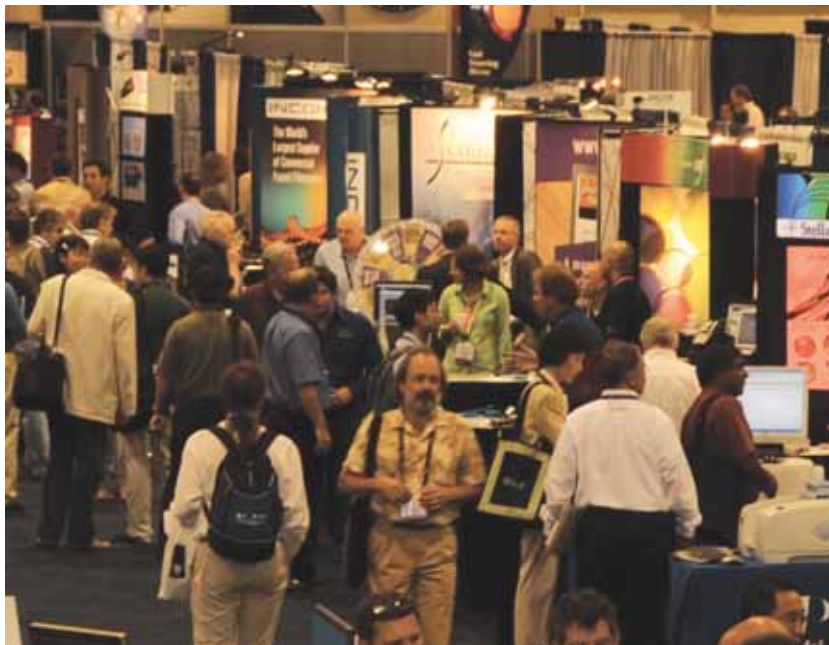
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SPIE Works Career Fair

Convention Center, Hall C

Tuesday 4 August | 10:00 am to 5:00 pm

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Whether you are looking for a better job, re-entering the workforce or just starting your career, this career fair is a great place to start!

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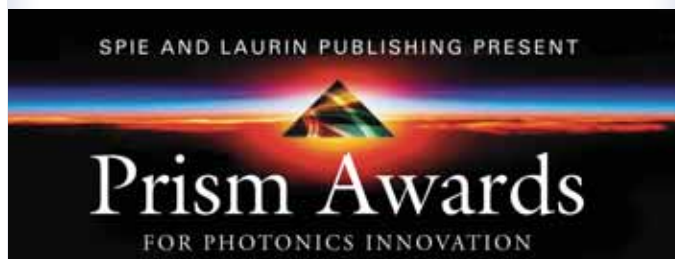
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NobelPeak Vision	TriWave Camera
Tessera	OptiML WLC
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Daylight Solutions	Broadly tunable, CW Mode-hop-free laser system
Product demonstrations Tuesday–Thursday, 11:00 to 11:30 am	
Sensor Electronic Technology Inc.	Deep UV Light Sources
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Soyndra	Solar photovoltaic (PV) system

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Events for Students/Early Career Professionals

Student Chapter Leadership Workshop

Marriott Hotel, Ballroom C

Saturday 1 August 8:00 am to 4:00 pm

Event by Invitation Only.

Join us for engaging speakers, professional development opportunities, and a chance to connect with Student Chapter Leaders from around the world! Collaborate with your peers, find new colleagues, and learn how to get the most from your Student Chapter involvement. You'll also learn the nuts and bolts of SPIE Student Membership Benefits such as Student Chapter funding, scholarships, travel grants, and visiting lecturers.

Please e-mail students@spie.org for more information.

Professional Skills Workshop

Marriott Hotel, Marina E

Sunday 2 August 9:00 am to 12:30 pm

Open to all Students and Early Career Professionals.

Join us for an exciting keynote discussion and break-out sessions focusing on education and professional skills development. Come ready to share your thoughts and ideas!

Panel Discussion

Marriott Hotel, Marina E

Part of the Professional Skills Workshop

Sunday 2 August 9:00 am to 10:30 am

Gain valuable insight into careers in optics/photonics at this panel discussion featuring representatives from academia, industry, and government.

Professional Development Skills

Marriott Hotel, Carlsbad & Cardiff

Part of the Professional Skills Workshop

Sunday 2 August 10:45 am to 12:20 pm

Keynote Luncheon

Marriott Hotel, Marina G

Sunday 2 August 12:30 to 1:30 pm

Open to all Students and Early Career Professionals

The morning's workshops conclude with lunch and a talk by Dr. Eugene Arthurs, SPIE CEO.

Early Career Networking Social

Marriott Hotel, South Poolside

Sunday 2 August 6:00 to 7:30 pm

Open to all Early Career Professionals.

Enjoy a casual outdoor networking event while getting connected with the larger optics and photonics community. Distinguished guests include technical experts and members of the SPIE Board of Directors.

"No Ties" Student Social

Marriott Hotel, South Poolside

Sunday 2 August 7:30 to 9:00 pm

Relax and hang out with new friends and peers while enjoying the warm weather and a West Coast sunset. No ties required but please bring photo ID - this is a licensed event.

Women in Optics Presentation and Reception

Convention Center, Room 11B

Monday 3 August 5:00 to 6:30

Open to all conference attendees.

Join us for an evening of networking and inspiration. Connect with others in our industry while enjoying wine and cheese refreshments.

See page 11 for complete details.

Lunch with the Experts—A Student Networking Event

Marriott Hotel, Marina G

Monday 3 August 12:30 to 1:30 pm

Advance Sign-up Required. Seating Limited.

Enjoy a casual meal with colleagues at this engaging networking opportunity. This event features experts willing to share their experience and wisdom on career paths in optics and photonics and an awards presentation for Newport Spectra-Physics travel grant winners. Lunch is complimentary to all students.

Advance sign-up by 10:00 am Monday in the Marketplace required.

Sponsored by:



Newport and Spectra-Physics Research Excellence Travel Awards

The Newport Spectra-Physics Research Excellence Travel Awards Program provides financial support for university students to attend the two largest SPIE meetings in order to present their research. These travel grants are open to any student who has an accepted paper for presentation at Photonics West or Optics+Photonics. Recipients will be selected based on both the quality of the original research described in the submitted paper(s) and financial need.

For application information for this and other SPIE travel grants visit Scholarships and Grants online at spie.org/scholarships.

SPIEWorks Career Fair Special 2-Day Event!

Convention Center, Exhibition Hall C

Tuesday 4 August 10:00 am to 5:00 pm

Wednesday 5 August 10:00 am to 5:00 pm

Top employers are coming together to interview and hire engineers and scientists like you. The SPIEWorks Career Fair at Optics+Photonics is a great place to get 'face to face' time with employers and interview on the spot, learn more about the jobs available in our industry, and network!

Free Admission; Registration Required.

Whether you are looking for a better job, re-entering the workforce or just starting your career, the SPIEWorks Career Fair is the place to start!

In addition to the onsite recruitment activities listed above, SPIEWorks offers you online services to help you with your search for employment before, during, and after the conference. Visit spieworks.com to post your resume, view jobs, or sign up for email alerts.

Free Services for Employers

Don't Miss This Recruiting Opportunity

- Stop by the SPIEWorks booth in the Career Fair and gain access to our proprietary resume database at no charge.
- Post jobs for free. That's right, there's no charge to post jobs to the Optics+Photonics Career Fair. Go to spieworks.com, create an account and sign in to post jobs online. Your free job(s) will be live 3-9 August.

Panel Discussion

Getting Hired in 2009 and Beyond

Convention Center, Hall C

Tuesday 4 August 2:30 to 3:30 pm

Learn about the corporate hiring process directly from professionals in the optics and photonics sector.

Student Chapter Exhibit Mixer

Convention Center, Hall C

Tuesday 4 August 4:00 to 5:00 pm

Exhibitors, join us for a late-afternoon mixer in the Student Chapter section of the Exhibition Hall. Meet our amazing students and learn about the innovative activities of some of the best and brightest Student Chapters across the globe!

See Professional Development Workshop descriptions on page 46.

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Gold Medal

NASA's Richard Hoover makes small things a big deal.



Richard Hoover, a NASA astrobiologist who has searched for the origins of life in Antarctica and in the far reaches of the universe, is the 2009 recipient of the Gold Medal of the Society in recognition of his work in X-ray and EUV optics, using microscopes to telescopes.

SPIE also recognized Hoover, an SPIE Fellow and past SPIE President, for his extraordinary dedication and service to optics and to the Society.

Hoover conducts research in microbial extremophiles and astromaterials at the National Space Science and Technology Center Astrobiology Laboratory at NASA, travelling from Santorini in Greece to Siberia for his work. He has authored or edited 35 books and more than 250 papers. His work has led to discoveries of a new genus, *Anaerovirgula*, and several new species of bacteria and archaea throughout his career.

Hoover has simultaneously studied and done research in X-ray optics, and his famous full-disk images of the sun in the X-ray and EUV wavelengths are among his many innovative advances for that field. He has also used X-ray mapping to analyze extremophiles—bacterium and other microorganisms that live in conditions inhospitable to most living things.

Extreme Expedition

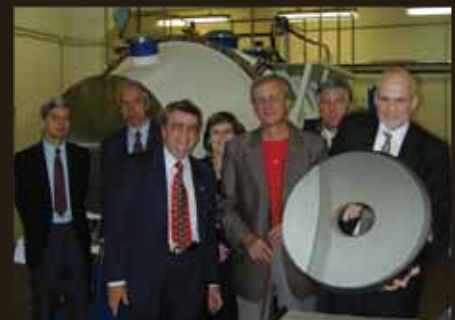
Extremophiles have become the main focus of Hoover's work over the years, and he has concentrated his search on complex filamentous microstructures.

His interest in extremophiles and their ability to survive for 32,000 years has led him to also explore extraterrestrial sources. As evidence of their extraterrestrial source, Hoover has found many meteorite microfossils to have a near total lack of nitrogen and to be permineralized with magnesium sulfate minerals.

"I have never observed these elemental compositions in modern cyanobacteria, or in ancient hair and tissues from Peruvian or Egyptian mummies and Pleistocene Woolly Mammoths, which contain nitrogen levels similar to living biological organisms," he says.

Hoover believes the ability of bacteria and other microorganisms to live cryopreserved in ice is a way life may be distributed throughout the universe, similar to how winds transport bacteria, pollen, and airborne seeds from one place on Earth to another.

"Despite enormous efforts on many of the best scientific minds of this century, we still simply do not know how, when, or where life as we know it on Earth began," Hoover notes.



Richard Hoover (third from left) visited Russia's Lebedev Physical Institute in 2001 as SPIE president.



Astrobiologist Richard Hoover on a research trip to Schirmacher Oasis, Antarctica, in February 2009.

His long-term interest in the field has led to his long chairmanship of the cross-disciplinary Instruments, Methods, and Missions for Astrobiology conference, to be held again this year at SPIE Optics+Photonics where he will accept his award. Hoover served as SPIE President in 2001.

Gold Medal

The Gold Medal of the Society is the highest honor SPIE bestows. It has been awarded since 1977 in recognition of outstanding engineering or scientific accomplishments in optics, electro-optics, or photographic technologies. Recipients have made an exceptional contribution to the advancement of a relevant technology. The honorarium for the award is \$10,000.

See full article in *SPIE Professional*, July 2009.

Serving Science

Charles Vest receives the Chandra S. Vikram Award.



Charles M. Vest is the inaugural winner of the Chandra S. Vikram Award in Optical Metrology.

Vest, president of the National Academy of Engineering (USA), is receiving the award for his significant contributions to the mathematical analysis of holographic interferometry taken through flames and other 3D objects. He is also honored for major contributions to technology and engineering as president of

the Massachusetts Institute of Technology and the NAE and his service on numerous government advisory boards.

One of Vest's favorite projects was the determination of three-dimensional fields from interferograms and that the underlying mathematics was the Radon transform. "I enjoyed working out all the essentials of the field, including the apparent localization of fringes through very simple analysis with a minimum of complicated mathematics," Vest says.

The bulk of his career has been spent working as an administrator, in academia and government, to promote science and engineering. Vest, a former dean of Engineering at Michigan, was vice chair of the U.S. Council on Competitiveness for eight years and served on the President's Committee of Advisors on Science and Technology during the Clinton and Bush administrations as well as several other security and higher education committees. Vest was awarded the 2006 National Medal of Technology by President Bush.

During his 14 years at MIT, Vest placed special emphasis on exploring new organizational forms to meet emerging directions in research and education, building a stronger international dimension into education and research programs, developing stronger relations with industry, and enhancing racial and cultural diversity.

Vest has authored a book on holographic interferometry and two books on higher education. He has 10 honorary doctoral degrees.

See full article in *SPIE Professional*, July 2009.

Vikram Award

The Chandra S. Vikram Award in Optical Metrology recognizes exceptional contributions to the field and comes with a \$2000 honorarium.

It is named for the research professor and expert in speckle metrology, holography, interferometry, and optical logic who died in 2007.

Banquet Speaker

Award winner Charles Vest will discuss *Why Science and Engineering Matter in the 21st Century* at the SPIE Optics+Photonics awards banquet 7:30 pm, Wednesday 5 August at the San Diego Marriott Hotel and Marina.

Tickets for the banquet are not included in the registration fee but may be ordered on the registration form or purchased onsite at the SPIE Registration Desk until 12 noon on Tuesday 4 August.

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2009 SPIE Awards

A.E. Conrady Award



Roland Winston, a professor at the University of California, Merced (USA), is the 2009 recipient of the A.E. Conrady Award in recognition of his prodigious achievements in non-imaging optics and his advancements in solar and illumination technology applications, including his Winston Series CPC Collector. This award recognizes

exceptional contributions in design, construction, and testing of optical systems and instrumentation, without which the technology would not have progressed to its present state.

Dennis Gabor Award



Rajpal Sirohi, vice chancellor of Amity University Rajasthan (India), is the 2009 winner of the Dennis Gabor award in recognition of outstanding accomplishments in the science and technology of numerous aspects of holography, speckle metrology, interferometry, and confocal microscopy. The award is presented annually for outstanding

accomplishments in diffractive wavefront technologies, especially those which further the development of holography and metrology applications.

George W. Goddard Award



Neil Gehrels, chief of the Astroparticle Physics Laboratory at the NASA Goddard Space Flight Center (USA), is this year's winner of the George W. Goddard award. Gehrels opened the new field of gamma-ray astronomy through his leadership of the Compton Gamma Ray Observatory and the Swift Mission. The Goddard Award is presented annually in recognition

of exceptional achievement in optical or photonic instrumentation for aerospace, atmospheric science, or astronomy. The award is also for the invention and development of a new technique, photonic instrumentation, instrument, or system.

Frits Zernike Award In Microlithography



Chris Mack, developer of the Prolith suite of lithography simulation software, is the 2009 recipient of the Frits Zernike Award for Microlithography. Mack was recognized for the software development, for his contributions to the underlying principles upon which it is based, and for his dedication and success as a teacher and author. This award is given

for outstanding accomplishments in microlithographic technology, especially those furthering the development of semiconductor lithographic imaging solutions.

Nominate a Colleague

SPIE presents several yearly awards that recognize outstanding individual and team technical accomplishments and meritorious service to the Society. SPIE urges you to nominate a colleague for his or her outstanding achievements. Nominations may be made through 1 October and will be considered active for three years from the submission date.

spie.org/awardsform

SPIE Early Career Achievement Award



Marc Kuchner, an astronomer with the Laboratory for Exoplanets and Stellar Astrophysics, NASA Goddard Space Flight Center (USA), is the 2009 recipient of the SPIE Early Career Achievement award for his outstanding achievements in facilitating the detection and characterization of extra-solar planets. His invention and refinement of new

telescope coronagraph masks provide astronomers with innovative tools needed to detect planets directly around bright stars. The Early Career Achievement Award, given for the first time in 2008, recognizes significant and innovative technical contributions to any of the engineering or scientific fields of interest to SPIE.

SPIE Educator Award



Fenna Hanes, senior director at the New England Board of Higher Education (USA), is the 2009 SPIE Educator Award winner in recognition of her leadership in several NSF-ATE programs. Her unfailing enthusiasm for optics/photronics technology has fostered the growth of optics education in secondary schools and colleges throughout the United States.

The annual award honors outstanding contributions to optics education by an SPIE instructor or other educator.

SPIE Technology Achievement Award



James G. Grote, an SPIE Board Member and principal electronics research engineer at the Air Force Research Laboratory, Wright-Patterson Air Force Base (USA), is the 2009 recipient of the SPIE Technology Achievement award in recognition of his outstanding contributions in the new field of biotronics- and biopolymer-based photonic

and electronic materials and devices engineering. The annual Technology Achievement Award is to recognize outstanding technical accomplishment in optics, electro-optics, photonic engineering, or imaging.

SPIE Professional

Reach the active 16,000+ Members of SPIE through the Society's quarterly magazine, *SPIE Professional*

Build visibility in the optics and photonics community by advertising in *SPIE Professional* magazine, the easiest and most reliable way to reach all the Members of SPIE. The quarterly magazine is delivered to our 16,000+ Members, providing you with a unique opportunity to reach your targeted audience in the optics and photonics industry.

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SPIE Elevates 59 to Fellow

The new 59 SPIE new Fellows include the first Danish, Belarusian, and African Society Members to be so honored for their significant and technical contributions in the multidisciplinary fields of optics, photonics, and imaging.

Jesper Glückstad is the first SPIE Fellow from Denmark, and Sergey Maksimenko is the first SPIE Fellow from Belarus. Zohra Ben Lakhdar of Tunisia and Paul Buah-Bassuah of Ghana are the first representing Africa.

Fellows are SPIE Members honored for their technical achievement, for their service to the general optics community,

and to SPIE in particular. They are recognized at SPIE meetings of their choice throughout the year.

“The annual recognition of Fellows provides an opportunity for us to acknowledge outstanding Members for their service,” says SPIE President María Yzuel.

For more information, including a Fellows nomination form and criteria, see spie.org/fellows.



Roger Appleby
QinetiQ Ltd, UK, for specific achievements in millimeter-wave imaging



Francesco Baldini
Istituto di Fisica Applicata Nello Carrara, Italy, for specific achievements in biological and chemical sensing



Zohra Ben Lakhdar
University El Manaur, Tunisia, for specific achievements in applied atomic and molecular spectroscopy



Steve Boppart
University of Illinois at Urbana-Champaign, USA, for specific achievements in biophotonics and biomedical optics



Julian Bristow
Honeywell Automation and Control Solutions, USA, for specific achievements in optoelectronics, optical interconnects, and optical sensors



Paul Buah-Bassuah
University of Cape Coast, Ghana, for specific achievements in optical instrumentation and the advancement of optical sciences in Africa



David Cardimona
Air Force Research Lab, USA, for specific achievements in nonlinear and quantum optics



John Carrano
Carrano Consulting, USA, for specific achievements in micro-electro-mechanical systems



Franco Cerrina
University of Wisconsin, Madison, USA, for specific achievements in microarrays, EUV and X-ray lithography



Shaochen Chen
University of Texas at Austin, USA, for specific achievements in laser materials processing at nanoscale



Zhongping Chen
University of California, Irvine, USA, for specific achievements in biomedical photonics and optical coherence



Koen Clays
Katholieke Universiteit Leuven, Belgium, for specific achievements in hyper-Rayleigh scattering (HRS)



Ralph Dammell
AZ Electronic Materials USA Corp, USA,
for specific achievements in photoresist
materials and processes



Jesper Glückstad
Danmarks Tekniske Universitet, Denmark,
for specific achievements in coherent optical
control



Kishan Dholakia
University of St. Andrews, UK, for specific
achievements in optical manipulation and
biophotonics



Thomas Glynn
National University of Ireland Galway,
Ireland, for specific achievements in laser
materials processing



Thomas Dickinson
Washington State University, USA, for
specific achievements in laser interaction
with materials



Brian Grenon
Grenon Consulting Inc., USA, for specific
achievements in photomask advancement
and development



Mostafa El-Sayed
Georgia Institute of Technology, USA,
for specific achievements in solid-state
spectroscopy and biophotonics



Ruyan Guo
University of Texas at San Antonio, USA,
for specific achievements in advanced optical
materials



Charles Falco
University of Arizona, USA, for specific
achievements in X-ray optics, optics and
art history



Sailing He
Zhejiang University, China, for specific
achievements in micro- and nanophotonics



Lee Feinberg
NASA Goddard Space Flight Center, USA,
for specific achievements in large space optics
and optical technology



Glenn Healey
University of California, Irvine, USA, for
specific achievements in multispectral and
hyperspectral imaging



Ian Ferguson
Georgia Institute of Technology, USA, for
specific achievements in III-V materials and
optoelectronic devices for solid state lighting,
detectors, and solar cell applications



Ray Johnson
Lockheed Martin Corp., USA, and SPIE
Board of Directors, for specific achievements
in optical defense technologies



Joseph Geary
University of Alabama in Huntsville,
USA, for specific achievements in optical
engineering



Norbert Kaiser
Fraunhofer-Institut für Angewandte Optik
und Feinmechanik, Germany, for specific
achievements in optical coatings



2009 SPIE Fellows



Aggelos Katsaggelos
Northwestern University, USA, for specific achievements in image and video processing



John Merritt
Merritt Group, USA, for specific achievements in stereoscopic displays and applications



Bruno LaFontaine
Advanced Micro Devices Inc., USA, for specific achievements in EUV and optical lithography



María Millán García-Varela
Universitat Politècnica de Catalunya, Spain, for specific achievements in image processing, optical pattern recognition, and optical applications to textile inspection



Keith Lewis
Sciovis Ltd., UK, for specific achievements in thin film optics for high-power lasers



Risto Myllylä
University of Oulu, Finland, for specific achievements in laser pulse range finding and optical coherence tomography



Lars Liebmann
IBM Microelectronics Div., USA, for specific achievements in VLSI microelectronics



Rajesh Naik
Air Force Research Lab, USA, for specific achievements in biophotonics



Sergey Maksimenko
Belarusian State University, Belarus, for specific achievements in carbon nanoelectromagnetics



Kazuhiko Oka
Hokkaido University, Japan, for specific achievements in polarimetry and optical engineering



Claire Max
University of California, Santa Cruz, USA, for specific achievements in astronomical and physical optics



Boon Ooi
Lehigh University, USA, for specific achievements in semiconductor photonic integration



Martin McCall
Imperial College London, UK, for specific achievements in complex structure optics



Jacobus (Jim) Oschmann
Ball Aerospace & Technologies Corp., USA, for specific achievements in astronomical telescope design and lasers



Alexis Mendez
MCH Engineering LLC, USA, for specific achievements in optical fibers and fiber sensors



Andreas Ostendorf
Ruhr-Universität Bochum, Germany, for specific achievements in laser materials processing and nanotechnology



Stanley Pau
University of Arizona, USA, for specific achievements in micro-optics and MEMS/NEMS



Larry Stotts
Defense Advanced Research Projects Agency, USA, for specific achievements in free space laser communications and systems



Jeffery Puschell
Raytheon Space & Airborne Systems, USA, for specific achievements in satellite optical remote sensing technology, laser-based systems, observational astrophysics



John Sturtevant
Mentor Graphics Corp., USA, for specific achievements in photolithography



Henri Rajbenbach
European Commission Joint Research Center, Belgium, for specific achievements in optics in computing



Gary Sullivan
Microsoft Corp., USA, for specific achievements in video and image compression technologies



Bernice Rogowitz
IBM Thomas J Watson Research Center, USA, for specific achievements in human vision/electronic imaging



Chi-Kuang Sun
National Taiwan University, Taiwan, for specific achievements in nonlinear microscopy and nano-ultrasonics



Osami Sasaki
Niigata University, Japan, for specific achievements in laser interferometry



David Titterton
Defence Science and Technology Lab, UK, for specific achievements in high-power lasers



Selim Shahriar
Northwestern University, USA, for specific achievements in static and dynamic volume holography



Shoji Tominaga
Chiba University, Japan, for specific achievements in electronic imaging



Azad Siahmakoun
Rose-Hulman Institute of Technology, USA, for specific achievements in optical signal processing devices and systems



Alfred Vogel
University of Lübeck, Germany, for specific achievements in experimental and theoretical biophysics of linear and nonlinear pulsed laser interactions in living tissue, laser pulse applications for biophotonics and medicine, and laser bioeffects research



Franky So
University of Florida, USA, for specific achievements in OLED technology



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Prism Awards
FOR PHOTONICS INNOVATION

Call For Entries

The 2009 award competition will recognize new photonics products and processes that generate revenue, break with conventional ideas, and solve real life problems. Winners will be announced in January 2010 at SPIE Photonics West in San Francisco.

The Prism Awards for Photonics Innovation, sponsored by SPIE and Laurin Publishing, is an international competition for companies that brought a laser device, new light source, green/sustainable, biophotonic, or other photonics innovation to market between September 2008 and August 2009.

The deadline for applying for the second annual Prism Awards for Photonics Innovation is
22 September.

2008 Prism Award Winners

- Aragon Photonics Labs (Analytical, Test, and Measurement)
- Coherent (Lasers, tied)
- Daylight Solutions (Lasers, tied)
- JPK Instruments AG (Life Sciences)
- Luxtera (Photonics Systems and overall Best in Show)
- NoblePeak Vision (Detectors, Sensing, and Imaging)
- Princeton (Photonics Processes)
- Sensor Electronic Technology, Inc. (Other Light Sources)
- Solyndra (Sustainable/Green Technology)
- Tessera Technologies (Optics)

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Continuing Education Units

 SPIE has been approved as an authorized provider of CEUs by IACET, The International Association for Continuing Education and Training (Provider #1002092). In obtaining this approval, SPIE has demonstrated that it complies with the ANSI/IACET Standards which are widely recognized as standards of good practice.

SPIE reserves the right to cancel a course due to insufficient advance registration.

The Society has hand picked some of the top minds from academia and industry to lead a variety of courses at SPIE Events.

Register for a course:

- ▶ Take advantage of the industry's best instructors
- ▶ Further your career through ongoing education
- ▶ Earn CEUs for your continuing education

spie.org/education

**Register for Courses at
the SPIE Cashier**

Course Daily Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Advanced Metrology					
	<p>SC211 Practical Interferometry and Fringe Analysis (<i>Creath</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC213 Introduction to Interferometric Optical Testing (<i>Wyant</i>) 1:30 to 5:30 pm, \$340 / \$395</p>		<p>SC020 Optical Scattering: Measurement and Analysis (<i>Stover</i>) 8:30 am to 12:30 pm, \$395 / \$450</p> <p>SC017 Principles of Fourier Optics and Diffraction (<i>Gaskill</i>) 8:30 am to 5:30 pm, \$620 / \$730 p. 186</p> <p>SC492 Predicting, Modeling, and Interpreting Light Scattered by Surfaces (<i>Germer</i>) 1:30 to 5:30 pm, \$340 / \$395</p>	SC850 Metrology for Modern Optical Manufacturing (<i>Murphy</i>) 8:30 am to 12:30 pm, \$340 / \$395	
Astronomical Optics and Instrumentation					
SC561 Optomechanics for Space Applications (<i>Shipley</i>) 8:30 am to 5:30 pm, \$565 / \$675	<p>SC835 Infrared Systems - Technology & Design (<i>Daniels</i>) 8:30 am to 3:30 pm, \$1095 / \$1250</p> <p>SC010 Introduction to Optical Alignment Techniques (<i>Ruda</i>) 8:30 am to 5:30 pm, \$1040 / \$1295</p> <p>SC504 Introduction to CCD and CMOS Imaging Sensors and Applications (<i>Janesick</i>) 8:30 am to 5:30 pm, \$685 / \$795</p>	<p>SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (<i>Janesick</i>) 8:30 am to 5:30 pm, \$610 / \$720</p> <p>SC135 Adaptive Optics (<i>Tyson</i>) 8:30 am to 5:30 pm, \$600 / \$710</p>	<p>SC218 Advanced Composite Materials for Optomechanical Systems (<i>Zweber</i>) 8:30 am to 5:30 pm, \$565 / \$675</p> <p>SC152 Infrared Focal Plane Arrays (<i>Dereniak, Hubbs</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC915 Radiometry Revealed (<i>Shaw</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC567 Introduction to Optical Remote Sensing Systems (<i>Shaw</i>) 1:30 to 5:30 pm, \$340 / \$395</p>		
Atmospheric and Space Optical Systems					
SC561 Optomechanics for Space Applications (<i>Shipley</i>) 8:30 am to 5:30 pm, \$565 / \$675		<p>SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (<i>Janesick</i>) 8:30 am to 5:30 pm, \$610 / \$720</p> <p>SC180 Imaging Polarimetry (<i>Dereniak, Miles, Sabatke</i>) 1:30 to 5:30 pm, \$340 / \$395</p> <p>SC135 Adaptive Optics (<i>Tyson</i>) 8:30 am to 5:30 pm, \$600 / \$710</p>	<p>SC915 Radiometry Revealed (<i>Shaw</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC567 Introduction to Optical Remote Sensing Systems (<i>Shaw</i>) 1:30 to 5:30 pm, \$340 / \$395</p>		
Detectors and Imaging Devices					
	<p>SC504 Introduction to CCD and CMOS Imaging Sensors and Applications (<i>Janesick</i>) 8:30 am to 5:30 pm, \$685 / \$795</p>	<p>SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (<i>Janesick</i>) 8:30 am to 5:30 pm, \$610 / \$720</p> <p>SC068 Use of CCD and CMOS Sensors in Visible Imaging Applications (<i>Lomheim</i>) 8:30 am to 12:30 pm, \$400 / \$455</p> <p>SC180 Imaging Polarimetry (<i>Dereniak, Miles, Sabatke</i>) 1:30 to 5:30 pm, \$340 / \$395</p>	<p>SC959 Image Chain Modeling of Digital Camera Systems (<i>Fiete</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC152 Infrared Focal Plane Arrays (<i>Dereniak, Hubbs</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC194 Multispectral and Hyperspectral Image Sensors (<i>Lomheim</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC567 Introduction to Optical Remote Sensing Systems (<i>Shaw</i>) 1:30 to 5:30 pm, \$340 / \$395</p>		

Register for Courses at the SPIE Cashier

Course Daily Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Illumination Engineering					
	<p>SC958 LED & Solid-State Lighting Standardization (Jiao) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC490 Solid State Lighting I (Ferguson) 8:30 am to 12:30 pm, \$340 / \$395</p>	<p>SC388 Non-Imaging Optics (Winston) 1:30 to 5:30 pm, \$340 / \$395</p>	<p>SC011 Design of Efficient Illumination Systems (Cassarly) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC915 Radiometry Revealed (Shaw) 8:30 am to 12:30 pm, \$340 / \$395</p>		
Image and Signal Processing					
	<p>SC608 Photonic Crystals: A Crash Course, from Bandgaps to Fibers (Johnson) 1:30 to 5:30 pm, \$385 / \$440</p>	<p>SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (Janesick) 8:30 am to 5:30 pm, \$610 / \$720</p>	<p>SC959 Image Chain Modeling of Digital Camera Systems (Fiete) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC017 Principles of Fourier Optics and Diffraction (Gaskill) 8:30 am to 5:30 pm, \$670 / \$780</p>		
NanoEngineering					
	<p>Mon SC655 Introduction to Optical Tweezers and Optical Micromanipulation (Dholakia, Spalding) 8:30 am to 12:30 pm, \$340 / \$395 NEW</p>				
NanoScience					
<p>SC497 Nanophotonics (Prasad) 1:30 to 5:30 pm, \$340 / \$395</p>	<p>SC958 LED & Solid-State Lighting Standardization (Jiao) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC490 Solid State Lighting I (Ferguson) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC608 Photonic Crystals: A Crash Course, from Bandgaps to Fibers (Johnson) 1:30 to 5:30 pm, \$385 / \$440</p>			<p>SC727 Nanoplasmonics (Stockman) 8:30 am to 5:30 pm, \$565 / \$675</p>	
Optical Design					
<p>SC003 Practical Optical System Design - EXPANDED 2-Day Format (Fischer) 8:30 am to 5:30 pm, \$1125 / \$1380</p>	<p>SC010 Introduction to Optical Alignment Techniques (Ruda) 8:30 am to 5:30 pm, \$1040 / \$1295</p> <p>SC156 Basic Optics for Engineers (Ducharme) 8:30 am to 5:30 pm, \$600 / \$710</p> <p>SC720 Cost-Conscious Tolerancing of Optical Systems (Youngworth) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC912 Intermediate Lens Design (Bentley) 8:30 am to 5:30 pm, \$650 / \$760</p>	<p>SC135 Adaptive Optics (Tyson) 8:30 am to 5:30 pm, \$600 / \$710</p>	<p>SC552 Aspheric Optics: Design, Fabrication, and Test (Fischer) 8:30 am to 12:30 pm, \$425 / \$480</p> <p>WS609 Basic Optics for Non-Optics Personnel (Harding) 8:30 to 11:00 am, \$150 / \$200</p> <p>SC020 Optical Scattering: Measurement and Analysis (Stover) 8:30 am to 12:30 pm, \$395 / \$450</p> <p>SC017 Principles of Fourier Optics and Diffraction (Gaskill) 8:30 am to 5:30 pm, \$670 / \$780</p> <p>SC492 Predicting, Modeling, and Interpreting Light Scattered by Surfaces (Germer) 1:30 to 5:30 pm, \$340 / \$395</p>		
<p>SC690 Optical System Design: Layout Principles and Practice (Greivenkamp) 8:30 am to 5:30 pm, \$675 / \$785</p> <p>SC206 Polarized Light: A Practical Hands-on Introduction (Fisher) 8:30 am to 5:30 pm, \$565 / \$675</p> <p>SC792 Polarization in Optical Design (Chipman) 1:30 to 5:30 pm, \$340 / \$395</p> <p>SC384 The Design of Plastic Optical Systems (Schaub) 1:30 to 5:30 pm, \$340 / \$395</p>					
<p><i>Legend for Education Products:</i> Price = SPIE Member / Non-Member SC000 = Course Number WS000 = Workshop Number</p>					

Course Daily Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Optical Systems Engineering					
SC003 Practical Optical System Design - EXPANDED 2-Day Format (Fischer) 8:30 am to 5:30 pm, \$1125 / \$1380			SC152 Infrared Focal Plane Arrays (Dereniak, Hubbs) 8:30 am to 12:30 pm, \$340 / \$395		
SC690 Optical System Design: Layout Principles and Practice (Greivenkamp) 8:30 am to 5:30 pm, \$675 / \$785	SC835 Infrared Systems - Technology & Design (Daniels) 8:30 am to 3:30 pm, \$1095 / \$1250		SC020 Optical Scattering: Measurement and Analysis (Stover) 8:30 am to 12:30 pm, \$395 / \$450		
SC792 Polarization in Optical Design (Chipman) 1:30 to 5:30 pm, \$340 / \$395	SC010 Introduction to Optical Alignment Techniques (Ruda) 8:30 am to 5:30 pm, \$1040 / \$1295	SC180 Imaging Polarimetry (Dereniak, Miles, Sabatke) 1:30 to 5:30 pm, \$340 / \$395	SC017 Principles of Fourier Optics and Diffraction (Gaskill) 8:30 am to 5:30 pm, \$670 / \$780		
SC384 The Design of Plastic Optical Systems (Schaub) 1:30 to 5:30 pm, \$340 / \$395	SC156 Basic Optics for Engineers (Ducharme) 8:30 am to 5:30 pm, \$600 / \$710	SC135 Adaptive Optics (Tyson) 8:30 am to 5:30 pm, \$600 / \$710	SC019 Radiometry Revealed (Shaw) 8:30 am to 12:30 pm, \$340 / \$395		
	SC958 LED & Solid-State Lighting Standardization (Jiao) 8:30 am to 12:30 pm, \$340 / \$395		SC492 Predicting, Modeling, and Interpreting Light Scattered by Surfaces (Germer) 1:30 to 5:30 pm, \$340 / \$395		
	SC321 Thin Film Optical Coatings (Macleod) 8:30 am to 5:30 pm, \$565 / \$675				
	SC912 Intermediate Lens Design (Bentley) 8:30 am to 5:30 pm, \$600 / \$710				
Optomechanics and Optical Manufacturing					
SC014 Introduction to Optomechanical Design (Vukobratovich) 8:30 am to 5:30 pm, \$1040 / \$1295					
SC561 Optomechanics for Space Applications (Shipley) 8:30 am to 5:30 pm, \$565 / \$675	SC010 Introduction to Optical Alignment Techniques (Ruda) 8:30 am to 5:30 pm, \$1040 / \$1295		SC218 Advanced Composite Materials for Optomechanical Systems (Zweber) 8:30 am to 5:30 pm, \$565 / \$675	SC850 Metrology for Modern Optical Manufacturing (Murphy) 8:30 am to 12:30 pm, \$340 / \$395	
SC384 The Design of Plastic Optical Systems (Schaub) 1:30 to 5:30 pm, \$340 / \$395	SC720 Cost-Conscious Tolerancing of Optical Systems (Youngworth) 8:30 am to 12:30 pm, \$340 / \$395	SC013 Precision Mounting of Optical Components (Yoder, Jr.) 8:30 am to 5:30 pm, \$650 / \$760	SC552 Aspheric Optics: Design, Fabrication, and Test (Fischer) 8:30 am to 12:30 pm, \$425 / \$480		
	SC211 Practical Interferometry and Fringe Analysis (Creath) 8:30 am to 12:30 pm, \$340 / \$395	SC015 Structural Adhesives for Optical Bonding (Daly) 8:30 am to 12:30 pm, \$340 / \$395			
	SC321 Thin Film Optical Coatings (Macleod) 8:30 am to 5:30 pm, \$565 / \$675	SC220 Optical Alignment Mechanisms (Guyer) 1:30 to 5:30 pm, \$340 / \$395			
	SC213 Introduction to Interferometric Optical Testing (Wyant) 1:30 to 5:30 pm, \$340 / \$395	SC135 Adaptive Optics (Tyson) 8:30 am to 5:30 pm, \$600 / \$710			
Organic Photonics and Electronics					
	SC490 Solid State Lighting I (Ferguson) 8:30 am to 12:30 pm, \$340 / \$395		SC915 Radiometry Revealed (Shaw) 8:30 am to 12:30 pm, \$340 / \$395		

Register for Courses at
the SPIE Cashier

Course/Workshop Daily Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Photonic Devices and Applications					
	<p>SC958 LED & Solid-State Lighting Standardization (<i>Jiao</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC490 Solid State Lighting I (<i>Ferguson</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC608 Photonic Crystals: A Crash Course, from Bandgaps to Fibers (<i>Johnson</i>) 1:30 to 5:30 pm, \$385 / \$440</p>				
Remote Sensing					
<p>SC561 Optomechanics for Space Applications (<i>Shipley</i>) 8:30 am to 5:30 pm, \$565 / \$675</p> <p>SC206 Polarized Light: A Practical Hands-on Introduction (<i>Fisher</i>) 8:30 am to 5:30 pm, \$565 / \$675</p>	<p>Mon-Tues SC835 Infrared Systems - Technology & Design (<i>Daniels</i>) 8:30 am to 3:30 pm, \$1095 / \$1250</p> <p>SC156 Basic Optics for Engineers (<i>Ducharme</i>) 8:30 am to 5:30 pm, \$600 / \$710</p> <p>SC504 Introduction to CCD and CMOS Imaging Sensors and Applications (<i>Janesick</i>) 8:30 am to 5:30 pm, \$685 / \$795</p>	<p>SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (<i>Janesick</i>) 8:30 am to 5:30 pm, \$610 / \$720</p> <p>SC068 Use of CCD and CMOS Sensors in Visible Imaging Applications (<i>Lomheim</i>) 8:30 am to 12:30 pm, \$400 / \$455</p> <p>SC180 Imaging Polarimetry (<i>Dereniak, Miles, Sabatke</i>) 1:30 to 5:30 pm, \$340 / \$395</p>	<p>SC152 Infrared Focal Plane Arrays (<i>Dereniak, Hubbs</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC194 Multispectral and Hyperspectral Image Sensors (<i>Lomheim</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC915 Radiometry Revealed (<i>Shaw</i>) 8:30 am to 12:30 pm, \$340 / \$395</p> <p>SC567 Introduction to Optical Remote Sensing Systems (<i>Shaw</i>) 1:30 to 5:30 pm, \$340 / \$395</p>		
Solar Energy + Applications					
	<p>SC321 Thin Film Optical Coatings (<i>Macleod</i>) 8:30 am to 5:30 pm, \$565 / \$675</p>	<p>SC910 Design and Reliability of Photovoltaic Modules (<i>Dhere, Wohlgemuth</i>) 1:30 to 5:30 pm, \$340 / \$395</p> <p>SC388 Non-Imaging Optics (<i>Winston</i>) 1:30 to 5:30 pm, \$340 / \$395</p>	<p>SC915 Radiometry Revealed (<i>Shaw</i>) 8:30 am to 12:30 pm, \$340 / \$395</p>		
Thin Films					
	<p>SC321 Thin Film Optical Coatings (<i>Macleod</i>) 8:30 am to 5:30 pm, \$565 / \$675</p>				
Business + Professional Development Workshops					
<p>WS852 Hands-On Optics (HOO) - Making an Impact with Light: Terrific Telescopes Workshop (<i>Baine</i>) 8:30 to 11:30 am, \$10 / \$20</p>	<p>WS667 The Craft of Scientific Presentations: A Workshop on Technical Presentations (<i>Alley</i>) 8:30 am to 12:30 pm, \$125 / \$175</p> <p>WS668 The Craft of Scientific Writing: A Workshop on Technical Writing (<i>Alley</i>) 1:30 to 5:30 pm, \$125 / \$175</p> <p>WS961 Optics Magic - Easy Demonstrations from the PHOTON Projects (<i>Donnelly</i>) 1:30 to 5:30 pm, Free—registration required</p>	<p>WS962 Job Search Preparation Workshop (<i>O'Brien</i>) 8:30 am to 12:30 pm, \$100 / \$150</p>	<p>WS609 Basic Optics for Non-Optics Personnel (<i>Harding</i>) 8:30 to 11:00 am, \$150 / \$200</p> <p>WS951 Leading Successful Product Innovation (<i>Carrano</i>) 1:30 to 5:30 pm, \$200 / \$250</p>		
<p><i>Legend for Education Products:</i> Price = SPIE Member / Non-Member SC000 = Course Number WS000 = Workshop Number</p>					

Professional Development Workshops

Leading Successful Product Innovation

WS951

NEW

Course level: Intermediate
CEU .35 \$200 / \$250 USD
Wednesday 1:30 to 5:30 pm

The fundamental goal of this course is to answer the question: "How do I take an idea off the white-board and turn it into a windfall product?" We will explore and apply the principles of good leadership to create a culture of excellence within your organization—the most basic ingredient for success. A special emphasis will be placed on learning how to develop and construct an effective new project pitch using the instructor's "Disciplined Creativity" concept and framework. We will then describe the "Spiral Development Process" for rapid, effective, and successful prototype development, followed by an in-depth examination of the life-cycle approach to product development. This course will also enable you to conduct a "red teaming" exercise to identify competitive threats, identify weaknesses in your company, and most importantly, develop solution strategies. We will also place an emphasis on how to properly vet an idea and how to ask tough-minded questions designed to ferret out shortcomings.

INTENDED AUDIENCE

This course designed for R&D managers at all levels. It is also appropriate for other senior department managers with responsibility for aspects of product development (e.g. marketing, manufacturing, business development). Start-up companies, or anyone contemplating starting their own venture will find the material relevant and useful. Scientists and engineers aspiring to management track positions will also benefit from this course.

INSTRUCTOR

John Carrano is President of Carrano Consulting. Previously, he was the Vice President, Research & Development, Corporate Executive Officer, and Chairman of the Scientific Advisory Board for Luminex Corporation, where he led the successful development of several major new products from early conception to market release and FDA clearance. Before joining Luminex, Dr. Carrano was as a Program Manager at DARPA, where he created and led several major programs related to bio/chem sensing, hyperspectral imaging and laser systems. He retired from the military as a Lieutenant Colonel in June 2005 after over 24 years' service; his decorations include the "Defense Superior Service Medal" from the Secretary of Defense. Dr. Carrano is a West Point graduate with a doctorate in Electrical Engineering from the University of Texas at Austin. He has co-authored over 50 scholarly publications and has 3 patents pending. He is the former DSS Symposium Chairman (2006-2007).

Basic Optics for Non-Optics Personnel

WS609

Course level: Introductory
CEU .20 \$150 / \$200 USD
Wednesday 8:30 to 11:00 am

This course will provide the technical manager, sales engineering, marketing staff, or other non-optics personnel with a basic understanding of the terms, specifications, and measurements used in optical technology to facilitate effective communication with optics professionals on a functional level. Topics to be covered include basic concepts such as interference, diffraction, polarization and aberrations, definitions relating to color and optical quality, and an overview of the basic measures of optical performance such as MTF and wavefront error. The material will be presented with a minimal amount of math, rather emphasising working concepts, definitions, rules of thumb, and visual interpretation of specifications. Specific applications will include defining basic imaging needs such as magnification and depth-of-field, understanding MTF curves and interferograms, and interpreting radiometric terms.

INTENDED AUDIENCE

This course is intended for the non-optical professional who needs to understand basic optics and interface with optics professionals.

INSTRUCTOR

Kevin Harding has been active in the optics industry for over 30 years, and has taught machine vision and optical methods for over 25 years in over 70 workshops and tutorials, including engineering workshops on machine vision, metrology, NDT, and interferometry used by vendors and system houses to train their own engineers. He has been recognized for his leadership in optics and machine vision by the Society of Manufacturing Engineers, Automated Imaging Association, and Engineering Society of Detroit. Kevin is a Fellow of SPIE and was the 2008 President of the Society.

The Craft of Scientific Presentations: A Workshop on Technical Presentations

WS667

Course level: Introductory
CEU .35 \$125 / \$175 USD
Monday 8:30 am to 12:30 pm

This course provides attendees with an overview of what distinguishes the best scientific presentations. The course introduces a new design for presentation slides that is both more memorable and persuasive from what is typically shown at conferences.

INTENDED AUDIENCE

This material is intended for anyone who needs to present scientific research. Those who either have not yet presented or have made several presentations will find this course valuable.

INSTRUCTOR

Michael Alley teaches writing and speaking to engineering students at Penn State. Alley has taught this workshop to researchers at the Army Research Laboratory, Lawrence Livermore National Laboratory, United Technologies, the University of Illinois, the University of Oslo, and Virginia Tech.

COURSE PRICE INCLUDES the text *The Craft of Scientific Presentations* (Springer, 2003) by Michael Alley. This workshop is free to SPIE Student Members. You must register to attend.

The Craft of Scientific Writing: A Workshop on Technical Writing

WS668

Course level: Introductory
CEU .35 \$125 / \$175 USD
Monday 1:30 to 5:30 pm

This course provides an overview on writing a scientific paper. The course focuses on the structure, language, and illustration of scientific papers.

INTENDED AUDIENCE

This material is intended for anyone who needs to write about scientific research. Those who either have not yet written a paper or have written several papers will find this course valuable.

INSTRUCTOR

Michael Alley teaches writing and speaking to engineering students at Penn State. Alley has taught this workshop to researchers at the Army Research Laboratory, Lawrence Livermore National Laboratory, United Technologies, the University of Illinois, the University of Oslo, and Virginia Tech.

COURSE PRICE INCLUDES the text *The Craft of Scientific Writing* (Springer, 2003) by Michael Alley. This workshop is free to SPIE Student Members. You must register to attend.

Professional Development Workshops

Job Search Preparation Workshop

WS962

NEW

Course level: Introductory
CEU .35 \$100 / \$150 USD
Tuesday 8:30 am to 12:30 pm

This course provides attendees with tools, techniques, and collateral for conducting an effective and successful job search. The course concentrates on defining your accomplishments and results to be used as the basis of all communication in your job search. You will learn to communicate the most crucial information about yourself during your job search and not just react to interview questions. The goal of this is to provide the right information to hiring teams to ensure their decisions are based on your factual accomplishments, rather than their emotions or your presentation skills.

INTENDED AUDIENCE

Anyone engaged in a job search, or who would like to hone their job searching skills and collateral, will find this course valuable.

INSTRUCTOR

Amber O'Brien is a Recruiting Consultant and Trainer, and has been in the staffing industry for over ten years.

This workshop is free to SPIE Student members, but you must register to attend.

Optics Magic - Easy Demonstrations from the PHOTON Projects

WS961

Course level: Introductory
Free—registration required
Monday 1:30 to 5:30 pm

Make glass disappear! Turn a tomato into a plum! See a "solid" wall vanish before your eyes and more. It's all done with optics! These magical inquiry-based demonstrations in light and vision may be easily replicated with inexpensive, commonly found supplies. Complete instructions and supplier list will be provided. Based on the PHOTON Explorations, these informative hands-on activities are some of the favorite demonstrations of the teacher participants of the PHOTON professional development projects funded by the Advanced Technology Education program of the National Science Foundation.

INTENDED AUDIENCE

This workshop is intended for anyone who wants a few engaging, simple demonstrations to take into their community for outreach purposes.

INSTRUCTOR

Judith Donnelly is currently Professor of Physics at Three Rivers Community Technical College and the 2003 recipient of the SPIE Educator of the Year award. She is the co-author of Author, "Light: Introduction to Optics and Photonics" and the co-creator of "Laser Camp", a hands-on introduction to optics and careers for High School students.

Note: Even though there is no charge to attend this workshop, participants must pre-register.

**Register for Workshops
at the SPIE Cashier**

Hands-On Optics (HOO) - Making an Impact with Light: Terrific Telescopes Workshop

WS852

Course level: Introductory
CEU .20 \$10 / \$20 USD
Sunday 8:30 to 11:30 am


This workshop will train attendees on the use of Terrific Telescopes, a hands-on activity kit intended to engage and enrich the math/science learning experience for students in the middle grades. It was developed as part of HOO, a program funded by a grant from the U.S. National Science Foundation (NSF) to design and implement a science enrichment program for children ages 11 to 14 years old.

INTENDED AUDIENCE

Optics professionals, university students, and pre-college teachers.

INSTRUCTOR

Celeste Baine runs the popular website EngineerInGedu.com where she promotes science and engineering learning for all ages. Before discovering her passion for teaching, she earned her Bachelors in Electrical Engineering Technology, worked in the Silicon Valley, and later became a Biomedical Engineer. In 2003, she returned to school for her Masters of Education. Celeste has given keynotes or presentations at more than 20 well known government, academic, and industry locations and received numerous awards for her work.



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Symposium Chairs

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James G. Grote, Air Force Research Lab. (United States)



Top image courtesy of Georgia Tech, Gary Meek. Sankar Nair, an assistant professor in the Georgia Tech School of Chemical and Biomolecular Engineering, holds a model showing the structure of metal oxide nanotubes he is developing. The research could lead to a technique for precisely controlling the dimensions of the structures.

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Jean-Eric Wegrowe, École Polytechnique (France)
Nikolay I. Zheludev, Univ. of Southampton (United Kingdom)

Sunday	Monday	Tuesday	Wednesday	Thursday
NanoScience				
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7393 Nanophotonic Materials VI (Cabrini/Mokari), p.53				
7394 Plasmonics: Metallic Nanostructures and Their Optical Properties VII (Stockman), p.55				
7395 Plasmonics: Nanoimaging, Nanofabrication, and their Applications V (Kawata/Shalaev/Tsai), p.60				
7396 Physical Chemistry of Interfaces and Nanomaterials VIII (Monti), p.64				
7397 Biosensing II (Razeghi/Mohseni), p.66				
7398 Spintronics II (Razeghi/Drouhin/Wegrowe), p.68				
7399 Carbon Nanotubes, Graphene, and Associated Devices II (Razeghi/Pribat/Lee), p.71				
7400 Optical Trapping and Optical Micromanipulation VI (Dholakia/Spalding), p.73				
7401 Biomimetics and Bioinspiration (Martín-Palma/Lakhtakia), p.77				
NanoEngineering				
7402 Nanoengineering: Fabrication, Properties, Optics, and Devices VI (Dobisz/Eldada), p.79				
7403 Nanobiosystems: Processing, Characterization, and Applications II (Kobayashi/Ouchen/Rau), p.81				
7404 Nanostructured Thin Films II (Smith/Lakhtakia/Lee), p.83				
7405 Instrumentation, Metrology, and Standards for Nanomanufacturing III (Postek), p.85				
7406 Nanoepitaxy: Homo and Heterogeneous Synthesis, Characterization, and Device Integration of Nanomaterials (Islam/Talin/Hersee), p.87				
7411 Nanoscale Photonic and Cell Technologies for Photovoltaics II (Tsakalacos), p.100				
7467 Nanophotonics and Macrophotonics for Space Environments III (Taylor/Cardimona), p.249				

See the Special Event Daily Schedule on page 9.

See the Course Daily Schedule on pages 42-45. Register for Courses at the SPIE Cashier.

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Conference 7392

Sunday-Wednesday 2-5 August 2009 • Proceedings of SPIE Vol. 7392

Metamaterials: Fundamentals and Applications II

Conference Chairs: **Mikhail A. Noginov**, Norfolk State Univ.; **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom); **Allan D. Boardman**, Univ. of Salford (United Kingdom); **Nader Engheta**, Univ. of Pennsylvania

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Sunday 2 August

Room: Conv. Ctr. 8 Sun. 8:00 to 8:10 am

Opening Remarks

Session Chair: **Allan D. Boardman**, Univ. of Salford (United Kingdom)

SESSION 1

Room: Conv. Ctr. 8 Sun. 8:10 to 10:40 am

Novel Concepts and Phenomena

Session Chair: **Nader Engheta**, Univ. of Pennsylvania

8:10 am: **Progress in superconducting metamaterials** (*Keynote Paper*), Steven M. Anlage, Univ. of Maryland, College Park (United States) . . . [7392-01]

9:00 am: **Stereometamaterials: electric and magnetic coupling and chiral properties** (*Invited Paper*), Na Liu, Hui Liu, Nanjing Univ. (China); Harald W. Giessen, Univ. Stuttgart (Germany) [7392-02]

9:30 am: **Metamaterials on curved surfaces**, D. Bruce Burckel, Michael B. Sinclair, Igal Brener, Gregory A. Ten Eyck, A. Rob Ellis, Joel R. Wendt, Brandon S. Passmore, Eric A. Shaner, Paul Davids, Sandia National Labs. (United States) [7392-03]

9:50 am: **Quantum chaos in metamaterials** (*Invited Paper*), Evgenii E. Narimanov, Purdue Univ. (United States) [7392-04]

10:20 am: **Surface plasmon polaritons and electric currents in silver films**, A. V. Yakim, Guohua Zhu, Natalia E. Noginova, Mikhail A. Noginov, Norfolk State Univ. (United States) [7392-05]

Coffee Break 10:40 to 11:00 am

SESSION 2

Room: Conv. Ctr. 8 Sun. 11:00 am to 12:20 pm

Chiral Metamaterials

Session Chair: **Allan D. Boardman**, Univ. of Salford (United Kingdom)

11:00 am: **Tunable chirality in photonic meta-materials** (*Invited Paper*), Eric Plum, Vasilli A. Fedotov, Xing-Xiang Liu, Nikolay I. Zheludev, Univ. of Southampton (United Kingdom) [7392-06]

11:30 am: **Spectral signatures of chirality**, Jesper Goor-Pedersen, Niels A. Mortensen, Technical Univ. of Denmark (Denmark) [7392-07]

11:50 am: **Non-reciprocal chiral fibers as optical isolators** (*Invited Paper*), Gennady Shvets, Simeon Trendafilov, Michael Tokman, The Univ. of Texas at Austin (United States) [7392-08]

Lunch Break 12:20 to 1:40 pm

SESSION 3

Room: Conv. Ctr. 8 Sun. 1:40 to 3:30 pm

Advanced Applications

Session Chair: **Mikhail A. Noginov**, Norfolk State Univ.

1:40 pm: **SERS and its plasmonic progeny** (*Invited Paper*), Martin Moskovits, Univ. of California, Santa Barbara (United States) [7392-09]

2:10 pm: **Plasmonic metamaterials for photo-catalytic reactors** (*Invited Paper*), Din Ping Tsai, National Taiwan Univ. (Taiwan) and RCAS, Academia Sinica (Taiwan) and Instrument Technology Research Ctr. (Taiwan) . . [7392-10]

2:40 pm: **Absorption enhancement and control of thermal radiation with meta-material structures** (*Invited Paper*), Shanhui Fan, Stanford Univ. (United States) [7392-11]

3:10 pm: **Coupling efficiency of nonreciprocal optical isolator with metamaterials substrate and linear cladding**, Hala J. El-Khozondar, The Islamic Univ. of Gaza (Palestinian Territory, Occupied); Rifa J. El-Khozondar, Al-Aqsa Univ. (Palestinian Territory, Occupied); Mohammed M. Shabat, The Islamic Univ. of Gaza (Palestinian Territory, Occupied); Alexander W. Koch, Technische Univ. München (Germany) [7392-12]

Coffee Break 3:30 to 4:00 pm

SESSION 4

Room: Conv. Ctr. 8 Sun. 4:00 to 5:50 pm

THz and Microwave Metamaterials

Session Chair: **Steven M. Anlage**, Univ. of Maryland, College Park

4:00 pm: **Self-supported all-metal THz metamaterials** (*Invited Paper*), Herbert O. Moser, Linke Jian, National Univ. of Singapore (Singapore); Hongsheng Chen, Zhejiang Univ. (China); Mohammed Bahou, Shenbaga M. P. Kalaiselvi, Selven Virasawmy, Sivakumar Maniam, National Univ. of Singapore (Singapore); Xiangxiang Cheng, Zhejiang Univ. (China); Sascha P. Heussler, Shahrain bin Mahmood, National Univ. of Singapore (Singapore); Bae-Ian Wu, Massachusetts Institute of Technology (United States) [7392-13]

4:30 pm: **Novel metamaterial devices at terahertz frequencies** (*Invited Paper*), Willie J. Padilla, Boston College (United States) [7392-14]

5:00 pm: **Terahertz near-field imaging of electric and magnetic resonances in metamaterials** (*Invited Paper*), Markus Walther, Andreas Bitzer, Albert-Ludwigs-Univ. Freiburg (Germany) [7392-15]

5:30 pm: **All-dielectric metamaterial: a ferroelectric-based scheme in the microwave range**, Thomas Lepetit, Eric Akmansoy, Univ. Paris-Sud (France); Jean-Pierre Ganne, Thales Research & Technology (France) [7392-16]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

Tuesday 4 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

- 8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)
- 9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)
- 10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)
- 11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)
- See page 16-17 for presentation details.

Lunch/Exhibition Break 12:00 to 1:20 pm

SESSION 5

Room: Conv. Ctr. 8 Mon. 1:20 to 5:00 pm

Metamaterials Theory

- Session Chair: **Francisco Javier García de Abajo**, Consejo Superior de Investigaciones Científicas (Spain)
- 1:20 pm: **Plasmon guided modes and nonlocal effects in closely-spaced nanoparticle metamaterials** (*Invited Paper*), Francisco Javier García de Abajo, Rebecca Sainidou, Consejo Superior de Investigaciones Científicas (Spain). . . [7392-17]
- 1:50 pm: **The homogenization of piezoelectric metamaterials via the strong-property-fluctuation theory** (*Invited Paper*), Andrew Duncan, Tom G. Mackay, Univ. of Edinburgh (United Kingdom); Akhlesh Lakhtakia, The Pennsylvania State Univ. (United States) [7392-18]
- 2:20 pm: **Metamaterial homogenization: extraction of effective constitutive parameters**, Christopher Fietz, Gennady Shvets, The Univ. of Texas at Austin (United States) [7392-19]
- 2:40 pm: **Molecular states in double quantum wells: nanochemistry for metamaterials with new optical properties**, Rafael M. Gutiérrez, Arcesio Castañeda, Univ. Antonio Nariño (Colombia) [7392-20]
- Coffee Break 3:00 to 3:30 pm
- 3:30 pm: **Practicable enhancement of photoluminescence with metal nanoparticles** (*Invited Paper*), Jacob B. Khurgin, The Johns Hopkins Univ. (United States); Gregory Sun, Univ. of Massachusetts Boston (United States) [7392-21]
- 4:00 pm: **Modification of spontaneous emission by anisotropic metamaterials**, Zubin Jacob, Evgenii E. Narimanov, Purdue Univ. (United States) [7392-22]
- 4:20 pm: **Confined modes in periodic planar particle arrays**, Xesus M. Bendaña, Francisco Javier García de Abajo, Consejo Superior de Investigaciones Científicas (Spain) [7392-23]
- 4:40 pm: **Radiation pressure and photon momentum in negative-index media**, Masud Mansuripur, College of Optical Sciences, The Univ. of Arizona (United States); Armin R. Zakharian, Corning Inc. (United States) [7392-24]

SESSION 6

Room: Conv. Ctr. 8 Mon. 5:00 to 6:00 pm

Modeling and Computation

Session Chair: **Satoshi Kawata**, Osaka Univ. (Japan)

- 5:00 pm: **Optical absorption of $\text{Cu}_{(1-x)}\text{Zn}_{(x)}$, $\text{Ag}_{(1-x)}\text{Cd}_{(x)}$, and $\text{Ag}_{(1-x)}\text{In}_{(x)}$ alloys**, Alexander V. Gavrilenko, Doyle J. Baker, Casey A. Gonder, Vladimir I. Gavrilenko, Norfolk State Univ. (United States) [7392-25]
- 5:20 pm: **Ulam's method to estimate invariant measures and Lyapunov exponents for one-dimensional discretely randomized photonic structures**, Glen J. Kissel, Univ. of Southern Indiana (United States) [7392-26]
- 5:40 pm: **NanoHUB web-based nanophotonics simulation tools**, Xingjie Ni, Matthew D. Swanson, Satoshi Ishii, Zhengtong Liu, Zubin Jacob, Uday K. Chettiar, Alexander V. Kildishev, Vladimir M. Shalaev, Purdue Univ. (United States) [7392-27]

SESSION 7

Room: Conv. Ctr. 8 Tues. 8:30 to 10:20 am

Optical Transformations and Cloaking

- Session Chairs: **Andrey K. Sarychev**, Institute for Theoretical and Applied Electromagnetism (Russian Federation); **Mark I. Stockman**, Georgia State Univ.
- 8:30 am: **Cloaking at optical frequencies** (*Invited Paper*), Jensen Li, Xiang Zhang, Univ. of California, Berkeley (United States) [7392-28]
- 9:00 am: **Anisotropic metamaterials emulated by tapered waveguides** (*Invited Paper*), Igor I. Smolyaninov, BAE Systems (United States) . . . [7392-29]
- 9:30 am: **Transforming light and cloaking with metamaterials** (*Invited Paper*), Vladimir M. Shalaev, Alexander V. Kildishev, Vladimir P. Drachev, Uday K. Chettiar, Purdue Univ. (United States) [7392-30]
- 10:00 am: **A metamaterial frequency-selective super-absorber**, Jack Ng, Huanyang Chen, Che Ting Chan, The Hong Kong Univ. of Science and Technology (Hong Kong, China) [7392-31]
- Coffee Break 10:20 to 10:50 am

SESSION 8

Room: Conv. Ctr. 8 Tues. 10:50 am to 12:40 pm

Fabrication and Synthesis

- Session Chair: **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)
- 10:50 am: **Direct laser writing of photonic nanostructures** (*Invited Paper*), Maria Farsari, Foundation for Research and Technology-Hellas (Greece) [7392-32]
- 11:20 am: **Bottom-up approach towards metamaterials** (*Invited Paper*), Dorothea A. Pawlak, Sebastian Turczynski, Katarzyna Kolodziejak, Marcin Gajc, Andrzej Klos, Institute of Electronic Materials Technology (Poland) . . . [7392-33]
- 11:50 am: **Oriental order in systems of nanorods** (*Invited Paper*), Oleg D. Lavrentovich, Kent State Univ. (United States) [7392-34]
- 12:20 pm: **Nano-structured metal-polymer hybrid particles for novel photonic materials**, Hiroshi Yabu, Tohoku Univ. (Japan) and JST-PRESTO (Japan); Kazutaka Koike, Kiwamu Motoyoshi, Takeshi Higuchi, Masatsugu Shimomura, Tohoku Univ. (Japan) [7392-35]

Lunch/Exhibition Break 12:40 to 2:00 pm

SESSION 9

Room: Conv. Ctr. 8 Tues. 2:00 to 5:30 pm

Active Metamaterials

- Session Chair: **Martin W. McCall**, Imperial College London (United Kingdom)
- 2:00 pm: **Ultrafast active nanoplasmonics** (*Invited Paper*), Mark I. Stockman, Georgia State Univ. (United States) [7392-36]
- 2:30 pm: **Active metamaterials**, Andrey K. Sarychev, Institute for Theoretical and Applied Electrodynamics (Russian Federation); Gennady Tartakovskiy, Lockheed Martin Maritime Systems & Sensors (United States) [7392-37]
- 3:00 pm: **Nonlinear guided waves in tuneable, gyrotropic, metamaterial complex structures** (*Invited Paper*), Allan D. Boardman, Peter Egan, Rhiannon R. C. Mitchell-Thomas, Yuriy G. Rapoport, Univ. of Salford (United Kingdom) [7392-38]
- Coffee Break 3:30 to 3:50 pm

Courses of Related Interest

See *SPIE Cashier* for information and to register.

- SC608 Photonic Crystals: A Crash Course, from Bandgaps to Fibers (Johnson) Monday, 1:30 to 5:30 pm
- SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7392

3:50 pm: **Analysis of active metamaterials**, Ekateina Poutrina, David R. Smith, Duke Univ. (United States) [7392-39]

4:10 pm: **Nonlinear effects in positive-negative-index guided wave structures** (*Invited Paper*), Natalia M. Litchinitser, Univ. at Buffalo (United States); Yuanjiang Xiang, Vladimir M. Shalaev, Purdue Univ. (United States) [7392-40]

4:40 pm: **Nonlinear tunable metamaterials** (*Invited Paper*), Yuri S. Kivshar, The Australian National Univ. (Australia) [7392-41]

5:10 pm: **Active infrared metamaterials based on hybrid vanadium oxide-silver split ring resonators**, Koray Aydin, Matthew J. Dicken, Imogen M. Pryce, California Institute of Technology (United States); James Ma, Luke A. Sweatlock, Northrop Grumman Space Technology (United States); Harry A. Atwater, Jr., California Institute of Technology (United States) [7392-42]

Wednesday 5 August

SESSION 10

Room: Conv. Ctr. 8 Wed. 8:20 to 11:30 am

Imaging with Metamaterials

Session Chair: Lucio Vegni, Univ. degli Studi di Roma Tre (Italy)

8:20 am: **Magnified color imaging through plasmonic nanolens** (*Invited Paper*), Satoshi Kawata, Prabhat Verma, Osaka Univ. (Japan) [7392-43]

8:50 am: **Hypergratings: far-field subwavelength focusing in planar metamaterials** (*Invited Paper*), Viktor A. Podolskiy, Sukosin Thongrattanasiri, Oregon State Univ. (United States) [7392-44]

9:20 am: **Super-resolution imaging using spatial Fourier transform infrared spectroscopy**, Leonid Alekseyev, Princeton Univ. (United States) and Purdue Univ. (United States); Evgenii E. Narimanov, Purdue Univ. (United States); Jacob B. Khurgin, Johns Hopkins Univ. (United States) [7392-45]

9:40 am: **Transporting an image through a subwavelength hole** (*Invited Paper*), Mario G. Silveirinha, Univ. of Pennsylvania (United States) and Univ. de Coimbra (Portugal); Nader Engheta, Univ. of Pennsylvania (United States) [7392-47]

Coffee Break 10:10 to 10:40 am

10:40 am: **Near field pattern synthesis at visible frequencies** (*Invited Paper*), Lucio Vegni, Filiberto Bilotti, Univ. degli Studi di Roma Tre (Italy) [7392-48]

11:10 am: **A study of the image quality in a lossy NFSL**, Kwangchil Lee, Kyongsik Kim, Yonsei Univ. (Korea, Republic of) [7392-49]

SESSION 11

Room: Conv. Ctr. 8 Wed. 11:30 am to 12:50 pm

Split Ring Resonators

Session Chair: Martin Moskovits, Univ. of California, Santa Barbara

11:30 am: **Interaction effects in low-symmetry split-ring resonator arrays** (*Invited Paper*), Martin Wegener, Manuel Decker, Stefan Linden, Forschungszentrum Karlsruhe (Germany) and Univ. Karlsruhe (Germany) [7392-50]

12:00 pm: **Spectroscopy of individual photonic atoms** (*Invited Paper*), Stefan Linden, Forschungszentrum Karlsruhe (Germany) [7392-51]

12:30 pm: **Plasmonic couplings in split-ring resonators by electric excitation**, Chia-Yun Chen, Ta-Jen Yen, National Tsing Hua Univ. (Taiwan) [7392-52]

Lunch/Exhibition Break 12:50 to 2:00 pm

SESSION 12

Room: Conv. Ctr. 8 Wed. 2:00 to 3:30 pm

Magnetic Phenomena

Session Chair: Evgenii E. Narimanov, Purdue Univ.

2:00 pm: **Optical magnetism in metal nanoforests** (*Invited Paper*), Ortwin Hess, Univ. of Surrey (United Kingdom) [7392-53]

2:30 pm: **Luminescence of Eu³⁺ ions: toward monitoring optical electric and magnetic fields**, Mikhail A. Noginov, Yu. A. Barnakov, Heng Li, Natalia E. Noginova, Norfolk State Univ. (United States) [7392-54]

2:50 pm: **Magneto-optical activity and surface-plasmon resonance**, Rosa A. Lukaszew, César Clavero Perez, The College of William & Mary (United States) [7392-55]

3:10 pm: **An optical metamaterial with a negative permeability from an array of artificial flowers**, Jingjing Li, Hewlett-Packard Labs. (United States); Lars H. Thylén, Hewlett-Packard Labs. (United States) and Royal Institute of Technology (Sweden) and Zhejiang Univ. (China); Alexander M. Bratkovsky, Shih-Yuan Wang, R. Stanley Williams, Hewlett-Packard Labs. (United States) [7392-56]

Coffee Break 3:30 to 4:00 pm

SESSION 13

Room: Conv. Ctr. 8 Wed. 4:00 to 6:00 pm

Negative Index Materials

Session Chair: Vladimir M. Shalaev, Purdue Univ.

4:00 pm: **What is negative refraction?** (*Invited Paper*), Martin W. McCall, Paul Kinsler, Imperial College London (United Kingdom); Dan Censor, Ben-Gurion Univ. of the Negev (Israel) [7392-57]

4:30 pm: **Novel homogeneous negative refractive index materials** (*Invited Paper*), Adil-Gerai Kussow, Alkim Akyurtlu, Univ. of Massachusetts Lowell (United States) [7392-58]

5:00 pm: **Negative refraction in split-ring-resonator stack at normal incidence**, Boubacar Kante, Rasta Ghasemi, André de Lustrac, Jean Michel Lourtioz, Univ. Paris-Sud (France) [7392-59]

5:20 pm: **Surface polaritons at a negative index material grating**, Ricardo A. Depine, Mauro A. Cuevas, Univ. de Buenos Aires (Argentina) [7392-60]

5:40 pm: **Perturbation of multilayered structures of positive and negative index materials**, Rola Aylo, Partha P. Banerjee, Univ. of Dayton (United States) [7392-61]

Room: Conv. Ctr. Exhibiton Hall D. Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Why nanotechnology needs a nanoscience, Bradley S. Tice, Advanced Human Design (United States) [7392-62]

Coherent control of metamaterials, Sangeeta Chakrabarti, Subramanian A. Ramakrishna, Harshawardhan Wanare, Indian Institute of Technology Kanpur (India) [7392-63]

Synthesis of novel organic ligands for gold nanoparticles decoration and architectures based on them, Alexander G. Majouga, Roman Antipin, Leonid Agron, Elena Beloglazkina, Lomonosov Moscow State Univ. (Russian Federation); Renata Romashkina, Lomonosov Moscow State University (Russian Federation); Nikolay Zyk, Lomonosov Moscow State Univ. (Russian Federation) [7392-64]

Retrieval method for nonlinear metamaterials, S. Larouche, D. R. Smith, Duke Univ. (United States) [7392-65]

Room: Conv. Ctr. 8 Wed. 6:00 to 6:10 pm

Closing Remarks

Session Chair: Mikhail A. Noginov, Norfolk State Univ.

Conference 7393

Sunday-Monday 2-3 August 2009 • Proceedings of SPIE Vol. 7393

Nanophotonic Materials VI

Conference Chairs: **Stefano Cabrini**, Lawrence Berkeley National Lab.; **Taleb Mokari**, Lawrence Berkeley National Lab.

Program Committee: **David L. Andrews**, Univ. of East Anglia Norwich (United Kingdom); **Angus J. Bain**, Univ. College London (United Kingdom); **Mireille H. Blanchard-Desce**, Univ. de Rennes I (France); **Robert W. Boyd**, Univ. of Rochester; **Zeno Gaburro**, Univ. degli Studi di Trento (Italy); **Aaron W. Harper**, Univ. of Southern California; **Ghassan E. Jabbour**, Arizona State Univ.; **François Kajzar**, Univ. d'Angers (France); **Dmitri I. Kovalev**, Univ. of Bath (United Kingdom); **Paras N. Prasad**, Univ. at Buffalo; **Dmitri Talapin**, The Univ. of Chicago; **Younan Xia**, Univ. of Washington

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 14B Sun. 8:30 to 10:20 am

Synthesis and Fabrication I

Session Chair: **Stefano Cabrini**, Lawrence Berkeley National Lab.

8:30 am: **Charge separation in self-assembled type-II tunneling structures of CdTe and CdSe nanocrystals**, Dieter Gross, Ludwig-Maximilians-Univ. München (Germany); Iván Mora Sero, Univ. Jaume I (Spain); Thomas Dittrich, Helmholtz Zentrum München, GmbH (Germany); Andrei S. Susa, Enrico Da Como, Andrey L. Rogach, Jochen Feldmann, Ludwig-Maximilians-Univ. München (Germany) [7393-01]

8:50 am: **Optical and nonlinear optical properties of Co-doped ZnO nanostructures**, Karthikeyan Balasubramanian, National Institute of Technology, Tiruchirappalli (India); Suchand C. S. Sandeep, Reji Philip, Raman Research Institute (India) [7393-02]

9:10 am: **Thiol capped colloidal CdTe quantum dots synthesized using laser ablation**, Diogo B. Almeida, Eugenio Rodriguez, Ricardo S. Moreira, Univ. Estadual de Campinas (Brazil); Said Agouram, Univ. de València (Spain); Luis C. Barbosa, Univ. Estadual de Campinas (Brazil); Ernesto V. Jimenez, Univ. de València (Spain); Carlos L. Cesar, Univ. Estadual de Campinas (Brazil) [7393-03]

9:30 am: **Confocal microscopy of single silicon nanoparticles**, Alexey Chizhik, Anna Chizhik, Eberhard Karls Univ. Tübingen (Germany); Torsten Schmidt, Friedrich-Schiller-Univ. Jena (Germany); Raphael Gutbrod, Sebastian Baer, Eberhard Karls Univ. Tübingen (Germany); Friedrich Huisken, Friedrich-Schiller-Univ. Jena (Germany); Alfred J. Meixner, Eberhard Karls Univ. Tübingen (Germany) [7393-04]

9:50 am: **An evolutionary tree for morphological engineering of plasmonic gold nanoparticles (Invited Paper)**, Jiaying Huang, Northwestern Univ. (United States) [7393-05]

Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Conv. Ctr. 14B Sun. 10:50 am to 12:20 pm

Characterization I

Session Chair: **Jiaying Huang**, Northwestern Univ.

10:50 am: **Excitons and multi-excitons in heterostructured semiconductor nanorods (Invited Paper)**, Uri Banin, The Hebrew Univ. of Jerusalem (Israel) [7393-06]

11:20 am: **Tuning the optical properties of semiconductor nanostructures via leaky mode resonance**, Linyou Cao, Justin S. White, Stanford Univ. (United States); Joon-Shik Park, Korea Electronics Technology Institute (Korea, Republic of); Mark L. Brongersma, Stanford Univ. (United States) [7393-07]

11:40 am: **Characterization of surface plasmon peak shifts and dampening in Au-YSZ nanocomposites**, Phillip H. Rogers, Michael A. Carpenter, Univ. at Albany (United States) [7393-08]

12:00 pm: **Electric field modulated directional energy flow in strongly-coupled quantum dot nano-assemblies**, Yashwant K. Verma, Somnath Ghosh, Maribel Gallardo, Christopher G. Ferri, Sayantani Ghosh, Univ. of California, Merced (United States) [7393-09]

Lunch Break 12:20 to 1:40 pm

SESSION 3

Room: Conv. Ctr. 14B Sun. 1:40 to 3:10 pm

Characterization II

Session Chair: **Bruce E. Cohen**, Lawrence Berkeley National Lab.

1:40 pm: **Directed self-assembly of silver nanocubes: a method for regenerable surface-enhanced Raman spectroscopy (SERS) substrates (Invited Paper)**, Oded Rabin, Univ. of Maryland, College Park (United States) [7393-10]

2:10 pm: **Energy transfer in hybrid organic/inorganic nanocomposites**, Thilo Stoeferle, Rainer F. Mahrt, IBM Zürich Research Lab. (Switzerland) [7393-11]

2:30 pm: **Investigation of H-bonded media by means of Raman scattering in terms of the fractal formalism**, Andrii Maksymov, Andrey Yakunov, National Taras Shevchenko Univ. of Kyiv (Ukraine) [7393-12]

2:50 pm: **Three-dimensional subwavelength confinement of light with non resonant dielectric structures**, Alexis Devilez, Nicolas Bonod, Brian D. Stout, Jérôme Wenger, Davy Gérard, Evgueni K. Popov, Institut Fresnel (France) [7393-13]

Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Conv. Ctr. 14B Sun. 3:40 to 5:30 pm

Applications of Nanophotonic Materials

Session Chair: **Oded Rabin**, Univ. of Maryland, College Park

3:40 pm: **Self-assembly of a thiophene/phenylene co-oligomer (Invited Paper)**, Frank Balzer, Manuela Schiek, Syddansk Univ. (Denmark); Arne Lützen, Univ. Bonn (Germany); Horst-Günter Rubahn, Syddansk Univ. (Denmark) [7393-14]

4:10 pm: **Hybrid light emitting diodes**, Pavlos G. Lagoudakis, Univ. of Southampton (United Kingdom) [7393-15]

4:30 pm: **Lu₂SiO₅:Ce optical ceramic scintillator**, Yimin Wang, Radiation Monitoring Devices, Inc. (United States); William H. Rhodes, ALEM Associates (United States); Edgar van Loef, Jaroslav Glodo, Gary Baldoni, Radiation Monitoring Devices, Inc. (United States); Long Nguyen, Nanocerox, Inc. (United States); Charles Brecher, ALEM Associates (United States); Kanai S. Shah, Radiation Monitoring Devices, Inc. (United States) [7393-16]

4:50 pm: **High photon extraction efficiency from GaAs pillar with InAs quantum dots embedded in niobium metal**, Taimotu Kato, Makoto Takada, Hokkaido Univ. (Japan); Yasuhiro Idutsu, Hokkaido Univ. (Japan) and JST-CREST (Japan); Sotaro Ida, Saki Ito, Hokkaido Univ. (Japan); Jae-Hoon Huh, Hokkaido Univ. (Japan) and GCOE (Japan); Hirotaka Sasakura, Ikuo Suemune, Hokkaido Univ. (Japan) and JST-CREST (Japan) [7393-17]

5:10 pm: **Growth of silver nanoparticles in SiO₂ matrix by RF sputtering technique**, Sanal K. C. Kozhiparambil, R. Sreeja, Madambi K. Jayaraj, Cochin Univ. of Science & Technology (India) [7393-18]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Conference 7393

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 14B Mon. 1:30 to 3:00 pm

Nanophotonics for Biology

Session Chair: **Frank Balzer**, Univ. of Southern Denmark (Denmark)

1:30 pm: **Artificial optical activity in chiral resonant nanogratings**, Benfeng Bai, Jari P. Turunen, Univ. of Joensuu (Finland) [7393-19]

1:50 pm: **Time-resolved fluorescence and fluorescence correlation spectroscopy studies of dye-doped DNA**, Nick Nicolaou, Elinor Bailey, Univ. College London (United Kingdom); Xiaohai Liu, Bojan Obrabovic, Illumina, Inc. (United Kingdom); Angus J. Bain, Univ. College London (United Kingdom) [7393-20]

2:10 pm: **Luminescent dye-doped or rare-earth-doped monodisperse silica nanospheres as efficient labels in DNA microarrays**, Francesco Enrichi, Raffaele Riccò, Anna Meneghella, R. Pierobon, F. Marinello, Piero Schiavuta, CIVEN (Italy); Alvise Parma, Pietro Riello, Alvise Benedetti, Univ. Ca' Foscari Venezia (Italy) [7393-21]

2:30 pm: **Smart nanoparticles for biological imaging (Invited Paper)**, Bruce E. Cohen, Lawrence Berkeley National Lab. (United States) [7393-22]

Coffee Break 3:00 to 3:30 pm

SESSION 6

Room: Conv. Ctr. 14B Mon. 3:30 to 5:20 pm

Synthesis and Fabrication II

Session Chair: **Taleb Mokari**, Lawrence Berkeley National Lab.

3:30 pm: **Structuration of Sol-Gel materials: a powerful nanofabrication method (Invited Paper)**, Christophe Peroz, Abeam Technologies (United States); G. Han, J. Urban, Scott D. Dhuey, Allan Chang, Stefano Cabrini, Lawrence Berkeley National Lab. (United States) [7393-23]

4:00 pm: **Optical characterization of colloidal crystals based on oxide submicrospheres**, Sabine M. Portal, Oriol Arteaga, Maria Angels Vallvé, Adolf Canillas, Enric Bertran, Univ. de Barcelona (Spain) [7393-24]

4:20 pm: **Luminescence and photoconductivity studies on amorphous and nanocrystalline ZnO thin films obtained by sol-gel**, Jorge A. Garcia-Macedo, Guadalupe Valverde-Aguilar, Jose Luis Manriquez-Zepeda, Univ. Nacional Autónoma de México (Mexico) [7393-25]

4:40 pm: **PbTe quantum dots multilayer embedded in a CdTe matrix**, Eugenio Rodriguez, Ernesto V. Jimenez, Ricardo S. Moreira, Univ. Estadual de Campinas (Brazil); Lino Misoguti, Sérgio C. Zilio, Univ. de São Paulo (Brazil); Luis C. Barbosa, Carlos L. Cesar, Univ. Estadual de Campinas (Brazil) . . . [7393-26]

5:00 pm: **Individual pore infiltration with dyes in macroporous silicon**, Peter W. Noite, Daniel Pergande, Ralf B. Wehrspohn, Hans H. Blaschek, Martin-Luther Univ. Halle-Wittenberg (Germany); Markus Geuss, Martin Steinhart, Max-Planck-Institut für Mikrostrukturphysik (Germany); Roland Salzer, Fraunhofer-Institut für Werkstoffmechanik (Germany) [7393-27]

Room: Conv. Ctr. Exhibiton Hall D. Wed. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Optical limiting effects of graphene hybrid materials with porphyrin and fullerene, Zhi-Bo Liu, Nankai Univ. (China) [7393-28]

Thermal characterisation of nanofluids using laser induced thermal lens technique, Achamma Kurian, Rajesh B. Kumar, Catholicate College (India); Sajjan D. George, Leibniz Univ. Hannover (Germany) [7393-30]

Calculations of transmission spectra in 1D photonic structures accounting polariton effects, Yury Timoshenko, Voronezh State Univ. (Russian Federation); Valentina Shunina, Voronezh State Technical Univ. (Russian Federation); Yuriy V. Smirnov, Oxana Kazarina, Voronezh State Univ. (Russian Federation) [7393-31]

Calculation of the dielectric function of zigzag (6,0) boron nitride nanotubes with adsorption of molecular hydrogen, Raul A. Vazquez-Nava, Norberto Arzate, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7393-32]

Synthesis, characterization, and photoconductivity studies on amorphous and nanocrystalline TiO₂ films doped with gold nanoparticles, Jorge A. Garcia-Macedo, Guadalupe Valverde-Aguilar, Pablo Galvan-Ramirez, Univ. Nacional Autónoma de México (Mexico) [7393-33]

Thiol-ene reaction as tool for crosslinking of polymeric micelles in the nanoscale, Barbara Rupp, Polymer Competence Ctr. Leoben GmbH (Austria); Thomas Bauer, Frank Wiesbrock, Christian Slugovc, Technische Univ. Graz (Austria) [7393-35]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7394

Sunday-Thursday 2-6 August 2009 • Proceedings of SPIE Vol. 7394

Plasmonics: Metallic Nanostructures and their Optical Properties VII

Conference Chair: **Mark I. Stockman**, Georgia State Univ.

Program Committee: **Martin Aeschlimann**, Univ. Kaiserslautern (Germany); **David J. Bergman**, Tel Aviv Univ. (Israel); **Jochen Feldmann**, Ludwig-Maximilians-Univ. München (Germany); **Harald W. Giessen**, Univ. Stuttgart (Germany); **Naomi J. Halas**, Rice Univ.; **Martti Kauranen**, Tampere Univ. of Technology (Finland); **Satoshi Kawata**, Osaka Univ. (Japan); **Fritz Keilmann**, Max-Planck-Institut für Biochemie (Germany); **Dai-Sik Kim**, Seoul National Univ. (Korea, Republic of); **Victor I. Klimov**, Los Alamos National Lab.; **Aaron Lewis**, The Hebrew Univ. of Jerusalem (Israel); **Olivier J. F. Martin**, Swiss Federal Institute of Technology (Switzerland); **Martin Moskovits**, Univ. of California, Santa Barbara; **Peter J. Nordlander**, Rice Univ.; **Lukas Novotny**, Univ. of Rochester; **Motoichi Ohtsu**, Japan Science and Technology Agency (Japan); **John B. Pendry**, Imperial College London (United Kingdom); **Barry S. Perlmán**, Army Research Lab.; **Lewis J. Rothberg**, Univ. of Rochester; **Vahid H. Sandoghdar**, Eidgenössische Technische Hochschule (Switzerland); **George C. Schatz**, Northwestern Univ.; **Tigran V. Shahbazyan**, Jackson State Univ.; **Vladimir M. Shalaev**, Purdue Univ.; **Gennady Shvets**, The Univ. of Texas at Austin; **Din Ping Tsai**, National Taiwan Univ. (Taiwan); **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom); **Joseph Zyss**, Ecole Normale Supérieure de Cachan (France)

Sunday 2 August

Room: Conv. Ctr. 6B Sun. 8:25 to 8:30 am

Chair Foreword

Mark I. Stockman, Georgia State Univ. (United States)

SESSION 1

Room: Conv. Ctr. 6B Sun. 8:30 to 10:30 am

Special Invited Session: Nanoplasmonic Sensing and Imaging: Fundamentals and Applications

Session Chair: **Mark I. Stockman**, Georgia State Univ.

8:30 am: **Nanoptical characterization of plasmonic nanostructures and devices with single and multiprobe NSOM** (Keynote Presentation), Aaron Lewis, The Hebrew Univ. of Jerusalem (Israel) [7394-01]

9:15 am: **Exploring single-molecule SERS, the plasmonic periodic table, and plasmon microscopy** (Keynote Presentation), Richard P. Van Duyne, Kristin L. Wustholz, Jon Dieringer, George C. Schatz, George Chan, David J. Masiello, Karl Scheidt, Laurence D. Marks, Northwestern Univ. (United States); Jon P. Camden, Univ. of Tennessee (United States) [7394-02]

10:00 am: **Single molecule detection using superhydrophobic surfaces and advanced biophotonic devices** (Invited Paper), Enzo M. Di Fabrizio, Univ. degli studi Magna Græcia di Catanzaro (Italy) and INFN-TASC (Italy) [7394-03]

Coffee Break 10:30 to 11:00 am

SESSION 2

Room: Conv. Ctr. 6B Sun. 11:00 am to 1:10 pm

Spasers, Nanolasers, and Loss Compensation

Session Chair: **Richard P. Van Duyne**, Northwestern Univ.

11:00 am: **SPASER and nanolaser effects in hybrid Au/silica/dye nanoparticles** (Invited Paper), Mikhail A. Noginov, Guohua Zhu, Akeisha M. Belgrave, Norfolk State Univ. (United States); Reuben M. Bakker, Vladimir M. Shalaev, Evgenii E. Narimanov, Purdue Univ. (United States); Samantha Stout, Erik Herz, Ulrich B. Wiesner, Cornell Univ. (United States) [7394-04]

11:30 am: **Experimental demonstration of strong coupling between grating and particle resonances in metal nanoparticle arrays near a metal film**, Amitabh Ghoshal, Pieter G. Kik, CREOL, The College of Optics and Photonics (United States) [7394-05]

11:50 am: **Computational plasmonic enhancement of fluorescence**, Ravi K. Kannadorai, Anand K. Asundi, Nanyang Technological Univ. (Singapore) [7394-06]

12:10 pm: **Photonic metamaterials: three-dimensional structures and loss compensation** (Invited Paper), Martin Wegener, Forschungszentrum Karlsruhe (Germany) [7394-07]

12:40 pm: **Metallic nano-cavity lasers at near infrared wavelengths** (Invited Paper), Martin T. Hill, Technische Univ. Eindhoven (Netherlands) [7394-08]

Lunch Break 1:10 to 2:10 pm

SESSION 3

Room: Conv. Ctr. 6B Sun. 2:10 to 3:30 pm

Superresolution in Far Field and Extraordinary Transmission

Session Chair: **Aaron Lewis**, Nanonics Imaging Ltd. (Israel)

2:10 pm: **Superoscillation in optics** (Invited Paper), Mark R. Dennis, Jari Lindberg, Univ. of Bristol (United Kingdom); Johannes K. Courtial, Alistair Hamilton, Univ. of Glasgow (United Kingdom); Francisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain); Nikolay I. Zheludev, Univ. of Southampton (United Kingdom) [7394-09]

2:40 pm: **Nanoscale slit arrays as planar far-field lenses**, Peter B. Catrysse, Lieven Verslegers, Zongfu Yu, Justin S. White, Edward S. Barnard, Mark L. Brongersma, Shanhui Fan, Stanford Univ. (United States) [7394-10]

3:00 pm: **Universal optimal transmission of light through disordered materials** (Invited Paper), Allard P. Mosk, Univ. Twente (Netherlands) [7394-11]

Coffee Break 3:30 to 4:00 pm

SESSION 4

Room: Conv. Ctr. 6B Sun. 4:00 to 6:00 pm

THz Plasmonics and Related Issues

Session Chair: **Enzo M. Di Fabrizio**, Univ. degli studi Magna Græcia di Catanzaro (Italy)

4:00 pm: **Reconfigurable terahertz metamaterial and plasmonic structures** (Invited Paper), Richard D. Averitt, Boston Univ. (United States) [7394-12]

4:30 pm: **Terahertz transmission through a nanogap**, Minah Seo, Hyeong-Ryeol Park, Jisoo Kyoung, Sukmo Koo, Namkyoo Park, Seoul National Univ. (Korea, Republic of); Om K. Suwal, Seong-Soo Choi, Sun Moon Univ. (Korea, Republic of); Q-Han Park, Korea Univ. (Korea, Republic of); Dai-Sik Kim, Seoul National Univ. (Korea, Republic of) [7394-13]

4:50 pm: **Polarization dependent terahertz spectroscopy of a single subwavelength hole in thin metallic film**, Tae-Ho Park, Joong-Wook Lee, Peter J. Nordlander, Daniel M. Mittleman, Rice Univ. (United States) [7394-14]

5:10 pm: **Sub-wavelength imaging and sensing using mid-infrared SPPs** (Invited Paper), Gennady Shvets, Dmitriy Korobkin, Burton Neuner III, Christopher Fietz, The Univ. of Texas at Austin (United States); Gabriel Ferro, Univ. Claude Bernard Lyon 1 (France) [7394-15]

5:40 pm: **THz anomalous transmission in plasmonic lattices: incidence angle dependence**, Tho D. Nguyen, Valy Z. Vardeny, Ajay Nahata, The Univ. of Utah (United States) [7394-16]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Conference 7394

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Lunch Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 6B Mon. 1:30 to 3:30 pm

Active Nanoplasmonics and Related Subjects

Session Chair: **Gennady Shvets**, The Univ. of Texas at Austin

1:30 pm: **Phase-change chalcogenide glasses in active plasmonics** (*Invited Paper*), Nikolay I. Zheludev, Univ. of Southampton (United Kingdom); Shih-Chiang Yen, Univ. of Southampton (United Kingdom) and National Taiwan Univ. (Taiwan); Zsolt L. Sámson, Kevin F. MacDonald, Kenton J. Knight, Daniel W. Hewak, Univ. of Southampton (United Kingdom) [7394-17]

2:00 pm: **Plasmonic drag effect**, Maxim Durach, Anastasia Rusina, Mark I. Stockman, Georgia State Univ. (United States) [7394-18]

2:20 pm: **Nanoscale optical field localization by resonantly focused plasmons**, Liang Feng, Derek Van Orden, Maxim Abashin, Vitaliy Lomakin, Yeshiahu Fainman, Univ. of California, San Diego (United States) [7394-19]

2:40 pm: **Transparent conducting oxides for active plasmonics**, Eyal Feigenbaum, Kenneth Diest, Harry A. Atwater, California Institute of Technology (United States) [7394-20]

3:00 pm: **Wavefront engineering with nanoplasmonics** (*Invited Paper*), Federico Capasso, Nanfang Yu, Romain Blanchard, Jonathan Fan, Harvard Univ. (United States) [7394-21]

Coffee Break 3:30 to 4:00 pm

SESSION 6

Room: Conv. Ctr. 6B Mon. 4:00 to 6:20 pm

SERS and Nanoplasmonic Sensing

Session Chair: **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)

4:00 pm: **Approaching the ultimate limits in analytics using plasmonics** (*Invited Paper*), Katrin D. Kneipp, Harald Kneipp, Harvard Medical School (United States); Janina Kneipp, Humboldt-Univ. zu Berlin (Germany) [7394-22]

4:30 pm: **Single-molecule detection through controlled ultrasensitive surface-enhanced Raman scattering**, Laura Rodríguez-Lorenzo, Ramón Álvarez-Puebla, Isabel Pastoriza-Santos, Univ. de Vigo (Spain); Stefano Mazzucco, Odile Stéphan, Mathieu Kociak, Univ. Paris-Sud 11 (France); Luis M. Liz-Marzán, Univ. de Vigo (Spain); Francisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) [7394-23]

4:50 pm: **SERS analysis of the structural phase transition in vanadium dioxide nanoparticles**, Jed I. Ziegler, Eugenii U. Donev, Richard F. Haglund, Jr., Vanderbilt Univ. (United States) [7394-24]

5:10 pm: **3D metallic metamaterials for EIT and optical sensors** (*Invited Paper*), Harald W. Giessen, Martin Mesch, Na Liu, Univ. Stuttgart (Germany) [7394-25]

5:40 pm: **Single molecule LSPR sensing using gold nanostars and nanobipyramids**, Feng Hao, Kathryn M. Mayer, Seunghyun Lee, Jason H. Hafner, Peter J. Nordlander, Rice Univ. (United States) [7394-26]

6:00 pm: **Fluctuation in surface enhanced Raman scattering intensity due to plasmon related heating effect**, Dinish U. Soudamini, Chit Yaw Fu, Singapore Bioimaging Consortium (Singapore); Kiang-Wei Kho, National Cancer Ctr. of Singapore (Singapore); Praveen Thoniyot, Singapore Bioimaging Consortium (Singapore); Malini Olivo, Singapore Bioimaging Consortium (Singapore) and National Cancer Ctr. of Singapore (Singapore) [7394-27]

Tuesday 4 August

SESSION 7

Room: Conv. Ctr. 6B Tues. 8:00 to 10:30 am

Nonlinear and Strong-field Nanoplasmonics, and Related Topics

Session Chair: **Federico Capasso**, Harvard Univ.

8:00 am: **High harmonics generation by plasmonic field enhancement** (*Keynote Presentation*), Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7394-28]

8:45 am: **Design of nanostructures for high harmonic generation by localized surface plasmon resonance**, In-Yong Park, Seungchul Kim, Junhee Choi, Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7394-29]

9:05 am: **Enhanced nonlinear optical response in silver/zinc oxide transparent metals**, Canek Fuentes-Hernandez, Georgia Institute of Technology (United States); Lazaro Padilha, Univ. of Central Florida (United States); Joel M. Hales, Daniel Owens, Jungbae Kim, Georgia Institute of Technology (United States); Scott Webster, Univ. of Central Florida (United States); Joseph W. Perry, Georgia Institute of Technology (United States); David Hagan, Eric W. VanStryland, Univ. of Central Florida (United States); Bernard Kippelen, Georgia Institute of Technology (United States) [7394-30]

9:25 am: **Local melting effects on phospholipid membranes using plasmonic heating**, Alexander S. Urban, Michael Fedoruk, Fernando D. Stefani, Jochen Feldmann, Ludwig-Maximilians-Univ. München (Germany) [7394-31]

9:45 am: **True nano-plasmonics: from nanoscale integrated circuits to nano-photovoltaics** (*Keynote Presentation*), Albert Polman, FOM Institute for Atomic and Molecular Physics (Netherlands) [7394-32]

Coffee Break 10:30 to 11:00 am

SESSION 8

Room: Conv. Ctr. 6B Tues. 11:00 am to 12:55 pm

Ultrafast Nanoplasmonics

Session Chair: **Seung-Woo Kim**, Korea Advanced Institute of Science and Technology (Korea, Republic of)

11:00 am: **Simultaneous spatial and temporal control of the local excitation of a nanostructure using polarization shaped laser pulses** (*Keynote Presentation*), Martin Aeschlimann, Technische Univ. Kaiserslautern (Germany) [7394-33]

11:45 am: **Ultrafast properties of gold-nanoshell/J-aggregate complexes**, Nche T. Fofang, Nathaniel K. Grady, Tae-Ho Park, Peter J. Nordlander, Naomi J. Halas, Rice Univ. (United States) [7394-34]

12:05 pm: **Time-of flight PEEM for ultrahigh spatiotemporal probing of nanoplasmonic optical fields** (*Invited Paper*), Ulf Kleineberg, Jingquan Lin, Soo-Hoon Chew, Ludwig-Maximilians-Univ. München (Germany); Nils Weber, Matthias Escher, Michael Merkel, FOCUS GmbH (Germany); Adrian Wirth, Matthias F. Kling, Ferenc Krausz, Max-Planck-Institut für Quantenoptik (Germany); Mark I. Stockman, Georgia State Univ. (United States) [7394-35]

12:35 pm: **Saturable absorption of femtosecond laser pulses at surface plasmon resonance in gold nanoshells**, Ida Ros, Univ. degli Studi di Padova (Italy); Piero Schiavuta, CIVEN (Italy); Renato Bozio, Giovanni Mattei, Univ. degli Studi di Padova (Italy) [7394-36]

Lunch/Exhibition Break 12:55 to 2:30 pm

SESSION 9

Room: Conv. Ctr. 6B Tues. 2:30 to 3:30 pm

Invited Session: Electron Microscopy and Spectroscopy in Nanoplasmonics

Session Chair: **Ulf Kleineberg**, Ludwig-Maximilians-Univ. München (Germany)

2:30 pm: **Plasmon excitations in electron microscopy** (*Invited Paper*), Francisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Cientificas (Spain) [7394-37]

3:00 pm: **Optical spectroscopy of tunneling electrons and conductive molecules in plasmonic cavities** (*Invited Paper*), Javier Aizpurua, Consejo Superior de Investigaciones Cientificas (Spain); Olalla Perez-Gonzalez, Nerea Zabala, Univ. del País Vasco (Spain); Naomi J. Halas, Peter J. Nordlander, Rice Univ. (United States) [7394-38]

Coffee Break 3:30 to 4:00 pm

SESSION 10

Room: Conv. Ctr. 6B Tues. 4:00 to 5:50 pm

Optical Magnetism and Fundamental Problems in Nanoplasmonics

Session Chair: **Javier Aizpurua**, Consejo Superior de Investigaciones Cientificas (Spain)

4:00 pm: **Optical magnetism and the Landau-Lifshitz permeability argument** (*Invited Paper*), Roberto D. Merlin, Univ. of Michigan (United States) . [7394-39]

4:30 pm: **Magnetic and electric resonances in 3D plasmonic nanostructures**, Nikolay A. Mirin, Naomi J. Halas, Rice Univ. (United States) [7394-40]

4:50 pm: **Plasmon resonances in reduced dimensions** (*Invited Paper*), Shiwu Gao, Univ. of Gothenburg (Sweden) [7394-41]

5:20 pm: **On surface plasmons, Babinet metamaterials, and enhanced light transmission** (*Invited Paper*), Willie J. Padilla, Boston College (United States) [7394-42]

Wednesday 5 August

SESSION 11

Room: Conv. Ctr. 6B Wed. 8:00 to 10:15 am

Fundamental Problems in Nanoplasmonics

Session Chair: **Francisco Javier García de Abajo**, Consejo Superior de Investigaciones Cientificas (Spain)

8:00 am: **Symmetry breaking in plasmonic nanostructures** (*Keynote Presentation*), Peter J. Nordlander, Rice Univ. (United States) [7394-43]

8:45 am: **An aperture near-field probe: Bethe's single hole for magnetic dipole radiation?**, Dai-Sik Kim, Jin-Eun Kim, Kwang-Jun Ahn, Jae-Sung Ahn, Seoul National Univ. (Korea, Republic of); Kwang-Geol Lee, ETH Zürich (Switzerland) [7394-44]

9:05 am: **Reproducible ultrahigh optical resolution using gold nanoantennas as near-field probes**, Hadi Eghlidi, Kwang-Geol Lee, Xuewen Chen, Mario Agio, Stephan Götzinger, Vahid H. Sandoghdar, ETH Zürich (Switzerland) . [7394-45]

9:25 am: **Controlling light emission with plasmonic nanocavity resonators**, Carrie E. Hofmann, Anna M. Hiszpanski, Domenico Pacifici, California Institute of Technology (United States); Francisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Cientificas (Spain); Harry A. Atwater, California Institute of Technology (United States) [7394-46]

9:45 am: **Surface plasmon lifetime in metal nanostructures** (*Invited Paper*), Tigran V. Shahbazyan, Jackson State Univ. (United States) [7394-47]

Coffee Break 10:15 to 10:45 am

SESSION 12

Room: Conv. Ctr. 6B Wed. 10:45 am to 12:20 pm

Engineering Nanoplasmonic Responses I

Session Chair: **Dai-Sik Kim**, Seoul National Univ. (Korea, Republic of)

10:45 am: **New routes to reduced-symmetry plasmonics** (*Keynote Presentation*), Naomi J. Halas, James B. Lassiter, Nikolay A. Mirin, Mark W. Knight, Rice Univ. (United States) [7394-48]

11:30 am: **Infrared spectroscopy of antenna resonances**, Annemarie Pucci, Frank Neubrech, Hoang V. Chung, Daniel Weber, Ruprecht-Karls-Univ. Heidelberg (Germany) [7394-49]

11:50 am: **Plasmonic nanostructures as model systems for classical oscillator physics: from subradiant LSPR sensing to Fano cavities** (*Invited Paper*), Stefan A. Maier, Imperial College London (United Kingdom) . [7394-50]

Lunch/Exhibition Break 12:20 to 1:50 pm

SESSION 13

Room: Conv. Ctr. 6B Wed. 1:50 to 3:20 pm

Controlling Nanolocalization of Optical Energy

Session Chair: **Stefan A. Maier**, Imperial College London (United Kingdom)

1:50 pm: **Control of localization in nanoplasmonics** (*Invited Paper*), Meir Orenstein, Technion-Israel Institute of Technology (Israel) [7394-51]

2:20 pm: **Application of fishnet structure in optical modulators and deep sub-wavelength sized optical cavities**, Jingjing Li, Hewlett-Packard Labs. (United States); Lars H. Thylén, Hewlett-Packard Labs. (United States) and Kungliga Tekniska Högskolan (Sweden) and Zhejiang Univ. (China); Wu Wei, Alexander M. Bratkovsky, Shih-Yuan Wang, R. Stanley Williams, Hewlett-Packard Labs. (United States) [7394-52]

2:40 pm: **Plasmon modes in individual noble metal nanoparticles**, Viktor Myroshnychenko, Consejo Superior de Investigaciones Cientificas (Spain); Jaysen Nelayah, Mathieu Kociak, Odile Stéphane, Christian Colliex, Univ. Paris-Sud 11 (France); Giorgio Adamo, Kevin F. MacDonald, Nikolay I. Zheludev, Univ. of Southampton (United Kingdom); Jessica Rodríguez-Fernandez, Enrique Carbó-Argibay, Luis M. Liz-Marzán, Univ. de Vigo (Spain); Francisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Cientificas (Spain) [7394-53]

3:00 pm: **Controlling the plasmon modes of 1D and 2D plasmonic lattices by near-field coupling**, Yasin Ekinci, ETH Zürich (Switzerland); Andre Christ, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Mario Agio, ETH Zürich (Switzerland); Nikolai A. Gippius, Sergei G. Tikhodeev, A. M. Prokhorov General Physics Institute (Russian Federation); Harun H. Solak, Paul Scherrer Institut (Switzerland); Olivier J. F. Martin, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Jörg F. Löffler, ETH Zürich (Switzerland) [7394-54]

Coffee Break 3:20 to 3:50 pm

SESSION 14

Room: Conv. Ctr. 6B Wed. 3:50 to 5:45 pm

Nanoplasmonics in Energy Conversion and Related Subjects

Session Chair: **Naomi J. Halas**, Rice Univ.

3:50 pm: **Plasmonic photovoltaics: light-matter interactions for solar energy conversion** (*Keynote Presentation*), Harry A. Atwater, Jr., California Institute of Technology (United States) [7394-55]

4:35 pm: **Plasmonic nanorectennas for energy conversion**, Richard M. Osgood III, Brian R. Kimball, Joel B. Carlson, David P. Ziegler, James R. Welch, Lauren Belton, U.S. Army Soldier Systems Ctr. (United States); Gustavo E. Fernandes, Zhijun Liu, Jimmy Xu, Brown Univ. (United States) [7394-56]

4:55 pm: **Surface plasmon coupling for emission enhancement and polarization control of a light emitting device**, Cheng-Yen Chen, Kun-Ching Shen, Tsung-Yi Tang, Yean-Woei Kiang, Chih-Chung Yang, National Taiwan Univ. (Taiwan) [7394-57]

5:15 pm: **From antenna theory to plasmonics: 1D resonator theory for optical antennas and dipolar emitters** (*Invited Paper*), Tim H. Taminiau, ICFO - Instituto de Ciencias Fotónicas (Spain); Fernando D. Stefani, Ludwig-Maximilians-Univ. München (Germany); Niek F. van Hulst III, ICFO - Instituto de Ciencias Fotónicas (Spain) [7394-58]

Conference 7394

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

- Nonlinear magneto-optical transversal Kerr effect in magneto-plasmonic nanosandwiches**, Irina Kolmychek, Tatyana V. Murzina, Oleg A. Aktsipetrov, Lomonosov Moscow State Univ. (Russian Federation); Alfonso Cebollada, Ctr. Nacional de Microelectrónica (Spain) [7394-75]
- A new type of Mach-Zehnder stripe interferometer**, Kristy C. Vernon, Daniel E. Gomez, Timothy J. Davis, Commonwealth Scientific and Industrial Research Organisation (Australia) [7394-76]
- Ultrafast light transmission behavior of surface plasmon excited Maxwell-Garnet type Ag nanocomposite polymer**, Karthikeyan Balasubramanian, National Institute of Technology, Tiruchirappalli (India); Suchand C. S. Sandeep, Reji Philip, Raman Research Institute (India) [7394-78]
- Spatially varying near-resonant aperture arrays for beam manipulation**, Xiao Ming Goh, Ling Lin, Ann Roberts, The Univ. of Melbourne (Australia) . [7394-79]
- Simulation study on surface plasmon interaction for absorption enhancement in nitride-based solar cell**, Jyh-Yang Wang, Yean-Woei Kiang, Chih-Chung Yang, National Taiwan Univ. (Taiwan) [7394-80]
- Energy decay mechanisms of surface plasmon-light emitter coupling systems**, Jyh-Yang Wang, Wen-Hung Chuang, Yean-Woei Kiang, Chih-Chung Yang, National Taiwan Univ. (Taiwan) [7394-81]
- Nanoscale characterization of single metal nanoparticles by their scattering patterns**, Tina Züchner, Eberhard Karls Univ. Tübingen (Germany); Antonio Virgilio Failla, Univ. of Cambridge (United Kingdom); Frank Wackenhut, Alfred J. Meixner, Eberhard Karls Univ. Tübingen (Germany) [7394-82]
- Critical coupling to surface phonon-polaritons in silicon carbide**, Burton Neuner III, Dmitriy Korobkin, Christopher Fietz, The Univ. of Texas at Austin (United States); Davy Carole, Gabriel Ferro, Univ. Claude Bernard Lyon 1 (France); Gennady Shvets, The Univ. of Texas at Austin (United States)[7394-83]
- Energy transfer between silver nanoparticles and coating lanthanide complex**, Ji Zhou, Tsinghua Univ. (United States) [7394-84]
- Plasmon-exciton transition in iodized Ag-Cu nanostructured films**, Channappayya S. Sunandana, M. Gnanavel, Univ. of Hyderabad (India)[7394-85]
- Plasmonic resonance for improved spontaneous emission of a nano-fluorophore in metal nanoshells**, Wallace C. Choy, Xue-Wen Chen, The Univ. of Hong Kong (Hong Kong, China); Sailing He, Zhejiang Univ. (China); Po-Ching Chui, The Univ. of Hong Kong (Hong Kong, China) [7394-86]
- Backward wave phenomenon for light propagating through a silver nanorod array**, Yi-Jun Jen, Ching-Wei Yu, Chin-Te Lin, National Taipei Univ. of Technology (Taiwan) [7394-87]
- Plasmonic-enhanced periodic nanoparticle arrays for surface-enhanced Raman spectroscopy**, Fan-Ching Chien, Wen-Yen Huang, Jau-Ye Shiu, Chiung-Wen Kuo, Peilin Chen, Academia Sinica (Taiwan) [7394-88]
- Encapsulation of gold nanoparticles in thermoresponsive microgels: molecular traps for SERS**, Rafael Contreras-Cáceres, Univ. de Almería (Spain); Ramón Álvarez-Puebla, Isabel Pastoriza-Santos, Jorge Pérez-Juste, Luis M. Liz-Marzán, Univ. de Vigo (Spain) [7394-89]
- The absorption modes of a dielectric-metal-dielectric nanorod array in the Kretschmann configuration**, Yi-Jun Jen, Chia-Feng Lin, Chan-Yi Tzu, National Taipei Univ. of Technology (Taiwan) [7394-90]
- SPR of Ag nanoparticles in a photochromic glasses**, Alexei V. Nashchekin, Oleg A. Usov, Ioffe Physico-Technical Institute (Russian Federation); Alexander I. Sidorov, Institute for Laser Physics (Russian Federation); Nadezhda V. Kurbatova, E.K. Zavoisky Physical-Technical Institute (Russian Federation); Victor A. Tsekhomsky, Institute for Laser Physics (Russian Federation) [7394-91]
- Dipole coupling studied by parabolic mirror assisted scanning near-field optical microscopy**, Kai Braun, Dai Zhang, Monika Fleischer, Sebastian Jäger, Dieter P. Kern, Alfred J. Meixner, Eberhard Karls Univ. Tübingen (Germany) [7394-92]
- Optimizing gold nanoshell SERS tags for biomedical applications**, Demosthenes P. Morales III, David S. Sebba, John P. Nolan, La Jolla Bioengineering Institute (United States) [7394-93]
- Plasmonic structures fabricated by interference lithography for sensor applications**, Jacson W. Menezes, Edmundo S. Braga, Lucila H. D. Cescato, Univ. Estadual de Campinas (Brazil) [7394-94]

- Plasma-induced size control in SiN/nano-Au based sandwich structures**, Jesus Fandiño, Univ. Autónoma de la Ciudad de Mexico (Mexico); Alejandro Crespo, Guillermo Santana, Juan C. Alonso, Mario F. Garcia, Armando Ortiz, Univ. Nacional Autónoma de México (Mexico); Osvaldo Vigil-Galan, Instituto Politécnico Nacional (Mexico); Alicia Oliver, Univ. Nacional Autónoma de México (Mexico) [7394-95]
- Controlling nonlinear optical properties associated with plasmons in hybrid organic-metallic colloids containing Au nanoparticles**, Márcio A. R. C. Alencar, Eduardo J. S. Fonseca, Cassio E. A. Santos, Sara F. A. Morais, Marcos A. Gelesky, Mario R. Meneghetti, Jandir M. Hickmann, Univ. Federal de Alagoas (Brazil) [7394-96]
- Plasmonic nano-nets**, Eyal Feigenbaum, Harry A. Atwater, California Institute of Technology (United States) [7394-97]
- Sensitivity of plasmon resonance frequencies in nanodimers to changes in local dielectric function**, Davon W. Ferrara, Joyeeta Nag, Jed I. Ziegler, Richard F. Haglund, Jr., Vanderbilt Univ. (United States) [7394-98]
- Generalized surface plasmon beams**, Gabriel C. Martinez-Niconoff, Javier Munoz-Lopez, Noemi Abundiz-Cisneros, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7394-99]
- Preparation of metal nanoparticles embedded polymer nanoparticles with phase separation structure**, Kazutaka Koike, Kiwamu Motoyoshi, Takeshi Higuchi, Hiroshi Yabu, Masatsugu Shimomura, Tohoku Univ. (Japan)[7394-100]
- Solvent and ligand effects on the optical properties of silver nanoparticles in silica sol-gel films**, Jorge A. Garcia-Macedo, Victor Rentería-Tapia, Univ. Nacional Autónoma de México (Mexico) [7394-101]
- Surface plasmon resonance of metal-dielectric periodic nanostructures at the Kretschmann configuration**, Junpeng Guo, Hai Sheng Leong, The Univ. of Alabama in Huntsville (United States) [7394-102]
- High transmission metallic nano aperture array for optical data storage**, Sinjeung Park, Jae W. Hahn, Yonsei Univ. (Korea, Republic of) [7394-104]
- Selection of optimal metals and intermetallics for improved performance in nanoplasmonics**, Matthew D. Arnold, Martin G. Blaber, Mike J. Ford, Univ. of Technology, Sydney (Australia) [7394-105]
- Optical excitation of terahertz plasmon polaritons on a structured metal surface**, Michael Bakunov, Maxim Tsarev, N.I. Lobachevsky State Univ. of Nizhny Novgorod (Russian Federation) [7394-106]
- Nanoscale bowtie aperture as high efficiency light coupler with plasmonic waveguide**, Edward Kinzel, Xianfan Xu, Purdue Univ. (United States)[7394-107]
- Plasmon hybridization in nanoapertures for development of an efficient nanoantenna array**, Ahmet A. Yanik, Ronen Adato, Shyamsunder Erramilli, Hatice Altug, Boston Univ. (United States) [7394-108]
- Nanoscale materials for sensing and detection based on surface plasmon excitation**, Bader H. Alhasson, Mohammad Matin, Univ. of Denver (United States) [7394-109]

Thursday 6 August

SESSION 15

Room: Conv. Ctr. 6B Thurs. 8:20 to 10:05 am

Engineering Nanoplasmonic Responses II

Session Chair: Meir Orenstein, Technion-Israel Institute of Technology (Israel)

- 8:20 am: **Surface plasmon circuitry** (Keynote Presentation), Francisco J. Garcia-Vidal, Univ. Autónoma de Madrid (Spain) [7394-59]
- 9:05 am: **Optical properties of gold nanostructures with individually designed geometries**, Monika Fleischer, Sebastian Jäger, Kai Braun, Dai Zhang, Michael Häffner, Alfred J. Meixner, Dieter P. Kern, Eberhard Karls Univ. Tübingen (Germany) [7394-61]
- 9:25 am: **Design of visible frequency broad-band thin film plasmonic absorbers for unpolarized light**, Koray Aydin, Ryan M. Briggs, Harry A. Atwater, California Institute of Technology (United States) [7394-62]
- 9:45 am: **Engineering the resonances of plasmonic resonator antennas**, Edward S. Barnard, Justin S. White, Ana M. Brown, Mark L. Brongersma, Stanford Univ. (United States) [7394-63]
- Coffee Break 10:05 to 10:35 am

SESSION 16

Room: Conv. Ctr. 6B Thurs. 10:35 am to 12:00 pm

Control of Optical Energy Concentration

Session Chair: **Francisco J. Garcia-Vidal**, Univ. Autónoma de Madrid (Spain)

10:35 am: **Plasmonics: a focus on light concentration** (*Keynote Presentation*), Mark L. Brongersma, Stanford Univ. (United States) [7394-64]

11:20 am: **Electronic energy transfer in coupled colloidal QDs on roughened metallic surfaces**, Somnath Ghosh, Christopher G. Ferri, Yashwant K. Verma, Brent Rich, Michelle Khine, Sayantani Ghosh, Univ. of California, Merced (United States) [7394-65]

11:40 am: **Coupling dynamics between photoluminescent centers in ZnO and surface plasmons**, Benjamin J. Lawrie, Vanderbilt Univ. (United States); Richard Mu, Fisk Univ. (United States); Richard F. Haglund, Jr., Vanderbilt Univ. (United States) [7394-66]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 17

Room: Conv. Ctr. 6B Thurs. 1:30 to 2:55 pm

Novel Trends in Nanoplasmonics

Session Chair: **Mark L. Brongersma**, Stanford Univ.

1:30 pm: **Spinoptics: spin symmetry breaking in plasmonic nanostructures** (*Keynote Presentation*), Erez Hasman, Yuri Gorodetski, Konstantin Y. Bliokh, Avi Niv, Vladimir Kleiner, Technion-Israel Institute of Technology (Israel) . [7394-67]

2:15 pm: **Observation of plasmon resonance linewidth narrowing in embedded gold nanoparticle arrays**, Ronen Adato, Ahmet A. Yanik, Hatice Altug, Boston Univ. (United States) [7394-68]

2:35 pm: **All-optical absorption switches in subwavelength metal-dielectric-metal plasmonic waveguides**, Changjun Min, Georgios Veronis, Louisiana State Univ. (United States) [7394-69]

Coffee Break 2:55 to 3:25 pm

SESSION 18

Room: Conv. Ctr. 6B Thurs. 3:25 to 5:15 pm

Electromagnetic Eigenstates and Resonances in Nanoplasmonic Systems

Session Chair: **Erez Hasman**, Technion-Israel Institute of Technology (Israel)

3:25 pm: **Electromagnetic eigenstates applied to the theoretical discussion of meta-materials with negative refraction** (*Invited Paper*), David J. Bergman, Jacob Ben-Yakar, Tel Aviv Univ. (Israel) [7394-70]

3:55 pm: **Plasmonic properties of nanocrescents**, Tamer A. Ali, Rice Univ. (United States); Rostislav Bukasov, Jennifer S. Shumaker-Parry, The Univ. of Utah (United States); Peter J. Nordlander, Rice Univ. (United States) . [7394-71]

4:15 pm: **Modeling rectangular grooves in metal as side-coupled SPP cavities**, John Liu, Mark L. Brongersma, Stanford Univ. (United States)[7394-72]

4:35 pm: **Plasmon resonance differences between the near- and far-field and implications for molecular detection**, Benjamin M. Ross, Savas Tasoglu, Luke P. Lee, Univ. of California, Berkeley (United States) [7394-73]

4:55 pm: **Designing plasmonic systems: applications to dark modes in nanoparticle pairs**, Timothy J. Davis, Kristy C. Vernon, Daniel E. Gomez, Commonwealth Scientific and Industrial Research Organisation (Australia) [7394-74]

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Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC727 Nanoplasmonics (Stockman) Thursday, 8:30 am to 5:30 pm

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7395

Sunday-Thursday 2-6 August 2009 • Proceedings of SPIE Vol. 7395

Plasmonics: Nanoimaging, Nanofabrication, and their Applications V

Conference Chairs: **Satoshi Kawata**, Osaka Univ. (Japan); **Vladimir M. Shalae**v, Purdue Univ.; **Din Ping Tsai**, National Taiwan Univ. (Taiwan)

Program Committee: **Harry A. Atwater, Jr.**, California Institute of Technology; **David J. Bergman**, Tel Aviv Univ. (Israel); **Sergey I. Bozhevolnyi**, Aalborg Univ. (Denmark); **Nader Engheta**, Univ. of Pennsylvania; **Nicholas X. Fang**, Univ. of Illinois at Urbana-Champaign; **Jochen Feldmann**, Ludwig-Maximilians-Univ. München (Germany); **Naomi J. Halas**, Rice Univ.; **Teruya Ishihara**, Tohoku Univ. (Japan); **Fritz Keilmann**, Max-Planck-Institut für Biochemie (Germany); **Pieter G. Kik**, College of Optics & Photonics/Univ. of Central Florida; **Victor I. Klimov**, Los Alamos National Lab.; **Joachim R. Krenn**, Karl-Franzens-Univ. Graz (Austria); **Aaron Lewis**, Nanonics Imaging Ltd. (Israel); **Olivier J. F. Martin**, Swiss Federal Institute of Technology (Switzerland); **Martin Moskovits**, Univ. of California, Santa Barbara; **Peter J. Nordlander**, Rice Univ.; **Masaya Notomi**, NTT Basic Research Labs. (Japan); **Lukas Novotny**, Univ. of Rochester; **Motoichi Ohtsu**, The Univ. of Tokyo (Japan); **Joseph W. Perry**, Georgia Institute of Technology; **Vahid H. Sandoghdar**, Eidgenössische Technische Hochschule (Switzerland); **George C. Schatz**, Northwestern Univ.; **Tigran V. Shahbazyan**, Jackson State Univ.; **Mark I. Stockman**, Georgia State Univ.; **Cheng Sun**, Northwestern Univ.; **Prabhat Verma**, Osaka Univ. (Japan); **Xiang Zhang**, Univ. of California, Berkeley; **Nikolay I. Zheludev**, Univ. of Southampton (United Kingdom)

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 6C Sun. 8:30 to 11:20 am

Nano Fabrication and Lithography

Session Chairs: **Alexandra E. Boltasseva**, Purdue Univ.; **Richard P. Van Duyne**, Northwestern Univ.

8:30 am: **Nano-scale fabrication technique of three-dimensional metal structures for plasmonic metamaterials** (*Invited Paper*), Takuo Tanaka, The Institute of Physical and Chemical Research (Japan) and Japan Science and Technology Agency, Presto (Japan) [7395-01]

8:55 am: **Molecular manipulation and nano-fabrication using local polarization in optical near-fields** (*Invited Paper*), Yasuo Ohdaira, Kazunari Shinbo, Akira Baba, Keizo Kato, Futao Kaneko, Niigata Univ. (Japan). [7395-02]

9:20 am: **Contact nano aperture probe lithography for sub 50nm patterning**, Yongwoo Kim, Howon Jung, Seok Kim, Jae W. Hahn, Yonsei Univ. (Korea, Republic of) [7395-03]

9:40 am: **Nanoscale photo polymerization induced by the enhanced optical near field of metallic nanoparticles**, Claire Deeb, Anne-Laure Baudrion, Safi Jradl, Jérôme Plain, Univ. de Technologie de Troyes (France); Alexandre Bouhelier, Univ. de Bourgogne (France); Olivier Soppera, Univ. de Haute Alsace (France); Pascal Royer, Renaud J. B. Bachelot, Univ. de Technologie de Troyes (France) [7395-04]

Coffee Break 10:00 to 10:30 am

10:30 am: **Making plasmonic structures for nano- and meta-photonics: fabrication methods and challenges** (*Invited Paper*), Alexandra E. Boltasseva, Purdue Univ. (United States) and Technical Univ. of Denmark (Denmark); Paul West, Purdue Univ. (United States); Rasmus B. Nielsen, Claus Jeppesen, Anders Kristensen, Technical Univ. of Denmark (Denmark) [7395-05]

10:55 am: **Fabrication of III-V semiconductor quantum dots** (*Invited Paper*), Kouichi Akahane, Naokatsu Yamamoto, National Institute of Information and Communications Technology (Japan); Tadashi Kawazoe, Motoichi Ohtsu, The Univ. of Tokyo (Japan). [7395-06]

SESSION 2

Room: Conv. Ctr. 6C Sun. 11:20 am to 12:05 pm

Plasmonic Spectroscopy

Session Chair: **Richard P. Van Duyne**, Northwestern Univ.

11:20 am: **Plasmonics in UV for nano-imaging and analysis** (*Invited Paper*), Satoshi Kawata, Osaka Univ. (Japan); Atsushi Taguchi, The Institute of Physical and Chemical Research (Japan) [7395-07]

11:45 am: **Near-field Raman scattering at the gap between a metallic nanopip and a nano-film system**, Kazumasa Uetsuki, Prabhat Verma, Taro Ichimura, Yasushi Inouye, Satoshi Kawata, Osaka Univ. (Japan). [7395-08]

Lunch Break 12:05 to 1:05 pm

SESSION 3

Room: Conv. Ctr. 6C Sun. 1:05 to 3:20 pm

Plasmonic Spectroscopy II

Session Chair: **Gary P. Wiederrecht**, Argonne National Lab.

1:05 pm: **Nanoscale tuneable light source** (*Invited Paper*), Nikolay I. Zheludev, Giorgio Adamo, Univ. of Southampton (United Kingdom); Yuan Hsing Fu, National Taiwan Univ. (Taiwan); Kevin F. MacDonald, Univ. of Southampton (United Kingdom); Chih-Ming Wang, Din Ping Tsai, National Taiwan Univ. (Taiwan); Francisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) [7395-09]

1:30 pm: **Surface plasmon polariton enhanced fluorescence from quantum dots on nanostructured metal surfaces** (*Invited Paper*), Igor I. Smolyaninov, BAE Systems (United States) [7395-10]

1:55 pm: **Spectroscopic TPL mapping of plasmonic systems** (*Invited Paper*), Petru V. Ghenuche, Sudhir Cherukulappurath, Tim H. Taminiau, ICFO - Instituto de Ciencias Fotónicas (Spain); Niek F. van Hulst III, ICFO - Instituto de Ciencias Fotónicas (Spain) and ICREA- Institut Català de Recerca i Estudis Avançats (Spain); Romain Quidant, ICFO - Instituto de Ciencias Fotónicas (Spain) and ICREA-Institut Català de Recerca i Estudis Avançats (Spain) [7395-11]

2:20 pm: **Tip-sample distance dependent near-field Raman investigation with a sub-nanometric distance regulation**, Taro Ichimura, Takaaki Yano, Prabhat Verma, Yasushi Inouye, Satoshi Kawata, Osaka Univ. (Japan). [7395-12]

2:40 pm: **Flow spectroscopy for high throughput single nanoparticle analysis**, David S. Sebba, Dakota A. Watson, John P. Nolan, La Jolla Bioengineering Institute (United States) [7395-14]

3:00 pm: **Confocal and near-field spectroscopic investigation of P3HT/PCBM organic blend film upon thermal annealing**, Xiao Wang, Dai Zhang, Kai Braun, Eberhard Karls Univ. Tübingen (Germany); Hans-Joachim Egelhaaf, Christoph J. Brabec, Konarka Technologies GmbH (Germany); Alfred J. Meixner, Eberhard Karls Univ. Tübingen (Germany) [7395-15]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Conv. Ctr. 6C Sun. 3:50 to 5:20 pm

Nano Imaging I

Session Chair: **Takuo Tanaka**, The Institute of Physical and Chemical Research (Japan)

3:50 pm: **Imaging ultrafast energy and charge flow in hybrid plasmonic materials** (*Invited Paper*), Gary P. Wiederrecht, Yugang G. Sun, Argonne National Lab. (United States); Alexandre Bouhelier, Univ. de Bourgogne (United States); Gregory A. Wurtz, Univ. of North Florida (United States). [7395-16]

4:15 pm: **Infrared near-field imaging: exploring nanoscale physics** (*Invited Paper*), Tom Driscoll, Mumtaz Qazilbash, Greg O. Andreev, Dmitri N. Basov, Univ. of California, San Diego (United States). [7395-17]

4:40 pm: **Nanometer scale imaging and spectroscopy of organic semiconductor film**, Dai Zhang, Ute Heinemeyer, Frank Schreiber, Eberhard Karls Univ. Tübingen (Germany); Reinhard Scholz, Technische Univ. München (Germany); Alfred J. Meixner, Eberhard Karls Univ. Tübingen (Germany)[7395-18]

5:00 pm: **Probing bright and dark surface-plasmon modes in individual and coupled noble metal nanoparticles using an electron beam**, Viktor Myroshnychenko, Consejo Superior de Investigaciones Científicas (Spain); Ming-Wen Chu, Cheng-Hsuan Chen, National Taiwan Univ. (Taiwan); Jing-Pei Deng, Tamkang Univ. (Taiwan); Chung-Yuan Mou, National Taiwan Univ. (Taiwan); Fransisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) [7395-19]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm
All-Conference Plenary Session
Four Hundred Years through the Eye of the Telescope
Jerry Nelson, Univ. of California, Santa Cruz (USA)
Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae
Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)
See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm
NanoScience + Engineering Plenary Session
 8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)
 9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)
 10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)
 11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)
See page 16-17 for presentation details.

Lunch Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 6C Mon. 1:30 to 2:15 pm
Nano Imaging II
Session Chair: Martin Moskovits, Univ. of California, Santa Barbara
 1:30 pm: **Plasmonic mediated optical imaging at nanoscale** (*Invited Paper*), Zhaowei Liu, Univ. of California, San Diego (United States) [7395-20]
 1:55 pm: **Enhancement of spatial resolution with high sensitive photo-initiators in two-photon induced polymerization**, Nobuyuki Takeyasu, Takuo Tanaka, Satoshi Kawata, The Institute of Physical and Chemical Research (Japan) [7395-21]

SESSION 6

Room: Conv. Ctr. 6C Mon. 2:15 to 4:15 pm
Nanosensing
Session Chair: Martin Moskovits, Univ. of California, Santa Barbara
 2:15 pm: **Plasmonic nanoparticle based biosensing: experiments and simulations** (*Invited Paper*), Takumi Sannomiya, Christian Hafner, Janos Vörös, ETH Zürich (Switzerland) [7395-23]
 2:40 pm: **Highly sensitive molecular sensing using pyramidal plasmonic crystals** (*Invited Paper*), Hanwei Gao, Jiun-Chan Yang, Min Hyung Lee, Northwestern Univ. (United States); Andreea Stuparu, The Univ. of Chicago (United States); Julia Lin, Northwestern Univ. (United States); Milan Mrksich, The Univ. of Chicago (United States); Teri W. Odom, Northwestern Univ. (United States) [7395-24]
 Coffee Break 3:05 to 3:35 pm

3:35 pm: **Exploiting plasmonics in biosensing and bioimaging: monitoring cell receptors with surface enhanced spectroscopy and microscopy**, Li-Lin Tay, David Kennedy, John E. Hulse, John P. Pezacki, National Research Council Canada (Canada) [7395-25]

3:55 pm: **Self-assembled nanowire arrays for LSPR biosensing**, Robert N. MacKenzie, Takumi Sannomiya, ETH Zürich (Switzerland); Vaida Auzelyte, Paul Scherrer Institut (Switzerland); Janos Vörös, ETH Zürich (Switzerland) [7395-26]

SESSION 7

Room: Conv. Ctr. 6C Mon. 4:15 to 4:40 pm
Manipulation of Plasmonic Effect I
Session Chair: Vladimir M. Shalaev, Purdue Univ.
 4:15 pm: **Imaging and controlling plasmonic near-fields in visible and IR nanoantennas** (*Invited Paper*), Javier Aizpurua, Aitzol Garcia-Etxarri, Consejo Superior de Investigaciones Científicas (Spain) and Donostia International Physics Ctr. (Spain); Martin Schnell, Rainer Hillenbrand, CIC nanoGUNE Consolider (Spain) [7395-28]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm
Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Fast, surface plasmon-polariton-based, optical phase modulator, Oren Guilatt, Ben-Gurion Univ. of the Negev (Israel); Boris Apter, Holon Institute of Technology (Israel); Uzi Efron, Ben-Gurion Univ. of the Negev (Israel) . [7395-83]

Problem of hard X-ray collimation by zone plate, Armen V. Kuyumchyan, Institute of Microelectronics Technology and High Purity Materials (Russian Federation); Anatoli Snigirev, Irina Snigireva, European Synchrotron Radiation Facility (France); Maksim Grigorev, Institute of Microelectronics Technology (Russian Federation); Victor Kohn, Russian Research Ctr. Kurchatov Institute (Russian Federation); Sergey Kouznetsov, Institute of Microelectronics Technology (Russian Federation) [7395-87]

Tuesday 4 August

SESSION 8

Room: Conv. Ctr. 6C Tues. 8:00 to 10:15 am
Manipulation of Plasmonic Effect II
Session Chair: Stefan A. Maier, Imperial College London (United Kingdom)

8:00 am: **Control of absorption loss in metallic films** (*Invited Paper*), Mikhail A. Noginov, Guohua Zhu, Mohammed Mayy, E. Mayy, Dwayne A. Bobb, A. V. Yakim, Heng Li, Patricia F. Mead, Norfolk State Univ. (United States); César Clavero Perez, Kang Yang, Rosa A. Lukaszew, The College of William & Mary (United States); Viktor A. Podolskiy, Oregon State Univ. (United States); Alexander V. Gavrilenko, Carla S. McKinney, Vladimir I. Gavrilenko, Norfolk State Univ. (United States) [7395-30]

8:25 am: **Enhanced rates and high directivity for single emitters with optical antennas** (*Invited Paper*), Tim H. Taminiau, ICFO - Instituto de Ciencias Fotónicas (Spain); Fernando D. Stefani, Ludwig-Maximilians-Univ. München (Germany); Alberto G. Curto, Niek F. van Hulst III, ICFO - Instituto de Ciencias Fotónicas (Spain) [7395-31]

8:50 am: **Control light propagation and polarization with plasmons for surface-enhanced Raman scattering** (*Invited Paper*), Hongxing Xu, Institute of Physics (China) [7395-32]

9:15 am: **Gap plasmon waveguide with a stub: structure for a wavelength selective device**, Masanobu Haraguchi, Kazunori Iuchi, Hidenori Sokabe, Tatsuya Okuno, Toshihiro Okamoto, Masuo Fukui, Univ. of Tokushima (Japan); Kazumasa Okamoto, Seiichi Tagawa, Osaka Univ. (Japan) [7395-33]

Conference 7395

9:35 am: **Transient surface plasmon polariton launched by a metal subwavelength slit scattering**, Yann Gravel, Yunlong Sheng, Univ. Laval (Canada) [7395-34]

9:55 am: **Active molecular plasmonics: controlling plasmon resonances with molecular switches**, Yue Bing Zheng, The Pennsylvania State Univ. (United States); Ying-Wei Yang, Univ. of California, Los Angeles (United States); Lasse Jensen, The Pennsylvania State Univ. (United States); Lei Fang, Northwestern Univ. (United States); Bala Krishna Juluri, The Pennsylvania State Univ. (United States); Amar H. Flood, Indiana Univ. (United States); Paul S. Weiss, The Pennsylvania State Univ. (United States); J. Fraser Stoddart, Northwestern Univ. (United States); Tony Jun Huang, The Pennsylvania State Univ. (United States) [7395-35]

Coffee Break 10:15 to 10:45 am

SESSION 9

Room: Conv. Ctr. 6C Tues. 10:45 am to 12:00 pm

Plasmonics I

Session Chair: Din Ping Tsai, National Taiwan Univ. (Taiwan)

10:45 am: **Nanoplasmonics beyond the dipolar regime: probing bright and dark plasmonic modes using optical and electron spectroscopies** (*Invited Paper*), Stefan A. Maier, Imperial College London (United Kingdom) . . . [7395-36]

11:10 am: **Sensitivities and amplification of surface plasmons** (*Invited Paper*), Pierre Berini, Israel De Leon, Univ. of Ottawa (Canada) [7395-37]

11:35 am: **Plasmonics: nonlinear optics, negative phase and transformable transparency** (*Invited Paper*), Alexander K. Popov, Univ. of Wisconsin-Stevens Point (United States) and Kirensky Institute of Physics (Russian Federation) and Purdue Univ. (United States); Sergey A. Myslivets, Kirensky Institute of Physics (Russian Federation); Vladimir M. Shalaev, Purdue Univ. (United States) [7395-38]

Lunch/Exhibition Break 12:00 to 1:00 pm

SESSION 10

Room: Conv. Ctr. 6C Tues. 1:00 to 2:55 pm

Plasmonics II

Session Chair: Peter J. Nordlander, Rice Univ.

1:00 pm: **Unconventional plasmonic materials and emerging applications** (*Invited Paper*), Teri W. Odom, Northwestern Univ. (United States) . . . [7395-39]

1:25 pm: **Surface-plasmon-polaritonic band gaps in metal films covered with dielectric gratings** (*Invited Paper*), Gero von Plessen, Alexander Sprafke, RWTH Aachen (Germany) [7395-40]

1:50 pm: **Coupling light to a surface plasmon-polariton** (*Invited Paper*), Mario Agio, ETH Zürich (Switzerland) [7395-41]

2:15 pm: **Extraordinary optical absorption through subwavelength slits**, Justin S. White, Stanford Univ. (United States); Georgios Veronis, Louisiana State Univ. (United States); Zongfu Yu, Edward S. Barnard, Anu Chandran, Shanhuai Fan, Mark L. Brongersma, Stanford Univ. (United States) . . . [7395-42]

2:35 pm: **Intense plasmon resonances on Cu nanoplates**, Isabel Pastoriza-Santos, Ana M. Sánchez-Iglesias, Jose B. Rodríguez-González, Luis M. Liz-Marzán, Univ. de Vigo (Spain) [7395-43]

Coffee Break 2:55 to 3:25 pm

SESSION 11

Room: Conv. Ctr. 6C Tues. 3:25 to 5:45 pm

Plasmonics III

Session Chair: Satoshi Kawata, Osaka Univ. (Japan)

3:25 pm: **Plasmons in strongly coupled metallic nanostructures** (*Invited Paper*), Peter J. Nordlander, Rice Univ. (United States) [7395-44]

3:50 pm: **Optical response of a single hybrid nanoparticle** (*Invited Paper*), Hatim Baida, Alice Berthelot, Aurelien Crut, Paolo Maioli, Natalia Del Fatti, Fabrice Vallee, Univ. Claude Bernard Lyon 1 (France) [7395-45]

4:15 pm: **Nanoparticle optics of complex nanorod architectures** (*Invited Paper*), Kevin L. Shuford, Oak Ridge National Lab. (United States); Sungho Park, Sungkyunkwan Univ. (Korea, Republic of) [7395-46]

4:40 pm: **Modeling near-field properties of plasmonic nanoparticles: a surface integral approach** (*Invited Paper*), Andreas M. Kern, Olivier J. F. Martin, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7395-47]

5:05 pm: **Defect state dampening of surface plasmons in Au-YSZ nanocomposites**, Phillip H. Rogers, Michael A. Carpenter, Univ. at Albany (United States) [7395-48]

5:25 pm: **Fano resonances in plasmonic nanoparticle septamers**, Kui Bao, Nikolay A. Mirin, Peter J. Nordlander, Rice Univ. (United States) [7395-49]

Wednesday 5 August

SESSION 12

Room: Conv. Ctr. 6C Wed. 8:00 to 10:05 am

Plasmonic Metamaterials I

Session Chair: Mikhail A. Noginov, Norfolk State Univ.

8:00 am: **Plasmonic metamaterials: single layer negative index materials, broadband absorbers and tunable split ring resonators** (*Invited Paper*), Harry A. Atwater, Jr., California Institute of Technology (United States) [7395-50]

8:25 am: **Theory of the negative refractive index in double fishnet structures** (*Invited Paper*), Francisco J. Garcia-Vidal, Univ. Autónoma de Madrid (Spain) [7395-51]

8:50 am: **Graded-index plasmonic metamaterials: linear and nonlinear wave propagation** (*Invited Paper*), Natalia M. Litchinitser, Tolanya Gibson, Univ. at Buffalo (United States); Ildar R. Gabitov, The Univ. of Arizona (United States); Vladimir M. Shalaev, Purdue Univ. (United States) [7395-52]

9:15 am: **Artificial dielectric metamaterials made of metals and their terahertz-wave propagation properties** (*Invited Paper*), Masanori Hangyo, Osaka Univ. (Japan) [7395-53]

9:40 am: **Optical activity in metal and dielectric planar chiral gratings** (*Invited Paper*), Kuniaki Konishi, Natsuki Kanda, Makoto Kuwata-Gonokami, The Univ. of Tokyo (Japan) and CREST-JST (Japan) [7395-54]

Coffee Break 10:05 to 10:30 am

SESSION 13

Room: Conv. Ctr. 6C Wed. 10:30 am to 12:00 pm

Plasmonic Metamaterials II

Session Chair: Harry A. Atwater, Jr., California Institute of Technology

10:30 am: **Plasmonic nanorod metamaterial with enhanced biosensing functionalities** (*Invited Paper*), Andrei V. Kabashin, Ecole Polytechnique de Montréal (Canada); Robert Pollard, Paul R. Evans, Queen's Univ. Belfast (United Kingdom); Serhiy Pastkovsky, Ecole Polytechnique de Montréal (Canada); William Hendren, Queen's Univ. Belfast (United Kingdom); Viktor A. Podolskiy, Oregon State Univ. (United States); Anatoly V. Zayats, Queen's Univ. Belfast (United Kingdom) [7395-55]

10:55 am: **Manipulating the optical transparency of anisotropic metamaterials with magnetic field and liquid crystals** (*Invited Paper*), Yakov M. Strel'niker, Bar-Ilan Univ. (Israel); David J. Bergman, Tel Aviv Univ. (Israel); David G. Stroud, The Ohio State Univ. (United States); Anna O. Voznesenskaya, St. Petersburg State Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [7395-56]

11:20 am: **An experimental investigation of Fang's Ag superlens suitable for integration**, Claus Jeppesen, Rasmus B. Nielsen, Sanshui Xiao, Niels A. Mortensen, Technical Univ. of Denmark (Denmark); Alexandra E. Boltasseva, Purdue Univ. (United States); Anders Kristensen, Technical Univ. of Denmark (Denmark) [7395-57]

11:40 am: **Loss monitoring in resonant photon tunneling through metal/dielectric multi-layer metamaterials**, Motonobu Matsunaga, Satoshi Tomita, Takashi Yokoyama, Hisao Yanagi, Nara Institute of Science and Technology (Japan) [7395-58]

Lunch/Exhibition Break 12:00 to 1:10 pm

SESSION 14

Room: Conv. Ctr. 6C Wed. 1:10 to 3:10 pm

Plasmonic Metamaterials III

Session Chair: Nader Engheta, Univ. of Pennsylvania

1:10 pm: **Magnetic resonance in stratified metal-dielectric metamaterials** (*Invited Paper*), Teruya Ishihara, Ryosuke Watanabe, Aunuddin S. Vioktalamo, Tohoku Univ. (Japan) [7395-59]

1:35 pm: **Diversity of effective optical indices in stratified metal-dielectric metamaterials** (*Invited Paper*), Masanobu Iwanaga, National Institute for Material Science (Japan) [7395-60]

2:00 pm: **Squeezing photons into metamaterials** (*Invited Paper*), Nicholas X. Fang, Univ. of Illinois at Urbana-Champaign (United States) [7395-61]

2:25 pm: **Multiphysics modeling of nanophotonic imaging and sensing devices** (*Invited Paper*), Alexander V. Kildishev, Josh Borneman, Xingjie Ni, Zhengtong Liu, Vladimir P. Drachev, Vladimir M. Shalaev, Purdue Univ. (United States) [7395-62]

2:50 pm: **Modeling, simulation and fabrication of random composite superlens prototypes**, Mark D. Thoreson, Uday K. Chettiar, Alexander V. Kildishev, Vladimir P. Drachev, Vladimir M. Shalaev, Purdue Univ. (United States) [7395-63]

Coffee Break 3:10 to 3:40 pm

SESSION 15

Room: Conv. Ctr. 6C Wed. 3:40 to 5:45 pm

Nanoplasmonic Applications I

Session Chair: **Anatoly V. Zayats**, Queen's Univ. Belfast (United Kingdom)

3:40 pm: **Magnetically-coupled nanoscale channels in optical epsilon-near-zero (ENZ) substrates** (*Invited Paper*), Nader Engheta, Univ. of Pennsylvania (United States); Andrea Alu, Univ. of Pennsylvania (United States) and Univ. of Texas Austin (United States) [7395-64]

4:05 pm: **Scattering cancellation with plasmonic shells** (*Invited Paper*), Vladimir P. Drachev, Vashista C. de Silva, Piotr Nyga, Vladimir M. Shalaev, Purdue Univ. (United States) [7395-65]

4:30 pm: **Film with reduced scattering and enhanced absorption** (*Invited Paper*), Shengli Zou, Haining Wang, Univ. of Central Florida (United States) [7395-66]

4:55 pm: **Quantitative amplification of Cy5 SERS in warm spots created by plasmonic coupling in nanoparticle assemblies of controlled structure** (*Invited Paper*), Shiu-an-Yeh Chen, Anne A. Lazarides, Duke Univ. (United States) [7395-67]

5:20 pm: **Transmission through Kerr media barriers within waveguides and circuits** (*Invited Paper*), Arthur R. McGurn, Western Michigan Univ. (United States) [7395-68]

Thursday 6 August

SESSION 16

Room: Conv. Ctr. 6C Thurs. 8:00 to 10:00 am

Nanoplasmonic Applications II

Session Chair: **Prabhat Verma**, Osaka Univ. (Japan)

8:00 am: **Sensoric applications based on plasmonic effects at metal nanoparticles** (*Invited Paper*), Andrea Csaki, Marie Loechner, Thomas Schneider, Andrea Steinbrück, Wolfgang Fritzsche, IPHT Jena (Germany) [7395-69]

8:25 am: **Nanoplasmonic resonance energy transfer spectroscopic pH imaging** (*Invited Paper*), G. Logan Liu, Univ. of Illinois at Urbana-Champaign (United States) [7395-70]

8:50 am: **Infrared antennas for near-field microscopy and enhanced near-field spectroscopy** (*Invited Paper*), Thomas Taubner, RWTH Aachen (Germany); Jon A. Schuller, Mark L. Brongersma, Stanford Univ. (United States) . [7395-71]

9:15 am: **Aligned-carbon nanotubes as polarization sensitive near field detectors** (*Invited Paper*), Federico Capasso, Harvard Univ. (United States); Ertugrul Cubukcu, Univ. of California, Berkeley (United States); Coskun Cokabas, Fatih Degirmenci, Mariano Zimmler, Harvard Univ. (United States); John A. Rogers, Univ. of Illinois at Urbana-Champaign (United States) [7395-72]

9:40 am: **Designs of electro-optic plasmonic modulators**, Wenshan Cai, Mark L. Brongersma, Stanford Univ. (United States) [7395-73]

Coffee Break 10:00 to 10:30 am

SESSION 17

Room: Conv. Ctr. 6C Thurs. 10:30 to 11:45 am

Nanoplasmonic Applications III

Session Chair: **Federico Capasso**, Harvard Univ.

10:30 am: **Shaping the optical and thermal properties of plasmonic nanostructures for biological applications** (*Invited Paper*), Romain Quidant, ICFO - Instituto de Ciencias Fotónicas (Spain) [7395-74]

10:55 am: **Weakly and strongly coupled optical metamaterials** (*Invited Paper*), Costas M. Soukoulis, Iowa State Univ. (United States); Maria Kafesaki, Foundation for Research and Technology-Hellas (Greece) [7395-75]

11:20 am: **Enhancing optical signals with single gold nanostars** (*Invited Paper*), Frank Jaeckel, Calin Hrelescu, Tapan K. Sau, Andrey L. Rogach, Jochen Feldmann, Ludwig-Maximilians-Univ. München (Germany) [7395-76]

Lunch Break 11:45 am to 12:55 pm

SESSION 18

Room: Conv. Ctr. 6C Thurs. 12:45 to 2:50 pm

Nanoplasmonic Applications IV

Session Chair: **Wolfgang Fritzsche**, IPHT Jena (Germany)

12:45 pm: **Nanophotonic devices: spontaneous emission faster than stimulated** (*Invited Paper*), Eli Yablonovitch, Univ. of California, Berkeley (United States); Shantha Vedantam, Japeck Tang, Matteo Staffaroni, Univ. of California, Los Angeles (United States) [7395-77]

1:10 pm: **Plasmonic cavities for light generation and detection** (*Invited Paper*), Mark L. Brongersma, Stanford Univ. (United States) [7395-78]

1:35 pm: **Plasmon array antennas: design ideas and practical constraints** (*Invited Paper*), A. Femius Koenderink, I. Sersic, M. Frimmer, FOM Institute for Atomic and Molecular Physics (Netherlands) [7395-79]

2:00 pm: **Plasmonic manipulation of the local density of states: optical antennas, corrals, and a plasmon mirage** (*Invited Paper*), Jennifer A. Dionne, Univ. of California, Berkeley (United States); Philip Munoz, California Institute of Technology (United States); A. Paul Alivisatos, Univ. of California, Berkeley (United States); Harry A. Atwater, California Institute of Technology (United States) [7395-80]

2:25 pm: **Applications of surface plasmon interferometry** (*Invited Paper*), Vasily V. Temnov, Massachusetts Institute of Technology (United States) [7395-81]

Coffee Break 3:00 to 3:20 pm

SESSION 19

Room: Conv. Ctr. 6C Thurs. 3:20 to 4:45 pm

Nanoplasmonic Applications V

Session Chair: **Mark L. Brongersma**, Stanford Univ.

3:20 pm: **Sub-wavelength plasmonic lasers** (*Invited Paper*), Rupert F. Oulton, Volker J. Sorger, Thomas Zentgraf, Guy Bartal, Xiang Zhang, Univ. of California, Berkeley (United States) [7395-82]

3:45 pm: **Luminescence nanoimaging of quantum and molecular structures using a highly localized plasmon source**, Manuel J. Romero, Anthony J. Morfa, Thomas H. Reilly III, Jao van de Lagemaat, National Renewable Energy Lab. (United States) [7395-84]

4:05 pm: **Scanning electron microscopy (SEM) and surface enhanced Raman (SER) spectroscopy correlation studies of antibody-functionalized composite organic-inorganic nanoparticles (COINs) on cancer cells**, Ai Leen Koh, Imperial College London (United Kingdom) and Stanford Univ. (United States); Catherine M. Shachaf, Sailaja V. Elchuri, Dennis Mitchell, Garry P. Nolan, Robert Sinclair, Stanford Univ. (United States) [7395-85]

4:25 pm: **Nanoscale resolved infrared spectra of a thermal oxide using s-SNOM and QC lasers**, Greg O. Andreev, Gerardo Dominguez, Mark Thiemens, Fritz Keilmann, Dmitri N. Basov, Univ. of California, San Diego (United States) [7395-86]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC727 Nanoplasmonics (Stockman) Thursday, 8:30 am to 5:30 pm

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7396

Sunday-Tuesday 2-4 August 2009 • Proceedings of SPIE Vol. 7396

Physical Chemistry of Interfaces and Nanomaterials VIII

Conference Chair: **Oliver L. A. Monti**, The Univ. of Arizona
Conference Co-Chairs: **Oleg V. Prezhdo**, Univ. of Washington; **Sergei Tretiak**, Los Alamos National Lab.

Program Committee: **John B. Asbury**, The Pennsylvania State Univ.

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 12Sun. 1:10 to 3:00 pm

Interfaces in Catalysis

Session Chair: **Oleg V. Prezhdo**, Univ. of Washington

1:10 pm: **Mechanistic studies informing the synthesis of new catalysts oxygen reduction in fuel cell catalysis** (Invited Paper), Andrew A. Gewirth, Univ. of Illinois at Urbana-Champaign (United States) [7396-21]

1:40 pm: **Effect of aliphatic chains of triacylglycerols on order-disorder phase transformation and nanomechanics**, Wen-Dung Hsu, Jia-Yuan Huang, Hon-Wei Chen, National Cheng Kung Univ. (Taiwan); Angela Violi, Univ. of Michigan (United States) [7396-22]

2:00 pm: **Deposition of an oxomanganese water oxidation catalyst on TiO₂ nanoparticles: computational modeling, assembly, and characterization** (Invited Paper), Gonghu Li, Eduardo M. Sproviero, Robert C. Snoeberger III, Nobuhito Iguchi, James D. Blakemore, Robert H. Crabtree, Gary W. Brudvig, Victor S. Batista, Yale Univ. (United States) [7396-23]

2:30 pm: **Interfacial Processes in Quantum Dot - Catalyst Assemblies** (Invited Paper), Milan Sykora, Alexey Kuposov, John A. McGuire, Victor I. Klimov, Los Alamos National Lab. (United States) [7396-24]

Coffee Break 3:00 to 3:30 pm

SESSION 2

Room: Conv. Ctr. 12Sun. 3:30 to 5:20 pm

Structure and Dynamics in Nanoparticles

Session Chair: **Oliver L. A. Monti**, The Univ. of Arizona

3:30 pm: **Dynamics on the nanoscale: time-domain ab initio studies of quantum dots and carbon nanotubes** (Invited Paper), Oleg V. Prezhdo, Univ. of Washington (United States) [7396-01]

4:00 pm: **Photoexcitation of the triplet exciton in single wall carbon nanotubes** (Invited Paper), Bruce Alphenaar, Aditya Mohite, Univ. of Louisville (United States); Tiffany Santos, Jagadeesh Moodera, Massachusetts Institute of Technology (United States) [7396-03]

4:30 pm: **The effect of surface ligands on optical and electronic spectra of semiconductor nanoclusters**, Svetlana V. Kilina, Los Alamos National Lab. (United States) [7396-04]

4:50 pm: **Theoretical characterization of Co²⁺- and Mn²⁺-doped ZnO nanocrystals: optical transitions and charge carrier effects** (Invited Paper), Xiaosong Li, Univ. of Washington (United States) [7396-05]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 12 Mon. 1:30 to 3:10 pm

Interfaces in Organic Electronic Devices

Session Chair: **Oliver L. A. Monti**, The Univ. of Arizona

1:30 pm: **The role of nanometer-scale morphology in the performance of conjugated polymer-based bulk heterojunction solar cells** (Invited Paper, Presentation Only), Benjamin J. Schwartz, Univ. of California, Los Angeles (United States) [7396-06]

2:00 pm: **Nanometer size hybrid organic-inorganic materials with confined chromophore architecture to tune fluorescence efficiency**, Pascal André, Ge Cheng, Arvydas Ruseckas, Tanja van Mourik, Herbert Frücht, Joe A. Crayston, Russell E. Morris, David J. Cole-Hamilton, Ifor D. W. Samuel, Univ. of St. Andrews (United Kingdom) [7396-07]

2:20 pm: **Energy-level alignment of aryl thiols chemisorbed on metal surfaces: implications for charge transport** (Invited Paper), Chris D. Zangmeister, National Institute of Standards and Technology (United States) [7396-16]

2:50 pm: **Excited state coherence along conjugated polymer chains**, Gregory D. Scholes, Elisabetta Collini, Univ. of Toronto (Canada) [7396-09]

Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Conv. Ctr. 12 Mon. 3:40 to 5:40 pm

Single Nanoparticles: Synthesis and Spectroscopy

Session Chair: **Andrei Piryatinski**, Los Alamos National Lab.

3:40 pm: **Light harvesting action spectroscopy of individual nanostructures** (Invited Paper), John M. Lupton, The Univ. of Utah (United States) [7396-10]

4:10 pm: **Controlling the optical properties of single molecules by optical confinement in a tunable microcavity**, Raphael Gutbrod, Alexey Chizhik, Anna Chizhik, Eberhard Karls Univ. Tübingen (Germany); Dmitry Khoptyar, Lund Univ. (Sweden); Sebastian Baer, Eberhard Karls Univ. Tübingen (Germany); Jörg Enderlein, Georg-August-Univ. Göttingen (Germany); Alfred J. Meixner, Eberhard Karls Univ. Tübingen (Germany) [7396-11]

4:30 pm: **Investigation of ultrafast carrier dynamics in ZnO rods using two-photon emission and second-harmonic generation microscopy** (Invited Paper), John M. Papanikolas, The Univ. of North Carolina at Chapel Hill (United States) [7396-12]

5:00 pm: **Non-blinking semiconductor nanocrystals**, Xiaoyong Wang, Univ. of Rochester (United States); Xiaofan Ren, Kodak's Graphic Communications Group (United States); Keith Kahen, Eastman Kodak Co. (United States); Megan A. Hahn, Univ. of Rochester (United States); Manju Rajeswaran, Eastman Kodak Co. (United States); Sara E. Maccagnano-Zacher, John Silcox, Cornell Univ. (United States); George E. Cragg, Alexander L. Efros, Naval Research Lab. (United States); Todd D. Krauss, Univ. of Rochester (United States) . . [7396-13]

5:20 pm: **Enhancement of Foerster energy transfer rate between semiconductor nanocrystals by surface plasmon resonances**, Andrei Piryatinski, Los Alamos National Lab. (United States) [7396-29]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Electron structure of AgCl nanocrystal with silver ion adsorbed on atomic-rough surface and quantum transitions, Yury Timoshenko, Voronezh State Univ. (Russian Federation); Valentina Shunina, Voronezh State Technical Univ. (Russian Federation) [7396-02]

Effect of solvent on morphological properties of TiO_x thin film, Meng-Yueh Liu, Chih-Hua Chang, Chin-Hsiang Chang, Jing-Shun Huang, Chia-Shin Chao, Yu-Hong Lin, Wen-Han Lin, Ching-Fuh Lin, National Taiwan Univ. (Taiwan) [7396-28]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. 12 Tues. 8:30 to 10:10 am

Electronic Structure at Interfaces

Session Chair: John B. Asbury, The Pennsylvania State Univ.

8:30 am: **Controlling energy level offsets in organic/organic heterostructures using intramolecular polar bonds** (*Invited Paper*), Norbert Koch, Humboldt-Univ. zu Berlin (Germany) [7396-14]

9:00 am: **Electronic interactions of epitaxial vanadyl naphthalocyanine films on metallic surfaces**, Michael L. Blumenfeld, Mary P. Steele, Oliver L. A. Monti, The Univ. of Arizona (United States) [7396-15]

9:20 am: **Modification of an aluminum oxide electrode with self-assembled monolayers of alkylphosphonates for electron injection in a polymer** (*Invited Paper*), Zelei Guan, T. Joseph Dennes, Jeffrey Schwartz, Antoine L. Kahn, Princeton Univ. (United States) [7396-08]

9:50 am: **Interfacial Charge Transfer between Cu(111) and Sexithiophene Thin Films**, Mary P. Steele, Oliver L. A. Monti, Michael L. Blumenfeld, The Univ. of Arizona (United States) [7396-17]

Coffee Break 10:10 to 10:40 am

SESSION 6

Room: Conv. Ctr. 12 Tues. 10:40 am to 12:10 pm

Electronic Structure and Dynamics at Interfaces

Session Chair: John B. Asbury, The Pennsylvania State Univ.

10:40 am: **Interfacial molecular and electronic structure at fullerene-donor heterojunctions** (*Invited Paper*), Steven W. Robey, National Institute of Standards and Technology (United States) [7396-18]

11:10 am: **Electron dynamics and photovoltages at semiconductor surfaces** (*Invited Paper*), Dmitri S. Kilin, David A. Micha, Univ. of Florida (United States) [7396-19]

11:40 am: **Surface chemistry of TiO₂: rutile and anatase** (*Invited Paper*), Shao-Chun Li, Tulane Univ. (United States); Jian-guo Wang, Princeton Univ. (United States); Peter Jacobson, Yunbin He, Olga Dulub, Tulane Univ. (United States); Xue-Qing Gong, Annabella Selloni, Princeton Univ. (United States); Ulrike Diebold, Tulane Univ. (United States) [7396-20]

SESSION 7

Room: Conf. Ctr. 6F Tues. 4:00 to 6:00 pm

Charge Transfer Processes and Excitations

Session Chair: David George Lidzey, The Univ. of Sheffield (United Kingdom)

Joint Session with conference 7416: Organic Photovoltaics X

4:00 pm: **Charge transfer excitons in organic bulk heterojunctions for photovoltaic applications** (*Invited Paper*), Maria A. Loi, Univ. of Groningen (Netherlands) [7416-11]

4:30 pm: **Charge transfer excitons in conjugated polymer-fullerene blends**, Enrico Da Como, Markus Hallermann, Ilka Kriegel, Jochen Feldmann, Ludwig-Maximilians-Univ. München (Germany) [7416-12]

4:50 pm: **Two-dimensional IR-visible sum frequency generation spectroscopy - a unique probe of surface electronic states at buried interfaces** (*Invited Paper*), Qifeng Li, Keng C. Chou, The Univ. of British Columbia (Canada) [7396-25]

5:20 pm: **Electric field assisted charge separation at the interface between electron donor and acceptor in an organic photovoltaic blend**, Ryan Pensack, Larry W. Barbour, Maureen Hegadorn, John B. Asbury, The Pennsylvania State Univ. (United States) [7396-26]

5:40 pm: **Structure and dynamics correlations of photoinduced charge separation processes in organic photovoltaic materials**, Jianchang Guo, Argonne National Lab. (United States); Jodi Szarko, Northwestern Univ. (United States); Yongye Liang, The Univ. of Chicago (United States); Brian Rolczynski, Northwestern Univ. (United States); Luping Yu, The Univ. of Chicago (United States); Lin X. Chen, Argonne National Lab. (United States) [7396-27]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7397

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7397

Biosensing II

Conference Chairs: **Manijeh Razeghi**, Northwestern Univ.; **Hooman Mohseni**, Northwestern Univ.

Program Committee: **Massoud Agahi**, Cedars-Sinai Medical Ctr.; **Gert Cauwenberghs**, Univ. of California, San Diego; **Philippe M. Fauchet**, Univ. of Rochester; **David H. Gracias**, Johns Hopkins Univ.; **Kimberly S. Hamad-Schifferli**, Massachusetts Institute of Technology; **Sean Humbert**, Univ. of Maryland, College Park; **Giacomo Indiveri**, ETH Zürich (Switzerland); **Eric Lagally**, The Univ. of British Columbia (Canada); **Chang Liu**, Northwestern Univ.; **Yu-Hwa Lo**, Univ. of California, San Diego; **Ryan P. McClinton**, Northwestern Univ.; **Masoud Panjehpour**, Thompson Cancer Survival Ctr.; **Tadashi Shibata**, The Univ. of Tokyo (Japan); **Donald J. Silversmith**, Air Force Office of Scientific Research; **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Din Ping Tsai**, National Taiwan Univ. (Taiwan); **Adam T. Woolley**, Brigham Young Univ.; **Jae Su Yu**, Kyung Hee Univ. (Korea, Republic of)

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 15B Tues. 8:00 to 10:10 am

Biosensors I

8:00 am: **Optical microcavities: label-free biosensing down to single virus particles** (*Invited Paper*), Frank Vollmer, Harvard Univ. (United States); Stephen Arnold, New York Univ. (United States) [7397-01]

8:30 am: **Silicon-based mesoporous photonic crystals: towards single cell optical biosensors** (*Invited Paper*), Kristopher A. Kilian, Till Böcking, Katharina Gaus, Michael Gal, Justin Gooding, Univ. of New South Wales (Australia) [7397-02]

9:00 am: **Optical glucose monitoring using vertical cavity surface emitting lasers (VCSELs)** (*Invited Paper*), Sahba Talebi Fard, The Univ. of British Columbia (Canada); Werner H. Hofmann, Walter Schottky Institute (Germany); Ezra Kwok M.D., The Univ. of British Columbia (Canada); Markus C. Amann, Walter Schottky Institute (Germany); Lukas Chrostowski, The Univ. of British Columbia (Canada) [7397-03]

9:30 am: **Thermal characteristics and analysis of quantum cascade lasers for biochemical sensing applications**, Jae Su Yu, Hee Kwan Lee, Kyung Hee Univ. (Korea, Republic of); Steven Slivken, Manijeh Razeghi, Northwestern Univ. (United States) [7397-04]

9:50 am: **High-sensitivity near-IR absorption measurements of nanoliter samples in a cavity enhanced fiber sensor**, Anthony L. Gomez, Julia A. Fruetel, Ray P. Bambha, Sandia National Labs. (United States) [7397-05]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Conv. Ctr. 15B Tues. 10:40 am to 12:30 pm

Bio-inspired Devices and Systems

10:40 am: **Novel approaches to biosensing and nano-biological interactions** (*Invited Paper*), Nathaniel C. Cady, Univ. at Albany (United States) . . . [7397-06]

11:10 am: **Bio-inspired polymer optics** (*Invited Paper*), Guy Beadie, Erin F. Fleet, James S. Shirk, Naval Research Lab. (United States); Anne Hiltner, Eric Baer, Case Western Reserve Univ. (United States) [7397-07]

11:40 am: **Designing nanosensors based on ion channel-forming peptides** (*Invited Paper*), Jerry Yang, Michael Macrae, Steven Blake, Univ. of California, San Diego (United States); Michael Mayer, Univ. of Michigan (United States) [7397-08]

12:10 pm: **Scattering properties of blood cells**, Gautam Mukhopadhyay, Shruti R. Puri, Indian Institute of Technology, Bombay (India) [7397-09]

Lunch/Exhibition Break 12:30 to 2:00 pm

SESSION 3

Room: Conv. Ctr. 15B Tues. 2:00 to 3:40 pm

Advances in SPR I

2:00 pm: **Multi-modal plasmonic nanosensor for the detection of pathogenic bacteria**, Li-Lin Tay, John E. Hulse, Shannon Ryan, Jamshid Tanha, Jeff Fraser, Xiaohua Wu, National Research Council Canada (Canada) [7397-11]

2:20 pm: **Glucose sensing using 3D array of reproducible surface enhanced Raman scattering substrates**, Dinish U. Soudamini, Chit Yaw Fu, Singapore Bioimaging Consortium (Singapore); Ajay Agarwal, Institute of Microelectronics (Singapore); Praveen Thoniyot, Malini Olivo, Singapore Bioimaging Consortium (Singapore) [7397-12]

2:40 pm: **Refinement of a SPR sensor for application within air-tight buildings**, Emma Bryce, James Sommerville, Kofi Aidoo, Glasgow Caledonian Univ. (United Kingdom) [7397-13]

3:00 pm: **Release of multiple species from gold nanorods by ultrafast laser excitation** (*Invited Paper*), Kimberly S. Hamad-Schifferli, Massachusetts Institute of Technology (United States) [7397-14]

Coffee Break 3:30 to 4:00 pm

SESSION 4

Room: Conv. Ctr. 15B Tues. 4:00 to 5:00 pm

Biosensors II

4:00 pm: **Second harmonic nanoparticle markers** (*Invited Paper*), Rachel Grange, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Chia-Lung Hsieh, Ecole Polytechnique Fédérale de Lausanne (Switzerland) and California Institute of Technology (Switzerland); Ye Pu, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Demetri Psaltis, Ecole Polytechnique Fédérale de Lausanne (Switzerland) and California Institute of Technology (United States) [7397-15]

4:20 pm: **Rational design of noble metal nanostructures: implications for nanosensing** (*Invited Paper*), Prashant K. Jain, Univ. of California, Berkeley (United States) [7397-16]

4:40 pm: **Compartmentalized dynamics and single particle tracking in live cells** (*Invited Paper, Presentation Only*), Joseph M. K. Irudayaraj, Purdue Univ. (United States) [7397-17]

Wednesday 5 August

SESSION 5

Room: Conv. Ctr. 15B Wed. 8:00 to 10:10 am

Biomimitation

- 8:00 am: **Seeing the unseen: from polarization-sensitive eyes to biologically inspired imaging and sensing science** (*Invited Paper*), Nader Engheta, Univ. of Pennsylvania (United States). [7397-19]
- 8:30 am: **Toxins and antimicrobial peptides: interactions with membranes** (*Invited Paper*), Judy Kim, Diana Schlamadinger, Jonathan Gable, Univ. of California, San Diego (United States) [7397-20]
- 9:00 am: **Functional modular contact lens** (*Invited Paper*), Angela J. Shum, Melissa Cowan, Ilkka Lähdesmäki, Andrew Lingley, Brian Otis, Babak Parviz, Univ. of Washington (United States) [7397-21]
- 9:30 am: **Biosensing using chemiluminescent solid lipid nanoparticles**, Jennifer L. Sample, Julia Patrone, Jason Benkoski, Jennifer Breidenich, Huong Le, Lisa Kelly, The Johns Hopkins Univ. Applied Physics Lab. (United States) [7397-22]
- 9:50 am: **Biochemically responsive wireless micromechanical devices**, David H. Gracias, The Johns Hopkins Univ. (United States). [7397-23]
- Coffee Break 10:10 to 10:40 am

SESSION 6

Room: Conv. Ctr. 15B Wed. 10:40 am to 12:30 pm

Biosensors III

- 10:40 am: **Biosensing platforms for wireless health** (*Invited Paper*), William Kaiser, Univ. of California, Los Angeles (United States) [7397-24]
- 11:10 am: **The design of a wireless portable device for personalized ultraviolet monitoring** (*Invited Paper*), Navid Amini, Majid Sarrafzadeh, Univ. of California, Los Angeles (United States) [7397-25]
- 11:40 am: **Conducting polymer nanowire based biosensor array** (*Invited Paper*), Nosang V. Myung, Univ. of California, Riverside (United States)[7397-26]
- 12:10 pm: **Sol-gel silica planar waveguide biophotonic sensors doped with green fluorescent protein**, Yasufumi Enami, Hiroshima Univ. (Japan); Shin-ichiro Suye, Univ. of Fukui (Japan) [7397-27]
- Lunch/Exhibition Break 12:30 to 1:50 pm

SESSION 7

Room: Conv. Ctr. 15B Wed. 1:50 to 3:30 pm

Biosensors IV

- 1:50 pm: **A parametric design study of an electrochemical sensor**, Daniel Garcia, Ting-Hsuan Chen, Fang Wei, Chih-Ming Ho, Univ. of California, Los Angeles (United States) [7397-28]
- 2:10 pm: **CMOS descanning for faster random access confocal imaging** (*Invited Paper*), Dejan Vucinic, The Salk Institute for Biological Studies (United States) [7397-29]
- 2:40 pm: **The role of the protein surface on the local biological water dynamics** (*Invited Paper*), Andrea G. Markelz, Yunfen He, Wei Liang, Deepu George, Univ. at Buffalo (United States) [7397-30]
- 3:10 pm: **A dynamic surface plasmon resonance imager based on interferometric phase measurements**, Jya-Hong Yan, Yi-Chun Chen, Cheng-Chung Lee, National Central Univ. (Taiwan) [7397-31]
- Coffee Break 3:30 to 4:00 pm

SESSION 8

Room: Conv. Ctr. 15B Wed. 4:00 to 6:20 pm

DNA

- 4:00 pm: **Dielectrophoretic manipulation of DNA for the integration of molecular structures** (*Invited Paper*), Christian Leiterer, Steffen Berg, Andrea Csaki, Norbert Jahr, Andreas Wolff, Robert Kretschmer, IPHT Jena (Germany); Ralph Hoelzel, Fraunhofer-Institut für Biomedizinische Technik (Germany); Wolfgang Fritzsche, IPHT Jena (Germany) [7397-32]
- 4:30 pm: **Electrically conductive gold nanowires on DNA scaffolds** (*Invited Paper*), Subrata Kundu, Hong Liang, Texas A&M Univ. (United States)[7397-33]
- 5:00 pm: **Massively parallel fabrication and characterization of DNA templated magnetic wires** (*Invited Paper*), Alvena Ivanisevic, Purdue Univ. (United States) [7397-34]
- 5:30 pm: **Surface plasmon resonance biosensors** (*Invited Paper*), Laura M. Lechuga, Ctr. d'Investigacions en Nanociència i Nanotecnologia (Spain) [7397-35]
- 6:00 pm: **Laser transmission and scattering studies of bio-molecules and bio-chemical simulations: relationship to mutagenesis and carcinogenesis**, Gary C. Vezzoli, Lebanon College (United States); Jessica K. Willett, Dartmouth Hitchcock Medical Ctr. (United States) [7397-36]

Thursday 6 August

SESSION 9

Room: Conv. Ctr. 15B Thurs. 8:00 to 9:50 am

Biosensors V

- 8:00 am: **Label-free biosensors on silicon-on-insulator optical chips** (*Invited Paper*), Katrien De Vos, Peter Debackere, Tom Claes, Jordi Girones, Etienne Schacht, Roel G. Baets, Peter Bienstman, Univ. Gent (Belgium) [7397-37]
- 8:30 am: **High resolution, lensless, and cheap on-chip optofluidic microscope** (*Invited Paper*), Changhui Yang, Xiquan Cui, Lapman Lee, California Institute of Technology (United States) [7397-38]
- 9:00 am: **A hybrid CMOS-microfluidic luminescence contact imaging microsystem** (*Invited Paper*), Ritu R. Singh, Roman Genov, Lian Leng, Axel Guenther, Univ. of Toronto (Canada) [7397-39]
- 9:30 am: **Magnetic lab-on-a-chip devices for multiplexed diagnostics**, Thanos Mitrelas, Theodossis Trypiniotis, Justin Llandro, Justin J. Palfreyman, Bingyan Hong, Kunal Vyas, Crispin H. W. Barnes, Univ. of Cambridge (United Kingdom) [7397-40]
- Coffee Break 9:50 to 10:20 am

SESSION 10

Room: Conv. Ctr. 15B Thurs. 10:20 am to 12:20 pm

Advances in SPR II

- 10:20 am: **Optically resonant devices for biomolecular analysis** (*Invited Paper*), David Erickson, Cornell Univ. (United States) [7397-41]
- 10:50 am: **Periodic plasmonic structures with high field enhancement for SERS applications**, Jingjing Li, David A. Fattal, Zhiyong Li, Hewlett-Packard Labs. (United States) [7397-42]
- 11:10 am: **Enhanced sensitivity by optimizing metal thicknesses in intensity-interrogation surface plasmon resonance biosensors**, Chung Tien Li, Ta-Jen Yen, National Tsing Hua Univ. (Taiwan) [7397-43]
- 11:30 am: **The effect of design parameters of metallic substrate on the reproducibility of SERS measurement for biosensing**, Chit Yaw Fu, Singapore Bioimaging Consortium (Singapore); Zhen Yu K. Koh, National Univ. of Singapore (Singapore); U. S. Dinis, Singapore Bioimaging Consortium (Singapore); Kiang-Wei Kho, National Cancer Ctr. of Singapore (Singapore); Praveen Thoniyot, Malini Olivo, Singapore Bioimaging Consortium (Singapore) [7397-44]
- 11:50 am: **Topology, dynamics, and control in cortical blood flow elucidated with optical techniques** (*Invited Paper*), David Kleinfeld, Univ. of California, San Diego (United States) [7397-45]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7398

Sunday-Wednesday 2-5 August 2009 • Proceedings of SPIE Vol. 7398

Spintronics II

Conference Chairs: **Manijeh Razeghi**, Northwestern Univ.; **Henri-Jean M. Drouhin**, Ecole Polytechnique (France); **Jean-Eric Wegrowe**, Ecole Polytechnique (France)

Program Committee: **Jack Bass**, Michigan State Univ.; **Vincent Cros**, Thales Research & Technology (France); **Michel I. Dyakonov**, Univ. Montpellier II (France); **Michael E. Flatté**, The Univ. of Iowa; **Henri Jaffrès**, Thales Research & Technology (France); **Mathias Klaui**, Univ. Konstanz (Germany); **Yuri A. Mamaev**, St. Petersburg Technical Univ. (Russian Federation); **Ryan P. McClintock**, Northwestern Univ.; **Laurens W. Molenkamp**, Univ. Würzburg (Germany); **Yoshichika Otani**, The Institute of Physical and Chemical Research (Japan); **Alain Schuhl**, Commissariat à l'Energie Atomique (France); **Jing Shi**, Univ. of California, Riverside; **Donald J. Silversmith**, Air Force Office of Scientific Research; **Luc Thomas**, IBM Almaden Research Ctr.; **Evgeny Tsymbal**, Univ. of Nebraska, Lincoln; **Jörg Wunderlich**, Hitachi Cavendish Lab. (United Kingdom)

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 14ASun. 8:30 to 10:00 am

Spin Coherence I

Session Chair: **Henri-Jean M. Drouhin**, Ecole Polytechnique (France)

8:30 am: **Spin noise spectroscopy in semiconductors** (*Invited Paper*), Michael Oestreich, Georg Müller, Michael Römer, Jens Hübner, Leibniz Univ. Hannover (Germany) [7398-01]

9:00 am: **Collective spin excitations in doped CdMnTe quantum wells** (*Invited Paper*), Denis Scalbert, Masha Vladimirova, Steeve Cronenberger, Philippe Barate, Univ. Montpellier 2 (France) [7398-02]

9:30 am: **Exploring mode-locking of spins** (*Invited Paper*), Alex Greilich, Dmitri R. Yakovlev, Univ. Dortmund (Germany); Andre Shabaev, Alexander L. Efros, Naval Research Lab. (United States); Irina A. Yugova, Univ. Dortmund (Germany); Dirk Reuter, Andreas D. Wieck, Ruhr-Univ. Bochum (Germany); Manfred Bayer, Univ. Dortmund (Germany) [7398-03]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 14A Sun. 10:30 am to 12:00 pm

Spin Coherence II

Session Chair: **Vasily V. Bel'kov**, Ioffe Physico-Technical Institute (Russian Federation)

10:30 am: **Enhancement of the spin accumulation at the interface between a spin-polarized tunnel junction and a semiconductor** (*Invited Paper*), Michael Tran, Henri Jaffrès, Cyrille Deranlot, Jean-Marie George, Albert Fert, Unité Mixte de Physique CNRS/Thales (France); Audrey Miard, Aristide Lemaître, Ctr. National de la Recherche Scientifique (France) [7398-04]

11:00 am: **Spin injection, transport, and control in silicon** (*Invited Paper*), Ian Appelbaum, Univ. of Maryland, College Park (United States) [7398-05]

11:30 am: **Magnetization dynamics down to zero field in dilute (Cd,Mn)Te quantum wells** (*Invited Paper*), Mateusz Goryca, Univ. of Warsaw (Poland) ... [7398-06]

Lunch Break 12:00 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 14ASun. 1:30 to 3:00 pm

Spin Transfer I

Session Chair: **Van 't Erve**, Naval Research Labs (United States)

1:30 pm: **Current-driven vortex dynamics in metallic nanocontacts** (*Invited Paper*), Joo-Von Kim, Ctr. National de la Recherche Scientifique (France) and Univ. Paris-Sud (France); Thibaut Devolder, Claude Chappert, Ctr. National de la Recherche Scientifique (France); Mauricio Manfrini, Liesbet Lagae, IMEC (Belgium); Gino Hrkac, Thomas Schrefl, Univ. of Sheffield (United Kingdom) [7398-07]

2:00 pm: **Landau-Lifshitz-Gilbert Equation with longitudinal and transverse spin-accumulation: application to diffusive spin-transfer** (*Invited Paper*), Jean-Eric Wegrowe, Henri-Jean M. Drouhin, Ecole Polytechnique (France) [7398-08]

2:30 pm: **Perpendicular spin torques in asymmetric MgO-based magnetic tunnel junctions** (*Invited Paper*), Kyung-Jin Lee, Korea Univ. (Korea, Republic of) [7398-09]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. 14ASun. 3:30 to 5:30 pm

Spin Transfer II

Session Chair: **Michael E. Flatté**, The Univ. of Iowa

3:30 pm: **Current-induced dynamics on almost symmetric magnetic nanopillars: What makes the polarizer behave differently from the free layer?** (*Invited Paper*), Sergei Urazhdin, West Virginia Univ. (United States) [7398-10]

4:00 pm: **Spin transfer torque by point-contact spin injection** (*Invited Paper*), Tingyong Chen, The Johns Hopkins Univ. (United States); Yi Ji, Univ. of Delaware (United States); Sunxiang Huang, Chia-Ling Chien, The Johns Hopkins Univ. (United States); Mark Stiles, National Institute of Standards and Technology (United States) [7398-11]

4:30 pm: **Spin-transfer in nanopillars with a perpendicularly magnetized spin polarizer** (*Invited Paper*), Andrew D. Kent, New York Univ. (United States) [7398-12]

5:00 pm: **Current-induced domain wall motion in perpendicularly magnetized Co/Ni wires** (*Invited Paper*), H. Tanigawa, T. Koyama, G. Yamada, D. Chiba, S. Kasai, Kyoto Univ. (Japan); S. Fukami, T. Suzuki, NEC Corp. (Japan); N. Ohshima, Consultant (Japan); N. Ishiwata, NEC Corp. (Japan); Y. Nakatani, Univ. of Electro-Communications (Japan); T. Ono, Kyoto Univ. (Japan) [7398-48]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

- 8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)
- 9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)
- 10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)
- 11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)
- See page 16-17 for presentation details.

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 14A Mon. 1:30 to 3:30 pm

Spin Injection

Session Chair: **Jean-Eric Wegrowe**, Ecole Polytechnique (France)

- 1:30 pm: **Spin diffusion in lateral spin valves and spin lasers** (*Invited Paper*), Debashish Basu, Pallab Bhattacharya, Dipankar Saha, Univ. of Michigan (United States) [7398-13]
- 2:00 pm: **Electrical injection, detection, and modulation of spin currents in silicon using a lateral transport geometry** (*Invited Paper*), Olaf Van 't Erve, Chaffra Awo-Affouda, Aubrey Hanbicki, George Kioseoglou, Michael Holub, Connie H. Li, Phillip E. Thompson, Berry Jonker, Naval Research Lab. (United States) [7398-14]
- 2:30 pm: **Electrical spin injection and detection in lateral all-semiconductor devices** (*Invited Paper*), Dieter K. Weiss, Mariusz Ciorga, Andreas Einwanger, Ursula Wurstbauer, Dieter Schuh, Werner Wegscheider, Univ. Regensburg (Germany) [7398-15]
- 3:00 pm: **A scenario for spintronics: from spin scattering to a circuit** (*Invited Paper*), Lu J. Sham, Univ. of California, San Diego (United States) . . . [7398-16]
- Coffee Break 3:30 to 4:00 pm

SESSION 6

Room: Conv. Ctr. 14A Mon. 4:00 to 6:00 pm

DMS, Multiferroics, and Tunneling

Session Chair: **Paul A. Crowell**, Univ. of Minnesota

- 4:00 pm: **The physical origin of the measured magnetic moment in Mn_xSi_{1-x} with $x=0.1\%$** (*Invited Paper*), C. Y. Fong, Univ. of California, Davis (United States) [7398-17]
- 4:30 pm: **Optical and electrical manipulation of single ion spins in semiconductors** (*Invited Paper*), Jian-Ming Tang, Univ. of New Hampshire (United States) [7398-18]
- 5:00 pm: **Spin-dependent transport and magnetoelectric effects in all-oxide heterostructures** (*Invited Paper*), John D. Burton, Univ. of Nebraska, Lincoln (United States) [7398-19]
- 5:30 pm: **Spin transport and tunneling in ferromagnetic semiconductor heterostructures** (*Invited Paper*), Nitin Samarth, The Pennsylvania State Univ. (United States) [7398-20]

Tuesday 4 August

SESSION 7

Room: Conv. Ctr. 14A Tues. 8:30 to 10:00 am

Spin Transfer and Dynamics I

Session Chair: **Luc Thomas**, IBM Almaden Research Ctr.

- 8:30 am: **Phase locking and AC spin torque-based methods for characterizing spin transfer oscillators** (*Invited Paper*), Matthew R. Pufall, William Rippard, Stephen Russek, Thomas J. Silva, National Institute of Standards and Technology (United States) [7398-21]
- 9:00 am: **High power microwave emission from nanoscale MgO based magnetic tunnel junctions** (*Invited Paper*), Li Gao, IBM Almaden Research Ctr. (United States) and Stanford Univ. (United States) [7398-22]
- 9:30 am: **Magnetic dynamics in planar spin-transfer devices** (*Invited Paper*), Yaroslav Bazalyi, Univ. of South Carolina (United States) [7398-23]
- Coffee Break 10:00 to 10:30 am

SESSION 8

Room: Conv. Ctr. 14A Tues. 10:30 am to 12:00 pm

Spin Transfer and Dynamics II

Session Chair: **Jörg Wunderlich**, Hitachi Cambridge Lab. (United Kingdom)

- 10:30 am: **Time-resolved spin transfer torque dynamics: from coherent control to ballistic magnetization reversal** (*Invited Paper*), Santiago Serrano Guisan, Physikalisch-Technische Bundesanstalt (Germany); Karsten Rott, Gunter Reiss, Univ. Bielefeld (Germany); Hans-Werner Schumacher, Physikalisch-Technische Bundesanstalt (Germany) [7398-24]
- 11:00 am: **Ultrafast demagnetization induced by interlayer spin angular momentum transfer** (*Invited Paper, Presentation Only*), Gregory Malinowski, Univ. Konstanz (Germany); Francesco Dalla Longa, Jeroen H. H. Rietjens, Pares V. Paluskar, Roeland Huijink, Henk J. M. Swagten, Bert Koopmans, Technische Univ. Eindhoven (Netherlands) [7398-25]
- 11:30 am: **Generation of electric current by a moving domain wall** (*Invited Paper*), Rembert A. Duine, Utrecht Univ. (Netherlands) [7398-26]
- Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 9

Room: Conv. Ctr. 14A Tues. 1:30 to 3:30 pm

Spin-orbit Coupling

Session Chair: **Denis Scalbert**, Univ. Montpellier II (France)

- 1:30 pm: **Zero-bias spin separation in quantum wells** (*Keynote Paper*), Vasily V. Bel'kov, Ioffe Physico-Technical Institute (Russian Federation) . . . [7398-27]
- 2:30 pm: **Spin-injection Hall effect in a planar photovoltaic cell** (*Invited Paper*), Jörg Wunderlich, Hitachi Cambridge Lab. (United Kingdom) . . [7398-28]
- 3:00 pm: **Manipulating spin coherence in semiconductors through heterostructure engineering** (*Invited Paper*), Shawn Mack, Univ. of California, Santa Barbara (United States); Jake Koralek, Chris P. Weber, Lawrence Berkeley National Lab. (United States); Joseph Orenstein, Lawrence Berkeley National Lab. (United States) and Univ. of California, Berkeley (United States); Andrei Bernevig, Princeton Univ. (United States); Shoucheng Zhang, Stanford Univ. (United States); David D. Awschalom, Univ. of California, Santa Barbara (United States) [7398-29]
- Coffee Break 3:30 to 4:00 pm

Conference 7398

SESSION 10

Room: Conv. Ctr. 14A Tues. 4:00 to 6:00 pm

Spin-orbit Coupling and Tunneling

Session Chair: **Olaf Van 't Erve**, Naval Research Lab.

- 4:00 pm: **Anomalous hall and Nernst effects in GaMnAs ferromagnetic semiconductors** (*Invited Paper*), Jing Shi, Yong Pu, Univ. of California, Riverside (United States); Daichi Chiba, Fumihiro Matsukura, Hideo Ohno, Tohoku Univ. (Japan). [7398-30]
- 4:30 pm: **Transport in ferromagnet-semiconductor heterostructures** (*Invited Paper*), Paul A. Crowell, Univ. of Minnesota (United States). [7398-31]
- 5:00 pm: **The origin of strong bias dependences in Fe-semiconductor based spintronic devices** (*Invited Paper*), Athanasios N. Chantis, Los Alamos National Lab. (United States). [7398-32]
- 5:30 pm: **Probability current related to a non-quadratic Hamiltonian: application to semiconductors** (*Invited Paper*), Henri-Jean M. Drouhin, Hoai T. L. Nguyen, Ecole Polytechnique (France); Guy Fishman, Univ. Paris-Sud 11 (France); Jean-Eric Wegrowe, Ecole Polytechnique (France) [7398-33]

Wednesday 5 August

SESSION 11

Room: Conv. Ctr. 14A Wed. 8:30 to 10:00 am

Spin Transfer and Domain Walls I

Session Chair: **Dieter K. Weiss**, Univ. Regensburg (Germany)

- 8:30 am: **Scaling of spin relaxation and angular momentum dissipation in Permalloy nanowires** (*Invited Paper*), Thomas A. Moore, Commissariat à l'Energie Atomique (France); Mathias Klaui, Lutz Heyne, Philipp Moehrke, Dirk Backes, Jan Rühstus, Univ. Konstanz (Germany); Laura J. Heyderman, Paul Scherrer Institut (Switzerland); Jan-Ulrich Thiele, Hitachi Global Storage Technologies, Inc. (United States); Ulrich Ruediger, Univ. Konstanz (Germany) [7398-34]
- 9:00 am: **High velocity domain wall motion in spin-valve nanostripes induced by spin-polarised current** (*Invited Paper, Presentation Only*), Vojtech Uhlir, Institut Neel (France) and Brno Univ. of Technology (Czech Republic); Stefania Pizzini, Jan Vogel, Nicolas Rougemaille, Institut Neel (France); Vincent Cros, Sana Laribi, Unité Mixte de Physique CNRS/Thales (France); Julio Camarero, Erika Jiménez, Univ. Autónoma de Madrid (Spain); Carsten Tieg, European Synchrotron Radiation Facility (France); Giancarlo Faini, Ctr. National de la Recherche Scientifique (France). [7398-35]
- 9:30 am: **Domain wall depinning under current in perpendicularly magnetized elements** (*Invited Paper*), Dafine Ravelosona, C. Burrowes, J. V. Kim, M. N. Nguyen, S. Park, Claude Chappert, Univ. Paris-Sud (France); Eric E. Fullerton, Univ. of California, San Diego (United States). [7398-36]
- Coffee Break 10:00 to 10:30 am

SESSION 12

Room: Conv. Ctr. 14A Wed. 10:30 am to 12:00 pm

Spin Transfer and Domain Walls II

Session Chair: **Matthew R. Pufall**, National Institute of Standards and Technology

- 10:30 am: **Thermally activated depinning of a domain wall: interplay of depinning field statistical distributions and relaxation times** (*Invited Paper*), François Montaigne, Joel Briones, Michel Hehn, Daniel Lacour, Univ. Henri Poincaré Nancy (France); Matthew J. Carey, Jeffrey R. Childress, Hitachi Global Storage Technologies, Inc. (United States). [7398-37]
- 11:00 am: **Effect of wall width on spin torque in ferromagnetic domain walls** (*Invited Paper*), Michael E. Flatté, Elizabeth A. Golovatski, The Univ. of Iowa (United States). [7398-38]
- 11:30 am: **Current-controlled motion of trains of domain walls in magnetic racetracks** (*Invited Paper*), Luc Thomas, IBM Almaden Research Ctr. (United States). [7398-39]
- Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 13

Room: Conv. Ctr. 14A Wed. 1:30 to 3:00 pm

Optical Properties and Techniques

Session Chair: **Jing Shi**, Univ. of California, Riverside

- 1:30 pm: **Structural color printing using magnetically tunable photonic materials** (*Invited Paper*), Yadong Yin, Univ. of California, Riverside (United States) [7398-40]
- 2:00 pm: **Spin state of a single Mn atom embedded in an InAs quantum dot** (*Invited Paper*), Aristide Lemaitre, Arkadiusz Kudelski, Audrey Miard, Paul Voisin, Ctr. National de la Recherche Scientifique (France); Tim C. M. Graham, Richard J. Warburton, Heriot-Watt Univ. (United Kingdom); Olivier Krebs, Ctr. National de la Recherche Scientifique (France) [7398-41]
- 2:30 pm: **Spin-dependent photoemission due to g-factor jump at the p-GaAs(Cs,O)-vacuum interface** (*Invited Paper*), Vitaly Alperovich, Institute of Semiconductor Physics (Russian Federation); Dmitry Orlov, Max-Planck-Institut für Kernphysik (Germany); Alexander S. Terekhov, Institute of Semiconductor Physics (Russian Federation) [7398-42]
- Coffee Break 3:00 to 3:30 pm

SESSION 14

Room: Conv. Ctr. 14A Wed. 3:30 to 5:00 pm

Graphene, Nanoparticles, and Nanowires

Session Chair: **Sergei Urazhdin**, West Virginia Univ.

- 3:30 pm: **Spin transport in graphite and graphene spin valves** (*Invited Paper*), Roland K. Kawakami, Wei Han, Wei-Hua Wang, Wenzhong Bao, Keyu Pi, Kathy McCreary, Yan Li, Peng Wei, Jing Shi, Chun Ning Lau, Univ. of California, Riverside (United States). [7398-43]
- 4:00 pm: **Magnetic frustration of interacting nanomagnet arrays** (*Invited Paper*), Xianglin Ke, The Pennsylvania State Univ. (United States). [7398-44]
- 4:30 pm: **Magnetoresistance and magnetization reversal of single Co nanowires** (*Invited Paper, Presentation Only*), T. S. Machado, R. A. Silva, G. Cernicchiaro, A. P. Guimaraes, Luiz C. Sampaio, Ctr. Brasileiro de Perquisas Fisicas (Brazil) [7398-45]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

- Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.*
- A study on ferromagnetic properties of Zn1-xCr_xO thin films grown by PLD**, Deuk Young Kim, Woochul Yang, Hoon Young Cho, Tae Won Kang, Dongguk Univ. (Korea, Republic of) [7398-46]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7399

Wednesday-Thursday 5-6 August 2009 • Proceedings of SPIE Vol. 7399

Carbon Nanotubes, Graphene, and Associated Devices II

Conference Chairs: **Manijeh Razeghi**, Northwestern Univ.; **Didier Pribat**, Ecole Polytechnique (France); **Young-Hee Lee**, Sungkyunkwan Univ. (Korea, Republic of)

Program Committee: **Phaedon Avouris**, IBM Thomas J. Watson Research Ctr.; **Ray Henry Baughman**, The Univ. of Texas at Dallas; **Jean-Philippe Bourgoin**, Commissariat à l'Energie Atomique (France); **Manish Chhowalla**, Rutgers Univ.; **Hongjie Dai**, Stanford Univ.; **Nicole Grobert**, Univ. of Oxford (United Kingdom); **Kenji Hata**, National Institute of Advanced Industrial Science and Technology (Japan); **Mark C. Hersam**, Northwestern Univ.; **Ali Javey**, Univ. of California, Berkeley; **Seung Hee Lee**, Chonbuk National Univ. (Korea, Republic of); **Pierre Legagneux**, Thales Research & Technology (France); **Annick Loiseau**, ONERA (France); **Ryan P. McClintock**, Northwestern Univ.; **William I. Milne**, Univ. of Cambridge (United Kingdom); **Philip W. T. Pong**, The Univ. of Hong Kong (Hong Kong, China); **John A. Rogers**, Univ. of Illinois at Urbana-Champaign; **Siegmar Roth**, Max-Planck-Institut für Festkörperforschung (Germany); **Donald J. Silversmith**, Air Force Office of Scientific Research; **Jin Zhang**, Peking Univ. (China)

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Properties of optically transparent carbon-nanotube networks, Steven M. Anlage, Univ. of Maryland, College Park (United States) [7399-34]

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 15A Wed. 8:00 to 10:00 am

Carbon Nanotube Synthesis

Session Chair: **Didier Pribat**, Ecole Polytechnique (France)

8:00 am: **Carbon nanotubes for multifunctional application** (*Invited Paper*), Wonbong Choi, Florida International Univ. (United States) [7399-01]

8:40 am: **Carbon nanotubes and buds: synthesis, structure, and deposition for TCE and TFT applications** (*Invited Paper*), Esko I. Kauppinen, Helsinki Univ. of Technology (Finland) [7399-02]

9:20 am: **Study on the effects of hydrogen pretreatment on nickel catalyst used for multi-walled carbon nanotube growth**, Mauricio Kossler, Benjamin L. Crossley, Ronald A. Coutu, Jr., LaVern A. Starman, Peter J. Collins, Air Force Institute of Technology (United States) [7399-03]

9:40 am: **Synthesis of MWCNTs using CVD without metallic catalysts**, Hsiu-Wei Chen, Hui-Ling Ma, National Sun Yat-Sen Univ. (Taiwan); Jarrn-Horng Lin, National Univ. of Tainan (Taiwan) [7399-04]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 15A Wed. 10:30 am to 12:30 pm

Carbon Nanotube Devices I

Session Chair: **Andrea C. Ferrari**, Univ. of Cambridge (United Kingdom)

10:30 am: **Carbon nanotube transistor: ambipolarity versus doping** (*Invited Paper*), Young-Hee Lee, Sungkyunkwan Univ. (Korea, Republic of) . . . [7399-05]

11:10 am: **Pool-Frenkel emission and hopping conduction in semiconducting carbon nanotube transistor** (*Invited Paper*), Minhee Yun, David Perello, Univ. of Pittsburgh (United States); Moon J. Kim, The Univ. of Texas at Dallas (United States); Dong Jae Bae, Woo Jung Yu, Seung Jin Chae, Young-Hee Lee, Sungkyunkwan Univ. (Korea, Republic of) [7399-06]

11:50 am: **Microwave conductance spectra of single-wall carbon nanotube arrays**, Mark Lee, Clark Highstrete, A. Alec Talin, Sandia National Labs. (United States) [7399-07]

12:10 pm: **High performances CNTFET achieved using CNT networks for selective gas sensing**, Louis Gorintin, Thales Research & Technology (France) and Ecole Polytechnique (France); Paolo Bondavalli, Pierre Legagneux, Thales Research & Technology (France); Didier Pribat, Ecole Polytechnique (France) [7399-08]

Lunch/Exhibition Break 12:30 to 2:00 pm

SESSION 3

Room: Conv. Ctr. 15A Wed. 2:00 to 3:00 pm

Sorting and Characterization of Single-wall Nanotubes I

Session Chair: **Chang-Soo Han**, Korea Institute of Machinery & Materials (Korea, Republic of)

2:00 pm: **Optical and electronic properties of monodisperse carbon nanotube materials and devices** (*Invited Paper*), Mark C. Hersam, Northwestern Univ. (United States) [7399-09]

2:40 pm: **High concentrated diameter selectivity nanodispersion of single-walled carbon nanotubes in water**, Chandan Biswas, Ki Kang Kim, Hong-Zhang Geng, Hyeon Ki Park, Seong Chu Lim, Seung Jin Chae, Soo Min Kim, Sungkyunkwan Univ. (Korea, Republic of); Michel Nayhouse, Minhee Yun, Univ. of Pittsburgh (United States); Young-Hee Lee, Sungkyunkwan Univ. (Korea, Republic of) [7399-11]

Coffee Break 3:00 to 3:50 pm

SESSION 4

Room: Conv. Ctr. 15A Wed. 3:30 to 5:10 pm

Graphene I

Session Chair: **Jing Kong**, Massachusetts Institute of Technology

3:30 pm: **Correlation of atomic and electronic structure of graphene oxide to opto-electronic properties** (*Invited Paper*), Manish Chhowalla, Rutgers Univ. (United States) [7399-12]

4:10 pm: **Correlation between conductance fluctuations and temperature dependence of conductivity in graphene** (*Invited Paper*), Viera Skakalova, Max-Planck-Institut für Festkörperforschung (Germany) [7399-13]

4:50 pm: **A mechanism of adsorption of beta-NAD on graphene sheets: experiments and theory**, Roberto Scipioni, Martin Pumera, National Institute for Materials Science (Japan) [7399-14]

Conference 7399

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Single wall nanotubes forests as demonstration for nanotubes length controlling, Francesco Lamberti, Moreno Meneghetti, Nicola Elvassore, Univ. degli Studi di Padova (Italy) [7399-30]

Synthesis of large-area graphene layers on poly-nickel substrate by chemical vapor deposition: wrinkle formation, Seung Jin Chae, Fethullah Güneş, Ki Kang Kim, Eun Sung Kim, Gang Hee Han, Soo Min Kim, Sungkyunkwan Univ. (Korea, Republic of); Didier Pribat, Ecole Polytechnique (France); Young-Hee Lee, Sungkyunkwan Univ. (Korea, Republic of) . [7399-32]

Fluorescence correlation spectroscopy of carbon nanotubes, Denis Pristinski, Jeffrey Fagan, Erik K. Hobbie, National Institute of Standards and Technology (United States) [7399-33]

Thursday 6 August

SESSION 5

Room: Conv. Ctr. 15A Thurs. 8:00 to 10:00 am

Carbon Nanotube Devices II

Session Chair: **Young-Hee Lee**, Sungkyunkwan Univ. (Korea, Republic of)

8:00 am: **Thermal Moore's Law and near-field thermal conductance in carbon-based electronics** (*Invited Paper*), Slava V. Rotkin, Lehigh Univ. (United States) [7399-15]

8:40 am: **Ink-jet printing of nano-carbon materials** (*Invited Paper*), Taishi Takenobu, Tohoku Univ. (Japan) [7399-16]

9:20 am: **Time-domain ab initio studies of excitation dynamics in carbon nanotubes and nanoribbons**, Oleg V. Prezhdo, Univ. of Washington (United States) [7399-17]

9:40 am: **Enhanced electrochemical double layer capacitances in carbon nanotube-based electrodes**, Chaiwat Engtrakul, Jeffrey L. Blackburn, John-David R. Rocha, Robert C. Tenent, National Renewable Energy Lab. (United States); Michael J. Heben, The Univ. of Toledo (United States) and National Renewable Energy Lab. (United States) [7399-18]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. 15A Thurs. 10:30 am to 12:30 pm

Carbon Nanotube Devices III

Session Chair: **Slava V. Rotkin**, Lehigh Univ.

10:30 am: **Nanotube-based polymer optoelectronics** (*Invited Paper*), Andrea C. Ferrari, Univ. of Cambridge (United Kingdom) [7399-19]

11:10 am: **In situ characterization of common failure modes of carbon nanotube-based nanoelectromechanical systems**, Horacio D. Espinosa, Owen Loh, Krishanu Nandy, Northwestern Univ. (United States); Changhong Ke, Binghamton Univ. (United States) [7399-20]

11:30 am: **Nonlinear finite element analysis of interfacial properties of CNT reinforced nanocomposites**, Hossein Sadeghi, Mehdi Sadeghpour, Sharif Univ. of Technology (Iran, Islamic Republic of) [7399-21]

11:50 am: **Stabilizing a pulsed field emission from an array of carbon nanotubes**, Debiprosad Roy Mahapatra, Sandeep Anand, Indian Institute of Science (India); Niraj Sinha, Massachusetts Institute of Technology (United States); Roderick V. N. Melnik, Wilfrid Laurier Univ. (Canada) [7399-22]

12:10 pm: **Photoactivated switch based on VCSELs, charge-activated carbon nanotubes, and SiC thyristor**, Moncef B. Tayahi, Rutgers Univ. (United States) [7399-23]

Lunch Break 12:30 to 2:00 pm

SESSION 7

Room: Conv. Ctr. 15A Thurs. 2:00 to 3:20 pm

Sorting and Characterization of Single-wall Nanotubes II

Session Chair: **Mark C. Hersam**, Northwestern Univ.

2:00 pm: **Separation of carbon nanotube using a microfluidics chip** (*Invited Paper*), Chang-Soo Han, Korea Institute of Machinery & Materials (Korea, Republic of) [7399-24]

2:40 pm: **Steady-state and time-resolved photoluminescence of length separated single-walled carbon nanotube aqueous suspensions**, John-David R. Rocha, National Renewable Energy Lab. (United States); Xiaomin Tu, Univ. of Arkansas at Little Rock (United States); Wyatt K. Metzger, Robert C. Tenent, National Renewable Energy Lab. (United States); Wei Zhao, Univ. of Arkansas at Little Rock (United States); Michael J. Heben, The Univ. of Toledo (United States); Jeffrey L. Blackburn, National Renewable Energy Lab. (United States) [7399-25]

3:00 pm: **Novel molecular architectures for nanotube- and nanoribbon-based electronics: exploration via a first-principle computational approach** (*Presentation Only*), Sean C. Smith, Aijun Du, The Univ. of Queensland (Australia) [7399-26]

Coffee Break 3:20 to 3:50 pm

SESSION 8

Room: Conv. Ctr. 15A Thurs. 3:50 to 5:30 pm

Graphene II

Session Chair: **Manish Chhowalla**, Rutgers Univ.

3:50 pm: **Large area, few layer graphene films on insulating substrates and their Raman characterizations** (*Invited Paper*), Alfonso Reina, Xiaoting Jia, Stefan Thiele, Daniel Nezhich, Mildred S. Dresselhaus, Jing Kong, Massachusetts Institute of Technology (United States) [7399-27]

4:30 pm: **Graphene materials and their device applications** (*Invited Paper*), Yongsheng Chen, Nankai Univ. (China) [7399-28]

5:10 pm: **Plasma enhanced chemical vapour deposition assisted growth of graphene films**, Laurent Baraton, Ecole Polytechnique (France); Laurent Gangloff, Stéphane Xavier, Thales Research & Technology (France); Costel S. Cojocaru, Ecole Polytechnique (France); Pierre Legagneux, Thales Research & Technology (France); Vincent Huc, Univ. Paris-Sud 11 (France); Young-Hee Lee, Sungkyunkwan Univ. (Korea, Republic of); Didier Pribat, Ecole Polytechnique (France) [7399-29]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7400

Sunday-Thursday 2-6 August 2009 • Proceedings of SPIE Vol. 7400

Optical Trapping and Optical Micromanipulation VI

Conference Chairs: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom); **Gabriel C. Spalding**, Illinois Wesleyan Univ.

Program Committee: **Elliot L. Botvinick**, Beckman Laser Institute; **Carlos L. Cesar**, Univ. Estadual de Campinas (Brazil); **Roberto Di Leonardo**, Univ. degli Studi di Roma, La Sapienza (Italy); **Jesper Glückstad**, Danmarks Tekniske Univ. (Denmark); **Min Gu**, Swinburne Univ. of Technology (Australia); **Masud Mansuripur**, College of Optical Sciences/The Univ. of Arizona; **Jens-Christian D. Meiners**, Univ. of Michigan; **H. Daniel Ou-Yang**, Lehigh Univ.; **Thomas T. Perkins**, Univ. of Colorado at Boulder; **Rubén Ramos-García II**, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); **Halina H. Rubinsztein-Dunlop**, The Univ. of Queensland (Australia); **Pavel Zemánek**, Institute of Scientific Instruments (Czech Republic)

Cosponsored by:



Sunday 2 August

SESSION 1

Room: Conv. Ctr. 6D Sun. 8:50 to 10:00 am

Bio I: Single Molecules

Session Chair: **Douglas E. Smith**, Univ. of California, San Diego

8:50 am: **Sensitivity of DNA-hairpins dynamics to the mechanism of force feedback probed using a surface-coupled passive force clamp** (*Invited Paper*), Yeonee Seol, National Institute of Health (United States); Thomas T. Perkins, Univ. of Colorado at Boulder (United States) [7400-01]

9:20 am: **Boundary-condition dependent elasticity of short double-stranded DNA molecules**, Yih-Fan Chen, K. Raghunathan, David Wilson, Jens-Christian D. Meiners, Univ. of Michigan (United States) [7400-02]

9:40 am: **Quantifying and pinpointing sources of noise in optical tweezers**, Fabian Czerwinski, Andrew Richardson, Lene B. Oddershede, Univ. of Copenhagen (Denmark) [7400-03]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 6D Sun. 10:30 am to 12:20 pm

Bio II: From Single Molecules to Multiple Motors

Session Chair: **Thomas T. Perkins**, JILA

10:30 am: **Quantifying the force dependence of initiation by T7 RNA polymerase**, Bennett Kalafut, The Univ. of Arizona (United States); Gary M. Skinner, Technische Univ. Delft (Netherlands); Koen Visscher, The Univ. of Arizona (United States) [7400-04]

10:50 am: **Using optical tweezers to probe the elasticity of short molecules**, Benjamin P. B. Downing, Astrid V. D. Horst, Marjan Shayegan, Nancy R. Forde, Simon Fraser Univ. (Canada) [7400-05]

11:10 am: **Ångström-resolution optical tweezers for investigating DNA-binding/translocating molecular motors**, Anders E. Wallin, Heikki Ojala, Edward Haeggström, Univ. of Helsinki (Finland) [7400-06]

11:30 am: **Bacterial swimming studied using optical traps** (*Invited Paper*), T. Lance Min, Patrick Mears, Lon Chubiz, Christopher Rao, Ido Golding, Yann R. Chemla, Univ. of Illinois at Urbana-Champaign (United States) [7400-07]

12:00 pm: **Evidence of chemotaxis by quantitative measurement of the force vectors of Trypanosoma cruzi in the vicinity of the Rhodnius prolixus midgut wall cells**, André A. de Thomaz, Diogo B. Almeida, Univ. Estadual de Campinas (Brazil); Adriana Fontes, Univ. Federal de Pernambuco (Brazil); Cecília Vieira Stahl, Jacenir R. Santos-Mallet, Suzete A. O. Gomes, Fundacao Oswaldo Cruz (Brazil); Denise Feder, Univ. Federal Fluminense (Brazil); Carlos L. Cesar, Univ. Estadual de Campinas (Brazil) [7400-08]

Lunch Break 12:20 to 1:50 pm

SESSION 3

Room: Conv. Ctr. 6D Sun. 1:50 to 3:10 pm

Bio III: From DNA Damage to Cell Elasticity

Session Chair: **Elliot L. Botvinick**, Univ. of California, Irvine

1:50 pm: **Healthy ageing: laser microbeam studies reveal why birds are performing better**, Karl O. Greulich, Paulius Grigaravicius, Shamsi Monajembashi, Fritz Lipmann Institute (Germany) [7400-09]

2:10 pm: **A combined double-tweezers and wavelength-tunable laser nanosurgery microscope**, Qingyuan Zhu, Univ. of California, Irvine (United States); Shahab Parsa, Linda Z. Shi, Marcellinus Harsono, Univ. of California, San Diego (United States); Michael W. Berns, Univ. of California, Irvine (United States) [7400-10]

2:30 pm: **The interaction of Escherichia coli with its surrounding three dimensional substrate measured by optical tweezers**, Novia Yen, Ming-Tzo Wei, Arthur E. Chiou, National Yang-Ming Univ. (Taiwan) [7400-11]

2:50 pm: **Theoretical prediction for cell deformation in the optical traps**, Paul Brule-Bareil, Yunlong Sheng, Univ. Laval (Canada); Arthur E. Chiou, National Yang-Ming Univ. (Taiwan) [7400-12]

Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Conv. Ctr. 6D Sun. 3:40 to 5:10 pm

Nanoparticle Techniques I

Session Chair: **Jens-Christian D. Meiners**, Univ. of Michigan

3:40 pm: **Combining optical trapping and gold post arrays: nanometer-scale localization of DNA to gold with a high strength, biocompatible bond**, Thomas T. Perkins, D. Hern Paik, Yeonee Seol, Wayne Halsey, Univ. of Colorado at Boulder (United States) [7400-13]

4:00 pm: **Optical trapping of individual quantum dots and other challenging particles** (*Invited Paper*), Lene B. Oddershede, Univ. of Copenhagen (Denmark) [7400-14]

4:30 pm: **Towards spatio-temporal control in optical trapping**, Debjit Roy, Arijit K. De, Debabrata Goswami, Indian Institute of Technology Kanpur (India) [7400-15]

4:50 pm: **Nano-optical trapping of Rayleigh particles and E-coli bacteria with optical resonant antennas**, Romain Quidant, Maurizio Righini, Petru V. Ghenuche, Sudhir Cherukulappurath, ICFO - Instituto de Ciencias Fotónicas (Spain); Viktor Myroshnychenko, Francisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) [7400-16]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Conference 7400

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page16-17 for presentation details.

Lunch Break 12:00 to 1:15 pm

SESSION 5

Room: Conv. Ctr. 6D Mon. 1:15 to 3:30 pm

Optical Lattices

Session Chair: **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom)

1:15 pm: **Colloidal monolayers on quasicrystalline light fields** (*Keynote Presentation*), Clemens Bechinger, Univ. Stuttgart (Germany) [7400-17]

2:00 pm: **Dynamics of colloidal particles on optical trap arrays** (*Invited Paper*), Charles M. Reichardt, Los Alamos National Lab. (United States) [7400-18]

2:30 pm: **Particle dynamics in optical lattices**, Petr Ják, Mojmir Jer?, Pavel Zemánek, Institute of Scientific Instruments (Czech Republic) [7400-19]

2:50 pm: **Maximization of axial optical force acting upon nonspherical object placed in standing wave**, Jan Trojek, Vítizslav Karásek, Pavel Zemánek, Institute of Scientific Instruments (Czech Republic) [7400-20]

3:10 pm: **Brownian motion rectification in optically generated asymmetric potentials**, Ulises Ruiz-Corona, Maria Guadalupe Mendez-Vazquez, Nikolai A. Korneev, Victor M. Arrizón-Peña, Rubén Ramos-García II, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7400-21]

Coffee Break 3:30 to 4:00 pm

SESSION 6

Room: Conv. Ctr. 6D Mon. 4:00 to 6:10 pm

Optical Sorting and Guidance

Session Chair: **Gabriel C. Spalding**, Illinois Wesleyan Univ.

4:00 pm: **Laser guidance based cell detection**, Zhen Ma, Julie X. Yun, Yangzhang Wei, Karen J. L. Burg, Xiacong Yuan, Bruce Z. Gao, Clemson Univ. (United States) [7400-22]

4:20 pm: **Optical chromatographic sample fractionation**, Alex V. Terray, Joseph D. Taylor, Sean J. Hart, Naval Research Lab. (United States) . [7400-23]

4:40 pm: **Analytical measurement using optical chromatography**, Sean J. Hart, Naval Research Lab. (United States) [7400-24]

5:00 pm: **Simultaneous laser particle guidance and fluid counterflow in single-mode hollow core photonic crystal fibres** (*Invited Paper*), Tijmen G. Euser, Martin K. Garbos, Jocelyn S. Y. Chen, Philip S. J. Russell, Max Planck Institute for the Science of Light, Erlangen (Germany) [7400-25]

5:30 pm: **Integrated optical chromatography using photonic crystal fiber**, Praveen C. Ashok, Robert F. Marchington, Thomas F. Krauss, Kishan Dholakia, Univ. of St. Andrews (United Kingdom) and Scottish Univ. Physics Alliance (United Kingdom) [7400-26]

5:50 pm: **Micro particle sorting using non-periodic structure of optical pattern**, Yuji Nishi, Yasuyuki Hayashi, Kousuke Iwai, Shoji Takeuchi, Tsutomu Shimura, Kazuo Kuroda, The Univ. of Tokyo (Japan) [7400-28]

Tuesday 4 August

SESSION 7

Room: Conv. Ctr. 6D Tues. 8:00 to 10:20 am

Integrated Platforms

Session Chair: **Arthur E. Chiou**, National Yang-Ming Univ. (Taiwan)

8:00 am: **Optical manipulation using silicon nanophotonics** (*Invited Paper*), David Erickson, Cornell Univ. (United States) [7400-29]

8:30 am: **Light-driven microfluidic platforms for droplet-based biochemical analysis**, Sungyong Park, Sheraz Kalim, Caitlin Callahan, Michael A. Teitell, Eric P. Y. Chiou, Univ. of California, Los Angeles (United States) [7400-30]

8:50 am: **A novel optically driven electrokinetic technique for manipulating nanoparticles**, Aloke Kumar, Stuart J. Williams, Steven T. Wereley, Purdue Univ. (United States) [7400-31]

9:10 am: **Integrated silicon platform for photonic tweezing and levitation** (*Invited Paper*), Hong Tang, Yale Univ. (United States) [7400-32]

9:40 am: **Optically actuated micromanipulation of silicon nanomembranes**, Stefan M. Oehrlein, R. B. Jacobson, Frank S. Flack, Max G. Lagally, Ryan J. Kershner, Univ. of Wisconsin-Madison (United States) [7400-33]

10:00 am: **Optomechanics with surface plasmons: attractive and repulsive forces between planar metal surfaces**, David N. Woolf, Marko Loncar, Federico Capasso, Harvard Univ. (United States) [7400-34]

Coffee Break 10:20 to 10:50 am

SESSION 8

Room: Conv. Ctr. 6D Tues. 10:50 am to 12:20 pm

Fundamental Issues of Force and Momentum

Session Chair: **Roberto Di Leonardo**, Univ. degli Studi di Roma, La Sapienza, CNR (Italy)

10:50 am: **AFM measurement of long-range quantum forces** (*Invited Paper*), Jeremy Munday, California Institute of Technology (United States) . . [7400-35]

11:20 am: **Whence the Minkowski momentum?**, Masud Mansuripur, College of Optical Sciences, The Univ. of Arizona (United States); Armin R. Zakharian, Corning Inc. (United States) [7400-36]

11:40 am: **Where to split between the material and electromagnetic momentum?**, Michael Mazilu, Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-37]

12:00 pm: **What is wrong with the interpretation of recent nano-filament experiments?**, Masud Mansuripur, College of Optical Sciences, The Univ. of Arizona (United States); Armin R. Zakharian, Corning Inc. (United States) [7400-38]

Lunch Break 12:20 to 1:50 pm

SESSION 9

Room: Conv. Ctr. 6D Tues. 1:50 to 3:20 pm

Key Techniques

Session Chair: **Carlos L. Cesar**, Univ. Estadual de Campinas (Brazil)

1:50 pm: **Precise calculation of three-dimensional force fields from Brownian motion** (*Invited Paper*), Ernst-Ludwig Florin, The Univ. of Texas at Austin (United States) [7400-39]

2:20 pm: **Single molecule chemical reactions within femtoliter volume containers**, Ana M. Jofre, Ben Faulk, The Univ. of North Carolina at Charlotte (United States) [7400-40]

2:40 pm: **Measuring the surface tension of oil droplets using optical tweezers**, Graham M. Gibson, Alison M. Yao, Richard Bowman, Jonathan M. Cooper, Miles J. Padgett, Univ. of Glasgow (United Kingdom) [7400-42]

3:00 pm: **Power spectral analysis trap calibration using high-speed camera position detection with limited bandwidth**, Astrid V. D. Horst, Benjamin P. B. Downing, Nancy R. Forde, Simon Fraser Univ. (Canada) [7400-43]

Coffee Break 3:20 to 3:50 pm

SESSION 10

Room: Conv. Ctr. 6D Tues. 3:50 to 5:30 pm

Fluidics and Interactions

Session Chair: **H. Daniel Ou-Yang**, Lehigh Univ.

- 3:50 pm: **Measurement of interparticle capillary forces in colloidal self-assembly with holographic optical tweezers**, Supone Manakasettharn, Ryan J. Kershner, Kevin T. Turner, Univ. of Wisconsin-Madison (United States) [7400-45]
- 4:10 pm: **Hydrodynamic interactions at a fluid wall**, Roberto Di Leonardo, Univ. degli Studi di Roma, La Sapienza, CNR (Italy); Carol López Quesada, Univ. de Barcelona (Spain) [7400-46]
- 4:30 pm: **Mapping fluid velocity in a microfluidic device using optical trapping**, Daniel J. Day, Jing Wu, Min Gu, Swinburne Univ. of Technology (Australia) [7400-48]
- 4:50 pm: **The optical micro-pipeline**, Etienne Basselet, Bruno Issenman, Charles Loussert, Virginie Hourtane, Régis Wunenburger, Jean-Pierre Delville, Univ. Bordeaux 1 (France) [7400-49]
- 5:10 pm: **Three dimensional holographic optical trapping and manipulation of multiple particles and defects in liquid crystals**, Ivan I. Smalyukh, Rahul P. Trivedi, Taewoo Lee, Gabriel Stockdale, Dennis F. Gardner, Jr., Suman Anand, Univ. of Colorado at Boulder (United States) [7400-50]

Wednesday 5 August

SESSION 11

Room: Conv. Ctr. 6D Wed. 8:30 to 11:50 am

Binding Interactions

Session Chair: **Masud Mansuripur**, College of Optical Sciences, The Univ. of Arizona

- 8:30 am: **Depletion-driven selective optical trapping in nanoparticle suspensions**, Joseph Junio, H. Daniel Ou-Yang, Lehigh Univ. (United States) [7400-51]
- 8:50 am: **Revisiting transverse optical binding**, Jörg Baumgartl, Andrew P. Rudhall, Michael Mazilu, Univ. of St. Andrews (United Kingdom); Ewan M. Wright, College of Optical Sciences, The Univ. of Arizona (United States); Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-52]
- 9:10 am: **Optical binding forces acting on two colloidal particles in a dual optical tweezers**, Ming-Tzo Wei, Lehigh Univ. (United States); Jack Ng, Ping Sheng, Che Ting Chan, The Hong Kong Univ. of Science and Technology (Hong Kong, China); H. Daniel Ou-Yang, Lehigh Univ. (United States) [7400-53]
- 9:30 am: **Optical trapping and binding in evanescent optical landscapes**, Luen Y. Wong, Colin D. Bain, Durham Univ. (United Kingdom) [7400-54]
- 9:50 am: **Modeling optical forces near planar interfaces**, Brian D. Stout, Institut Fresnel (France) and Univ. de Provence (France); Alexis Devilez, Institut Fresnel (France) [7400-55]
- Coffee Break 10:10 to 10:30 am
- 10:30 am: **Mechanisms for optical binding**, David L. Andrews, Univ. of East Anglia Norwich (United Kingdom) [7400-56]
- 10:50 am: **Manipulation of optically fabricated particle arrays using broadband radiation**, Justo J. Rodriguez, David L. Andrews, Univ. of East Anglia Norwich (United Kingdom) [7400-57]
- 11:10 am: **Optical nonlinearity of liquid nanosuspensions: Kerr versus exponential model**, Ewan M. Wright, College of Optical Sciences, The Univ. of Arizona (United States); Woei-Ming Lee, Kishan Dholakia, Univ. of St. Andrews (United Kingdom); Demetrios N. Christodoulides, Ramy A. H. El-Ganainy, The College of Optics and Photonics, Univ. of Central Florida (United States) [7400-58]
- 11:30 am: **Particles collective effects in counter-propagating Bessel beams**, Oto Brzobohaty, Vítizslav Karásek, Jan Trojek, Pavel Zemánek, Institute of Scientific Instruments (Czech Republic); Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-59]
- Lunch Break 11:50 am to 1:10 pm

SESSION 12

Room: Conv. Ctr. 6D Wed. 1:10 to 3:10 pm

Optical Trapping Suites

Session Chair: **Pavel Zemánek**, Institute of Scientific Instruments of the ASCR, v.v.i. (Czech Republic)

- 1:10 pm: **Sensing interactions in the microworld with optical tweezers**, Cecile Pacoret, Univ. Pierre et Marie Curie (France) and Commissariat à l'Energie Atomique (France); Richard Bowman, Graham M. Gibson, Univ. of Glasgow (United Kingdom); D. Sinan Haliyo, Univ. Pierre et Marie Curie (France); Moustapha Hafez, Commissariat à l'Energie Atomique (France); Miles J. Padgett, Univ. of Glasgow (United Kingdom) [7400-60]
- 1:30 pm: **The nano-world at your fingertips**, James A. Grieve, Arturas Ulcinas, Sriram Subramanian, Univ. of Bristol (United Kingdom); Graham M. Gibson, Miles J. Padgett, Univ. of Glasgow (United Kingdom); David M. Carberry, Mervyn J. Miles, Univ. of Bristol (United Kingdom) [7400-61]
- 1:50 pm: **A comprehensive software suite for optical trapping and manipulation**, Daryl C. Preece, Richard Bowman, Graham M. Gibson, Graeme Whyte, Miles J. Padgett, Univ. of Glasgow (United Kingdom) [7400-62]
- 2:10 pm: **The mGPC method: generalized phase contrast combined with matched filtering**, Jesper Glückstad, Darwin Z. Palima, Technical Univ. of Denmark (Denmark) [7400-63]
- 2:30 pm: **Wavefront correction for holographic optical trapping**, Tomáš Cižmar, Michael Mazilu, Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-64]
- 2:50 pm: **Axial intensity shaping of a Bessel beam**, Tomáš Cižmar, Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-65]
- Coffee Break 3:10 to 3:30 pm

SESSION 13

Room: Conv. Ctr. 6D Wed. 3:30 to 6:00 pm

Novel Beams/Novel Probes

Session Chair: **Halina H. Rubinsztein-Dunlop**, The Univ. of Queensland (Australia)

- 3:30 pm: **Optical snowblowing of microparticles and cells in a microfluidic environment using Airy and parabolic wavepackets (Invited Paper)**, Jörg Baumgartl, Gregor M. Hannappel, David J. Stevenson, Michael Mazilu, Univ. of St. Andrews (United Kingdom); Daniel J. Day, Min Gu, Swinburne Univ. of Technology (Australia); Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-66]
- 4:00 pm: **Optical path clearing**, Michael Mazilu, Antonia E. Carruthers, Tomáš Cižmar, Univ. of St. Andrews (United Kingdom); Barbara A. Capron, William A. McNeely, Boeing Space & Defense Group (United States); Ewan M. Wright, College of Optical Sciences, The Univ. of Arizona (United States); Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-67]
- 4:20 pm: **The optical force induced by an angular momentum carrying beam alone can never trap a particle: the damping force from the water medium is working in harmony**, Jack Ng, The Hong Kong Univ. of Science and Technology (Hong Kong, China); Zhi Fang Lin, Fudan Univ. (China); Che Ting Chan, The Hong Kong Univ. of Science and Technology (Hong Kong, China) [7400-68]
- 4:40 pm: **Dynamic properties of a micro-sphere optically trapped in air by radially polarized laser beam**, Masaki Michihata, Yasuhiro Takaya, Terutake Hayashi, Osaka Univ. (Japan) [7400-69]
- 5:00 pm: **Optical trap assisted direct write nanolithography**, Craig B. Arnold, Euan R. McLeod, Princeton Univ. (United States) [7400-70]
- 5:20 pm: **Thermal motion of an optically trapped nano-tool**, Stephen H. Simpson, Mervyn J. Miles, Simon Hanna, Univ. of Bristol (United Kingdom) [7400-71]
- 5:40 pm: **Using holographic optical tweezers to measure forces with SPM-like probes**, David M. Carberry, Leo Ikin, Univ. of Bristol (United Kingdom); Graham M. Gibson, Miles J. Padgett, Univ. of Glasgow (United Kingdom); Mervyn J. Miles, Univ. of Bristol (United Kingdom) [7400-72]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Optical trapping of hydrosomes, Carlos Lopez-Mariscal, Kristian Helmerson, National Institute of Standards and Technology (United States) [7400-41]

Multiple optical traps created with an inclined fiber optical tweezers, Yuxiang Liu, Miao Yu, Univ. of Maryland, College Park (United States)[7400-81]

Optical rotation of the shrunken multi-lamellar vesicle in optical tweezers, Chungil Ha, Hyuk Kyu Pak, Pusan National Univ. (Korea, Republic of); Kipom Kim, Univ. of California, Santa Barbara (United States) [7400-82]

Measurement of trap length for an optical trap, Susan Y. Wrbanek, NASA Glenn Research Ctr. (United States) [7400-83]

Target tracking for cell in the fluid by joint transform correlator and wavelet transform (Presentation Only), Hui Chi Chen, Yui Han Gong, Fu-Jen Catholic Univ. (Taiwan) [7400-84]

Analysis of the trapping forces on a spheroidal microparticle, Hector Sosa-Martinez, Julio C. Gutiérrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico) [7400-85]

SONOPTICS: spatio-temporal micromanipulation by light and sound, Paul A. Campbell, Univ. of Dundee (United Kingdom); Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7400-86]

Rectification of Brownian motion by dielectrophoresis, A. Covarrubias-Jaramillo, Univ. de las Américas Puebla (Mexico); Daniel A. May-Arrijoja, Julio C. Ramirez-San-Juan, Nikolai A. Korneev, Rubén Ramos-García II, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico). [7400-87]

Thursday 6 August

SESSION 14

Room: Conv. Ctr. 6D Thurs. 9:00 to 10:30 am

Optically Driven Systems and Micromachines

Session Chair: **Jesper Glückstad**, Technical Univ. of Denmark (Denmark)

9:00 am: **Optical trapping and guiding of absorbing nanoclusters in air (Invited Paper)**, Vladlen G. Shvedov, Yana V. Izdebskaya, Anton S. Desyatnikov, Andrei V. Rode, Yuri S. Kivshar, Wieslaw Z. Krolikowski, The Australian National Univ. (Australia) [7400-73]

9:30 am: **Optimization of optically-driven micromachines**, Vincent L. Y. Loke, Theodor Asavei, Timo A. Nieminen, Norman R. Heckenberg, Halina H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia) [7400-74]

9:50 am: **Optical paddle-wheel**, Theodor Asavei, Vincent L. Y. Loke, Timo A. Nieminen, Norman R. Heckenberg, Halina H. Rubinsztein-Dunlop, The Univ. of Queensland (Australia). [7400-75]

10:10 am: **Detaching and optical trapping of micro-part solidified using microstereolithography**, Md. Tallal Bin Najam, Yong-Gu Lee, Gwangju Institute of Science and Technology (Korea, Republic of) [7400-76]

Coffee Break 10:30 to 11:00 am

SESSION 15

Room: Conv. Ctr. 6D Thurs. 11:00 am to 12:20 pm

Nanostructures

11:00 am: **Optically tunable surfaces via trapped particles in microcavities**, Rebecca Sainidou, Fransisco Javier Garcia de Abajo, Consejo Superior de Investigaciones Científicas (Spain) [7400-77]

11:20 am: **Manipulating vanadium oxide nanotubes with optical tweezers**, Woei-Ming Lee, Univ. of St. Andrews (United Kingdom); Jose Luis Hernández-Pozos, Liliana I. Vera-Robles, Antonio Campero Celis, Univ. Autónoma Metropolitana-Iztapalapa (Mexico); Kishan Dholakia, Univ. of St. Andrews (United Kingdom). [7400-78]

11:40 am: **Measurement of the axial rotation of nanorods trapped by a laser beam**, Sun-Uk Hwang, Gwangju Institute of Science and Technology (Korea, Republic of); Yong-Jin Kim, Gyu-Chul Yi, Pohang Univ. of Science and Technology (Korea, Republic of); Yong-Gu Lee, Gwangju Institute of Science and Technology (Korea, Republic of) [7400-79]

12:00 pm: **Micro-crystal sample manipulation for x-ray microdiffraction experiments**, Silvia C. Santucci, Enrico Ferrari, Lab. Nazionale TASC/INFM (Italy); Michael Rappolt, Heinz Amenitsch, Barbara Sartori, Benedetta Marmiroli, Institute of Biophysics and X-Ray Structure Research (Austria); Manfred Burghammer, Christian Riekel, European Synchrotron Radiation Facility (France); Danut-Adrian Cojoc, Lab. Nazionale TASC/INFM (Italy) [7400-80]

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Courses of Related Interest

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SC655 Introduction to Optical Tweezers and Optical Micromanipulation (Dholakia, Spalding) Monday, 8:30 am to 12:30 pm

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7401

Sunday-Monday 2-3 August 2009 • Proceedings of SPIE Vol. 7401

Biomimetics and Bioinspiration

Conference Chairs: Raúl J. Martín-Palma, Univ. Autónoma de Madrid (Spain); Akhlesh Lakhtakia, The Pennsylvania State Univ.

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 15BSun. 8:30 to 10:15 am

General

Session Chair: Raúl J. Martín-Palma, Univ. Autónoma de Madrid (Spain)

8:30 am: **Humanlike robots: the upcoming revolution in robotics** (*Keynote Presentation*), Yoseph Bar-Cohen, Jet Propulsion Lab. (United States)[7401-01]

9:15 am: **Drawing inspiration from biological optical systems** (*Invited Paper*), H. Donald Wolpert, Bio-Optics (United States) [7401-02]

9:45 am: **Plant tissue optics: micro- and nanostructures** (*Invited Paper*), David W. Lee, Florida International Univ. (United States) [7401-03]

Coffee Break 10:15 to 10:45 am

SESSION 2

Room: Conv. Ctr. 15B Sun. 10:45 am to 12:25 pm

Structural Colors

Session Chair: David W. Lee, Florida International Univ.

10:45 am: **Modified multilayer systems in the structural color of animals** (*Invited Paper*), Shinya Yoshioka, Shuichi Kinoshita, Osaka Univ. (Japan) [7401-04]

11:15 am: **Structural colors, cosmetics, and fabrics** (*Invited Paper*), Natalia M. Dushkina, Millersville Univ. (United States); Akhlesh Lakhtakia, The Pennsylvania State Univ. (United States) [7401-05]

11:45 am: **Approaches to mimic the metallic sheen in beetles**, Torben A. Lenau, Technical Univ. of Denmark (Denmark) [7401-06]

12:05 pm: **Light extraction from the bioluminescent organs of fireflies**, Annick Bay, Jean-Pol Vigneron, Facultes Univ. Notre Dame de la Paix (Belgium) [7401-07]

Lunch Break 12:25 to 1:50 pm

SESSION 3

Room: Conv. Ctr. 15BSun. 1:50 to 3:00 pm

Biomechanics I

Session Chair: Yoseph Bar-Cohen, Jet Propulsion Lab.

1:50 pm: **Biomimetics: determining engineering opportunities from nature** (*Invited Paper*), Frank E. Fish, West Chester Univ. of Pennsylvania (United States) [7401-08]

2:20 pm: **An investigation of viscous-mediated coupling of insects' cercal hair sensors using a scaled up model**, Pasupathy Sangareddy Alagirisamy, George Jeronimidis, Velérie Le Moal, The Univ. of Reading (United Kingdom) [7401-10]

2:40 pm: **Possible uses of the layered structure found in the scales of *Hoplia coerulea* (Coleoptera)**, Jean-Pol Vigneron, Priscilla Simonis, Jean-Francois Colomer, Annick Bay, Facultes Univ. Notre Dame de la Paix (Belgium) [7401-11]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. 15BSun. 3:30 to 4:50 pm

Bioinspired Fabrication

Session Chair: Akhlesh Lakhtakia, The Pennsylvania State Univ.

3:30 pm: **Biotemplated nanofabrication and biomimicking nanotechnology** (*Invited Paper*), Zhong Lin Wang, Georgia Institute of Technology (United States) [7401-12]

4:00 pm: **Biomimetic hollow bone scaffolds** (*Invited Paper*), Bert Müller, Fabienne C. Fierz, Basel Univ. Hospital (Switzerland); Felix Beckmann, GKSS-Forschungszentrum Geeshacht (Germany); Stephan H. Irsen, Özer Degistirici, Michael Thie, Ctr. of Advanced European Studies and Research (Germany) [7401-13]

4:30 pm: **Bioinspired dental fillings**, Stefan Buser, Hans Deyhle, Bert Müller, Univ. Basel (Switzerland) [7401-14]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 15B Mon. 1:30 to 2:00 pm

Biomechanics II

Session Chair: Akhlesh Lakhtakia, The Pennsylvania State Univ.

1:30 pm: **Biomimetic inspiration from fire and combustion in nature, including the bombardier beetle** (*Invited Paper*), Andy C. McIntosh, Univ. of Leeds (United Kingdom) [7401-09]

Conference 7401

SESSION 6

Room: Conv. Ctr. 15B Mon. 2:00 to 3:30 pm

Biomimetic Fabrication

Session Chair: **Bert Müller**, Basel Univ. Hospital (Switzerland)

2:00 pm: **High-dielectric photonic crystals from biological templates** (*Invited Paper*), Michael H. Bartl, Jeremy W. Galusha, The Univ. of Utah (United States) [7401-15]

2:30 pm: **Towards replication of the exoskeleton of *Lamprocyphus augustus*** for photonic applications, Akhlesh Lakhtakia, Raúl J. Martín-Palma, Carlo G. Pantano, The Pennsylvania State Univ. (United States) [7401-16]

2:50 pm: **Platinum-free H₂-evolving materials engineered through the chemical derivatization of carbon nanotubes with a bio-inspired hydrogenase mimic** (*Presentation Only*), Alan Le Goff, Vincent Artero, Bruno Joussemme, Nicolas Guillet, Romain Metaye, Aziz Fihri, Serge Palacin, Marc Fontecave, Commissariat à l'Energie Atomique (France) [7401-17]

3:10 pm: **Nanostructured biomimetic moth-eye arrays in silicon by nanoimprint lithography**, Stuart A. Boden, Darren M. Bagnall, Univ. of Southampton (United Kingdom) [7401-18]

Coffee Break 3:30 to 4:00 pm

SESSION 7

Room: Conv. Ctr. 15B Mon. 4:00 to 5:40 pm

Bioinspired Polymeric Structures

Session Chair: **Jean-Pol Vigneron**, Facultes Univ. Notre Dame de la Paix (Belgium)

4:00 pm: **Plasmonic nanoflowers: bioinspired manipulation of plasmonic architectures via active polymers**, Benjamin M. Ross, Liz Y. Wu, Luke P. Lee, Univ. of California, Berkeley (United States) [7401-19]

4:20 pm: **Polymer nanoparticles having periodic nano-structures**, Kiwamu Motoyoshi, Kazutaka Koike, Takeshi Higuchi, Tohoku Univ. (Japan); Hiroshi Yabu, Tohoku Univ. (Japan) and PRESTO, JST (Japan); Masatsugu Shimomura, Tohoku Univ. (Japan) and CREST, JST (Japan) [7401-20]

4:40 pm: **Polymer nanoparticles having nanoscale structures**, Takeshi Higuchi, Tohoku Univ. (Japan) and CREST, JST (Japan); Kiwamu Motoyoshi, Kazutaka Koike, Tohoku Univ. (Japan); Hiroshi Yabu, Tohoku Univ. (Japan) and PRESTO, JST (Japan); Masatsugu Shimomura, Tohoku Univ. (Japan) and CREST, JST (Japan) [7401-21]

5:00 pm: **Surface properties of biomimetic stimuli-responsive honeycomb-patterned films and pincushion-structured films**, Miki Kojima, Yuji Hirai, Hiroshi Yabu, Tohoku Univ. (Japan); Masatsugu Shimomura, Tohoku Univ. (Japan) and CREST, JST (Japan) [7401-22]

5:20 pm: **Biomimetic superhydrophobic metal-polymer hybrid films**, Daisuke Ishii, Hiroshi Yabu, Masatsugu Shimomura, Tohoku Univ. (Japan) and CREST, JST (Japan) [7401-25]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

End-to-end assembly of metallic nanowires with engineered DNA sequences, Rong Li, Jiebin Zhong, Cengiz S. Ozkan, Mihri Ozkan, Univ. of California, Riverside (United States) [7401-24]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7402

Tuesday-Wednesday 4-5 August 2009 • Proceedings of SPIE Vol. 7402

Nanoengineering: Fabrication, Properties, Optics, and Devices VI

Conference Chairs: **Elizabeth A. Dobisz**, Hitachi Global Storage Technologies, Inc.; **Louay A. Eldada**, HelioVolt Corp.

Program Committee: **Andre-Jean Attias**, Univ. Pierre et Marie Curie (France); **Gregory J. Exarhos**, Pacific Northwest National Lab.; **Cynthia Hanson**, Space and Naval Warfare Systems Command; **Daniel J. C. Herr**, Semiconductor Research Corp.; **Ghassan E. Jabbour**, Arizona State Univ.; **Miguel Levy**, Michigan Technological Univ.; **Robert Magnusson**, Univ. of Connecticut; **Juan R. Maldonado**, Stanford Univ.; **Jun Tanida**, Osaka Univ. (Japan); **Chee Wei Wong**, Columbia Univ.; **Gabriel Zeltzer**, Hitachi Global Storage Technologies

Monday 3 August

SESSION 3

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Room: Conv. Ctr. 13 Tues. 1:40 to 3:00 pm

Sensing Nanostructures

Session Chair: **Louay A. Eldada**, HelioVolt Corp.

1:40 pm: **Locally-controlled domain microstructures in bismuth iron garnet films for magneto-optical current sensors**, Alan Y. Hsu, Michael J. Cich, Gordon A. Keeler, Sandia National Labs. (United States). [7402-08]

2:00 pm: **Real time micro/nano particle detection and tracking with nanosecond resolution**, Feng Qian, Qi Song, En-Kuang Tien, Ozdal Boyraz, Univ. of California, Irvine (United States). [7402-09]

2:20 pm: **Luminescent plasma nanocomposites for the fabrication of photonic sensing devices**, Angel Barranco, Francisco Aparicio, Iwona Blaszczyk-Lezak, Juan R. Sanchez-Valencia, Consejo Superior de Investigaciones Científicas (Spain); Ana I. Borrás, Pierangelo Groening, EMPA (Switzerland); Agustín R. Gonzalez-Elipe, Consejo Superior de Investigaciones Científicas (Spain) [7402-10]

2:40 pm: **Modeling of GaN/AlN heterostructure-based nano pressure sensors**, Sunil R. Patil, Wilfrid Laurier Univ. (Canada); Niraj Sinha, Massachusetts Institute of Technology (United States); Roderick V. N. Melnik, Wilfrid Laurier Univ. (Canada) [7402-11]

Coffee Break 3:00 to 3:30 pm

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 13 Tues. 9:00 to 10:30 am

Future Trends in Nanoengineering

Session Chair: **Louay A. Eldada**, HelioVolt Corp.

9:00 am: **Nanopatterning: current state of the art and future trends**, Cengiz S. Ozkan, Univ. of California, Riverside (United States) [7402-01]

9:20 am: **Enhancing the performance of photonic DNA nanomachines for implementing photonic nanoscale automaton (Invited Paper)**, Takahiro Nishimura, Yusuke Ogura, Jun Tanida, Osaka Univ. (Japan) [7402-02]

9:50 am: **Novel fabrication and optoelectronic property of semiconductor filaments by optical-fiber thermal drawing**, Daosheng Deng, Massachusetts Institute of Technology (United States) [7402-03]

10:10 am: **Fabrication and engineering of dimensionally constrained functional oxide nanopatterns**, Zixiao Pan, Suresh Donthu, Exponent, Inc. (United States) and Northwestern Univ. (United States); Vinayak P. Dravid, Northwestern Univ. (United States) [7402-04]

Coffee Break 10:30 to 11:00 am

SESSION 2

Room: Conv. Ctr. 13 Tues. 11:00 am to 12:10 pm

Nanotechnologies for Printed Electronics and Photovoltaics

Session Chair: **Elizabeth A. Dobisz**, Hitachi Global Storage Technologies, Inc.

11:00 am: **Nanoscale self-assembly of high-efficiency copper indium gallium selenide photovoltaic thin films (Invited Paper)**, Louay A. Eldada, HelioVolt Corp. (United States) [7402-05]

11:30 am: **Ultraviolet photoresponse of ZnO-based polycrystalline thin film by inkjet printing**, Yan Wu, Takahiko Tamaki, Wolfgang Voit, Lyubov M. Belova, K. V. Rao, Royal Institute of Technology (Sweden) [7402-06]

11:50 am: **Fabrication of metal array photomask using dip pen nanolithography®**, Jae-Won Jang, Jason R. Haaheim, Omkar A. Nafday, Paul L. Stiles, Nanolnk, Inc. (United States) [7402-07]

Lunch/Exhibition Break 12:10 to 1:40 pm

SESSION 4

Room: Conv. Ctr. 13 Tues. 3:30 to 4:30 pm

Self-Assembled Nanostructures and Nanoimprint Technologies

Session Chair: **Elizabeth A. Dobisz**, Hitachi Global Storage Technologies, Inc.

3:30 pm: **Low voltage field ionization on high-density P-type Si nanowhiskers grown on Si micropillars**, Ramin Banan Sadeghian, Veerayah J. Logeeswaran, M. Saif Islam, Univ. of California, Davis (United States) [7402-12]

3:50 pm: **Alignment of 1-D nanostructures via directed assembly in block copolymer microdomains**, Maziar Ghazinejad, Huiqing Ma, Mihri Ozkan, Cengiz S. Ozkan, Univ. of California, Riverside (United States) [7402-13]

4:10 pm: **A simple two-stage nanoimprinting technique**, Jayan Thomas, Palash Gangopadhyay, Nasser N. Peyghambarian, College of Optical Sciences, The Univ. of Arizona (United States) [7402-14]

Wednesday 5 August

SESSION 5

Room: Conv. Ctr. 13 Wed. 9:00 to 10:00 am

Toward Single Photon and Single Electron Nanodevices

Session Chair: **Michael Hochberg**, Univ. of Washington

9:00 am: **Highly directional emission from ultra-small photonic crystal resonators**, Se-Heon Kim, California Institute of Technology (United States); Yong-Hee Lee, Korea Advanced Institute of Science and Technology (Korea, Republic of); Jingqing Huang, Axel Scherer, California Institute of Technology (United States) [7402-19]

Conference 7402

9:20 am: **Characterization of single electron effects in nanoscale MOSFETs**, Leonard Forbes, Drake A. Miller, Oregon State Univ. (United States) . [7402-20]

9:40 am: **InSb nanowire based field effect transistor**, Xiaoye Jing, Miroslav V. Penchev, Cengiz S. Ozkan, Mihri Ozkan, Univ. of California, Riverside (United States) [7402-21]

Coffee Break 10:20 to 11:10 am

SESSION 6

Room: Conv. Ctr. 13 Wed. 10:30 am to 12:10 pm

Photonic Crystals and Nanophotonic Integrated Circuits

Session Chair: Louay A. Eldada, HelioVolt Corp.

10:30 am: **Lithographic scaling in silicon photonics: Is smaller better?** (*Invited Paper*), Michael Hochberg, Thomas W. Baehr-Jones, Univ. of Washington (United States) [7402-15]

11:00 am: **Design and integration of polymer, silicon, and plasmonic nano-wires for nano-photonics integrated circuit application** (*Invited Paper*), El-Hang Lee, Inha Univ. (Korea, Republic of) [7402-16]

11:30 am: **Polymer photonic crystal dye lasers as label free evanescent cell sensors**, Mads B. Christiansen, Joanna M. Lopacinska, Mogens H. Jakobsen, Niels A. Mortensen, Martin Dufva, Anders Kristensen, Technical Univ. of Denmark (Denmark) [7402-17]

11:50 am: **Comparative study of optical properties of photonic crystal fibers fill up with nanotubes based on carbon or bismuth**, Valentín Guzmán, Paulina Segovia Olvera, Mario Osorio, Oxana V. Kharisova, Univ. Autonoma de Nuevo Leon (Mexico); Ismael Torres-Gomez, Ctr. de Investigaciones en Óptica, A.C. (Mexico); Romeo J. Selvas-Aguilar, Univ. Autonoma de Nuevo Leon (Mexico) [7402-18]

Lunch/Exhibition Break 12:10 to 1:20 pm

SESSION 7

Room: Conv. Ctr. 13 Wed. 1:40 to 2:40 pm

Nanoengineering Designs and Processes

Session Chair: Louay A. Eldada, HelioVolt Corp.

1:40 pm: **Micro and nano product engineering using data management for silicon-based fabrication process development**, Dirk Ortloff, Process Relations GmbH (Germany); Kai Hahn, Univ. Siegen (Germany); Jens Popp, Process Relations GmbH (Germany); Thilo Schmidt, Rainer Brück, Univ. Siegen (Germany) [7402-22]

2:00 pm: **Optimizing and engineering PbSe/PbSrSe quantum well laser structures: SQW, SQW-SCH, MQW, and MMQW**, Majed Khodr, Hariri Canadian Univ. (Lebanon) [7402-23]

2:20 pm: **Sensitization of erbium in silicon oxide by evaporation and thermal oxidation**, Hossein Alizadeh, Nazir P. Kherani, Stefan Zukotynski, Univ. of Toronto (Canada) [7402-24]

Coffee Break 2:40 to 3:30 pm

SESSION 8

Room: Conv. Ctr. 13 Wed. 3:20 to 4:20 pm

2D and 3D Nanostructures

Session Chair: Elizabeth A. Dobisz, Hitachi Global Storage Technologies, Inc.

3:20 pm: **Holographic 3D microfabrication of line and dot array**, Masahiro Yamaji, Hayato Kawashima, Jun'ichi Suzuki, Shuhei Tanaka, New Glass Forum (Japan) [7402-26]

3:40 pm: **High-throughput fabrication of SERS-specific nanostructures using dip pen nanolithography**, Omkar A. Nafday, Jason R. Haaheim, Paul L. Stiles, Jae-Won Jang, Nanolink, Inc. (United States) [7402-27]

4:00 pm: **Undesired effects of nanostructured thin films**, Gabrielle Thériault, Réal Tremblay, Nathalie McCarthy, Univ. Laval (Canada) [7402-28]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Characterization of additive influence on reaction sintering of nano aluminum titanate, Maryam Khosravi, Iran Univ. of Science and Technology (Iran, Islamic Republic of) [7402-25]

Nanoimprint lithography for complex 3D micro-nano structures replication under low temperature, Hongwen Sun, Hohai Univ. (China); Jingquan Liu, Di Chen, Shanghai Jiao Tong Univ. (China) [7402-29]

Study of electrical properties of InSb nanowires by conductive atomic force microscopy (CAFM), Miroslav V. Penchev, Alfredo A. Martinez-Morales, Jiebin Zhong, Xiaoye Jing, Mihri Ozkan, Cengiz S. Ozkan, Univ. of California, Riverside (United States) [7402-30]

Characterization of hologram multiplexing in nanoparticle-polymer composites, Soko Koda, Eiji Hata, Yasuo Tomita, The Univ. of Electro-Communications (Japan) [7402-31]

Electrical characterization of compositionally modulated InxSb1-x nanowire field effect transistors by scanning gate microscopy, Alfredo A. Martinez-Morales, Mihri Ozkan, Cengiz S. Ozkan, Miroslav V. Penchev, Univ. of California, Riverside (United States) [7402-32]

Blue-sensitive nanoparticle-polymer composites for volume holographic recording, Koji Omura, Kohshi Gotoh, Yasuo Tomita, The Univ. of Electro-Communications (Japan); Kentaroh Ohmori, Motohiko Hidaka, Nissan Chemical Industries, Ltd. (Japan) [7402-33]

A facile fabrication of periodic micro/nanostructures from photoinduced surface relief gratings and replication method, Seungwoo Lee, Yong-Cheol Jeong, Yongjoon Heo, Jihye Lee, Dowon Ahn, Jung-Ki Park, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7402-34]

Novel hierarchical surface reliefs from creeping and aggregation of azopolymer, Seungwoo Lee, Yong-Cheol Jeong, Yongjoon Heo, Jihye Lee, Dowon Ahn, Jung-Ki Park, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7402-35]

Synthesis and characterization of electrospun gallium nitride nanofibers, Anamaris Melendez, Kristle Morales, Idalia Ramos, Univ. de Puerto Rico en Humacao (United States); Eva Campo, Lehigh Univ. (United States); Jorge Santiago, Univ. of Pennsylvania (United States) [7402-36]

Effect of temperature on oxidation growth of ZnO nanoparticles, Yanhui Liu, Shanghai Univ. of Engineering Science (China) [7402-37]

Bandgap tuning of photonic crystals on III-V nitride thin films, Hyma Yalamanchili, Lawrence A. Hornak, Dimitris Korakakis, Jeremy M. Dawson, West Virginia Univ. (United States) [7402-39]

Novel polarization splitters based on simple dielectric periodic structure, Yuan Zhang, Wei Xue, Yurong Jiang, Beijing Institute of Technology (China) [7402-40]

Modelling of electroconductivity and photosensitivity of porous silicon for gas-adsorption sensor structures, Liubomyr S. Monastyrskii, Bogdan S. Sokolovsky, Ivan Franko National Univ. of L'viv (Ukraine) [7402-41]

Fabrication of silver nanoparticles in a photopolymer matrix promoted by photochemical way, Lavinia Balan, Ecole Nationale Supérieure de Chimie de Mulhouse (France); Jean-Pierre Malval, Daniel-Joseph Lougnot, Univ. de Haute Alsace (France) [7402-42]

Development of UV cross-link optical coating material for planarization, Satoshi Takei, Nissan Chemical Industries, Ltd. (Japan) [7402-43]

Physical nature of nanostructure formation on plasma strengthening of cast-iron rolls, Victor E. Gromov, Oleg Y. Efimov, Sergey V. Kononov, Siberian State Univ. of Industry (Russian Federation) [7402-44]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7403

Wednesday-Thursday 5-6 August 2009 • Proceedings of SPIE Vol. 7403

Nanobiosystems: Processing, Characterization, and Applications II

Conference Chairs: **Norihisa Kobayashi**, Chiba Univ. (Japan); **Fahima Ouchen**, Air Force Research Lab.; **Ileana Rau**, Polytechnic Univ. of Bucharest (Romania)

Program Committee: **Carrie M. Bartsch**, General Dynamics Information Technology; **Liming Dai**, Univ. of Dayton; **Ananth Dodabalapur**, The Univ. of Texas at Austin; **James G. Grote**, Air Force Research Lab.; **Emily M. Heckman**, General Dynamics Information Technology; **Kuniharu Ijiri**, Hokkaido Univ. (Japan); **Jung-Il Jin**, Korea Univ. (Korea, Republic of); **François Kajzar**, Univ. d'Angers (France); **Sang Kim**, Air Force Research Lab.; **Norihisa Kobayashi**, Chiba Univ. (Japan); **Oksana Krupka**, Univ. d'Angers (France); **Charles Y. C. Lee**, Air Force Office of Scientific Research; **Misoon Mah**, Asian Office of Aerospace Research and Development (Japan); **Naoya Ogata**, Chitose Institute of Science and Technology (Japan); **Bruce H. Robinson**, Univ. of Washington; **Anna Samoc**, The Australian National Univ. (Australia); **Marek J. Samoc**, The Australian National Univ. (Australia); **Niyazi Serdar Sariciftci**, Johannes Kepler Univ. Linz (Austria); **Kristi M. Singh**, Air Force Research Lab.; **Andrew J. Steckl**, Univ. of Cincinnati; **Morley O. Stone**, Air Force Research Lab.; **Perry P. Yaney**, Univ. of Dayton

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

SESSION 2

Room: Conv. Ctr. 11A Wed. 10:30 am to 12:30 pm

DNA Applications I

Session Chair: **Mireille H. Blanchard-Desce**, Univ. de Rennes I (France)

10:30 am: **Novel applications of DNA materials (Invited Paper)**, Naoya Ogata, Chitose Institute of Science and Technology (Japan) [7403-04]

11:00 am: **Electronics and photonics based on biotechnology (Invited Paper)**, James G. Grote, Air Force Research Lab. (United States) [7403-05]

11:30 am: **Deposition of Nano-composite DNA Thin Films by Through Thin Film Ablation**, Paul T. Murray, Eunsung Shin, Neal Pierce, Univ. of Dayton Research Institute (United States) [7403-06]

11:50 am: **Biomaterials based on DNA embedded in silica matrix**, Maria Mihaly, Roxana Popescu, Mirela Moldoveanu, Aurelia Meghea, Ileana Rau, Univ. Politehnica Bucuresti (Romania) [7403-07]

12:10 pm: **On the reactivity of biopolymers thin films for optoelectronic applications**, Roxana Popescu, Univ. Politehnica Bucuresti (Romania); Viorica Trandafir, National R&D Institute for Textile and Leather (Romania); Ioana Demetrescu, Mirela Moldoveanu, Univ. Politehnica Bucuresti (Romania); James G. Grote, Air Force Research Lab. (United States); François Kajzar, Univ. d'Angers (France); Ileana Rau, Univ. Politehnica Bucuresti (Romania) . [7403-08]

Lunch/Exhibition Break 12:30 to 2:00 pm

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 11A Wed. 8:30 to 10:00 am

Multifunctional Materials

Session Chair: **Ileana Rau**, Polytechnical Univ. of Bucharest (Romania)

8:30 am: **Bio-enabled approaches to multifunctional materials (Keynote Presentation)**, Rajesh R. Naik, Sang Nyon Kim, Joseph Slocik, Lawrence F. Drummy, Zhifeng Kuang, Richard A. Vaia, Barry L. Farmer, James G. Grote, Air Force Research Lab. (United States) [7403-01]

9:10 am: **Customized multiphotonics nanotools for bio-applications: from soft organic nanodots as an ecofriendly alternative to quantum dots to biphotonic nanotriggers for synchronization of enzymes (Invited Paper)**, Mireille H. Blanchard-Desce, Olivier M. Mongin, Univ. de Rennes 1 (France); Anne-Marie Caminade, Jean-Pierre Majoral, Ctr. National de la Recherche Scientifique (France); Anny Schwok, Institut National de la Recherche Agronomique (France) [7403-02]

9:40 am: **Bio-inspired high functional density photo-electronic material based on photosynthetic proteins and carbon nanotube arrayed electrode**, Nikolai Lebedev, Scott A. Trammell, Stanislav Tsoi, Naval Research Lab. (United States); Anthony Spano, Univ. of Virginia (United States); Jimmy Xu, Jin Ho Kim, Brown Univ. (United States); Mark E. Twigg, Naval Research Lab. (United States) [7403-03]

Coffee Break 10:00 to 10:30 am

SESSION 3

Room: Conv. Ctr. 11A Wed. 2:00 to 3:10 pm

DNA Applications II

Session Chair: **Antoni Cz. Mitus**, Wroclaw Univ. of Technology (Poland)

2:00 pm: **Dielectric and electrical properties of Sol-gel/DNA blends (Invited Paper)**, Robert A. Norwood, Christopher T. DeRose, College of Optical Sciences, The Univ. of Arizona (United States); Roland Himmelhuber, The Univ. of Arizona (United States); Jiafu Wang, Li Li, TIPD, LLC (United States); Fahima Ouchen, James G. Grote, Air Force Research Lab. (United States) [7403-09]

2:30 pm: **Photoconductivity and current-voltage characteristics in thin DNA films: theoretical modeling and experiments**, Ravindra Venkatramani, Duke Univ. (United States); De-Yu Zang, IPITEK, Inc. (United States); Choon Oh, ; James G. Grote, Air Force Research Lab. (United States); David Beratan, Duke Univ. (United States) [7403-10]

2:50 pm: **DNA on graphene**, Jian Lin, Xiaoye Jing, Rong Li, Sushmee Badluka, Univ. of California, Riverside (United States) [7403-11]

Coffee Break 3:10 to 3:40 pm

Conference 7403

SESSION 4

Room: Conv. Ctr. 11A Wed. 3:40 to 5:20 pm

DNA Applications III

Session Chair: **Robert A. Norwood**, College of Optical Sciences, The Univ. of Arizona

3:40 pm: **Stretching of (DNA/functional molecules) complex between electrodes towards DNA molecular wire** (*Invited Paper*), Norihisa Kobayashi, Chiba Univ. (Japan) [7403-12]

4:10 pm: **DNA-assisted fabrication of functional metal nanostructures** (*Invited Paper*), Kuniharu Ijro, Aya Tanaka, Ayako Ishikawa, Ken-ichi Niikura, Yasutaka Matsuo, Hokkaido Univ. (Japan) [7403-13]

4:40 pm: **DNA-Pt thin films as semiconductors for BioFET**, Fahima Ouchen, Air Force Research Lab. (United States); Perry Yanney, Univ. of Dayton (United States); Kristi M. Singh, James G. Grote, Rajesh R. Naik, Air Force Research Lab. (United States) [7403-14]

5:00 pm: **Enhanced electromagnetic properties of biopolymers**, Guru Subramanyam, Univ. of Dayton (United States); Fahima Ouchen, Air Force Research Lab. (United States); Chenhao Zhang, Kyusoon Park, Liming Dai, ; Rajesh R. Naik, Air Force Research Lab. (United States) [7403-15]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

New nanobiomaterials based on irridoidic compounds, Nicoleta Radu, Cosmin Corobea, Institutul National de Cercetare (Romania); Ileana Rau, Univ. Politehnica Bucuresti (Romania) [7403-28]

Biological properties of nanomaterials based on irridoidic compounds, Nicoleta Radu, Institutul National de Cercetare (Romania); Isabel G. Cristescu, Carol Davila Univ. of Medicine and Pharmacy (Romania); Dragomir Coprean, Univ. Ovidius Constanta (Romania); Ileana Rau, Univ. Politehnica Bucuresti (Romania) [7403-29]

Thursday 6 August

SESSION 5

Room: Conv. Ctr. 11A Thurs. 8:30 to 10:20 am

Nanobiosystems

Session Chair: **Fahima Ouchen**, Air Force Research Lab.

8:30 am: **Hyperbranched polysiloxysilane nanoparticles for nonviral gene delivery vectors and nanoprobe** (*Invited Paper*), Kwang-Sup Lee, Hannam Univ. (Korea, Republic of); Won Jin Kim, Hannam Univ. (Korea, Republic of) and Univ. at Buffalo (United States); Adela C. Bonoiu, Haridas E. Pudavar, Univ. at Buffalo (United States); Masa-aki Kakimoto, Tokyo Institute of Technology (Japan); Paras N. Prasad, Univ. at Buffalo (United States) [7403-16]

9:00 am: **Genomic DNA-Single Wall Carbon Nanotube Hybrid**, Sang Nyon Kim, Zhifeng Kuang, Kristi M. Singh, Fahima Ouchen, James G. Grote, Barry L. Farmer, Rajesh R. Naik, Air Force Research Lab. (United States) [7403-18]

9:20 am: **Biological application of laser technology using metallic nanoparticles**, Yehia A. H. Badr, Cairo Univ. (Egypt); Samia Shouman, National Cancer Institute (Egypt); Mohammed T. Hassan, The British Univ. in Egypt (Egypt) [7403-20]

9:40 am: **Synthesis and characterization of nano hydroxyapatite using cationic surfactant as template**, Michael S. L. Shanthi, M. Ashok, Uthira Kumar, National Institute of Technology, Tiruchirappalli (India) [7403-21]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. 11A Thurs. 10:30 am to 11:30 pm

DNA Photonics

Session Chair: **Kwang-Sup Lee**, Hannam Univ. (Korea, Republic of)

10:30 am: **Optical properties of dye doped biopolymer based materials**. (*Invited Paper*), Jaroslaw Mysliwiec, Andrzej Miniewicz, Grzegorz Pawlik, Antoni C. Mitus, Wroclaw Univ. of Technology (Poland); Ileana Rau, Univ. Politehnica Bucuresti (Romania); Bouchta Sahraoui, François Kajzar, Univ. d'Angers (France) [7403-22]

11:00 am: **Characterization of polymer and DNA thin films prepared for enhanced electrical conductivity** (*Invited Paper*), Perry P. Yaney, Univ. of Dayton (United States); Fahima Ouchen, James G. Grote, Air Force Research Lab. (United States) [7403-24]

SESSION 7

Room: Conv. Ctr. 11A Thurs. 11:30 to 12:50 pm

Nonlinear Optical Properties

Session Chair: **Norihisa Kobayashi**, Chiba Univ. (Japan)

11:30 pm: **Nonlinear optical characterization in a degenerate multi-wave mixing configuration** (*Invited Paper*), Georges Boudebs, Kamil Fedus, Univ. d'Angers (France) [7403-25]

12:00 pm: **The frequency-time distribution of a spontaneous photon emitted by two level atom in one-dimensional damped nanocavity with a single resonance mode** (*Invited Paper, Presentation Only*), Vladislav F. Cheltsov, Moscow State Mining Univ. (Russian Federation) [7403-26]

12:30 pm: **Nonlinear optical properties of photoswitchable fluorescent proteins**, Koen J. Clays, Katholieke Univ. Leuven (Belgium) [7403-27]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7404

Wednesday–Thursday 5–6 August 2009 • Proceedings of SPIE Vol. 7404

Nanostructured Thin Films II

Conference Chairs: **Geoffrey B. Smith**, Univ. of Technology/Sydney (Australia); **Akhlesh Lakhtakia**, The Pennsylvania State Univ.; **Cheng-Chung Lee**, National Central Univ. (Taiwan)

Program Committee: **Ibrahim S. Abdulhalim II**, Ben-Gurion Univ. of the Negev (Israel); **Richard J. Blaikie**, Univ. of Canterbury (New Zealand); **Michael J. Brett**, Univ. of Alberta (Canada); **Didier Felbacq**, Univ. Montpellier II (France); **Dentcho A. Genov**, Louisiana Tech Univ.; **Tom G. Mackay**, Univ. of Edinburgh (United Kingdom); **Raúl J. Martín-Palma**, Univ. Autónoma de Madrid (Spain); **Philip J. Moriarty**, The Univ. of Nottingham (United Kingdom); **Albert Polman**, FOM Institute for Atomic and Molecular Physics (Netherlands); **Katyayani Seal**, Oak Ridge National Lab.; **Motofumi Suzuki**, Kyoto Univ. (Japan); **Cuong Ton-That**, Univ. of Technology/Sydney (Australia); **Jian Xu**, The Pennsylvania State Univ.

Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16–17 for presentation details.

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 18 Wed. 8:20 to 10:00 am

Optical Properties/Metamaterials

Session Chair: **Tom G. Mackay**, Univ. of Edinburgh (United Kingdom)

8:20 am: **Surface plasmon modes and their interactions in multilayer thin-film structures** (*Invited Paper*), Timothy J. Davis, Daniel E. Gomez, Kristy C. Vernon, Commonwealth Scientific and Industrial Research Organisation (Australia). [7404-01]

8:50 am: **Optical and terahertz metamaterials** (*Invited Paper*), Shuang Zhang, Xiang Zhang, Univ. of California, Berkeley (United States). [7404-02]

9:20 am: **Polarization properties of nano-structured thin films in reflection and transmission: a new theorem on polarized light**, Martin W. McCall, Imperial College London (United Kingdom); Ian Hodgkinson, Univ. of Otago (New Zealand). [7404-03]

9:40 am: **N-doped TiO₂ photoactive optical thin films in the visible-light region**, Angel Barranco, Pablo Romero-Gomez, Victor Rico, Juan Pedro Espinos, Saïd Hamad, Agustin R. Gonzalez-Elipe, Consejo Superior de Investigaciones Científicas (Spain). [7404-04]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 18 Wed. 10:30 am to 12:10 pm

Nanostructure and EM

Session Chair: **Timothy J. Davis**, Commonwealth Scientific and Industrial Research Organisation (Australia)

10:30 am: **On limitations of conventional approaches to homogenization applied to dissipative and active composite materials** (*Invited Paper*), Tom G. Mackay, Univ. of Edinburgh (United Kingdom); Akhlesh Lakhtakia, The Pennsylvania State Univ. (United States); Andrew Duncan, Univ. of Edinburgh (United Kingdom). [7404-05]

11:00 am: **Comparisons of enhanced absorption in closely-coupled grating-mirror and random particle-mirror systems** (*Invited Paper*), Matthew D. Arnold, Geoffrey B. Smith, Univ. of Technology, Sydney (Australia). . . [7404-06]

11:30 am: **Periodic nanoscale Si structures by ion beam induced glancing angle deposition**, Bernd Rauschenbach, Christian Patzig, Leibniz-Institut für Oberflächenmodifizierung e.V. (Germany). [7404-07]

11:50 am: **Effective properties of resonant arrays of nanorods**, Didier Felbacq, Univ. Montpellier 2 (France); Guy Bouchitte, Christophe Bourel, Univ. du Sud Toulon-Var (France); Brahim Guizal, Univ. Montpellier 2 (France). [7404-08]

Lunch Break 12:10 to 1:40 pm

SESSION 3

Room: Conv. Ctr. 18 Wed. 1:40 to 3:20 pm

Semiconductors and Oxides

Session Chair: **Bernd Rauschenbach**, Leibniz-Institut für Oberflächenmodifizierung e.V. (Germany)

1:40 pm: **Self-organized nanostructuring on Si and Ge surfaces by low-energy ion beam bombardment** (*Invited Paper*), Bernd Rauschenbach, Frank Frost, Bashkim Ziberi, Leibniz-Institut für Oberflächenmodifizierung e.V. (Germany). [7404-09]

2:10 pm: **Novel low-refractive-index materials and their applications** (*Invited Paper*), Jong Kyu Kim, E. Fred Schubert, Rensselaer Polytechnic Institute (United States). [7404-10]

2:40 pm: **Characterization of gallium zinc oxide thin films**, Manuel Filipe M. Costa, Univ. do Minho (Portugal). [7404-11]

3:00 pm: **Effects of oxygen on structural, morphological and optical properties of sputtered ZnO thin films on glass substrate**, Zhan-Sheng Guo, Shanghai Univ. (China). [7404-12]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Conv. Ctr. 18 Wed. 3:50 to 5:20 pm

Polymers and Nanocomposites

Session Chair: **Gunnar Westin**, Uppsala Univ. (Sweden)

3:50 pm: **Formation of polymer thin films and interface control by physical vapor deposition** (*Invited Paper*), Hiroaki Usui, Tokyo Univ. of Agriculture and Technology (Japan). [7404-13]

4:20 pm: **Thin film, nanoparticle, and nanocomposite fabrication through thin film ablation**, Paul T. Murray, Eunsung Shin, Leanne Petry, Neal Pierce, Univ. of Dayton Research Institute (United States). [7404-15]

4:40 pm: **One step dry method for the synthesis of supported single-crystalline organic nanowires: perylenes, porphyrins and phthalocyanines**, Ana I. Borrás, Myriam Aguirre, Oliver Groening, EMPA (Switzerland); Fabian Gramm, ETH Zürich (Switzerland); Pierangelo Groening, EMPA (Switzerland). [7404-16]

5:00 pm: **Mechanical properties of epoxy nanocomposites reinforced with very low content of amino-functionalized single-walled carbon nanotubes**, Haiping Hong, South Dakota School of Mines and Technology (United States). [7404-17]

Conference 7404

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Characterization of ZnS nano layers produced by pulsed laser deposition PLD, Nehal Aboufotouh, Tanta Univ. (Egypt); Yahia Badr, Cairo Univ. (Egypt); Bahaa Moharram, Tanta Univ. (Egypt); Dina M. Atwa, Cairo Univ. (Egypt) [7404-28]

Optical and transport properties of nanostructured PbTe(In) films, Alexandr Dobrovolsky, Ivan Belogorokhov, Lomonosov Moscow State Univ. (Russian Federation); Zinovi Dashevsky, Vladimir Kasiyan, Ben-Gurion Univ. of the Negev (Israel); Ludmila I. Ryabova, Dmitry R. Khokhlov, Lomonosov Moscow State Univ. (Russian Federation) [7404-29]

Growth model of crystalline TiO₂ by plasma CVD deposition, Ana I. Borrás, EMPA (Switzerland); Juan R. Sanchez-Valencia, Instituto de Ciencia de Materiales de Sevilla (Spain); Roland Widmer, EMPA (Switzerland); Victor Rico, Angel Justo, Instituto de Ciencia de Materiales de Sevilla (Spain); Pierangelo Groening, EMPA (Switzerland); Agustin R. Gonzalez-Elipse, Instituto de Ciencia de Materiales de Sevilla (Spain) [7404-30]

Preparation and characterization studies of amorphous silicon (a-Si) thin films prepared using RF magnetron sputtering, Detty P. Alappatt, Vellara P. Mahadevan Pillai, Geo Rajan, Univ. of Kerala (India) [7404-32]

Surface plasmon resonance of gold nanoparticles aggregated, Dae-Gun Kim, William T. Nichols III, Hyeongtag Jeon, Young Do Kim, Hanyang Univ. (Korea, Republic of) [7404-33]

Measurement of phase and amplitude modulations in Sb-based films, Luis F. de Avila, Univ. Estadual de Campinas (Brazil); Marcelo Nalin, Univ. Estadual Paulista (Brazil); Lucila H. D. Cescato, Univ. Estadual de Campinas (Brazil) [7404-34]

Relationship between the contact angle and the tilt angle on the vertical polymer layer of NLC using atomic beam exposure, Dae-Shik Seo, Ji-Hun Lim, Young-Hwan Kim, Byeong-Yun Oh, Byoung-Yong Kim, Jeong-Min Han, Jeong-Yeon Hwang, Yonsei Univ. (Korea, Republic of) [7404-35]

Magnetogyrotropic chiral waveguide with negative refractive index, Dmitry G. Sannikov, Ulyanovsk State Univ. (Russian Federation) [7404-36]

Thursday 6 August

SESSION 5

Room: Conv. Ctr. 18 Thurs. 8:30 to 10:00 am

Environmental and Solar

Session Chair: **Geoffrey B. Smith**, Univ. of Technology, Sydney (Australia)

8:30 am: **Solution processing of highly efficient spectrally selective heat absorbers** (*Invited Paper*), Gunnar Westin, Uppsala Univ. (Sweden) . . [7404-18]

9:00 am: **Angular selectivity: impact on optimized coatings for night sky radiative cooling**, Geoffrey B. Smith, Angus R. Gentle, Univ. of Technology, Sydney (Australia) [7404-19]

9:20 am: **Optical properties and aging of gasochromic WO₃**, Rudresh Ghosh, Matthew B. Baker, René Lopez, The Univ. of North Carolina at Chapel Hill (United States) [7404-20]

9:40 am: **Electrochromic MoO₃ thin film fabricated by using volatile MoO₃(OH)₂**, Young Jung Lee, Chang Won Park, William T. Nichols III, Dae-Gun Kim, Young Do Kim, Hanyang Univ. (Korea, Republic of) [7404-21]

Coffee Break 10:00 to 10:40 am

Courses of Related Interest

See SPIE Cashier for information and to register.

SC321 Thin Film Optical Coatings (MacLeod) Monday, 8:30 am to 5:30 pm

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

SESSION 6

Room: Conv. Ctr. 18 Thurs. 10:30 am to 12:20 pm

Structure/Sensing

Session Chair: **Cheng-Chung Lee**, National Central Univ. (Taiwan)

10:30 am: **Design and preparation of nanostructured thin films for biomimetic surfaces** (*Invited Paper*), Osamu Takai, Nagahiro Saito, Nagoya Univ. (Japan) [7404-23]

11:00 am: **Development of electrical biosensors and biomarkers based on nanostructured porous silicon**, Gonzalo Recio-Sánchez, Darío Gallach, Vicente Torres-Costa, Miguel Manso, Raúl J. Martín-Palma, Univ. Autónoma de Madrid (Spain) [7404-24]

11:20 am: **Interfacial strength of silicon nitride films measured by blister test**, Bong-Bu Jung, Hun-Kee Lee, Hyun-Chul Park, Pohang Univ. of Science and Technology (Korea, Republic of) [7404-25]

11:40 am: **High temperature XRD of zirconia/alumina multilayer thin films prepared by pulsed laser deposition**, G. Balakrishnan, National Institute of Technology, Tiruchirappalli (India); S. Murugesan, C. Ghosh, P. Kuppusami, R. Divakar, E. Mohandas, Indira Gandhi Ctr. for Atomic Research (India); Dillibabu Sastikumar, National Institute of Technology, Tiruchirappalli (India) . . [7404-26]

12:00 pm: **Effect of Pr₂O₃ doping on the structural and optical properties of RF magnetron sputtered ZnO thin films**, R. Vinodkumar, I. Navas, Detty P. Alappatt, Renju R. Krishnan, Vellara P. Mahadevan Pillai, Univ. of Kerala (India) [7404-27]

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Conference 7405

Tuesday-Wednesday 4-5 August 2009 • Proceedings of SPIE Vol. 7405

Instrumentation, Metrology, and Standards for Nanomanufacturing III

Conference Chair: **Michael T. Postek**, National Institute of Standards and Technology; Conference Co-Chair: **John A. Allgair**, SEMATECH, Inc. and Freescale Semiconductors, Inc.

Program Committee: **Daniel J. C. Herr**, Semiconductor Research Corp.; **Shaochen Chen**, National Science Foundation; **Mark D. Hoover**, The National Institute for Occupational Safety and Health; **David C. Joy**, The Univ. of Tennessee; **Kevin W. Lyons**, National Institute of Standards and Technology; **Jeffrey D. Morse**, Univ. of Massachusetts, Amherst; **N. George Orji**, National Institute of Standards and Technology; **Yi Qiao**, 3M Co.; **Nora Savage**, U.S. Environmental Protection Agency; **John Small**, National Institute of Standards and Technology

Technical Cosponsor:



Monday 3 August

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 14B Tues. 8:30 to 10:20 am

Nanomanufacturing Metrology I

Session Chairs: **John A. Allgair**, SEMATECH Inc.; **N. George Orji**, National Institute of Standards and Technology

8:30 am: **Historic commitment of the NIST manufacturing engineering laboratory to nanomanufacturing and nanometrology** (*Invited Paper*), Kevin W. Lyons, Michael T. Postek, National Institute of Standards and Technology (United States) [7405-01]

9:00 am: **Nanoscale dimensional metrology in Russia** (*Invited Paper*), Valery P. Gavrilenko, Yury A. Novikov, Alexander V. Rakov, Pavel A. Todua, A. M. Prokhorov General Physics Institute (Russian Federation) [7405-02]

9:30 am: **Measurement traceability and quality assurance in a nanomanufacturing environment** (*Invited Paper*), N. George Orji, Ronald Dixon, National Institute of Standards and Technology (United States); Aaron M. Cordes, Benjamin D. Bunday, John A. Allgair, International SEMATECH Manufacturing Initiative (United States) [7405-03]

10:00 am: **PPM level water vapor measurement, delivery, and control**, Jeffrey Spiegelman, RASIRC (United States) [7405-04]

Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Conv. Ctr. 14B Tues. 10:50 am to 12:30 pm

Nanomanufacturing Metrology II

Session Chairs: **Kevin W. Lyons**, National Institute of Standards and Technology; **Shaochen Chen**, National Science Foundation

10:50 am: **Measurement of thickness of native silicon dioxide with a scanning electron microscope**, Valery P. Gavrilenko, Yury A. Novikov, Alexander V. Rakov, Pavel A. Todua, A. M. Prokhorov General Physics Institute (Russian Federation) [7405-05]

11:10 am: **Silica nanoparticle dispersion size measurement using dielectrophoresis on a microfabricated electrode array**, Yi Qiao, David L. Hofeldt, Susan K. Yarmey, 3M Co. (United States) [7405-06]

11:30 am: **Localization of gold nanoparticles with three-dimensional selectivity in polymer microstructure**, Shaomin Wu, Li-Hsin Han, Shaochen Chen, The Univ. of Texas at Austin (United States) [7405-07]

11:50 am: **Recommended practices for dispersing NIST's single-walled carbon nanotube raw soot reference material**, Elisabeth Mansfield, Roy Geiss, Jeffrey Fagan, Stephanie A. Hooker, National Institute of Standards and Technology (United States) [7405-08]

12:10 pm: **Towards accurate and reproducible metrology of manufactured ZnO nanoparticles**, Victoria A. Coleman, A. La Fontaine, Toni Endmann, Asa K. Jämting, Jan Herrmann, John R. Miles, National Measurement Institute of Australia (Australia) [7405-09]

Lunch/Exhibition Break 12:30 to 1:40 pm

SESSION 3

Room: Conv. Ctr. 14B Tues. 1:40 to 3:20 pm

Instrumentation and Standards for Nanomanufacturing I

Session Chairs: **Yi Qiao**, 3M Co.; **Jeffrey D. Morse**, Univ. of Massachusetts

1:40 pm: **Improved diffraction-based overlay metrology by use of a two dimensional array target**, Yi-Sha Ku, Hsiu-Lan Pang, Wei-Te Hsu, Deh-Ming Shyu, Industrial Technology Research Institute (Taiwan) [7405-10]

2:00 pm: **Threshold variation analysis of x-ray nanotomography reconstruction data of gas diffusion layers**, Hossein Ostadi, The Univ. of Birmingham (United Kingdom); Pratap Rama, Yu Liu, Rui Chen, Loughborough Univ. (United Kingdom); Xiaoxian Zhang, Liverpool John Moores Univ. (United Kingdom); Dimitri Grinev, Univ. of Abertay Dundee (United Kingdom); Kyle C. Jiang, The Univ. of Birmingham (United Kingdom) [7405-11]

2:20 pm: **High-performance, multi-channel, fiber-based absolute distance measuring interferometer system**, Leslie L. Deck, Zygo Corp. (United States) [7405-12]

2:40 pm: **Interferometric imaging ellipsometry: fundamental study**, Seichi Sato, Shigeru Ando, The Univ. of Tokyo (Japan) [7405-13]

3:00 pm: **Fabrication of nanoimprinting molds by two-photon polymerization**, Wande Zhang, Li-Hsin Han, Shaochen Chen, The Univ. of Texas at Austin (United States) [7405-14]

Coffee Break 3:20 to 3:50 pm

Conference 7405

SESSION 4

Room: Conv. Ctr. 14B Tues. 3:50 to 5:30 pm

Instrumentation and Standards for Nanomanufacturing II

Session Chairs: **John Small**, National Institute of Standards and Technology; **N. George Orji**, National Institute of Standards and Technology

- 3:50 pm: **Independent measurements of an AFM tip's absolute z-position and applied force**, Thomas T. Perkins, Gavin M. King, Allison B. Churnside, Univ. of Colorado at Boulder (United States) [7405-15]
- 4:10 pm: **Spectral effects of AFM tip geometry**, Cornelius F. Hahlweg, Hendrik Rothe, Helmut-Schmidt Univ. (Germany) [7405-16]
- 4:30 pm: **Further developments in the implementation of a concept of AFM measurements using a priori knowledge**, Christian Recknagel, Hendrik Rothe, Helmut-Schmidt Univ. (Germany) [7405-17]
- 4:50 pm: **Non-linear distortions caused by AFM-tip geometry and limitations of reconstruction on discrete data**, Cornelius F. Hahlweg, Hendrik Rothe, Helmut-Schmidt Univ. (Germany) [7405-18]
- 5:10 pm: **Improvements to spectral spot-scanning techniques for accurate and efficient data acquisition**, Jonathan D. Bray, Kevin M. Gaab, Bruce M. Lambert, Terrence S. Lomheim, The Aerospace Corp. (United States) [7405-20]

Wednesday 5 August

SESSION 5

Room: Conv. Ctr. 14B Wed. 8:30 to 9:50 am

Instrumentation and Standards for Nanomanufacturing III

Session Chairs: **John Small**, National Institute of Standards and Technology; **Kevin W. Lyons**, National Institute of Standards and Technology

- 8:30 am: **Experimental methods for measurement of the modulation transfer function (MTF) for time-delay-and-integrate (TDI) charge coupled device (CCD) imagers**, Bruce M. Lambert, Jeffrey M. Harbold, Jerris F. Johnson, The Aerospace Corp. (United States) [7405-21]
- 8:50 am: **Strained enabled ferroelectricity in CaTiO₃ thin films probed by nonlinear optics and scanning probe microscopy**, Eftihia Vlahos, Amit Kumar, Sava Denev, Charles Brooks, Darrell G. Schlom, The Pennsylvania State Univ. (United States); Carl J. Eklund, Karin M. Rabe, Rutgers Univ. (United States); Craig J. Fennie, Cornell Univ. (United States); Venkatraman Gopalan, The Pennsylvania State Univ. (United States) [7405-22]
- 9:10 am: **An improved phase quadrature correction method based on phase error prediction model**, Chao-Wen Liang, Yung-Sheng Tsai, National Central Univ. (Taiwan) [7405-23]
- 9:30 am: **Nonstandard refraction of light from one-dimensional dielectric quasi-periodic surfaces**, Zu-Han Gu, Surface Optics Corp. (United States); Anting Wang, Univ. of Science and Technology of China (China) [7405-25]
- Coffee Break 9:50 to 10:20 am

SESSION 6

Room: Conv. Ctr. 14B Wed. 10:20 am to 12:00 pm

Instrumentation and Standards for Nanomanufacturing IV

Session Chairs: **John Small**, National Institute of Standards and Technology; **Jeffrey D. Morse**, Univ. of Massachusetts

- 10:20 am: **Front-side illuminated CMOS spectral pixel response and modulation transfer function characterization: impact of pixel layout details and pixel depletion volume**, Jonathan D. Bray, Lee W. Schumann, Terrence S. Lomheim, The Aerospace Corp. (United States) [7405-26]
- 10:40 am: **193 nm angle resolved scatterfield microscope for semiconductor metrology**, Yeung Joon Sohn, Richard Quintanilha, Bryan M. Barnes, Richard M. Silver, National Institute of Standards and Technology (United States) [7405-27]
- 11:00 am: **Strain distribution analysis in Si-SiGe line structures for CMOS technology by Raman spectroscopy**, Marek Roelke, Advanced Micro Devices GmbH (Germany); Victor H. Vartanian, International SEMATECH Manufacturing Initiative (United States) [7405-28]
- 11:20 am: **Photo-reflectance characterization of USJ activation in flash anneals**, William W. Chism, Xitronix Corp. (United States); Paul J. Timans, Mattson Technology, Inc. (United States); Victor H. Vartanian, International SEMATECH Manufacturing Initiative (United States) [7405-29]
- 11:40 am: **Role of supercontinuum in the fragmentation of colloidal gold nanoparticles in solution**, Fabian A. Videla, Univ. Nacional de la Plata (Argentina); Gustavo A. Torchia, Daniel Schinca, Lucia B. Scaffardi, Ctr. de Investigaciones Opticas (Argentina); Pablo Moreno, Cruz Méndez, Luis Roso, Univ. de Salamanca (Spain); Lisandro Giovanetti, Jose Ramallo Lopez, Univ. Nacional de la Plata (Argentina) [7405-31]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

- Imaging comparison of reflection and transmission grating systems**, Lingyu Wan, Guangxi Univ. (China) [7405-19]
- Measuring a laser focal spot on a large intensity range: effect of optical component laser damages on the focal spot**, Stéphane Bouillet, Commissariat à l'Energie Atomique (France) [7405-33]
- Self-assembled monolayer and its wearing behavior on AFM probes**, Cheng-Hsien Chen, Hao-Chih Liu, Wen-Dung Hsu, National Cheng Kung Univ. (Taiwan) [7405-34]
- Effect of the measurement wavelength on the phase measurement of a multi-dielectric mirror**, Stéphane Bouillet, Sophiane Tournois, Commissariat à l'Energie Atomique (France) [7405-35]
- Detecting molecular stress in metals**, Eduardo Hernandez-Gomez, CICATA Querétaro (Mexico); José G. Suárez-Romero, Instituto Tecnológico de Querétaro (Mexico); Juan B. Hurtado-Ramos, CICATA Querétaro (Mexico) [7405-36]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Conference 7406

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7406

Nanoepitaxy: Homo and Heterogeneous Synthesis, Characterization, and Device Integration of Nanomaterials

Conference Chairs: **M. Saif Islam**, Univ. of California, Davis; **A. Alec Talin**, Sandia National Labs.; **Stephen D. Hersee**, The Univ. of New Mexico

Program Committee: **Connie J. Chang-Hasnain**, Univ. of California, Berkeley; **Aykutlu Dana**, Bilkent Univ. (Turkey); **Yi Cui**, Stanford Univ.; **Achyut Kumar Dutta**, Banpil Photonics, Inc.; **Ravi Dat**, Booz Allen Hamilton; **Supratik Guha**, IBM Thomas J. Watson Research Ctr.; **Mohamed-Ali Hasan**, The Univ. of North Carolina at Charlotte; **Savas Kaya**, Ohio Univ.; **Nobuhiko P. Kobayashi**, Univ. of California, Santa Cruz; **Ma Jan**, Nanyang Technological Univ. (Singapore); **Xianglei S. Mao**, Lawrence Berkeley National Lab.; **Sanjay Mathur**, Univ. zu Köln (Germany); **Gilberto Medeiros-Ribeiro**, Lab. Nacional de Luz Sincrotron (Brazil); **Juan Ramon Morante**, Univ. de Barcelona (Spain); **Lionel Vayssieres**, National Institute for Materials Science (Japan); **S. Tom Picraux**, Arizona State Univ.; **Sharka M. Prokes**, Naval Research Lab.; **Loucas Tsakalacos**, GE Global Research; **Giorgio Sberveglieri**, Univ. degli Studi di Brescia (Italy); **Sungsoo Yi**, Sundiote, Inc.; **Priyalal S. Wijewarnasuriya**, Army Research Lab.; **Chongwu Zhou**, Univ. of Southern California; **James S. Im**, Columbia Univ.

NANO

Monday 3 August

SESSION 2

Room: Conv. Ctr. Room 6A Mon. 8:30 am to 12:00 pm

NanoScience + Engineering Plenary Session

8:30 am: **Taming the Light with Metamaterials**, Nader Engheta, Univ. of Pennsylvania (United States)

9:15 am: **Sub-nanometer Resolution for the Inspection of Specular Surfaces using White Light**, Werner P. O. Jüptner, Thorsten Bothe, Bremer Institut für angewandte Strahltechnik (Germany)

10:30 am: **Adapting to the Nanoscale Era of Technology**, Nils O. Petersen, National Institute for Nanotechnology, NRC (Canada); Lori Sheremeta, Univ. of Alberta (Canada) and National Institute for Nanotechnology, NRC (Canada)

11:15 am: **Nanophotonics: Dressed Photon Science and its Applications**, Takashi Yatsui, The Univ. of Tokyo (Japan)

See page 16-17 for presentation details.

Lunch Break 12:00 to 1:15 pm

SESSION 1

Room: Conv. Ctr. 15A Mon. 1:15 to 3:25 pm

Novel Nanostructure Synthesis

Session Chairs: **Sanjay Mathur**, Univ. zu Köln (Germany); **Sonia Grego**, RTI International

1:15 pm: **Semiconducting nanowire devices in out-of-plane geometry with high spatial registry**, Pradeep Manandhar, S. Tom Picraux, Los Alamos National Lab. (United States) [7406-01]

1:30 pm: **Epitaxial semiconductor contacts by electrodeposition** (*Invited Paper*), Karen L. Kavanagh, Simon Fraser Univ. (Canada) [7406-02]

1:55 pm: **Colloidal solution-liquid-solid syntheses of In/InN core/shell nanostructures and InN nanotubes**, Pascal André, Ge Cheng, Ross A. Blackley, Wuzong Zhou, Ifor D. W. Samuel, David J. Cole-Hamilton, Univ. of St. Andrews (United Kingdom) [7406-03]

2:10 pm: **Formation of novel binary and ternary metal oxide nanostructures and their potential for device incorporation** (*Invited Paper*), Lena Mazeina, Yoosuf N. Picard, Serguei Maximenko, Hua Qi, Evan R. Glaser, Joshua D. Caldwell, Stephen Arnold, Sharka M. Prokes, Naval Research Lab. (United States) [7406-04]

2:35 pm: **Rapid flame synthesis of dense, aligned Fe₂O₃ nanoneedle arrays** (*Invited Paper*), Xiaolin Zheng, Stanford Univ. (United States) [7406-05]

3:00 pm: **Vertically oriented metal oxide nanorod-arrays onto various substrates by aqueous chemical growth** (*Invited Paper*), Lionel Vayssieres, National Institute for Materials Science (Japan) [7406-06]

Coffee Break 3:25 to 3:45 pm

Room: Conv. Ctr. 15A Mon. 3:45 to 5:45 pm

Nanostructures for Devices

Session Chairs: **Lionel Vayssieres**, National Institute for Materials Science (Japan); **Xiaolin Zheng**, Stanford Univ.

3:45 pm: **Tailoring oxide electrolyte thin films for micro solid oxide fuel cells** (*Invited Paper*), Enrico Traversa, Univ. degli Studi di Roma Tor Vergata (Italy) [7406-07]

4:10 pm: **Metal oxide nanowires for gas sensing: growth and device applications** (*Invited Paper*), Sanjay Mathur, Univ. zu Köln (Germany); Francisco Hernández-Ramírez, Univ. de Barcelona (Spain) [7406-08]

4:35 pm: **III-V compound semiconductor nanowires for optoelectronic applications** (*Invited Paper*), Qiang Gao, Hannah J. Joyce, Suriati Paiman, Hoe H. Tan, Chennupati Jagadish, The Australian National Univ. (Australia) [7406-09]

5:00 pm: **Waveguide integrated nanowire photoconductors on a non-single crystal surface**, Sonia Grego, Kristin H. Gilchrist, RTI International (United States); Ja-Yeon Kim, Min-Ki Kwon, M. Saif Islam, Univ. of California, Davis (United States) [7406-10]

5:15 pm: **Extracting carrier concentration and mobility from space-charge-limited transport in InAs nanowires**, Aaron M. Katzenmeyer, M. Eugenia Toimil Molares, Jeffrey Cederberg, Francois Leonard, A. Alec Talin, Sandia National Labs. (United States) [7406-11]

5:30 pm: **Growth of silicon nanowire on amorphous evaporated silicon surfaces**, Veerayah J. Logeeswaran, Min-Ki Kwon, Ramin Banan Sadeghian, Ja-Yeon Kim, M. Saif Islam, Univ. of California, Davis (United States) . [7406-12]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Design and simulations of electrically tunable quantum dot cascade Laser, Dibyendu Dey, Wei Wu, Omer G. Memis, Hooman Mohseni, Northwestern Univ. (United States) [7406-26]

Controlled growth of organic nanofibers on nano-and micro-structured gold surfaces, Roana M. Oliveira, Morten Madsen, Jakob Kjelstrup-Hansen, Horst-Günter Rubahn, Univ. of Southern Denmark (Denmark) [7406-27]

Coalescence Overgrowth of GaN Nanocolumns with Patterned Metalorganic Chemical Vapor Deposition, Tsung-Yi Tang, Wen-Yu Shiao, Yung-Sheng Chen, Cheng-Hung Lin, Kun-Ching Shen, Chih-Chung Yang, National Taiwan Univ. (Taiwan); Chiu-Lin Yao, Jui-Hung Yeh, Ta-Cheng Hsu, Epistar Corp. (Taiwan) [7406-28]

Synthesis of vanadium oxide nanowires by pulsed laser deposition, Li-Chia Tien, National Dong Hwa Univ. (Taiwan); David Norton, Fernando Lugo, Stephen J. Pearton, Univ. of Florida (United States) [7406-30]

Conference 7406

Observing Catastrophic breakdown of InP nanowires under high current injection, Veerayah J. Logeeswaran, Univ. of California, Davis (United States); Nobuhiko P. Kobayashi, Univ. of California, Santa Cruz (United States); Shih-Yuan Wang, Hewlett-Packard Labs. (United States); M. Saif Islam, Univ. of California, Davis (United States) [7406-32]

InAs quantum dot distribution and number control by the facets on truncated submicron InP pyramids grown by selective area epitaxy, Hao Wang, Jiyue Yuan, Richard Nortzel, Technische Univ. Eindhoven (Netherlands) [7406-33]

Synthesis of the CdS nanoparticles from lowtemperature solution, Elshan F. Nasirov, Maarif A. Jafarov, Baku State Univ. (Azerbaijan) [7406-34]

Formation of dielectric core/metal sheath nanowire composites and their application to SERS sensing, Hua Qi, Dimitri Alexson, Lena Mazeina, Sharka M. Prokes, Naval Research Lab. (United States) [7406-35]

Tuesday 4 August

SESSION 3

Room: Conv. Ctr. 15A Tues. 8:30 am to 5:30 pm

Workshop on Nano-epitaxy

8:30 am: **Ultrafast carrier dynamics in semiconductor nanowires** (*Invited Paper*), Rohit P. Prasankumar, Los Alamos National Lab. (United States) [7406-13]

9:00 am: **Low dimensional III-V compound semiconductor structures** (*Invited Paper*), Nobuhiko P. Kobayashi, Univ. of California, Santa Cruz (United States) [7406-14]

9:30 am: **Electronic transport in nanowires: from injection-limited to space-charge-limited behavior** (*Invited Paper*), Francois Leonard, Sandia National Labs. (United States) [7406-15]

Coffee Break 10:00 to 10:30 am

10:30 am: **Evolution of open and closed nanocrystalline Ge:Si(001) islands towards equilibrium** (*Invited Paper*), Marina S. Leite, California Institute of Technology (United States) [7406-16]

11:00 am: **Group IV semiconductor nanowire arrays: different flavors of epitaxy** (*Keynote Presentation*), Paul C. McIntyre, Irene Goldthorpe, Shu Hu, Makoto Koto, Paul Leu, Ann Marshall, Christopher Chidsey, Stanford Univ. (United States) [7406-17]

11:45 am: **Atomic scale study of intermixing and segregation effects during thin film growth of Ge on chemically patterned Si substrates**, Avinash M. Dongare, North Carolina State Univ. (United States); Leonid V. Zhigilei, Univ. of Virginia (United States) [7406-18]

Lunch/Exhibition Break 12:00 to 1:15 pm

1:15 pm: **MOCVD growth of multiple quantum well nanowire heterostructures** (*Invited Paper*), Yat Li, Univ. of California, Santa Cruz (United States) [7406-19]

1:45 pm: **Epitaxial science of GaN: nanowires, quantum dots, and mesoscopic morphology** (*Invited Paper*), Jung Han, Yale Univ. (United States) [7406-20]

2:15 pm: **Complex branched and heterostructured nanowires by nanoepitaxy** (*Invited Paper*), Yi Cui, Stanford Univ. (United States) [7406-22]

Coffee Break 2:45 to 3:15 pm

3:15 pm: **Silicon nanowire array synthesis for photovoltaic applications** (*Invited Paper*), Loucas Tsakalakos, Jody Fronheiser, Joleyn E. Balch, Bastiaan A. Korevaar, GE Global Research (United States) [7406-23]

3:45 pm: **Growth and electronic properties of Ge-SiGe core-shell nanowire heterostructures** (*Invited Paper*), Emanuel Tutuc, Kamran Varahramyan, Jungghyo Nah, En-Shao Liu, Davood Shahrjerdi, Sanjay K. Banerjee, The Univ. of Texas at Austin (United States) [7406-24]

4:15 pm: **Advances in the growth and characterization of indium arsenide nanowires** (*Invited Paper*), Shadi A. Dayeh, Los Alamos National Lab. (United States) [7406-25]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC497 Nanophotonics (Prasad) Sunday, 1:30 to 5:30 pm

Solar Energy + Technology



Part of **SPIE** Optics+Photonics

Symposium Chair:



Martha Symko-Davies, National Renewable Energy Lab. (United States)

Technical Organizing Committee:

- Alan E. Delahoy**, EPV Solar, Inc. (United States)
- Neelkanth G. Dhere**, Florida Solar Energy Ctr./Univ. of Central Florida (United States)
- Louay A. Eldada**, HelioVolt Corp. (United States)
- Lori Greene**, National Renewable Energy Lab. (United States)
- Frank E. Osterloh**, Univ. of California, Davis (United States)
- Benjamin K. Tsai**, National Institute of Standards and Technology (United States)
- Lucas Tsakalakos**, GE Global Research (United States)

SOLAR

Sunday	Monday	Tuesday	Wednesday	Thursday
	7407 High and Low Concentrator Systems for Solar Electric Applications IV (Greene), p.90			
	7408 Solar Hydrogen and Nanotechnology IV (Osterloh), p.92			
7409 Thin Film Solar Technology (Delahoy/Eldada), p.95				
7410 Optical Modeling and Measurements for Solar Energy Systems III (Tsai), p.98				
7411 Nanoscale Photonic and Cell Technologies for Photovoltaics II (Tsakalakos), p.100				
	7412 Reliability of Photovoltaic Cells, Modules, Components, and Systems II (Dhere), p.103			
	7416 Organic Photovoltaics X (Kafafi), p.116			
7423 Nonimaging Optics: Efficient Design for Illumination and Solar Concentration VI (Winston/Gordon), p.141				



Photo courtesy of SCHOTT. Receiver for solar thermal power plants. Successful test run: The receiver from SCHOTT has already proven itself as a part of a string of collectors at a parabolic trough power plant in California.

See the Special Event Daily Schedule on page 9.

See the Course Daily Schedule on pages 42-45. Register for Courses at the SPIE Cashier.

Conference 7407

Monday-Wednesday 3-5 August 2009 • Proceedings of SPIE Vol. 7407

High and Low Concentrator Systems for Solar Electric Applications IV

Conference Chair: **Lori E. Greene**, National Renewable Energy Lab. and Univ. of California, Irvine

Program Committee: **Vahan Garboushian**, Amonix Inc.; **Scott A. McHugo**, Skyline Solar, Inc.; **Noren Pan**, MicroLink Devices; **Adam Plesniak**, The Boeing Co.; **Raed A. Sherif**, eSolar Inc.; **Martha Symko-Davies**, National Renewable Energy Lab.

Monday 3 August

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

Solar Energy Plenary Session

Session Chair: **Martha Symko-Davies**, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

2:00 pm: **Thin-Film Silicon PV Modules: Status and Prospects**, Arvind Shah, Univ. of Neuchâtel (Switzerland) [7409-102]

2:30 pm: **Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy**, Kazunari Domen, The Univ. of Tokyo (Japan) . . [7408-103]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

4:00 pm: **Thin Film PV: The Pathway to Grid Parity**, David Eaglesham, First Solar, LLC (United States) [7409-105]

4:30 pm: **Concentrating Solar Power for Utility Scale Applications**, Raed A. Sherif, eSolar Inc. (United States) [7407-106]

See page 17-19 for presentation details.

Room: Marriott Hotel, Marina F. Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: **Jake Jacobsen**, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: **Prof. Roland Winston**, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 11B Tues. 8:00 to 10:00 am

High-Concentration Systems

Session Chair: **Scott A. McHugo**, Skyline Solar, Inc.

8:00 am: **Performance of the Amonix multi-junction array** (*Keynote Presentation*), Vahan Garboushian, Robert B. Gordon, Robert McConnell, Amonix Inc. (United States) [7407-01]

8:30 am: **Demonstration of high performance concentrating photovoltaic module designs for utility scale power generation** (*Keynote Presentation*), Adam Plesniak, The Boeing Co. (United States); Russ Jones, Spectrolab, Inc. (United States); Joel Schwartz, Boeing Satellite Systems International, Inc. (United States); Guy Martins, John Hall, Authi A. Narayanan, David A. Whelan, The Boeing Co. (United States); Pablo Benitez, Juan C. Minano, Oliver Dross, Roberto Alvarez, Light Prescriptions Innovators, LLC (United States); Aleksandra Cvetkovic, Univ. Politécnica de Madrid (Spain) [7407-02]

9:00 am: **Active heat sink for solar photovoltaic cells operating with concentrators**, John Vetrovec, Aqwest (United States) [7407-03]

9:20 am: **Soliant Energy concentrator module performance and comparison to flat panel performance**, Neil Fromer, Simone Missirian, Richard Johnson, Dan McDermott, Soliant Energy, Inc. (United States) [7407-24]

9:40 am: **Field tests on CPV ISFOC plants**, Francisca Rubio, María Martínez, Julián Perea, Daniel Sánchez, Pedro Banda, Instituto de Sistemas Fotovoltaicos de Concentración (Spain) [7407-05]

Coffee Break 10:00 to 10:30 am

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: **Loucas Tsakalacos**, GE Global Research (United States) and **Sean E. Shaheen**, Univ. of Denver (United States)

Panelists: **Harry A. Atwater, Jr.**, California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Lunch/Exhibition Break 12:00 to 1:30 pm

Conference 7407

Wednesday 5 August

SESSION 2

Room: Conv. Ctr. 11B Tues. 1:30 to 3:20 pm

Low-Concentration Systems and CPV Cells

Session Chair: Raed A. Sherif, eSolar Inc.

- 1:30 pm: **High gain solar photovoltaics** (*Invited Paper*), Bob MacDonald, Eric Johnson, Skyline Solar, Inc. (United States) [7407-06]
- 2:00 pm: **Thermal characteristics of a medium-level concentration photovoltaic unit with evaporation cooling**, Yuri V. Kokotov, Michael A. Reyz, Yossi Fisher, Solaris Synergy (Israel) [7407-07]
- 2:20 pm: **Low concentrating PV/thermal hybrid system for roof-top application**, Markus Proell, Nidia Gawehns, Manfred Reuss, Richard Auer, Bavarian Ctr. for Applied Energy Research E.V. (Germany) [7407-08]
- 2:40 pm: **Light weight, low cost InGaP/GaAs dual-junction (DJ) solar cells on 4-inch epitaxial lifted off (ELO) wafers**, Rao Tatavarti, Glen Hillier, Chris Youtsey, David McCallum, Genevieve Martin, Andree Wibowo, Raja Navaratnarajah, Francis Tuminello, Melanie Disabb, Daniel Hertkorn, Noren Pan, MicroLink Devices, Inc. (United States) [7407-09]
- 3:00 pm: **Localized irradiation effects on tunnel diode transitions in multi-junction concentrator solar cells**, Avi Braun, Baruch Hirsch, Eugene A. Katz, Jeffrey M. Gordon, Ben-Gurion Univ. of the Negev (Israel); Wolfgang Guter, Andreas W. Bett, Fraunhofer-Institut für Solare Energiesysteme (Germany) [7407-10]
- Coffee Break 3:20 to 3:50 pm

SESSION 3

Room: Conv. Ctr. 11B Tues. 3:50 to 4:50 pm

Concentrator Optics

Session Chair: Adam Plesniak, The Boeing Co.

- 3:50 pm: **Planar micro-optic solar concentration using multiple imaging lenses into a common slab waveguide**, Jason H. Karp, Joseph Ford, Univ. of California, San Diego (United States) [7407-11]
- 4:10 pm: **Holographic elements in solar concentrator and collection systems**, Raymond K. Kostuk, Brian W. Myer, Demming Zhang, The Univ. of Arizona (United States); Glenn A. Rosenberg, Prism Solar Technologies, Inc. (United States) [7407-13]
- 4:30 pm: **Optical modeling of a spectrally selective reflector based on a TiO₂:Nb transparent conducting oxide for silicon solar cell application**, Christopher M. Maghanga, Kabarak Univ. (Kenya); Gunnar A. Niklasson, Claes-Göran Granqvist, Sr., Uppsala Univ. (Sweden); Mwamburi M. Mghendi, Moi Univ. (Kenya) [7407-15]

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

- New concentrator multifocus Fresnel lens for improved uniformity: design and characterization**, Daniel Vázquez Moliní, Antonio A. Fernandez-Balbuena, Eusebio Bernabeu Martinez, Javier Muñoz de Luna Clemente, Univ. Complutense de Madrid (Spain) [7407-12]
- Integral concentrating solar thermal collector producing high pressure steam for electricity**, Gabor P. Menyharth, American Solar Institute (United States) [7407-18]
- Optimal homogenization of concentrated flux in mid- and high-concentration photovoltaic modules**, Viktor P. Vasylyev, Vladislav V. Sergeev, Sergey V. Vasylyev, SOLERC (United States) [7407-19]
- Diffraction solar collector at higher-orders**, Thomas D. Ditto, DeWitt Brothers Tool Co. (United States); Stephen P. McGrew, New Light Industries, Ltd. (United States) [7407-20]
- Improved boost mirror for low-concentration photovoltaic solar power systems**, David N. Wells, Consultant (United States) [7407-23]

SESSION 4

Room: Conv. Ctr. 6E Wed. 10:25 am to 12:15 pm

Reliability of Concentrator Optics

Session Chair: Dan T. Ton, U.S. Dept. of Energy

Joint Session with Conference 7412: Reliability of Photovoltaic Cells, Modules, Components, and Systems II

- 10:25 am: **Stress in large-area optics for solar concentrators** (*Invited Paper*), Ralf Leutz, Ling Fu, Hans Philipp Annen, Concentrator Optics GmbH (Germany) [7412-05]
- 10:50 am: **Recent progress in concentrating photovoltaic solar cell technology and manufacturing** (*Invited Paper*), Nasser H. Karam, Richard R. King, Spectrolab, Inc. (United States) [7412-06]
- 11:15 am: **Assuring long-term reliability of concentrator PV systems**, Robert McConnell, Geoffrey S. Kinsey, Vahan Garboushian, Ben Lascelles, Amonix Inc. (United States) [7412-08]
- 11:35 am: **Analysis of transmitted optical spectrum enabling accelerated testing of CPV designs**, David C. Miller, Michael D. Kempe, Cheryl E. Kennedy, Sarah R. Kurtz, National Renewable Energy Lab. (United States) [7407-16]
- 11:15 pm: **Empirical and analytical predictive models for a novel medium concentration CPV system**, Marc Finot, Matt Kilkenny, Jason Well, Mehrdad Roosta, Eric Johnson, Khiem B. Do, Skyline Solar, Inc. (United States)[7407-17]

SOLAR

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Conference 7408

Monday-Thursday 3-6 August 2009 • Proceedings of SPIE Vol. 7408

Solar Hydrogen and Nanotechnology IV

Conference Chair: **Frank E. Osterloh**, Univ. of California, Davis

Program Committee: **Hironori Arakawa**, Tokyo Univ. of Science (Japan); **Jan Augustynski**, Univ. Warszawski (Poland); **Maria L. Ghirardi**, National Renewable Energy Lab.; **Michael Grätzel**, Swiss Federal Institute of Technology (Switzerland); **Jinghua Guo**, Lawrence Berkeley National Lab.; **Akihiko Kudo**, Tokyo Univ. of Science (Japan); **Claude Levy-Clement**, Ctr. National de la Recherche Scientifique (France); **Janusz Nowotny**, Univ. of Western Sydney (Australia); **Ian C. Plumb**, Commonwealth Scientific and Industrial Research Organisation (Australia); **John A. Turner**, National Renewable Energy Lab.; **Lionel Vayssieres**, National Institute for Materials Science (Japan); **T. Nejat Veziroglu**, Univ. of Miami; **Gunnar Westin**, Uppsala Univ. (Sweden); **Upul Wijayantha**, Loughborough Univ. (United Kingdom); **Jin Zhong Zhang**, Univ. of California, Santa Cruz

Conference Cosponsors:



Monday 3 August

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

Solar Energy Plenary Session

Session Chair: **Martha Symko-Davies**, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

2:00 pm: **Thin-Film Silicon PV Modules: Status and Prospects**, Arvind Shah, Univ. of Neuchâtel (Switzerland) [7409-102]

2:30 pm: **Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy**, Kazunari Domen, The Univ. of Tokyo (Japan) . . [7408-103]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

4:00 pm: **Thin Film PV: The Pathway to Grid Parity**, David Eaglesham, First Solar, LLC (United States) [7409-105]

4:30 pm: **Concentrating Solar Power for Utility Scale Applications**, Raed A. Sherif, eSolar Inc. (United States) [7407-106]

See page 17-19 for presentation details.

Room: Marriott Hotel, Marina F. Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: **Jake Jacobsen**, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: **Prof. Roland Winston**, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: **Loucas Tsakalacos**, GE Global Research (United States) and **Sean E. Shaheen**, Univ. of Denver (United States)

Panelists: **Harry A. Atwater, Jr.**, California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Solar redox apparatus, Donald G. Lewis, Michael R. Otto, Solar Redox Group (United States) [7408-30]

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 11B Wed. 9:00 to 10:00 am

The Current State of Hydrogen Production from Water

Session Chair: **Frank E. Osterloh**, Univ. of California, Davis

9:00 am: **Hydrogen production using solar energy: status, challenges, and plans (Invited Paper)**, Richard W. Farner, Roxanne Garland, U.S. Dept. of Energy (United States) [7408-01]

9:30 am: **Electrolytic oxidation of water and hydrogen generation for future energy markets (Invited Paper)**, Everett B. Anderson II, Katherine E. Ayers, Lawrence C. Moulthrop, Proton Energy Systems, Inc. (United States) [7408-02]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 11B Wed. 10:30 am to 12:10 pm

Semiconductor Films: Fabrication, Structure, and Properties

Session Chair: Felix N. Castellano, Bowling Green State Univ.

10:30 am: **Chemical and electronic structure of a-SiC thin films for photoelectrochemical water splitting**, Yufeng Zhang, Kyle George, Sujitra Pookpanratana, Timo Hofmann, Univ. of Nevada, Las Vegas (United States); Monika Blum, Univ. of Nevada, Las Vegas (United States) and Univ. Würzburg (Germany); Marcus Baer, Clemens Heske, Univ. of Nevada, Las Vegas (United States); Lothar Weinhardt, Univ. Würzburg (Germany); Jian Hu, Feng Zhu, Arun Madan, MVSystems, Inc. (United States); Wanli Yang, Jonathan Denlinger, Lawrence Berkeley National Lab. (United States) [7408-03]

10:50 am: **Low cost production solar grade silicon production**, Matthias Mede, Thermal Technology Inc. (United States) [7408-04]

11:10 am: **Chemical vapor deposition of copper oxide films for photoelectrochemical hydrogen production**, Raymond A. Adomaitis, Glenn Guglietta II, Timon Wanga, Rangan Pati, Sheryl H. Ehrman, Univ. of Maryland, College Park (United States) [7408-05]

11:30 am: **Pulsed laser deposition of metal oxide semiconductor photoelectrodes for solar-driven hydrogen production**, Coleman X. Kronawitter, Samuel S. Mao, Univ. of California, Berkeley (United States) and Lawrence Berkeley National Lab. (United States) [7408-06]

11:50 am: **Nanostructured CuInSe₂ grown from multilayered Cu/In/Se and by electro-chemical synthesis**, Sebastian J. Pathiyamattom, Univ. Nacional Autónoma de México (Mexico); Rocio V. Castañeda, Univ. de Guadalajara (Mexico); Gildardo Casarubias, Univ. Nacional Autónoma de México (Mexico); Rogelio V. Mejia, Univ. Autónoma del Estado de Morelos (Mexico) . . . [7408-07]

Lunch/Exhibition Break 12:10 to 1:40 pm

SESSION 3

Room: Conv. Ctr. 11B Wed. 1:40 to 4:20 pm

Doped Semiconductors: Optimizing Electronic Structure

Session Chair: Gunnar Westin, Uppsala Univ. (Sweden)

1:40 pm: **Photosensitive oxide semiconductors for solar hydrogen** (*Invited Paper*), Janusz Nowotny, Univ. of Western Sydney (Australia) [7408-08]

2:10 pm: **Nitrogen-doped ZnO nanowires for photoelectrochemical water splitting**, Xunyu Yang, Abraham Wolcott, Alissa Sobo, Robert C. Fitzmorris, Jin Zhong Zhang, Yat Li, Univ. of California, Santa Cruz (United States) . . [7408-09]

2:30 pm: **Minimization of charge carrier recombination through the imposition of segregation-induced electric fields**, Leigh R. Sheppard, Univ. of Western Sydney (Australia); Armand Atanacio, Australian Nuclear Science and Technology Organisation (Australia); Tadeusz Bak, Janusz Nowotny, Maria K. Nowotny, Univ. of Western Sydney (Australia); Kathryn E. Prince, Australian Nuclear Science and Technology Organisation (Australia) [7408-10]

2:50 pm: **Anion-doped TiO₂, In₂O₃ and WO₃ semiconductor nanoparticle materials for solar hydrogen generation** (*Invited Paper*), Daniel Rafferty, Yanping Sun, Karla R. Reyes Gil, Nathan Morris, Jason Thornton, Sarah Henkes, Purdue Univ. (United States) [7408-11]

Coffee Break 3:20 to 3:50 pm

3:50 pm: **(Photo)electrochemical characterization of nanostructured ZnO electrodes** (*Invited Paper*), Heli Wang, Todd Deutsch, Sudhakar Shet, Yanfa Yan, Mowafak M. Al-Jassim, John A. Turner, National Renewable Energy Lab. (United States) [7408-12]

SESSION 4

Room: Conv. Ctr. 11B Wed. 4:20 to 5:30 pm

Nanostructured Composites: Interfacial Processes and Photocatalytic Properties I

Session Chair: Frank E. Osterloh, Univ. of California, Davis

4:20 pm: **Measuring interfacial electron transfer rates using potential modulated spectroscopies**, Judith L. Jenkins, Zeynep O. Araci, R. Clayton Shallcross, Erin L. Ratcliff, S. Scott Saavedra, Neal R. Armstrong, The Univ. of Arizona (United States) [7408-13]

4:40 pm: **Optical excitations of metallic nanoclusters buried in TiO₂ for solar photochemistry**, Richard L. Kurtz, Frank Womack, Fei Wang, Ziyu L. Zhang, Phillip T. Sprunger, Louisiana State Univ. (United States) [7408-14]

5:00 pm: **Hydrogen generation using photoelectrochemical cells based on 1D and 0D doped metal oxide nanostructures** (*Invited Paper*), Jin Zhong Zhang, Abraham Wolcott, Jennifer Hensel, Univ. of California, Santa Cruz (United States); Wilson Smith, Yiping Zhao, The Univ. of Georgia (United States) [7408-15]

Thursday 6 August

SESSION 5

Room: Conv. Ctr. 11B Thurs. 9:00 to 10:10 am

Nanostructured Composites: Interfacial Processes and Photocatalytic Properties II

Session Chair: Lionel Vayssieres, National Institute for Materials Science (Japan)

9:00 am: **Visible-light active nanorod-based metal oxide structures and devices** (*Invited Paper*), Lionel Vayssieres, National Institute for Materials Science (Japan) [7408-16]

9:30 am: **Interfacial electron transfer kinetics in semiconductor quantum dots/TiO₂ electrode**, Yasuhiro Tachibana, Kazuya Umekita, Keisuke Yoshimura, Takahisa Higuchi, Susumu Kuwabata, Osaka Univ. (Japan) [7408-17]

9:50 am: **Photocatalytic hydrogen production over CdS/TiO₂ composites under solar light**, Shaohua Shen, Xiaobo Chen, Samuel S. Mao, Lawrence Berkeley National Lab. (United States) [7408-18]

Coffee Break 10:10 to 10:40 am

SESSION 6

Room: Conv. Ctr. 11B Thurs. 10:40 am to 12:20 pm

Synthetic Aspects of Photocatalytic Materials

Session Chair: Lionel Vayssieres, National Institute for Materials Science (Japan)

10:40 am: **Metal-organic synthesis of complex oxide photo-catalysts** (*Invited Paper*), Gunnar Westin, Uppsala Univ. (Sweden) [7408-19]

11:10 am: **Nitride based materials and nanowire based assemblies for photolysis of water** (*Invited Paper*), Mahendra K. Sunkara, Univ. of Louisville (United States) [7408-20]

11:40 am: **TiO₂ and TiO₂/WO₃ porous film electrodes for application in solar energy conversion**, Haroldo G. Oliveira, Erika D. Silva, Claudia Longo, Univ. Estadual de Campinas (Brazil) [7408-21]

12:00 pm: **Characterization of Fe-TiO₂ films synthesized by sol-gel method for application in energy conversion devices**, Reginaldo da Silva Santos, Claudia Longo, Univ. Estadual de Campinas (Brazil) [7408-22]

Lunch/Exhibition Break 12:20 to 1:50 pm

SESSION 7

Room: Conv. Ctr. 11B Thurs. 1:50 to 3:10 pm

Self-Supported Water Splitting Catalysts

Session Chair: Janusz Nowotny, Univ. of Western Sydney (Australia)

1:50 pm: **Kinetic study on overall water splitting using heterogeneous photocatalysts** (*Invited Paper*), Takashi Hisatomi, Kazuo Miyazaki, Kazuhiko Maeda, Kazuhiro Takanabe, Jun Kubota, The Univ. of Tokyo (Japan); Yoshihisa Sakata, Yamaguchi Univ. (Japan); Kazunari Domen, The Univ. of Tokyo (Japan) [7408-23]

2:20 pm: **Photocatalytic production of hydrogen from water using the molecule/semiconductor interface**, Felix N. Castellano, Bowling Green State Univ. (United States) [7408-24]

2:40 pm: **Photocatalytic water splitting properties of nanosheets derived from K₂Ti₄O₉** (*Invited Paper*), Frank E. Osterloh, Mark Allen, Erwin M. Sabio, Nigel D. Browning, Univ. of California, Davis (United States) [7408-25]

Coffee Break 3:10 to 3:40 pm

SOLAR

Conference 7408

SESSION 8

Room: Conv. Ctr. 11B Thurs. 3:40 to 5:20 pm

New Approaches to Solar Water Splitting Devices

Session Chair: **Jin Zhong Zhang**, Univ. of California, Santa Cruz

3:40 pm: **Silicon and tungsten oxide nanostructures for water splitting**, Karla R. Reyes Gil, Joshua M. Spurgeon, Craig Wiggernhorn, Nathan S. Lewis, California Institute of Technology (United States) [7408-26]

4:00 pm: **Construction of optimum semiconductor-catalyst composite photoelectrodes (Invited Paper)**, Kyoung-Shin Choi, Purdue Univ. (United States) [7408-27]

4:30 pm: **Single crystal semiconductor micropillar and nanowire on amorphous substrates for low cost solar hydrogen generation**, Veerayah J. Logeeswaran, Aaron M. Katzenmeyer, M. Saif Islam, Univ. of California, Davis (United States) [7408-28]

4:50 pm: **A bio-inspired molecular water oxidation catalyst for renewable hydrogen generation (Invited Paper)**, Leone Spiccia, Robin Brimblecombe, Annette Koo, Monash Univ. (Australia); Gerhard F. Swiegers, Commonwealth Scientific and Industrial Research Organisation (Australia); G. Charles Dismukes, Princeton Univ. (Australia) [7408-29]

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Conference 7409

Sunday-Tuesday 2-4 August 2009 • Proceedings of SPIE Vol. 7409

Thin Film Solar Technology

Conference Chairs: **Alan E. Delahoy**, EPV Solar, Inc.; **Louay A. Eldada**, HeliVolt Corp.

Program Committee: **Paola Delli Veneri**, ENEA (Italy); **David S. Ginley**, National Renewable Energy Lab.; **Jihad Mohaidat**, Masdar (United Arab Emirates); **Baosheng Sang**, HeliVolt Corp.; **William N. Shafarman**, Institute of Energy Conversion, Univ. of Delaware; **James R. Sites**, Colorado State Univ.; **Alexander P. Stavrides II**, EPV Solar, Inc.; **Ayodhya N. Tiwari**, EMPA (Switzerland); **Baojie Yan**, United Solar Ovonic LLC

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 11BSun. 9:10 to 10:10 am

Novel Thin Film Photovoltaic Devices

Session Chair: **Louay A. Eldada**, HeliVolt Corp.

9:10 am: **InGaN thin film Schottky solar cells**, Balakrishnam Jampana, Univ. of Delaware (United States); Andrew G. Melton, Muhammad Jamil, Georgia Institute of Technology (United States); Robert L. Opila, Univ. of Delaware (United States); Christiana B. Honsberg, Arizona State Univ. (United States); Ian T. Ferguson, Georgia Institute of Technology (United States) [7409-04]

9:30 am: **Study of quasi monocrystalline porous silicon (QMPS) for optoelectronic applications**, Mahua Chakraborty Banerjee, TECHNO INDIA (India) [7409-05]

9:50 am: **Solid-phase crystallization of evaporated silicon thin films on glass for photovoltaics: a combined SEM and TEM study**, Fude Liu, Manuel J. Romero, Kim M. Jones, Mowafak M. Al-Jassim, National Renewable Energy Lab. (United States); Oliver Kunz, Johnson Wong, Armin Aberle, Univ. of New South Wales (Australia) [7409-06]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Conv. Ctr. 11B Sun. 10:40 am to 12:00 pm

Growth and Patterning of Thin Film for Solar Modules

Session Chair: **Baojie Yan**, United Solar Ovonic, LLC

10:40 am: **New features of DC power supplies for TCO magnetron sputtering**, Dirk Ochs, HÜTTINGER Elektronik GmbH + Co. KG (Germany) [7409-07]

11:00 am: **Application of closed field magnetron sputter deposition in thin film photovoltaics**, Desmond R. Gibson, Applied Multilayers Ltd. (United Kingdom); Hari M. Upadhyaya, Loughborough Univ. (United Kingdom); Bob Waugh, Michael J. Walls, Applied Multilayers Ltd. (United Kingdom) . [7409-08]

11:20 am: **Use of multiple DC magnetron deposition sources for uniform coating of large areas**, David W. Reicher, Roberto Christian, Patrick Davidson, S. Systems Corp. (United States); Stanley Z. Peplinski, Wright Patterson Airforce Base (United States) [7409-09]

11:40 am: **Comparison of multilayer laser scribing of thin film solar cells with femto, pico and nanosecond pulse durations**, Tai-Wook Kim, Heui-Jae Park, Seoul National Univ. (Korea, Republic of); Hee K. Park, AppliFlex LLC (United States); David J. Hwang, Costas P. Grigoropoulos, Univ. of California, Berkeley (United States) [7409-10]

Lunch Break 12:00 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 11BSun. 1:30 to 3:30 pm

a-Si and nc-Si Photovoltaics I

Session Chair: **Alan E. Delahoy**, EPV Solar, Inc.

1:30 pm: **Thin film silicon solar cells: recent developments and production technologies** (*Invited Paper*), Matthieu Despeisse, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7409-11]

2:00 pm: **Status and future perspective of a-Si:H, a-SiGe:H, and nc-Si:H thin film photovoltaic technology** (*Invited Paper*), Jeffrey Yang, United Solar Ovonic, LLC (United States) [7409-12]

2:30 pm: **Efficiency enhancement of thin film silicon solar cells on plastic substrates using distributed Bragg reflectors**, Ehsanollah Fathi, Andrei Sazonov, Univ. of Waterloo (Canada) [7409-13]

2:50 pm: **Powder formation detection by optical emission spectroscopy in silane-hydrogen discharge**, Benjamin Strahm, Andrea Feltrin, Richard Bartlome, Christophe Ballif, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7409-14]

3:10 pm: **2D modeling of silicon based thin film dual and triple junction solar cells**, Yegao Xiao, Crosslight Software Inc. (Canada); Kentaro Uehara, Crosslight Software Inc. (Japan); Michel Lestrade, Zhiqiang Li, Zhanming S. Li, Crosslight Software Inc. (Canada) [7409-15]

Coffee Break 3:30 to 4:00 pm

SESSION 4

Room: Conv. Ctr. 11BSun. 4:00 to 5:40 pm

a-Si and nc-Si Photovoltaics II

Session Chair: **James R. Sites**, Colorado State Univ.

4:00 pm: **Hybrid a-Si/nc-Si solar cells fabricated on a directly-deposited, textured, zinc oxide transparent conductor**, Alan E. Delahoy, Tongyu Liu, Gaurav Saraf, Anamika Patel, John Cambridge, Sheyu Guo, EPV Solar, Inc. (United States); Paola Delli Veneri, Lucia V. Mercaldo, Iurie Usatii, ENEA (Italy) [7409-16]

4:20 pm: **Extraction of carrier transport parameters from hydrogenated amorphous and nanocrystalline silicon solar cells**, Baojie Yan, Guozhen Yue, Laura Sivec, Jeffrey Yang, Subhendu Guha, United Solar Ovonic, LLC (United States) [7409-17]

4:40 pm: **Transition from amorphous to microcrystalline silicon by varying the silane concentration: transition width dependence on the input silane concentration**, Benjamin Strahm, Andrea Feltrin, Grégory Bugnon, Fanny Sculati-Meillaud, Christophe Ballif, Alan A. Howling, Christoph Hollenstein, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7409-18]

5:00 pm: **3D photonic crystal intermediate reflector for micromorph thin-film tandem solar cell**, Johannes Üpping, Andreas Bielawny, Paul T. Miclea, Ralf B. Wehrspohn, Martin-Luther Univ. Halle-Wittenberg (Germany); Carsten Rockstuhl, Falk L. Lederer, Friedrich-Schiller-Univ. Jena (Germany); Marius Peters, Albert-Ludwigs-Univ. Freiburg (Germany); Lorenz Steidl, Rudolf Zentel, Johannes Gutenberg Univ. Mainz (Germany); Seung-Mo Lee, Mato Knez, Max-Planck-Institut für Mikrostrukturphysik (Germany); Andreas Lambert, Reinhard Carius, Forschungszentrum Jülich GmbH (Germany) [7409-19]

5:20 pm: **Novel in situ series connection for flexible photovoltaic modules**, Rainer Merz, Markus B. Schubert, Mohamed Ali Bouattour, Jürgen H. Werner, Univ. Stuttgart (Germany) [7409-20]

Conference 7409

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 5

Room: Conv. Ctr. 11B Mon. 8:15 to 10:15 am

CIGS and CdTe Devices and Modules

Session Chair: David S. Ginley, National Renewable Energy Lab.

8:15 am: **Flexible CdTe solar cells and modules: challenges and prospects** (*Invited Paper*), Julian Perrenoud, Stephan Buecheler, Ayodhya N. Tiwari, EMPA (Switzerland) [7409-21]

8:45 am: **Required materials properties for high-efficiency CIGS modules** (*Invited Paper*), Ingrid Repins, Stephen C. Glynn, Joel Duenow, Timothy J. Coutts, Wyatt K. Metzger, Miguel Contreras, National Renewable Energy Lab. (United States) [7409-22]

9:15 am: **Rapid reactive transfer printing of CIGS photovoltaics**, Louay A. Eldada, Baosheng Sang, Matthew Taylor, Peter Hersh, Billy J. Stanbery, HelioVolt Corp. (United States) [7409-23]

9:35 am: **Light-soaking and power measurements of thin film modules**, Karl-Anders Weiss, Simon Kratochwill, Jochen Wirth, Michael Köhl, Fraunhofer-Institut für Solare Energiesysteme (Germany) [7409-24]

9:55 am: **Bismuth telluride as a back contact for CdS/CdTe solar cells: the influence of the p+ region**, Osvaldo Vigil-Galan, Instituto Politécnico Nacional (Mexico); Jesus Fandiño, Univ. Autónoma de la Ciudad de Mexico (Mexico); Armando Plesent, Antonio Arce, Jorge Sastré-Hernández, Instituto Politécnico Nacional (Mexico) [7409-25]

Coffee Break 10:15 to 10:45 am

SESSION 6

Room: Conv. Ctr. 11B Mon. 10:45 am to 12:25 pm

Analysis and Characterization of Solar Thin Films and Modules

Session Chair: Louay A. Eldada, HelioVolt Corp.

10:45 am: **Impact of local nonuniformities on thin-film PV performance** (*Invited Paper*), James R. Sites, Colorado State Univ. (United States) . [7409-26]

11:15 am: **Atomic force microscopy-based nano-characterizations of electrical properties of thin-film solar cell materials and devices** (*Invited Paper*), Chunsheng Jiang, Helio R. Moutinho, Yanfa Yan, Mowafak M. Al-Jassim, National Renewable Energy Lab. (United States) [7409-27]

11:45 am: **Refractive index and thickness of coating measurement interferometer**, Chao-Yuan Wu, Kai Wu, National Central Univ. Chapter (Taiwan); Cheng-Chung Lee, National Central Univ. (Taiwan) [7409-28]

12:05 pm: **In situ stress measurement of silicon dioxide thin films**, Fang Ming, Zhengxiu Fan, Shanghai Institute of Optics and Fine Mechanics (China) [7409-29]

Lunch Break 12:25 to 1:30 pm

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

Solar Energy Plenary Session

Session Chair: Martha Symko-Davies, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

2:00 pm: **Thin-Film Silicon PV Modules: Status and Prospects**, Arvind Shah, Univ. of Neuchâtel (Switzerland) [7409-102]

2:30 pm: **Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy**, Kazunari Domen, The Univ. of Tokyo (Japan) . [7408-103]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

4:00 pm: **Thin Film PV: The Pathway to Grid Parity**, David Eaglesham, First Solar, LLC (United States) [7409-105]

4:30 pm: **Concentrating Solar Power for Utility Scale Applications**, Raed A. Sherif, eSolar Inc. (United States) [7407-106]

See page 17-19 for presentation details.

Room: Marriott Hotel, Marina F. Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: Jake Jacobsen, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: Prof. Roland Winston, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: **Loucas Tsakalakos**, GE Global Research (United States) and **Sean E. Shaheen**, Univ. of Denver (United States)

Panelists: **Harry A. Atwater, Jr.**, California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Defect state investigation of amorphous silicon carbide using electron spin resonance and photothermal deflection spectroscopy, Brian J. Simonds, Colorado School of Mines (United States); Josh Gallon, Colorado School of Mines (United States) and MVSystems, Inc. (United States); Tining Su, Colorado School of Mines (United States); Arun Madan, MVSystems, Inc. (United States); P. Craig Taylor, Colorado School of Mines (United States) [7409-39]

Effect of post-sulfurization annealing and gallium grading on thinner $\text{CuIn}_{1-x}\text{Ga}_x\text{S}_2$ absorbers, Ashwani Kaul, Parag Vasekar, Neelkanth G. Dhere, Univ. of Central Florida (United States) [7409-40]

Pulse electrodeposited tin sulfide films for photovoltaic applications, Hirian Berenice N. Anaya, Ildefonso Zamudio Torres, Nini Rose Mathews, Univ. Nacional Autónoma de México (Mexico). [7409-41]

Nanocrystalline silicon thin film solar cells, Victoria Koval, Yuriy Chechuga, Alexandra N. Shmyryeva, National Technical Univ. of Ukraine (Ukraine)[7409-42]

Minimizing shadow losses in III-nitride solar cells, Andrew G. Melton, Georgia Institute of Technology (United States); Balakrishnam Jampana, Univ. of Delaware (United States); Muhammad Jamil, Georgia Institute of Technology (United States); Robert L. Opila, Univ. of Delaware (United States); Christiana B. Honsberg, Arizona State Univ. (United States); Ian T. Ferguson, Georgia Institute of Technology (United States). [7409-45]

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Photovoltaic properties and charge transfer processes of ZnO nanocrystals-coupled photoactive natural derived dyes, Ganesh Thothadri, Hanyang Univ. (Korea, Republic of) [7409-30]

Cd1-xMgxTe thin films and top-cells for possible applications in tandem solar cells, Omar S. Martinez, David Reyes-Coronado, Xavier Mathew, Univ. Nacional Autónoma de México (Mexico). [7409-31]

Optical and electric properties of aluminum-gallium doped zinc oxide for transparent conducting film, Meng-Chi Li, Chien-Cheng Kuo, Sheng-Hui Chen, Cheng-Chung Lee, National Central Univ. (Taiwan) [7409-32]

Evaporated erbium oxide as an antireflective layer for C-Si solar cells, Hossein Alizadeh, Adel B. Gougam, Nazir P. Kherani, Stefan Zukotynski, Univ. of Toronto (Canada). [7409-34]

Influence of post-annealing treatment on conductivity behavior of ZnO-Li thin films by rf magnetron sputtering, Shu-Yi Tsai, National Cheng Kung Univ. (Taiwan); Yang-Ming Lu, National Univ. of Tainan (Taiwan); Min-Hsiung Hon, National Cheng Kung Univ. (Taiwan). [7409-35]

Relationship between hydrogen dilution and oxygen impurity in amorphous silicon carbide of amorphous solar cells, Yang-Ming Lu, Chieh-Min Lin, National Univ. of Tainan (Taiwan) [7409-36]

Theoretical study on $\text{In}_x\text{Ga}_{1-x}\text{N}/\text{Si}$ hetero-junction solar cells, Jiangong Li, Fubin Li, Shuo Lin, Shuiku Zhong, Yiming Wei, Xianghai Meng, Xiaoming Shen, Guangxi Univ. (China) [7409-37]

Development of silicon nitride barrier layer for CIGS thin film solar cells, Shirish A. Pethe, Vinay Hadagali, Neelkanth G. Dhere, Univ. of Central Florida (United States). [7409-38]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC321 Thin Film Optical Coatings (Macleod) Monday, 8:30 am to 5:30 pm

SC910 Design and Reliability of Photovoltaic Modules (Dhere, Wohlgemuth) Tuesday, 1:30 to 5:30 pm

Conference 7410

Sunday-Tuesday 2-4 August 2009 • Proceedings of SPIE Vol. 7410

Optical Modeling and Measurements for Solar Energy Systems III

Conference Chair: **Benjamin K. Tsai**, National Institute of Standards and Technology

Program Committee: **Jorge Gonzalez**, Santa Clara Univ.; **Joseph J. Michalsky, Jr.**, National Oceanic and Atmospheric Administration; **Daryl R. Myers**, National Renewable Energy Lab.; **Govindasamy Tamizh-Mani**, Arizona State Univ.; **Frank E. Vignola**, Univ. of Oregon

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 11ASun. 8:30 to 10:10 am

Solar Radiation Measurements and Modeling Applications I

Session Chair: **Daryl R. Myers**, National Renewable Energy Lab.

8:30 am: **Establishment of a broadband radiometric ground station on the South African East Coast**, Michael J. Brooks, Lance W. Roberts, Univ. of KwaZulu-Natal (South Africa) [7410-01]

8:50 am: **Testing a model of IR radiative losses**, Frank E. Vignola, Univ. of Oregon (United States); Ibrahim Reda, National Renewable Energy Lab. (United States); Charles N. Long, Pacific Northwest National Lab. (United States) [7410-03]

9:10 am: **Optical engineering application of modeled photosynthetically active radiation (PAR) for high-speed digital camera dynamic range optimization**, James Alves, Advanced Recognition Technologies, LLC (United States); Christian A. Gueymard, Solar Consulting Services (United States) [7410-04]

9:30 am: **Modelling of solar irradiance using satellite images and direct terrestrial measurements with PV modules**, Igor Tyukhov, All-Russian Research Institute for Electrification of Agriculture (Russian Federation); Frank E. Vignola, Univ. of Oregon (United States); Dmitry Strebkov, Michael Schakhramanyan, Anton Tikhonov, All-Russian Research Institute for Electrification of Agriculture (Russian Federation) [7410-05]

9:50 am: **Joint Solar Power Industry and Department of Energy Solar Resource and Meteorological Assessment Project (SOLRMAP)**, Stephen M. Wilcox, Thomas L. Stoffel, Daryl R. Myers, National Renewable Energy Lab. (United States) [7410-06]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Conv. Ctr. 11A Sun. 10:40 am to 12:00 pm

Solar Radiation Measurements and Modeling Applications II

Session Chair: **Frank E. Vignola**, Univ. of Oregon

10:40 am: **Incidence of latitude, climate and spectral effects on the performance of concentrating PV technologies**, Christian A. Gueymard, Solar Consulting Services (United States) [7410-07]

11:00 am: **Spectroradiometric characterization of the NIST pulsed solar simulator**, Howard W. Yoon, Brian P. Dougherty, Vladimir B. Khromchenko, National Institute of Standards and Technology (United States) [7410-08]

11:20 am: **System for variable spectra solar light source**, Juan C. M. Anton, Daniel Vázquez Molini, Jose A. Gomez-Pedrero, Eusebio Bernabeu, Univ. Complutense de Madrid (Spain) [7410-09]

11:40 am: **Terrestrial solar spectral distributions derived from broadband hourly solar radiation data**, Daryl R. Myers, National Renewable Energy Lab. (United States) [7410-10]

Lunch Break 12:00 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 11ASun. 1:30 to 3:30 pm

Solar Device and System Performance Measurements and Modeling

Session Chair: **Christian A. Gueymard**, Solar Consulting Services

1:30 pm: **Optical losses in solid-state dye sensitized solar cells**, David M. Huang, Univ. of California, Davis (United States); Henry J. Snaith, Univ. of Oxford (United Kingdom); Markus Kaiser, Univ. zu Köln (Germany); Michael Graetzel, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Klaus Meerholz, Univ. zu Köln (Germany); Adam J. Moule, Univ. of California, Davis (United States) [7410-11]

1:50 pm: **High-performance selective coatings for solar thermal applications using sub-wavelength metallo-dielectric structures**, Nicholas P. Sergeant, Mukul Agrawal, Peter Peumans, Stanford Univ. (United States) [7410-12]

2:10 pm: **Solar panel installation requirements for optimum system performance**, Asu R. Jha, JHA Technical Consulting Services (United States) [7410-13]

2:30 pm: **Correlation between collimated flash test and in-sun measurements of high concentration photovoltaic modules**, Evan D. Green, SolFocus, Inc. (United States) [7410-14]

2:50 pm: **Optical properties of thermochromic VO₂W films for 'smart' solar energy applications**, Antonio Paone, Martin Joly, Rosendo Sanjines, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Andriy Romanyuk, Univ. of Basel (Switzerland); Jean-Louis Scartezzini, Andreas M. Schüler, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7410-15]

3:10 pm: **Carbon-in-silica composite selective solar absorbers: a determination of composition and dielectric properties**, Gift Katumba, Council for Scientific and Industrial Research (South Africa); Andrew Forbes, Council for Scientific and Industrial Research (South Africa) and Univ. of KwaZulu-Natal (South Africa) [7410-16]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

Solar Energy Plenary Session

Session Chair: **Martha Symko-Davies**, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

2:00 pm: **Thin-Film Silicon PV Modules: Status and Prospects**, Arvind Shah, Univ. of Neuchâtel (Switzerland) [7409-102]

2:30 pm: **Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy**, Kazunari Domen, The Univ. of Tokyo (Japan) . . [7408-103]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

4:00 pm: **Thin Film PV: The Pathway to Grid Parity**, David Eaglesham, First Solar, LLC (United States) [7409-105]

4:30 pm: **Concentrating Solar Power for Utility Scale Applications**, Raed A. Sherif, eSolar Inc. (United States) [7407-106]

See page 17-19 for presentation details.

Room: Marriott Hotel, Marina F. Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: **Jake Jacobsen**, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: **Prof. Roland Winston**, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: **Loucas Tsakalakos**, GE Global Research (United States) and **Sean E. Shaheen**, Univ. of Denver (United States)

Panelists: **Harry A. Atwater, Jr.**, California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

ADASY®, Daniel Vázquez Moliní, Eusebio Bernabeu Martínez, Antonio A. Fernandez-Balbuena, Univ. Complutense de Madrid (Spain); Angel García Botella, Univ. Politécnica de Madrid (Spain); Lucas García Rodríguez, Lledó Iluminación S.A. (Spain); Mario González Montes, Univ. Complutense de Madrid (Spain) [7410-02]

Design of wideband solar ultraviolet radiation intensity monitoring and control system, Linmao Ye, Henan Institute of Meteorological Science (China); Zhigang Wu, Zhengzhou AoYan Electronic Co., Ltd. (China); Yusheng Li, Henan Institute of Meteorological Science (China); Qi Jin, Zhengzhou AoYan Electronic Co., Ltd. (China) [7410-17]

Calculation of spatial distribution of global irradiation in México using DEM and GIS, Vicente Estrada-Cajigal, Solartronic, S.A. de C.V. (Mexico) . [7410-19]

Outdoor test of multiple PV technologies, Marcus A. Zettl, Omar I. Stern, Oliver Mayer, Joerg Stromberger, Mark R. Lynass, Marianne Hartung, Eva Bernal, Eike Mueggenburg, Toby Ferenczi, GE Global Research (Germany) [7410-20]

Investigation and optimisation of biomimetic dye sensitised solar cells, Thomas P. Oreilly, Univ. College Dublin (Ireland) [7410-22]

Conference 7411

Sunday-Tuesday 2-4 August 2009 • Proceedings of SPIE Vol. 7411

Nanoscale Photonic and Cell Technologies for Photovoltaics II

Conference Chair: **Loucas Tsakalagos**, GE Global Research

Program Committee: **Eray S. Aydil**, Univ. of Minnesota; **Alberto Salleo**, Stanford Univ.; **Joop Schoonman**, Technische Univ. Delft (Netherlands); **Sean E. Shaheen**, Univ. of Denver; **Wilfried G. J. H. M. van Sark**, Univ. Utrecht (Netherlands); **Xianfan Xu**, Purdue Univ.

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 6ESun. 2:00 to 3:10 pm

Inorganic Nano Solar Cells I

Session Chair: **Loucas Tsakalagos**, GE Global Research

2:00 pm: **To be announced (Invited Paper)**, Harry A. Atwater, Jr., California Institute of Technology (United States) [7411-01]

2:30 pm: **Synthesis and structural properties of Ge nanocrystals in multilayer superlattice structure**, Bo Zhang, Santosh Shrestha, Shujuan Huang, Pasquale Aliberti, Gavin Conibeer, Martin A. Green, Univ. of New South Wales (Australia) [7411-02]

2:50 pm: **Recent advances in PbSe nanocrystal solar cells**, Matt Law, Sean Seefeld, Yao Liu, Univ. of California, Irvine (United States) [7411-03]

Coffee Break 3:10 to 3:40 pm

SESSION 2

Room: Conv. Ctr. 6ESun. 3:40 to 5:20 pm

Inorganic Nano Solar Cells II

Session Chair: **Alberto Salleo**, Stanford Univ.

3:40 pm: **To be announced (Invited Paper)**, Christiana B. Honsberg, Arizona State Univ. (United States) [7411-05]

4:10 pm: **Suppressing electron-phonon coupling in quantum dot photovoltaic materials for enhanced efficiency (Invited Paper)**, Xiulin Ruan, Xianfan Xu, Purdue Univ. (United States) [7411-06]

4:40 pm: **Light harvesting in hybrid epitaxial/colloidal nanostructures**, Pavlos G. Lagoudakis, Univ. of Southampton (United Kingdom) [7411-07]

5:00 pm: **Growth and characterization of Cu₂ZnSnS₄ nano-rods using anodized aluminum as the growth mask**, Chung Pui Chan, Zhuo Chen, Hong Lam, Charles C. Surya, The Hong Kong Polytechnic Univ. (Hong Kong, China) [7411-08]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 3

Room: Conv. Ctr. 6E Mon. 8:00 to 10:10 am

Nanostructured Organic and Hybrid Solar Cells I

Session Chair: **Sean E. Shaheen**, Univ. of Denver

Joint Session with Conference 7416: Organic Photovoltaics X

8:00 am: **The implications of fullerene intercalation between polymer side chains in bulk heterojunction solar cells (Invited Paper)**, Michael D. McGehee, Stanford Univ. (United States) [7411-09]

8:30 am: **Transparent metal electrodes for organic solar cells**, Jan Meiss, Moritz K. Riede, Karl Leo, Technische Univ. Dresden (Germany) [7416-69]

8:50 am: **High-performance dye-sensitized solar cells with nanomaterials as counter electrode**, Jianyong Ouyang, Benhu Fan, Kuan Sun, National Univ. of Singapore (Singapore) [7411-11]

9:10 am: **Effects of DNA and Pt-DNA electrodes on bulk heterojunction solar cells**, Emre Yengel, Liang Wang, Mihri Ozkan, Cengiz S. Ozkan, Univ. of California, Riverside (United States) [7411-12]

9:30 am: **Nanocrystal size-dependent carrier transport and recombination behavior of poly(3-hexylthiophene)/TiO₂ hybrid bulk heterojunction solar cells**, Shao-Sian Li, Chia-Hao Chang, Yun-Yue Lin, Ming-Wen Chu, Wei-Fang Su, Chun-Wei Chen, National Taiwan Univ. (Taiwan) [7416-01]

9:50 am: **The use of nanofibers of P3HT in bulk heterojunction solar cells: the effect of order in the performance of P3HT/PCBM blends**, Dirk J. M. Vanderzande, Wibren Oosterbaan, Jean V. Manca, Laurence J. Lutsen, Thomas J. Cleij, Univ. Hasselt (Belgium); Jun Zhao, Guy Van Assche, Bruno Van Mele, Vrije Univ. Brussel (Belgium); Jan D'Haen, Univ. Hasselt (Belgium) ... [7416-02]

Coffee Break 10:10 to 10:40 am

SESSION 4

Room: Conv. Ctr. 6E Mon. 10:40 am to 12:10 pm

Nanostructured Organic and Hybrid Solar Cells II

Session Chair: **Dana C. Olson**, National Renewable Energy Lab.

Joint Session with Conference 7416: Organic Photovoltaics X

10:40 am: **Plasmonic enhancement of excitonic solar cells (Invited Paper)**, Jao van de Lagemaat, Thomas H. Reilly III, Anthony J. Morfa, National Renewable Energy Lab. (United States); Allison C. Kanarr, Univ. of Colorado at Boulder (United States); Justin C. Johnson, National Renewable Energy Lab. (United States) [7411-13]

11:10 am: **Eliminating the middle man: how ligands affect electronic communication between the two phases in CdSe/P3HT bulk heterojunctions**, Smita Dayal, Nikos Kopidakis, Dana C. Olson, David S. Ginley, Garry Rumbles, National Renewable Energy Lab. (United States) [7416-03]

11:30 am: **Hybrid solar cells using ZnO nanorods**, Taeksoo Ji, Soyoun Jung, Arun Vasudevan, Univ. of Arkansas (United States) [7416-04]

11:50 am: **Semi-transparent solid-state dye-sensitized solar cells**, Seung-Bum Rim, Brian E. Hardin, Jung-Yong Lee, Han Sun Kim, Yi Cui, Michael D. McGehee, Peter Peumans, Stanford Univ. (United States) [7416-05]

Lunch Break 12:10 to 1:30 pm

Conference 7411

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. 6E Tues. 8:30 to 10:00 am

Nanophotonics for Photovoltaics I

Session Chair: **Wilfried G. J. H. M. van Sark**, Utrecht Univ. (Netherlands)

8:30 am: **Third generation photovoltaics** (*Invited Paper*), Gavin Conibeer, Univ. of New South Wales (Australia) [7411-14]

9:00 am: **Upconverted fluorescence in Er-doped fluorozirconate based glass ceramics for high efficiency solar cells**, Bastian Henke, Fraunhofer-Ctr. für Silizium-Photovoltaik (Germany); Bernd Ahrens, Univ. Paderborn (Germany); Jacqueline A. Johnson, The Univ. of Tennessee Space Institute (United States); Paul T. Miclea, Fraunhofer-Institut für Werkstoffmechanik (Germany); Stefan Schweizer, Fraunhofer-Ctr. für Silizium-Photovoltaik (Germany) [7411-15]

9:20 am: **Design of plasmonic thin-film solar cells with broadband absorption enhancements**, Ragip Pala, Justin S. White, Edward S. Barnard, John Liu, Mark L. Brongersma, Stanford Univ. (United States) [7411-16]

9:40 am: **The physical limits of light trapping in thin-films and structures operating near the limit**, Mukul Agrawal, Peter Peumans, Stanford Univ. (United States) [7411-17]

Coffee Break 10:00 to 10:30 am

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: **Loucas Tsakalakos**, GE Global Research (United States) and **Sean E. Shaheen**, Univ. of Denver (United States)

Panelists: **Harry A. Atwater, Jr.**, California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 6

Room: Conv. Ctr. 6E Tues. 1:30 to 3:00 pm

Nanophotonics for Photovoltaics II

Session Chair: **Xianfan Xu**, Purdue Univ.

1:30 pm: **Towards harvesting additional solar inventory through photon upconversion** (*Invited Paper*), Felix N. Castellano, Bowling Green State Univ. (United States) [7411-18]

2:00 pm: **Plasmonic and biomimetic light-trapping for photovoltaics**, Darren M. Bagnall, Tristan L. Temple, Stuart A. Boden, Univ. of Southampton (United Kingdom) [7411-19]

2:20 pm: **Nanostructured surface in spherical silicon photovoltaic devices for reduced reflection**, Majid Gharghi, s2e Technologies Inc. (Canada); Bahareh Sadeghimakki, Siva Sivonthaman, Univ. of Waterloo (Canada) [7411-20]

2:40 pm: **Optical Enhancement in Solar Cells by the Incorporation of Periodic Metallic Nanopatterns**, Shaomin Wu, Wei Wang, Shaochen Chen, The Univ. of Texas at Austin (United States) [7411-21]

Coffee Break 3:00 to 3:30 pm

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

Solar Energy Plenary Session

Session Chair: **Martha Symko-Davies**, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

2:00 pm: **Thin-Film Silicon PV Modules: Status and Prospects**, Arvind Shah, Univ. of Neuchâtel (Switzerland) [7409-102]

2:30 pm: **Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy**, Kazunari Domen, The Univ. of Tokyo (Japan) . . [7408-103]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

4:00 pm: **Thin Film PV: The Pathway to Grid Parity**, David Eaglesham, First Solar, LLC (United States) [7409-105]

4:30 pm: **Concentrating Solar Power for Utility Scale Applications**, Raed A. Sherif, eSolar Inc. (United States) [7407-106]

See page 17-19 for presentation details.

Room: Marriott Hotel, Marina F. Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: **Jake Jacobsen**, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: **Prof. Roland Winston**, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

SOLAR

Conference 7411

SESSION 7

Room: Conv. Ctr. 6E Tues. 3:30 to 5:00 pm

Nanophotonics for Photovoltaics III

Session Chair: **Eray S. Aydil**, Univ. of Minnesota

3:30 pm: **Thin film plasmonic photovoltaics** (*Invited Paper*), Mark L. Brongersma, Stanford Univ. (United States) [7411-22]

4:00 pm: **Studies of LSPR-based photo-generation enhancement in solar cells**, Oren Guilatt, Ben-Gurion Univ. of the Negev (Israel); Boris Apter, Itzhak David, Holon Institute of Technology (Israel); Uzi Efron, Ben-Gurion Univ. of the Negev (Israel) [7411-23]

4:20 pm: **Transport and structural characterization of solution-processable doped ZnO nanowires**, Rodrigo J. Noriega-Manez, Jonathan Rivnay, Ludwig J. Goris, Stanford Univ. (United States); Daniel Kälblein, Hagen Klauk, Max-Planck-Institut für Festkörperforschung (Germany); Linda Thompson, Jonathan Stebbins, Alberto Salleo, Stanford Univ. (United States) [7411-24]

4:40 pm: **Photonic band-engineering absorption enhancement of amorphous silicon for solar cells**, Ounsi El Daif, Yeonsang Park, Emmanuel Drouard, Ecole Centrale de Lyon (France); Alain Fave, Anne Kaminski, Mustapha Lemiti, Institut National des Sciences Appliquées de Lyon (France); Xavier Letartre, Pierre Viktorovitch, Ecole Centrale de Lyon (France); Sungmo Ahn, Heonsu Jeon, Seoul National Univ. (Korea, Republic of); Christian Seassal, Ecole Centrale de Lyon (France) [7411-25]

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Transparent single-walled carbon nanotube network contacts for organic photovoltaics, Jeremy D. Bergeson, Jeffrey L. Blackburn, Robert C. Tenent, Dana C. Olson, Teresa M. Barnes, National Renewable Energy Lab. (United States) [7411-26]

Improved short-circuit current in hybrid photovoltaics by lithium doping of zinc oxide, Matthew T. Lloyd, Yun-ju Lee, Robert J. Davis, Julia W. P. Hsu, Sandia National Labs. (United States) [7411-27]

Plasmon-enhanced light harvesting in organic solar cells, Sudhir Cherukulappurath, ICFO - Instituto de Ciencias Fotónicas (Spain); Monica Della Pirra, Univ. Politècnica de Catalunya (Spain); Stephanie Cheylan, ICFO - Instituto de Ciencias Fotónicas (Spain); Joaquim Puigdollers, Univ. Politècnica de Catalunya (Spain); Stefan Enoch, Institut Fresnel (France); Romain Quidant, ICFO - Instituto de Ciencias Fotónicas (Spain) [7411-28]

Enhancements in the photovoltage of ZnO-P₃HT hybrid solar cells via inorganic interface modification, Yun-Ju Lee, Erik D. Spörke, Matthew T. Lloyd, James A. Voigt, Julia W. P. Hsu, Sandia National Labs. (United States) [7411-29]

Growth of titanium oxide nanotubes by anodic method using in dye-sensitized solar cell, Yang-Ming Lu, Chih Ting He, National Univ. of Tainan (Taiwan) [7411-30]

Photovoltaic application of sub-band absorption in quantum wells, Partha Goswami, Avinashi Kapoor, Univ. of Delhi (India) [7411-31]

One aspect of solar cell efficiency: multiple photon absorption in nano silicon structures, Jaspreet S. Nayyar, Anand Kulkarni, Michigan Technological Univ. (United States) [7411-32]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC910 Design and Reliability of Photovoltaic Modules (Dhere, Wohlgemuth)
Tuesday, 1:30 to 5:30 pm

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Conference 7412

Monday-Thursday 3-6 August 2009 • Proceedings of SPIE Vol. 7412

Reliability of Photovoltaic Cells, Modules, Components, and Systems II

Conference Chair: **Neelkanth G. Dhere**, Univ. of Central Florida *Conference Co-Chairs:* **John H. Wohlgemuth**, BP Solar International LLC; **Dan T. Ton**, U.S. Dept. of Energy

Program Committee: **David S. Albin**, National Renewable Energy Lab.; **Ward Bower**, Sandia National Labs.; **Michael DeBergalis**, DuPont Co.; **Alan E. Delahoy**, EPV Solar, Inc.; **Jennifer E. Granata**, Sandia National Labs.; **Steve Hogan**, Spire Corp.; **Michael Köhl**, Fraunhofer-Institut für Solare Energiesysteme (Germany); **Ralf Leutz**, Univ. Marburg (Germany) and Concentrator Optics GmbH (Germany); **Xavier Mathew**, Univ. Nacional Autónoma de México (Mexico); **Robert McConnell**, Amonix Inc.; **John Pern**, National Renewable Energy Lab.; **Bolko von Roedern**, National Renewable Energy Lab.; **Charles Whitaker**, BEW Engineering, Inc.

Monday 3 August

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

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Session Chair: **Martha Symko-Davies**, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

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Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

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Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnic de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: **Loucas Tsakalacos**, GE Global Research (United States) and **Sean E. Shaheen**, Univ. of Denver (United States)

Panelists: **Harry A. Atwater, Jr.**, California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

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Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

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Golden sun certification: the national certification program, Zong Wang, China General Certification Ctr. (China) [7412-29]

Diagnostic methods of solar cells in dependence on temperature, Jan Dolensky, Brno Univ. of Technology (Czech Republic) [7412-30]

Materials characterization for photovoltaics: 700 MHz high field NMR data for optimizing structure-process-property relationships, Elizabeth F. McCord, DuPont Co. (United States) [7412-32]

Local probe of moisture content in glass/glass laminates using an inductive contactless technique, Ricardo L. Theron, Ségolène Péliisset, Rosmarie Neukomm, Marylene Ræis-Barneoud, Christophe Ballif, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7412-33]

Pyretic test and breakdown test for c-Si PV cells and single-cell PV modules, Takuya Doi, Takao Yamada, Kazuaki Ikeda, National Institute of Advanced Industrial Science and Technology (Japan) [7412-34]

Effects of module performance and long-term degradation on economics and energy payback: A comparison of different photovoltaic technologies, Kristopher Davis, Houtan Moaveni, Univ. of Central Florida (United States) [7412-35]

Conference 7412

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 6E Wed. 8:30 to 9:55 am

Metrology and Certification

Session Chair: John H. Wohlgemuth, BP Solar International LLC

8:30 am: **Development and application of a UV light source for PV-module testing** (*Invited Paper*), Michael Köhl, Daniel Philipp, Fraunhofer-Institut für Solare Energiesysteme (Germany); Norbert Lenck, SCHOTT Solar GmbH (Germany); Matthias Zundel, SLZ-Maschinenbau GmbH (Germany) . . . [7412-01]

8:55 am: **Measurement and simulation of dynamic mechanical loads on PV-modules**, Karl-Anders Weiss, Marcus Assmus, Steffen Jack, Michael Köhl, Fraunhofer-Institut für Solare Energiesysteme (Germany) . . . [7412-02]

9:15 am: **Striving for a standard protocol for preconditioning or stabilization of polycrystalline thin film photovoltaic modules**, Joseph A. del Cueto, Chris A. Deline, David S. Albin, Steven R. Rummel, National Renewable Energy Lab. (United States) . . . [7412-03]

9:35 am: **Exploring diagnostic capabilities for application to new photovoltaic technologies**, Enrico C. Quintana, Michael A. Quintana, Kevin D. Rolfe, Sandia National Labs. (United States); Peter Hacke, Advent Solar, Inc. (United States) . . . [7412-04]

Coffee Break 9:55 to 10:25 am

SESSION 2

Room: Conv. Ctr. 6E Wed. 10:25 am to 12:15 pm

Reliability of Concentrator Optics

Session Chair: Dan T. Ton, U.S. Dept. of Energy

Joint Session with Conference 7407: High and Low Concentrator Systems for Solar Electric Applications IV

10:25 am: **Stress in large-area optics for solar concentrators** (*Invited Paper*), Ralf Leutz, Ling Fu, Hans Philipp Annen, Concentrator Optics GmbH (Germany) . . . [7412-05]

10:50 am: **Recent progress in concentrating photovoltaic solar cell technology and manufacturing** (*Invited Paper*), Nasser H. Karam, Richard R. King, Spectrolab, Inc. (United States) . . . [7412-06]

11:15 am: **Assuring long-term reliability of concentrator PV systems**, Robert McConnell, Geoffrey S. Kinsey, Vahan Garboushian, Ben Lascelles, Amonix Inc. (United States) . . . [7412-08]

11:35 am: **Analysis of transmitted optical spectrum enabling accelerated testing of CPV designs**, David C. Miller, Michael D. Kempe, Cheryl E. Kennedy, Sarah R. Kurtz, National Renewable Energy Lab. (United States) . . . [7407-16]

11:55 pm: **Empirical and analytical predictive models for a novel medium concentration CPV system**, Marc Finot, Matt Kilkenny, Jason Well, Mehrdad Roosta, Eric Johnson, Khiem B. Do, Skyline Solar, Inc. (United States)[7407-17]

Lunch/Exhibition Break 12:15 to 1:50 pm

SESSION 3

Room: Conv. Ctr. 6E Wed. 1:50 to 3:20 pm

Encapsulant/Backsheets

Session Chair: John Pern, National Renewable Energy Lab.

1:50 pm: **Influence of glass morphology and internal topography on moisture penetration for glass/PVB/glass laminates** (*Invited Paper*), Ivan Sinicco, Stefan Krull, Oerlikon Solar Ltd. (Switzerland); Ségolène Pélisset, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . [7412-09]

2:15 pm: **Impact of humidity on PV module encapsulants**, Thomas Swonke, Ulrich Hoyer, Rudolf Weissmann, Richard Auer, ZAE Bayern (Germany)[7412-10]

2:35 pm: **A semi-empirical method of predicting the lifetime of EVA encapsulant and polyester based backsheet materials** (*Invited Paper*), Zhiyong Xia, John H. Wohlgemuth, Daniel W. Cunningham, BP Solar International LLC (United States) . . . [7412-11]

3:00 pm: **Research on the non-thermal DBD surface modification and the humidity and heat aging resistant performance in solar cell modules of FFC backsheet**, Qiong Si, Zhihuang Fei, Jing Jin, Jolywood (Suzhou) Solar Material Technology Co., Ltd. (China); Huayu Qiu, Hangzhou Normal Univ. (China); Yuzheng Zhang, Jolywood (Suzhou) Solar Material Technology Co., Ltd. (China) . . . [7412-12]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Conv. Ctr. 6F Wed. 3:50 to 5:35 pm

Stability and Degradation Processes in Organic Solar Cells

Session Chair: Steve Hogan, Spire Corp.

Joint Session with Conference 7416: Organic Photovoltaics X

3:50 pm: **Stability investigations of organic photovoltaics** (*Invited Paper*), Jens A. Hauch, Andrea Seemann, Christoph J. Brabec, Konarka Technologies GmbH (Germany); Russell A. Gaudiana, Steven Wicks, Richard Childers, Konarka Technologies, Inc. (United States) . . . [7412-13]

4:15 pm: **Shelf lifetime study of unencapsulated organic and hybrid photovoltaic devices**, Matthew T. Lloyd, Sandia National Labs. (United States); Dana C. Olson, Matthew O. Reese, National Renewable Energy Lab. (United States); Erica Fang, Diana L. Moore, James A. Voigt, Julia W. P. Hsu, Sandia National Labs. (United States) . . . [7416-18]

4:35 pm: **A low temperature hybrid encapsulation method for organic solar cells**, Samuel Graham, Namsu Kim, William J. Potscavage, Jr., Benoit Domercq, Bernard Kippelen, Georgia Institute of Technology (United States) . . . [7416-19]

4:55 pm: **Examination of the degradation in organic photovoltaic active layers**, Matthew O. Reese, Nikos Kopidakis, David S. Ginley, National Renewable Energy Lab. (United States) . . . [7416-20]

5:15 pm: **Real time measurement of the structural change in P3HT:PCBM thin films and the relation with device performance in OPV cells**, Hyo Jung Kim, Jang-Joo Kim, Seoul National Univ. (Korea, Republic of); Hyun Hwi Lee, Pohang Univ. of Science and Technology (Korea, Republic of) . . . [7416-21]

Thursday 6 August

SESSION 5

Room: Conv. Ctr. 6E Thurs. 8:30 to 9:55 am

Reliability of BOS Components and PV Systems

Session Chair: **Ward Bower**, Sandia National Labs.

8:30 am: **Performance of rooftop photovoltaic modules: air gap effects** (*Invited Paper*), Bijay L. Shrestha, Arizona State Univ. (United States); Ernie G. Palomino, Salt River Project (United States); Govindasamy Tamizh-Mani, Arizona State Univ. (United States) and TUV Rheinland PTL (United States) . . [7412-14]

8:55 am: **Monitoring of a grid-connected solar plant through performance ratio analysis**, Amine Alami, David Williams, Robert Batista, MMA Renewable Ventures LLC (United States) [7412-15]

9:15 am: **Using probabilistic methods to define reliability requirements for high power inverters**, Michael M. Fife, PV Powered, Inc. (United States); Russell W. Morris, The Boeing Co. (United States) [7412-16]

9:35 am: **Study on the thermal performance of different types of junction boxes**, Fanjian Kong, Phono Solar Technology Co., Ltd. (China) [7412-17]

Coffee Break 9:55 to 10:30 am

SESSION 6

Room: Conv. Ctr. 6E Thurs. 10:30 am to 12:25 pm

Thin Film PV Reliability

Session Chair: **Jennifer E. Granata**, Sandia National Labs.

10:30 am: **Mobile ion generation during stress testing of CdTe solar cells** (*Invited Paper*), David S. Albin, Ramesh G. Dhere, Stephen C. Glynn, Timothy A. Gessert, Wyatt K. Metzger, National Renewable Energy Lab. (United States) . . [7412-18]

10:55 am: **Stability of TCO window layers for thin-film CIGS solar cells upon damp heat exposures: part II**, Rajalakshmi Sundaramoorthy, John Pern, Clay DeHart, Thomas Gennett, National Renewable Energy Lab. (United States); FanYing Meng, Shanghai Jiao Tong Univ. (China); Miguel Contreras, Timothy A. Gessert, National Renewable Energy Lab. (United States) [7412-19]

11:15 am: **Stability of TCO window layers for thin-film CIGS solar cells upon damp heat exposures: part III** (*Invited Paper*), John Pern, Stephen H. Glick, XiaoNan Li, Clay DeHart, Thomas Gennett, Miguel Contreras, Timothy A. Gessert, National Renewable Energy Lab. (United States) [7412-20]

11:40 am: **Understanding and mitigating effects of nonuniformities on reliability of thin film photovoltaics** (*Invited Paper*), Victor G. Karpov, Diana Shvydka, Univ. of Toledo (United States) [7412-21]

12:05 pm: **Mechanical scribing as a quality and reliability analysis tool for CIGSeS thin film solar cells**, Shirish A. Pethe, Univ. of Central Florida (United States), Michael J. Mendoza, Siemens Building Technologies, Inc. (United States); Ashwani Kaul, Neelkanth G. Dhere, Univ. of Central Florida (United States) [7412-22]

Lunch/Exhibition Break 12:25 to 1:55 pm

SESSION 7

Room: Conv. Ctr. 6E Thurs. 1:55 to 4:10 pm

Long Term PV Module Reliability

Session Chair: **David S. Albin**, National Renewable Energy Lab.

1:55 pm: **Product reliability and thin film photovoltaics** (*Invited Paper*), Simon Yeung, Ryan Gaston, Rebekah Feist, Michael Hus, Mark T. Bernius, Marc Langlois, The Dow Chemical Co. (United States); Jennifer E. Granata, Michael A. Quintana, Sandia National Labs. (United States); Neelkanth G. Dhere, Univ. of Central Florida (United States); Douglas Ogden, Adam Mettas, Harry Guo, Carl Carlson, ReliaSoft Corp. (United States) [7412-23]

2:20 pm: **Relationship between the environmental test and the reliability test**, Kang Wei, China Quality Certification Ctr. (China) [7412-24]

2:40 pm: **Failure mode analysis methods applied to PV module reliability** (*Invited Paper*), William J. Gambogi, Jr., Elizabeth F. McCord, H. David Rosenfeld, Roger Senigo, Scott Peacock, Katherine Stika, DuPont Co. (United States) [7412-25]

3:05 pm: **Effects of cerium removal from glass on photovoltaic module performance and stability** (*Invited Paper*), Michael D. Kempe, National Renewable Energy Lab. (United States) [7412-26]

3:30 pm: **The effect of metal foil tape degradation on the long-term reliability PV modules**, Neil R. Sorensen, Michael A. Quintana, Joseph D. Puskar, Samuel J. Lucero, Sandia National Labs. (United States) . . . [7412-27]

3:50 pm: **Outdoor monitoring and high voltage bias testing of PV modules as necessary test for assuring long term reliability**, Neelkanth G. Dhere, Shirish A. Pethe, Ashwani Kaul, Univ. of Central Florida (United States)[7412-28]


SOLAR

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC910 Design and Reliability of Photovoltaic Modules (Dhere, Wohlgemuth)
Tuesday, 1:30 to 5:30 pm

SPIE Optics+Photonics papers are available in 2-4 weeks.



Photonic Devices + Applications

Part of **SPIE** Optics+Photonics



Symposium Chair:

Zakya H. Kafafi, National Science Foundation (United States)

Technical Organizing Committee:

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Eustace L. Dereniak, College of Optical Sciences/The Univ. of Arizona (United States)

Theodore G. Goodson III, Univ. of Michigan (United States)

Ruyan Guo, The Univ. of Texas at San Antonio (United States)

John P. Hartke, U.S. Military Academy (United States)

Iam Choon Khoo, The Pennsylvania State Univ. (United States)

Paul A. Lane, Naval Research Lab. (United States)

Paul D. LeVan, Air Force Research Lab. (United States)

Randolph E. Longshore, Raytheon Missile Systems (Retired) (United States)

Iain McCulloch, Imperial College London (United Kingdom)

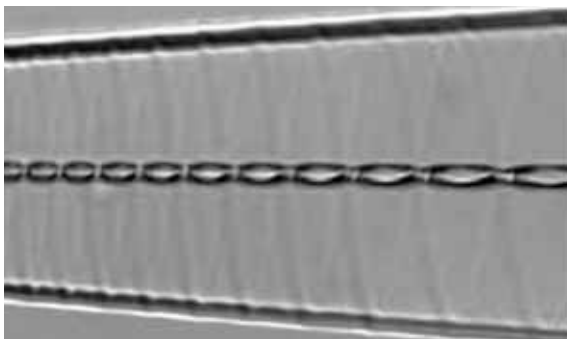
Susanna Orlic, Technische Univ. Berlin (Germany)

Ruth Shinar, Iowa State Univ. (United States)

Franky So, Univ. of Florida (United States)

Ashok K. Sood, Magnolia Optical Technologies, Inc. (United States)

Shizhuo Yin, The Pennsylvania State Univ. (United States)



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Sunday	Monday	Tuesday	Wednesday	Thursday
Organic Photonics and Electronics				
7413 Linear and Nonlinear Optics of Organic Materials IX (Goodson), p.108				
7414 Liquid Crystals XIII (Khoo), p.110				
7415 Organic Light Emitting Materials and Devices XIII (So), p.112				
7416 Organic Photovoltaics X (Kafafi), p.116				
7417 Organic Field-Effect Transistors VIII (Bao/McCulloch), p.120				
7418 Organic Semiconductors in Sensors and Bioelectronics II (Shinar), p.123				
Detectors and Imaging Devices				
7419A Infrared Detectors and Focal Plane Arrays X (Dereniak/Hartke/LeVan), p.125				
7419B Infrared Detector Devices and Photoelectronic Imagers IV (Longshore/Sood), p.127				
Applications				
7420 Photonic Fiber and Crystal Devices: Advances in Materials and Innovations in Device Applications III (Yin/Guo), p.129				
7422 Ninth International Conference on Solid State Lighting (Ferguson/Hoelen/Jiao/Taguchi), p.138				

See the Special Event Daily Schedule on page 9.

See the Course Daily Schedule on pages 42-45. Register for Courses at the SPIE Cashier.

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Conference 7413

Sunday-Wednesday 2-5 August 2009 • Proceedings of SPIE Vol. 7413

Linear and Nonlinear Optics of Organic Materials IX

Conference Chair: **Theodore G. Goodson III**, Univ. of Michigan *Conference Co-Chairs:* **Manfred Eich**, Technische Univ. Hamburg-Harburg (Germany); **Jean-Michel Nunzi**, Queen's Univ. (Canada); **Rachel Jakubiak**, Air Force Research Lab.

Program Committee: **Kevin D. Belfield**, Univ. of Central Florida; **Antao Chen**, Univ. of Washington; **Koen J. Clays**, Katholieke Univ. Leuven (Belgium); **Alain F. Fort**, Institut de Physique et Chimie des Matériaux de Strasbourg (France); **François Kajzar**, Univ. d'Angers (France); **Satoshi Kawata**, Osaka Univ. (Japan); **Mark G. Kuzyk**, Washington State Univ.; **Charles Y. C. Lee**, Air Force Office of Scientific Research; **Kwang-Sup Lee**, Hannam Univ. (Korea, Republic of); **Geoffrey A. Lindsay**, Naval Air Warfare Ctr.; **Aristides Marciano**, Delaware State Univ.; **Robert A. Norwood**, College of Optical Sciences/The Univ. of Arizona; **André P. Persoons**, Katholieke Univ. Leuven (Belgium); **Joy E. Rogers-Haley**, Air Force Research Lab.; **Jayan Thomas**, College of Optical Sciences/The Univ. of Arizona; **Tatsuo Wada**, The Institute of Physical and Chemical Research (Japan); **A. Todd Yeates**, Air Force Research Lab.

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 7ASun. 8:30 to 10:15 am

Organic Nonlinear Optical Frontiers

Session Chair: **Theodore G. Goodson III**, Univ. of Michigan

- 8:30 am: **Optimizing the nonlinear response of a molecule using external fields and symmetry** (*Invited Paper*), Mark G. Kuzyk, David S. Watkins, Washington State Univ. (United States) [7413-01]
- 8:50 am: **Third-order nonlinear optical characteristics and the morphologies of polythiophene derivative thin films fabricated by solution method**, Shizuyasu Ochiai, Suguru Mototani, Kenzo Kojima, Teruyoshi Mizutani, Aichi Institute of Technology (Japan) [7413-02]
- 9:05 am: **Electronic delocalisation in branched nonlinear fluorophores**, Daven A. Armoogum, Richard J. Marsh, Nick Nicolaou, Univ. College London (United Kingdom); Olivier M. Mongin, Mireille H. Blanchard-Desce, Univ. de Rennes 1 (France); Angus J. Bain, Univ. College London (United Kingdom) [7413-03]
- 9:20 am: **Nanophotonics in silicon-organic hybrid structures** (*Invited Paper*), Manfred Eich, Jan Hendrik Wülbern, Alexander Y. Petrov, Technische Univ. Hamburg-Harburg (Germany) [7413-04]
- 9:40 am: **Role of the conjugated spacer in the optimization of second-order nonlinear chromophores**, Javier Pérez-Moreno, Koen J. Clays, Katholieke Univ. Leuven (Belgium); Mark G. Kuzyk, Washington State Univ. (United States) [7413-05]
- 9:55 am: **Photonic research interests of the organic materials chemistry program at Air Force Office of Scientific Research** (*Invited Paper*), Charles Y. C. Lee, Air Force Office of Scientific Research (United States) [7413-06]
- Coffee Break 10:15 to 10:45 am

SESSION 2

Room: Conv. Ctr. 7A Sun. 10:45 am to 12:00 pm

New Nonlinear Optical Materials and Applications

Session Chair: **Charles Y. C. Lee**, Air Force Office of Scientific Research

- 10:45 am: **Multiple time scale characterization of the nonlinear multi-photon absorption characteristics of a neat organic liquid** (*Invited Paper*), Iam Choon Khoo, The Pennsylvania State Univ. (United States) [7413-07]
- 11:05 am: **Dynamics and multiphoton absorption properties of chromophore functionalized metal and semiconductor nanomaterials** (*Invited Paper*), Rama Krishna Guda, Western Michigan Univ. (United States) [7413-09]
- 11:25 am: **High-performance solution processable organic semiconductors: photophysical and photoconductive properties and their manipulation by doping** (*Invited Paper*), Oksana Ostroverkhova, Andrew D. Platt, Jonathan Day, Whitney E. B. Shepherd, Oregon State Univ. (United States); John E. Anthony, Univ. of Kentucky (United States) [7413-10]
- 11:45 am: **Introducing a newly synthesized organic-inorganic hybrid nanocomposite to the realm of nonlinear optics**, Yasaman Aghilli, Mohsen Mohseni, Amirkabir Univ. of Technology (Iran, Islamic Republic of); Ezeddin Mohajerani, Hamid Reza Shirvani, Shahid Beheshti Univ. (Iran, Islamic Republic of); Siamak Moradian, Ali Reza Khosravi, Amirkabir Univ. of Technology (Iran, Islamic Republic of) [7413-08]
- Lunch Break 12:00 to 1:00 pm

SESSION 3

Room: Conv. Ctr. 7ASun. 1:00 to 2:35 pm

Two Photon Effects in Novel Materials

Session Chair: **Theodore G. Goodson III**, Univ. of Michigan

- 1:00 pm: **Organic photonic materials for all-optical signal processing and optical limiting** (*Invited Paper*), Joseph W. Perry, Georgia Institute of Technology (United States) [7413-11]
- 1:20 pm: **Two-photon absorption in fluorescent proteins: from accurate quantitative characterization to understanding structure-property relationships**, Mikhail A. Drobizhev, Shane E. Tillo, Nikolay S. Makarov, Thomas E. Hughes, Aleksander K. Rebane, Montana State Univ., Bozeman (United States) [7413-12]
- 1:35 pm: **Synthesis and characterization of novel platinum acetylide oligomers** (*Invited Paper*), Thomas M. Cooper, Air Force Research Lab. (United States) [7413-13]
- 1:55 pm: **Magnetic and magneto-optic properties of conjugated polymers** (*Invited Paper*), André P. Persoons, Katholieke Univ. Leuven (Belgium); Palash Gangopadhyay, College of Optical Sciences, The Univ. of Arizona (United States) [7413-14]
- 2:15 pm: **Materials for third-order nonlinear optics** (*Invited Paper, Presentation Only*), Seth R. Marder, Georgia Institute of Technology (United States) [7413-15]

SESSION 4

Room: Conv. Ctr. 7ASun. 2:35 to 5:10 pm

New Photonic Effects in Novel Materials

Session Chair: **Rama Krishna Guda**, Western Michigan Univ.

- 2:35 pm: **Design small molecules for optical and electrical applications** (*Invited Paper*), Luping Yu, The Univ. of Chicago (United States) [7413-16]
- 2:55 pm: **Quantum optical applications in spectroscopy: entangled two-photon absorption in organic dendritic systems**, Ozgun Suzer, Theodore G. Goodson III, Univ. of Michigan (United States) [7413-17]
- Coffee Break 3:10 to 3:40 pm
- 3:40 pm: **Nano-engineering of materials for nonlinear optical imaging** (*Invited Paper*), Koen J. Clays, Katholieke Univ. Leuven (Belgium) [7413-18]
- 4:00 pm: **Thin optical films of $TiC_xO_yN_z$ prepared by room temperature plasma enhanced chemical vapor deposition**, Hao Jiang, General Dynamics Information Technology (United States); Kurt Eyink, Rachel Jakubiak, Air Force Research Lab. (United States); John T. Grant, Univ. of Dayton Research Institute (United States); Jesse O. Enlow, Weijie Su, Walter E. Johnson, Timothy J. Bunning, Air Force Research Lab. (United States) [7413-20]
- 4:15 pm: **Nonlinear optical ellipsometry for thin film and microparticle characterization** (*Invited Paper*), Garth J. Simpson, Nathan J. Begue, Purdue Univ. (United States) [7413-21]
- 4:35 pm: **Organic nanoclusters for nonlinear optics: a counter mainstream approach** (*Invited Paper*), Francesca Terenzi, Univ. de Rennes I (Italy) and Univ. degli Studi di Parma (Italy); Venkatakrisnan Parthasarathy, Univ. de Rennes I (Italy); Olivier M. Mongin, Univ. de Rennes I (France); Sampa Ghosh, Ravindra Pandey, Puspendu K. Das, Indian Institute of Science (India); Mireille H. Blanchard-Desce, Univ. de Rennes I (France) [7413-22]
- 4:55 pm: **Determination of geometry of 1:1 molecular complexes in solution by hyper-Rayleigh scattering**, Sampa Ghosh, Puspendu K. Das, Indian Institute of Science (India) [7413-23]

Wednesday 5 August

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Tuesday 4 August

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Nonlinear optical and ellipsometric studies of manganese-phthalocyanine thin films, Shinichiro Yanagiya, Jouta Morimoto, Univ. of Tokushima (Japan); Amr S. Helmy, Univ. of Toronto (Canada); Nobuo Goto, Univ. of Tokushima (Japan) [7413-24]

Nano-engineering of magnetic colloidal photonic crystals, Koen J. Clays, Katholieke Univ. Leuven (Belgium) [7413-25]

Hyperspectral two-photon near-infrared cancer imaging in-vitro and in-vivo, Nikolay S. Makarov, Jean R. Starkey, Mikhail A. Drobizhev, Aleksander K. Rebane, Montana State Univ., Bozeman (United States) [7413-26]

Analytical and numerical study of the couplet non linear Schrödinger equations system in a Kerr medium, Julio C. Quiceno, Juan C. Muñoz, Efraín Solarte, Univ. del Valle (Colombia) [7413-27]

Photophysical properties of organic semiconductor composites, Andrew D. Platt, Mark J. Kendrick, Whitney E. B. Shepherd, Oregon State Univ. (United States); John E. Anthony, Univ. of Kentucky (United States); Oksana Ostroverkhova, Oregon State Univ. (United States) [7413-28]

Optical bistability of polythiophene derivative/polymethylmethacrylate composite thin films, Shizuyasu Ochiai, Jayaraman Ramajothi, Aichi Institute of Technology (Japan) [7413-29]

Electrochemically induced switching of the second-order nonlinear optical response, Inge Asselberghs, Koen J. Clays, Katholieke Univ. Leuven (Belgium) [7413-30]

Index patterning of photoreactive polymers, Ute Daschiel, Wolfgang Kern, Gisbert Riess, Univ. of Leoben (Austria); Thomas Bauer, Technical Univ. of Graz (Austria); Valentin Satzinger, Georg Jakopic, Volker Schmidt, JOANNEUM RESEARCH Forschungsgesellschaft mbH (Austria) [7413-31]

Two-photon patterning of optical waveguides in flexible polymers, Sabine Bichler, Rachel Woods, Sonja Feldbacher, Polymer Competence Ctr. Leoben GmbH (Austria); Gregor Langer, Austria Technologie & Systemtechnik AG (Austria); Valentin Satzinger, Volker Schmidt, Georg Jakopic, JOANNEUM RESEARCH Forschungsgesellschaft mbH (Austria); Franz Stelzer, Technische Univ. Graz (Austria); Wolfgang Kern, Univ. of Leoben (Austria) [7413-32]

Investigations of entangled two-photon active materials, Michael R. Harpham, Theodore G. Goodson III, Univ. of Michigan (United States) [7413-33]

Non-linear optical imaging in the nano regime, Jeffery Raymond, Theodore G. Goodson III, Univ. of Michigan (United States) [7413-34]

Two-photon absorption properties of silsesquioxane derivatives, Jin Zhang, Theodore G. Goodson III, Univ. of Michigan (United States) [7413-35]

Optical investigation of an organic dendrimer for sensory signal amplification, Meng Guo, Theodore G. Goodson III, Univ. of Michigan (United States) [7413-36]

A theoretical study on the structural properties of some imines as nonlinear optical materials, Saeed Sheykhshoaeieekhtiarabadi, Chalmers Univ. of Technology (Sweden) [7413-37]

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: **Zakya H. Kafafi**, National Science Foundation

8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)

9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)

9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)

Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am

10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)

11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

PHOTONICS

Conference 7414

Sunday-Wednesday 2-5 August 2009 • Proceedings of SPIE Vol. 7414

Liquid Crystals XIII

Conference Chair: **Iam Choon Khoo**, The Pennsylvania State Univ.

Program Committee: **Timothy J. Bunning**, Air Force Research Lab.; **Shaw H. Chen**, Univ. of Rochester; **Neil Collings**, Univ. of Cambridge (United Kingdom); **Jean-Pierre Huignard**, Thales Research & Technology (France); **Tomiki Ikeda**, Tokyo Institute of Technology (Japan); **Francesco F. Simoni**, Univ. Politecnica delle Marche (Italy); **David M. Walba**, Univ. of Colorado at Boulder

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 13 Sun. 1:05 to 3:15 pm

Novel Liquid Crystalline Optical Materials

Session Chair: **Iam Choon Khoo**, The Pennsylvania State Univ.

1:05 pm: **Red-green-blue tuneable liquid crystal lasers and displays** (*Invited Paper*), Harry J. Coles, Univ. of Cambridge (United Kingdom) [7414-01]

1:30 pm: **Opto-mechanics of liquid crystal droplets** (*Invited Paper*), Saulius Juodkakis, Hokkaido Univ. (Japan); Etienne Brasselet, Univ. Bordeaux 1 (France) [7414-02]

1:55 pm: **Molecular design of main-chain liquid crystalline polyolefin** (*Invited Paper*), Naofumi Naga, Shibaura Institute of Technology (Japan); Masato Sone, Tokyo Institute of Technology (Japan); Keiichi Noguchi, Shigemitsu Murase, Tokyo Univ. of Agriculture and Technology (Japan) [7414-03]

2:20 pm: **Glassy liquid crystalline films of monodisperse conjugated oligomers** (*Invited Paper*), Lichang Zeng, Feng Yan, Siamon Wei, Shaw H. Chen, Univ. of Rochester (United States) [7414-04]

2:45 pm: **Nanoparticle-decorated cholesteric liquid crystal blue phases for tunable optical metamaterials**, Dennis F. Gardner, Jr., Bethany R. Wilcox, Rahul P. Trivedi, Ivan I. Smalyukh, Univ. of Colorado at Boulder (United States) [7414-05]

3:00 pm: **Electro-optical effects of oxidized multiwalled carbon nanotube doping on holographic polymer dispersed liquid crystal films**, Sameet K. Shriyan, Adam K. Fontecchio, Drexel Univ. (United States) [7414-06]

Coffee Break 3:15 to 3:45 pm

SESSION 2

Room: Conv. Ctr. 13 Sun. 3:45 to 5:40 pm

Liquid Crystal Lasers, Imaging and Tuning Devices

Session Chair: **Shaw H. Chen**, Univ. of Rochester

3:45 pm: **Microscopic birefringence imaging by phase-shift interferometry using a liquid crystal phase shifter** (*Invited Paper*), Toshiaki Nose, Yuta Terui, Manami Mizumoto, Kei-jiyu Okano, Hajime Muraguchi, Noriaki Ozaki, Ryouta Ito, Michinori Honma, Akita Prefectural Univ. (Japan) [7414-07]

4:10 pm: **Low-threshold lasing in the photonic structure of blue phase** (*Invited Paper*), Koichiro Shirota, Satoshi Kawata, The Institute of Physical and Chemical Research (Japan) [7414-08]

4:35 pm: **Nonlinear tuning in optical metamaterials** (*Invited Paper*), Yonatan Sivan, Purdue Univ. (United States) and Univ. at Buffalo (United States); Alexander V. Kildishev, Purdue Univ. (United States); Natalia M. Litchinitser, Univ. at Buffalo (United States); Iam Choon Khoo, The Pennsylvania State Univ. (United States); Vladimir M. Shalaev, Purdue Univ. (United States) ... [7414-09]

5:00 pm: **Stable holographic gratings based on small-molecular, liquid-crystalline trisazo-derivatives**, Pascal Wolfer, ETH Zürich (Switzerland); Kaus Kreger, Hubert Audoerff, Lothar Kador, Hans-Werner Schmidt, Univ. Bayreuth (Germany); Paul Smith, ETH Zürich (Switzerland); Natalie Stingelin-Stutzmann, Imperial College London (United Kingdom) [7414-10]

5:15 pm: **The de Vries smectics: more complicated than we thought?** (*Invited Paper*), Eva D. Korblova, Lixing Wang, Tao Gong, Mark Moran, Renfan Shao, Yongqian Shen, Matthew Glaser, Joseph MacLennan, Noel A. Clark, David M. Walba, Univ. of Colorado at Boulder (United States) [7414-11]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 3

Room: Conv. Ctr. 13 Mon. 8:15 to 10:00 am

Optical Tuning and Switching, Microwave Application

Session Chair: **Shaw H. Chen**, Univ. of Rochester

8:15 am: **New wavelength-tuning method in optical ring resonators with liquid crystal cladding: exploiting the longitudinal E-field**, Wout De Cort, Jeroen Beeckman, Univ. Gent (Belgium); Richard W. James, Anibal Fernandez, Univ. College London (United Kingdom); Roel Baets, Kristiaan Neyts, Univ. Gent (Belgium) [7414-12]

8:30 am: **Dynamic control of liquid-crystalline helical structures with the aid of light- and temperature-driven multi-stable chiral materials** (*Invited Paper*), Masuki Kawamoto, Natsuki Shiga, Takuya Aoki, Tatsuo Wada, The Institute of Physical and Chemical Research (Japan) [7414-13]

8:55 am: **Response characteristics of microwave and milliwave variable phase shifter using nematic and ferroelectric liquid crystals** (*Invited Paper*), Hiroshi Moritake, Nguyen T. Bach, Ryotaro Ozaki, Toshihisa Kamei, Yo-ozo Utsumi, National Defense Academy (Japan) [7414-14]

9:20 am: **Sub-microsecond all-optical switching with bulk nematic liquid crystal**, Iam Choon Khoo, Justin D. Liou, Yi Ma, The Pennsylvania State Univ. (United States) [7414-15]

9:35 am: **Photoswitchable gas permeation membranes based on azobenzene-doped liquid crystals** (*Invited Paper*), Kenneth L. Marshall, Eric Glowacki, Ching W. Tang, Univ. of Rochester (United States) [7414-16]

Coffee Break 10:00 to 10:30 am

SESSION 4

Room: Conv. Ctr. 13 Mon. 10:30 am to 12:00 pm

Opto-optical Switching, Nonlinear Optics

Session Chair: **Iam Choon Khoo**, The Pennsylvania State Univ.

10:30 am: **Fabrication of sub-millisecond response devices for precision polarization control based on sheared polymer-stabilized nematic liquid crystals**, Robert A. Ramsey, Meadowlark Optics, Inc. (United States) [7414-17]

10:45 am: **Planar chiral azobenzenophanes as chiroptic switches for reversible reflection color control in induced chiral nematic liquid crystals** (*Invited Paper*), Nobuyuki Tamaoki, Meethale C. Basheer, Hokkaido Univ. (Japan); Manoj Mathews, National Institute of Advanced Industrial Science and Technology (Japan) [7414-18]

Tuesday 4 August

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Low voltage adaptive 128x128 element liquid crystal micro lens array with electric tunable focal length, Hui Li, Kan Liu, Xinyu Zhang, Tianxu Zhang, Xubang Shen, Huazhong Univ. of Science and Technology (China) . . [7414-31]

Miniaturized optical surface profilometer by fringe pattern scanning methods using an electrically tunable liquid crystal Fabry-Perot device, Chang Sub Park, Unsang Jung, Kyung-Woo Park, Byoung-Ho Kang, JeeHyun Kim, Shin-Won Kang, Hak-Rin Kim, Kyungpook National Univ. (Korea, Republic of) [7414-32]

Nonlinearity in liquid crystals by Z-scan technique, Monica Trejo-Duran, Edgar Alvarado-Mendez, Julian M. Estudillo-Ayala, Roberto Rojas-Laguna, J. Amparo Andrade-Lucio, Everardo Vargas-Rodriguez, Claudio E. Valencia-Loredo, Univ. de Guanajuato (Mexico) [7414-33]

Electrochemiluminescence properties of nematic liquid crystal cells doped with rubrene, Michinori Honma, Takao Horiuchi, Masashi Tanimoto, Toshiaki Nose, Akita Prefectural Univ. (Japan) [7414-34]

Beam steering performance of electrowetting micropattern arrays, Wei Han, Joseph W. Haus, Paul F. McManamon, Univ. of Dayton (United States); Jason C. Heikenfeld, Neil R. Smith, Jia Yang, Univ. of Cincinnati (United States) [7414-35]

A real circular polarizer by cholesteric liquid crystal material, HuiLung Kuo, Yi-Ping Hsieh, Ping-Chen Chen, Industrial Technology Research Institute (Taiwan) [7414-36]

11:10 am: **Non-linear light propagation and bistability in nematic liquid crystals** (*Invited Paper*), Kristiaan Neyts, Jeroen Beeckman, Wout De Cort, Univ. Gent (Belgium) [7414-19]

11:35 am: **Azobenzene liquid crystals for fast optical switching and relaxation** (*Invited Paper*), Uladzimir Hrozhyk, Svetlana Serak, Nelson Tabirian, BEAM Engineering for Advanced Measurements Co. (United States); Landa Hoke, Diane M. Steeves, Brian R. Kimball, U.S. Army Soldier Systems Ctr. (United States) [7414-20]

Lunch Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 13 Mon. 1:30 to 3:00 pm

Optical Switching, Optoelectronic Devices, Optical Manipulation

Session Chair: Nelson Tabirian, BEAM Engineering for Advanced Measurements Co.

1:30 pm: **Colloidal structures and interactions in a nematic liquid crystal** (*Invited Paper*), Miha ?karabot, Univ. of Ljubljana (Slovenia) and Univ. of Ljubljana (Slovenia); Uro? Tkalec, Miha Ravnik, Univ. of Ljubljana (Slovenia); Slobodan Zumer, Univ. of Ljubljana (Slovenia) and J. Stefan Institute (Slovenia); Igor Mu?evic, Univ. of Ljubljana (Slovenia) and Univ. of Ljubljani (Slovenia) [7414-21]

1:55 pm: **Liquid crystal over silicon devices for holographic projection of high-definition video** (*Invited Paper*), Andreas Georgiou, Bill A. Crossland, Neil Collings, Univ. of Cambridge (United Kingdom) [7414-22]

2:20 pm: **Fabrications of liquid-crystal polarization converters and their applications** (*Invited Paper*), Andy Y.-G. Fuh, Shih-Wei Ko, Shu-Hao Huang, National Cheng Kung Univ. (Taiwan); Tsung-Hsien Lin, National Sun Yat-Sen Univ. (Taiwan) [7414-23]

2:45 pm: **Polarizational response of photonic structures with a liquid crystal defect**, Etienne Brasselet, Univ. Bordeaux 1 (France); Andrey E. Miroshnichenko, Deng Feng Chen, Wieslaw Krolikowsky, Yuri S. Kivshar, The Australian National Univ. (Australia) [7414-24]

Coffee Break 3:00 to 3:30 pm

SESSION 6

Room: Conv. Ctr. 13 Mon. 3:30 to 5:35 pm

Wave Mixing, Slow Light, Holographic Devices, Nanomachine

Session Chair: Iam Choon Khoo, The Pennsylvania State Univ.

3:30 pm: **Arbitrary two-photon excitation patterns by spatiotemporal shaping of ultrashort pulses** (*Invited Paper*), Eirini Papagiakoumou, Vincent de Sars, René Descartes Univ. (France); Dan Oron, Weizmann Institute of Science (Israel); Valentina Emiliani, René Descartes Univ. (France) [7414-25]

3:55 pm: **Two-wave mixing and slow-light effects in liquid crystal light-valves** (*Invited Paper*), Stefania Residori, Umberto Bortolozzo, Institut Non Linéaire de Nice Sophia Antipolis (France); Jean-Pierre Huignard, Thales Research & Technology (France) [7414-26]

4:20 pm: **Rewritable Bragg holograms of azobenzene polymers with fast response** (*Invited Paper*), Atsushi Shishido, Hyo-Bok Cha, Tomiki Ikeda, Tokyo Institute of Technology (Japan) [7414-27]

4:45 pm: **Possible nanomachine made of chiral liquid crystals** (*Invited Paper*), Yuka Tabe, Waseda Univ. (Japan) [7414-28]

5:10 pm: **Studies of high resolution LC modulators** (*Invited Paper*), Uzi Efron, Ben-Gurion Univ. of the Negev (Israel); Boris Apter, Holon Institute of Technology (Israel); Pavel Kogan, Oren Guilatt, Ben-Gurion Univ. of the Negev (Israel); Itzik Baal-Zedaka, Holon Institute of Technology (Israel) [7414-30]

Wednesday 5 August

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: Zakya H. Kafafi, National Science Foundation

8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)

9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)

9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)

Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am

10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)

11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

See page 21-22 for presentation details.

Conference 7415

Sunday-Tuesday 2-4 August 2009 • Proceedings of SPIE Vol. 7415

Organic Light Emitting Materials and Devices XIII

Conference Chair: **Franky So**, Univ. of Florida; Conference Co-Chair: **Chihaya Adachi**, Kyushu Univ. (Japan)

Program Committee: **Alasdair J. Campbell**, Imperial College London (United Kingdom); **Brian W. D'Andrade**, Universal Display Corp.; **Andrew B. Holmes**, Bio21 Molecular Science and Biotechnology Institute (Australia); **Arvid Hunze**, Siemens AG (Germany); **Yuichiro Kawamura**, Idemitsu Kosan Co., Ltd. (Japan); **Jang-Joo Kim**, Seoul National Univ. (Korea, Republic of); **Changhee Lee**, Seoul National Univ. (Korea, Republic of); **Chun-Sing Lee**, City Univ. of Hong Kong (Hong Kong, China); **Michele Muccini**, Istituto per lo Studio dei Materiali Nanostrutturati (Italy); **Hideyuki Murata**, Japan Advanced Institute of Science and Technology (Japan); **Soo-Jin Park**, SAMSUNG SDI Co., Ltd. (Korea, Republic of); **Ifor D. W. Samuel**, Univ. of St. Andrews (United Kingdom); **Linda S. Sapochak**, National Science Foundation; **Joseph Shinar**, Iowa State Univ.; **Chung-Chih Wu**, National Taiwan Univ. (Taiwan)

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 6FSun. 8:30 to 10:20 am

OLED Materials I

Session Chair: **Franky So**, Univ. of Florida

8:30 am: **Towards deep blue phosphorescent solution-processed materials** (*Invited Paper*), Ifor D. W. Samuel, Ruth E. Harding, Stuart Stevenson, Univ. of St. Andrews (United Kingdom); Shih-Chun Lo, Paul L. Burn, The Univ. of Queensland (Australia) [7415-01]

8:50 am: **Photoluminescence and delayed electroluminescence studies of small molecule luminescent materials** (*Invited Paper*), Hany M. Aziz, Yichun Luo, Univ. of Waterloo (Canada) [7415-02]

9:10 am: **Photophysical study of iridium complexes by absolute photoluminescence quantum yield measurements using an integrating sphere** (*Invited Paper*), Kengo Suzuki, Hamamatsu Photonics K.K. (Japan); Ayataka Endo, Kyushu Univ. (Japan); Toshitada Yoshihara, Seiji Tobita, Gunma Univ. (Japan); Masayuki Yahiro, Chihaya Adachi, Kyushu Univ. (Japan) [7415-03]

9:30 am: **Design of new anchored p-dopants for high power efficiency OLEDs**, Linda S. Sapochak, National Science Foundation (United States); Philip K. Koech, James E. Rainbolt, Lelia Cosimbescu, Eugene Polikarpov, James S. Swensen, Liang Wang, Asanga B. Padmameruma, Daniel J. Gaspar, Pacific Northwest National Lab. (United States) [7415-04]

9:45 am: **The development of poly(dendrimers) light emitting diodes**, Paul L. Burn, Wen-Yong Lai, The Univ. of Queensland (Australia); Jack Levell, Ifor D. W. Samuel, Univ. of St. Andrews (United Kingdom) [7415-05]

10:00 am: **High-efficiency emitting materials based on phenylquinoline/carbazole-based compounds for organic light emitting diode applications** (*Invited Paper*), Sung Ho Jin, Pusan National Univ. (Korea, Republic of) [7415-06]

Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Conv. Ctr. 6FSun. 10:50 to 11:55 am

OLED Materials II

Session Chair: **Chihaya Adachi**, Kyushu Univ. (Japan)

10:50 am: **Transient spikes and emission tails in small molecular OLEDs** (*Invited Paper*), Rui Liu, Zhengqing Gan, Ruth Shinar, Joseph Shinar, Iowa State Univ. (United States) [7415-07]

11:10 am: **Quenching of Coulomb stabilized excitons in deep-blue emitting organic host/guest systems**, Stephan Haneder, Enrico Da Como, Jochen Feldmann, Ludwig-Maximilians-Univ. München (Germany); Ingo Muenster, Christian Lennartz, Christian D. Schildknecht, Gerhard G. Wagenblast, BASF Aktiengesellschaft (Germany) [7415-08]

11:25 am: **Triplet excitation scavenging as method to control the triplet concentration**, Sarah Schols, Andrey Kadaschuk, Paul L. Heremans, IMEC (Belgium); Anke Helfer, Ulrich Scherf, Bergische Univ. Wuppertal (Germany) [7415-09]

11:40 am: **Improvement in triplet exciton confinement of electrophosphorescent device using fluorinated polymer host**, Isao Takasu, Yukitami Mizuno, Shuichi Uchikoga, Shintaro Enomoto, Tomoaki Sawabe, Akio Amano, Atsushi Wada, Jiro Yoshida, Tomio Ono, Toshiba Corp. (Japan) [7415-10]

Lunch Break 11:55 am to 1:30 pm

SESSION 3

Room: Conv. Ctr. 6FSun. 1:30 to 3:20 pm

Charge Transport

Session Chair: **Denis Kondakov**, Eastman Kodak Co.

1:30 pm: **OLED characteristics fabricated at extremely high evaporation rate** (*Invited Paper*), Hideyuki Murata, Toshinori Matsushima, Japan Advanced Institute of Science and Technology (Japan) [7415-11]

1:50 pm: **Optically-detected charge density dynamics in organic light emitting diodes (OLEDs)** (*Invited Paper*), Marc Sims, Ian D. Parker, DuPont Displays (United States) [7415-12]

2:10 pm: **Theoretical equations for current-voltage characteristics in OLED** (*Invited Paper*), Reiji Hattori, Sang-Gun Lee, Kyushu Univ. (Japan) ... [7415-13]

2:30 pm: **Organic light emitting devices having multi-layer structure of thin-film organic single crystals**, Hajime Nakanotani, Chihaya Adachi, Kyushu Univ. (Japan) [7415-14]

2:45 pm: **Charge carrier injection in organic light emitting diodes studied by impedance spectroscopy**, Stefan Nowy, Wei Ren, Julia Wagner, Josef A. Weber, Wolfgang Brütting, Univ. Augsburg (Germany) [7415-15]

3:00 pm: **Tuning charge balance in PHOLEDs with ambipolar host materials to achieve high efficiency** (*Invited Paper*), Asanga B. Padmameruma, Philip K. Koech, Lelia Cosimbescu, Eugene Polikarpov, James S. Sensen, Neetu Chopra, Pacific Northwest National Lab. (United States); Linda S. Sapochak, National Science Foundation (United States); Daniel J. Gaspar, Pacific Northwest National Lab. (United States) [7415-16]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Conv. Ctr. 6FSun. 3:50 to 5:45 pm

Interfaces and Device Physics

Session Chair: **Jang-Joo Kim**, Seoul National Univ. (Korea, Republic of)

3:50 pm: **Layer and interface characteristics of OLED devices studied by transmission electron microscopy techniques** (*Invited Paper*), Suhan Kim, Ting Zhang, Andrew M. Minor, Gao Liu, Lawrence Berkeley National Lab. (United States) [7415-17]

4:10 pm: **Interface study of insertion layers in organic semiconductor devices** (*Invited Paper*), Huanjun Ding, Irfan Irfan, Yongli Gao, Univ. of Rochester (United States); Franky So, Univ. of Florida (United States) [7415-18]

4:30 pm: **Electronic structures and electric properties of OLED-related interfaces** (*Invited Paper*), Hisao Ishii, Yutaka Noguchi, Yasuo Nakayama, Chiba Univ. (Japan) [7415-19]

4:50 pm: **The correlation of interfacial electronic structures and transport properties in organic light emitting diodes**, Chih-I Wu, National Taiwan Univ. (Taiwan) [7415-20]

5:05 pm: **Ultrafast molecular photonics** (*Invited Paper*), Guglielmo Lanzani, Politecnico di Milano (Italy) [7415-21]

5:25 pm: **Prediction of carrier injection barriers at organic-metal interfaces** (*Invited Paper*), Chun-Sing Lee, City Univ. of Hong Kong (Hong Kong, China) [7415-22]

SESSION 7

Room: Conv. Ctr. 6F Mon. 1:30 to 3:00 pm

Phosphorescent OLEDs

Session Chair: **Hideyuki Murata**, Japan Advanced Institute of Science and Technology (Japan)

1:30 pm: **Strong phosphorescence from tris(8-hydroxyquinoline) aluminum in organic light emitting diodes** (*Invited Paper*), Shizuo Tokito, NHK Science & Technical Research Labs. (Japan) [7415-34]

1:50 pm: **High efficiency phosphorescent OLEDs based on the heterostructured light emission and charge injection layers** (*Invited Paper*), Byung-Doo Chin, Dankook Univ. (Korea, Republic of); Yu-Ri Choi, Korea Institute of Science and Technology (Korea, Republic of); Heume-II Baek, Changhee Lee, Seoul National Univ. (Korea, Republic of) [7415-35]

2:10 pm: **High efficiency deep-blue and white phosphorescent OLEDs** (*Invited Paper*), Jiangeng Xue, Sang-Hyun Eom, Ying Zheng, Edward Wrzesniewski, Neetu Chopra, Jaewon Lee, Franky So, Univ. of Florida (United States) [7415-36]

2:30 pm: **High efficiency blue phosphorescent organic light emitting diodes by charge balance**, Neetu Chopra, Jaewon Lee, Franky So, Univ. of Florida (United States) [7415-37]

2:45 pm: **Highly efficient electrophosphorescent organic light emitting diodes based on indium tin oxide electrodes with tailored work function**, Asha Sharma, Peter J. Hotchkiss, Seth R. Marder, Bernard Kippelen, Georgia Institute of Technology (United States) [7415-38]

Coffee Break 3:00 to 3:30 pm

SESSION 8

Room: Conv. Ctr. 6F Mon. 3:30 to 5:00 pm

Light Extraction and Novel Devices

Session Chair: **Soo-Jin Park**, SAMSUNG SDI Co., Ltd. (Korea, Republic of)

3:30 pm: **Theoretical analysis of the optical outcoupling efficiency in organic light emitting diodes** (*Invited Paper*), Jang-Joo Kim, Sei-Yong Kim, Seoul National Univ. (Korea, Republic of) [7415-39]

3:50 pm: **Vertical type organic transistor for flexible sheet display** (*Invited Paper*), Yasuyuki Watanabe, Kazuhiro Kudo, Chiba Univ. (Japan) [7415-40]

4:10 pm: **Organic field-effect transistors: from unipolar to ambipolar to light emission** (*Invited Paper*), Christian Melzer, Martin Schidleja, Heinz von Seggern, Technische Univ. Darmstadt (Germany) [7415-41]

4:30 pm: **Solid-state organic DFB laser in near-infrared wavelength region**, Kunishige OE, Shun Yuyama, Takaya Watanabe, Kenichi Yamashita, Kyoto Institute of Technology (Japan) [7415-42]

4:45 pm: **Multicolor solution processed organic light emitting transistors**, Ebinazar B. Namdas, Univ. of California, Santa Barbara (United States); Ifor D. W. Samuel, Univ. of St. Andrews (United Kingdom); Ben B. Y. Hsu, Jonathan D. Yuen, Univ. of California, Santa Barbara (United States); Paul L. Burn, The Univ. of Queensland (Australia); Daniel A. Moses, Alan J. Heeger, Univ. of California, Santa Barbara (United States) [7415-43]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 5

Room: Conv. Ctr. 6F Mon. 8:00 to 10:00 am

OLED Displays and Processing

Session Chair: **Hisao Ishii**, Chiba Univ. (Japan)

8:00 am: **AMOLED R&D status** (*Invited Paper*), Jong Hyuk Lee, SAMSUNG SDI Co., Ltd. (Korea, Republic of) [7415-23]

8:20 am: **Gravure printing high performance, flexible polymer light emitting diodes and field-effect transistors** (*Invited Paper*), Alasdair J. Campbell, Imperial College London (United Kingdom) [7415-24]

8:40 am: **Recent advance in small molecule OLED-on-silicon microdisplays** (*Invited Paper*), Amalkumar P. Ghosh, Tariq A. Ali, Ilyas Khayrullin, Fridrich Vazan, Olivier F. Prache, Ihor Wacyk, eMagin Corp. (United States) [7415-25]

9:00 am: **OLED degradation insight through comparison of chemical processes in transport and emission layers** (*Invited Paper*), Denis Kondakov, Eastman Kodak Co. (United States) [7415-26]

9:20 am: **OLED light extraction with roll-to-roll fabricated nanostructured film** (*Invited Paper*), David Stegall, 3M Co. (United States) [7415-27]

9:40 am: **ITO-free flexible white OLEDs with Orgacon PEDOT:PSS and printed metal shunting lines** (*Invited Paper*), Stephan Harkema, Sibe Mennema, Gerwin Kirchner, Marco Barink, Walter Stals, Harmen Rooms, Eric Rubingh, Joanne Wilson, Ton van Mol, TNO Science and Industry (Netherlands); Dirk Bollen, Agfa-Gevaert Group (Belgium); Piet Bouten, Philips Research (Netherlands) [7415-28]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. 6F Mon. 10:30 am to 12:00 pm

Solid State Lighting/White OLEDs

Session Chair: **Jie Liu**, GE Global Research

10:30 am: **Efficient white polymer light emitting devices for solid-state lighting** (*Invited Paper*), Hongbin Wu, South China Univ. of Technology (China); Guijiang Zhou, Hong Kong Baptist Univ. (Hong Kong, China); Jianhua Zou, South China Univ. of Technology (China); Cheuk-Lam Ho, Wai-Yeung Wong, Hong Kong Baptist Univ. (Hong Kong, China); Yong Cao, South China Univ. of Technology (China) [7415-29]

10:50 am: **Some approaches for fabricating high-efficiency organic light emitting diodes** (*Invited Paper*), Jwo-Huei Jou, National Tsing Hua Univ. (Taiwan) [7415-30]

11:10 am: **The green solution for display and lighting** (*Invited Paper*), Yu-Hsin Lin, AU Optronics Corp. (Taiwan) [7415-31]

11:30 am: **Development of large area transparent conducting oxides from a combinatorial lead for organic solid state lighting**, Dean W. Matson, Charles C. Bonham, James S. Swensen, Liang Wang, Asanga B. Padmameruma, Daniel J. Gaspar, Pacific Northwest National Lab. (United States); Joseph J. Berry, National Renewable Energy Lab. (United States); Ajaya K. Sigdel, Univ. of Denver (United States); Christopher W. Gorrie, David S. Ginley, National Renewable Energy Lab. (United States) [7415-32]

11:45 am: **Transparent white organic light emitting diode with improved cathode transparency**, Jeong-Ik Lee, Hye-Yong Chu, Jeonghee Lee, Jae-Heon Shin, Chi-Sun Hwang, Electronics and Telecommunications Research Institute (Korea, Republic of) [7415-33]

Lunch Break 12:00 to 1:30 pm

Conference 7415

Tuesday 4 August

SESSION 9

Room: Conv. Ctr. 6A Tues. 8:30 to 10:00 am

Solid State Lighting and OLEDs Plenary Session

Session Chairs: Ian T. Ferguson, The Univ. of North Carolina at Charlotte and Franky So, Univ. of Florida

Joint Plenary Session with Conference 7422: Ninth International Conference on Solid State Lighting

8:30 am: **n-UV Based White LEDs**, Tsunemasa Taguchi, Yamaguchi Univ. (Japan) [7422-10]

9:15 am: **High Performance OLEDs for General Lighting**, Junji Kido, Yamagata Univ. (Japan) [7415-44]

See page 19 for presentation details.

Coffee Break 10:00 to 10:30 am

SESSION 10

Room: Conv. Ctr. 10

(Note Room Change) Tues. 10:30 am to 12:30 pm

OLEDs and Solid State Lighting

Session Chair: Franky So, Univ. of Florida

Joint Session with Conference 7422: Ninth International Conference on Solid State Lighting

10:30 am: **Coupling of InGaN/GaN quantum-well with surface plasmon for enhancing light emitting diode efficiency** (Invited Paper), Yen-Cheng Lu, Jyh-Yang Wang, Fu-Ji Tsai, Kun-Ching Shen, Cheng-Yen Chen, Cheng-Hung Lin, Chih-Feng Lu, Tsung-Yi Tang, Dong-Ming Yeh, Yean-Woei Kiang, Gehi-Chung Yang, National Taiwan Univ. (Taiwan) [7422-11]

11:00 am: **White OLEDs for lighting applications** (Invited Paper), Hans-Peter Loebl, Volker van Elsbergen, Herbert F. Boerner, Claudia Goldmann, Philips Research (Germany); Dietrich Bertram, Philips GmbH (Germany); Stefan Grabowski, Philips Research (Germany) [7415-45]

11:30 am: **The growth of indium-rich group III-N alloys and heterostructures by high-pressure CVD** (Invited Paper), Nikolaus Dietz, Mustafa Alevli, Ramazan Atalay, Max Buegler, Göksel Durkaya, Enno Malguth, Jielei Wang, Georgia State Univ. (United States) [7422-12]

12:00 pm: **Organic light emitting devices for solid state lighting** (Invited Paper), Jie Liu, GE Global Research (United States) [7415-46]

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Light extraction and optical loss mechanisms in organic light emitting diodes: influence of the emitter quantum efficiency, Stefan Nowy, Univ. Augsburg (Germany); Benjamin C. Krummacher, OSRAM Opto Semiconductors GmbH (Germany); Jörg Frischeisen, Wolfgang Brütting, Univ. Augsburg (Germany) [7415-47]

Study of optimal laser beam profile for laser induced thermal printing of organic film, Jonghoon Yi, Kangin Lee, Kwangwon Lee, Jin-Hyuk Kwon, Yeungnam Univ. (Korea, Republic of); Lee-Soon Park, Kyungpook National Univ. (Korea, Republic of) [7415-48]

High density multilayer carbon nanotubes for organic light emitting diodes, Muhammad Khizar, M. Yasin R. Akhtar, The Univ. of North Carolina at Charlotte (United States) [7415-49]

The modeling of dynamical degradation process for operating organic light emitting diode, Henglong Yang, Ting-Hui Lu, National Taipei Univ. of Technology (Taiwan) [7415-50]

Design and Synthesis of Highly Emissive Solid Fluorophores, Masaki Shimizu, Kenji Mochida, Youhei Takeda, Yuiga Asai, Tamejiro Hiyama, Kyoto Univ. (Japan) [7415-52]

Lasing characteristics of optically pumped edge-emitting organic semiconductor laser with 4,4'-bis[(N-carbazolyl)biphenyl], Kenji Shirakawa, Hiroki Yamaoka, Yasuhiro Toriyama, Shinichi N. Takahashi, Keio Univ. (Japan); Chihaya Adachi, Kyushu Univ. (Japan) [7415-53]

Determination of internal quantum efficiency of OLEDs with the consideration of the Purcell effect, Wallace C. Choy, Xue-Wen Chen, The Univ. of Hong Kong (Hong Kong, China); Sailing He, Zhejiang Univ. (China); Po-Ching Chui, The Univ. of Hong Kong (Hong Kong, China) [7415-54]

Solution processed photonic crystals to enhance the light outcoupling efficiency of organic light emitting diodes, Hwan-Hee Cho, Hyong-Jun Kim, Seoul National Univ. (Korea, Republic of); Junho Jeong, Dae-Geun Choi, Jongyoun Shim, Ali Ozhan Altun, Sohee Jeon, Korea Institute of Machinery & Materials (Korea, Republic of); Jang-Joo Kim, Seoul National Univ. (Korea, Republic of) [7415-55]

The design of the multiple-resonance microcavity by reflection phase manipulation of non-QWS DBR for OLED chromaticity enhancement, Nien-Po Chen, Meng-Hsian Chou, Chao-Chen Wang, Cheng-Jung Hsieh, Yu-Cheng Chan, Yuan Ze Univ. (Taiwan) [7415-56]

Charge injection and transport in spiro-linked arylamine compounds, Wing Hong Choi, Shu Kong So, Hong Kong Baptist Univ. (Hong Kong, China) [7415-57]

Independently controllable stacked OLEDs with high efficiency by using semitransparent Al/oxide/Ag(Au) intermediate connecting layer, Wallace C. Choy, Hongmei Zhang, The Univ. of Hong Kong (Hong Kong, China); Y. F. Dai, Changchun Institute of Applied Chemistry (China) [7415-58]

Improved light emission utilizing polyfluorene and polythiophene derivatives by thermal printing and solution process, Daisuke Kasama, Ryotaro Takata, Hirotake Kajii, Yutaka Ohmori, Osaka Univ. (Japan) [7415-59]

Improved performances of blue and white phosphorescent organic light emitting diodes through mixed host structure, Jonghee Lee, Jeong-Ik Lee, Hye-Yong Chu, Electronics and Telecommunications Research Institute (Korea, Republic of) [7415-60]

White emission from a single-component single-layer solution processed OLED, Carmen Coya, Maria Mar Ramos, Xenia Luna, Angel Luis Alvarez, Univ. Rey Juan Carlos (Spain); Alicia de Andrés, Consejo Superior de Investigaciones Científicas (Spain); Raúl Blanco, Univ. Complutense de Madrid (Spain); Rafael Juárez, Univ. Rey Juan Carlos (Spain); Rafael Gómez, Jose Luis Segura, Univ. Complutense de Madrid (Spain) [7415-61]

Novel ways to significantly enhance the conductivity of transparent PEDOT:PSS films, Jianyong Ouyang, Yijie Xia, Benhu Fan, National Univ. of Singapore (Singapore) [7415-62]

Fabrication of electroluminescence device using CdSe-ZnS quantum dot, Byoung-Ho Kang, Seok-Min Hong, Kyungpook National Univ. (Korea, Republic of); Ji-Hye Lee, So-Hee Jeong, Korea Institute of Machinery & Materials (Korea, Republic of); Do-Eok Kim, Kyu-Jin Kim, Kyungpook National Univ. (Korea, Republic of); Chang-Soo Han, Korea Institute of Machinery & Materials (Korea, Republic of); Shin-Won Kang, Kyungpook National Univ. (Korea, Republic of) [7415-63]

New phosphorescent dendrimer based organic light emitting diode and its near-IR electroluminescence, Hyong-Jun Kim, Seoul National Univ. (Korea, Republic of); Myung-Jun Kim, Korea Institute of Industrial Technology (Korea, Republic of); Se-Hyung Lee, Hyung-Dol Park, Young-Seo Park, Won-Ik Jeong, Jae-Hyun Lee, Seoul National Univ. (Korea, Republic of); Young-Chul Lee, Korea Institute of Industrial Technology (Korea, Republic of); Jang-Joo Kim, Seoul National Univ. (Korea, Republic of) [7415-64]

High efficiency blue phosphorescent light emitting diodes, Kyungmo Yoo, Hyong-Jun Kim, Jang-Joo Kim, Seoul National Univ. (Korea, Republic of) [7415-65]

Energy-level alignment at metal/dielectric/organic interfaces: the role of interface states, Michael G. Helander, Zhibin Wang, Mark T. Greiner, Zhenghong Lu, Univ. of Toronto (Canada) [7415-66]

Physisorption gap states at a transition metal oxide/organic interface, Mark T. Greiner, Michael G. Helander, Zhibin Wang, Zhenghong Lu, Univ. of Toronto (Canada) [7415-67]

Criteria for an Ohmic contact: comparison of transition metal oxides as hole injection layers in organic electronics, Zhibin Wang, Michael G. Helander, Mark T. Greiner, Zhenghong Lu, Univ. of Toronto (Canada) [7415-68]

Tandem white organic light emitting diodes consisting of blue and red phosphorescent unit devices connected with a transparent Al:LiF/MoO₃ connecting layer, Jungjin Yang, Chandra K. Suman, Joonyoung Kim, Won-Jun Song, Changhee Lee, Seoul National Univ. (Korea, Republic of) [7415-69]

- Photoluminescence-detected magnetic resonance (PLDMR) study of rubrene and oxygen-doped rubrene films**, Min Cai, Ying Chen, Joseph Shinar, Iowa State Univ. (United States); Oleg Mitrofanov, Univ. College London (United Kingdom); Christian Kloc, Nanyang Technological Univ. (Singapore); Arthur P. Ramirez, LGS Innovations Inc. (United States) [7415-71]
- Preparation and characterization of white phosphorescence polymer light emitting diodes**, Hak Min Lee, Su Choel Gong, Chang Duk Jun, Jin Eun Choi, Ho Jung Chang, Dankook Univ. (Korea, Republic of) [7415-72]
- Luminescence quenching by electron and hole space charges in organic electroluminescent materials**, Yichun Luo, Hany M. Aziz, Univ. of Waterloo (Canada) [7415-73]
- Fabrication and properties of small-molecular/polymer hybrid phosphorescent OLEDs based on poly(N-vinyl carbazole) (PVK)**, Teng Xiao, Min Cai, Ying Chen, Ruth Shinar, Joseph Shinar, Iowa State Univ. (United States) [7415-74]
- Electroluminescence-detected magnetic resonance (ELDMR) study of OLEDs containing a mixed N,N'-diphenyl-N,N'-bis(1-naphthylphenyl)-1,1'-biphenyl-4,4'-diamine (NPB)/tris(quinolinolate) Al (Alq₃) layer**, Emily Hellerich, Ying Chen, Min Cai, Joseph Shinar, Iowa State Univ. (United States) [7415-75]
- Microcavity effects on light extraction efficiency of blue phosphorescent organic light emitting devices**, Jaewon Lee, Neetu Chropa, Franky So, Univ. of Florida (United States) [7415-77]
- Efficiency enhancement in light emitting diodes using polymer interfacial layer**, Michael Hartel, Jegadesan Subbiah, Franky So, Univ. of Florida (United States) [7415-78]
- Inkjet printed organic light emitting diodes using iridium based stellate macromolecules**, Madhusudan Singh, Arizona State Univ. (United States); Hyun Sik Chae, Jesse D. Froehlich, Takashi Kondou, Sheng Li, Amane Mochizuki, Nitto Denko Technical Corp. (United States); Ghassan E. Jabbour, Arizona State Univ. (United States) [7415-79]

Wednesday 5 August

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: Zakya H. Kafafi, National Science Foundation

- 8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States) [7416-201]
- 9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States) [7417-202]
- 9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany) [7420-203]
- Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am
- 10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States) [7419A-204]
- 11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States) [7419B-205]
- 11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States) [7420-206]

See page 21-22 for presentation details.

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Courses of Related Interest

See SPIE Cashier for information and to register.

SC011 Design of Efficient Illumination Systems (Cassarly) Wednesday, 8:30 am to 12:30 pm

SC490 Solid State Lighting I (Ferguson) Monday, 8:30 am to 12:30 pm

SC958 LED & Solid-State Lighting Standardization (Jiao) Monday, 8:30 am to 12:30 pm

Conference 7416

Monday-Thursday 3-6 August 2009 • Proceedings of SPIE Vol. 7416

Organic Photovoltaics X

Conference Chair: **Zakya H. Kafafi**, National Science Foundation; *Conference Co-Chairs:* **Christoph J. Brabec**, Konarka Austria Forschungs und Entwicklungs GmbH (Austria); **Paul A. Lane**, Naval Research Lab.

Program Committee: **Katsuhiko Fujita**, Kyushu Univ. (Japan); **Rene A. Janssen**, Technische Univ. Eindhoven (Netherlands); **Bernard Kippelen**, Georgia Institute of Technology; **Kwanghee Lee**, Gwangju Institute of Science and Technology (Korea, Republic of); **Toby B. Meyer**, Solaronix SA (Switzerland); **Peter Peumans**, Stanford Univ.; **Sean E. Shaheen**, Univ. of Denver; **Jiangeng Xue**, Univ. of Florida; **Yang Yang**, Univ. of California, Los Angeles

Monday 3 August

SESSION 1

Room: Conv. Ctr. 6E Mon. 8:00 to 10:10 am

Nanostructured Organic and Hybrid Solar Cells I

Session Chair: **Sean E. Shaheen**, Univ. of Denver

Joint Session with Conference 7411: Nanoscale Photonic and Cell Technologies for Photovoltaics II

8:00 am: **The implications of fullerene intercalation between polymer side chains in bulk heterojunction solar cells** (*Invited Paper*), Michael D. McGehee, Stanford Univ. (United States) [7411-09]

8:30 am: **Transparent metal electrodes for organic solar cells**, Jan Meiss, Moritz K. Riede, Karl Leo, Technische Univ. Dresden (Germany) [7416-69]

8:50 am: **High-performance dye-sensitized solar cells with nanomaterials as counter electrode**, Jianyong Ouyang, Benhu Fan, Kuan Sun, National Univ. of Singapore (Singapore) [7411-11]

9:10 am: **Effects of DNA and Pt-DNA electrodes on bulk heterojunction solar cells**, Emre Yengel, Liang Wang, Mihri Ozkan, Cengiz S. Ozkan, Univ. of California, Riverside (United States) [7411-12]

9:30 am: **Nanocrystal size-dependent carrier transport and recombination behavior of poly(3-hexythiophene)/TiO₂ hybrid bulk heterojunction solar cells**, Shao-Sian Li, Chia-Hao Chang, Yun-Yue Lin, Ming-Wen Chu, Wei-Fang Su, Chun-Wei Chen, National Taiwan Univ. (Taiwan) [7416-01]

9:50 am: **The use of nanofibers of P3HT in bulk heterojunction solar cells: the effect of order in the performance of P3HT/PCBM blends**, Dirk J. M. Vanderzande, Wibren Oosterbaan, Jean V. Manca, Laurence J. Lutsen, Thomas J. Cleij, Univ. Hasselt (Belgium); Jun Zhao, Guy Van Assche, Bruno Van Mele, Vrije Univ. Brussel (Belgium); Jan D'Haen, Univ. Hasselt (Belgium) [7416-02]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Conv. Ctr. 6E Mon. 10:40 am to 12:10 pm

Nanostructured Organic and Hybrid Solar Cells II

Session Chair: **Dana C. Olson**, National Renewable Energy Lab.

Joint Session with Conference 7411: Nanoscale Photonic and Cell Technologies for Photovoltaics II

10:40 am: **Plasmonic enhancement of excitonic solar cells** (*Invited Paper*), Jao van de Lagemaat, Thomas H. Reilly III, Anthony J. Morfa, National Renewable Energy Lab. (United States); Allison C. Kanarr, Univ. of Colorado at Boulder (United States); Justin C. Johnson, National Renewable Energy Lab. (United States) [7411-13]

11:10 am: **Eliminating the middle man: how ligands affect electronic communication between the two phases in CdSe/P3HT bulk heterojunctions**, Smita Dayal, Nikos Kopidakis, Dana C. Olson, David S. Ginley, Garry Rumbles, National Renewable Energy Lab. (United States) [7416-03]

11:30 am: **Hybrid solar cells using ZnO nanorods**, Taeksoo Ji, Soyoun Jung, Arun Vasudevan, Univ. of Arkansas (United States) [7416-04]

11:50 am: **Semi-transparent solid-state dye-sensitized solar cells**, Seung-Bum Rim, Brian E. Hardin, Jung-Yong Lee, Han Sun Kim, Yi Cui, Michael D. McGehee, Peter Peumans, Stanford Univ. (United States) [7416-05]

Lunch Break 12:10 to 1:30 pm

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

Solar Energy Plenary Session

Session Chair: **Martha Symko-Davies**, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

2:00 pm: **Thin-Film Silicon PV Modules: Status and Prospects**, Arvind Shah, Univ. of Neuchâtel (Switzerland) [7409-102]

2:30 pm: **Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy**, Kazunari Domen, The Univ. of Tokyo (Japan) [7408-103]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

4:00 pm: **Thin Film PV: The Pathway to Grid Parity**, David Eaglesham, First Solar, LLC (United States) [7409-105]

4:30 pm: **Concentrating Solar Power for Utility Scale Applications**, Raed A. Sherif, eSolar Inc. (United States) [7407-106]

See page 17-19 for presentation details.

Room: Marriott Hotel, Marina F Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: **Jake Jacobsen**, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: **Prof. Roland Winston**, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benítez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: **Loucas Tsakalacos**, GE Global Research (United States) and **Sean E. Shaheen**, Univ. of Denver (United States)

Panelists: **Harry A. Atwater, Jr.**, California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 6F Tues. 1:30 to 3:30 pm

Novel Donors and Acceptors for Organic Photovoltaics

Session Chair: **Christoph J. Brabec**, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

1:30 pm: **Evolution of acceptor materials for bulk heterojunction PV: the quest for the fittest** (*Invited Paper*), Jan C. Hummelen, Univ. of Groningen (Netherlands) [7416-06]

2:00 pm: **Dendrimers for photon harvesting in organic and organic/inorganic hybrid solar cells**, Paul Meredith, Byeong K. An, Benjamin Langley, Paul L. Burn, The Univ. of Queensland (Australia) [7416-07]

2:20 pm: **Endohedral fullerenes for improved organic solar cell efficiencies** (*Invited Paper*), Martin Drees, Claudia Cardona, Brian Holloway, Luna Innovations Inc. (United States); Russell Ross, Edward R. Van Keuren, Georgetown Univ. (United States); Dirk M. Guldi, Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany); Jeff Peet, Guillermo C. Bazan, Univ. of California, Santa Barbara (United States) [7416-08]

2:50 pm: **Very efficient, solution-processed small molecule-based BHJ cells based on organic semiconductors containing a diketopyrrolopyrrole chromophore**, Arnold Tamayo, Thuc-Quyen T. Nguyen, Univ. of California, Santa Barbara (United States) [7416-09]

3:10 pm: **Thiophene rich fused-aromatic thienopyrazine acceptor for donor-acceptor low band-gap polymers for OTFT and solar cell**, Rajib Mondal, Hector A. Becerril, Zhenan Bao, Stanford Univ. (United States) [7416-10]

Coffee Break 3:30 to 4:00 pm

SESSION 4

Room: Conf. Ctr. 6F Tues. 4:00 to 6:00 pm

Charge Transfer Processes and Excitons

Session Chair: **David G. Lidzey**, The Univ. of Sheffield (United Kingdom)

Joint Session with Conference 7396: Physical Chemistry of Interfaces and Nanomaterials VIII

4:00 pm: **Charge transfer excitons in organic bulk heterojunctions for photovoltaic applications** (*Invited Paper*), Maria A. Loi, Univ. of Groningen (Netherlands) [7416-11]

4:30 pm: **Charge transfer excitons in conjugated polymer-fullerene blends**, Enrico Da Como, Markus Hallermann, Ilka Kriegel, Jochen Feldmann, Ludwig-Maximilians-Universität München (Germany) [7416-12]

4:50 pm: **Two-dimensional IR-visible sum frequency generation spectroscopy - a unique probe of surface electronic states at buried interfaces** (*Invited Paper*), Qifeng Li, Keng C. Chou, The Univ. of British Columbia (Canada) [7396-25]

5:20 pm: **Electric field assisted charge separation at the interface between electron donor and acceptor in an organic photovoltaic blend**, Ryan Pensack, Larry W. Barbour, Maureen Hegadorn, John B. Asbury, The Pennsylvania State Univ. (United States) [7396-26]

5:40 pm: **Structure and dynamics correlations of photoinduced charge separation processes in organic photovoltaic materials**, Jianchang Guo, Argonne National Lab. (United States); Jodi Szarko, Northwestern Univ. (United States); Yongye Liang, The Univ. of Chicago (United States); Brian Rolczynski, Northwestern Univ. (United States); Luping Yu, The Univ. of Chicago (United States); Lin X. Chen, Argonne National Lab. (United States) [7396-27]

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Optical properties of polysilane thin films by heat treatment, Hiroaki Tachibana, National Institute of Advanced Industrial Science and Technology (Japan) [7416-39]

Novel solution processable n-type materials for organic photovoltaic devices, Ying Shu, Univ. of Kentucky (United States); Yee-Fun Lim, Cornell Univ. (United States); Matthew Bruzek, Sean R. Parkin, John E. Anthony, Univ. of Kentucky (United States); George G. Malliaras, Cornell Univ. (United States) [7416-40]

Additive ink-jet printing of organic solar cells, Séverine Coppée, William J. Pottsavage, Jr., Bernard Kippelen, Georgia Institute of Technology (United States) [7416-41]

Graphene and its application in organic photovoltaic devices, Yongsheng Chen, Nankai Univ. (China) [7416-43]

Polymer solar cells with new donor polymers incorporating three components, Won Suk Shin, Hye-Young Lee, Song Lee, Kyu-Nam Kim, Won-Wook So, Sang-Jin Moon, Korea Research Institute of Chemical Technology (Korea, Republic of) [7416-44]

Effect of fabrication processes on bulk heterojunctions (BHJ) photovoltaic device performance, Kai-Yin Cheung, Cho-Tung Yip, Man-Kin Fung, Aleksandra B. Djurisic, The Univ. of Hong Kong (Hong Kong, China); Wai-Young Wong, Ze He, Xing-zhu Wang, Hong Kong Baptist Univ. (Hong Kong, China); Wai-Kin Chan, The Univ. of Hong Kong (Hong Kong, China) [7416-45]

Solid-state NMR to investigate the nanomorphology of PCPDTBT:PCBM blends processed with octane dithiol, Sylvain Chambon, Raoul Mens, Univ. Hasselt (Belgium); Markus C. Scharber, Konarka Austria Forschungs und Entwicklungs GmbH (Austria); Laurence J. Lutsen, IMEC (Belgium); Dirk J. M. Vanderzande, Peter Adriaenssens, Univ. Hasselt (Belgium) [7416-47]

Hybrid tandem solar cell with interfacial layer/IZO middle electrode, Bong Joon Lee, Hyo Jung Kim, Jang-Joo Kim, Seoul National Univ. (Korea, Republic of) [7416-48]

High voltage polymer solar cell patterned with photolithography, Yee-Fun Lim, Jin-Kyun Lee, Christopher K. Ober, George G. Malliaras, Cornell Univ. (United States) [7416-49]

Solution processable boron subphthalocyanine derivatives as active materials for organic photovoltaics, Biwu Ma, Lawrence Berkeley National Lab. (United States); Yoshikazu Miyamoto, Claire Woo, Univ. of California, Berkeley (United States); Yi Liu, Lawrence Berkeley National Lab. (United States); Jean M. J. Fréchet, Univ. of California, Berkeley (United States) and Lawrence Berkeley National Lab. (United States) [7416-50]

Flexible polymer electronic devices using highly conductive polyaniline electrode, Byoung Hoon Lee, Sung Heum Park, Hyung Cheol Back, Kwanghee Lee, Gwangju Institute of Science and Technology (Korea, Republic of) [7416-52]

Design and synthesis of functionalized regio regular poly(3-hexylthiophene) based copolymers and application in thermally stable bulk heterojunction organic solar cells, Bert J. Campo, Wibren Oosterbaan, Sabine Bertho, Univ. Hasselt (Belgium); Afshin Hadipour, Tom Aernouts, Jef Poortmans, IMEC (Belgium); Thomas J. Cleij, Univ. Hasselt (Belgium); Laurence J. Lutsen, IMEC (Belgium); Jean V. Manca, Univ. Hasselt (Belgium); Dirk J. M. Vanderzande, Univ. Hasselt (Belgium) and IMEC (Belgium) [7416-53]

Conference 7416

Wednesday 5 August

Performance enhancement of organic/inorganic hybrid solar cells by improving the optical absorption of polymer, Jing-Shun Huang, Chen-Yu Chou, Chung-Hao Wu, Meng-Yueh Liu, Yu-Hung Lin, Wen-Hen Lin, Ching-Fuh Lin, National Taiwan Univ. (Taiwan). [7416-54]

Modeling of the transient current density in organic solar cells under pulsed illumination, Nico Christ, Sebastian Valouch, Siegfried W. Kettlitz, Simon Züfle, Univ. Karlsruhe (Germany); Christian Gärtner, OSRAM Opto Semiconductors GmbH (Germany); Uli Lemmer, Univ. Karlsruhe (Germany). [7416-55]

Surface plasmon resonance enhanced optical absorption by using gold nanoparticles in organic solar cell, Weicheng Lai, National Taiwan Univ. (Taiwan). [7416-56]

Studies of the molecular p-n junction formed with an n-type and p-type polymer fragment: theory and experiment, Diane Hinkens, South Dakota State Univ. (United States); Seth B. Darling, Argonne National Lab. (United States); Qiquan Qiao, South Dakota State Univ. (United States). [7416-57]

Characterising dye-sensitized solar cells, Laura L. Tobin, Univ. College Dublin (Ireland) and Strategic Research Cluster in Solar Energy Conversion (Ireland); Thomas P. O'Reilly, John T. Sheridan, Dominic Zerulla, Univ. College Dublin (Ireland). [7416-58]

Efficient recombination zones for organic tandem solar cell, Andreas Pütz, Hung Do, Nico Christ, Michael Klein, Alexander Colsmann, Uli Lemmer, Univ. Karlsruhe (Germany). [7416-59]

Transparent polymer electrodes for efficient organic photovoltaic devices, Thai Hung Do, Manuel Reinhard, Henry Vogeler, Andreas Pütz, Felix Nickel, Alexander Colsmann, Uli Lemmer, Univ. Karlsruhe (Germany). [7416-60]

Characterization of pore-filling of spiro-MeOTAD in solid-state dye-sensitized solar cells and its consequence in device performance, I-Kang Ding, Brian E. Hardin, Stanford Univ. (United States); Nicolas Tetreault, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Eva H. Smith, Stanford Univ. (United States); Michael Gratzel, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Michael D. McGehee, Stanford Univ. (United States). [7416-61]

Morphology-dependent photocarrier generation and recombination dynamics in donor-acceptor bulk heterojunctions for OPV applications, Nikos Kopidakis, William L. Rance, Benjamin L. Rupert, Muhammed E. Kose, National Renewable Energy Lab. (United States); Alexandre M. Nardes, Sean E. Shaheen, Univ. of Denver (United States). [7416-62]

Solvent effect on the morphology of P3HT/PCBM films, Yu Xie, Pavel Dutta, Dorin Cengher, Venkat BommiSETTY, Jing Li, David W. Galipeau, Qiquan Qiao, South Dakota State Univ. (United States). [7416-63]

Characterization and electro-optical modeling of the role of layer interfaces in organic photovoltaic device function, David M. Huang, Adam J. Moulé, Univ. of California, Davis (United States); Anne Köhnen, Hans Lademann, Klaus Meerholz, Univ. zu Köln (Germany). [7416-64]

Cross-linked organosilicate hole transport interlayers for organic photovoltaics, Younhee Lim, Do Young Jang, Insun Park, Sangtaik Noh, Seoul National Univ. (Korea, Republic of); Joo Hyun Kim, Pukyong National Univ. (Korea, Republic of); Changhee Lee, Do Yeung Yoon, Seoul National Univ. (Korea, Republic of). [7416-65]

Comparison of hybrid bulk heterojunction photovoltaic cells based on ZnO nanoparticles with different semiconducting polymers, Insun Park, Xin-Ran Zhang, Sangtaik Noh, Seunguk Noh, Seoul National Univ. (Korea, Republic of); Don Cho, Klaus Müllen, Max-Planck-Institut für Polymerforschung (Germany); Changhee Lee, Do Yeung Yoon, Seoul National Univ. (Korea, Republic of). [7416-66]

Harvesting lost photons: minimizing subbandgap losses in organic photovoltaic devices by up-conversion, Sébastien Loranger, David Banville, Ecole Polytechnique de Montréal (Canada); Dmitrii F. Perepichka, McGill Univ. (Canada); Federico Rosei, Institut National de la Recherche Scientifique (Canada); Clara Santato, Ecole Polytechnique de Montréal (Canada). [7416-67]

Ultra-thin films of titanium oxide via UV-assisted decomposition of sol-gel precursors: potential as tandem-cell interlayers and encapsulation layers in organic photovoltaic devices, Delvin Tadytin, Diogenes Placencia, Neal R. Armstrong, The Univ. of Arizona (United States). [7416-68]

Interface layer effects on polymer solar cells, Franky So, Univ. of Florida (United States). [7416-70]

The effect of molybdenum oxide interlayer on organic photovoltaic cells, Franky So, Univ. of Florida (United States). [7416-71]

Inorganic hole transport layers for organic photovoltaics, Dana C. Olson, Joseph J. Berry, Brian A. Bailey, N. Edwin Widjonarko, David S. Ginley, National Renewable Energy Lab. (United States). [7416-72]

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: Zakya H. Kafafi, National Science Foundation

8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)

9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)

9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)

Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am

10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)

11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 6F Wed. 1:30 to 3:20 pm

Towards the Commercialization of Organic Solar Cells

Session Chair: Zakya H. Kafafi, National Science Foundation

1:30 pm: **Commercialization of organic solar cells (Invited Paper)**, Claudia N. Hoth, Andrea Seemann, Roland Steim, Konarka Technologies GmbH (Germany); Tayebeh Ameri, Hamed Azimi, Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria). [7416-13]

1:55 pm: **Degradation and stability of R2R manufactured polymer solar cells**, Kion Norrman, Frederik C. Krebs, Technical Univ. of Denmark (Denmark). [7416-73]

2:15 pm: **Recent development on polymer solar cell materials and devices: route to commercialization (Invited Paper)**, Gang Li, SOLARMER Energy, Inc. (United States). [7416-15]

2:40 pm: **Area-scaling of the performance of organic solar cells**, Seungkeun Choi, William J. Potscavage, Jr., Bernard Kippelen, Georgia Institute of Technology (United States). [7416-16]

3:00 pm: **Efficient and long-term stable organic vacuum deposited tandem solar cells**, Bert Maennig, Martin P. Pfeiffer, Christian L. Uhrich, Karsten Walzer, Wolf-Michael Gnehr, Gregor Schwartz, Stefan Sonntag, Oliver Erfurth, Eginhard Wollrab, heliatek GmbH (Germany). [7416-17]

Coffee Break 3:20 to 3:50 pm

SESSION 6

Room: Conv. Ctr. 6F Wed. 3:50 to 5:35 pm

Stability and Degradation Processes in Organic Solar Cells

Session Chair: Steve Hogan, Spire Corp.

Joint Session with Conference 7412: Reliability of Photovoltaic Cells, Modules, Components, and Systems II

3:50 pm: **Stability investigations of organic photovoltaics (Invited Paper)**, Jens A. Hauch, Andrea Seemann, Christoph J. Brabec, Konarka Technologies GmbH (Germany); Russell A. Gaudiana, Steven Wicks, Richard Childers, Konarka Technologies, Inc. (United States). [7412-13]

4:15 pm: **Shelf lifetime study of unencapsulated organic and hybrid photovoltaic devices**, Matthew T. Lloyd, Sandia National Labs. (United States); Dana C. Olson, Matthew O. Reese, National Renewable Energy Lab. (United States); Erica Fang, Diana L. Moore, James A. Voigt, Julia W. P. Hsu, Sandia National Labs. (United States). [7416-18]

4:35 pm: **A low temperature hybrid encapsulation method for organic solar cells**, Samuel Graham, Namsu Kim, William J. Potscavage, Jr., Benoit Domercq, Bernard Kippelen, Georgia Institute of Technology (United States) . . . [7416-19]

4:55 pm: **Examination of the degradation in organic photovoltaic active layers**, Matthew O. Reese, Nikos Kopidakis, David S. Ginley, National Renewable Energy Lab. (United States) . . . [7416-20]

5:15 pm: **Real time measurement of the structural change in P3HT:PCBM thin films and the relation with device performance in OPV cells**, Hyo Jung Kim, Jang-Joo Kim, Seoul National Univ. (Korea, Republic of); Hyun Hwi Lee, Pohang Univ. of Science and Technology (Korea, Republic of) . . . [7416-21]

Thursday 6 August

SESSION 7

Room: Conv. Ctr. 6F Thurs. 8:00 to 10:00 am

Bulk Heterojunction Solar Cells: Performance and Morphology

Session Chair: Paul A. Lane, Naval Research Lab.

8:00 am: **High efficiency polymer solar cells with internal quantum efficiency approaching 100%** (*Invited Paper*), Kwanghee Lee, Sung Heum Park, Univ. of California, Santa Barbara (United States); Mario Leclerc, Univ. Laval (Canada); Alan J. Heeger, Univ. of California, Santa Barbara (United States) . . . [7416-22]

8:25 am: **Bulk vs surface recombination in polymer:fullerene solar cells**, Carsten Deibel, Andreas Baumann, Alexander Wagenpfahl, Julius-Maximilians-Univ. of Würzburg (Germany); Daniel Rauh, Vladimir Dyakonov, Julius-Maximilians-Univ. of Würzburg (Germany) and Bavarian Ctr. for Applied Energy Research E.V. (Germany) . . . [7416-23]

8:40 am: **Charge density measurements on polymer/fullerene solar cells and some implications for electric field, recombination, and IV modeling** (*Invited Paper*), Brian C. O'Regan, James Durrant, Christopher G. Shuttle, Imperial College London (United Kingdom) . . . [7416-24]

9:05 am: **Organic/organic heterojunctions: issues leading to control of open-circuit photopotential in organic solar cells**, Weining Wang, Brian Zacher, Diogenes Placencia, Erin Ratcliff, Neal R. Armstrong, The Univ. of Arizona (United States) . . . [7416-25]

9:20 am: **Photovoltaic devices based on polymer-fullerene blends: materials and processing** (*Invited Paper*), David G. Lidzey, The Univ. of Sheffield (United Kingdom) . . . [7416-26]

9:45 am: **Nano-morphology versus Voc in organic bulk heterojunction solar cells**, Jean V. Manca, Koen Vandewal, Abay Gadisa, Wibren Oosterbaan, Sabine Bertho, Univ. Hasselt (Belgium); Laurence J. Lutsen, IMEC (Belgium); Dirk J. M. Vanderzande, Univ. Hasselt (Belgium) . . . [7416-27]

Coffee Break 10:00 to 10:30 am

SESSION 8

Room: Conv. Ctr. 6F Thurs. 10:30 am to 12:00 pm

Hybrid and Dye-sensitized Organic Solar Cells

Session Chair: Barry P. Rand, IMEC (Belgium)

10:30 am: **Applications of metal oxides in organic photovoltaics** (*Invited Paper*), Dana C. Olson, Joseph J. Berry, Matthew S. White, Brian A. Bailey, N. Edwin Widjonarko, David S. Ginley, National Renewable Energy Lab. (United States) . . . [7416-28]

10:55 am: **Efficient photo-induced charge injection in Zn-Zn porphyrin dimer-sensitized TiO₂ solar cells: towards 3-dimensional light harvesting** (*Invited Paper*), Attila J. Mozer, Univ. of Wollongong (Australia) . . . [7416-29]

11:20 am: **Highly efficient dye-sensitized solar cells** (*Invited Paper*), Liyuan Han, National Institute for Materials Science (Japan) . . . [7416-30]

11:45 am: **Highly efficient dye-sensitized solar cells using novel phenothiazine dyes**, Zhibin Xie, Anupam Midya, Kian Ping Loh, Stefan Adams, Daniel J. Blackwood, John Wang, Xuanjun Zhang, National Univ. of Singapore (Singapore); Zhikuan Chen, A*STAR Institute of Materials Research and Engineering (Singapore) . . . [7416-31]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 9

Room: Conv. Ctr. 6F Thurs. 1:30 to 3:30 pm

Novel Concepts and Structures for Organic Solar Cells

Session Chair: Brian C. O'Regan, Imperial College London (United Kingdom)

1:30 pm: **Electrical properties of transparent interelectrodes for tandem organic solar cells** (*Invited Paper*), Changhee Lee, Seoul National Univ. (Korea, Republic of) . . . [7416-32]

1:56 pm: **Characterisation of organic tandem solar cells**, Moritz K. Riede, Rico Schueppel, Ronny Timmreck, Jan Meiss, André Merten, Karl Leo, Technische Univ. Dresden (Germany) . . . [7416-33]

2:13 pm: **Semi-transparent inverted organic solar cells**, Hans Schmidt, Thomas Winkler, Markus Tilgner, Harald Fluegge, Stephan Schmale, Tim Buelow, Jens Meyer, Thomas Riedl, Hans H. Johannes, Wolfgang Kowalsky, Technische Univ. Braunschweig (Germany) . . . [7416-34]

2:30 pm: **Sensitized phosphorescence and its application to bulk heterojunction solar cells** (*Invited Paper*), Barry P. Rand, Claudio Grotto, Alexander Mityashin, Afshin Hadipour, Paul L. Heremans, Jan Genoe, IMEC (Belgium) . . . [7416-35]

2:56 pm: **Advances in fiber-based photovoltaics**, David L. Carroll, Jiwen Liu, Wei Zhou, Yuan Li, Wanyi Nie, Wake Forest Univ. (United States) . . . [7416-36]

3:13 pm: **Fully solution-processed organic solar cells on metal foil substrates**, Whitney Gaynor, Jung-Yong Lee, Peter Peumans, Stanford Univ. (United States) . . . [7416-37]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC910 Design and Reliability of Photovoltaic Modules (Dhere, Wohlgemuth)
Tuesday, 1:30 to 5:30 pm

Conference 7417

Monday-Wednesday 3-5 August 2009 • Proceedings of SPIE Vol. 7417

Organic Field-Effect Transistors VIII

Conference Chairs: **Zhenan Bao**, Stanford Univ.; **Iain McCulloch**, Imperial College London (United Kingdom)

Conference Cosponsors:



CORNING



Monday 3 August

SESSION 1

Room: Conv. Ctr. 7A Mon. 8:15 to 10:05 am

Materials I

Session Chair: **Antonio F. Facchetti**, Polyera Corp.

8:15 am: **Structural effects in naphthalene diimide-based organic thin-film transistors** (*Invited Paper*), Deepak Shukla, Eastman Kodak Co. (United States) [7417-01]

8:40 am: **Conductors and semiconductors for advanced organic electronics**, Timo Meyer-Friedrichsen, Andreas Elschner, H.C. Starck GmbH (Germany); Frank L. Keohan, H.C. Starck Inc. (United States); Wilfried Lövenich, H.C. Starck GmbH (Germany); Sergei A. Ponomarenko, Institute of Synthetic Polymeric Materials (Russian Federation) [7417-02]

8:55 am: **Solution processable polymeric semiconductor with high oxidation stability: alternating copolymers containing bithiophene and dialkoxynaphthalene**, Chan-Eon Park, Pohang Univ. of Science and Technology (Korea, Republic of); Soon-Ki Kwon, Gyeongsang National Univ. (Korea, Republic of); Dae Sung Chung, Pohang Univ. of Science and Technology (Korea, Republic of); Jong Won Park, Gyeongsang National Univ. (Korea, Republic of) [7417-03]

9:10 am: **Triindole based single crystals and thin films for OLED and OFET applications**, Eva M. García-Frutos, Consejo Superior de Investigaciones Científicas (Spain); Carmen Coya, Univ. Rey Juan Carlos (Spain); Alicia de Andrés, Consejo Superior de Investigaciones Científicas (Spain); Rafael Ramirez, Univ. Carlos III de Madrid (Spain); Rocio Martinez-Morillas, Rafael Ramirez, Pedro de Andres, Enrique Gutierrez-Puebla, Angeles Monge, Berta Gómez-Lor, Consejo Superior de Investigaciones Científicas (Spain) [7417-04]

9:25 am: **Herringbone structured thin films of alkyl-substituted pentacenes and FET performance** (*Invited Paper*), Takashi Minakata, Yutaka Natsume, K. Nagata, T. Saeki, H. Tateishi, M. Matsunaga, Masahiro Tojo, K. Sakabe, S. Tonomura, M. Yakiyama, Y. Naruta, Asahi Kasei EMD Corp. (Japan) [7417-05]

9:50 am: **Bracketing pentacene: organic semiconductors based on tetracene and hexacene**, John E. Anthony, Adolphus G. Jones, Balaji Purushothaman, Sean R. Parkin, Univ. of Kentucky (United States); Oana D. Jurchescu, David J. Gundlach, National Institute of Standards and Technology (United States); Thomas N. Jackson, The Pennsylvania State Univ. (United States) [7417-06]

Coffee Break 10:05 to 10:35 am

SESSION 2

Room: Conv. Ctr. 7A Mon. 10:35 am to 12:25 pm

Materials II

Session Chair: **Iain McCulloch**, Imperial College London (United Kingdom)

10:35 am: **Solution-processed n-channel organic thin film transistors with mobility higher than 1.5 cm²/Vs** (*Invited Paper*), He Yan, Antonio F. Facchetti, Polyera Corp. (United States) [7417-07]

11:00 am: **Donor-acceptor conjugated polymers for organic field-effect transistors** (*Invited Paper*), Mark D. Watson, Xugang Guo, Univ. of Kentucky (United States); Felix S. Kim, Samson A. Jenekhe, Univ. of Washington (United States) [7417-08]

11:25 am: **Molecular design and process strategy towards high performance n-channel organic field-effect transistors**, Joon Hak Oh, Stanford Univ. (United States); Rüdiger Schmidt, Frank Würthner, Univ. Würzburg (Germany); Zhenan Bao, Stanford Univ. (United States) ... [7417-09]

11:40 am: **Synthesis and characterization of α -, α' -modified, β -, β' -alkyl disubstituted fused thienoacenes**, Weijun Niu, Mingqian He, Michael L. Sorensen, Thomas M. Leslie, Corning Inc. (United States) [7417-10]

11:55 am: **High performance organic field effect transistor based on polythiophene derivatives with side chain conjugation system**, Dong Hoon Lee, Chan-Eon Park, Pohang Univ. of Science and Technology (Korea, Republic of); Soon-Ki Kwon, Gyeongsang National Univ. (Korea, Republic of) . [7417-11]

12:10 pm: **Solution-processed organic field-effect transistors composed of poly(4-styrene sulfonate) wrapped multi-walled-carbon-nanotube source/drain electrodes**, Kipyo Hong, Chan-Eon Park, Pohang Univ. of Science and Technology (Korea, Republic of) [7417-12]

Lunch Break 12:25 to 1:25 pm

SESSION 3

Room: Conv. Ctr. 7A Mon. 1:25 to 3:25 pm

Materials III

Session Chair: **Zhenan Bao**, Stanford Univ.

1:25 pm: **Structure vs. property relationships in high mobility fused thiophene polymers** (*Invited Paper*), Mingqian He, Jianfeng Li, Feixia Zhang, Michael L. Sorensen, Corning Inc. (United States); Hon Hang Fong, Vladimir A. Pozdin, George G. Malliaras, Cornell Univ. (United States) [7417-13]

1:50 pm: **Solution-processed organic single crystals exhibit high mobilities** (*Invited Paper*), Alejandro L. Briseno, Univ. of Massachusetts Amherst (United States) [7417-23]

2:15 pm: **Evaluation of quaterthiophene-OFET prepared by solution-method**, Shizuyasu Ochiai, Yosuke Kitajima, Kenzo Kojima, Teruyoshi Mizutani, Aichi Institute of Technology (Japan) [7417-15]

2:30 pm: **Using Langmuir-Blodgett to study the effect of the phase and density of the OTS modification layer on OFET performance**, Ajay A. Virkar, Stanford Univ. (United States); Stefan C. B. Mannsfeld, Stanford Linear Accelerator Ctr. (United States); Yutaka Ito, Toppan Printing Co., Ltd. (Japan); Michael F. Toney, Stanford Linear Accelerator Ctr. (United States); Zhenan Bao, Stanford Univ. (United States) [7417-16]

2:45 pm: **Functionalized triindoles as a new class of p-type organic semiconductors**, Berta Gómez-Lor, Eva M. García-Frutos, Consejo Superior de Investigaciones Científicas (Spain) [7417-17]

3:00 pm: **High performance organic thin-film transistors based on molecular materials** (*Invited Paper*), Yunqi Liu, Chongan Di, Yugeng Wen, Dacheng Wei, Yunlong Guo, Ying Liu, Gui Yu, Wenping Hu, Institute of Chemistry (China) [7417-18]

Coffee Break 3:25 to 3:55 pm

SESSION 4

Room: Conv. Ctr. 7A Mon. 3:55 to 5:15 pm

Fabrication and Characterization

Session Chair: **Michael L. Chabinye**, Univ. of California, Santa Barbara

3:55 pm: **Characteristics of small molecule-polymer blend semiconductors and high-k polymer dielectric for organic thin film transistors** (*Invited Paper*), Do Yeung Yoon, Seoul National Univ. (Korea, Republic of) [7417-19]

4:20 pm: **Molecular characterization of organic semiconductors for thin film transistors** (*Invited Paper*), Lee J. Richter, National Institute of Standards and Technology (United States) [7417-20]

4:45 pm: **Solvent-free processing of poly(3-hexylthiophene) into high-mobility structures**, Natalie Stingelin-Stutzmann, Imperial College London (United Kingdom) and ETH Zürich (Switzerland) [7417-21]

5:00 pm: **Effects of solvent, thermal annealing, surface treatment and side chains for high performance fused thiophene polymers**, Jianfeng Li, Mingqian He, Feixia Zhang, Michael L. Sorensen, Corning Inc. (United States); Hon Hang Fong, Vladimir A. Pozdin, George G. Malliaras, Cornell Univ. (United States) [7417-22]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. 7A Tues. 8:15 to 10:00 am

Devices I

Session Chair: **David J. Gundlach**, National Institute of Standards and Technology

8:15 am: **Charge transport physics of high mobility organic semiconductors** (*Invited Paper*), Tomo Sakanoue, Henning Sirringhaus, Univ. of Cambridge (United Kingdom) [7417-24]

8:40 am: **Precise structure of pentacene monolayers on amorphous silicon oxide and relation to charge transport**, Stefan C. B. Mannsfeld, Stanford Linear Accelerator Ctr. (United States); Ajay A. Virkar, Colin C. Reese, Stanford Univ. (United States); Michael F. Toney, Stanford Linear Accelerator Ctr. (United States); Zhenan Bao, Stanford Univ. (United States) [7417-25]

8:55 am: **Printed pentacene transistors** (*Invited Paper*), Gerwin H. Gelinck, TNO Science and Industry (Netherlands) [7417-26]

9:20 am: **Effect of intergrain defects on transport in semicrystalline polymeric semiconductors**, Alberto Salleo, Leslie H. Jimison, Chenchen Wang, Stanford Univ. (United States); Michael F. Toney, SLAC National Accelerator Lab. (United States); Alexander Ziegler, Max-Planck-Institut für Biochemie (Germany); Martin J. Heeney, Queen Mary, Univ. of London (United Kingdom); Iain McCulloch, Imperial College London (United Kingdom) [7417-27]

9:35 am: **Inkjet-printed single-droplet transistors based on polythiophene nanowires embedded in insulating polymer** (*Invited Paper*), Kilwon Cho, Jung Ah Lim, Juhyun Kim, Longzhen Qiu, Wi Hyoung Lee, Pohang Univ. of Science and Technology (Korea, Republic of) [7417-28]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. 7A Tues. 10:30 am to 12:15 pm

Applications I

Session Chair: **Henning Sirringhaus**, Univ. of Cambridge (United Kingdom)

10:30 am: **A flexible electrophoretic panel driven by organic TFTs** (*Invited Paper*), Tang-Shiang Hu, Industrial Technology Research Institute (Taiwan) [7417-29]

10:55 am: **High-performance organic thin-film transistors for flexible displays** (*Invited Paper*), Shizuo Tokito, NHK Science & Technical Research Labs. (Japan) [7417-30]

11:20 am: **An ultra-thin flex-OLED driven by OTFT backplane manufactured using a scalable process** (*Invited Paper*), Mao Katsuhara, Iwao Yagi, Makoto Noda, Nobukazu Hirai, Toshiki Moriwaki, Ryoichi Yasuda, Shinichi Ushikura, Ayaka Imaoka, Akira Yumoto, Tetsuo Urabe, Kazumasa Nomoto, Sony Corp. (Japan) [7417-31]

11:45 am: **Enhanced crystal germination of solution-processable semiconductors on polymer-brush coupled dielectrics**, Hoichang Yang, Inha Univ. (Korea, Republic of); John E. Anthony, Univ. of Kentucky (United States) [7417-33]

12:10 pm: **Micrometer sized organic single crystals, anisotropic transport and field-effect transistors**, Wenping Hu, Institute of Chemistry (China) [7417-32]

Lunch/Exhibition Break 12:15 to 1:15 pm

SESSION 7

Room: Conv. Ctr. 7A Tues. 1:15 to 2:55 pm

Applications II

Session Chair: **Gerwin H. Gelinck**, TNO Science and Industry (Netherlands)

1:15 pm: **Printed transistors for low-cost electronics: the confluence of printing and printable electronic materials** (*Invited Paper*), Vivek Subramanian, Alejandro de la Fuente Vornbrock, Steven E. Molesa, Daniel Soltman, Huai-Yuan Tseng, Steven K. Volkman, Univ. of California, Berkeley (United States) [7417-34]

1:40 pm: **Organic complementary inverters and non-volatile memory elements based on ferroelectric field-effect transistors**, Tse Nga Ng, Sanjiv Sambandan, Robert A. Street, Rene Lujan, Ana Claudia Arias, Palo Alto Research Center, Inc. (United States); Christopher Newman, He Yan, Antonio Fachetti, Polyera Corp. (United States) [7417-35]

1:55 pm: **Solution processed low-voltage organic transistors and circuits based on self-assembled monolayer gate dielectrics**, James M. Ball, Paul H. Wöbkenberg, Florian Colléaux, Donal D. C. Bradley, Thomas D. Anthopoulos, Imperial College London (United Kingdom) [7417-36]

2:10 pm: **High-speed growth of pentacene thin films by linear organic vapor phase deposition**, Cédric Rolin, Soeren Steudel, Peter Vicca, Jan Genoe, IMEC (Belgium); Paul L. Heremans, IMEC (Belgium) and Katholieke Univ. Leuven (Belgium) [7417-37]

2:25 pm: **Low-voltage flexible organic complementary inverters with high noise margin and high dc gain**, Xiaohong Zhang, William J. Potscavage, Jr., Seungkeun Choi, Bernard Kippelen, Georgia Institute of Technology (United States) [7417-38]

2:40 pm: **Frequency response in vertical-type metal-base organic transistor**, Ken-ichi Nakayama, Yamagata Univ. (Japan); Ryuzo Yamamoto, Osaka Univ. (Japan); Makoto Ouchi, Yong-Jin Pu, Junji Kido, Yamagata Univ. (Japan); Masaaki Yokoyama, Osaka Univ. (Japan) [7417-39]

Coffee Break 2:55 to 3:25 pm

Conference 7417

SESSION 8

Room: Conv. Ctr. 7A Tues. 3:25 to 5:30 pm

Devices II

Session Chair: **Alberto Salleo**, Stanford Univ.

- 3:25 pm: **Electrolyte-gated organic transistors: electrochemical vs. field-effect mode of operation** (*Invited Paper*), Magnus Berggren, Xavier Crispin, Linköping Univ. (Sweden); David Nilsson, Acreo AB (Sweden); Lars Herlogsson, Elias Said, Linköping Univ. (Sweden); Henning Sirringhaus, Ni Zhao, Univ. of Cambridge (United Kingdom); Yong-Young Noh, Electronics and Telecommunications Research Institute (Korea, Republic of) [7417-40]
- 3:50 pm: **Interfacial effects at polymer dielectrics in thin film transistors**, Michael L. Chabinyk, Justin Cochran, Univ. of California, Santa Barbara (United States); Michael F. Toney, Stanford Linear Accelerator Ctr. (United States); Iain McCulloch, Imperial College London (United Kingdom); Martin J. Heeney, Queen Mary, Univ. of London (United Kingdom) [7417-41]
- 4:05 pm: **Self-assembled monolayers on organic semiconductors: composition, growth mechanism, transport and optical properties** (*Invited Paper*), Vitaly Podzorov, Rutgers Univ. (United States) [7417-42]
- 4:30 pm: **Preparation of crystalline dielectric modification silane layer by spin-coating and its improvements on organic transistor performance**, Yutaka Ito, Toppan Printing Co., Ltd. (Japan); Ajay A. Virkar, Stefan C. B. Mannsfeld, Stanford Univ. (United States); Jason Locklin, Univ. of Georgia (United States); Zhenan Bao, Stanford Univ. (United States) [7417-43]
- 4:45 pm: **Characterizing the interfacial composition of organic bulk heterojunction solar cells using organic thin-film transistor analogues**, Calvin K. Chan, David S. Germack, Behrang H. Hamadani, Lee J. Richter, Dean M. DeLongchamp, David J. Gundlach, National Institute of Standards and Technology (United States) [7417-44]
- 5:00 pm: **Quasi one-dimensional transport in doped PBTTT and PBTTT thin film transistors**, Jonathan D. Yuen, Univ. of California, Santa Barbara (United States); Reghu Menon, Indian Institute of Science (India); Nelson E. Coates, Ebinazar B. Namdas, Shinuk Cho, Daniel A. Moses, Alan J. Heeger, Univ. of California, Santa Barbara (United States) [7417-45]
- 5:15 pm: **High electron mobility and ambient stability in solution-processed perylene-based organic field effect transistors**, Claudia Piliago, Lawrence Berkeley National Lab. (United States) and Zernike Institute for Advanced Materials (Netherlands); Dorota Jarzab, Univ. of Groningen (Netherlands); Zhihua Chen, Antonio F. Facchetti, Polyera Corp. (United States); Maria A. Loi, Univ. of Groningen (Netherlands) [7417-46]

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

- Studies of organic complementary inverters with pentacene and PTCDI-C₁₃H₂₇**, Wei-Yang Chou, Bo-Liang Yeh, Yu-Hao Chen, Tzu-Hsiu Chou, National Cheng Kung Univ. (Taiwan) [7417-47]
- Surface energy patterning for inkjet printing in device fabrication**, Jian Lin, Åbo Akademi Univ. (Finland) and Tampere Univ. of Technology (Finland); Ronald Österbacka, Åbo Akademi Univ. (Finland) [7417-48]
- Pentacene Organic Field Effect Transistor working in water for biosensing applications**, Junhyuk Jang, Jang-Joo Kim, Seoul National Univ. (Korea, Republic of) [7417-49]
- The geometry effect on threshold voltage of top-contact and bottom contact pentacene based thin film transistors**, Yu Wu Wang, National Changhua Univ. of Education (Taiwan) [7417-50]
- Structural and electrical characteristics of small molecule-polymer blend semiconductors for organic thin film transistors**, Nayool Shin, Jihoon Kang, Seoul National Univ. (Korea, Republic of); John E. Anthony, Univ. of Kentucky (United States); Dean M. DeLongchamp, R. Joseph Klaine, Vivek M. Prabhu, Lee J. Richter, David J. Gundlach, National Institute of Standards and Technology (United States); Do Yeung Yoon, Seoul National Univ. (Korea, Republic of) [7417-51]

Wednesday 5 August

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: **Zakya H. Kafafi**, National Science Foundation

- 8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)
- 9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)
- 9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)
- Coffee Break/Best Student Paper Award Announcement . 10:00 to 10:30 am
- 10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)
- 11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)
- 11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

See page 21-22 for presentation details.

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Conference 7418

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7418

Organic Semiconductors in Sensors and Bioelectronics II

Conference Chair: **Ruth Shinar**, Iowa State Univ. Conference Co-Chair: **George G. Malliaras**, Cornell Univ.

Program Committee: **Magnus Berggren**, Linköpings Univ. (Sweden); **Graciela B. Blanchet**, Nano-Terra, Inc.; **Emil J. W. List**, Technische Univ. Graz (Austria); **Roisin Owens**, Cornell Univ.; **Franky So**, Univ. of Florida; **Luisa Torsi**, Univ. degli Studi di Bari (Italy)

Tuesday 4 August

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

OLED-based ZnO sensing platform, Yuankun Cai, Joseph Shinar, Ruth Shinar, Iowa State Univ. (United States) [7418-26]

Design and analysis of OLED-based lab on CD for multianalyte biosensing, Srikanth Vengasandra, Yuankun Cai, David Grewell, Joseph Shinar, Ruth Shinar, Iowa State Univ. (United States) [7418-27]

Chemical vapor sensors based on polybenzobisoxazole thin film transistors, Daniel G. Putnam, Jared F. Mike, Malika Jeffries-El, Sumit Chaudhary, Iowa State Univ. (United States) [7418-28]

Wednesday 5 August

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: **Zakya H. Kafafi**, National Science Foundation

8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)

9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)

9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)

Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am

10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)

11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

See page 21-22 for presentation details.

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 1

Room: Conv. Ctr. 16B Wed. 1:30 to 3:10 pm

Organic Semiconductors in Sensors and Bioelectronics I

Session Chair: **Ioannis Kyriassis**, Massachusetts Institute of Technology

1:30 pm: **Ultrathin, functionalized organic semiconductor films for fast, selective phosphonate vapor sensing** (*Invited Paper*), Howard E. Katz, Jia Huang, Kevin C. See, Thomas Dawidczyk, The Johns Hopkins Univ. (United States) [7418-01]

2:00 pm: **Solid-state dendrimer sensors**, Paul L. Burn, Homar Barcena, Hamish Cavaye, Paul Meredith, The Univ. of Queensland (Australia); Ifor D. W. Samuel, Univ. of St. Andrews (United Kingdom) [7418-02]

2:20 pm: **Semiconducting polymers for sensing airborne chemicals** (*Invited Paper*), Christine K. Luscombe, Shane D. Boyd, Univ. of Washington (United States) [7418-03]

2:50 pm: **Melanins: bio-electronic materials**, Paul Meredith, Ben Powell, Jacques Bothma, Bernard Mostert, Paul L. Burn, The Univ. of Queensland (Australia) [7418-04]

Coffee Break 3:10 to 3:40 pm

SESSION 2

Room: Conv. Ctr. 16B Wed. 3:40 to 6:00 pm

Organic Semiconductors in Sensors and Bioelectronics II

Session Chair: **Howard E. Katz**, The Johns Hopkins Univ.

3:40 pm: **Luminescent conjugated oligothiophenes: real time in vivo imaging of biomolecules** (*Invited Paper*), Peter Nilsson, Linköping Univ. (Sweden) [7418-05]

4:10 pm: **Electrical control of cell density and morphology on conducting polymer surfaces**, Alwin M. D. Wan, Daniel J. Brooks, Claudia Fischbach-Teschl, George G. Malliaras, Cornell Univ. (United States) [7418-06]

4:30 pm: **Organic electronics to record and regulate cell signaling** (*Invited Paper*), Magnus Berggren, Edwin Jager, Klas Tybrandt, Daniel Simon, Linköping Univ. (Sweden); Agneta Richter Dahlfors, Barbara Canlon, Karin Larsson, Sindhulakshmi Kurup, Karolinska Institutet (Sweden) [7418-07]

5:00 pm: **Sniffing out cancer in the breath: detection of non-polar volatile compounds through carrier scattering in random networks of carbon nanotubes** (*Invited Paper*), Hossam Haick, Technion-Israel Institute of Technology (Israel) and The Russel Berrie Nanotechnology Institute, Technion (Israel); Peng Gang, Ulrike Tisch, Yael Zilberman, Technion-Israel Institute of Technology (Israel); Wojciech Pisula, Xinliang Feng, Klaus Müllen, Max-Planck-Institut für Polymerforschung (Germany) [7418-08]

5:30 pm: **Polymer biophotonic lab-on-chip devices with integrated organic semiconductor lasers** (*Invited Paper*), Timo Mappes, Christoph Vannahme, Univ. Karlsruhe (Germany); Soenke Klinkhammer, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe (Germany); Uli Lemmer, Mauno Schelb, Univ. Karlsruhe (Germany); Steven Lenhart, Juergen Mohr, Forschungszentrum Karlsruhe (Germany) [7418-09]

PHOTONICS

Conference 7418

Thursday 6 August

SESSION 3

Room: Conv. Ctr. 16B Thurs. 8:30 to 10:20 am

Organic Semiconductors in Sensors and Bioelectronics III

Session Chair: **Ananth Dodabalapur**, The Univ. of Texas at Austin

8:30 am: **Novel concepts for organic and inorganic (printed) sensor devices** (*Invited Paper*), Emil J. W. List, NanoTecCenter Weiz GmbH (Austria). [7418-10]

9:00 am: **Advances in OLED-based biosensors** (*Invited Paper*), Joseph Shinar, Srikanth Vengasandra, Yuankun Cai, Alan A. DiSpirito, David Grewell, Ruth Shinar, Iowa State Univ. (United States) [7418-11]

9:30 am: **The transient emission tail of OLEDs: implications for biological and chemical sensors**, Rui Liu, Zhengqing Gan, Yuankun Cai, Iowa State Univ. (United States); Alex Smith, Integrated Sensor Technologies, Inc. (United States); Ruth Shinar, Joseph Shinar, Iowa State Univ. (United States) [7418-12]

9:50 am: **Integrated sensors for point of care diagnostics** (*Invited Paper*), John C. de Mello, Imperial College London (United Kingdom). [7418-13]

Coffee Break 10:20 to 10:50 am

SESSION 4

Room: Conv. Ctr. 16B Thurs. 10:50 am to 12:00 pm

Organic Semiconductors in Sensors and Bioelectronics IV

Session Chair: **Emil J. W. List**, Technische Univ. Graz (Austria)

10:50 am: **Polymer-based photodetectors for structurally integrated OLED-based oxygen sensors**, Kanwar S. Nalwa, Aaron L. Thoeming, Ruth Shinar, Iowa State Univ. (United States); Rui Liu, Joseph Shinar, Ames Lab. (United States); Sumit Chaudhary, Iowa State Univ. (United States) [7418-14]

11:10 am: **Dual-beam, dual-channel 'on-chip' refractometers using organic light emitting diode light sources and organic photovoltaic detectors** (*Invited Paper*), Neal R. Armstrong, P. Alex Veneman, Erin Ratcliff, Dan M. Huebner, S. Scott Saavedra, The Univ. of Arizona (United States). . . [7418-15]

11:40 am: **Organic optoelectronic nanofibers**, Haifeng Yang, Liang Dong, Iowa State Univ. (United States) [7418-16]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 16B Thurs. 1:30 to 3:30 pm

Organic Semiconductors in Sensors and Bioelectronics V

Session Chair: **Paul L. Burn**, The Univ. of Queensland (Australia)

1:30 pm: **Ultrasensitive solution processed polymer photodetectors**, Xiong Gong, Univ. of California, Santa Barbara (United States) and CBrite Inc. (United States); Minghong Tong, Univ. of California, Santa Barbara (United States); Yangjun Xia, Wanzhu Cai, Yong Cao, South China Univ. of Technology (China); Gang Yu, Chan-Long Shieh, Boo Nilsson, Cbrite Inc. (United States); Alan J. Heeger, Univ. of California, Santa Barbara (United States) and CBrite Inc. (United States) [7418-17]

1:50 pm: **Printed circuit board integration and encapsulation of high-speed polymer photodiodes**, Sebastian Valouch, Celal M. Ögün, Siegfried W. Kettlitz, Uli Lemmer, Univ. Karlsruhe (Germany) [7418-18]

2:10 pm: **Biosensors: the next big thing for organic electronics?** (*Invited Paper*), Sang Y. Yang, Tae Hyuk Im, Fabio Cicoira, George G. Malliaras, Cornell Univ. (United States) [7418-19]

2:40 pm: **Highly photosensitive organic thin film transistors based on a composite of poly(3-hexylthiophene) and TiO₂ nanoparticles**, Feng Yan, Sheung Man Mok, The Hong Kong Polytechnic Univ. (Hong Kong, China) [7418-20]

3:00 pm: **Organic transistor chemical sensor device physics** (*Invited Paper*), Ananth Dodabalapur, Soumya Dutta, The Univ. of Texas at Austin (United States) [7418-21]

Coffee Break 3:30 to 4:00 pm

SESSION 6

Room: Conv. Ctr. 16B Thurs. 4:00 to 5:40 pm

Organic Semiconductors in Sensors and Bioelectronics VI

Session Chair: **Magnus Berggren**, Linköping Univ. (Sweden)

4:00 pm: **Engineering of organic electrochemical transistors for enzymatic sensing**, Fabio Cicoira, Cornell Univ. (United States) and CNR-IFN Trento (Italy); John A. DeFranco, Sang Y. Yang, George G. Malliaras, Cornell Univ. (United States) [7418-22]

4:20 pm: **Rapid detection of enteric pathogens using organic electrochemical transistors**, Abdurrahman Gumus, George G. Malliaras, Cornell Univ. (United States) [7418-23]

4:40 pm: **A locally amplified strain sensor using piezoelectric polymers and OFETs** (*Invited Paper*), Ioannis Kymissis, Yu-Jen Hsu, Columbia Univ. (United States) [7418-24]

5:10 pm: **Large-area stretchable organic transistor integrated circuits for sensor applications** (*Invited Paper*), Tsuyoshi Sekitani, Takao Someya, The Univ. of Tokyo (Japan). [7418-25]

Conference 7419A

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7419A

Infrared Detectors and Focal Plane Arrays X

Conference Chairs: Eustace L. Dereniak, College of Optical Sciences/The Univ. of Arizona; John P. Hartke, U.S. Military Academy; Paul D. LeVan, Air Force Research Lab.

Program Committee: Arvind I. D'Souza, DRS Sensors & Targeting Systems, Inc.; Sarath D. Gunapala, Jet Propulsion Lab.; John E. Hubbs, Ball Aerospace & Technologies Corp.; Herbert K. Pollehn, Army Research Lab.; Robert E. Sampson, I-Technology Applications; James A. Stobie, BAE Systems; William B. Weissbard, Teledyne Imaging Sensors

Tuesday 4 August

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Possibility of constructing a standard comparison for laser radiation based on a combined trap detector, Alexander Kovalev, Andrey Kotyuk, Sergey Moskaluk, All-Russian Research Institute for Optical and Physical Measurement (Russian Federation); Eugene Yankevich, Kompaniya Medkorporaziya (Russian Federation) [7419A-35]

Wednesday 5 August

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: Zakya H. Kafafi, National Science Foundation

8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)

9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)

9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)

Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am

10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)

11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

See page 21-22 for presentation details.

Thursday 6 August

SESSION 1

Room: Conv. Ctr. 17B Thurs. 8:30 to 10:10 am

Room Temperature Detector Materials

Session Chair: Paul D. LeVan, Air Force Research Lab.

Joint Session with Conference 7419B: Infrared Detector Devices and Photoelectronic Imagers IV

8:30 am: **Carbon nanotube-based non-cryogenic cooled spectrum IR detectors**, Ning Xi, Michigan State Univ. (United States) [7419A-01]

8:50 am: **Electrical properties of silver nanoparticles reinforced LiTaO₂:P(VDF-TrFE) composite films**, Ashok K. Batra, John C. Corda, Padmaja Guggilla, Mohan D. Aggarwal, Matthew E. Edwards, Alabama A&M Univ. (United States) [7419A-02]

9:10 am: **Design and development of nanostructure based antireflection coatings for EO/IR sensor applications**, Ashok K. Sood, Yash R. Puri, Magnolia Optical Technologies, Inc. (United States); Martin F. Schubert, David J. Poxson, Jong Kyu Kim, E. Fred Schubert, Rensselaer Polytechnic Institute (United States); Dennis L. Polla, Defense Advanced Research Projects Agency (United States); Martin B. Soprano, U.S. Army (United States) [7419B-03]

9:30 am: **Si integrated pyroelectric sensor array using epitaxial -Al₂O₃/Si substrates and epitaxial PZT thin films**, Daisuke Akai, Takahiro Sugai, Toyohashi Univ. of Technology (Japan); Kazuaki Sawada, Makoto Ishida, Toyohashi Univ. of Technology (Japan) and Japan Science and Technology Agency (Japan) [7419A-04]

9:50 am: **Pyroelectric nano-composite thin films containing triglycine sulfate nano-crystals with uniform polar orientation**, Michal Nitzani, Roman Yasinov, Shlomo Berger, Technion-Israel Institute of Technology (Israel) [7419A-05]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Conv. Ctr. 17B Thurs. 10:40 am to 12:00 pm

Spectral Sensors

Session Chair: Arvind I. D'Souza, DRS Sensors & Targeting Systems, Inc.

10:40 am: **The James Webb Space Telescope's near infrared focal plane array: recent test results**, Erin C. Smith, NASA Goddard Space Flight Ctr. (United States) [7419A-06]

11:00 am: **Infrared stokes imaging polarimeter using microbolometers**, Michael W. Kudenov, College of Optical Sciences, The Univ. of Arizona (United States); J. Larry Pezzaniti, Polaris Sensor Technologies, Inc. (United States); Eustace L. Dereniak, College of Optical Sciences, The Univ. of Arizona (United States); Grant R. Gerhart, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. (United States) [7419A-07]

11:20 am: **False signature reduction in infrared channeled spectropolarimetry**, Julia M. Craven, Michael W. Kudenov, Eustace L. Dereniak, College of Optical Sciences, The Univ. of Arizona (United States) [7419A-08]

11:40 am: **All-chalcogenide variable infrared filter**, Hasan E. Kondakci, Mecit Yaman, Ozlem Koylu, Aykutlu Dana, Mehmet Bayindir, Bilkent Univ. (Turkey) [7419A-09]

Lunch/Exhibition Break 12:00 to 1:30 pm

PHOTONICS

Conference 7419A

SESSION 3

Room: Conv. Ctr. 17B Thurs. 1:30 to 3:10 pm

Novel Detector Arrays

Session Chair: **John P. Hartke**, U.S. Military Academy

1:30 pm: **Barrier infrared detector**, David Z. Ting, Cory J. Hill, Alexander Soibel, Jean Nguyen, Sam A. Keo, Sarath D. Gunapala, Jet Propulsion Lab. (United States) [7419A-10]

1:50 pm: **Curvable silicon retinal prosthesis with multiple series-connected diodes per pixel**, Rostam Dinyari, Jim Loudin, Stanford Univ. (United States); Philip Huie, Stanford Univ. Medical Ctr. (United States); Alex F. A. Butterwick, Stanford Univ. (United States); Daniel V. Palanker, Stanford Univ. Medical Ctr. (United States); Peter Peumans, Stanford Univ. (United States) [7419A-11]

2:10 pm: **A thermal-electrically cooled quantum dot infrared photodetector with tunneling barrier**, Jarrod Vaillancourt, Applied NanoFemto Technologies, LLC (United States); Xuejun Lu, Univ. of Massachusetts Lowell (United States) [7419A-12]

2:30 pm: **Correlation between band structure and magneto-transport properties in medium-infrared detector II-VI superlattice**, Abdelhakim Nafidi, Hassan Chaib, Abdelhamid El Kaaouachi, Univ. Ibn Zohr (Morocco) . [7419A-13]

2:50 pm: **Exact offset voltage cancellation of sensitive IRFPA microbolometers by a novel feedback readout circuit**, Ou-Yang Mang, Yu-Ta Chen, Yao-Fang Hsieh, Ting-Wei Huang, National Central Univ. (Taiwan) [7419A-14]

Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Conv. Ctr. 17B Thurs. 3:40 to 5:00 pm

Unique Applications and Materials

Session Chair: **John E. Hubbs**, Ball Aerospace & Technologies Corp.

Joint Session with Conference 7419B: Infrared Detector Devices and Photoelectronic Imagers IV

3:40 pm: **On the dispersive properties of HgCdTe as a function of depth**, Vaidya Nathan, Air Force Research Lab. (United States); Yong Chang, Univ. of Illinois at Chicago (United States); Paul D. LeVan, Air Force Research Lab. (United States) [7419A-15]

4:00 pm: **IR detector response on ultra-fast laser irradiance**, Michael K. Rafailov, RICHER International LLC (United States) [7419A-16]

4:20 pm: **The research on spectral matching technique of low-light-level and infrared fusion optoelectronic detector**, Lei Liu, Yinghao Fan, Benkang Chang, Nanjing Univ. of Science & Technology (China) [7419A-17]

4:40 pm: **Design considerations using APD s for high resolution UV imaging applications**, Ashok K. Sood, Robert A. Richwine, Yash R. Puri, Magnolia Optical Technologies, Inc. (United States); Stuart B. Horn, Defense Advanced Research Projects Agency (United States); Raymond S. Balcerak, Raymond S. Balcerak, LLC (United States) [7419B-18]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC152 Infrared Focal Plane Arrays (Dereniak, Hubbs) Wednesday, 8:30 am to 12:30 pm

SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (Janesick) Tuesday, 8:30 am to 5:30 pm

SC959 Image Chain Modeling of Digital Camera Systems (Fiete) Wednesday, 8:30 am to 12:30 pm

Conference 7419B

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7419B

Infrared Detector Devices and Photoelectronic Imagers IV

Conference Chairs: **Randolph E. Longshore**, Raytheon Missile Systems (Retired); **Ashok K. Sood**, Magnolia Optical Technologies, Inc.

Program Committee: **Raymond S. Balcerak**, Raymond S. Balcerak, LLC; **Nibir K. Dhar**, Army Research Lab.; **Paul LoVecchio**, BAE Systems; **Meimei Z. Tidrow**, Missile Defense Agency; **Priyalal S. Wijewarnasuriya**, Army Research Lab.; **Jimmy Xu**, Brown Univ.; **Sung-Shik Yoo**, Northrop Grumman Electronic Systems

Tuesday 4 August

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Study on the short pulselength direct-detect laser reflective tomography imaging lidar, Jianfeng Sun, Xiaofeng Jin, Liren Liu, De'an Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7419B-28]

Study on corrective algorithms for reflective tomography laser radar imaging wavefront curvature, Xiaofeng Jin, Jianfeng Sun, Yi Sin Yan, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7419B-29]

Scene-based nonuniformity correction algorithm for MEMS-based uncooled IR image system, Liqun Dong, Xiaohua Liu, Yuejin Zhao, Mei Hui, Xiaoxiao Zhou, Beijing Institute of Technology (China) [7419B-30]

Quadrant photodiode for electronic processing, Alicia Vera, Univ. de Sonora (Mexico); Alejandro Diaz, Miguel Rocha, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Dainet Berman Mendoza, Univ. de Sonora (Mexico) [7419B-31]

Design of integrated eye tracker-display system for head mounted display applications, Yizhak David, Boris Apter, Nonel S. Thirer, Itzik Baal-Zedaka, Holon Institute of Technology (Israel); Uzi Efron, Ben-Gurion Univ. of the Negev (Israel) [7419B-32]

Ion implantation of B ions into CMT substrates and determination of optimum optical characteristics for making photodiode p-n structures in narrow (-band-) gap semiconductor material, Ruslana S. Udovyt'ska, Genadiy V. Kalisty, Vladimir V. Fedulov, V. E. Lashkaryov Institute of Semiconductor Physics (Ukraine) [7419B-33]

Wednesday 5 August

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: **Zakya H. Kafafi**, National Science Foundation

8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)

9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)

9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)

Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am

10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)

11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

See page 21-22 for presentation details.

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 17B Wed. 1:30 to 3:00 pm

Infrared Detector Technology

Session Chair: **Ashok K. Sood**, Magnolia Optical Technologies, Inc.

1:30 pm: **IRFPA technology utilizing HgCdTe/Si: successes and current roadblocks (Invited Paper)**, Gregory N. Brill, Army Research Lab. (United States) [7419B-19]

2:00 pm: **Development of silicon blocked impurity band detectors with integrated linear amplification**, Valentin P. Fedl, Max-Planck-Institut Halbleiterlabor (Germany); Lothar Barl, Gerhard Lutz, Lothar W. Strüder, Max-Planck-Institut für extraterrestrische Physik (Germany) [7419B-20]

2:20 pm: **Photoconductive gain in silicon for digital night-vision**, James E. Carey III, Homayoon Haddad, Martin U. Pralle, SiOnyx Inc. (United States) [7419B-21]

2:40 pm: **Near infrared single photon avalanche detector with negative feedback and self quenching**, Krishna R. Linga, Amplification Technologies, Inc. (United States) [7419B-22]

Coffee Break 3:00 to 3:30 pm

SESSION 6

Room: Conv. Ctr. 17B Wed. 3:30 to 5:20 pm

Imaging Technology

Session Chair: **Randolph E. Longshore**, Raytheon Missile Systems (Retired)

3:30 pm: **Phase retarders for optical communications**, Mohamad A. Habli, Hariri Canadian Univ. (Lebanon) [7419B-24]

3:50 pm: **Development of an EMCCD for LIDAR applications**, Bertrand De Monte, e2v semiconductors SAS (France) [7419B-25]

4:10 pm: **Decoding algorithm for the photon counting detectors based on the Vernier anode**, Hao Yang, Xi'an Institute of Optics and Precision Mechanics (China) [7419B-26]

4:30 pm: **Comparative study of MWIR and LWIR high operating temperature non-equilibrium photovoltaic HgCdTe devices**, Silviu Velicu, P. Y. Emelie, Michael Carmody, Christoph H. Grein, EPIR Technologies, Inc. (United States); Jamie D. Phillips, Univ. of Michigan (United States); Priyalal S. Wijewarnasuriya, Army Research Lab. (United States) [7419B-27]

4:50 pm: **Delta-doped back-illuminated CMOS imaging arrays: progress and prospects (Invited Paper)**, Michael E. Hoenk, Todd J. Jones, Matthew R. Dickie, Thomas J. Cunningham, Edward R. Blazewski, Shouleh Nikzad, Frank Greer, Jet Propulsion Lab. (United States) [7419B-34]

PHOTONICS

Conference 7419B

Thursday 6 August

SESSION 1

Room: Conv. Ctr. 17B Thurs. 8:30 to 10:10 am

Room Temperature Detector Materials

Session Chair: **Paul D. LeVan**, Air Force Research Lab.

Joint Session with Conference 7419A: Infrared Detectors and Focal Plane Arrays X

8:30 am: **Carbon nanotube-based non-cryogenic cooled spectrum IR detectors**, Ning Xi, Michigan State Univ. (United States). [7419A-01]

8:50 am: **Electrical properties of silver nanoparticles reinforced LiTaO₂:P(VDF-TrFE) composite films**, Ashok K. Batra, John C. Corda, Padmaja Guggilla, Mohan D. Aggarwal, Matthew E. Edwards, Alabama A&M Univ. (United States). [7419A-02]

9:10 am: **Design and development of nanostructure based antireflection coatings for EO/IR sensor applications**, Ashok K. Sood, Yash R. Puri, Magnolia Optical Technologies, Inc. (United States); Martin F. Schubert, David J. Poxson, Jong Kyu Kim, E. Fred Schubert, Rensselaer Polytechnic Institute (United States); Dennis L. Polla, Defense Advanced Research Projects Agency (United States); Martin B. Soprano, U.S. Army (United States) [7419B-03]

9:30 am: **Si integrated pyroelectric sensor array using epitaxial -Al₂O₃/Si substrates and epitaxial PZT thin films**, Daisuke Akai, Takahiro Sugai, Toyohashi Univ. of Technology (Japan); Kazuaki Sawada, Makoto Ishida, Toyohashi Univ. of Technology (Japan) and Japan Science and Technology Agency (Japan) [7419A-04]

9:50 am: **Pyroelectric nano-composite thin films containing triglycine sulfate nano-crystals with uniform polar orientation**, Michal Nitzani, Roman Yasinov, Shlomo Berger, Technion-Israel Institute of Technology (Israel) [7419A-05]

SESSION 4

Room: Conv. Ctr. 17B Thurs. 3:40 to 5:00 pm

Unique Applications and Materials

Session Chair: **John E. Hubbs**, Ball Aerospace & Technologies Corp.

Joint Session with Conference 7419A: Infrared Detectors and Focal Plane Arrays X

3:40 pm: **On the dispersive properties of HgCdTe as a function of depth**, Vaidya Nathan, Air Force Research Lab. (United States); Yong Chang, Univ. of Illinois at Chicago (United States); Paul D. LeVan, Air Force Research Lab. (United States). [7419A-15]

4:00 pm: **IR detector response on ultra-fast laser irradiance**, Michael K. Rafailov, RICHER International LLC (United States) [7419A-16]

4:20 pm: **The research on spectral matching technique of low-light-level and infrared fusion optoelectronic detector**, Lei Liu, Yinghao Fan, Benkang Chang, Nanjing Univ. of Science & Technology (China) [7419A-17]

4:40 pm: **Design considerations using APD s for high resolution UV imaging applications**, Ashok K. Sood, Robert A. Richwine, Yash R. Puri, Magnolia Optical Technologies, Inc. (United States); Stuart B. Horn, Defense Advanced Research Projects Agency (United States); Raymond S. Balcerak, Raymond S. Balcerak, LLC (United States) [7419B-18]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC152 Infrared Focal Plane Arrays (Dereniak, Hubbs) Wednesday, 8:30 am to 12:30 pm

SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (Janesick) Tuesday, 8:30 am to 5:30 pm

SC959 Image Chain Modeling of Digital Camera Systems (Fieta) Wednesday, 8:30 am to 12:30 pm

Conference 7420

Sunday-Wednesday 2-5 August 2009 • Proceedings of SPIE Vol. 7420

Photonic Fiber and Crystal Devices: Advances in Materials and Innovations in Device Applications III

Conference Chairs: **Shizhuo Yin**, The Pennsylvania State Univ.; **Ruyan Guo**, The Univ. of Texas at San Antonio

Program Committee: **Partha P. Banerjee**, Univ. of Dayton; **Joseph Grant**, NASA Stennis Space Ctr.; **Ken Yuh Hsu**, National Chiao Tung Univ. (Taiwan); **Rongqing Hui**, The Univ. of Kansas; **Yoonchan Jeong**, Univ. of Southampton (United Kingdom); **Suganda Jutamulia**, Univ. of Northern California; **Tsuyoshi Konishi**, Osaka Univ. (Japan); **Eckhard Kratzig**, Univ. Osnabrück (Germany); **Nichcolai V. Kuktarev**, Alabama A&M Univ.; **Ravindra B. Lal**, Alabama A&M Univ.; **Byoungcho Lee**, Seoul National Univ. (Korea, Republic of); **Sergei F. Lyuksyutov**, Univ. of Akron; **Karl M. Reichard**, The Pennsylvania State Univ.; **Gérald Roosen**, Institut d'Optique (France); **Paul B. Ruffin**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Ching-Cherng Sun**, National Central Univ. (Taiwan); **Xiang Zhang**, Univ. of California, Berkeley

Honorary Conference Chair: **Francis T. S. Yu**, The Pennsylvania State Univ. (United States)

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 15A Sun. 8:30 to 10:20 am

Photonic Materials I

Session Chairs: **Ruyan Guo**, The Univ. of Texas at San Antonio; **Richard G. Madonna**, Northrop Grumman Electronic Systems

8:30 am: **(SiC)_x(AlN)_{1-x} solid-solution grown by PVT method** (*Invited Paper*), Narsingh B. Singh, Brian P. Wagner, Andre Berghmans, David J. Knuteson, David A. Kahler, Sean McLaughlin, Northrop Grumman Electronic Systems (United States) [7420-01]

9:00 am: **On the static stability of the menisci in the case of semiconductor crystals grown by dewetted Bridgman technique**, Liliana Braescu, West Univ. of Timisoara (Romania) [7420-02]

9:20 am: **Development of infrared single-mode fibers for 2 wavelength bands of the DARWIN mission: test results of prototypes**, Lun-Kai Cheng, TNO Science and Industry (Netherlands) [7420-03]

9:40 am: **Broadband enhancement of light emission in silicon slot waveguides**, Young Chul Jun, Mark L. Brongersma, Stanford Univ. (United States) [7420-04]

10:00 am: **Photonic crystal based quantum Hadamard gate**, Rohit K. Ramakrishnan, Indian Institute of Science (India) and Cochin Univ. of Science & Technology (India); Srinivas Talabatulla, Indian Institute of Science (India) [7420-05]

Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Conv. Ctr. 15A Sun. 10:50 to 11:50 am

Photonic Materials II

Session Chair: **Partha P. Banerjee**, Univ. of Dayton

10:50 am: **Efficient frequency upconversion of erbium-doped metaphosphate glasses**, Márcio A. R. C. Alencar, Ricardo M. Romão, Univ. Federal de Alagoas (Brazil); Roger G. Fernandes, Gaël Y. Poirier, Univ. Federal de Alfenas (Brazil); Jandir M. Hickmann, Univ. Federal de Alagoas (Brazil) [7420-07]

11:10 am: **Negative refraction in visible region using nano-structured metallo-dielectric photonic crystal**, Monika Rajput, Ravindra K. Sinha, Swati Rawal, Delhi College of Engineering (India) [7420-08]

11:30 am: **Dispersion properties of chalcogenide photonic crystal fiber**, Bhawana Dabas, Ravindra K. Sinha, Anshu D. Varshney, Delhi College of Engineering (India) [7420-09]

Lunch Break 11:50 am to 1:30 pm

SESSION 3

Room: Conv. Ctr. 15A Sun. 1:30 to 3:20 pm

Photonic Devices I

Session Chair: **Abdalla M. Darwish**, Dillard Univ.

1:30 pm: **Enhanced electro-optic effect by engineering piezoelectric resonance processes**, Ruyan Guo, Robert McIntosh, Hongbo Liu, Amar S. Bhalla, The Univ. of Texas at San Antonio (United States) [7420-10]

1:50 pm: **Waveguide-based surface plasmon resonance sensor design** (*Invited Paper*), Byoungcho Lee, Sookyoung Roh, Joonku Hahn, Seoul National Univ. (Korea, Republic of) [7420-11]

2:20 pm: **Chi 3 dispersion in planar tantalum pentoxide waveguides in the telecoms window**, Ruiqi Chen, Martin D. B. Charlton, Pavlos G. Lagoudakis, Univ. of Southampton (United Kingdom) [7420-12]

2:40 pm: **Unique nonlinear optical properties of SiC:Ge:Fe waveguide for device applications**, Abdalla M. Darwish, Dillard Univ. (United States); Brent D. Koplitz, Tulane Univ. (United States); Hadi Alkahby, Chase Deniro, Dillard Univ. (United States) [7420-13]

3:00 pm: **Unidirectional coupler for surface plasmon polaritons**, Seong-Woo Cho, Junghyun Park, Byoungcho Lee, Seoul National Univ. (Korea, Republic of) [7420-14]

Coffee Break 3:20 to 3:50 pm

Conference 7420

SESSION 4

Room: Conv. Ctr. 15A Sun. 3:50 to 5:10 pm

Photonic Devices II

Session Chair: **Nichcolai V. Kuktarev**, Alabama A&M Univ.

3:50 pm: **Micro optical spatial and spectral elements**, Pradeep Srinivasan, CREOL, The College of Optics and Photonics (United States); Yigit O. Yilmaz, Eric G. Johnson, The Univ. of North Carolina at Charlotte (United States) [7420-15]

4:10 pm: **Transmission, reflection and absorption gratings in photorefractive polymers**, Partha P. Banerjee, Univ. of Dayton (United States); Gary Cook, Dean R. Evans, Jeremy M. Wofford, Elizabeth O'Gorman, Air Force Research Lab. (United States); Pierre A. Blanche, Jayan Thomas, Nasser N. Peyghambarian, College of Optical Sciences, The Univ. of Arizona (United States) [7420-16]

4:30 pm: **Use of dual-frequency excitation method to improve the accuracy of an optical current sensor**, Shuping Wang, Avinash Karri, Univ. of North Texas (United States); Yossi J. Harlev, Optisense Network, Inc. (United States) [7420-17]

4:50 pm: **Lens array modulation for the collinear holographic storage system**, Yeh-Wei Yu, Chih-Yuan Cheng, Ching-Cherng Sun, National Central Univ. (Taiwan) [7420-18]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 5

Room: Conv. Ctr. 15A Mon. 8:30 to 10:20 am

Photonic Application I

Session Chair: **Shizhuo Yin**, The Pennsylvania State Univ.

8:30 am: **Recent advances on IR supercontinuum source and its application (Invited Paper)**, Shizhuo Yin, The Pennsylvania State Univ. (United States); Paul B. Ruffin, Christina Brantley, Eugene Edwards, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. (United States); Claire Luo, General Opto Solutions, LLC (United States) [7420-19]

9:00 am: **Combined optical and electrical effects in ferroelectric crystal for high laser intensities**, Nichcolai V. Kuktarev, Tatiana V. Kukhtareva, Gregory Stargell, Jai-Ching Wang, Alabama A&M Univ. (United States) [7420-20]

9:20 am: **An all-fiber phase locking of fiber lasers**, Sami A. Shakir, William R. Culver, Burke E. Nelson, Yuji Starcher, Northrop Grumman Corp. (United States) [7420-21]

9:40 am: **Measurement of non-stationary optical signals using an acousto-optic spectrometer**, Sergei V. Kulakov, Victor V. Kludzin, Dmitri A. Denisenkov, St. Petersburg State Univ. of Aerospace Instrumentation (Russian Federation) [7420-22]

10:00 am: **Parallel data processing based on high density volume holographic correlator**, Liangcai Cao, Tsinghua Univ. (China) and Univ. of California, Santa Cruz (United States); Qingsheng He, Guofan Jin, Tsinghua Univ. (China) [7420-23]

Coffee Break 10:20 to 10:50 am

SESSION 6

Room: Conv. Ctr. 15A Mon. 10:50 to 11:30 am

Photonic Application II

Session Chair: **Paul B. Ruffin**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.

10:50 am: **A fibre optic sensor for high temperature measurements**, Claudio Calisti Tassini, D'Appolonia S.p.A. (Italy); Charalambos L. Tsangaris, Andreas Othonos, Univ. of Cyprus (Cyprus) [7420-24]

11:10 am: **Micro-temperature sensor based on optical whispering gallery mode of fiber taper-microsphere coupling system**, Qiulin Ma, Tobias Rossmann, Zhixiong Guo, Rutgers Univ. (United States) [7420-25]

Tuesday 4 August

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Optical properties of the modulation doped InGaAs/InAlAs quantum well, Chung-Chih Chang, Ming-Seng Hsu, Yueh Ouyang, Chinese Military Academy (Taiwan); Yau-Chyr Wang, Nan Jeon Institute of Technology (Taiwan) [7420-06]

Biomedical imaging and detection with broadband spatially coherent supercontinuum, Chia-En Yang, Jimmy Yao, Yun-Ching Chang, Shizhuo Yin, The Pennsylvania State Univ. (United States) [7420-27]

A quantitative analysis of remote THz generation by laser induced plasmonic resonance, Shizhuo Yin, Yaohui Guo, Meng-Ku Chen, Yun-Ching Chang, Chia-En Yang, The Pennsylvania State Univ. (United States) . [7420-28]

Ultrafast magneto-optic switches and their applications, Chia-En Yang, Jimmy Yao, Yun-Ching Chang, Shizhuo Yin, The Pennsylvania State Univ. (United States) [7420-29]

Laser-induced domain preferential nucleation in hafnium-doped congruent LiNbO₃ crystal, Peipei Hou, Ya'nan Zhi, De'an Liu, Aimin Yan, Yu Zhou, Zhu Luan, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7420-31]

Phase-mapping of domain kinetics in lithium niobate by digital holographic interferometry, Ya'nan Zhi, De'an Liu, Jianfeng Sun, Aimin Yan, Yu Zhou, Zhu Luan, Enwen Dai, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7420-32]

All-optically switchable photonic crystal fiber, Chang-Yu Ko, Cheng-Long Chen, Vincent K. S. Hsiao, National Chi Nan Univ. (Taiwan) [7420-33]

Holographic scattering noise in LiNbO₃:Fe:Ru crystals, Zhifang Chai, East China Normal Univ. (China); De'an Liu, Shanghai Institute of Optics and Fine Mechanics (China); Qiang Zhao, East China Normal Univ. (China); Ya'nan Zhi, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) . . [7420-34]

Fiber variable optical attenuator based on both side polished fiber and solid thermo-optic polymer, Zhe Chen, Jiarong Qin, Jingang Zhong, Jinan Univ. (China) [7420-36]

Two-waves optical switching element based on 1D (layered) nonlinear photonic crystal, Vyacheslav A. Trofimov, Aleksey G. Volkov, Lomonosov Moscow State Univ. (Russian Federation); Sheng Lan, South China Normal Univ. (China) [7420-37]

The thermal conductivity of alumina thin film for LED, Ming-Seng Hsu, Chung-Chih Chang, Hsiang-Hsi Cheng, Yueh Ouyang, Tien-Yu Hsiao, Hsin-Chih Liu, Chinese Military Academy (Taiwan); Yau-Chyr Wang, Nan Jeon Institute of Technology (Taiwan) [7420-38]

Tunable selectively liquid-filled photonic crystal fibers (Presentation Only), Chin-Ping Yu, Jia-Hong Liou, Jin-Hui Liu, Chi-Ping Chen, National Sun Yat-Sen Univ. (Taiwan) [7420-39]

High delay bandwidth product and low dispersion slow light in silicon-insulator based photonic crystal waveguides, Swati Rawal, Ravindra K. Sinha, Delhi College of Engineering (India) [7420-40]

Conference 7420

Wednesday 5 August

Characterization of polarization maintaining photonic crystal fiber from far field measurements, Kamal Kishor, Ravindra K. Sinha, Anshu D. Varshney, Delhi College of Engineering (India); Jaspreet Singh, Fiberonics (India)[7420-41]

Infrared characteristics of magnetic iron oxide nanoparticles of a transparent matrix, Narsingh B. Singh, David J. Knuteson, David A. Kahler, Andre Berghmans, Sean McLaughlin, Brian P. Wagner, Northrop Grumman Electronic Systems (United States) [7420-42]

Analysis of intrinsic perturbation by thermal stress birefringence, Chandrakant M. Jadhao, G.S. College of Khamgaon (India); Deepak S. Dhote, Brijlal Biyani Science College of Amravati (India) [7420-43]

Optimal edge-enhanced correlation via four-wave mixing in BaTiO₃, Ming-Seng Hsu, Chung-Chih Chang, Shiang-Shi Cheng, Chinese Military Academy (Taiwan); Wei-Chia Su, National Changhua Univ. of Education (Taiwan); Yueh Ouyang, Chinese Military Academy (Taiwan) [7420-44]

Anisotropic intensity profiles in ferroelectric LiNbO₃ single crystal fibers, Hongbo Liu, The Univ. of Texas at San Antonio (United States); Pape A. Sene, The Pennsylvania State Univ. (United States); Ruyan Guo, The Univ. of Texas at San Antonio (United States) and The Pennsylvania State Univ. (United States) [7420-45]

A dual-fiber modulation configuration based on new speckle-based volume holographic multiplexing technique, Hongbo Liu, Amar S. Bhalla, Ruyan Guo, The Univ. of Texas at San Antonio (United States) [7420-46]

Holographic photopolymers based on organic/inorganic hybrid interpenetrating networks for high dimensional stability, SeungWoo Lee, Yong-Cheol Jeong, Yongjoon Heo, Korea Advanced Institute of Science and Technology (Korea, Republic of); Sunil Kim, Yoonsun Choi, Samsung Advanced Institute of Technology (Korea, Republic of); Jihye Lee, Jung-Ki Park, Korea Advanced Institute of Science and Technology (Korea, Republic of) . . [7420-47]

High-efficiency pump-resonant quasi-phase-matched frequency doublers with flattop broadband responses, Amirhossein Tehrani, Raman Kashyap, Ecole Polytechnique de Montréal (Canada) [7420-48]

Electron-beam lithographic computer-generated holograms designed by direct search coding algorithm, Hitoshi Tamura, Univ. of Industrial Technology (Japan) and Tokyo Univ. of Science (Japan); Yasuhiro Torii, Univ. of Industrial Technology (Japan); Yukihiko Ishii, Tokyo Univ. of Science (Japan) . . . [7420-49]

Electro-optic probe in low frequency range, Maobin Yi, Rulong Jin, Zhaoxu Yan, Han Yang, Hongbo Sun, Jilin Univ. (China) [7420-51]

Room: Conv. Ctr. 6A Wed. 8:30 am to 12:00 pm

Photonic Materials and Devices Plenary Session

Session Chair: **Zakya H. Kafafi**, National Science Foundation

8:30 am: **Low Cost 'Plastic' Solar Cells: Self-Assembly of Bulk Heterojunction Nano-Materials by Spontaneous Phase Separation**, Alan J. Heeger, Univ. of California, Santa Barbara (United States)

9:00 am: **Materials and Processing Strategies for Unconventional Printed Organic, Organometallic, and Inorganic Electronic Circuitry**, Tobin J. Marks, Northwestern Univ. (United States)

9:30 am: **Photonic Metamaterials: Optics Starts Walking on Two Feet**, Martin Wegener, Univ. Karlsruhe (Germany) and Forschungszentrum Karlsruhe GmbH (Germany)

Coffee Break/Best Student Paper Award Announcement. 10:00 to 10:30 am

10:30 am: **WISE: the Widefield Infrared Survey Explorer**, Edward L. Wright, Univ. of California, Los Angeles (United States)

11:00 am: **N/MEMS: Building the Future from the Inside Out**, Dennis L. Polla, Defense Advanced Research Projects Agency (United States)

11:30 am: **Talking Between Quantum Dots and a Quantum Well**, Gregory J. Salamo, Univ. of Arkansas (United States)

See page 21-22 for presentation details.

PHOTONICS

Courses of Related Interest

See SPIE Cashier for information and to register.

SC608 Photonic Crystals: A Crash Course, from Bandgaps to Fibers (Johnson)
Monday, 1:30 to 5:30 pm

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Toru Yoshizawa, Saitama Medical Univ. (Japan)
Richard N. Youngworth, Light Capture, Inc. (United States)
Xiaolei Zou, Florida State Univ. (United States)

Sunday	Monday	Tuesday	Wednesday	Thursday
Special Program				
	7421 The Nature of Light: What are Photons? III (Roychoudhuri/Kracklauer/Khrennikov), p. 136			
Illumination Engineering				
Program Chair: Ian T. Ferguson , Georgia Institute of Technology (United States)				
	7422 Ninth International Conference on Solid State Lighting (Ferguson/Hoelen/Jiao/Taguchi), p. 138			
	7423 Nonimaging Optics: Efficient Design for Illumination and Solar Concentration VI (Winston/Gordon), p. 141			
	7415 Organic Light Emitting Materials and Devices XIII (So) (United States), p. 112			
Optomechanics and Optical Manufacturing				
Program Chair: H. Philip Stahl , NASA Marshall Space Flight Ctr. (United States)				
	7425 Optical Materials and Structures Technologies IV (Robichaud), p. 146		7424 Advances in Optomechanics (Hatheway), p. 144	
		7426 Optical Manufacturing and Testing VIII (Burge/Fähnle/Williamson), p. 148		
			7427 Optical Modeling and Performance Predictions IV (Kahan), p. 150	
Optical Design				
Program Chair: R. John Koshel , Photon Engineering LLC (United States) and College of Optical Sciences/The Univ. of Arizona (United States)				
	7428 Current Developments in Lens Design and Optical Engineering X (Mouroulis/Johnson/Mahajan), p. 152			
	7429 Novel Optical Systems Design and Optimization XII (Koshel/Gregory), p. 154			
	7430 Laser Beam Shaping X (Forbes/Lizotte), p. 157			
	7423 Nonimaging Optics: Efficient Design for Illumination and Solar Concentration VI (Winston/Gordon), p. 141			

See the Special Event Daily Schedule on page 9.

See the Course Daily Schedule on pages 42-45. Register for Courses at the SPIE Cashier.

Sunday	Monday	Tuesday	Wednesday	Thursday
Advanced Metrology				
Program Chair: Katherine Creath , Optneering (United States) and College of Optical Sciences/The Univ. of Arizona (United States)				
	7432 Optical Inspection and Metrology for Non-Optics Industries (Huang/Yoshizawa/Harding), p. 161		7431 Time and Frequency Metrology II (Ido/Reid), p. 159	
		7405 Instrumentation, Metrology, and Standards for Nanomanufacturing III (Postek), p. 87		
Optical Systems Engineering				
Program Chair: José M. Sasian , College of Optical Sciences/The Univ. of Arizona (United States)				
	7433 Optical System Alignment, Tolerancing, and Verification III (Sasian/Youngworth), p. 163		7434 Optical Technologies for Arming, Safing, Fuzing, and Firing V (Dickey/Beyer), p. 165	
	7409 Thin Film Solar Technology (Delahoy/Eldada), p. 95		7404 Nanostructured Thin Films II (Smith/Lakhtakia/Lee), p. 83	
Astronomical Optics and Instrumentation				
Program Chair: Oswald H. Siegmund , Univ. of California, Berkeley (United States)				
7439A Focal Plane Arrays for Space telescopes IV (Warren/Marshall), p. 177	7435 UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XVI (Siegmund), p. 166	7437 Optics for EUV, X-Ray, and Gamma-Ray Astronomy IV (O'Dell/Pareschi), p. 170		
	7436 UV/Optical/IR Space Telescopes: Innovative Technologies and Concepts IV (MacEwen/Breckinridge), p. 168	7438 Solar Physics and Space Weather Instrumentation III (Fineschi/Fennelly), p. 174		
	7439B Astronomical Adaptive Optics Systems and Applications IV (Tyson/Lloyd-Hart), p. 178	7440 Techniques and Instrumentation for Detection of Exoplanets IV (Shaklan), p. 182		
	7439C Cryogenic Optical Systems and Instruments XIII (Heaney/Kvamme), p. 180	7441A X-Ray, UV, Visible, and IR Instrumentation for Planetary Missions (Retherford), p. 185		
		7441B Instruments, Methods, and Missions for Astrobiology XII (Hoover/Levin/Rozanov), p. 187		
Image and Signal Processing				
Program Chair: Khan M. Iftekharuddin , The Univ. of Memphis (United States)				
7444B Advanced Signal Processing Algorithms, Architectures, and Implementations XIX (Luk), p. 197			7442 Optics and Photonics for Information Processing III (Iftekharuddin/Awwal), p. 190	
	7443 Applications of Digital Image Processing XXXII (Tescher), p. 193			
	7444A Mathematics of Data/Image Coding, Compression, and Encryption with Applications XII (Schmalz/Ritter/Barrera/Astola), p. 196			
			7445 Signal and Data Processing of Small Targets 2009 (Drummond), p. 199	
7446 Wavelets XIII (Goyal/Papadakis/van de Ville), p. 201				
7447 Videometrics, Range Imaging, and Applications X (Remondino/Shortis/El-Hakim), p. 204				

See the Special Event Daily Schedule on page 9.

Sunday	Monday	Tuesday	Wednesday	Thursday
X-Ray, Gamma-Ray, and Particle Technologies				
<i>Program Chairs: Sandra G. Biedron, Argonne National Lab. (United States); Massimo Altarelli, Deutsches Elektronen-Synchrotron (Germany)</i>				
	7448 Advances in X-Ray/EUV Optics and Components IV (Khounsary/Morawe/Goto), p. 206			
	7449 Hard X-Ray, Gamma-Ray, and Neutron Detector Physics XI (James/Franks/Burger), p. 208			7450 Penetrating Radiation Systems and Applications X (Doty/Barber/Roehrig/Schirato), p. 212
				7451 Soft X-Ray Lasers and Applications VIII (Dunn/Tallents), p. 215
Remote Sensing				
<i>Program Chair: Allen H.-L. Huang, Univ. of Wisconsin, Madison (United States)</i>				
7459 Ocean Remote Sensing: Methods and Applications (Frouin), p. 234	7452 Earth Observing Systems XIV (Butler/Xiong), p. 218		7453 Infrared Spaceborne Remote Sensing and Instrumentation XVII (Strojnik), p.221	
			7454 Remote Sensing and Modeling of Ecosystems for Sustainability VI (Gao), p. 223	
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	7457 Imaging Spectrometry XIV (Shen/Lewis), p. 230		7456 Atmospheric and Environmental Remote Sensing Data Processing and Utilization V: Readiness for GEOSS III (Goldberg/Bloom), p. 228	
	7460 Lidar Remote Sensing for Environmental Monitoring X (Singh), p. 236	7458 Remote Sensing System Engineering II (Ardanuy/Puschell), p. 232		
	7461 Polarization Science and Remote Sensing IV (Shaw/Tyo), p. 238			
	7462 Ultraviolet and Visible Ground- and Space-based Measurements, Trace Gases, Aerosols and Effects VI (Herman/Gao), p. 240			
Atmospheric and Space Optical Systems				
<i>Program Chairs: Stephen M. Hammel, Space and Naval Warfare Systems Ctr., San Diego (United States); Alexander M. J. van Eijk, TNO Defense, Security and Safety (Netherlands)</i>				
7468A Adaptive Coded Aperture Imaging and Non-Imaging Sensors III (Casasent/Rogers), p. 251	7463 Atmospheric Optics: Models, Measurements, and Target-in-the-Loop Propagation III (Hammel/van Eijk/Vorontsov), p. 241			
7464 Free-Space Laser Communications IX (Majumdar/Davis), p. 243		7465 Quantum Communications and Quantum Imaging VII (Meyers/Shih/Deacon), p. 245		
	7467 Nanophotonics and Macrophotonics for Space Environments III (Taylor/Cardimona), p.249			7466 Advanced Wavefront Control: Methods, Devices, and Applications VII (Carreras/Rhodarmar/Dayton), p. 247
	7468B Unconventional Imaging V (Dolne/Karr/Gamiz), p. 253			
<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;"> <p>See the Course Daily Schedule on pages 42-45. Register for Courses at the SPIE Cashier.</p> </div>				

Conference 7421

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7421

The Nature of Light: What are Photons? III

Conference Chairs: **Chandrasekhar Roychoudhuri**, Univ. of Connecticut and Femto Macro Continuum; **Al F. Kracklauer**, Bauhaus Univ. Weimar (Germany); **Andrei Yu. Khrennikov**, Växjö Univ. (Sweden)

Program Committee: **Shahriar S. Afshar**, Rowan Univ.; **Katherine Creath**, Optinering and College of Optical Sciences/The Univ. of Arizona; **Benjamin J. Eggleton**, The Univ. of Sydney (Australia); **Albrecht Giese**, Consultant (Germany); **Karl Otto Greulich**, Fritz Lipmann Institute (Germany); **Margaret H. Hawton**, Lakehead Univ. (Canada); **Subhash C. Kak**, Louisiana State Univ.; **Akhlesh Lakhtakia**, The Pennsylvania State Univ.; **Ashok Muthukrishnan**, Texas A&M Univ.; **John M. Myers**, Harvard Univ.; **Narasimha S. Prasad**, NASA Langley Research Ctr.; **Vijaya Ramarao**, Indian Institute of Technology Bombay (India); **Chary Rangacharyulu**, Univ. of Saskatchewan (Canada); **Wolfgang P. Schleich**, Univ. Ulm (Germany); **Marlan O. Scully**, Texas A&M Univ. and Princeton Univ.; **Selim M. Shahriar**, Northwestern Univ.; **Weilong She**, Sun Yat-Sen Univ. (China); **C. S. Unnikrishnan**, Tata Institute of Fundamental Research (India); **Ian A. Walsmsley**, Univ. of Oxford (United Kingdom); **Herbert G. Winful**, Univ. of Michigan; **Ewan M. Wright**, College of Optical Sciences/The Univ. of Arizona

Monday 3 August

SESSION 1

Room: Conv. Ctr. Room 11A Mon. 9:00 to 10:00 am

Classical and Quantum Interrelations

Session Chairs: **Andrei Yu. Khrennikov**, Växjö Univ. (Sweden); **Chandrasekhar Roychoudhuri**, Univ. of Connecticut

9:00 am: **Can fluctuations of classical random field produce quantum averages?** (*Invited Paper*), Andrei Yu. Khrennikov, Växjö Univ. (Sweden) [7421-01]

9:40 am: **Spectral properties and nonlinear dynamics of spontaneous emission of a resonance photon by two-level atom trapped in damped nanocavity with a resonance mode b** , Vladislav F. Cheltsov, Moscow State Mining Univ. (Russian Federation) [7421-02]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. Room 11A Mon. 10:30 am to 12:20 pm

Superposition and Divisibility of Photons I

Session Chairs: **Karl Otto Greulich**, Fritz Lipmann Institute (Germany); **Ashok Muthukrishnan**, Texas A&M Univ.

10:30 am: **A non-quantum mechanical explanation of the single photon double slit experiment** (*Invited Paper*), Karl Otto Greulich, Fritz Lipmann Institute (Germany) [7421-03]

11:00 am: **Arguments for and against photon divisibility**, Ashok Muthukrishnan, Texas A&M Univ. (United States); Chandrasekhar Roychoudhuri, Univ. of Connecticut (United States) [7421-04]

11:20 am: **Do light beams cross each other unperturbed?**, Ghenadie N. Mardari, Rutgers Univ. (United States); James A. Greenwood, Open Worlds Research (United States) [7421-05]

11:40 am: **Angular spectrum based analysis of diffraction through two diffractive elements**, Habib Hamam, Univ. de Moncton (Canada) [7421-35]

12:00 pm: **Some experiments and mathematical methods to clarify that if there are photons in dark fringes**, Akbar Rahmani Nejad, Independent Researcher (Iran, Islamic Republic of); Mohammad Ahmadi Olia, Independent Researcher (United States) [7421-06]

Lunch Break 12:20 to 1:30 pm

SESSION 3

Room: Conv. Ctr. Room 11A Mon. 1:30 to 3:00 pm

Superposition and Divisibility of Photons II

Session Chairs: **David L. Andrews**, Univ. of East Anglia Norwich (United Kingdom); **Narasimha S. Prasad**, NASA Langley Research Ctr.

1:30 pm: **The irreducible photon** (*Invited Paper*), David L. Andrews, Univ. of East Anglia Norwich (United Kingdom) [7421-07]

2:00 pm: **Exploring divisibility and summability of 'photon' wave packets in linear and nonlinear optical phenomena**, Narasimha S. Prasad, NASA Langley Research Ctr. (United States); Chandrasekhar Roychoudhuri, Univ. of Connecticut (United States) [7421-08]

2:20 pm: **What can we learn by differentiating between the physical processes behind interference and diffraction phenomena?**, Qing Peng, California State Univ., Northridge (United States); Michael A. Barootkoob, Chandrasekhar Roychoudhuri, Univ. of Connecticut (United States) . . [7421-09]

2:40 pm: **Active mode-locking at high frequencies**, Vijaya Ramarao, Indian Institute of Technology, Bombay (India); Deepa Venkitesh, VES College of Arts, Science & Commerce (India) and IIT Bombay (India) [7421-10]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. Room 11A Mon. 3:30 to 6:00 pm

Relativity, Cosmology and Astrophysics

Session Chairs: **C. S. Unnikrishnan**, Tata Institute of Fundamental Research (India); **Michael J. Mobley**, Arizona State Univ.

3:30 pm: **Precision comparison of the one-way speed of light and implications to relativity theories** (*Invited Paper*), C. S. Unnikrishnan, Tata Institute of Fundamental Research (India) [7421-11]

4:00 pm: **Astrophysical evidence shows no direct interaction between gravitation and electromagnetism in vacuum space**, Edward H. Dowdye, Jr., NASA Goddard Space Flight Ctr. (United States) [7421-12]

4:20 pm: **Light, photons, slow-light, and gravity**, C. S. Unnikrishnan, Tata Institute of Fundamental Research (India) [7421-13]

4:40 pm: **Relativistic transformation of wavelength provides insights into the geometry of photons**, Michael J. Mobley, Arizona State Univ. (United States) [7421-14]

5:00 pm: **The natural philosophy of the cosmos (B)**, Riccardo C. Storti, Delta Group Engineering, P/L (Australia) [7421-15]

5:20 pm: **Relativistic Doppler Effect explained by classical concepts**, Viraj Fernando, Natural Philosophy Alliance (Canada) [7421-36]

5:40 pm: **On the violation of the CHSH network model inequality and a note on GHZ**, J. F. Geurdes, Consultant (Netherlands) [7421-40]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

A new approach for solution of the paradox of electron spin, Akbar Rahmani Nejad, Independent Researcher (Iran, Islamic Republic of); Mohammad Ahmadi Oliia, Independent Researcher (United States) [7421-31]

A quantum-mathematical model to state single photon (electron) double slit experiment, Fraunhofer and Fresnel diffractions, Akbar Rahmani Nejad, Independent Researcher (Iran, Islamic Republic of); Mohammad Ahmadi Oliia, Independent Researcher (United States) [7421-32]

The nature of light coherence, Petro O. Demianenko, Yurii F. Zinkovskii, National Technical Univ. of Ukraine (Ukraine) [7421-33]

Hidden variables: the resonance factor, Juliana H. J. Brooks, General Resonance LLC (United States) [7421-38]

A two body photon model, Randy T. Dorn, Independent Researcher (United States) [7421-39]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. Room 11A Tues. 8:10 to 10:00 am

Maxwell's Equations and Electromagnetism

Session Chairs: **John E. Carroll**, Univ. of Cambridge (United Kingdom); **Al F. Kracklauer**, Bauhaus Univ. Weimar (Germany)

8:10 am: **Photon-like solutions of Maxwell's equations in dispersive media (Invited Paper)**, John E. Carroll, Joseph Beals IV, Univ. of Cambridge (United Kingdom) [7421-17]

8:40 am: **Photon: quantum representation versus field representation seen from a new stand point**, Erich H. Berloff, Leopold-Franzens-Univ. Innsbruck (Austria) [7421-18]

9:00 am: **Two mathematically equivalent versions of Maxwell's equations**, Tepper L. Gill, Woodford W. Zachary, Howard Univ. (United States) . . [7421-19]

9:20 am: **Two-field viewpoint for light**, Robert Crane, Consultant (United States) [7421-20]

9:40 am: **Photons as momentum-energy eigenmodes**, Michael Mazilu, Univ. of St. Andrews (United Kingdom) [7421-21]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. Room 11A Tues. 10:30 am to 12:00 pm

Critical Concepts and Interpretations

Session Chairs: **Al F. Kracklauer**, Bauhaus Univ. Weimar (Germany); **Chary Rangacharyulu**, Univ. of Saskatchewan (Canada)

10:30 am: **Elementary quanta: are they discrete individual entities? (Invited Paper)**, Chary Rangacharyulu, Univ. of Saskatchewan (Canada) [7421-22]

11:00 am: **Another loophole for the Bell inequalities in experiments on photon entanglement**, Karl Otto Greulich, Fritz Lipmann Institute (Germany) [7421-23]

11:20 am: **Hidden variables: the elementary quantum of light**, Juliana H. J. Brooks, General Resonance LLC (United States) [7421-37]

11:40 am: **Can the quantum theory of light contain the classical electromagnetic theory of light?**, Yongchao Gan, Hubei Univ. (China) [7421-25]

Lunch/Exhibition Break 12:00 to 1:40 pm

SESSION 7

Room: Conv. Ctr. Room 11A Tues. 1:40 to 3:10 pm

Critical Concepts and Interpretations II

Session Chair: **Andrei Yu. Khrennikov**, Växjö Univ. (Sweden)

1:40 pm: **Classical simulations of EPR experiments (Invited Paper)**, Al F. Kracklauer, Bauhaus Univ. Weimar (Germany) [7421-26]

2:10 pm: **Modified Afshar experiment: calculations**, Eduardo V. Flores, Rowan Univ. (United States) [7421-27]

2:30 pm: **Why do we need to continue a conference like this one? (Keynote Presentation)**, Chandrasekhar Roychoudhuri, Univ. of Connecticut (United States) [7421-28]

Coffee Break 3:10 to 3:40 pm

Panel Discussion: Is Indivisible Single Photon Really Essential for Quantum Communications, Computing and Encryption?

Room: Conv. Ctr. Room 11A Tues. 3:40 to 5:40 pm

Panel Moderators: **Chandrasekhar Roychoudhuri**, Univ. of Connecticut; **Selim M. Shahriar**, Northwestern Univ.;

Panelists: **Juliana H. J. Brooks**, General Resonance; **John E. Carroll**, Univ. of Cambridge (United Kingdom); **Andrei Yu. Khrennikov**, Växjö Univ. (Sweden); **Al F. Kracklauer**, Bauhaus Univ. Weimar (Germany); **Chary Rangacharyulu**, Univ. of Saskatchewan (Canada)

Presentations:

3:40 pm: **Interdependence of quantization of massive particles and electromagnetic fields and the need for photons in quantum computing (Keynote Presentation)**, Selim M. Shahriar, Northwestern Univ. (United States) [7421-29]

4:20 pm: **Information in a photon: further considerations**, Subhash C. Kak, Oklahoma State Univ. (United States) [7421-30]

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Conference 7422

Monday-Wednesday 3-5 August 2009 • Proceedings of SPIE Vol. 7422

Ninth International Conference on Solid State Lighting

Conference Chairs: Ian T. Ferguson, The Univ. of North Carolina at Charlotte; Christoph Hoelen, Philips Lighting B.V. (Netherlands); Jianzhong Jiao, OSRAM Opto Semiconductors Inc.; Tsunemasa Taguchi, Yamaguchi Univ. (Japan)

Program Committee: Srinath K. Aanegola, GE Lumination LLC; Andrew A. Allerman, Sandia National Labs.; Ian E. Ashdown, byHeart Consultants Ltd. (Canada); Lianghai Chen, Institute of Semiconductors (China); Volker K. Härle, OSRAM Opto Semiconductors GmbH (Germany); Matthew H. Kane, Univ. of Oklahoma; Asif M. Khan, Univ. of South Carolina; Michael R. Krames, Philips Lumileds Lighting Co.; Yung-Sheng Liu, National Tsing Hua Univ. (Taiwan); Eun-Hyun Park, Kyung Hee Univ. (Korea, Republic of); Seong-Ju Park, Gwangju Institute of Science and Technology (Korea, Republic of); Robert V. Steele, Strategies Unlimited; Chih-Chung Yang, National Taiwan Univ. (Taiwan)

Monday 3 August

SESSION 1

Room: Conv. Ctr. 10 Mon. 1:30 to 3:20 pm

Growth I

Session Chair: Jianzhong Jiao, OSRAM Opto Semiconductors Inc.

1:30 pm: **Low-cost high-efficiency GaN LEDs on 6-inch Si: latest developments** (*Invited Paper*), Colin Humphreys, Dandan Zhu, Clifford McAleese, Maik Häberlen, Ted Thrush, Menno J. Kappers, Andrew Phillips, Univ. of Cambridge (United Kingdom); Penelope Lane, David Wallis, Michael Kane, Trevor Martin, Michael Astles, QinetiQ Ltd. (United Kingdom); Simon Thomas, Andy Pakes, AIXTRON Ltd. (United Kingdom); Michael Heuken, AIXTRON AG (Germany); Nicolas Hylton, Philip Dawson, The Univ. of Manchester (United Kingdom) [7422-01]

2:00 pm: **The effect of Mg and Si impurities on the optical property of InGaN-light emitting diode** (*Invited Paper*), Eun-Hyun Park, Jin Jang, Kyung Hee Univ. (Korea, Republic of) [7422-02]

2:30 pm: **Green LED development in polar and non-polar growth orientation** (*Invited Paper*), Christian Wetzel, Rensselaer Polytechnic Institute (United States) [7422-03]

3:00 pm: **Polarized InGaN/GaN quantum-well light-emitting diode with surface plasmon coupling**, Kun-Ching Shen, Cheng-Yen Chen, Tsung-Yi Tang, Yean-Woei Kiang, Chih-Chung Yang, National Taiwan Univ. (Taiwan). [7422-04]

Coffee Break 3:20 to 3:50 pm

SESSION 2

Room: Conv. Ctr. 10 Mon. 3:50 to 5:40 pm

Alternative Design

Session Chair: Chih-Chung Yang, National Taiwan Univ. (Taiwan)

3:50 pm: **The design of a spectrally tuneable light source** (*Invited Paper*), Kevin J. Dowling, Philips Solid-State Lighting Solutions (United States)[7422-05]

4:20 pm: **Precise optical and thermal modeling for silicate-based white LEDs**, Ching-Yi Chen, Hsin-Yin He, Cheng-Chien Chen, Wei-Ting Chien, Tsung-Xian Lee, Ching-Cherng Sun, Tsung-Hsun Yang, National Central Univ. (Taiwan) [7422-06]

4:40 pm: **Measurement methods of alternating-current (AC) light-emitting diodes**, Yuqin Zong, National Institute of Standards and Technology (United States); Pei-Ting Chou, Industrial Technology Research Institute (Taiwan) and National Institute of Standards and Technology (United States); Sheng-Chieh Tai, Min-Te Lin, Industrial Technology Research Institute (Taiwan); Yoshi Ohno, National Institute of Standards and Technology (United States) [7422-07]

5:00 pm: **Developing an accelerated life test method for LED drivers**, Han Lei, Narendran Nadarajah, Rensselaer Polytechnic Institute (United States) [7422-08]

5:20 pm: **Enhanced output power of GaN LED via magnetic field applied**, Rong Xuan, Industrial Technology Research Institute (Taiwan) [7422-09]

Room: Marriott Hotel, Marina F. Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: Jake Jacobsen, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: Prof. Roland Winston, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

SESSION 3

Room: Conv. Ctr. 6A Tues. 8:30 to 10:00 am

Solid State Lighting and OLEDs Plenary Session

Session Chairs: Ian T. Ferguson, The Univ. of North Carolina at Charlotte and Franky So, Univ. of Florida

Joint Plenary Session with Conference 7415: Organic Light Emitting Materials and Devices XIII

8:30 am: **n-UV Based White LEDs**, Tsunemasa Taguchi, Yamaguchi Univ. (Japan) [7422-10]

9:15 am: **High Performance OLEDs for General Lighting**, Junji Kido, Yamagata Univ. (Japan) [7415-44]

See page 19 for presentation details.

Coffee Break 10:00 to 10:30 am

SESSION 4

Room: Conv. Ctr. 10
(Note Room Change) Tues. 10:30 am to 12:30 pm

OLEDs and Solid State Lighting

Session Chair: Ian T. Ferguson, The Univ. of North Carolina at Charlotte

Joint Session with Conference 7415: Organic Light Emitting Materials and Devices XIII

10:30 am: **Coupling of InGaN/GaN quantum-well with surface plasmon for enhancing light emitting diode efficiency** (*Invited Paper*), Yen-Cheng Lu, Jyh-Yang Wang, Fu-Ji Tsai, Kun-Ching Shen, Cheng-Yen Chen, Cheng-Hung Lin, Chih-Feng Lu, Tsung-Yi Tang, Dong-Ming Yeh, Yean-Woei Kiang, Georgia State Univ. (United States) [7422-11]

11:00 am: **White OLEDs for lighting applications** (*Invited Paper*), Hans-Peter Loebel, Volker van Elsbergen, Herbert F. Boerner, Claudia Goldmann, Philips Research (Germany); Dietrich Bertram, Philips GmbH (Germany); Stefan Grabowski, Philips Research (Germany) [7415-45]

11:30 am: **The growth of indium-rich group III-N alloys and heterostructures by high-pressure CVD** (*Invited Paper*), Nikolaus Dietz, Mustafa Alevli, Ramazan Atalay, Max Buegler, Göksel Durkaya, Enno Malguth, Jielei Wang, Georgia State Univ. (United States) [7422-12]

12:00 pm: **Organic light emitting devices for solid state lighting** (*Invited Paper*), Jie Liu, GE Global Research (United States) [7415-46]

Lunch/Exhibition Break 12:30 to 2:00 pm

SESSION 5

Room: Conv. Ctr. 10 Tues. 2:00 to 3:40 pm

Phosphors

Session Chair: Tsunemasa Taguchi, Yamaguchi Univ. (Japan)

2:00 pm: **Phosphor quenching in LED packages: measurements, mechanisms, and paths forward** (*Invited Paper*), Anant A. Setlur, GE Global Research (United States); Uwe Happek, The Univ. of Georgia (United States) [7422-13]

2:30 pm: **Remote phosphor white LEDs** (*Invited Paper*), Narendran Nadarajah, Rensselaer Polytechnic Institute (United States) [7422-14]

3:00 pm: **Luminance and color management of optical diffuser plate in LED lighting**, Wei-Ting Chien, Chih-To Hsieh, Mo-Chia Lin, Shu-Li Shiao, Ching-Cherng Sun, Institute of Lighting and Display Science (Taiwan) [7422-15]

3:20 pm: **Extensive analysis of the degradation of phosphor-converted LEDs**, Matteo Meneghini, Francesco de Zuani, Lorenzo R. Trevisanetto D.D.S., Enrico Zaroni, Gaudenzio Meneghesso, Univ. degli Studi di Padova (Italy) [7422-16]

Coffee Break 3:40 to 4:00 pm

SESSION 6

Room: Conv. Ctr. 10 Tues. 4:00 to 5:50 pm

Growth II

Session Chair: Hugo Cornelissen, Philips Research Nederland B.V. (Netherlands)

4:00 pm: **Photonic crystal structures for high efficiency LEDs** (*Invited Paper*), Seong-Ju Park, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7422-17]

4:30 pm: **III-nitride epilayers on ZnO Substrates by MOCVD using Al₂O₃ as a transition layer**, Nola Li, William E. Fenwick, Georgia Institute of Technology (United States); Zhe Chuan Feng, National Taiwan Univ. (Taiwan); Christopher J. Summers, Muhammad Jamil, Ian T. Ferguson, Georgia Institute of Technology (United States) [7422-18]

4:50 pm: **Nanoscale InGaN/GaN on ZnO substrate for LED applications**, Zhe Chuan Feng, Tsuang-Lung Huang, Yi-Li Tu, National Taiwan Univ. (Taiwan); Nao Li, Hongbo Yu, Ian T. Ferguson, Georgia Institute of Technology (United States); Weijie Lu, Fisk Univ. (United States) [7422-19]

5:10 pm: **Method for controlling light emission of LEDs**, Hung Yu Chou, Tsung-Hsun Yang, National Central Univ. (Taiwan) [7422-20]

5:30 pm: **Low temperature buffer growth for vertical light emitting diodes**, Matthew H. Kane, Univ. of Oklahoma (United States) [7422-21]

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

Semi-cylindrical LED lamp, Akbar Rahmani Nejad, Independent Researcher (Iran, Islamic Republic of); Mohammad Ahmadi Olia, Independent Researcher (United States) [7422-37]

Study of top and bottom photonic gratings on gallium nitride light-emitting diodes, Simeon Trieu, Xiaomin Jin, California Polytechnic State Univ., San Louis Obispo (United States); Bei Zhang, Tao Dai, Wei Wei, Chang Xiong, Xiang-Ning Kang, Guo-Yi Zhang, Peking Univ. (China) [7422-38]

Investigation of illumination efficiency on the LED therapy with different array types, Hsi-Chao Chen, National Yunlin Univ. of Science and Technology (Taiwan); Cheng-Jyun Liou, De Lin Institute of Technology (Taiwan) . . [7422-39]

The influence of doping to characteristics of AlGaAs/AlAs distributed Bragg reflectors, Chin-Hua Tu, Yuan Ze Univ. (Taiwan) and Visual Photonics Epitaxy Co., Ltd (Taiwan); Nien-Po Chen, Yuan Ze Univ. (Taiwan); Jin-Hsiang Liu, Visual Photonics Epitaxy Co., Ltd. (Taiwan) [7422-40]

Resonant acoustic calorimetry of the interaction of high-power laser radiation with crystals, Aleksei V. Konyashkin, Institute of Radio-engineering and Electronics (Russian Federation) and NTO IRE-Polus (Russian Federation) and Moscow Institute of Physics and Technology (Russian Federation); Aleksei V. Doronkin, Moscow Institute of Physics and Technology (Russian Federation) and NTO IRE Polus (Russian Federation); Valentin A. Tyrtysnyy, Moscow Institute of Physics and Technology (Russian Federation); Daniil V. Myasnikov, Moscow Institute of Physics and Technology (Russian Federation) and NTO IRE-Polus (Russian Federation); Oleg A. Ryabushkin, Institute of Radio-engineering and Electronics (Russian Federation) and NTO IRE-Polus (Russian Federation) and Moscow Institute of Physics and Technology (Russian Federation) [7422-41]

Optical and structural properties of InN grown by HPCVD, Mustafa Alevli, Max Buegler, Göksel Durkaya, Georgia State Univ. (United States); Enno Malguth, Georgia State Univ. (United States) and Technische Univ. Berlin (Germany); Jielei Wang, Georgia State Univ. (United States); Ian T. Ferguson, Georgia Institute of Technology (United States); Nikolaus Dietz, Georgia State Univ. (United States) [7422-42]

Wednesday 5 August

SESSION 7

Room: Conv. Ctr. 10 Wed. 8:15 to 10:05 am

Growth III

Session Chair: Edward D. Petrov, Lincoln Technical Services, Inc.

8:15 am: **GaN nanorods on deep etched silicon for solid state lighting** (*Invited Paper*), Shunfeng Li, Sönke Fündling, Ünsal Sökman, Stephan Merzsch, Richard Neumann, Johannes Ledig, Technische Univ. Braunschweig (Germany); Peter Hinze, Thomas Weimann, Physikalisch-Technische Bundesanstalt (Germany); Uwe Jahn, Achim Trampert, Henning Riechert, Paul-Drude-Institut für Festkörperelektronik (Germany); Erwin Peiner, Hergo H. Wehmann, Andreas Waag, Technische Univ. Braunschweig (Germany) [7422-22]

8:45 am: **Optical and structural properties of In_{1-x}Ga_xN layers grown by HPCVD**, Max Buegler, Göksel Durkaya, Georgia State Univ. (United States); Enno Malguth, Georgia State Univ. (United States) and Technische Univ. Berlin (Germany); William E. Fenwick, Ian T. Ferguson, Georgia Institute of Technology (United States); Nikolaus Dietz, Georgia State Univ. (United States) . . [7422-23]

9:05 am: **MOCVD growth of GaN on Si substrates using an ALD-grown Al₂O₃ interlayer**, William E. Fenwick, Muhammad Jamil, Andrew Melton, Nola Li, Tianming Xu, Christopher J. Summers, Ian T. Ferguson, Georgia Institute of Technology (United States) [7422-24]

9:25 am: **Optical properties and material studies of different InGaN/GaN multi-quantum well structures light emitting diode wafer**, T. W. Kuo, Zhe Chuan Feng, National Taiwan Univ. (Taiwan); Ian T. Ferguson, Georgia Institute of Technology (United States); Weijie Lu, Fisk Univ. (United States) . . [7422-25]

9:45 am: **Stress analysis of transferred thin-GaN light emitting diode fabricated by Cu electroplating**, Shih-Chieh Hsu, Yuh-Jen Cheng, Academia Sinica (Taiwan) [7422-26]

Coffee Break 10:05 to 10:30 am

Conference 7422

SESSION 8

Room: Conv. Ctr. 10 Wed. 10:30 am to 12:20 pm

Application I

Session Chair: **Matthew H. Kane**, Univ. of Oklahoma

10:30 am: **Optimizing LED luminaires through integration of optical, electrical and mechanical systems** (*Invited Paper, Presentation Only*), Jeff Quinlan, Acuity Brands Lighting, Inc. (United States) [7422-27]

11:00 am: **LED solution for E14 candle lamp**, Yun Li, Ye Liu, Lei Shi, Yi Mei, Han Jiang, Qing Guo, Huarong Wu, Philips Lighting (China) [7422-43]

11:20 am: **A study of optical tolerance for various package of power LED**, Cheng-Chien Chen, Yi-Chien Lo, National Central Univ. (Taiwan); Shih-Hsin Ma, De Lin Institute of Technology (Taiwan); Wei-Ting Chien, Ching-Cherng Sun, National Central Univ. (Taiwan) [7422-29]

11:40 am: **Understanding heat transfer mechanisms in recessed LED luminaires**, Tianming Dong, Narendran Nadarajah, Rensselaer Polytechnic Institute (United States) [7422-30]

12:00 pm: **Active heat sink for solid-state lighting**, John Vetrovec, Aqwest (United States) [7422-31]

Lunch/Exhibition Break 12:20 to 1:30 pm

SESSION 9

Room: Conv. Ctr. 10 Wed. 1:30 to 3:40 pm

Application II

Session Chair: **Ian T. Ferguson**, The Univ. of North Carolina at Charlotte

1:30 pm: **SSL technology development and commercialization in the global context** (*Invited Paper*), Kenneth L. Simons, Rensselaer Polytechnic Institute (United States) [7422-32]

2:00 pm: **LED life prediction: towards a general approach**, Emil Radkov, GE Lumination LLC (United States) [7422-33]

2:20 pm: **An active lighting module with natural light guiding system and solid state source for indoor illumination**, Chi-Ann Chen, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) [7422-34]

2:40 pm: **Design of a bicycle head lamp with use of a power chip LED**, Yi-Chien Lo, Kai-Yu Yang, Ching-Cherng Sun, National Central Univ. (Taiwan) [7422-35]

3:00 pm: **Design a programmable Fresnel lens and arrange LED sources to optimize the illuminance and uniformity of a medium or large LED-based lighting system with varied shapes**, Wen-Gong Chen, Yung Ta Institute of Technology & Commerce (Taiwan) [7422-36]

3:20 pm: **Dual-blue emitting active regions illustrate enhancements in color rendering ability and luminous efficacy in phosphor-converted white light emitting diodes**, Roya Mirhosseini, Martin F. Schubert, Sameer Chhajed, Jaehee Cho, Jong Kyu Kim, E. Fred Schubert, Rensselaer Polytechnic Institute (United States) [7422-44]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC011 Design of Efficient Illumination Systems (Cassarly) Wednesday, 8:30 am to 12:30 pm

SC490 Solid State Lighting I (Ferguson) Monday, 8:30 am to 12:30 pm

SC958 LED & Solid-State Lighting Standardization (Jiao) Monday, 8:30 am to 12:30 pm

Conference 7423

Sunday-Tuesday 2-4 August 2009 • Proceedings of SPIE Vol. 7423

Nonimaging Optics: Efficient Design for Illumination and Solar Concentration VI

Conference Chairs: **Roland Winston**, Univ. of California, Merced; **Jeffrey M. Gordon**, Ben-Gurion Univ. of the Negev (Israel)

Program Committee: **Pablo Benitez**, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (Spain); **William J. Cassarly**, Optical Research Associates; **Philip L. Gleckman**, eSolar Inc.; **Kenneth K. Li**, Wavien, Inc.; **Juan C. Miñano**, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (Spain); **Narkis E. Shatz**, SAIC, Inc.; **R. John Koshel**, Photon Engineering LLC and College of Optical Sciences/The Univ. of Arizona; **Daniel Feuermann**, Ben Gurion Univ. of the Negev (Israel); **Ralf Leutz**, Concentrator Optics GmbH (Germany)

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 10 Sun. 8:30 to 10:40 am

Tailored and Optimized Optics at the Étendue Limit I

Session Chair: **Narkis E. Shatz**, SAIC

8:30 am: **Freeform reflector design with extended sources**, Florian Fournier, Univ. of Central Florida (United States); Jannick P. Rolland, Univ. of Rochester (United States); William J. Cassarly, Optical Research Associates (United States) [7423-01]

8:50 am: **Free form V-groove reflector design with the SMS method** (*Invited Paper*), Dejan Grabovickic, Univ. Politécnica de Madrid (Spain); Juan C. Miñano, Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators (United States) [7423-02]

9:25 am: **Sensitivity to figure error of a freeform refractive beam shaper**, Vladimir I. Oliker, Emory Univ. (United States) [7423-03]

9:45 am: **Illumination system design in a project-based course** (*Invited Paper*), R. John Koshel, Photon Engineering LLC (United States) and College of Optics/The Univ. of Arizona (United States) [7423-04]

10:20 am: **Novel aplanatic designs**, Roland Winston, Weiya Jiang, Univ. of California, Merced (United States) [7423-32]

Coffee Break 10:40 to 11:00 am

SESSION 2

Room: Conv. Ctr. 10 Sun. 11:00 am to 12:15 pm

Tailored and Optimized Optics at the Étendue Limit II

Session Chair: **Juan C. Miñano**, Light Prescriptions Innovators and Univ. Politécnica de Madrid (Spain)

11:00 am: **Field method for concentrator design**, Angel Garcia-Botella, Univ. Politécnica de Madrid (Spain); Antonio A. Fernandez-Balbuena, Daniel Vázquez Molini, Eusebio Bernabeu, Agustin Gonzalez-Cano, Univ. Complutense de Madrid (Spain) [7423-05]

11:20 am: **Thermodynamic efficiency of nonimaging concentrators** (*Invited Paper*), Narkis E. Shatz, John C. Bortz, SAIC (United States); Roland Winston, Univ. of California, Merced (United States) [7423-07]

11:55 am: **Beating the optical Liouville theorem**, Roland Winston, Weiya Jiang, Univ. of California, Merced (United States) [7423-33]

Lunch Break 12:15 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 10 Sun. 1:30 to 2:10 pm

Tailored and Optimized Optics at the Étendue Limit III

Session Chair: **Philip L. Gleckman**, eSolar Inc.

1:30 pm: **Shifted-elementary-mode representation for partially coherent vectorial fields**, Frank Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); Jani Tervo, Jari P. Turunen, Pasi Vahimaa, Univ. of Joensuu (Finland) [7423-08]

1:50 pm: **Aplanatic optics for radiative transfer at the thermodynamic limit: generalizing and categorizing the full spectrum of solutions**, Jeffrey M. Gordon, Daniel Feuermann, Ben-Gurion Univ. of the Negev (Israel) [7423-09]

SESSION 4

Room: Conv. Ctr. 10 Sun. 2:10 to 3:05 pm

High-Concentration Solar Optics I

Session Chair: **Philip L. Gleckman**, eSolar Inc.

2:10 pm: **Optical waveguide system for solar power applications in space**, Takashi Nakamura, Physical Sciences Inc. (United States) [7423-10]

2:30 pm: **Collimator design for extended sources** (*Invited Paper*), Hans Philipp Annen, Ling Fu, Ralf Leutz, Concentrator Optics GmbH (Germany) [7423-11]

Coffee Break 3:05 to 3:40 pm

SESSION 5

Room: Conv. Ctr. 10 Sun. 3:40 to 5:00 pm

High-Concentration Solar Optics II

Session Chair: **Ralf Leutz**, Concentrator Optics GmbH (Germany)

3:40 pm: **New solar cell concentrator with frequency conversion capability**, Xingzhong Yan, South Dakota State Univ. (United States) [7423-12]

4:00 pm: **Nonimaging solar thermal collector for high temperature terrestrial and space applications**, Michael Mouzouris, Michael J. Brooks, Univ. of KwaZulu-Natal (South Africa) [7423-13]

4:20 pm: **On development and testing of high concentration flat-plate Fresnel lenses**, Maxim Z. Shvarts, Ioffe Physico-Technical Institute (Russian Federation); Andrey A. Soluyanov, Technoexan Ltd. (Russian Federation) [7423-14]

4:40 pm: **Truncation of the secondary concentrator (CPC) between maximum performances and economic requirements**, Akiba Segal, Weizmann Institute of Science (Israel) [7423-15]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Conference 7423

Monday 3 August

SESSION 6

Room: Conv. Ctr. 10 Mon. 8:10 to 10:05 am

Solar Daylighting Optics

Session Chair: Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (Spain)

8:10 am: **An optical coupler of natural light guiding system based on prismatic structure and microlens array**, Po-Hsuan Pan, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) [7423-16]

8:30 am: **Using prismatic structure and étendue principle to design cascaded unit of static solar concentrator in natural light guiding system**, Shu-Hua Yang, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) [7423-17]

8:50 am: **Splitting up the anidolic integrated ceiling into small pieces: where does the use of highly reflective coating materials make most sense?** (*Invited Paper*), Friedrich Linhart, Jr., Ecole Polytechnique Fédérale de Lausanne (Switzerland); Stephen K. Wittkopf, National Univ. of Singapore (Singapore); Jean-Louis Scartezzini, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7423-18]

9:25 am: **A low-cost rugged solution for solar lighting**, Bharathwaj Narasimhan, Balaji Srinivasan, Indian Institute of Technology Madras (India) [7423-19]

9:45 am: **Novel structure of plastic optical fibre (POF) for daylighting application**, Jagadissen Munisami, London Metropolitan Univ. (United Kingdom) [7423-20]

Coffee Break 10:05 to 10:40 am

SESSION 7

Room: Conv. Ctr. 10 Mon. 10:40 am to 12:20 pm

LED and Illumination Optics

Session Chair: William J. Cassar, Optical Research Associates

10:40 am: **Improving the color uniformity of a LED-array based illumination system with a tailored light distribution**, Youri Meuret, Vrije Univ. Brussel (Belgium); Lieve Lanoye, Filip Bruyneel, Philips Consumer Lifestyle (Belgium); Hugo Thienpont, Vrije Univ. Brussel (Belgium) [7423-21]

11:00 am: **Design and evaluation of natural light guiding system in ecological illumination of traffic tunnels**, Cheng-Nan Chen, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) [7423-22]

11:20 am: **Pixelated wall washers**, Bart A. Salters, Marcel C. P. M. Krijn, Philips Research (Netherlands) [7423-23]

11:40 am: **Light source modulation using light guide rods**, André Domhardt, Univ. Karlsruhe (Germany); Udo Rohlfing, Hochschule Darmstadt (Germany); Simon Wendel, Uli Lemmer, Univ. Karlsruhe (Germany) [7423-24]

12:00 pm: **Modeling and design of grating cells diffusers for lighting applications**, Frank Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); Christian Hellmann, Hagen Schimmel, Michael Kuhn, LightTrans GmbH (Germany) [7423-25]

Lunch Break 12:20 to 1:30 pm

Room: Conv. Ctr. 6A Mon. 1:30 to 5:00 pm

Solar Energy Plenary Session

Session Chair: Martha Symko-Davies, National Renewable Energy Lab.

1:30 pm: **Progress in Organic Photovoltaics toward Low Cost PV**, David S. Ginley, Sean E. Shaheen, Joseph J. Berry, Matthew S. White, Matthew Reece, Dana C. Olson, National Renewable Energy Lab. (United States) [7411-101]

2:00 pm: **Thin-Film Silicon PV Modules: Status and Prospects**, Arvind Shah, Univ. of Neuchâtel (Switzerland) [7409-102]

2:30 pm: **Recent Progress in Photocatalysts for Overall Water Splitting by Solar Energy**, Kazunari Domen, The Univ. of Tokyo (Japan) .. [7408-103]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Photovoltaic-Reliability R&D toward a Solar-Powered World**, Sarah R. Kurtz, National Renewable Energy Lab. (United States); Jennifer E. Granata, Sandia National Labs. (United States) [7412-104]

4:00 pm: **Thin Film PV: The Pathway to Grid Parity**, David Eaglesham, First Solar, LLC (United States) [7409-105]

4:30 pm: **Concentrating Solar Power for Utility Scale Applications**, Raed A. Sherif, eSolar Inc. (United States) [7407-106]

See page 17-19 for presentation details.

Room: Marriott Hotel, Marina F. Mon. 8:00 to 10:00 pm

Illumination Technical Event

Chair: Jake Jacobsen, Optical Research Associates

We will be discussing state-of-the-art solar collection technology with an emphasis on the optical devices used to collect and concentrate solar energy.

Representatives from solar energy companies will present examples of their technology and discuss strategies, nuances and challenges in implementing economically feasible, marketable devices. Discussion to cover both small scale and large, utility sized installations. At the end of the planned event, any member of the audience may present information within the broad field of illumination.

Light refreshments will be served.

Speakers: Prof. Roland Winston, Univ. of California, Merced (USA)

Dr. Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Dr. Philip L. Gleckman, eSolar Inc. (USA)

Dr. Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (USA)

Tuesday 4 August

Room: Conv. Ctr. 6A Tues. 8:30 to 10:00 am

Solid State Lighting and OLEDs Plenary Session

Session Chairs: Ian T. Ferguson, The Univ. of North Carolina at Charlotte and Franky So, Univ. of Florida

Joint Plenary Session with Conference 7415: Organic Light Emitting Materials and Devices XIII

8:30 am: **n-UV Based White LEDs**, Tsunemasa Taguchi, Yamaguchi Univ. (Japan) [7422-10]

9:15 am: **High Performance OLEDs for General Lighting**, Junji Kido, Yamagata Univ. (Japan) [7415-44]

See page 19 for presentation details.

Coffee Break 10:00 to 10:30 am

Room: Conv. Ctr. Room 6A Tues. 10:30 am to 12:00 pm

Panel Discussion: Commercialization of Next-Generation Solar Technologies

Moderators: Loucas Tsakalakos, GE Global Research (United States) and Sean E. Shaheen, Univ. of Denver (United States)

Panelists: Harry A. Atwater, Jr., California Institute of Technology (United States)

Christoph J. Brabec, Konarka Austria Forschungs und Entwicklungs GmbH (Austria)

Sue Carter, Solexant (United States)

Christiana B. Honsberg, Arizona State Univ. (United States)

Darin W. Laird, Plextronics Inc. (United States)

Moritz K. Riede, IAPP, Technische Univ. Dresden (Germany)

Wladek Walukiewicz, RoseStreet Labs (United States)

James H. Ermer, Spectrolab, Inc. (United States)

Room: Conv. Ctr. Exhibit Hall D Tues. 8:00 to 10:00 pm

Poster/Demo Session-Tuesday

Conference attendees are invited to attend the Poster/Demonstration Session to network, enjoy light refreshments, view the poster papers, and see demonstrations of prototype devices. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Tuesday.

High pumping-efficiency and wideband L-band erbium-doped fiber ASE source using two-stage double-pass backward pumping configuration, Benrui Zheng, Univ. of North Carolina, Charlotte Chapter (United States); Wencai Huang, Xiamen Univ. (China) [7423-26]

Skylight: a hollow prismatic CPC, Antonio A. Fernandez-Balbuena, Daniel Vázquez Molini, Berta Garcia-Fernandez, Eusebio Bernabeu, Univ. Complutense de Madrid (Spain) [7423-27]

Analysis of a hybrid cost-effective solar lighting system, Xiaoming Shen, Youming Sun, Yiming Wei, Shuiku Zhong, Fubin Li, Shuo Lin, Jiangong Li, Xianghai Meng, Donghong Li, Guangxi Univ. (China) [7423-28]

LED beam shaping using microlens arrays, Yun-Chi Lee, Guo-Dung J. Su, National Taiwan Univ. (Taiwan) [7423-29]

Cylindrically symmetric Fresnel lens for high concentration photovoltaic, Yu-Ting Hung, National Taiwan Univ. (Taiwan) [7423-30]

Optical design of a new combo solar concentrator, Chung Ping Liu, Hung Yen Lin, Chin Tin Hsiao, Yuan Ze Univ. (Taiwan) [7423-31]

Generation of uniform illumination using faceted reflectors, Lirong Wang, José Sasián, R. John Koshel, College of Optical Sciences, The Univ. of Arizona (United States) [7423-34]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC011 Design of Efficient Illumination Systems (Cassarly) Wednesday, 8:30 am to 12:30 pm

SC384 The Design of Plastic Optical Systems (Schaub) Sunday, 1:30 to 5:30 pm

SC388 Non-Imaging Optics (Winston) Tuesday, 1:30 to 5:30 pm

SC490 Solid State Lighting I (Ferguson) Monday, 8:30 am to 12:30 pm

SC552 Aspheric Optics: Design, Fabrication, and Test (Fischer) Wednesday, 8:30 am to 12:30 pm

Conference 7424

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7424

Advances in Optomechanics

Conference Chair: **Alson E. Hatheway**, Alson E. Hatheway, Inc.

Program Committee: **Anees Ahmad**, Raytheon Missile Systems; **Joseph Antebi**, Simpson Gumpertz & Heger Inc.; **Patrick A. Bournes**, MicroMeasure, Inc.; **John M. Casstevens**, Dallas Optical Systems, Inc.; **Robert G. Chave**, RCAP Inc.; **Patrick A. Coronato**, Raytheon Missile Systems; **John G. Daly**, Vector Engineering; **Keith B. Doyle**, Sigmadyne, Inc.; **Robert C. Guyer**, BAE Systems; **Mark J. Hegge**, Ball Aerospace & Technologies Corp.; **Anthony B. Hull**, L-3 Communications Tinsley Labs. Inc.; **William J. Lees**, Johns Hopkins Univ.; **John J. Polizzotti**, BAE Systems; **Santiago Royo**, Univ. Politècnica de Catalunya (Spain); **Ann F. Shipley**, Univ. of Colorado at Boulder; **Deming Shu**, Argonne National Lab.; **David M. Stubbs**, Lockheed Martin Space Systems Co.; **Daniel Vukobratovich**, Raytheon Missile Systems; **Paul R. Yoder, Jr.**, Consultant; **Carl H. Zweben**, Consultant

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Room: Marriott Hotel, Mission Hills . Tues. 8:00 to 10:00 pm

Optomechanical/Instrument Technical Event

Chair: **Alson E. Hatheway**, Alson E. Hatheway Inc.

This is the annual meeting of the premier group of optomechanical engineers that design and analyze the world's optical instruments and systems.

Our feature speaker will be Scott Texter, the manager of the JWST Telescope for Northrop Grumman Aerospace Systems. He will review the progress on the development of the James Webb Space Telescope for us.

The James Webb Space Telescope (JWST) is a large, infrared-optimized space telescope, scheduled for launch in 2013. JWST will find the first galaxies that formed in the early Universe, connecting the Big Bang to our own Milky Way Galaxy. JWST will peer through dusty clouds to see stars forming planetary systems, connecting the Milky Way to our own Solar System. JWST's instruments will be designed to work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range. JWST will have a large mirror, 6.5 meters (21.3 feet) in diameter and a sunshield the size of a tennis court. Both the mirror and sunshade won't fit onto the rocket fully open, so both will fold up and open only once JWST is in outer space. JWST will reside in an orbit about 1.5 million km (1 million miles) from the Earth.

This gathering is open to all attendants to the Optics and Photonics Symposium. Anyone who wishes to put an item on the agenda should contact the Chair, Al Hatheway, at aeh@aehinc.com.

Following the speakers and other agenda items the floor will be open for our traditional 'Problems and Solutions Workshop' session so bring some challenges before the group.

See page 27 for presentation details.

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. Room 7A Wed. 8:30 to 10:00 am

Mechanics of Systems I

Session Chair: **Alson E. Hatheway**, Alson E. Hatheway, Inc.

8:30 am: **Optomechanical engineering education at University of Arizona** (Invited Paper), James H. Burge, Robert E. Parks, College of Optical Sciences, The Univ. of Arizona (United States) [7424-01]

9:00 am: **Optimizing the frequency response of a steering mirror mount for interferometry applications**, F. Ernesto Penado, Northern Arizona Univ. (United States); James H. Clark III, Naval Research Lab. (United States) [7424-02]

9:20 am: **Cooling flow requirements for the honeycomb cells of the LSST cast borosilicate primary-tertiary mirror**, Douglas R. Neill, National Optical Astronomy Observatory (United States) [7424-03]

9:40 am: **Flexure based mechanics for improved lens system optimization**, Keith Hanford, Corning Tropol Corp. (United States) [7424-04]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. Room 7A Wed. 10:30 to 11:30 am

Mechanics of Systems II

Session Chair: **Alson E. Hatheway**, Alson E. Hatheway, Inc.

10:30 am: **Monolithic interferometers for high precision radial velocity measurements**, Xiaoke Wan, Jian C. Ge, Brian Lee, Ji Wang, Univ. of Florida (United States) [7424-05]

10:50 am: **Performance evaluations of the LSST secondary mirror**, Myung K. Cho, Ming Liang, Douglas R. Neill, National Optical Astronomy Observatory (United States) [7424-06]

11:10 am: **Engineered spacecraft deployables**, David A. Pohl, Northrop Grumman Space Technology (United States); H. Donald Wolpert, Bio-Optics (United States) [7424-07]

SESSION 3

Room: Conv. Ctr. Room 7A Wed. 11:30 am to 12:30 pm

Mechanics of Mounting I

Session Chair: **Alson E. Hatheway**, Alson E. Hatheway, Inc.

11:30 am: **Tensile stresses in ring-mounted glass lenses**, Alson E. Hatheway, Alson E. Hatheway, Inc. (United States) [7424-14]

11:50 am: **Harmonic drive experimental characterization, model development, and simulation results**, Curt A. Preissner, Deming Shu, Argonne National Lab. (United States); Thomas J. Royston, Univ. of Illinois at Chicago (United States) [7424-08]

12:10 pm: **Optical mounts for harsh environments**, Mark E. Mimovich, James C. Goodding, Jonathan C. Griffee, Vann M. Stavast, CSA Engineering, Inc. (United States) [7424-10]

Lunch/Exhibition Break 12:30 to 2:00 pm

SESSION 4

Room: Conv. Ctr. Room 7A Wed. 2:00 to 3:00 pm

Mechanics of Mounting II

Session Chair: **Deming Shu**, Argonne National Lab.

2:00 pm: **Mirror deformation versus contact area in mounted flat mirrors**, James H. Clark III, Naval Research Lab. (United States); F. Ernesto Penado, Northern Arizona Univ. (United States); Frank Cornelius, Interferometrics, Inc. (United States) [7424-11]

2:20 pm: **Laminar linear weak-link mechanisms with sub-centimeter travel range and sub-nanometer positioning resolution**, Deming Shu, Jörg Maser, Argonne National Lab. (United States) [7424-12]

2:40 pm: **Lens barrel design of the NIRST IR Camera**, Patrice Côté, Mélanie R. Leclerc, François Châteauneuf, INO (Canada); Hugo G. Marraco, Comisión Nacional de Actividades Espaciales (Argentina) [7424-13]

Coffee Break 3:00 to 3:30 pm

SESSION 5

Room: Conv. Ctr. Room 7A Wed. 3:30 to 5:10 pm

Mechanics of Elements I

Session Chair: **Mark J. Hegge**, Ball Aerospace & Technologies Corp.

- 3:30 pm: **Research on impact resistance properties of key equipments using high speed CCD**, Guobiao Yang, Yi Ding, Tongji Univ. (China). [7424-16]
- 3:50 pm: **Picometer stable scan mechanism for gravitational wave detection in space**, Joep Pijnenburg, Niek Rijnveld, Harm Hogenhuis, TNO (Netherlands). [7424-17]
- 4:10 pm: **Advancements in linear piezoelectric actuator mechanisms**, Harry Marth, Physik Instrumente (PI) GmbH & Co. KG (Germany). [7424-18]
- 4:30 pm: **Developing a new generation of optomechanical derotator for analysis of the dynamic behaviour of rotating components**, Sahar Mirzaei, Omar Abo-Namous, Leibniz Univ. Hannover (Germany); Guenter Beichert, Holo Support (Germany); Thomas Fahlbusch, Eduard Reithmeier, Leibniz Univ. Hannover (Germany). [7424-19]
- 4:50 pm: **Glass design for optomechanical assembly**, Paul V. Mammini, Lockheed Martin Space Systems Co. (United States) [7424-20]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

- A novel combined laser tracking mechanism**, Anhu Li, Tongji Univ. (China); Yongcheng Liang, Shanghai Ocean Univ. (China); Yongming Bian, Yutian Zhu, Tongji Univ. (China) [7424-27]
- Development of a compact tool for sealing the compensator group in final stages of alignment**, Josep Arasa, Univ. Politècnica de Catalunya (Spain); Andres F. Cifuentes, ServiceVision System, S.A. (Spain); Santiago Royo, Univ. Politècnica de Catalunya (Spain). [7424-28]
- Design and performance of a pin base sensor for X-ray macromolecular crystallography**, Shenglan Xu, Oleg A. Makarov, Robert F. Fischetti, Argonne National Lab. (United States). [7424-29]
- Rapid prototype lens mount**, T. Scott Rowe, Rowe Technical Design (United States) [7424-30]

Thursday 6 August

SESSION 6

Room: Conv. Ctr. Room 7A Thurs. 8:30 to 11:30 am

Mechanics of Elements II

Session Chair: **Alson E. Hatheway**, Alson E. Hatheway, Inc.

- 8:30 am: **Optomechanical analysis of a high stability multi-channel vehicle sight**, Kenneth D. Ball, Qioptiq Ltd. (United Kingdom) [7424-21]
- 8:50 am: **Low-cost large-angle steering mirror development**, Steven R. Wassom, Utah State Univ. (United States) [7424-22]
- 9:10 am: **Optomechanical design of a prompt gamma ray diagnostic**, Morris I. Kaufman, Robert M. Malone, Brent C. Frogget, Thomas W. Tunnell, Brian C. Cox, National Security Technologies, LLC (United States); Hans Herrmann, Los Alamos National Lab. (United States); Wolfgang Stoeffl, Lawrence Livermore National Lab. (United States). [7424-23]
- 9:30 am: **Opto-mechanical review of a light weight compact visible zoom camera**, Brian M. McMaster, Corning Tropol Corp. (United States) . . [7424-32]
- Coffee Break 9:50 to 10:30 am
- 10:30 am: **An inverse kinematics approach to hexapod design and control**, Frank A. DeWitt IV, CVI Melles Griot (United States) [7424-25]
- 10:50 am: **Bulk optics for seismological applications**, Serge Olivier, Damien Ponceau, Philippe Millier, Nicolas Brebion, Commissariat à l'Énergie Atomique (France) [7424-26]
- 11:10 am: **Optical and mechanical design advantages using polymer optics**, Valentina V. Doushkina, Erik Fleming, Qioptiq Polymer, Inc. (United States) [7424-31]

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Courses of Related Interest

See *SPIE Cashier* for information and to register.

- SC010 Introduction to Optical Alignment Techniques (Ruda) Monday-Tuesday, 8:30 am to 5:30 pm
- SC013 Precision Mounting of Optical Components (Yoder, Jr.) Tuesday, 8:30 am to 5:30 pm
- SC014 Introduction to Optomechanical Design (Vukobratovich) Sunday-Monday, 8:30 am to 5:30 pm
- SC015 Structural Adhesives for Optical Bonding (Daly) Tuesday, 8:30 am to 12:30 pm
- SC218 Advanced Composite Materials for Optomechanical Systems (Zweben) Wednesday, 8:30 am to 5:30 pm

Conference 7425

Sunday-Monday 2-3 August 2009 • Proceedings of SPIE Vol. 7425

Optical Materials and Structures Technologies IV

Conference Chair: **Joseph L. Robichaud**, L-3 Communications SSG-Tinsley

Conference Co-Chair: **William A. Goodman**, Trex Hawaii LLC

Program Committee: **Christopher Carl Alexay**, StingRay Optics, LLC; **Scott R. Antonille**, NASA Goddard Space Flight Ctr.; **Carol A. Click**, SCHOTT North America, Inc.; **David A. Content**, NASA Goddard Space Flight Ctr.; **Brett J. de Blonk**, Air Force Research Lab.; **Douglas Deason**, U.S. Army Space and Missile Defense Command; **Richard A. Haber**, Rutgers Univ.; **Matthias R. Krödel**, ECM GmbH (Germany); **Lawrence E. Matson**, Air Force Research Lab.; **Rob V. Michel**, Brush Wellman, Inc.; **Iwona A. Palusinski**, The Aerospace Corp.; **Thomas B. Parsonage**, Brush Wellman Inc.; **John W. Pepi**, L-3 Communications SSG-Tinsley; **Marc Tricard**, QED Technologies, Inc.; **David V. Wick**, Sandia National Labs.

Sunday 2 August

SESSION 1

Room: Conv. Ctr. Room 32A Sun. 10:30 to 11:50 am

Material Selection and Characterization

Session Chair: **John W. Pepi**, L-3 Communications SSG-Tinsley

10:30 am: **Optical system material selection using performance indices in a simultaneous optimization approach**, Trent Newswander, Blake G. Crowther, Utah State Univ. Research Foundation (United States) [7425-01]

10:50 am: **CTE measurement of low CTE ceramic materials**, Matthias R. Krödel, ECM GmbH (Germany); Tsuyoshi Ozaki, Mitsubishi Electric Corp. (Japan). [7425-02]

11:10 am: **CTE characterisation of ZERODUR® for the ELT century**, Ralf Jedamzik, Thorsten Döhning, Thoralf Johansson, Peter Hartmann, Thomas Westerhoff, SCHOTT AG (Germany). [7425-03]

11:30 am: **Cryogenic refractometer for high accuracy measurements of the refractive index of materials**, Andrea Bianco, Paolo Spanò, Giorgio Toso, Giorgio Pariani, Osservatorio Astronomico di Brera (Italy) [7425-04]

Lunch Break 11:50 am to 1:00 pm

SESSION 2

Room: Conv. Ctr. Room 32A Sun. 1:00 to 2:30 pm

NDE of Silicon Carbide

Session Chair: **Iwona A. Palusinski**, The Aerospace Corp.

1:00 pm: **A general overview of some nondestructive evaluation (NDE) techniques for materials characterization** (*Invited Paper*), Shant Kenderian, The Aerospace Corp. (United States) [7425-05]

1:30 pm: **NDE methods for determining the materials properties of silicon carbide plates**, Shant Kenderian, Yong Kim, David B. Witkin, Iwona A. Palusinski, The Aerospace Corp. (United States) [7425-06]

1:50 pm: **High frequency ultrasound phased array characterization of SiC mirror blanks**, Richard A. Haber, Andrew Portune, Rutgers Univ. (United States). [7425-07]

2:10 pm: **Material testing of silicon carbide mirrors**, David B. Witkin, Iwona A. Palusinski, The Aerospace Corp. (United States) [7425-08]

SESSION 3

Room: Conv. Ctr. Room 32A Sun. 2:30 to 5:20 pm

Si-SiC

Session Chairs: **Bill Goodman**, Air Force Research Lab.; **Matthias R. Krödel**, ECM GmbH (Germany)

2:30 pm: **Proof load testing of lightweight silicon carbide mirror substrates**, Michael J. O'Brien, Aldrich De La Cruz, Ching-Yao Tang, Iwona A. Palusinski, The Aerospace Corp. (United States) [7425-09]

2:50 pm: **Recent achievements using chemical vapor composite silicon carbide (CVC SiC)**, William A. Goodman, Clifford T. Tanaka, Trex Advanced Materials (United States) [7425-10]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Silicon carbide missile seeker telescope**, Christopher J. Duston, Hugo D. Vargas, Entegris, Inc. (United States); Mehrdad Ketabchi, Axsys Technologies, Inc. (United States); Walter Wrigglesworth, P. Chris Theriault, Raytheon Missile Systems (United States) [7425-11]

4:00 pm: **Production of airborne mirrors made of HB-Cesic®**, Matthias R. Krödel, ECM GmbH (Germany); Georg Luichtel, Carl Zeiss Optronics GmbH (Germany); Gerhard Derst, Carl Zeiss AG (Germany) [7425-12]

4:20 pm: **Why silicon for telescope mirrors and structures?**, Roger A. Paquin, Douglas R. McCarter, McCarter Machine, Inc. (United States) [7425-13]

4:40 pm: **SPIRALE: the first flight heritage of Cesic®**, Matthias R. Krödel, ECM GmbH (Germany); Christophe Devilliers, Thales Alenia Space (France) [7425-14]

5:00 pm: **Silicon carbide mirror application in a flight system**, Christopher J. Duston, Entegris, Inc. (United States) [7425-15]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 4

Room: Conv. Ctr. Room 32A Mon. 8:50 to 10:10 am

Beryllium and Be Composites

Session Chairs: **Thomas B. Parsonage**, Brush Wellman Inc.; **Rob V. Michel**, Brush Wellman, Inc.

8:50 am: **An all-beryllium-aluminum optical system for reconnaissance applications**, Michael J. Russo, BAE Systems (United States) [7425-17]

9:10 am: **AIBeWeld™ net shaping technology through electron-beam welding** (*Presentation Only*), Rob V. Michel, Brush Wellman, Inc. (United States) [7425-36]

9:30 am: **Cryogenic adhesive testing for the NIRCcam optical bench assembly**, Michael S. Jacoby, Alison A. Nordt, Lockheed Martin Space Systems Co. (United States); Bryan Hurlbut, Rhombus Consultants Group (United States) [7425-19]

9:50 am: **NIRCcam optical bench assembly qualification testing**, Michael S. Jacoby, Alison A. Nordt, Lockheed Martin Space Systems Co. (United States) [7425-20]

Coffee Break 10:10 to 10:40 am

SESSION 5

Room: Conv. Ctr. Room 32A Mon. 10:40 am to 12:00 pm

Glass

Session Chair: **John W. Pepi**, L-3 Communications SSG-Tinsley

- 10:40 am: **Heritage of ZERODUR glass ceramic for space applications**, Thorsten Döhning, Peter Hartmann, Frank-Thomas Lentjes, SCHOTT AG (Germany); Mark J. Davis, SCHOTT North America, Inc. (United States)[7425-21]
- 11:00 am: **ZERODUR glass-ceramic for high stress applications**, Peter Hartmann, Kurt Nattermann, Thorsten Döhning, Markus Kuhr, Peter Thomas, SCHOTT AG (Germany); Guenther Kling, Stefano Lucarelli, EADS Astrium GmbH (Germany) [7425-22]
- 11:20 am: **Achromatic GRIN singlet lens design**, Erin F. Fleet, Guy Beadie, James S. Shirk, Naval Research Lab. (United States) [7425-23]
- 11:40 am: **A bonded precision optical assembly using potassium hydroxide**, Paul V. Mammini, Lockheed Martin Space Systems Co. (United States)[7425-24]
- Lunch Break 12:00 to 1:30 pm

SESSION 6

Room: Conv. Ctr. Room 32A Mon. 1:30 to 3:15 pm

Optical Materials, Proven and Emerging

Session Chair: **Joseph L. Robichaud**, L-3 Communications SSG-Tinsley

- 1:30 pm: **A century of sapphire crystal growth (Keynote Presentation)** (Presentation Only), Daniel C. Harris, Naval Air Systems Command (United States) [7425-25]
- 2:15 pm: **Silicon nitride for lightweight stiff structures for optical instruments**, Karl E. Berroth, FCT Ingenieurkeramik GmbH (Germany)[7425-26]
- 2:35 pm: **Structural design considerations for an 8-m space telescope**, H. Philip Stahl, William R. Arnold, NASA Marshall Space Flight Ctr. (United States) [7425-37]
- 2:55 pm: **Replication of lightweight hybrid mirrors**, Ming-Yung Chen, Lawrence E. Matson, Air Force Research Lab. (United States); Hee-Dong Lee, UES, Inc. (United States) [7425-28]
- Coffee Break 3:15 to 3:45 pm

SESSION 7

Room: Conv. Ctr. Room 32A Mon. 3:45 to 5:25 pm

Thin Film Coatings

Session Chair: **Michael J. Ellison**, Alpine Research Optics Corp.

- 3:45 pm: **Space radiation testing of thin film and multilayer optical coatings**, Gayle E. Thayer, Sandia National Labs. (United States) [7425-29]
- 4:05 pm: **Fabrication and characterization of cerium oxide thin films for ultraviolet sensing applications**, Kai Wang, Univ. of Waterloo (Canada) and Thunder Bay Regional Research Institute (Canada); Karim S. Karim, Univ. of Waterloo (Canada); Alla Reznik, Thunder Bay Regional Research Institute (Canada) [7425-30]
- 4:25 pm: **Characterization of custom mirror coatings for the MRO interferometer telescopes**, Colby A. Jurgenson, Krista McCord, Daniel A. Klinglesmith III, Eric J. Bakker, New Mexico Institute of Mining and Technology (United States); Reed A. Schmell, Anthony Jaramillo, Rod Schmell, Ray Desmarais, Optical Surface Technologies, LLC (United States) [7425-31]
- 4:45 pm: **Tailoring of process parameters to optimize optical and structural properties of SiO₂/HfO₂ multilayers**, Erik M. Krous, Dinesh Patel, Colorado State Univ. (United States); Ashot Markosyan, Stanford Univ. (United States); Luke A. Emmert, The Univ. of New Mexico (United States); Benjamin Langdon, Peter Langston, Federico J. Furch, Jorge J. Rocca, Colorado State Univ. (United States); Roger Route, Martin M. Fejer, Stanford Univ. (United States); Wolfgang Rudolph, The Univ. of New Mexico (United States); Michelle D. Shinn, Thomas Jefferson National Accelerator Facility (United States); Carmen S. Menoni, Colorado State Univ. (United States) [7425-32]
- 5:05 pm: **Structure transformation influence on optical properties and electronic structure of cobalt**, Roman I. Khakimov, Vasyi S. Staschuk, National Taras Shevchenko Univ. of Kyiv (Ukraine) [7425-33]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

X-ray absorption fine-structure study on silicon carbide by synchrotron radiation, Yi-Li Tu, Zhe Chuan Feng, National Taiwan Univ. (Taiwan); Lin-Yun Jang, National Synchrotron Radiation Research Ctr. (Taiwan); Tzuen-Rong Yang, National Taiwan Normal Univ. (Taiwan); Weijie Lu, Fisk Univ. (United States) [7425-34]

Fabrication of microlens array on a glass substrate by roll-to-roll process with PDMS mold, Chia-Nying Hu, Guo-Dung J. Su, National Taiwan Univ. (Taiwan) [7425-35]

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Conference 7426

Tuesday-Wednesday 4-5 August 2009 • Proceedings of SPIE Vol. 7426

Optical Manufacturing and Testing VIII

Conference Chairs: James H. Burge, College of Optical Sciences/The Univ. of Arizona and The Univ. of Arizona/Steward Observatory; Oliver W. Föhnle, FISBA OPTIK AG (Switzerland); Ray Williamson, Ray Williamson Consulting

Program Committee: Dave Baiocchi, Sandia National Labs.; Michael Bray, MBO-Metrology (France); Andrew R. Clarkson, L-3 Brashear; Glen C. Cole, L-3 Communications Tinsley Labs. Inc.; David A. Content, NASA Goddard Space Flight Ctr.; Olaf Dambon, Fraunhofer-Institut für Produktionstechnologie (Germany); Peter J. de Groot, Zygo Corp.; Roland Geyl, Sagem SA (France); John E. Greivenkamp, College of Optical Sciences/The Univ. of Arizona; Stephen D. Jacobs, Univ. of Rochester; Stephen E. Kendrick, Ball Aerospace & Technologies Corp.; Stephen J. Martinek, 4D Technology Corp.; Gary Matthews, ITT Industries, Inc.; Chunlin Miao, Univ. of Rochester; Ted Mooney, ITT Corp.; Robert E. Parks, Optical Perspectives Group, LLC; Joseph L. Robichaud, L-3 Communications SSG-Tinsley; Joanna Schmit, Veeco Instruments Inc.; Shai N. Shafir, Univ. of Rochester; Peter Z. Takacs, Brookhaven National Lab.; Martin J. Valente, College of Optical Sciences/The Univ. of Arizona; David D. Walker, Zeeko Ltd. (United Kingdom); Xue-jun Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China)

Tuesday 4 August

SESSION 1

SESSION 3

Room: Conv. Ctr. Room 32A Tues. 8:20 to 10:00 am

Multiple Surfaces and Freeform Optics

Session Chair: Oliver W. Föhnle, FISBA OPTIK AG (Switzerland)

8:20 am: **High-resolution measurement of internal interface of optically transparent materials**, Chun-Wei Chang, I-Jen Hsu, Chung Yuan Christian Univ. (Taiwan) [7426-01]

8:40 am: **Microfluidic design and fabrication of wafer-scale varifocal liquid lens**, Jeong Yub Lee, Seung-Tae Choi, Seung Wan Lee, Woon Bae Kim, Samsung Advanced Institute of Technology (Korea, Republic of) [7426-02]

9:00 am: **Fabrication and characterization of polymer based spatial light modulators**, Guangmin Ouyang, Kaiying Wang, Nadeem M. Akram, Xuyuan Chen, Vestfold Univ. College (Norway) [7426-03]

9:20 am: **Comparison of freeform manufacturing techniques in the production of monolithic lens arrays**, Gregg E. Davis, II-VI Infrared (United States); Jeffrey W. Roblee, AMETEK Precitech, Inc. (United States); Alan Hedges, II-VI Infrared (United States) [7426-04]

9:40 am: **Nanometer level freeform surface measurements with the NANOMEFOS non-contact measurement machine**, Rens Henselmans, TNO Science and Industry (Netherlands); Lennino Cacace, AC Optomechanix (Netherlands); Geerten Kramer, TNO Science and Industry (Netherlands); Nick Rosielle, Maarten Steinbuch, Technische Univ. Eindhoven (Netherlands) [7426-05]

Coffee Break 10:00 to 10:30 pm

SESSION 2

SESSION 4

Room: Conv. Ctr. Room 32A Tues. 10:30 to 11:50 am

Developments in Surface Finishing

Session Chair: Oliver W. Föhnle, FISBA OPTIK AG (Switzerland)

10:30 am: **Accuracy of freeform manufacturing processes**, Guido P. Gubbels, Bart van Venrooy, TNO Science and Industry (Netherlands) [7426-06]

10:50 am: **Ultraprecision machining techniques for the fabrication of freeform surfaces in highly integrated optical microsystems**, Sebastian Stobenau, Stefan Sinzinger, Technische Univ. Ilmenau (Germany) .. [7426-07]

11:10 am: **Increased UV transmission by improving the manufacturing processes for FS**, Jessica E. DeGroot-Nelson, Tobias Nitzsche, Jonathan T. Watson, Donald K. Henry, Andrew A. Haefner, Robert A. Wiederhold, Optimax Systems, Inc. (United States) [7426-08]

11:30 am: **Varying electro-kinetic interactions to achieve predictable removal rates and smooth surfaces on ZnS**, Jessica E. DeGroot-Nelson, Jarrett A. Drucker, Andrew A. Haefner, Robert A. Wiederhold, Optimax Systems, Inc. (United States) [7426-09]

Lunch/Exhibition Break 11:50 am to 1:00 pm

Room: Conv. Ctr. Room 32A Tues. 1:00 to 3:00 pm

MRF and Aspheres

Session Chair: Ray Williamson, Ray Williamson Consulting

1:00 pm: **Surface modification of carbonyl iron particles for magnetorheological finishing (MRF)**, Shai N. Shafir, Rui Shen, Chunlin Miao, Henry J. Romanofsky, Mimi Wang, Joni Mici, Hong Yang, John C. Lambropoulos, Stephen D. Jacobs, Univ. of Rochester (United States)[7426-10]

1:20 pm: **Normal force in magnetorheological finishing**, Chunlin Miao, Shai N. Shafir, John C. Lambropoulos, Stephen D. Jacobs, Univ. of Rochester (United States) [7426-11]

1:40 pm: **Control of mechanical and chemical effects in magnetorheological finishing**, Chunlin Miao, John C. Lambropoulos, Shai N. Shafir, Henry J. Romanofsky, Stephen D. Jacobs, Univ. of Rochester (United States) . [7426-12]

2:00 pm: **Detection, avoidance and modification of spatial mid-frequencies in subaperture finishing**, Karin Hauser, Safer Mourad, Mark Meeder, Oliver W. Föhnle, FISBA OPTIK AG (Switzerland) [7426-13]

2:20 pm: **Simulation and analysis of the polishing process for aspheres**, Rainer Boerret, Andreas Kelm, Hochschule Aalen (Germany); Stefan Sinzinger, Technische Univ. Ilmenau (Germany) [7426-14]

2:40 pm: **Parametric modeling of edge tool influence functions for computer controlled optical surfacing**, Dae Wook Kim, Won Hyun Park, College of Optical Sciences, The Univ. of Arizona (United States); Sug-Whan Kim, Yonsei Univ. (Korea, Republic of); James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States) [7426-15]

Coffee Break 3:00 to 3:20 pm

Room: Conv. Ctr. Room 32A Tues. 3:20 to 4:00 pm

Surface Shaping

Session Chair: Ray Williamson, Ray Williamson Consulting

3:20 pm: **Rough shaping and optical test of roughness surfaces by using the Ronchi test**, Jorge Castro-Ramos, Jaime Sanchez-Paredes, Brasília Cabrera-Perez, Gabriel Gordiano-Alvarado, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Agustin Santiago-Alvarado, Univ. Tecnológica de la Mixteca (Mexico); Javier Muñoz-Lopez, Sergio Vázquez Montiel, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7426-16]

3:40 pm: **Estimating BRDFs from surface PSDs for moderately rough surfaces**, James Harvey, Andrey Krywonos, Narak Choi, CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States) [7426-42]

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Wednesday 5 August

SESSION 5

Room: Conv. Ctr. Room 32A Wed. 8:20 to 10:00 am

Large Asphere Surfacing and Testing I

Session Chair: **James H. Burge**, College of Optical Sciences, The Univ. of Arizona

8:20 am: **Swing-arm optical CMM for aspherics**, Peng Su, James H. Burge, Robert E. Parks, Chang Jin Oh, College of Optical Sciences, The Univ. of Arizona (United States) [7426-18]

8:40 am: **Manufacture and performance test of an 800-mm space optic**, Matthias R. Krödel, ECM GmbH (Germany); Tsuyoshi Ozaki, Mitsubishi Electric Corp. (Japan) [7426-19]

9:00 am: **Fabrication and testing of 1.4-m convex off axis aspheric optical surfaces**, James H. Burge, Scott D. Benjamin, Colton Noble, Matthew J. Novak, Chang Jin Oh, College of Optical Sciences, The Univ. of Arizona (United States); Bryan K. Smith, The Univ. of Arizona (United States); Peng Su, Martin J. Valente, Chunyu Zhao, College of Optical Sciences, The Univ. of Arizona (United States) [7426-20]

9:20 am: **Non-null interferometric aspheric testing with partial null lens and reverse optimization**, Dong Liu, Yongying Yang, Yibing Shen, Zhejiang Univ. (China) [7426-21]

9:40 am: **Verification process for the wavefront quality of the primary mirrors for the MRO interferometer**, Eric J. Bakker, Andres Olivares, New Mexico Institute of Mining and Technology (United States); Reed A. Schmill, Rod Schmill, Anthony Jaramillo, Optical Surface Technologies, LLC (United States) [7426-22]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. Room 32A Wed. 10:30 am to 12:10 pm

Large Asphere Surfacing and Testing II

Session Chair: **James H. Burge**, College of Optical Sciences, The Univ. of Arizona

10:30 am: **Monolithic versus segmented primary mirror trades for space telescopes**, Stephen E. Kendrick, Ball Aerospace & Technologies Corp. (United States) [7426-23]

10:50 am: **Measurement of high-departure aspheric surfaces using subaperture stitching with adaptive null optics**, Paul E. Murphy, Gary M. DeVries, Jon F. Fleig, Gregory W. Forbes, Andrew W. Kulawiec, Dragisha Miladinovic, QED Technologies, Inc. (United States) [7426-24]

11:10 am: **Stitching interferometry: the practical side of things**, Michael Bray, MBO-Metrology (France) [7426-25]

11:30 am: **Research of precision interference locating method for a partial null compensator at aspheric testing**, Yongying Yang, Dong Liu, Xing Gao, Yibing Shen, Zhejiang Univ. (China) [7426-26]

11:50 am: **Fizeau interferometer with spherical reference and CGH correction for measuring of large convex aspherics**, Matthew B. Dubin, Chunyu Zhao, James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States) [7426-27]

Lunch/Exhibition Break 12:10 to 1:40 pm

SESSION 7

Room: Conv. Ctr. Room 32A Wed. 1:40 to 3:00 pm

Interferometry

Session Chair: **Ray Williamson**, Ray Williamson Consulting

1:40 pm: **Phase calculations using simultaneous phase shifting module**, Piotr Szwaykowski, Engineering Synthesis Design, Inc. (United States) [7426-28]

2:00 pm: **Limits for interferometer calibration using random ball test**, Ping Zhou, James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States) [7426-29]

2:20 pm: **Orthonormal vector polynomials in a unit circle - application: fitting mapping distortions in a null test**, Chunyu Zhao, James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States) [7426-30]

2:40 pm: **Determining transmittance of a large surface laser system**, Shen Zhu, U.S. Army Aviation and Missile Command (United States) [7426-31]

Coffee Break 3:00 to 3:30 pm

Panel Discussion: Issues with Mid-Frequency Surface Errors for Metrology and Fabrication

Room: Conv. Ctr. Room 32A Wed. 3:30 to 4:30 pm

Panel Moderator: **James H. Burge**, College of Optical Sciences, The Univ. of Arizona

Panelists: **Leslie L. Deck**, Zygo Corp.; **James E. Harvey**, CREOL, The College of Optics and Photonics, Univ. of Central Florida; **Jay Kumler**, Coastal Optical Systems, Inc.; **Paul E. Murphy**, QED Technologies, Inc.

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Scanning pentaprism measurements as a verification test for off-axis aspherics, Peng Su, James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States); Brian Cuerden, Hubert M. Martin, The Univ. of Arizona (United States) [7426-32]

Imaging analysis of a novel compound diffractive telescope system, Jinying Yue, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Sciences (China); Zhenwu Lu, Hua Liu, Changchun Institute of Optics, Fine Mechanics and Physics (China); Wenbin Xu, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Sciences (China); Hongxin Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China); Hu Zhang, Ying Liu, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate School of the Chinese Academy of Sciences (China) . . . [7426-33]

High-speed and precision auto-focusing system for direct laser lithography, Dong Ik Kim, Hyug-Gyo Rhee, Jae-Bong Song, Yun-Woo Lee, Korea Research Institute of Standards and Science (Korea, Republic of) [7426-34]

Development of a large ion beam figuring facility for correction of optics up to 1.7m diameter, Mauro Ghigo, Stefano Cornelli, Rodolfo Canestrari, Osservatorio Astronomico di Brera (Italy) [7426-35]

Fabrication of 300-mm silicon reference wafer fabrication by using direct laser writer, Hyug-Gyo Rhee, Dong Ik Kim, Seung-Ki Hong, Jae-Bong Song, Yun-Woo Lee, Korea Research Institute of Standards and Science (Korea, Republic of) [7426-37]

Laser tracker surface measurements of the 8.4m GMT primary mirror segment, Tom L. Zobrist, James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States); Hubert M. Martin, The Univ. of Arizona (United States) [7426-38]

Experimental investigation of the dimensions and quality of the laser-drilled holes in metals, Mihai Stafe, Constantin Negutu, Ionut Vladoiu, Adrian N. Ducariu, Ion M. Popescu, Univ. Politehnica Bucuresti (Romania) [7426-39]

Parametric and scattering characterization of PDMS membranes for optical applications, Agustín Santiago-Alvarado, Univ. Tecnológica de la Mixteca (Mexico); Sergio Vázquez Montiel, Jorge Castro-Ramos, Javier Muñoz-Lopez, Jose Alberto Delgado Atencio, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7426-40]

Aspheric surface test using a new alignment CGH, Jae-Bong Song, Ho-Soon Yang, Hyug-Gyo Rhee, Yun-Woo Lee, Korea Research Institute of Standards and Science (Korea, Republic of) [7426-41]

Courses of Related Interest

See *SPIE Cashier for information and to register.*

SC020 Optical Scattering: Measurement and Analysis (Stover) Wednesday, 8:30 am to 12:30 pm

SC211 Practical Interferometry and Fringe Analysis (Creath) Monday, 8:30 am to 12:30 pm

SC213 Introduction to Interferometric Optical Testing (Wyant) Monday, 1:30 to 5:30 pm

SC492 Predicting, Modeling, and Interpreting Light Scattered by Surfaces (Germer) Wednesday, 1:30 to 5:30 pm

SC552 Aspheric Optics: Design, Fabrication, and Test (Fischer) Wednesday, 8:30 am to 12:30 pm

SC720 Cost-Conscious Tolerancing of Optical Systems (Youngworth) Monday, 8:30 am to 12:30 pm

SC850 Metrology for Modern Optical Manufacturing (Murphy) Thursday, 8:30 am to 12:30 pm

Conference 7427

Wednesday-Thursday 5-6 August 2009 • Proceedings of SPIE Vol. 7427

Optical Modeling and Performance Predictions IV

Conference Chair: **Mark A. Kahan**, Optical Research Associates

Program Committee: **George Z. Angeli**, California Institute of Technology and Thirty Meter Telescope Project; **Edward B. Bragg**, MDA/ALTC; **Robert P. Breault**, Breault Research Organization, Inc.; **Gail J. Brown**, Air Force Research Lab.; **Robert J. Brown**, Ball Aerospace & Technologies Corp.; **Thomas G. Brown**, Univ. of Rochester Medical Ctr.; **William J. Cassarly**, Optical Research Associates; **H. John Caulfield**, Diversified Research Corp. and Fisk Univ.; **Russell A. Chipman**, College of Optical Sciences/The Univ. of Arizona; **David Doyle**, Luminus Devices, Inc.; **Keith B. Doyle**, Sigmadyne, Inc.; **G. Groot Gregory**, Optical Research Associates; **James B. Hadaway**, The Univ. of Alabama in Huntsville; **Claus K. Hoff**, Jet Propulsion Lab.; **Richard C. Juergens**, Raytheon Missile Systems; **George N. Lawrence**, Applied Optics Research; **Marie B. Levine**, Jet Propulsion Lab.; **Steven Peter Levitan**, Univ. of Pittsburgh; **H. Angus Macleod**, Thin Film Ctr., Inc.; **Gary Matthews**, ITT Industries, Inc.; **Duncan T. Moore**, Univ. of Rochester; **Gregory J. Moore**, Jet Propulsion Lab.; **James D. Moore, Jr.**, ManTech SRS Technologies; **Steven R. Murrill**, Army Research Lab.; **Sean G. O'Brien**, Army Research Lab.; **Jefferson E. Odhner**, OPTICS 1, Inc. and Odhner Holographics; **David C. Redding**, Jet Propulsion Lab.; **Harold B. Schall**, The Boeing Co.; **David A. Vaughn**, NASA Goddard Space Flight Ctr.; **James C. Wyant**, College of Optical Sciences/The Univ. of Arizona; **Richard N. Youngworth**, Light Capture, Inc.; **Feng Zhao**, Jet Propulsion Lab.

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Wednesday 5 August

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Holey birefringent fiber designed for wideband wave-plate, Zhi-Dong Shi, Ming-Jia Li, Jun Yin, Hua Chen, Xue-Nong Xiang, Shanghai Univ. (China) [7427-18]

Comparison between the straight-cut and the incescent-spin fiber-optic wave-plate, Zhi-Dong Shi, Min-Ning Ji, Jian-Qiang Lin, Hua Chen, Xue-Nong Xiang, Shanghai Univ. (China) [7427-19]

Study on the distortion prediction of focal plate, Jianping Wang, Jiaru Chu, Hongzhuan Hu, Xiaofeng Li, Zengxiang Zhou, Univ. of Science and Technology of China (China) [7427-20]

Accuracy characteristics of the shift control optical-electronic measurement system, Andrey G. Anisimov, Andrey V. Krasnyashchikh, Alexander N. Timofeev, St. Petersburg State Univ. of Information Technologies, Mechanics and Optics (Russian Federation) [7427-22]

Thursday 6 August

Room: Conv. Ctr. Room 32A Thurs. 8:55 to 9:00 am

Opening Remarks

Mark Kahan, Optical Research Associates (United States)

SESSION 1

Room: Conv. Ctr. Room 32A Thurs. 9:00 to 10:00 am

Component Design

9:00 am: **Free-space propagation of extreme NA polarized beams using the vector plane wave spectrum method and multi-gigabyte FFTs**, Alan W. Greynolds, Ruda-Cardinal Inc. (United States) [7427-01]

9:20 am: **Linear canonical transform sampling: analysis**, John J. Healy, John T. Sheridan, James P. Ryle, Univ. College Dublin (Ireland) [7427-02]

9:40 am: **Modeling of the zigzag amplifier**, George N. Lawrence, Applied Optics Research (United States); Nadia Baranova, Northrop Grumman Electronic Systems (United States); Anthony W. Yu, NASA Goddard Space Flight Ctr. (United States) [7427-03]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. Room 32A Thurs. 10:30 to 11:10 am

Detectors

10:30 am: **Theoretical evaluation of MTF and charge collection efficiency in CCD and CMOS image sensors**, Ibrahim Djité, Institut Supérieur de l'Aéronautique et de l'Espace (France) [7427-04]

10:50 am: **Development of a human eye model for visual performance assessment**, Chong-Jhih Jiang, Yi-Chun Chen, Tsung-Hsun Yang, Ching-Cherng Sun, National Central Univ. (Taiwan) [7427-05]

SESSION 3

Room: Conv. Ctr. Room 32A Thurs. 11:10 to 11:50 am

Radiometry and Stray Light

11:10 am: **Stochastic modeling of non-Lambertian surfaces for Monte Carlo computations in optical radiometry**, Alexander V. Prokhorov, Leonard M. Hanssen, National Institute of Standards and Technology (United States) [7427-06]

11:30 am: **Stray light characteristics of the Large Synoptic Survey Telescope (LSST)**, K. Scott Ellis, Photon Engineering LLC (United States) [7427-07]

Lunch Break 11:50 am to 1:20 pm

SESSION 4

Room: Conv. Ctr. Room 32A Thurs. 1:20 to 2:20 pm

Assembly and Test

1:20 pm: **Intensity distribution near focal point of high aperture optical system formed by partly polarized light**, Volodymyr N. Borovytsky, Viktoriia V. Chorna, National Technical Univ. of Ukraine (Ukraine) [7427-08]

1:40 pm: **Modeling interferometers with lens design software: beyond ray-based approaches**, Bryan D. Stone, Optical Research Associates (United States) [7427-09]

2:00 pm: **Statistical simulation of selectively assembled optical systems**, Max C. Funck, RWTH Aachen (Germany); Peter Loosen, Fraunhofer-Institut für Lasertechnik (Germany) [7427-10]

SESSION 5

Room: Conv. Ctr. Room 32A Thurs. 2:20 to 3:20 pm

Thermal

2:20 pm: **Fourier theory in temperature measurements**, José G. Suárez-Romero, Jose L. Rodriguez, Instituto Tecnológico de Querétaro (Mexico) [7427-11]

2:40 pm: **Antenna performance predictions of a radio telescope subject to thermal perturbations**, Keith B. Doyle, MIT Lincoln Lab. (United States) [7427-12]

3:00 pm: **Thermal performance prediction of the TMT telescope structure**, Myung K. Cho, National Optical Astronomy Observatory (United States); Andrew Corredor, The Univ. of Arizona (United States); Konstantinos Vogiatzis, George Z. Angeli, Thirty Meter Telescope Project (United States) [7427-13]

Coffee Break 3:20 to 3:50 pm

SESSION 6

Room: Conv. Ctr. Room 32A Thurs. 3:50 to 4:30 pm

Adaptive Optics and Dynamics

3:50 pm: **Investigation of primary mirror segment's residual errors for the Thirty Meter Telescope**, Byoung-Joon Seo, Carl R. Nissly, Jet Propulsion Lab. (United States); George Z. Angeli, Doug G. MacMynowski, Thirty Meter Telescope Project (United States); Norbert Sigrist, Mitchell Troy, Jet Propulsion Lab. (United States); Eric C. Williams, Thirty Meter Telescope Project (United States) [7427-14]

4:10 pm: **Investigation of disturbance effects on space-based weak lensing measurements with an integrated model**, Michael D. Lieber, Michael S. Kaplan, Ball Aerospace & Technologies Corp. (United States); Michael J. Sholl, Univ. of California, Berkeley (United States); Gary M. Bernstein, Univ. of Pennsylvania (United States) [7427-16]

SESSION 7

Room: Conv. Ctr. Room 32A Thurs. 4:30 to 4:50 pm

Integrated Modeling

4:30 pm: **A new software environment for the collaborative design and analysis of electro-optical sensors**, Jason Geis, Jeffrey A. Lang, Leslie Peterson, Francisco Roybal, David A. Thomas, The Aerospace Corp. (United States) [7427-17]

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Courses of Related Interest

See SPIE Cashier for information and to register.

- SC003 Practical Optical System Design - EXPANDED 2-Day Format (Fischer) Sunday-Monday, 8:30 am to 5:30 pm
- SC010 Introduction to Optical Alignment Techniques (Ruda) Monday-Tuesday, 8:30 am to 5:30 pm
- SC020 Optical Scattering: Measurement and Analysis (Stover) Wednesday, 8:30 am to 12:30 pm
- SC135 Adaptive Optics (Tyson) Tuesday, 8:30 am to 5:30 pm
- SC492 Predicting, Modeling, and Interpreting Light Scattered by Surfaces (Germer) Wednesday, 1:30 to 5:30 pm
- SC720 Cost-Conscious Tolerancing of Optical Systems (Youngworth) Monday, 8:30 am to 12:30 pm
- SC792 Polarization in Optical Design (Chipman) Sunday, 1:30 to 5:30 pm

Conference 7428

Monday-Wednesday 3-5 August 2009 • Proceedings of SPIE Vol. 7428

Current Developments in Lens Design and Optical Engineering X

Conference Chairs: **Pantazis Z. Mouroulis**, Jet Propulsion Lab.; **R. Barry Johnson**, PanTechne Corp. and Alabama A&M Univ.; **Virendra N. Mahajan**, The Aerospace Corp.

Program Committee: **Julie Bentley**, Corning Tropol Corp.; **Florian Bociort**, Technische Univ. Delft (Netherlands); **Michael Chrisp**, Lawrence Livermore National Lab.; **Apostolos Deslis**, InPhase Technologies Inc.; **Robert E. Fischer**, OPTICS 1, Inc.; **Alexander V. Goncharov**, National Univ. of Ireland, Galway (Ireland); **James Harvey**, College of Optics & Photonics/Univ. of Central Florida; **Lakshminarayan Hazra**, The Optical Society of India (India) and Univ. of Calcutta (India); **Daniel Malacara-Doblado**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Michael Mandina**, Optimax Systems, Inc.; **Laurent Mazuray**, EADS Astrium (France); **Ching-Cherng Sun**, National Central Univ. (Taiwan); **Akiyoshi Suzuki**, Canon Inc. (Japan); **Simon Thibault**, ImmerVision (Canada) and Laval Univ. (Canada); **Sergio Vázquez Montiel**, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); **Yongtian Wang**, Beijing Institute of Technology (China); **Andrew P. Wood**, Qioptiq Ltd. (United Kingdom); **Maria Josefa Yzuel**, Univ. Autònoma de Barcelona (Spain); **James M. Zavislan**, Univ. of Rochester

Monday 3 August

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Calculation of optical forces on a dielectric bead in a geometrically aberrated trap, Artur Carnicer, Denis Garnier, Salvador Bosch Puig, Ignasi Juvells, Univ. de Barcelona (Spain) [7428-08]

An optical switch of natural light guiding system based on cubic structure with aspheric surface, Gao-Syu Jhou, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) [7428-23]

Relationships between lens performance and different sensor sizes in professional photographic still SLR cameras, Carles Mitjà, Jaume Escofet, Fidel Vega, Univ. Politècnica de Catalunya (Spain) [7428-25]

Auto-focus imaging systems with MEMS deformable mirrors, Meng-Hsuan Lin, Hsin-Ta Hsieh, National Taiwan Univ. (Taiwan); Wei-Yao Hsu, Yuan-Chieh Cheng, Instrument Technology Research Ctr. (Taiwan); Cheng-Hsien Wu, National Kaohsiung Univ. of Applied Sciences (Taiwan); Guo-Dung J. Su, National Taiwan Univ. (Taiwan) [7428-26]

Exact analytical design method for paraxial chromatic correction in axis-symmetrical optical systems, Boian A. Hristov, Central Lab. of Optical Storage and Processing of Information [7428-27]

Exact analytical astigmatic function of aspherical surfaces, Boian A. Hristov, Central Lab. of Optical Storage and Processing of Information (Bulgaria) [7428-28]

Optical system module having zooming function and image quality of mega pixel for a cellular phone camera, Seong Jong Park, Suncheon Cheongam College (Korea, Republic of); Chang Sub Chung, Chonnam National Univ. (Korea, Republic of); Jong Jin Lee, Koeln Co., Ltd. (Korea, Republic of) [7428-29]

Optical design of a highly segmented wide field spectrograph, Demetrio Magrin, Osservatorio Astronomico di Padova (Italy) [7428-30]

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. Room 5B Tues. 1:30 to 3:10 pm

Invited Session

Session Chair: **R. Barry Johnson**, PanTechne Corp.

Joint session between conferences 7428: Current Developments in Lens Design and Optical Engineering X and 7429: Novel Optical Systems Design and Optimization XII

1:30 pm: **A fascinating early history of optics as we know it today!** (*Invited Paper*), Jay M. Enoch, Univ. of California, Berkeley (United States) . . . [7428-02]

2:10 pm: **Practical design considerations for modern photographic optics** (*Invited Paper*), Ken Rockwell, Consultant (United States) [7428-03]

2:40 pm: **Display systems and registration methods for mixed reality applications** (*Invited Paper*), Yongtian Wang, Dongdong Weng, Yue Liu, Jing Chen, Beijing Institute of Technology (China) [7428-04]

Coffee Break 3:10 to 4:00 pm

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Room: Marriott Hotel Marina D Tues. 8:00 to 10:00 pm

Lens Design Technical Event

Chairs: **Rich Pfisterer**, Photon Engineering, LLC; **Mary Turner**, Breault Research Organization, Inc.; **Steve Johnston**, Photon Engineering, LLC

"Let's Give 'Em Something to Talk About!"

Join us for our yearly gathering of experienced, "recognized" professional lens designers as we meet and discuss...lens design! We will hear about what they're designing, how they're going about doing it (what materials, software, techniques, etc.), and what problems they're encountering. We will also explore current technical and commercial trends in the marketplace.

Featured speaker this year will be Ren Ng, Refocus Imaging, Inc., giving a talk on Digital Light Field Photography. Digital light field photography begins with recording the radiance along all rays (the 4D light field) flowing into the image sensor. By processing the light field, we can implement the physical functions of the camera as software. This transformation eliminates physical constraints and enables features we thought were impossible. One of the revolutionary features enabled by this platform is refocusing photographs after taking the picture. Light field imaging also enables reduction of lens aberrations in software after exposure, which enables the design of lighter, cheaper lenses with more powerful zoom and aperture.

Ren Ng is Founder and CEO of Refocus Imaging, a startup company in the emerging area of computational photography. Dr. Ng graduated with his PhD from the Computer Science department at Stanford, where his dissertation on light field photography won the Arthur Samuel Thesis Award for the best dissertation in Stanford Computer Science, and went on to win the Association of Computing Machinery's Doctoral Dissertation Award for the best PhD in computer science and engineering judged against PhDs from around the world.

Wednesday 5 August

SESSION 2

Room: Conv. Ctr. Room 5B Wed. 8:20 to 10:20 am

Modeling and Optimization

Session Chair: **Virendra N. Mahajan**, The Aerospace Corp.

8:20 am: **Efficient design process for evaluation and control of flare in opto-mechanical systems**, Michael W. Zollers, John M. Tamkin, Optical Research Associates (United States) [7428-05]

8:40 am: **Paraxial ghost image analysis**, Rania H. Abd El-Maksoud, José Sasián, College of Optical Sciences, The Univ. of Arizona (United States) [7428-06]

9:00 am: **Automatic generation of new system shapes in optical system design**, Florian Bociort, Pascal van Grol, Maarten van Turnhout, Technische Univ. Delft (Netherlands) [7428-07]

9:20 am: **Photometrically corrected holographic lens**, José G. Suárez-Romero, Instituto Tecnológico de Querétaro (Mexico); Roberto Salas-Zuñiga, Ctr. de Ingeniería y Tecnología S. C. (Mexico) [7428-24]

9:40 am: **Designs and tolerances of numerical aperture 0.8 objective lenses for page-based holographic data storage systems**, Yuzuru Takashima, Lambertus Hesselink, Stanford Univ. (United States) [7428-09]

10:00 am: **Fast and accurate free space propagation based on automatic operator selection**, Frank Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); Michael Kuhn, Hagen Schimmel, LightTrans GmbH (Germany) [7428-10]

Coffee Break 10:20 to 10:50 am

SESSION 3

Room: Conv. Ctr. Room 5B Wed. 10:50 to 11:50 am

Optical Design I

Session Chair: **Pantazis Z. Mouroulis**, Jet Propulsion Lab.

10:50 am: **Design and optimization of a collimating optical system for high divergence LED light sources**, Eva Rodríguez, Fundación TEKNIKER (Spain) and Univ. de Cantabria (Spain); Fernando Moreno, Francisco González, Jose María Saiz, Univ. de Cantabria (Spain); Deitze Otaduy, Fundación TEKNIKER (Spain) [7428-11]

11:10 am: **LED and Fresnel design and characterization using Zemax optical design code**, G. Logan DesAutels, Univ. of Dayton (United States) . . [7428-12]

11:30 am: **Design, fabrication, and measurement of secondary optical element for LED applications**, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) [7428-13]

Lunch/Exhibition Break 11:50 am to 1:20 pm

SESSION 4

Room: Conv. Ctr. Room 5B Wed. 1:20 to 3:00 pm

Optical Design II

Session Chair: **Andrew P. Wood**, Qioptiq Ltd. (United Kingdom)

1:20 pm: **Active alignment of vertebrate cone and rod photoreceptor waveguides: a useful fiber-optics model?**, Jay M. Enoch, Univ. of California, Berkeley (United States) [7428-14]

1:40 pm: **Point symmetric design approach to a wide-field wide-wavelength Cat's Eye retro-reflector anastigmat**, Till W. Liepmann, Northrop Grumman Space Technology (United States) [7428-15]

2:00 pm: **Fast catadioptric optics with large field of view**, Nathalie Blanchard, Michel Doucet, Min Wang, Loïc Le Noc, Alain Bergeron, INO (Canada)[7428-16]

2:20 pm: **Lens designs for large format multi-band infrared focal plane arrays**, William R. Johnson, Jet Propulsion Lab. (United States) [7428-17]

2:40 pm: **Research on limitation of number of glasses and creation of the optimized catalogue containing the minimally necessary nomenclature of optical materials**, Sergey N. Bezdidko, S.I. Vavilov State Optical Institute (Russian Federation); Elena I. Morosova, House of Optics Scientific Ctr. (Russian Federation) [7428-18]

Coffee Break 3:00 to 3:30 pm

SESSION 5

Room: Conv. Ctr. Room 5B Wed. 3:30 to 4:30 pm

Optical Design III

Session Chair: **Florian Bociort**, Technische Univ. Delft (Netherlands)

3:30 pm: **Thinking outside the barrel: what really matters in modern photographic lens design**, Ken Rockwell, Consultant (United States)[7428-19]

3:50 pm: **Design and construction of a short-wave infrared 3.3X continuous zoom lens**, Craig Olson, Timothy D. Goodman, Steve Mifsud, Chris J. Addiego, L-3 Communications Sonoma EO (United States) [7428-21]

4:10 pm: **Aberration variations in zoom lens objectives**, Jyh Chyang Yen, National Changhua Univ. of Education (Taiwan); Kuang-Lung Huang, MingDao Univ. (Taiwan); Jin-Jia Chen, National Changhua Univ. of Education (Taiwan) [7428-22]

Courses of Related Interest

See SPIE Cashier for information and to register.

- SC003 Practical Optical System Design - EXPANDED 2-Day Format (Fischer) Sunday-Monday, 8:30 am to 5:30 pm
- SC011 Design of Efficient Illumination Systems (Cassarly) Wednesday, 8:30 am to 12:30 pm
- SC384 The Design of Plastic Optical Systems (Schaub) Sunday, 1:30 to 5:30 pm
- SC388 Non-Imaging Optics (Winston) Tuesday, 1:30 to 5:30 pm
- SC552 Aspheric Optics: Design, Fabrication, and Test (Fischer) Wednesday, 8:30 am to 12:30 pm
- SC690 Optical System Design: Layout Principles and Practice (Greivenkamp) Sunday, 8:30 am to 5:30 pm
- SC720 Cost-Conscious Tolerancing of Optical Systems (Youngworth) Monday, 8:30 am to 12:30 pm
- SC792 Polarization in Optical Design (Chipman) Sunday, 1:30 to 5:30 pm
- SC912 Intermediate Lens Design (Bentley) Monday, 8:30 am to 5:30 pm



Conference 7429

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7429

Novel Optical Systems Design and Optimization XII

Conference Chairs: **R. John Koshel**, Photon Engineering LLC and College of Optical Sciences/The Univ. of Arizona; **G. Groot Gregory**, Optical Research Associates

Program Committee: **Dmitry V. Bakin**, Micron Technology, Inc.; **W. Andrew Cheng**, PROSYS Optics Corp.; **Jyh-Long Chern**, National Chiao Tung Univ. (Taiwan); **Oliver Dross**, Light Prescriptions Innovators Europe, S. L. (Spain); **Joseph M. Howard**, NASA Goddard Space Flight Ctr.; **Richard C. Juergens**, Raytheon Missile Systems; **Scott A. Lerner**, Hewlett-Packard Co.; **Rongguang Liang**, Carestream Health, Inc.; **Paul K. Manhart**, IMAGE-N; **Craig Olson**, L-3 Communications Sonoma EO; **Andrew Rakich**, Large Binocular Telescope Corp.; **Michael D. Robinson**, Ricoh Innovations, Inc.; **José Sasián**, College of Optical Sciences/The Univ. of Arizona; **David L. Shealy**, The Univ. of Alabama at Birmingham; **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Kevin P. Thompson**, Optical Research Associates; **Mary G. Turner**, Breault Research Organization, Inc.

Monday 3 August

Room: Conv. Ctr. Room 17A Mon. 8:00 to 8:10 am

Opening Remarks: The State of Optical Design

G. Groot Gregory, Optical Research Associates (United States); **R. John Koshel**, Photon Engineering LLC (United States) and College of Optical Sciences/The Univ. of Arizona (United States)

SESSION 1

Room: Conv. Ctr. Room 17A Mon. 8:10 to 10:00 am

Design in Computed Imaging I

Session Chair: **R. John Koshel**, College of Optical Sciences/the Univ. of Arizona and Photon Engineering LLC

8:10 am: **Low-complexity digital filter geometry for spherical coded imaging systems**, Guotong Feng, Michael D. Robinson, Ricoh Innovations, Inc. (United States) [7429-01]

8:30 am: **Optimal phase mask profiles for increasing the defocus tolerance of hybrid digital-optical imaging systems** (*Invited Paper*), Tom Vettenburg, Heriot-Watt Univ. (United Kingdom); Andrew P. Wood, Nicholas K. Bustin, Qioptiq Ltd. (United Kingdom); Andrew R. Harvey, Heriot-Watt Univ. (United Kingdom) [7429-02]

9:00 am: **Depth of field extension in a low power microscope**, Pantazis Z. Mouroulis, Byron Van Gorp, Holly Bender, Eric E. Bloemhof, Julia D. Nichols, Jet Propulsion Lab. (United States) [7429-03]

9:20 am: **Depth perception with a rotationally symmetric coded camera**, Chuan-Chung Chang, National Central Univ. (Taiwan); Yung-Lin Chen, Chir-Weei Chang, Industrial Technology Research Institute (Taiwan); Cheng-Chung Lee, National Central Univ. (Taiwan) [7429-04]

9:40 am: **Infrared image guidance for ground vehicle based on fast wavelet image focusing and tracking**, Akira Akiyama, Kanazawa Technical College (Japan); Nobuaki Kobayashi, Kanazawa Institute of Technology (Japan); Eiichiro Mutoh, Kawasaki Heavy Industries, Ltd. (Japan); Hideo Kumagai, Tamagawa Seiki Co., Ltd. (Japan); Hirofumi Yamada, Kanazawa Technical College (Japan); Hiromitsu Ishii, Nihon Univ. (Japan) [7429-05]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. Room 17A Mon. 10:30 am to 12:00 pm

Illumination

Session Chair: **Oliver Dross**, Light Prescriptions Innovators Europe, S. L. (Germany)

10:30 am: **Chromatic perception of non-invasive lighting of cave paintings**, Jesus Zoido, Daniel Vázquez Molini, Antonio A. Fernandez-Balbuena, Eusebio Bernabeu, Univ. Complutense de Madrid (Spain); Miguel A. Garcia, Univ. Politecnica de Madrid (Spain); J. A. Herraes, Marian Egido, Instituto del Patrimonio Historico Español (Spain) [7429-06]

10:50 am: **Efficient measurement of large light source near-field color and luminance distributions for optical design and simulation** (*Invited Paper*), Hubert Kostal, Radiant Imaging, Inc. (United States) [7429-07]

11:20 am: **A beam splitter of natural light guiding system based on dichroic prism for ecological illumination**, Yu-Chi Lee, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) [7429-08]

11:40 am: **Design and optimization of microstructure in illumination lightpipe of natural light guiding system**, Zong-Yi Lee, Yi-Yung Chen, Allen J. Whang, National Taiwan Univ. of Science and Technology (Taiwan) . . [7429-09]

Lunch Break 12:00 to 1:20 pm

SESSION 3

Room: Conv. Ctr. Room 17A Mon. 1:20 to 3:00 pm

Modeling

Session Chair: **Michael D. Robinson**, Ricoh Innovations, Inc.

1:20 pm: **Partially coherent simulation of homogenization systems using micro lens arrays**, Frank Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); Hagen Schimmel, Michael Kuhn, LightTrans GmbH (Germany) [7429-10]

1:40 pm: **Overview of the SMS design method applied to imaging optics**, Juan C. Miñano, Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators Europe, S. L. (United States); Wang Lin, Univ. Politécnica de Madrid (Spain); Fernando Muñoz, Light Prescriptions Innovators Europe, S. L. (Spain); José M. Infante, Asunción Santamaría, Univ. Politécnica de Madrid (Spain) [7429-14]

2:00 pm: **Raytrace assisted analytical formulation of Fresnel lens transmission efficiency**, Arthur J. Davis, Reflexite Display Optics (United States) [7429-12]

2:20 pm: **Design, analysis, and fabrication of a really bad lens**, Alan W. Greynolds, Ruda-Cardinal Inc. (United States) [7429-13]

2:40 pm: **Optimization of optics with micro diffractive optical element via a hybrid Taguchi-genetic algorithm**, Yi-Chin Fang, National Kaohsiung First Univ. of Science and Technology (Taiwan) [7429-11]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. Room 17A Mon. 3:30 to 5:10 pm

Systems

Session Chair: Craig Olson, L-3 Communications Sonoma EO

3:30 pm: **Miniature Risley prism mechanism**, Stephen V. Gentile, Lockheed Martin Space Systems Co. (United States) [7429-16]

3:50 pm: **Collection optics for imaging spectroscopy of an electric arc shock tube**, Reid B. Greenberg, ELORET Corp. (United States); Brett A. Cruden, Jay H. Grinstead, NASA Ames Research Ctr. (United States); Dickson Yeung, Sierra Lobo Corp. (United States) [7429-17]

4:10 pm: **Laser despeckled imaging**, Michael M. Tilleman, Elbit Systems of America (United States) [7429-18]

4:30 pm: **Speckle interferometric sensor to measure low-amplitude high frequency ocular microtremor (OMT)**, James P. Ryle, Univ. College Dublin (Ireland); Unnikrishnan Gopinathan, Univ. College Dublin (Ireland) and Instrument Research and Development Establishment (India); Mohammed Al-Kalbani, Gerard Boyle, Davis Coakley, St. James's Hospital (Ireland); John T. Sheridan, Univ. College Dublin (Ireland) [7429-19]

4:50 pm: **Required shapes of a flexible sensor for different lens focus**, Dein Shaw, Shy-Pin Cuo, Chih-Wei Lin, National Tsing Hua Univ. (Taiwan). [7429-20]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

A telescope system of spherical refract-reflect type based on Cook structure compensating mirror, Jian Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China) [7429-29]

Fiber optic displacement sensor for measuring refractive index of liquids, Dillibabu Sastikumar, Gobi Govindan, Renganathan B. Balusamy, National Institute of Technology, Tiruchirappalli (India) [7429-30]

Forty-five degree polymer micro-mirrors and waveguides integration for board-level optical interconnects, Fengtao Wang, Georgia Tech Research Institute (United States); Fuhan Liu, Ali Adibi, Georgia Institute of Technology (United States) [7429-31]

Estimation of the depth of field: theory, experiment and application, Rania H. Abd El-Maksoud, Lirong Wang, José Sasián, College of Optical Sciences, The Univ. of Arizona (United States); Valorie S. Valencia, Authenti-Corp (United States) [7429-32]

Optical design of endoscopic shape tracker using quantum dots embedded in fiber bundles, Jessica A. Eisenstein, Robb Gavalis, Peter Y. Wong, Caroline G. L. Cao, Tufts Univ. (United States) [7429-34]

Optical design of a low vision goggle combining a display and an eye tracker, Yaniv Gershon, Ben-Gurion Univ. of the Negev (Israel); Boris Apter, Holon Institute of Technology (Israel); Uzi Efron, Ben-Gurion Univ. of the Negev (Israel) and Holon Institute of Technology (Israel) [7429-35]

Development of tissue multi-slice laser reflectance imaging system, Jothiramalingam Indumathi, Megha Singh, Vellore Institute of Technology Univ. (India) [7429-36]

Structural design of optically compensated zoom lenses using genetic algorithm, Sourav Pal, Univ. of Calcutta (India); Lakshminarayan Hazra, The Optical Society of India (India) and Univ. of Calcutta (India) [7429-37]

Illumination scheme for high-contrast contactless fingerprint images, Lirong Wang, José Sasián, Rania H. Abd El-Maksoud, College of Optical Sciences, The Univ. of Arizona (United States); Valorie S. Valencia, Authenti-Corp (United States) [7429-38]

Variable multiplexed holographic data storage device from an indigenously designed low cost SLM, K. Kochunarayanan, V. Krishnakumar, M. J. Augustine, V. P. Mahadevan Pillai, Geo Rajan, Univ. of Kerala (India) [7429-39]

PDV and shock physics: application to nitromethane shock-detonation transition and particles ejection, Pierre-Antoine Frugier, Patrick Mercier, Jacky Bénier, Jacqueline Veaux, Michel Debruyne, Christian Rion, Estelle Dubreuil, CEA DAM Ile de France (France) [7429-40]

Study on the reversibility of the diffraction light path, Weiping Zhang, Lingyu Wan, Guangxi Univ. (China) [7429-42]

A novel contactless aliveness testing (CAT) fingerprint sensor, Lirong Wang, Rania H. Abd El-Maksoud, José Sasián, College of Optical Sciences, The Univ. of Arizona (United States); William P. Kuhn, Opt-E (United States); Kathleen Gee, Valorie S. Valencia, Authenti-Corp (United States) [7429-43]

optical-fiber vortex-shedding flowmeter based on white-light interference, Dong Zhao, Hongyan Wu, Bo Jia, Fudan Univ. (China); Ya'nan Zhi, Shanghai Institute of Optics and Fine Mechanics (China) [7429-44]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. Room 17A Tues. 8:30 to 10:00 am

Design in Computed Imaging II

Session Chair: Joseph M. Howard, NASA Goddard Space Flight Ctr.

8:30 am: **Ray tracing, wavefronts, and caustics: use of Shack-Hartmann wavefront sensor for analyzing light propagation**, Salvador Bosch Puig, Santiago Vallmitjana Rico, Carme Ferran, Univ. de Barcelona (Spain) . [7429-21]

8:50 am: **Spherical coded imagers: improving lens speed, cost, and depth-of-field through enhanced spherical aberration and compensating image processing (Invited Paper)**, Michael D. Robinson, Guotong Feng, David G. Stork, Ricoh Innovations, Inc. (United States) [7429-22]

9:20 am: **A technique to remove image artefacts in optical systems with wavefront coding**, Mads Demenikov, Andrew R. Harvey, Heriot-Watt Univ. (United Kingdom) [7429-23]

9:40 am: **Passive depth recovery systems: a camera simulation framework**, Arash Razavi, Orly Yadid-Pecht, Graham A. Jullien, Univ. of Calgary (Canada); Mohamed Amtoun, Univ. of Windsor (Canada) [7429-24]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. Room 17A Tues. 10:30 to 11:50 am

Education

Session Chair: Barbara A. Darnell, ScinTech

10:30 am: **Case study findings of PHOTON problem-based learning (PBL) with high school photonics outreach programs**, Joyce Hilliard-Clark, Pamela O. Gilchrist, North Carolina State Univ. (United States) [7429-25]

10:50 am: **Restarting a high school photonics program**, Brian K. Belcher, Plainfield High School (United States) [7429-26]

11:10 am: **Teaching photonics technology students to think: methods**, Gary B. Beasley, Central Carolina Community College (United States) [7429-27]

11:30 am: **An optics first year experience course for community college students**, Judith F. Donnelly, Three Rivers Community College (United States) [7429-28]

Lunch/Exhibition Break 11:50 am to 1:30 pm

SESSION 7

Room: Conv. Ctr. Room 5B

(Note room change) Tues. 1:30 to 3:10 pm

Invited Session

Session Chair: R. Barry Johnson, PanTechno Corp.

Joint session between conferences 7428: Current Developments in Lens Design and Optical Engineering X and 7429: Novel Optical Systems Design and Optimization XII

1:30 pm: **A fascinating early history of optics as we know it today! (Invited Paper)**, Jay M. Enoch, Univ. of California, Berkeley (United States) . . . [7428-02]

2:10 pm: **Practical design considerations for modern photographic optics (Invited Paper)**, Ken Rockwell, Consultant (United States) [7428-03]

2:40 pm: **Display systems and registration methods for mixed reality applications (Invited Paper)**, Yongtian Wang, Dongdong Weng, Yue Liu, Jing Chen, Beijing Institute of Technology (China) [7428-04]

Coffee Break 3:10 to 4:00 pm

Conference 7429

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Room: Marriott Hotel Marina D Tues. 8:00 to 10:00 pm

Lens Design Technical Event

Chairs: **Rich Pfisterer**, Photon Engineering, LLC; **Mary Turner**, Breaux Research Organization, Inc.; **Steve Johnston**, Photon Engineering, LLC

"Let's Give 'Em Something to Talk About!"

Join us for our yearly gathering of experienced, "recognized" professional lens designers as we meet and discuss...lens design! We will hear about what they're designing, how they're going about doing it (what materials, software, techniques, etc.), and what problems they're encountering. We will also explore current technical and commercial trends in the marketplace.

Featured speaker this year will be Ren Ng, Refocus Imaging, Inc., giving a talk on Digital Light Field Photography. Digital light field photography begins with recording the radiance along all rays (the 4D light field) flowing into the image sensor. By processing the light field, we can implement the physical functions of the camera as software. This transformation eliminates physical constraints and enables features we thought were impossible. One of the revolutionary features enabled by this platform is refocusing photographs after taking the picture. Light field imaging also enables reduction of lens aberrations in software after exposure, which enables the design of lighter, cheaper lenses with more powerful zoom and aperture.

Ren Ng is Founder and CEO of Refocus Imaging, a startup company in the emerging area of computational photography. Dr. Ng graduated with his PhD from the Computer Science department at Stanford, where his dissertation on light field photography won the Arthur Samuel Thesis Award for the best dissertation in Stanford Computer Science, and went on to win the Association of Computing Machinery's Doctoral Dissertation Award for the best PhD in computer science and engineering judged against PhDs from around the world.

Courses of Related Interest

See SPIE Cashier for information and to register.

SC003 Practical Optical System Design - EXPANDED 2-Day Format (Fischer)
Sunday-Monday, 8:30 am to 5:30 pm

SC011 Design of Efficient Illumination Systems (Cassarly) Wednesday, 8:30
am to 12:30 pm

SC384 The Design of Plastic Optical Systems (Schaub) Sunday, 1:30 to 5:30
pm

SC388 Non-Imaging Optics (Winston) Tuesday, 1:30 to 5:30 pm

SC552 Aspheric Optics: Design, Fabrication, and Test (Fischer) Wednesday,
8:30 am to 12:30 pm

SC690 Optical System Design: Layout Principles and Practice (Greivenkamp)
Sunday, 8:30 am to 5:30 pm

SC720 Cost-Conscious Tolerancing of Optical Systems (Youngworth)
Monday, 8:30 am to 12:30 pm

SC792 Polarization in Optical Design (Chipman) Sunday, 1:30 to 5:30 pm

SC912 Intermediate Lens Design (Bentley) Monday, 8:30 am to 5:30 pm

Conference 7430

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7430

Laser Beam Shaping X

Conference Chairs: **Andrew Forbes**, CSIR National Laser Ctr. (South Africa) and Univ. of KwaZulu-Natal (South Africa); **Todd E. Lizotte**, Hitachi Via Mechanics (USA), Inc.

Program Committee: **Daniel M. Brown**, Optosensors Technology, Inc.; **Fred M. Dickey**, Sandia National Labs.; **Michael Rudolf Duparré**, Friedrich-Schiller-Univ. Jena (Germany); **Julio C. Gutiérrez-Vega**, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); **John A. Hoffnagle**, IBM Almaden Research Ctr.; **Kurt J. Kanzler**, Diffractive Laser Solutions; **Alexis V. Kudryashov**, Moscow State Open Univ. (Russian Federation); **William P. Latham**, Air Force Research Lab.; **Carlos Lopez-Mariscal**, National Institute of Standards and Technology; **Günter Luepke**, The College of William & Mary; **Olivier Magnin**, C2 Diagnostics (France); **Paul F. Michalowski**, Corning Tropol Corp.; **Tasso R. M. Sales**, RPC Photonics, Inc.; **José Sasián**, College of Optical Sciences/The Univ. of Arizona; **David L. Shealy**, The Univ. of Alabama at Birmingham; **Kenneth J. Weible**, SUSS MicroOptics SA (Switzerland); **Uwe Zeitner**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); **Shuyan Zhang**, The College of William & Mary

Monday 3 August

SESSION 1

Room: Conv. Ctr. Room 16B Mon. 8:00 to 10:00 am

Theory and Design

Session Chair: **Fred M. Dickey**, FMD Consulting LLC

8:00 am: **Transverse and axial beam shaping in the non-paraxial domain** (*Keynote Presentation*), Stephen M. Kuebler, Toufic G. Jabbour, CREOL, The College of Optics and Photonics (United States) [7430-01]

8:40 am: **Achromatic refractive beam shaping optics for broad spectrum laser applications**, Alexander Laskin, Molecular Technology GmbH (Germany) [7430-02]

9:00 am: **Design of refractive High-NA freeform beam shaping systems**, Frank Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); Hagen Schimmel, LightTrans GmbH (Germany). [7430-03]

9:20 am: **Improvements to optical performance in diffractive elements used for off-axis illumination**, Kevin Welch, Adam S. Fedor, John E. Childers, Tim Emig, Tessera North America (United States). [7430-04]

9:40 am: **Diffractive laser beam shaping for holography**, Kurt J. Kanzler, MEMS Optical, Inc. (United States). [7430-05]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. Room 16B Mon. 10:30 am to 12:30 pm

Non-Diffracting and Vortex Beams I

Session Chair: **Vladimir N. Belyi**, B.I. Stepanov Institute of Physics (Belarus)

10:30 am: **The role of vortexes in splitting, shaping, and diffusing light** (*Invited Paper*), Frank Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); Hagen Schimmel, LightTrans GmbH (Germany). [7430-06]

11:10 am: **Polynomial Gaussian beams**, Filippus S. Roux, CSIR National Laser Ctr. (South Africa) [7430-07]

11:30 am: **Numerical calculation of arbitrary Helmholtz-Gauss beams**, Carlos Lopez-Mariscal, National Institute of Standards and Technology (United States); Julio C. Gutiérrez-Vega, Tecnológico de Monterrey Chapter (Mexico) . [7430-08]

11:50 am: **Quasi-nondiffracting speckle fields**, Angela Dudley, National Laser Ctr. Trust (South Africa); Ruslan Vasilyeu, B.I. Stepanov Institute of Physics (Belarus); Andrew Forbes, National Laser Ctr. Trust (South Africa); Nikolai A. Khilo, Petr Ropot, Vladimir N. Belyi, Nikolai S. Kazak, B.I. Stepanov Institute of Physics (Belarus). [7430-09]

12:10 pm: **Generation of Laguerre-Gauss shaped optical vortices lattices using light beams with orbital angular momentum**, Willamys Soares, Dilson Pereira Caetano, Univ. Federal de Alagoas (Brazil); Sabino Chávez-Cerda, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Jandir M. Hickmann, Univ. Federal de Alagoas (Brazil) [7430-10]

Lunch Break 12:30 to 1:30 pm

SESSION 3

Room: Conv. Ctr. Room 16B Mon. 1:30 to 3:10 pm

Non-Diffracting and Vortex Beams II

Session Chair: **Julio C. Gutiérrez-Vega**, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico)

1:30 pm: **Accelerating vortices in Airy beams**, Michael Mazilu, Joerg Baumgartl, Tomas Cifmar, Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7430-11]

1:50 pm: **Diffraction of plane waves by apodized finite radius spiral phase plates of integer and fractional topological charge**, Hipolito Garcia-Gracia, Julio C. Gutiérrez-Vega, Tecnológico de Monterrey Chapter (Mexico). [7430-12]

2:10 pm: **Bessel-like beams with z-dependent cone angles**, Vladimir N. Belyi, Nikolai S. Kazak, Nikolai A. Khilo, B.I. Stepanov Institute of Physics (Belarus); Andrew Forbes, Council for Scientific and Industrial Research (South Africa); Piotr I. Ropot, B.I. Stepanov Institute of Physics (Belarus) [7430-13]

2:30 pm: **Generation and propagation of high-order Bessel vortices in linear and non-linear crystals**, Vladimir N. Belyi, Nikolai A. Khilo, B.I. Stepanov Institute of Physics (Belarus); Andrew Forbes, Council for Scientific and Industrial Research (South Africa); Anatol A. Ryzhevich, B.I. Stepanov Institute of Physics (Belarus) [7430-14]

2:50 pm: **Application of orbital angular momentum in optical measurement**, Jiao Lin, Nanyang Technological Univ. (Singapore) [7430-15]

Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Conv. Ctr. Room 16B Mon. 3:40 to 5:00 pm

Adaptive Beam Shaping

Session Chair: **Kenneth J. Weible**, SUSS MicroOptics SA (Switzerland)

3:40 pm: **Dynamic MEMS-based linear (1D) diffusers for laser beam homogenizing and beam shaping**, Jonathan Masson, Ecole Polytechnique Fédérale de Lausanne (Switzerland) and SUSS MicroOptics SA (Switzerland); Wilfried Noell, Nico De Rooij, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Andreas Bich, Kenneth J. Weible, Reinhard Völkel, SUSS MicroOptics SA (Switzerland) [7430-16]

4:00 pm: **Dynamic array spot shaping for laser micromachining**, Andreas Bich, SUSS MicroOptics SA (Switzerland) [7430-17]

4:20 pm: **Rapid beam shaping using tunable acoustic gradient index lenses for imaging and laser processing**, Yan Jin, Alexandre Mermillod-Blondin, Craig B. Arnold, Princeton Univ. (United States) [7430-18]

4:40 pm: **Multi-dither algorithms and their combinations for laser beam shaping**, Julia V. Sheidakova, Vadim V. Samarkin, Alexey L. Rukosuev, Aleksis V. Kudryashov, Moscow State Open Univ. (Russian Federation) [7430-44]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Shaping of elliptical photonic lattices, Adrian Ruelas, Servando Lopez-Aguayo, Tecnológico de Monterrey (Mexico); Julio C. Gutiérrez-Vega, Tecnológico de Monterrey Chapter (Mexico) [7430-35]

Conference 7430

SESSION 6

Room: Conv. Ctr. Room 16B Tues. 10:30 am to 12:40 pm

Applications

Session Chair: Kurt J. Kanzler, MEMS Optical, Inc.

Intracavity generating of long range nondiffracting narrow light beams, Igor A. Litvin, Council for Scientific and Industrial Research (South Africa); Nikolai A. Khilo, B.I. Stepanov Institute of Physics (Belarus); Andrew Forbes, Council for Scientific and Industrial Research (South Africa); Vladimir N. Belyi, B.I. Stepanov Institute of Physics (Belarus) [7430-36]

Investigation of local spatial spectra of Bessel light-beams, Vladimir N. Belyi, Nikolai S. Kazak, Nikolai A. Khilo, B.I. Stepanov Institute of Physics (Belarus); Andrew Forbes, Council for Scientific and Industrial Research (South Africa); Piotr I. Ropot, B.I. Stepanov Institute of Physics (Belarus) [7430-38]

Free-form lens for laser level system, Yu-Da Chen, Yi-Hsien Chen, National Taiwan Univ. (Taiwan); Wei-Yao Hsu, National Applied Research Labs. (Taiwan); Guo-Dung J. Su, National Taiwan Univ. (Taiwan) [7430-39]

Propagation of Whittaker-Gauss beams, Dorilian Lopez-Mago, Tecnológico de Monterrey Chapter (Mexico); Miguel A. Blandes, California Institute of Technology (United States); Julio C. Gutiérrez-Vega, Tecnológico de Monterrey Chapter (Mexico) [7430-40]

Study of temperature sensing in a novel fattened electric arc induced LPFG, Ruth I. Mata-Chavez, Julian M. Estudillo-Ayala, Roberto Rojas-Laguna, Everardo Vargas-Rodriguez, Univ. de Guanajuato (Mexico); Alejandro Martinez-Rios, Ismael Torres-Gomez, David Monzon-Hernandez, Ctr. de Investigaciones en Óptica, A.C. (Mexico); Monica Trejo-Duran, Rosa J. Perez-Chimal, Univ. de Guanajuato (Mexico) [7430-41]

Influence of grating shapes on diffraction properties of ultrashort pulse beam by local volume holographic grating, Zhijuan Hu, Shanghai Normal Univ. (China); Liren Liu, De'an Liu, Ya'nan Zhi, Shanghai Institute of Optics and Fine Mechanics (China); Yanxue Tang, Shanghai Normal Univ. (China) [7430-42]

High-conversion-efficiency and tunable phase-stabilized infrared optical parametric amplifier, Chunmei Zhang, Jianliang Wang, Liwei Song, Chuang Li, Yansui Huang, Yuxin Leng, Ruxin Li, Zhizhan Xu, Shanghai Institute of Optics and Fine Mechanics (China) [7430-43]

Adaptive optics for intracavity beam control and formation, Aleksis V. Kudryashov, Moscow State Open Univ. (Russian Federation) [7430-45]

Laser beam shaping: donut mode formation by interference, Liubov Kreminska, Carl Corder, Vanessa Engquist, Oleksiy Golovin, The Univ. of Nebraska at Kearney (United States); Herman Batelaan, Univ. of Nebraska, Lincoln (United States); Grover A. Swartzlander, Jr., Rochester Institute of Technology (United States) [7430-46]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. Room 16B Tues. 8:00 to 10:00 am

Resonators

Session Chair: Aleksis V. Kudryashov, Moscow State Open Univ. (Russian Federation)

8:00 am: **Beam shaping in laser resonators and coherent laser arrays: an overview and current state of the art** (*Invited Paper*), James R. Leger, Univ. of Minnesota (United States) [7430-19]

8:30 am: **Intracavity flat-top beam generation**, Igor A. Litvin, Andrew Forbes, Council for Scientific and Industrial Research (South Africa) [7430-20]

8:50 am: **Beam shaping diffractive optical elements for high power laser applications** (*Presentation Only*), Keren K. Jobbins, Atomic Weapons Establishment (United Kingdom) [7430-21]

9:10 am: **Paint stripping with high power flattened Gaussian beams**, Andrew Forbes, CSIR National Laser Ctr. (South Africa) and Univ. of KwaZulu-Natal (South Africa); Neil C. du Preez, Scientific Development and Integration (South Africa); Vladimir N. Belyi, B.I. Stepanov Institute of Physics (Belarus); Lourens R. Botha, CSIR National Laser Ctr. (South Africa) [7430-22]

9:30 am: **Some applications of Binary Diffractive Optical Elements** (*Invited Paper*), Kamel Ait-Ameur, Ecole Nationale Supérieure d'Ingenieurs de Caen et Ctr. de Recherche (France); Nicolas Passilly, Univ. de Franche-Comté (France); Michael Fromager, Emmanuel Cagniot, Ecole Nationale Supérieure d'Ingenieurs de Caen et Ctr. de Recherche (France) [7430-23]

Coffee Break 10:00 to 10:30 am

10:30 am: **High resolution x-ray imaging microscope for diagnostics of inertial confinement fusion** (*Invited Paper*), Helene Maury, Commissariat à l'Energie Atomique (France) [7430-24]

11:00 am: **Laser material processing with process optimized laser system profiles and intensity distributions based on free-form microlens systems**, Dirk Hauschild, Oliver Homburg, Thomas Mitra, Jens Meinschien, Vitalij N. Lissotschenko, LIMO Lissotschenko Mikrooptik GmbH (Germany) [7430-25]

11:20 am: **Advanced testing requirements for diffractive optical elements used for off-axis illumination in photolithography**, John E. Childers, Tom Baker, Tim Emig, James Carriere, Marc D. Himel, Tessera North America (United States) [7430-26]

11:40 am: **355nm diffractive beam shaper: modes and mechanism of failure and its impact on operational lifetime**, Todd E. Lizotte, Hitachi Via Mechanics (USA), Inc. (United States) [7430-27]

12:00 pm: **Adaptation of an existing diffractive mono-mode beam shaping design to compensate a wavelength change**, Kenneth J. Weible, SUSS MicroOptics SA (Switzerland); Todd E. Lizotte, Hitachi Via Mechanics (USA), Inc. (United States) [7430-28]

12:20 pm: **Vacuum isostatic micro/macro molding of PTFE materials for laser beam shaping in environmental applications: large scale UV laser water purification**, Todd E. Lizotte, Orest P. Ohar, Hitachi Via Mechanics (USA), Inc. (United States) [7430-29]

Lunch/Exhibition Break 12:40 to 2:00 pm

SESSION 7

Room: Conv. Ctr. Room 16B Tues. 2:00 to 3:00 pm

Ultra-Fast Pulse Shaping

Session Chair: John A. Hoffnagle, IBM Almaden Research Ctr.

2:00 pm: **Supercontinuum Airy beams**, Jill E. Morris, Joerg Baumgartl, Michael Mazilu, Tomas Ci?már, Kishan Dholakia, Univ. of St. Andrews (United Kingdom) [7430-30]

2:20 pm: **Femtosecond pulse duration as a tool for controlling high fluence of laser filament in air**, Elena P. Silaeva, Oleg V. Tverskoy, Valerii P. Kandidov, Lomonosov Moscow State Univ. (Russian Federation) [7430-31]

2:40 pm: **Pulse compression with volume holographic transmission gratings recorded in Slavich PFG-04 emulsions**, Ayalid M. Villamarín, Univ. de Zaragoza (Spain); Íñigo Sola, Univ. de Salamanca (Spain); Victoria Collados, Jesús Atencia, Univ. de Zaragoza (Spain); Cruz Mendez, Isabel Arias, Univ. de Salamanca (Spain); Manuel Quintanilla, Univ. de Zaragoza (Spain) [7430-32]

Coffee Break 3:00 to 4:00 pm

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC003 Practical Optical System Design - EXPANDED 2-Day Format (Fischer) Sunday-Monday, 8:30 am to 5:30 pm

SC011 Design of Efficient Illumination Systems (Cassarly) Wednesday, 8:30 am to 12:30 pm

SC135 Adaptive Optics (Tyson) Tuesday, 8:30 am to 5:30 pm

SC384 The Design of Plastic Optical Systems (Schaub) Sunday, 1:30 to 5:30 pm

SC552 Aspheric Optics: Design, Fabrication, and Test (Fischer) Wednesday, 8:30 am to 12:30 pm

SC690 Optical System Design: Layout Principles and Practice (Greivenkamp) Sunday, 8:30 am to 5:30 pm

SC792 Polarization in Optical Design (Chipman) Sunday, 1:30 to 5:30 pm

SC912 Intermediate Lens Design (Bentley) Monday, 8:30 am to 5:30 pm

Conference 7431

Wednesday 5 August 2009 • Proceedings of SPIE Vol. 7431

Time and Frequency Metrology II

Conference Chairs: **Tetsuya Ido**, National Institute of Information and Communications Technology (Japan); **Derryck T. Reid**, Heriot-Watt Univ. (United Kingdom)

Program Committee: **James C. Bergquist**, National Institute of Standards and Technology; **André Clairon**, Observatoire de Paris (France); **Patrick Gill**, National Physical Lab. (United Kingdom); **Feng-Lei Hong**, National Institute of Advanced Industrial Science and Technology (Japan); **R. Jason Jones**, College of Optical Sciences/The Univ. of Arizona; **Ekkehard Peik**, Physikalisch-Technische Bundesanstalt (Germany); **John D. Prestage**, Jet Propulsion Lab.; **Jun Ye**, JILA, NIST, Univ. of Colorado

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. Room 31B Wed. 8:00 to 10:00 am

Frequency Comb and Laser Sources

Session Chair: **Derryck T. Reid**, Heriot-Watt Univ. (United Kingdom)

8:00 am: **Optical frequency combs: looking toward optical frequency measurements at the 10^{-18} level** (*Invited Paper*), Tara M. Fortier, National Institute of Standards and Technology (United States) [7431-01]

8:30 am: **Coherent ultrafast pulse synthesis between an optical parametric oscillator and a laser**, Jinghua Sun, Derryck T. Reid, Heriot-Watt Univ. (United Kingdom) [7431-02]

8:50 am: **Compact ultrafast gigahertz repetition rate lasers for frequency comb generation**, Thomas Südmeyer, A. E. H. Oehler, D. J. H. C. Maas, B. Rudin, Aude-Reine Bellancourt, M. Hoffmann, Y. Barbarin, M. Golling, U. Keller, ETH Zürich (Switzerland) [7431-03]

9:10 am: **Optical frequency comb improvements and applications at NPL**, Barney R. Walton, Stephen N. Lea, Helen S. Margolis, Giuseppe Marra, National Physical Lab. (United Kingdom); Derryck T. Reid, Heriot-Watt Univ. (United Kingdom); Veronika Tsaturian, Patrick Gill, National Physical Lab. (United Kingdom) [7431-04]

9:30 am: **Fiber-based frequency combs for an Yb optical lattice clock** (*Invited Paper*), Hajime Inaba, Yoshiaki Nakajima, Atsushi Ihara, Masami Yasuda, Kazumoto Hosaka, Takuya Kohno, Kaoru Minoshima, Atsushi Onae, Feng-Lei Hong, National Institute of Advanced Industrial Science and Technology (Japan) [7431-05]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. Room 31B Wed. 10:30 to 11:50 am

Clock Stability and Comparison

Session Chair: **Tetsuya Ido**, National Institute of Information and Communications Technology (Japan)

10:30 am: **Preparation of reduced-quantum-uncertainty input states for an atomic clock** (*Invited Paper*), Monika H. Schleier-Smith, Ian D. Leroux, Vladan Vuletic, Massachusetts Institute of Technology (United States) and MIT-Harvard Center for Ultracold Atoms (United States) [7431-06]

11:00 am: **Frequency measurement of the 40Ca^+ clock transition using a LD-based clock laser and UTC(NICT)**, Kensuke Matsubara, Ying Li, Shigeo Nagano, Hiroyuki Ito, Masatoshi Kajita, Reiko Kojima, Kazuhiro Hayasaka, Mizuhiko Hosokawa, Yuko Hanado, National Institute of Information and Communications Technology (Japan) [7431-07]

11:20 am: **Alpha-dot or not: comparison of the Al^+ and Hg^+ optical clocks** (*Invited Paper*), James C. Bergquist, National Institute of Standards and Technology (United States) [7431-08]

Lunch/Exhibition Break 11:50 am to 1:20 pm

SESSION 3

Room: Conv. Ctr. Room 31B Wed. 1:20 to 3:20 pm

Fiber Transfer of Precision Optical Frequencies

Session Chair: **Tara M. Fortier**, National Institute of Standards and Technology

1:20 pm: **Ultrastable lasers: new developments and applications** (*Invited Paper*), Uwe Sterr, Physikalisch-Technische Bundesanstalt (Germany) and QUEST- Ctr. for Quantum Engineering and Space-Time Research (Germany); Thomas Legero, Physikalisch-Technische Bundesanstalt (Germany); Thomas Kessler, Harald Schnatz, Physikalisch-Technische Bundesanstalt (Germany) and QUEST- Ctr. for Quantum Engineering and Space-Time Research (Germany); Gesine E. Grosche, Osama Terra, Physikalisch-Technische Bundesanstalt (Germany); Fritz Riehle, Physikalisch-Technische Bundesanstalt (Germany) and QUEST- Ctr. for Quantum Engineering and Space-Time Research (Germany) [7431-09]

1:50 pm: **Frequency measurement of a magnesium frequency standard using a commercial telecommunication fiber link** (*Invited Paper*), Osama Terra, Gesine E. Grosche, Physikalisch-Technische Bundesanstalt (Germany); Wolfgang A. Ertmer, Leibniz Univ. Hannover (Germany) and QUEST- Ctr. for Quantum Engineering and Space-Time Research (Germany); Jan Friebe, Leibniz Univ. Hannover (Germany); Thomas Legero, Physikalisch-Technische Bundesanstalt (Germany); Katharina Predehl, Max-Planck-Institut für Quantenoptik (Germany) and Physikalisch-Technische Bundesanstalt (Germany); Ernst M. Rasel, Leibniz Univ. Hannover (Germany) and QUEST- Ctr. for Quantum Engineering and Space-Time Research (Germany); Matthias Riedmann, Leibniz Univ. Hannover (Germany); Uwe Sterr, Physikalisch-Technische Bundesanstalt (Germany) and QUEST- Ctr. for Quantum Engineering and Space-Time Research (Germany); Temmo Wübena, Leibniz Univ. Hannover (Germany); Thorsten Feldmann, Physikalisch-Technische Bundesanstalt (Germany); Harald Schnatz, Physikalisch-Technische Bundesanstalt (Germany) and QUEST- Ctr. for Quantum Engineering and Space-Time Research (Germany) [7431-10]

2:20 pm: **Long distance frequency transfer through an optical carrier** (*Invited Paper*), Paul A. Williams, Nathan R. Newbury, William C. Swann, National Institute of Standards and Technology (United States) [7431-11]

2:50 pm: **Long-distance ultrastable frequency transfer over urban fiber link** (*Invited Paper*), Fabien Kéfélian, Univ. Paris 13 (France) and Ctr. National de la Recherche Scientifique (France); Haifeng Jiang, Observatoire de Paris (France) and Ctr. National de la Recherche Scientifique (France); Olivier Lope, Christian Chardonnet, Anne Amy-Klein, Univ. Paris 13 (France) and Ctr. National de la Recherche Scientifique (France); Giorgio Santarelli, Observatoire de Paris (France) and Ctr. National de la Recherche Scientifique (France) [7431-12]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Conv. Ctr. Room 31B Wed. 3:50 to 6:00 pm

Lattice Clocks

Session Chair: **Uwe Sterr**, Physikalisch-Technische Bundesanstalt (Germany)

3:50 pm: **Optical lattice clocks based on fermions** (*Invited Paper*), Andrew D. Ludlow, Nathan Lemke, Tara M. Fortier, Scott Diddams, Chris Oates, National Institute of Standards and Technology (United States); Gretchen Campbell, Martin Boyd, Sebastian Blatt, Jun Ye, JILA (United States) [7431-13]

4:20 pm: **Background gas induced collision shift for a Sr spin-forbidden transition**, Tetsuya Ido, Nobuyasu Shiga, Ying Li, Hiroyuki Ito, Shigeo Nagano, Atsushi Yamaguchi, Michi Koide, Mizuhiko Hosokawa, National Institute of Information and Communications Technology (Japan); Kasia Bielska, Roman Ciurylo, Univ. Mikolaja Kopernika (Poland) [7431-14]

Conference 7431

4:40 pm: **Development of an Yb optical lattice clock using a fermionic isotope**, Masami Yasuda, National Institute of Advanced Industrial Science and Technology (Japan) and Japan Science and Technology Agency (Japan); Takuya Kohno, Japan Science and Technology Agency (Japan) and National Institute of Advanced Industrial Science and Technology (Japan); Kazumoto Hosaka, Hajime Inaba, Yoshiaki Nakajima, Atsushi Onae, National Institute of Advanced Industrial Science and Technology (Japan); Hidetoshi Katori, The Univ. of Tokyo (Japan) and Japan Science and Technology Agency (Japan); Feng-Lei Hong, National Institute of Advanced Industrial Science and Technology (Japan) and Japan Science and Technology Agency (Japan) [7431-15]

5:00 pm: **Optical lattice clocks with Sr and Hg atoms** (*Invited Paper*), Philip G. Westergaard, Arnaud Lecallier, Jérôme Lodewyck, Sinda Mejri, Michael Petersen, Observatoire de Paris (France); Daniel V. Magalhães, Univ. de São Paulo (Brazil); Cipriana Mandache, Observatoire de Paris (France) and National Institute for Lasers, Plasma and Radiation Physics (Romania); Samuel Dawkins, Radu Chichireanu, Yann Lecoq, André Clairon, Sébastien Bize, Pierre Lemonde, Observatoire de Paris (France) [7431-16]

5:30 pm: **Optical lattice clocks toward 10^{-17} uncertainty** (*Invited Paper*), Hidetoshi Katori, Tomoya Akatsuka, Hidekazu Hachisu, Masao Takamoto, The Univ. of Tokyo (Japan). [7431-17]

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Conference 7432

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7432

Optical Inspection and Metrology for Non-Optics Industries

Conference Chairs: **Peisen S. Huang**, Stony Brook Univ.; **Toru Yoshizawa**, Saitama Medical Univ. (Japan); **Kevin G. Harding**, GE Global Research

Program Committee: **Motoharu Fujigaki**, Wakayama Univ. (Japan); **Qingying Hu**, Akrometrix LLC; **Heinz Hügli**, Univ. de Neuchâtel (Switzerland); **Seung-Woo Kim**, Korea Advanced Institute of Science and Technology (Korea, Republic of); **Gunther Notni**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); **Guiju Song**, GE Global Research (China); **Muralidhara Subbarao**, Stony Brook Univ.; **Toshiyuki Takatsuji**, National Institute of Advanced Industrial Science and Technology (Japan); **Jiangtao Xi**, Univ. of Wollongong (Australia); **Jian Xu**, A*STAR Singapore Institute of Manufacturing Technology (Singapore); **Shenghua Ye**, Tianjin Univ. (China); **Stuart S. Yin**, The Pennsylvania State Univ.; **Song Zhang**, Iowa State Univ.

Monday 3 August

SESSION 1

Room: Conv. Ctr. Room 18. Mon. 8:00 to 10:00 am

Calibration and Analysis Methods I: Calibration

Session Chair: **Peisen S. Huang**, Stony Brook Univ.

8:00 am: **Optimum checkerboard selection for structured light system calibration**, Song Zhang, Iowa State Univ. (United States) [7432-01]

8:20 am: **Measurement accuracy of fringe projection depending on surface normal direction**, Peter Kuehmstedt, Christian Braeuer-Burchardt, Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) [7432-02]

8:40 am: **High precision calibration method of intrinsic parameters for fish-eye cameras**, Hideki Komagata, Ikuro Ishii, Saitama Medical Univ. (Japan); Hideo Makino, Niigata Univ. (Japan); Akira Takahashi, Nagaoka National College of Technology (Japan); Daisuke Wakatsuki, Tsukuba Univ. of Technology (Japan) [7432-03]

9:00 am: **A new calibration technique for novel stereo camera**, Xue Tu, Muralidhara Subbarao, Stony Brook Univ. (United States) [7432-04]

9:20 am: **3D cutting tool inspection system: CutterMap**, Xiaoming Du, Tian Chen, GE Global Research (China); Kevin G. Harding, GE Global Research (United States) [7432-05]

9:40 am: **3D measurement method based on wavelet transform by using SEM**, Yasuhiko Arai, Kansai Univ. (Japan) [7432-06]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. Room 18. Mon. 10:30 am to 12:10 pm

Calibration and Analysis Methods II: Data Analysis

Session Chair: **Song Zhang**, Iowa State Univ.

10:30 am: **A fringe period unwrapping technique for digital fringe profilometry based on spatial shift estimation**, Pu Cao, Jiangtao Xi, Joe F. Chicharo, Yanguang Yu, Univ. of Wollongong (Australia) [7432-07]

10:50 am: **Shift-variant image deblurring for machine vision: one-dimensional blur**, Muralidhara Subbarao, Younsik Kang, Xue Tu, Stony Brook Univ. (United States) [7432-08]

11:10 am: **Automatic inspection of textured surfaces by support vector machines**, Sina Jahanbin, Alan C. Bovik, The Univ. of Texas at Austin (United States); Eduardo Pérez, Dinesh Nair, National Instruments Corp. (United States) [7432-09]

11:30 am: **Stokes parameters of reflected and scattered light by a rough surface**, Lianhua Jin, Univ. of Yamanashi (Japan); Kuniharu Takizawa, Seikei Univ. (Japan) [7432-10]

11:50 am: **Data processing and parameter extraction for cutting tool inspection**, Tian Chen, Xiaoming Du, GE Global Research (China); Kevin G. Harding, GE Global Research (United States) [7432-11]

Lunch Break 12:10 to 1:40 pm

SESSION 3

Room: Conv. Ctr. Room 18. Mon. 1:40 to 3:00 pm

Optical Metrology and 3D Applications I

Session Chair: **Toru Yoshizawa**, Saitama Medical Univ. (Japan)

1:40 pm: **In-process inspection of internal threads of machined automotive parts**, Hongwei Zhang, Reuven Katz, Univ. of Michigan (United States); John S. Agapiou, General Motors Corp. (United States) [7432-12]

2:00 pm: **Measure of roughness of paper using speckle**, Josep Pladellourens Mallofre, Univ. Politècnica de Catalunya (Spain) [7432-13]

2:20 pm: **A novel method for overlay measurement by scatterometry**, Wei-Te Hsu, Yi-Shu Ku, Industrial Technology Research Institute (Taiwan) . . . [7432-14]

2:40 pm: **Optical inspection of granite fracture surfaces**, Manuel F. Costa, Graça F. Vasconcelos, Univ. do Minho (Portugal) [7432-15]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. Room 18. Mon. 3:30 to 5:30 pm

Optical Metrology and 3D Applications II

Session Chair: **Qingying Hu**, Akrometrix LLC

3:30 pm: **In-situ analysis of fruit anthocyanins by means of total internal reflectance, continuous wave and time-resolved spectroscopy**, Manuela Zude, Leibniz Institute for Agricultural Engineering Potsdam-Bornim (Germany); Alessandro Torricelli, Politecnico di Milano (Italy) [7432-16]

3:50 pm: **Spectral analysis of white-light coherence for high-resolution and dynamic particle detection**, Yongkai Zhu, Nanjing Univ. of Aeronautics and Astronautics (China) [7432-17]

4:10 pm: **Inner surface profile measurement of a hydrodynamic bearing by an oblique incidence and two-wavelength interferometer**, Osami Sasaki, Ryota Yamamura, Kazushi Yokoyama, Takamasa Suzuki, Niigata Univ. (Japan) [7432-18]

4:30 pm: **Digital processing of an interferometric velocimeter for ballistic shock measurement**, Pankaj Kumar, Akhil Thomas, Robert S. Weis, Tristan J. Tayag, Texas Christian Univ. (United States) [7432-19]

4:50 pm: **In-plane and out-of-plane deformation and vibration measurement using an optomechanical image derotator**, Maik Rahlves, Sahar Mirzaei, Thomas Fahlbusch, Eduard Reithmeier, Leibniz Univ. Hannover (Germany) [7432-20]

5:10 pm: **Detection of chatter in turning using cross recurrence plot analysis and sequential speckle images of machined surface**, Jacob Elias, Cochin Univ. of Science & Technology (India) [7432-21]

Conference 7432

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Research of the chromaticity coordinates and color spectrum calibration using tristimulus sensors and eigenspectrum method, Ou-Yang Mang, Yao-Fang Hsieh, Ting-Wei Huang, Yu-Ta Chen, National Central Univ. (Taiwan) [7432-39]

A flexible approach for calibrating phase measurement profilometry system, Yong Li, Haihua Zhang, Zhejiang Normal Univ. (China); Fang Song, The Academy of Equipment Command & Technology (China); Keyou Jin, Zhejiang Normal Univ. (China) [7432-41]

Iterative estimation of the topography by means of structured light, Amalia Martínez García, Juan Antonio Rayas-Alvarez, Ctr. de Investigaciones en Óptica, A.C. (Mexico); Héctor José Puga Soberanes, Instituto Tecnológico de León (Mexico); Katia Genovese, Univ. degli Studi della Basilicata (Italy) . . . [7432-42]

Multi-channel liquid crystal cell parameter measurement technique, Chih-Shang Liu, Kai-Ping Chuang, Yeou-Sung Lin, Ming-Yin Zhuang, Industrial Technology Research Institute (Taiwan) [7432-43]

Method to measure frequency change of tunable laser based on Jamin shearing interferometer, Lijuan Wang, Liren Liu, Jianfeng Sun, Yu Zhou, Zhu Luan, De'an Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7432-44]

Qualitative analysis of textile products by near infrared spectroscopy technology, Dongmin Wang, China Jiliang Univ. (China) and Jinan Univ. (China); Shangzhong Jin, China Jiliang Univ. (China) [7432-45]

Measurement of frequency swept linearly with Fabry-Perot fiber interferometer, Zhu Luan, Nan Xu, De'an Liu, Yu Zhou, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7432-46]

Computation of crack tip elastic strain intensity factor in mode I through electronic spackle, Jorge R. Parra Michel, Amalia Martínez García, Juan Antonio Rayas-Alvarez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7432-47]

Three-dimensional embedded defect detection and localization in a semi-transparent medium, Gil Abramovich, Christopher A. Nafis, Yana Z. Williams, Kevin G. Harding, Eric J. Tkaczyk, GE Global Research (United States) [7432-48]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. Room 18 Tues. 8:00 to 10:00 am

3D Methods I: Structured Light and Phase Methods

Session Chair: Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany)

8:00 am: **Digital multiple-wavelength phase-shifting algorithm**, Song Zhang, Iowa State Univ. (United States) [7432-22]

8:20 am: **Continuous scanning phase measurement for high immunity to vibration**, Jungjae Park D.D.S., Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7432-23]

8:40 am: **Three-dimensional profilometry system incorporating a MEMS scanner**, Toru Yoshizawa, Toshitaka Wakayama, Saitama Medical Univ. (Japan) [7432-24]

9:00 am: **Fast 3D-shape measurement method based on modulation measurement profilometry**, Xianyu Su, Yunfu Dou, Liqun Xiang, Qican Zhang, Sichuan Univ. (China) [7432-25]

9:20 am: **Improvement on out-of-plane shadow moiré**, Qingying Hu, Jiahui Pan, Akrometrix LLC (United States) [7432-26]

9:40 am: **Comparison of projection means for structured light systems**, Kevin G. Harding, GE Global Research (United States) [7432-27]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. Room 18 Tues. 10:30 to 11:50 am

3D Methods II: Speckle, Holographic, and Dynamic Methods

Session Chair: Kevin Harding, GE Global Research

10:30 am: **Microscopic TV sheroigraphy for microsystems characterization**, Paul K. Upputuri, Krishna M. Nandigana, Kothiyal P. Mahendra, Indian Institute of technology Madras (India) [7432-28]

10:50 am: **Automatic spatial filtering for dynamic analysis in digital holographic microscopy**, Jingang Zhong, Jiawen Weng, Cuiying Hu, Zhe Chen, Jinan Univ. (China) [7432-29]

11:10 am: **3D inspection microscope using holographic primary objective**, Thomas D. Ditto, DeWitt Brothers Tool Co. (United States) [7432-30]

11:30 am: **Dual mode interferometer for measuring dynamic displacement of specular and diffuse components**, Michael B. North Morris, 4D Technology Corp. (United States) [7432-31]

Lunch/Exhibition Break 11:50 am to 1:20 pm

SESSION 7

Room: Conv. Ctr. Room 18 Tues. 1:20 to 3:40 pm

3D Methods III: Other Methods Including Color, Stereo, and Focus

Session Chair: Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of)

1:20 pm: **Combined stereovision and phase shifting method: use of a color-coded visibility-modulated fringe pattern**, Xu Han, Peisen S. Huang, Stony Brook Univ. (United States) [7432-32]

1:40 pm: **Pixel synchronous measurement of object shape and colour**, Jens Siepmann, Matthias Heinze, Peter Kuehmstedt, Gunther Notni, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany) [7432-33]

2:00 pm: **Chromatic confocal spectral interferometry for technical surface characterization**, Wolfram Lyda, David Fleischle, Klaus K. Körner, Wolfgang Osten, Univ. Stuttgart (Germany) [7432-34]

2:20 pm: **Three-dimensional profilometry based on focus method by projecting LC grating pattern**, Yukitoshi Otani, Fumio Kobayashi, Yasuhiro Mizutani, Tokyo Univ. of Agriculture and Technology (Japan); Toru Yoshizawa, Saitama Medical Univ. (Japan) [7432-35]

2:40 pm: **A portable 3D shape measurement system based on the combined stereovision and phase shifting method**, Xu Han, Peisen S. Huang, Stony Brook Univ. (United States) [7432-36]

3:00 pm: **Real-time 3D part metrology using polarization rotation**, Gil Abramovich, Kevin G. Harding, GE Global Research (United States) . . [7432-37]

3:20 pm: **Laser Doppler distance sensors using phase and frequency evaluation**, Jürgen W. Czarske, Thorsten Pfister, Philipp Günther, Lars Büttner, Technische Univ. Dresden (Germany) [7432-38]

Coffee Break 3:40 to 4:00 pm

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Courses of Related Interest

See SPIE Cashier for information and to register.

SC020 Optical Scattering: Measurement and Analysis (Stover) Wednesday, 8:30 am to 12:30 pm

SC211 Practical Interferometry and Fringe Analysis (Creath) Monday, 8:30 am to 12:30 pm

SC213 Introduction to Interferometric Optical Testing (Wyant) Monday, 1:30 to 5:30 pm

SC492 Predicting, Modeling, and Interpreting Light Scattered by Surfaces (Germer) Wednesday, 1:30 to 5:30 pm

SC850 Metrology for Modern Optical Manufacturing (Murphy) Thursday, 8:30 am to 12:30 pm

Conference 7433

Sunday-Monday 2-3 August 2009 • Proceedings of SPIE Vol. 7433

Optical System Alignment, Tolerancing, and Verification III

Conference Chairs: **José Sasián**, College of Optical Sciences/The Univ. of Arizona; **Richard N. Youngworth**, Light Capture, Inc.

Program Committee: **Sen Han**, Veeco Metrology Inc.; **Chao-Wen Liang**, National Central Univ. (Taiwan); **Maria D. Nowak**, NASA Goddard Space Flight Ctr.; **Raymond G. Ohl IV**, NASA Goddard Space Flight Ctr.; **Craig Olson**, L-3 Communications Sonoma EO; **Robert E. Parks**, Optical Perspectives Group, LLC; **Mitchell C. Ruda**, Ruda-Cardinal Inc.

Sunday 2 August

SESSION 1

Room: Conv. Ctr. Room 16A Sun. 8:00 to 10:20 am

JWST and Large Optics

Session Chairs: **Sen Han**, Veeco Metrology Inc.; **Robert E. Parks**, Optical Perspectives Group, LLC

8:00 am: **Presentation, analysis, and simulation of active alignment strategies for the James Webb Space Telescope**, Robert S. Upton, Space Telescope Science Institute (United States) [7433-01]

8:20 am: **Optomechanical integration and alignment verification of the JWST optical telescope element** (*Invited Paper*), Conrad Wells, ITT Corp. (United States) [7433-02]

8:50 am: **Optical metrology of the ISIM test platform**, Joseph A. Connelly, Maria D. Nowak, NASA Goddard Space Flight Ctr. (United States); Joseph M. Stock, Stinger Ghaffarian Technologies, Inc. (United States); Gregory W. Wenzel, Kevin W. Redman, QinetiQ Inc. (United States) [7433-03]

9:10 am: **Updates to the optical alignment and test plan for the James Webb Space Telescope Integrated Science Instrument Module** (*Invited Paper*), Raymond G. Ohl IV, NASA Goddard Space Flight Ctr. (United States) [7433-04]

9:40 am: **Trades for ambient non-contact metrology**, Raymond G. Ohl IV, NASA Goddard Space Flight Ctr. (United States); Bente H. Eegholm, Swales Aerospace (United States); Scott R. Antonille, NASA Goddard Space Flight Ctr. (United States); Michael Casas, Metris USA (United States); Bradley J. Frey, Margaret Dominguez, NASA Goddard Space Flight Ctr. (United States); James E. Gill, QinetiQ North America/Mission Solutions Group (United States); Peter Morken, Metris USA (United States); Kevin W. Redman, Vicki Roberts, QinetiQ North America/Mission Solutions Group (United States); Babak N. Saif, Space Telescope Science Institute (United States); Tony Scirpo, Metris USA (United States) [7433-05]

10:00 am: **Development of a dual field of view optical system for uncooled IR camera**, Hyun Kyu Kim, Chang Min Ok, Jeon Ku Park, Topins Corp. (Korea, Republic of); Hai-Du Cheong, Hanbat National Univ. (Korea, Republic of) [7433-06]

Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Conv. Ctr. Room 16A Sun. 10:50 am to 12:40 pm

Alignment and Associated Aberrations of Optical Systems

Session Chairs: **Raymond G. Ohl IV**, NASA Goddard Space Flight Ctr.; **Mitchell C. Ruda**, Ruda and Associates, Inc.

10:50 am: **A simple and accurate method of aligning high-accuracy multi-element cylindrical lenses**, John P. Lehan, Univ. of Maryland, Baltimore County (United States); Theodore J. Hadjimichael, David Robinson, Raymond Russell, Glenn Byron, NASA Goddard Space Flight Ctr. (United States) [7433-07]

11:10 am: **Alignment challenges for optomechanical engineers** (*Invited Paper*), Alson E. Hatheway, Alson E. Hatheway, Inc. (United States) [7433-08]

11:40 am: **Alignment aberrations of the New Solar Telescope**, Anastacia M. Manuel, James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States) [7433-09]

12:00 pm: **Using nodal aberration theory to understand the aberrations of multiple unobscured three mirror anastigmatic (TMA) telescopes**, Chris J. Todd, Univ. of Rochester (United States); Kevin P. Thompson, Optical Research Associates (United States); Tobias Schmid, Jannick P. Rolland, Univ. of Rochester (United States) [7433-10]

12:20 pm: **Alignment of off-axis optical system with multi mirrors using derivative of Zernike polynomial coefficient**, Yunjong Kim, Yonsei Univ. (Korea, Republic of) and Korea Research Institute of Standards and Science (Korea, Republic of); Ho-Soon Yang, Korea Research Institute of Standards and Science (Korea, Republic of); Sug-Whan Kim, Yonsei Univ. (Korea, Republic of); Yun-Woo Lee, Korea Research Institute of Standards and Science (Korea, Republic of) [7433-11]

Lunch Break 12:40 to 1:40 pm

SESSION 3

Room: Conv. Ctr. Room 16A Sun. 1:40 to 3:20 pm

Tolerancing Methods and Applications

Session Chairs: **Maria D. Nowak**, NASA Goddard Space Flight Ctr.; **Craig Olson**, L-3 Communications Sonoma EO

1:40 pm: **Tolerancing panoramic lenses**, Simon Thibault, Jocelyn Parent, Laval Univ. (Canada) [7433-12]

2:00 pm: **The cost of tolerancing**, Richard N. Youngworth, Light Capture, Inc. (United States); David M. Aikens, Savvy Optics Corp. (United States); Jessica E. DeGroot-Nelson, Optimax Systems, Inc. (United States) [7433-13]

2:20 pm: **A six sigma review of miniature optics alignment**, John Tesar, Raytheon Missile Systems (United States) [7433-14]

2:40 pm: **Tolerance compensation in micro-optics**, Ingo Sieber, Forschungszentrum Karlsruhe GmbH (Germany) [7433-15]

3:00 pm: **Tolerancing Forbes aspheres: advantages of an orthogonal basis**, Richard N. Youngworth, Light Capture, Inc. (United States) [7433-16]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Conv. Ctr. Room 16A Sun. 3:50 to 5:50 pm

Design, Development, and Verification of Optical Systems

Session Chairs: **Chao-Wen Liang**, National Central Univ. (Taiwan); **Richard N. Youngworth**, Light Capture, Inc.

3:50 pm: **Toroidal variable-line-space gratings: the good the bad and the ugly**, Edward A. West, Jonathan W. Certain, Ken Kobayashi, NASA Marshall Space Flight Ctr. (United States) [7433-17]

4:10 pm: **Calculation of third-order misalignment aberrations with the Optical Plate diagram**, Andrew Rakich, Large Binocular Telescope Corp. (United States) [7433-25]

4:30 pm: **Semiconductor laser tracking frequency distance gauge** (*Presentation Only*), James D. Phillips, Robert D. Reasenber, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7433-19]

4:50 pm: **Design, assembly, and testing of a high-resolution relay lens used for holography with operation at both doubled and tripled Nd:YAG laser wavelengths**, Robert M. Malone, Brent C. Frogget, Morris I. Kaufman, Aric Tibbitts, Brian C. Cox, Gene A. Capelle, Michael Grover, Gerald D. Stevens, William D. Turley, National Security Technologies, LLC (United States); Peter D. Pazuchanics, Danny S. Sorenson, Los Alamos National Lab. (United States) [7433-20]

OPTICS

Conference 7433

5:10 pm: **The design and alignment of the DECam lenses and modelling of the static shear pattern and its impact on weak lensing measurements**, Michelle L. Antonik, Peter Doel, Univ. College London (United Kingdom); Timothy Abbot, Cerro Tololo Inter-American Observatory (Chile); Rebecca Bernstein, Bruce C. Bigelow, Univ. of California Observatories (United States); Sarah Bridle, David Brooks, Univ. College London (United Kingdom); Herman P. Cease, Fermi National Accelerator Lab. (United States); Darren L. DePoy, Ohio State Univ. (United States); Brenna Flaughner, Fermi National Accelerator Lab. (United States); Michael Gladders, Carnegie Observatories (United States); Gaston Gutierrez, Stephen M. Kent, Andrew Stefanik, Fermi National Accelerator Lab. (United States); Alistair R. Walker, Cerro Tololo Inter-American Observatory (Chile); Sue Worswick, Consultant (United Kingdom) [7433-21]

5:30 pm: **From design to assembly: getting the most from your optical software**, Mary G. Turner, Brealut Research Organization, Inc. (United States) [7433-22]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Measurement of chief ray exit angle for mobile phone camera, Ho-Soon Yang, Korea Research Institute of Standards and Science (Korea, Republic of); Yong-Geol Jo, Gyu-Uk Kim, Kumoh National Institute of Technology (Korea, Republic of); Jong-Woong Lee, Cheongju Univ. (Korea, Republic of); Yun-Woo Lee, Korea Research Institute of Standards and Science (Korea, Republic of) . [7433-23]

Pupil alignment reference (PAR) for the Mid-infrared Instrument (MIRI) for optical alignment and verification on the Integrated Science Instrument Module (ISIM) in James Webb Space Telescope (JWST), Cagatay Aymergen, Phillip Driggers, SGT, Inc. (United States); Raymond G. Ohl IV, NASA Goddard Space Flight Ctr. (United States) [7433-24]

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Room: Marriott Hotel, Mission Hills . Tues. 8:00 to 10:00 pm

Optomechanical/Instrument Technical Event

Chair: **Alison E. Hatheway**, Alison E. Hatheway Inc.

This is the annual meeting of the premier group of optomechanical engineers that design and analyze the world's optical instruments and systems.

Our feature speaker will be Scott Texter, the manager of the JWST Telescope for Northrop Grumman Aerospace Systems. He will review the progress on the development of the James Webb Space Telescope for us.

The James Webb Space Telescope (JWST) is a large, infrared-optimized space telescope, scheduled for launch in 2013. JWST will find the first galaxies that formed in the early Universe, connecting the Big Bang to our own Milky Way Galaxy. JWST will peer through dusty clouds to see stars forming planetary systems, connecting the Milky Way to our own Solar System. JWST's instruments will be designed to work primarily in the infrared range of the electromagnetic spectrum, with some capability in the visible range. JWST will have a large mirror, 6.5 meters (21.3 feet) in diameter and a sunshield the size of a tennis court. Both the mirror and sunshade won't fit onto the rocket fully open, so both will fold up and open only once JWST is in outer space. JWST will reside in an orbit about 1.5 million km (1 million miles) from the Earth.

This gathering is open to all attendants to the Optics and Photonics Symposium. Anyone who wishes to put an item on the agenda should contact the Chair, Al Hatheway, at aeh@aehinc.com.

Following the speakers and other agenda items the floor will be open for our traditional 'Problems and Solutions Workshop' session so bring some challenges before the group.

See page 27 for presentation details.

Courses of Related Interest

See SPIE Cashier for information and to register.

SC010 Introduction to Optical Alignment Techniques (Ruda) Monday-Tuesday, 8:30 am to 5:30 pm

SC220 Optical Alignment Mechanisms (Guyer) Tuesday, 1:30 to 5:30 pm

SC720 Cost-Conscious Tolerancing of Optical Systems (Youngworth) Monday, 8:30 am to 12:30 pm

Conference 7434

Wednesday 5 August 2009 • Proceedings of SPIE Vol. 7434

Optical Technologies for Arming, Safing, Fuzing, and Firing V

Conference Chairs: **Fred M. Dickey**, FMD Consulting LLC; **Richard A. Beyer**, Army Research Lab.

Program Committee: **Adrian A. Akinci**, Los Alamos National Lab.; **Ron Bechtold**, Alfalight, Inc.; **Thomas J. Blachowski**, Naval Surface Warfare Ctr.; **David P. Bour**, Photodigm, Inc.; **Michael D. Bowden**, Atomic Weapons Establishment (United Kingdom); **Gary C. Catella**, Gooch & Housego, Cleveland; **David W. Ewick**, Ensign-Bickford Aerospace & Defense Co.; **Andrew Forbes**, Council for Scientific and Industrial Research (South Africa); **Everett S. Hafenrichter**, Sandia National Labs.; **Scott J. Hamlin**, MegaWatt Lasers, Inc.; **Christopher R. Hardy**, Kigre, Inc.; **Keren K. Jobbins**, Atomic Weapons Establishment (United Kingdom); **Stephen R. Lerner**, Tyco Electronics Corp.; **Keith L. Lewis**, Electro Magnetic Remote Sensing Defence Technology Ctr. (United Kingdom); **Todd E. Lizotte**, Hitachi Via Mechanics (USA), Inc.; **Mikhail A. Maiorov**, Akela Laser Corp.; **Robert V. McDaniel**, Kollsman, Inc.; **Gregg L. Morelli**, Honeywell Federal Manufacturing & Technologies, LLC; **Barry T. Neyer**, PerkinElmer Optoelectronics; **Adam Parker**, QinetiQ Ltd. (United Kingdom); **Alex Rosiewicz**, EM4, Inc.; **Raymond J. Silva**, BAE Systems; **Kelly Simmons-Potter**, The Univ. of Arizona; **Bolesh J. Skutnik**, CeramOptec Industries, Inc.; **Gabriel L. Smith**, U.S. Army Research, Development and Engineering Command; **Donald R. Snyder**, Air Force Research Lab.

Tuesday 4 August

Room: Conv. Ctr. Room 6A Tues. 4:15 to 5:00 pm

Optical Engineering Plenary Session

4:15 pm: **Optical design dependence on technology development**, Iain A. Neil, ScotOptix (Switzerland) [7428-01]

See page 20 for presentation details.

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. Room 4. Wed. 8:00 to 10:10 am

Laser Ignition/Initiation Systems

Session Chair: **Michael D. Bowden**, Atomic Weapons Establishment (United Kingdom)

8:00 am: **The T-6A Texan (JPATS) CFIS laser assemblies initial quality evaluation test results** (*Invited Paper*), Thomas J. Blachowski, George Eccard, Travis Thom, Naval Surface Warfare Ctr. (United States) [7434-01]

8:30 am: **The effect of ablation layer material and thickness on the velocity of laser-driven flyer plates**, Michael D. Bowden, Atomic Weapons Establishment (United Kingdom) [7434-02]

8:50 am: **High-energy single-pulse operation of GaAs- and InP-based diode lasers**, Mikhail A. Maiorov, Igor E. Trofimov, Vladimir A. Zeidel, Robert F. Sellers, Akela Laser Corp. (United States) [7434-03]

9:10 am: **Assembly and characterization of a prototype laser-optical firing system**, Gregg L. Morelli, Honeywell Federal Manufacturing & Technologies, LLC (United States) [7434-04]

9:30 am: **Waveguide sensor for detection of HNS degradation**, Kathleen Alam, Laura E. Martin, Randal L. Schmitt, Gregory A. Ten Eyck, Sandia National Labs. (United States) [7434-05]

9:50 am: **Mechanical tolerance analysis of laser-optical system packaging**, Michelle R. Bright, Melanie G. Elazegui, Honeywell Federal Manufacturing & Technologies, LLC (United States) [7434-06]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Conv. Ctr. Room 4. Wed. 10:40 am to 12:00 pm

Radiation Effects

Session Chair: **Mikhail A. Maiorov**, Akela Laser Corp.

10:40 am: **Evaluation of the behaviour of optical firing unit components exposed to extreme temperatures, gamma radiation and neutron radiation: a literary review**, Sarah L. Waterhouse, Keren K. Jobbins, Atomic Weapons Establishment (United Kingdom) [7434-07]

11:00 am: **The effect of high dose rate transient gamma radiation on high energy optical fibers**, Michael D. Bowden, Atomic Weapons Establishment (United Kingdom) [7434-08]

11:20 am: **Dynamics of the optical response of Nd:YAG to ionizing radiation: testing for radiation hardness using UV laser radiation**, Boris L. Glebov, College of Optical Sciences, The Univ. of Arizona (United States); Kelly Simmons-Potter, The Univ. of Arizona (United States); Dorothy C. Meister, Sandia National Labs. (United States) [7434-09]

11:40 am: **Gamma-radiation-induced photodarkening in actively pumped Yb-doped optical fiber and investigation of post-irradiation transmittance recovery**, Brian P. Fox, Kelly Simmons-Potter, The Univ. of Arizona (United States); Dorothy C. Meister, Sean W. Moore, Sandia National Labs. (United States) [7434-10]

Lunch/Exhibition Break 12:00 to 1:50 pm

SESSION 3

Room: Conv. Ctr. Room 4. Wed. 1:50 to 3:00 pm

Laser/Fiber Advances

Session Chair: **Scott J. Hamlin**, MegaWatt Lasers, Inc.

1:50 pm: **Q-switching technologies: limitations and opportunities** (*Invited Paper*), Gary C. Catella, Gooch & Housego (United States) [7434-11]

2:20 pm: **A microlens-array injection method for tapered optical fibers**, Michael D. Bowden, Atomic Weapons Establishment (United Kingdom) [7434-12]

2:40 pm: **Evaluation of a compact high-energy fiber to fiber coupler**, Michael D. Bowden, Atomic Weapons Establishment (United Kingdom) [7434-13]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. Room 4. Wed. 3:30 to 4:50 pm

Novel Applications

Session Chair: **Gary C. Catella**, Gooch & Housego, Cleveland

3:30 pm: **Extracting ballistic forensic intelligence: microstamped firearms for GIS-based illegal firearm traffic mapping: technology**, Todd E. Lizotte, Orest P. Ohar, Hitachi Via Mechanics (USA), Inc. (United States) [7434-16]

3:50 pm: **Extracting ballistic forensic intelligence: microstamped firearms for GIS-based illegal firearm traffic mapping: implementation and applications**, Todd E. Lizotte, Orest P. Ohar, Hitachi Via Mechanics (USA), Inc. (United States) [7434-17]

4:10 pm: **New midwave infrared laser sources for defense and security needs**, Arkadiy A. Lyakh, Richard Maulini, Rowel Go, Alexei G. Tsekoun, Chandra Kumar N. Patel, Pranalytica, Inc. (United States) [7434-18]

4:30 pm: **Compact, rapid, and rugged detector of military and improvised explosives based on external grating cavity quantum cascade lasers**, Alexei G. Tsekoun, Ilya Dunayevskiy, Richard Maulini, Arkadiy A. Lyakh, Chandra Kumar N. Patel, Pranalytica, Inc. (United States) [7434-19]

OPTICS

Conference 7435

Monday 3 August 2009 • Proceedings of SPIE Vol. 7435

UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XVI

Conference Chair: **Oswald H. Siegmund**, Univ. of California, Berkeley

Program Committee: **James C. Green**, Univ. of Colorado at Boulder; **Michael P. Kowalski**, Naval Research Lab.; **Stephan R. McCandliss**, Johns Hopkins Univ.; **Barry Y. Welsh**, Univ. of California, Berkeley

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 1

Room: Conv. Ctr. 31B Mon. 8:00 to 10:00 am

X-Ray Focal Plane Instrumentation

Session Chair: **Stephan R. McCandliss**, The Johns Hopkins Univ.

8:00 am: **CCD detectors for spectroscopy and imaging of X-rays with the eROSITA space telescope**, Norbert Meidinger, Robert Andritschke, Stefanie Ebermayer, Johannes Elbs, Max-Planck-Institut für extraterrestrische Physik (Germany); Robert Hartmann, PNSensor GmbH (Germany); Sven Herrmann, Olaf Hälker, Nils J. Kimmel, Peter Predehl, Gabriele Schächner, Max-Planck-Institut für extraterrestrische Physik (Germany); Heike Softau, PNSensor GmbH (Germany); Lothar W. Strüder, Max-Planck-Institut für extraterrestrische Physik (Germany) [7435-01]

8:20 am: **Performance of the NuSTAR focal plane detectors**, Peter H. Mao, Fiona A. Harrison, Walter R. Cook III, Hiromasa Miyasaka, Vikram R. Rana, California Institute of Technology (United States) [7435-02]

8:40 am: **Development of Soft X-ray Imager (SXI) onboard the Astro-H satellite**, Takeshi G. Tsuru, Hironori Matsumoto, Makoto Sawada, Kyoto Univ. (Japan); Hiroshi Tsunemi, Kiyoshi Hayashida, Emi Miyata, Naohisa Anabuki, Hiroshi Nakajima, Daisuke Matsuura, Osaka Univ. (Japan); Tadayasu Dotani, Masanobu Ozaki, Aya Bamba, Takahisa Fujinaga, Japan Aerospace Exploration Agency (Japan); Takayoshi Kohmura, Kogakuin Univ. (Japan); Hiroshi Murakami, Rikkyo Univ. (Japan); Koji Mori, Makoto Yamauchi, Univ. of Miyazaki (Japan); Junko Hiraga, The Institute of Physical and Chemical Research (Japan); John P. Doty, Noqsi Aerospace, Ltd. (United States); Marshall W. Bautz, Massachusetts Institute of Technology (United States) [7435-03]

9:00 am: **Performance of an analog ASIC developed for the front-end electronics of the Soft X-ray Imager onboard ASTRO-H**, Hiroshi Nakajima, Daisuke Matsuura, Toshihiro Idehara, Naohisa Anabuki, Emi Miyata, Hiroshi Tsunemi, Osaka Univ. (Japan); John P. Doty, Noqsi Aerospace, Ltd. (United States); Hirokazu Ikeda, Japan Aerospace Exploration Agency (Japan) [7435-04]

9:20 am: **The wide field imager for the International X-ray Observatory**, Johannes Treis, Max-Planck-Institut für Sonnensystemforschung (Germany) and MPI Halbleiterlabor (Germany); Laci Andricek, Max-Planck-Institut für Physik (Germany); Sven Herrmann, Thomas Lauf, Max-Planck-Institut für extraterrestrische Physik (Germany); Peter H. Lechner, Gerhard Lutz, PNSensor GmbH (Germany); Matteo Porro, Max-Planck-Institut für extraterrestrische Physik (Germany); Rainer H. Richter, Max-Planck-Institut für Physik (Germany); Florian Schopper, Max-Planck-Institut für extraterrestrische Physik (Germany); Heike Softau, PNSensor GmbH (Germany); Alexander Stefanescu, Lothar W. Strüder, Max-Planck-Institut für extraterrestrische Physik (Germany) [7435-05]

9:40 am: **The DEPFET-based low energy detector on SIMBOL-X**, Johannes Treis, Max-Planck-Institut für Sonnensystemforschung (Germany); Laci Andricek, Max-Planck-Institut für Physik (Germany); Ulrich G. Briel, Max-Planck-Institut für extraterrestrische Physik (Germany); Klaus Heinzinger, PNSensor GmbH (Germany); Sven Herrmann, Heinrich Huber, Max-Planck-Institut für extraterrestrische Physik (Germany); Eckard Kendziorra, Univ. Tübingen (Germany); Thomas Lauf, Max-Planck-Institut für extraterrestrische Physik (Germany); Peter H. Lechner, Gerhard Lutz, PNSensor GmbH (Germany); Rainer H. Richter, Max-Planck-Institut für Physik (Germany); Gerhard Schaller, Florian Schopper, Max-Planck-Institut für extraterrestrische Physik (Germany); Martina Schnecke, Max-Planck-Institut für Physik (Germany); Gabriele Segneri, PNSensor GmbH (Germany); Lothar W. Strüder, Max-Planck-Institut für extraterrestrische Physik (Germany) [7435-06]

Coffee Break 10:00 am

SESSION 2

Room: Conv. Ctr. 31B Mon. 10:30 am to 12:10 pm

Space Missions and Instruments

Session Chair: **Oswald H. Siegmund**, Univ. of California, Berkeley

10:30 am: **The JANUS X-Ray Flash Monitor**, Abraham D. Falcone, David N. Burrows, The Pennsylvania State Univ. (United States) [7435-07]

10:50 am: **Low Earth Orbit background simulations for the black hole finder probe EXIST**, Alfred B. Garson III, Washington Univ. in St. Louis (United States); Gerald K. Skinner, Steven J. Sturmer, NASA Goddard Space Flight Ctr. (United States); Jae Sub Hong, Harvard-Smithsonian Ctr. for Astrophysics (United States); Henric S. Krawczynski, Washington Univ. in St. Louis (United States); Jonathan E. Grindlay, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7435-08]

11:10 am: **The High Energy Telescope (HET) on EXIST**, Jae Sub Hong, Jonathan E. Grindlay, Branden T. Allen, Harvard-Smithsonian Ctr. for Astrophysics (United States); Scott D. Barthelmy, Gerald K. Skinner, NASA Goddard Space Flight Ctr. (United States); Mark H. Finger, National Space Science and Technology Ctr. (United States); Garrett Jernigan, Univ. of California, Berkeley (United States) [7435-09]

11:30 am: **Imaging and burst location with the EXIST high-energy telescope**, Gerald K. Skinner, NASA Goddard Space Flight Ctr. (United States); Mark H. Finger, Universities Space Research Association (United States); Jae Sub Hong, Harvard-Smithsonian Ctr. for Astrophysics (United States); Garrett Jernigan, Univ. of California, Berkeley (United States); Steven J. Sturmer, NASA Goddard Space Flight Ctr. (United States); Branden T. Allen, Jonathan E. Grindlay, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7435-10]

11:50 am: **SXI on board EXIST: scientific performances**, Lorenzo Natalucci, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); Angela Bazzano, Istituto Nazionale di Astrofisica (Italy); Patricia A. Caraveo, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); Jonathan E. Grindlay, Harvard-Smithsonian Ctr. for Astrophysics (United States); Giovanni Pareschi, Gianpiero Tagliaferri, Osservatorio Astronomico di Brera (Italy); Pietro Ubertini III, Gabriele E. Villa, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy) [7435-11]

Lunch Break 12:10 pm

SESSION 3

Room: Conv. Ctr. 31B Mon. 1:10 to 2:30 pm

CCD/CMOS Detectors

Session Chair: **Matthew N. Beasley**, Univ. of Colorado at Boulder

1:10 pm: **Avalanche-amplifying high-speed pnCCD with optical single-photon sensitivity for astronomical observations**, Ivan Ordavo, Robert Hartmann, Peter Holl, PnSensor GmbH (Germany); Anton Irlbeck, Max-Planck-Institut für extraterrestrische Physik (Germany) and MPI Halbleiterlabor (Germany); Gerhard Lutz, PnSensor GmbH (Germany); Rainer H. Richter, Max-Planck-Institut für Physik (Germany) and MPI Halbleiterlabor (Germany); Gerhard Schaller, Max-Planck-Institut für extraterrestrische Physik (Germany) and MPI Halbleiterlabor (Germany); Heike Soltau, PnSensor GmbH (Germany); Lothar W. Strüder, Max-Planck-Institut für extraterrestrische Physik (Germany) and MPI Halbleiterlabor (Germany) [7435-12]

1:30 pm: **Measurements of Si hybrid CMOS x-ray detector characteristics**, Stephen D. Bongiorno, Abraham D. Falcone, David N. Burrows, Robert Cook, The Pennsylvania State Univ. (United States) [7435-13]

1:50 pm: **A comparative study of proton radiation damage in p- and n-channel CCDs**, Jason P. Gow, Neil J. Murray, Andrew D. Holland, The Open Univ. (United Kingdom); David J. Burt, Peter J. Pool, e2v technologies plc (United Kingdom) [7435-14]

2:10 pm: **Development of an EUV polarimeter with a transmission multilayer**, Shunji Kitamoto, Youichi Shishido, Norimitsu Gotoh, Takuma Shibata, Eri Takenaka, Kenta Nagasaki, Dai Takei, Mikio Morii, Hiroshi Murakami, Rikkyo Univ. (Japan) [7435-15]

SESSION 4

Room: Conv. Ctr. 31B Mon. 2:30 to 3:30 pm

High Energy Balloon Experiments

Session Chair: **Oswald H. Siegmund**, Univ. of California, Berkeley

2:30 pm: **A new low-background Compton telescope using LaBr₃ scintillator**, Peter F. Blosler, James M. Ryan, Jason S. Legere, Mark L. McConnell, Univ. of New Hampshire (United States); Mark Wallace, Richard M. Kippen, Los Alamos National Lab. (United States) [7435-16]

2:50 pm: **ProtoEXIST1: wide-field hard x-ray telescope and initial prototype for EXIST**, Branden T. Allen, Jae Sub Hong, Jonathan E. Grindlay, Harvard-Smithsonian Ctr. for Astrophysics (United States); Scott D. Barthelmy, Robert G. Baker, NASA Goddard Space Flight Ctr. (United States); Trey Garson, Henric S. Krawczynski, Washington Univ. in St. Louis (United States); Ryan Mclean, California Institute of Technology (United States); Simon E. Labov, Lawrence Livermore National Lab. (United States) [7435-17]

3:10 pm: **GRAPE: a balloon-borne gamma ray polarimeter**, Mark L. McConnell, Chris Bancroft, Peter F. Blosler, Taylor Connor, Jason S. Legere, James M. Ryan, Univ. of New Hampshire (United States) [7435-18]

Coffee Break 3:30 pm

SESSION 5

Room: Conv. Ctr. 31B Mon. 4:00 to 5:30 pm

UV/Optical Instrumentation

Session Chair: **James C. Green**, Univ. of Colorado at Boulder

4:00 pm: **High throughput, high performance UV/Vis/NIR imaging array activities at JPL (Invited Paper)**, Shouleh Nikzad, Jordana Blacksberg, Michael E. Hoenk, Todd J. Jones, Blake Jacquot, Steve P. Monacos, Frank Greer, Matthew R. Dickie, Tom Elliott, Thomas J. Cunningham, Jet Propulsion Lab. (United States); Stephen E. Holland, Lawrence Berkeley National Lab. (United States); Paul A. Scowen, Arizona State Univ. (United States) [7435-19]

4:30 pm: **Development of cross strip MCP detectors for UV and optical instruments**, Oswald H. Siegmund, Anton S. Tremsin, John V. Vallerga, Jeff Hull, Richard Raffanti, Univ. of California, Berkeley (United States) . . . [7435-20]

4:50 pm: **High efficiency ultraviolet spectrographs in conjunction with three mirror anastigmat telescopes**, Matthew N. Beasley, Univ. of Colorado at Boulder (United States) [7435-21]

5:10 pm: **Development of an ultraviolet proportional counter with potential for faint FUV line emission observations**, Kasandra K. J. OMalia, Matthew N. Beasley, James C. Green, Univ. of Colorado at Boulder (United States)[7435-22]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Design of an innovative gamma ray spectroscopy image-based telescope by assigning reciprocal vision color to each gamma photon depending on the energy of gamma photons, Akbar Rahmani Nejad, Independent Researcher (Iran, Islamic Republic of); Mohammad Ahmadi Olia, Independent Researcher (United States) [7435-23]

Imaging characteristics of ultraviolet imaging telescope (UVIT) through numerical simulations, Mudit K. Srivastava, Swapnil M. Prabhudesai, Shyam N. Tandon, The Inter-Univ. Ctr. for Astronomy and Astrophysics (India)[7435-24]

Development of a cadmium telluride pixel detector for astrophysical applications, Hiromasa Miyasaka, Fiona A. Harrison, Walter R. Cook III, Peter H. Mao, Vikram R. Rana, California Institute of Technology (United States); Shin'nosuke Ishikawa, Masayoshi Ushio, Hiroyuki Aono, Shin Watanabe, Goro Sato, Motohide Kokubun, Tadayuki Takahashi, Japan Aerospace Exploration Agency (Japan) [7435-25]

Proton radiation damage study of 0.18µm process CMOS image sensors, Ben J. Dryer, Andrew D. Holland, The Open Univ. (United Kingdom); David J. Burt, Paul Jerram, e2v technologies plc (United Kingdom) [7435-26]

Further development of a high-speed, event-driven Active Pixel Sensor readout for photon-counting detectors in space astronomy applications, Timothy J. Norton, NASA Goddard Space Flight Ctr. (United States) and Univ. of Maryland, Baltimore County (United States); Randy A. Kimble, James P. Haas, NASA Goddard Space Flight Ctr. (United States); Bedabrata Pain, Chao Sun, Christopher J. Wrigley, Jet Propulsion Lab. (United States) [7435-27]

X-ray photon counting with a CMOS imaging sensor, Ben J. Dryer, Neil J. Murray, Andrew D. Holland, e2v ctr. for electronic imaging, The Open Univ. (United Kingdom); Paul Jerram, Mark Robbins, e2v technologies plc (United Kingdom) [7435-28]

The Diffuse Interstellar Cloud experiment: calibration and data, Eric R. Schindhelm, Robert Kane, Brennan L. Gantner, Matthew N. Beasley, James C. Green, Univ. of Colorado at Boulder (United States) [7435-31]

Proton radiation damage study of the next generation of swept charge devices, Jason P. Gow, Andrew D. Holland, The Open Univ. (United Kingdom); Peter J. Pool, e2v technologies plc (United Kingdom) [7435-30]

A simulation model of imaging nonlinearity in photon-counting imaging detector with wedge-strip readout, Lingping He, Bo Chen, Qiliang Ni, Min Li, Changchun Institute of Optics, Fine Mechanics and Physics (China) . . [7435-33]

Planetary extreme ultraviolet spectrometer boarded on Japan's small satellite, Ichiro Yoshikawa, Kazuo Yoshioka, Go Murakami, The Univ. of Tokyo (Japan) [7435-32]

Conference 7436

Monday 3 August 2009 • Proceedings of SPIE Vol. 7436

UV/Optical/IR Space Telescopes: Innovative Technologies and Concepts IV

Conference Chairs: **Howard A. MacEwen**, ManTech SRS Technologies; **James B. Breckinridge**, Jet Propulsion Lab.

Program Committee: **Suzanne Casement**, Northrop Grumman Space Technology; **Webster C. Cash, Jr.**, Univ. of Colorado at Boulder; **Jennifer A. Dooley**, Jet Propulsion Lab.; **Lee D. Feinberg**, NASA Goddard Space Flight Ctr.; **David T. Leisawitz**, NASA Goddard Space Flight Ctr.; **Daniel F. Lester**, The Univ. of Texas at Austin; **Gary Matthews**, ITT Industries, Inc.; **David W. Miller**, Massachusetts Institute of Technology; **C. Matt Mountain**, Space Telescope Science Institute; **Ronald S. Polidan**, Northrop Grumman Space Technology; **Stuart B. Shaklan**, Jet Propulsion Lab.; **H. Philip Stahl**, NASA Marshall Space Flight Ctr.; **Mark T. Stier**, Goodrich Corp.; **Domenick J. Tenerelli**, Lockheed Martin Space Systems Co.

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

**Astronomical Optics and Instrumentation
Plenary Session**

10% of the Telescope: 40 Years of Adaptive Optics
Robert K. Tyson, The Univ. of North Carolina at Charlotte (United States)

TMT and Segmented Mirror Telescopes
Jerry Nelson, Univ. of California, Santa Cruz (United States)

**Prospects for Direct Imaging and Characterization
of Exoplanets from Space**
Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope
Jerry Nelson, Univ. of California, Santa Cruz (USA)

**Peering into the Explosion: Using Stellar Archaeology to
Unlock the Mysteries of Supernovae**
Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 1

Room: Conv. Ctr. 31A Mon. 8:20 to 10:00 am

Systems

Session Chairs: C. Matt Mountain, Space Telescope Science Institute; **Howard A. MacEwen**, ManTech SRS Technologies

8:20 am: **Cost model for ground and space telescopes**, H. Philip Stahl, NASA Marshall Space Flight Ctr. (United States); Marc Postman, Space Telescope Science Institute (United States); Ronald S. Polidan, Charles F. Lillie, Northrop Grumman Space Technology (United States). [7436-01]

8:40 am: **Observatory concepts for the Joint Dark Energy Mission**, Michael J. Sholl, Michael L. Lampton, Univ. of California, Berkeley (United States) . . . [7436-02]

9:00 am: **Assessment study of Euclid Dark Energy Mission**, David Lumb, Laurent Boissard, Ludovic Duvert, Renee Laurijs, European Space Agency (Netherlands) [7436-03]

9:20 am: **Assessment study activities of the European contribution to the SPICA mission**, Nicola A. Rando, Ana Heras, Luitjens Popken, European Space Research and Technology Ctr. (Netherlands) [7436-05]

9:40 am: **The New Worlds Observer**, Webster C. Cash, Jr., Univ. of Colorado at Boulder (United States) [7436-06]

Coffee Break 10:00 am

SESSION 2

Room: Conv. Ctr. 31A Mon. 10:30 am to 12:10 pm

Large Systems

Session Chair: Ronald S. Polidan, Northrop Grumman Space Technology

10:30 am: **Potential science missions enabled by NASA's planned Ares V**, H. Philip Stahl, NASA Marshall Space Flight Ctr. (United States); Harley A. Thronson, Jr., NASA Goddard Space Flight Ctr. (United States); Stephanie Langhoff, NASA Ames Research Ctr. (United States); Daniel Lester, Univ. of Texas (United States); Charles F. Lillie, Northrop Grumman Space Technology (United States). [7436-07]

10:50 am: **Large segmented UV-optical space telescope using a Hybrid Sensor Active Control (HSAC) architecture**, Lee D. Feinberg, Bruce H. Dean, Tupper Hyde, Bill Oegerle, Matthew R. Bolcar, Jeffrey S. Smith, NASA Goddard Space Flight Ctr. (United States). [7436-08]

11:10 am: **Design for an 8-meter monolithic UVOIR space telescope**, H. Philip Stahl, NASA Marshall Space Flight Ctr. (United States); Marc Postman, Space Telescope Science Institute (United States); William R. Arnold, L-3 Brashear (United States); Randall Hopkins, Linda Hornsby, ; Gary E. Mosier, Bert A. Pasquale, NASA Goddard Space Flight Ctr. (United States); Dennis C. Ebbets, Ball Aerospace & Technologies Corp. (United States); Charles F. Lillie, Northrop Grumman Space Technology (United States) [7436-10]

11:30 am: **Stellar Imager (SI): enhancements to the Mission enabled by the constellation architecture (Ares I/Ares V)**, Kenneth G. Carpenter, NASA Goddard Space Flight Ctr. (United States); Carolus Schrijver, Lockheed Martin Space Systems Co. (United States); Margarita Karovska, Harvard-Smithsonian Ctr. for Astrophysics (United States). [7436-09]

11:50 am: **Lightweight optical barrel assembly structures for large deployable space telescopes**, Peter A. Warren, Mark Silver, Benjamin J. Dobson, Jr., Foster-Miller, Inc. (United States). [7436-11]

Lunch Break 12:10 pm

SESSION 3

Room: Conv. Ctr. 31A Mon. 1:10 to 2:10 pm

JWST

Session Chair: James B. Breckinridge, Jet Propulsion Lab.

1:10 pm: **Optical modeling activities for NASA's James Webb Space Telescope (JWST)VI: aberration compensation with segmented primary and secondary mirror motions**, Joseph M. Howard, Lee D. Feinberg, NASA Goddard Space Flight Ctr. (United States) [7436-12]

1:30 pm: **Broadband and under-sampled phase retrieval results for the JWST Testbed Telescope**, Jeffrey S. Smith, NASA Goddard Space Flight Ctr. (United States); Daniel S. Acton, Ball Aerospace & Technologies Corp. (United States); David L. Aronstein, Bruce H. Dean, NASA Goddard Space Flight Ctr. (United States); Erin Elliott, Ball Aerospace & Technologies Corp. (United States); Doug B. Leviton, NASA Goddard Space Flight Ctr. (United States) . . . [7436-13]

1:50 pm: **Non-invasive optical end-to-end test of a large TMA telescope (JWST) from the intermediate focus**, Tony L. Whitman, ITT Corp. (United States); J. Scott Knight, Ball Aerospace & Technologies Corp. (United States); Mark Waldman, ITT Corp. (United States); Paul A. Lightsey, Ball Aerospace & Technologies Corp. (United States) [7436-14]

SESSION 4

Room: Conv. Ctr. 31A Mon. 2:10 to 3:30 pm

New Concepts

Session Chair: **H. Philip Stahl**, NASA Marshall Space Flight Ctr.

- 2:10 pm: **Propellantless precision formation flying with photonic laser thrusters for large space telescopes**, Young K. Bae, Y.K. Bae Corp. (United States) [7436-15]
- 2:30 pm: **Optical pathlength stabilization between formation-flying air-bearing robots**, Edward A. LeMaster, Lockheed Martin Space Systems Co. (United States) [7436-16]
- 2:50 pm: **Working model of a gossamer membrane spectrographic space telescope**, Thomas D. Ditto, DeWitt Brothers Tool Co. (United States); Joe Ritter, Univ. of Hawai'i (United States) [7436-17]
- 3:10 pm: **The lunar radio array**, T. Joseph W. Lazio, Naval Research Lab. (United States) [7436-18]
- Coffee Break 3:30 pm

SESSION 5

Room: Conv. Ctr. 31A Mon. 4:00 to 6:00 pm

Optical Technology

Session Chair: **Gary Matthews**, ITT Corp.

- 4:00 pm: **Multilayers/nanolaminates: nano-engineered materials for space telescopes**, Troy W. Barbee, Jr., Lawrence Livermore National Lab. (United States) [7436-19]
- 4:20 pm: **Hybrid active silicon carbide mirror technology**, Mark A. Ealey, John A. Wellman, Gerald Q. Weaver, Northrop Grumman Xinetics (United States) [7436-20]
- 4:40 pm: **Vibroacoustic analysis and optimization of lightweight, silicon carbide mirrors**, Lucy E. Cohan, David W. Miller, Massachusetts Institute of Technology (United States) [7436-21]
- 5:00 pm: **Minimizing high spatial frequency residual in active space telescope mirrors**, Thomas L. Gray, Matthew W. Smith, Lucy E. Cohan, David W. Miller, Massachusetts Institute of Technology (United States) [7436-22]
- 5:20 pm: **Photonic muscle active optics for space telescopes**, Joe Ritter, Univ. of Hawai'i (United States) [7436-23]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC218 Advanced Composite Materials for Optomechanical Systems (Zweben) Wednesday, 8:30 am to 5:30 pm

SC561 Optomechanics for Space Applications (Shiple) Sunday, 8:30 am to 5:30 pm

SC835 Infrared Systems - Technology & Design (Daniels) Monday-Tuesday, 8:30 am to 3:30 pm

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

The near-infrared DMD-based multi-object spectrograph for the EUCLID space mission, Andrea Cimatti, Univ. di Bologna (Italy); Filippo M. Zerbi, Osservatorio Astronomico di Brera (Italy); Luca Valenziano, Osservatorio Astronomico di Bologna (Italy); Carlton Baugh, Univ. of Durham (United Kingdom); Fabio Bortoletto, Osservatorio Astronomico di Padova (Italy); Paul Clark, Robert Content, Durham Univ. (United Kingdom); Vincenzo De Caprio, Osservatorio Astronomico di Brera (Italy); Emiliano Diolaiti, Osservatorio Astronomico di Bologna (Italy); Bianca Garilli, Istituto Nazionale di Astrofisica (Italy); Robert Grange, Observatoire Astronomique de Marseille-Provence (France); Luigi Guzzo, Osservatorio Astronomico di Brera (Italy); Nik Looker, Durham Univ. (United Kingdom); Luciano Nicastrò, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); Fabio Pasian, Osservatorio Astronomico di Trieste (Italy); Marco Scoddeggio, Istituto Nazionale di Astrofisica (Italy); Ray M. Sharples, Durham Univ. (United Kingdom); Paolo Spanò, Osservatorio Astronomico di Brera (Italy); Christian Surace, Observatoire Astronomique de Marseille-Provence (France); Robert G. Talbot, Durham Univ. (United Kingdom); Robert Vink, Technisch Physische Dienst-TNO (Netherlands); Andrea Zacchei, Osservatorio Astronomico di Trieste (Italy); Frederic Zamkotsian, Observatoire Astronomique de Marseille-Provence (France) [7436-04]

Low dispersion ghost-controlled optical window/combiner component, Paul D. Atcheson, Ball Aerospace & Technologies Corp. (United States) [7436-24]

Measurement of vibration environment of 6m diameter radiometer thermal vacuum chamber in JAXA, Haruyoshi Katayama, Yasuji Yamamoto, Masashi Miyamoto, Hideki Saruwatari, Yoshio Tange, Japan Aerospace Exploration Agency (Japan); Hidehiro Kaneda, Nagoya Univ. (Japan) [7436-25]

Optical testing of the Kepler Photometer in a thermal vacuum environment at Ball Aerospace, Mark A. Martella, Don Byrd, Christopher K. Stewart, Ball Aerospace & Technologies Corp. (United States) [7436-27]

4:30 pm: **Semiconductor laser tracking frequency distance gauge (Presentation Only)**, James D. Phillips, Robert D. Reasenberg, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7433-19]

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Conference 7437

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7437

Optics for EUV, X-Ray, and Gamma-Ray Astronomy IV

Conference Chairs: **Stephen L. O'Dell**, NASA Marshall Space Flight Ctr.; **Giovanni Pareschi**, Osservatorio Astronomico di Brera (Italy)

Program Committee: **Bernd E. Aschenbach**, Max-Planck-Institut für Extraterrestrische Physik (Germany); **Marcos Bavdaz**, European Space Agency (Netherlands); **Webster C. Cash, Jr.**, Univ. of Colorado at Boulder; **Finn E. Christensen**, National Space Institute, DTU (Denmark); **Oberto Citterio**, Osservatorio Astronomico di Brera (Italy); **Peter Friedrich**, Max-Planck-Institut für Extraterrestrische Physik (Germany); **Paul Gorenstein**, Harvard-Smithsonian Ctr. for Astrophysics; **Fiona A. Harrison**, California Institute of Technology; **René Hudec**, Astronomical Institute of the Academy of Sciences (Czech Republic); **Yasushi Ogasaka**, Japan Science and Technology Agency (Japan); **Mikhail N. Pavlinsky**, Space Research Institute (Russian Federation); **Robert Petre**, NASA Goddard Space Flight Ctr.; **Brian D. Ramsey**, NASA Marshall Space Flight Ctr.; **Paul B. Reid**, Harvard-Smithsonian Ctr. for Astrophysics; **Suzanne E. Romaine**, Harvard-Smithsonian Ctr. for Astrophysics; **John F. Seely**, Naval Research Lab.; **Gerald K. Skinner**, Univ. of Maryland/College Park; **Yuzuru Tawara**, Nagoya Univ. (Japan); **Peter von Ballmoos**, Ctr. d'Etude Spatiale des Rayonnements (France); **Richard Willingale**, Univ. of Leicester (United Kingdom); **David L. Windt**, Reflective X-Ray Optics LLC; **William W. Zhang**, NASA Goddard Space Flight Ctr.

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Tuesday 4 August

Room: Conv. Ctr. 33A Tues. 8:20 to 8:30 am

Welcome and Introduction

Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy)

SESSION 1

Room: Conv. Ctr. 33A Tues. 8:30 to 10:30 am

Telescope Systems

Session Chairs: **Mikhail N. Pavlinsky**, Space Research Institute
(Russian Federation); **Richard Willingale**, Univ. of Leicester (United
Kingdom)

8:30 am: **IXO system studies and technology preparation**, Marcos Bavdaz,
Philippe Gondoin, Kotska Wallace, T. Oosterbroek, David Lumb, Didier D.
E. Martin, Peter Verhoeve, L. Puig, L. Torres Soto, European Space Agency
(Netherlands) [7437-01]

8:50 am: **Current status of the Astro-H X-Ray Telescope System**, Hisamitsu
Awaki, Ehime Univ. (Japan); Hideyo Kunieda, Yasushi Ogasaka, Akihiro
Furuzawa, Takuya Miyazawa, Yoshito Haba, Yuzuru Tawara, Koujun Yamashita,
Nagoya Univ. (Japan); Peter J. Serlemitsos, Yang Soong, Takashi Okajima,
NASA Goddard Space Flight Ctr. (United States); Manabu Ishida, Keisuke
Tamura, Yoshitomo Maeda, Hideyuki Mori, Japan Aerospace Exploration
Agency (Japan); Yoshiharu Namba, Chubu Univ. (Japan); Kentaro Uesugi,
Yoshio Suzuki, Japan Synchrotron Radiation Research Institute (Japan); Keiji
Ogi, Ehime Univ. (Japan); Masayuki Itoh, Kobe Univ. (Japan); Hiroshi Tsunemi,
Osaka Univ. (Japan); Tatsuro Kosaka, Osaka City Univ. (Japan) [7437-02]

9:10 am: **Design and development of the multilayer optics for the New
Hard X-ray Mission**, Giovanni Pareschi, Gianpiero Tagliaferri, Stefano Basso,
Oberto Citterio, Daniele Spiga, Vincenzo Cotroneo, Osservatorio Astronomico di
Brera (Italy); Dervis Vernani, Giuseppe Borghi, Giuseppe Valsecchi, Media Lario
Technologies (Italy) [7437-03]

9:30 am: **The Focusing Optics X-ray Solar Imager (FOXSI)**, Steven Christe,
Lindsay Glesener, Sam Krucker, Univ. of California, Berkeley (United States);
Brian D. Ramsey, NASA Marshall Space Flight Ctr. (United States) . . . [7437-04]

9:50 am: **The x-ray mirror module of the Soft X-ray Imager (SXI) on board
of the EXIST mission**, Gianpiero Tagliaferri, Osservatorio Astronomico di Brera
(Italy) [7437-05]

10:10 am: **A DUAL mission for nuclear astrophysics**, Peter von Ballmoos, Ctr.
d'Etude Spatiale des Rayonnements (France) [7437-06]

Coffee Break 10:30 am

SESSION 2

Room: Conv. Ctr. 33A Tues. 11:00 am to 1:00 pm

Telescope Design and Optimization

Session Chairs: **Bernd E. Aschenbach**, Max-Planck-Institut für
Extraterrestrische Physik (Germany); **Robert Petre**, NASA Goddard
Space Flight Ctr.

11:00 am: **Design concept for the International X-Ray Observatory Flight
Mirror Assembly**, Ryan S. McClelland, SGT, Inc. (United States); David
Robinson, Michael D. Hill, NASA Goddard Space Flight Ctr. (United
States) [7437-07]

11:20 am: **The design, manufacture and predicted performance of
Kirkpatrick-Baez silicon stacks for the International X-ray Observatory or
similar applications**, Richard Willingale, Frank H. Spaan, Univ. of Leicester
(United Kingdom) [7437-08]

11:40 am: **Design of x-ray optics for IXO mission: analysis of performances
of different configurations**, Elisa C. Dell'Orto, Giovanni Pareschi, Paolo
Conconi, Osservatorio Astronomico di Brera (Italy); Giancarlo Parodi, BCV
Progetti S.r.l. (Italy); Vincenzo Cotroneo, Osservatorio Astronomico di Brera
(Italy) [7437-09]

12:00 pm: **NuSTAR hard x-ray optics design and performance**, Jason E.
Koglin, HongJun An, Kenneth L. Blaedel, Columbia Univ. (United States); Nicolai
F. Brejnholt, Finn E. Christensen, Danish National Space Ctr. (Denmark); William
W. Craig, Lawrence Livermore National Lab. (United States); Todd A. Decker,
Charles J. Hailey, Layton C. Hale, Columbia Univ. (United States); Fiona A.
Harrison, California Institute of Technology (United States); Carsten P. Jensen,
Danish National Space Ctr. (Denmark); Kristin K. Madsen, California Institute of
Technology (United States); Kaya Mori, Columbia Univ. (United States); Michael
J. Pivovarov, Lawrence Livermore National Lab. (United States); Gordon Tajiri,
Columbia Univ. (United States); William W. Zhang, NASA Goddard Space Flight
Ctr. (United States) [7437-10]

Conference 7437

Wednesday 5 August

SESSION 5

Room: Conv. Ctr. 33A Wed. 8:20 to 10:00 am

Mirror Fabrication and Characterization

Session Chairs: **Marcos Bavdaz**, European Space Agency (Netherlands); **Oberto Citterio**, Osservatorio Astronomico di Brera (Italy)

8:20 am: **Manufacture of mirror substrates for the NuSTAR mission**, William W. Zhang, NASA Goddard Space Flight Ctr. (United States) [7437-20]

8:40 am: **Shaping of thin glass optics for x-ray telescopes by thermal slumping against porous air bearings**, Mark L. Schattenburg, Mireille K. Akilian, Ralf K. Heilmann, Massachusetts Institute of Technology (United States) [7437-21]

9:00 am: **Hot slumping glass technology and integration process to manufacture a grazing incidence scaled prototype for the IXO telescope modules**, Mauro Ghigo, Rodolfo Canestrari, Laura Proserpio, Elisa C. Dell'Orto, Stefano Basso, Oberto Citterio, Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy) [7437-22]

9:20 am: **Mirror technology development for the International X-ray Observatory Mission**, William W. Zhang, NASA Goddard Space Flight Ctr. (United States) [7437-23]

9:40 am: **Metrology for the International X-ray Observatory's soft x-ray telescope: mirrors and mandrels**, John P. Lehan, Univ. of Maryland, Baltimore County (United States); Theodore J. Hadjimichael, Mao-Ling Hong, Kai-Wing Chan, Timo T. Saha, Peter N. Blake, William W. Zhang, NASA Goddard Space Flight Ctr. (United States); Ulf Griesmann, Gaungjun Gao, National Institute of Standards and Technology (United States) [7437-24]

Coffee Break 10:00 am

SESSION 6

Room: Conv. Ctr. 33A Wed. 10:30 to 11:30 am

Mirror Fabrication and Characterization II

Session Chair: **William W. Zhang**, NASA Goddard Space Flight Ctr.

10:30 am: **Advanced X-ray optics with Si wafers and slumped glass**, René Hudec, Michaela Skulinova, Astronomical Institute of the ASCR, v.v.i. (Czech Republic); Ladislav Pina, Czech Technical Univ. in Prague (Czech Republic); Veronika Semencova, Adolf J. Inneman, Rigaku Innovative Technologies Europe s.r.o. (Czech Republic); Martin Mika, Ondřej Gedeon, Institute of Chemical Technology (Czech Republic); Jan Sik, Michal Lorenc, ON Semiconductor Czech Republic (Czech Republic) [7437-25]

10:50 am: **Silicon pore optics development**, Kotska Wallace, Marcos Bavdaz, European Space Agency (Netherlands); Maximilien J. Collon, Marcelo D. Ackermann, Marco W. Beijersbergen, cosine Research B.V. (Netherlands); Mark Olde Riekerink, Marko T. Blom, Bob Lansdorp, Micronit Microfluidics BV (Netherlands) [7437-26]

11:10 am: **Production of silicon mirror plates**, Marinus B. Olde Riekerink, Bob Lansdorp, Lennart J. de Vreede, Marko T. Blom, Ronny van't Oever, Micronit Microfluidics BV (Netherlands); Maximilien J. Collon, cosine Research B.V. (Netherlands); Kotska Wallace, Marcos Bavdaz, European Space Agency (Netherlands) [7437-27]

SESSION 7

Room: Conv. Ctr. 33A Wed. 11:30 am to 12:30 pm

Mirror Fabrication and Characterization III

Session Chair: **David L. Windt**, Reflective X-Ray Optics LLC

11:30 am: **Technologies for manufacturing of high angular resolution multilayer coated optics for future hard X-ray missions: a status report**, Giuseppe Borghi, Enrico Boscolo Marchi, Oberto Citterio, Gabriele Grisoni, Jacques Kools, Fabio Marioni, Alessandro Orlandi, Antonio Ritucci, Massimiliano Rossi, Giuseppe Valsecchi, Dervis Vernani, Media Lario Technologies (Italy); Stefano Basso, Giovanni Pareschi, Daniele Spiga, Gianpiero Tagliaferri, Osservatorio Astronomico di Brera (Italy) [7437-28]

11:50 am: **Performance of supersmooth X-ray mandrels for new hard x-ray missions**, Dervis Vernani, Giuseppe Borghi, Oberto Citterio, Antonio Ritucci, Giorgia Sironi, Massimo Riva, Media Lario Technologies (Italy); Stefano Basso, Giovanni Pareschi, Gianpiero Tagliaferri, Osservatorio Astronomico di Brera (Italy); B. Negri, Agenzia Spaziale Italiana (Italy) [7437-29]

12:20 pm: **Design optimization and global trade-off study of the mirror system for the Wide Field X-ray Telescope mission**, Paolo Conconi, Sergio Campana, Oberto Citterio, Vincenzo Cotroneo, Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy); Giancarlo Parodi, BCV Progetti S.r.l. (Italy); Gianpiero Tagliaferri, Osservatorio Astronomico di Brera (Italy) [7437-11]

12:40 pm: **Optimization of detectors positioning with respect to flying dynamics for future formation flight missions**, Marta M. Civitani, Osservatorio Astronomico di Brera (Italy); Jean-Michel Le Duigou, Ctr. National d'Études Spatiales (France); Remi Chipaux, Commissariat à l'Énergie Atomique (France); Sophie Djalal, Ctr. National d'Études Spatiales (France) [7437-12]

Lunch/Exhibition Break 1:00 pm

SESSION 3

Room: Conv. Ctr. 33A Tues. 2:30 to 3:30 pm

Grating Spectroscopy

Session Chair: **John F. Seely**, Naval Research Lab.

2:30 pm: **Development of a critical-angle transmission grating spectrometer for the International X-Ray Observatory**, Ralf K. Heilmann, Minseung Ahn, David P. Huenemoerder, Mark L. Schattenburg, Massachusetts Institute of Technology (United States) [7437-13]

2:50 pm: **Off-plane grating spectrometer for the International X-ray Observatory**, Randall L. McEntaffer, The Univ. of Iowa (United States); Webster C. Cash, Jr., Phillip H. Oakley, Univ. of Colorado at Boulder (United States); Charles F. Lillie, Suzanne Casement, Dean R. Dailey, Tim Johnson, Northrop Grumman Space Technology (United States); Ted Schultz, The Univ. of Iowa (United States) [7437-14]

3:10 pm: **The EXOS Sounding Rocket payload**, Phillip H. Oakley, Webster C. Cash, Jr., Univ. of Colorado at Boulder (United States); Randall L. McEntaffer, The Univ. of Iowa (United States); Ann F. Shipley, Univ. of Colorado at Boulder (United States); Ted Schultz, The Univ. of Iowa (United States) [7437-15]

Coffee Break 3:30 pm

SESSION 4

Room: Conv. Ctr. 33A Tues. 4:00 to 5:20 pm

Diffraction Optics

Session Chairs: **Webster C. Cash, Jr.**, Univ. of Colorado at Boulder; **Peter von Ballmoos**, Ctr. d'Étude Spatiale des Rayonnements (France)

4:00 pm: **X-ray and Gamma-ray focusing and interferometry for astronomy**, Gerald K. Skinner, NASA Goddard Space Flight Ctr. (United States) [7437-16]

4:20 pm: **Soft gamma-ray optics: new Laue lens design and performance estimates**, Nicolas Barrière, Lorenzo Natalucci, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); Nikolai V. Abrosimov, Leibniz-Institut für Kristallzüchtung (Germany); Pierre Bastie, Univ. Joseph Fourier (France); Pierre Courtois, Michael Jentschel, Institut Laue-Langevin (France); Jürgen Knödseder, Julien Rousselle, Ctr. d'Étude Spatiale des Rayonnements (France); Pietro Ubertini III, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); Peter von Ballmoos, Ctr. d'Étude Spatiale des Rayonnements (France) [7437-17]

4:40 pm: **High-Z crystals for gamma-ray optics**, Julien Rousselle, Peter von Ballmoos, Ctr. d'Étude Spatiale des Rayonnements (France); Nicolas Barrière, Lorenzo Natalucci, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); Nikolai V. Abrosimov, Leibniz-Institut für Kristallzüchtung (Germany); Ken H. Andersen, Pierre Bastie, Pierre Courtois, Michael Jentschel, Institut Laue-Langevin (France); Gilles Bonnetto, Thales Alenia Space (France); Emmanuelle Rivière, Ctr. National d'Études Spatiales (France) [7437-18]

5:00 pm: **New results on focusing of gamma-rays with Laue lenses**, Cristiano Guidorzi, Filippo Frontera, Gianluca Loffredo, Enrico Virgilli, Francesca Ferrari, Filippo Nobili, Univ. degli Studi di Ferrara (Italy); Vittore Carassiti, Federico Evangelisti, Istituto Nazionale di Fisica Nucleare (Italy); Luca Landi, Univ. degli Studi di Ferrara (Italy); Stefano Squerzanti, Istituto Nazionale di Fisica Nucleare (Italy); Ezio Caroli, John B. Stephen, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy); Ken H. Andersen, Pierre Courtois, Institut Laue-Langevin (France); Natalia Auricchio, Univ. degli Studi di Ferrara (Italy); Filomena Schiavone, Angelo Basili, Istituto di Astrofisica Spaziale e Fisica Cosmica (Italy) [7437-19]

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12:10 pm: **Nitrides as a hardcoat to enhance surface durability of mandrels for X-ray telescopes**, Suzanne E. Romaine, Paul Gorenstein, Ricardo J. Bruni, Harvard-Smithsonian Ctr. for Astrophysics (United States); Brian D. Ramsey, National Space Science and Technology Ctr. (United States); Darell E. Engelhaupt, The Univ. of Alabama in Huntsville (United States); Jessica Boike, Jacobs Technology (United States); Mikhail V. Gubarev, National Space Science and Technology Ctr. (United States) [7437-30]

Lunch/Exhibition Break 12:30 pm

SESSION 8

Room: Conv. Ctr. 33A Wed. 2:00 to 3:00 pm

Atmospheric Cherenkov Telescopes

Session Chair: Gerald K. Skinner, Univ. of Maryland/College Park

2:00 pm: **Techniques for the manufacturing of stiff and lightweight optical mirror panels based on slumping of glass sheets: concepts and results**, Rodolfo Canestrari, Osservatorio Astronomico di Brera (Italy) and Univ. degli Studi dell'Insubria (Italy); Mauro Ghigo, Giovanni Pareschi, Stefano Basso, Laura Proserpio, Osservatorio Astronomico di Brera (Italy) [7437-31]

2:20 pm: **The Advanced Gamma-ray Imaging System (AGIS): Schwarzschild-Couder (SC) telescope optical system design**, Vladimir V. Vassiliev, Stephen Fegan, Univ. of California, Los Angeles (United States); Victor P. E. Guarino, Karen Byrum, Robert G. Wagner, Argonne National Lab. (United States) [7437-32]

2:40 pm: **Mirror Development for CTA**, Andreas Foerster, Max-Planck-Institut für Kernphysik (Germany); Michele Doro, Istituto Nazionale di Fisica Nucleare (Italy); Paula Chadwick, Durham Univ. (United Kingdom); Lluís Font, Univ. Autònoma de Barcelona (Spain); Eckart Lorenz, Max-Planck-Institut für Physik (Germany); Mose Mariotti, Istituto Nazionale di Fisica Nucleare (Italy); Jacek Niemiec, The Henryk Niewodniczanski Institute of Nuclear Physics (Poland); Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy); Bernard Peyaud, Commissariat à l'Énergie Atomique (France); Karol Seweryn, Space Research Ctr. (Poland) [7437-33]

Coffee Break 3:00 pm

SESSION 9

Room: Conv. Ctr. 33A Wed. 3:30 to 5:10 pm

Mirror Coating

Session Chair: Suzanne E. Romaine, Harvard-Smithsonian Ctr. for Astrophysics

3:30 pm: **Coating of silicon pore optics**, Carsten P. Jensen, Danish National Space Ctr. (Denmark); Marcelo D. Ackermann, cosine Science & Computing B.V. (Netherlands); Finn E. Christensen, Danish National Space Ctr. (Denmark); Maximilien J. Collon, cosine Research B.V. (Netherlands); Michael K. Krumrey, Physikalisch-Technische Bundesanstalt (Germany) [7437-34]

3:50 pm: **SiC/Al multilayers for normal incidence in the EUV**, David L. Windt, Jeffrey A. Bellotti, Reflective X-Ray Optics LLC (United States) [7437-35]

4:10 pm: **Depth-graded Co/C multilayers prepared by reactive sputtering**, David L. Windt, Jeffrey A. Bellotti, Reflective X-Ray Optics LLC (United States) [7437-36]

4:30 pm: **Optimizations of Pt/SiC multilayers for the Nuclear Spectroscopic Telescope Array**, Kristin K. Madsen, California Institute of Technology (United States); Finn E. Christensen, Danish National Space Ctr. (Denmark); Jason E. Koglin, Columbia Univ. (United States); Nicolai F. Brejnholt, Danish National Space Ctr. (Denmark); Fiona A. Harrison, California Institute of Technology (United States) [7437-37]

4:50 pm: **Optimization of the reflecting coatings for the New Hard X-Ray Mission**, Vincenzo Cotroneo, Daniele Spiga, Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy) [7437-38]

SESSION PS1

Room: Conv. Ctr. 33A Wed. 5:10 pm

Poster Preview

Session Chair: Stephen L. O'Dell, NASA Marshall Space Flight Ctr.

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Developments of the ASTRO-H Soft X-ray Telescope: design and progress, Takashi Okajima, Peter J. Serlemitsos, Yang Soong, Kai-Wing Chan, Robert Petre, NASA Goddard Space Flight Ctr. (United States) [7437-55]

The current status of ASTRO-H/HXT development facility, Akihiro Furuzawa, Yasushi Ogasaka, Hideyo Kunieda, Takuya Miyazawa, Masato Sakai, Yosuke Kinoshita, Youta Makinae, Shiori Sasaya, Yasufumi Kanou, Daisuke Niki, Kenji Matsuda, Takuya Ohgi, Nodoka Oishi, Koudai Yamane, Nobuyuki Yamane, Yosuke Ishida, Yoshito Haba, Yuzuru Tawara, Koujun Yamashita, Nagoya Univ. (Japan); Manabu Ishida, Yoshitomo Maeda, Hideyuki Mori, Keisuke Tamura, Japan Aerospace Exploration Agency (Japan); Hisamitsu Awaki, Ehime Univ. (Japan); Takashi Okajima, NASA Goddard Space Flight Ctr. (United States) [7437-56]

On the design of wide-field x-ray telescopes, Ronald F. Elsner, Stephen L. O'Dell, Brian D. Ramsey, Martin C. Weisskopf, NASA Marshall Space Flight Ctr. (United States) [7437-57]

A stainless-steel mandrel for slumping glass x-ray mirrors, Mikhail V. Gubarev, NASA Marshall Space Flight Ctr. (United States) [7437-58]

Alternative materials in view of new lightweight x-ray optics, Michaela Skulinova, René Hudec, Astronomical Institute of the ASCR, v.v.i. (Czech Republic); Jan Šik, Michal Lorenc, ON Semiconductor Czech Republic (Czech Republic); Ladislav Pina, Veronika Semencova, Rigaku Innovative Technologies Europe s.r.o. (Czech Republic) [7437-59]

Internal stress and optical properties of W/Si and Pt/C multilayer coating for hard X-Ray astronomy, Denis Garoli, Enrico Boscolo Marchi, Giuseppe Borghi, Jacques Kools, Media Lario Technologies (Italy); Daniele Spiga, Vincenzo Cotroneo, Gianpiero Tagliaferri, Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy) [7437-60]

Hard x-ray measurement of broadband multilayer samples, Vincenzo Cotroneo, Osservatorio Astronomico di Brera (Italy); Ricardo J. Bruni, Paul Gorenstein, Harvard-Smithsonian Ctr. for Astrophysics (United States); Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy); Suzanne E. Romaine, Harvard-Smithsonian Ctr. for Astrophysics (United States); Daniele Spiga, Osservatorio Astronomico di Brera (Italy); Zhong Zhong, Brookhaven National Lab. (United States) [7437-61]

Calibration of the coating facility for NuSTAR, Carsten P. Jensen, Nicolai Brejnholt, Finn E. Christensen, Danish National Space Ctr. (Denmark); Suzanne E. Romaine, Ricardo J. Bruni, Harvard-Smithsonian Ctr. for Astrophysics (United States); Zhong Zhong, Brookhaven National Lab. (United States) [7437-62]

Differential deposition technique for figure corrections in grazing incidence x-ray optics, Kiranmayee Kilaru, The Univ. of Alabama in Huntsville (United States); Brian D. Ramsey, Mikhail V. Gubarev, NASA Marshall Space Flight Ctr. (United States) [7437-63]

Space environment experiments of EUV multilayer for astronomical observation, Jingtao Zhu, Zhanshan Wang, Haochuan Li, Xiaoqiang Wang, Jiang Li, Moyan Tan, Jing Xu, Zhong Zhang, Lingyan Chen, Tongji Univ. (China); Lei Li, Ctr. for Space Science and Applied Research (China); Hunjun Zhou, Tonglin Huo, Univ. of Science and Technology of China (China) [7437-64]

Recent results from hard X-ray telescope characterization at SPRING-8, Takashi Okajima, NASA Goddard Space Flight Ctr. (United States); Yasushi Ogasaka, Nagoya Univ. (Japan); Tomonaga Iwahara, Nagoya Univ. (United States); Yasufumi Kanou, Youta Makinae, Shiori Sasaya, Akihiro Furuzawa, Yoshito Haba, Hideyo Kunieda, Koujun Yamashita, Nagoya Univ. (Japan); Kentaro Uesugi, Yoshio Suzuki, Japan Synchrotron Radiation Research Institute (Japan); Keisuke Tamura, Yoshitomo Maeda, Manabu Ishida, Japan Aerospace Exploration Agency (Japan) [7437-65]

Imaging performance and test of extreme ultraviolet telescope. Lin Yang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate Univ. of Chinese Academy of Science (China); Bo Chen, Changchun Institute of Optics, Fine Mechanics and Physics (China); Tiangang Cui, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate Univ. of Chinese Academy of Science (China) [7437-66]

Development of a computer-controlled polishing process for x-ray optics. Gufran S. Khan, Mikhail V. Gubarev, William R. Arnold, Brian D. Ramsey, NASA Marshall Space Flight Ctr. (United States) [7437-67]

SRG astrophysical project. Mikhail N. Pavlinsky, Space Research Institute (Russian Federation); Rashid Sunyaev, Eugene Churazov, Space Research Institute (Russian Federation) and Max-Planck-Institute for Astrophysics (Germany); Alexey Vikhlinin, Space Research Institute (Russian Federation) and Harvard-Smithsonian Center for Astrophysics (United States); Sergey Sazonov, Space Research Institute (Russian Federation); Mikhail Revnivtsev, Technische Univ. München (Germany) and Space Research Institute (Russian Federation); Vadim A. Arefiev, Igor Y. Lapshov, Vasily A. Levin, Valery V. Akimov, Mike Buntov, Nikolay Semena, Space Research Institute (Russian Federation); Sergey V. Grigorovich, Russian Federal Nuclear Ctr. (Russian Federation); V. Babyskhin, Lavochkina Association (Russian Federation); Peter Predehl, Max-Planck-Institut für extraterrestrische Physik (Germany) [7437-68]

Thin gold layer in N1 electroforming process: optical surface characterization. G. Sironi, Osservatorio Astronomico Al Brera (Italy), Media Lario Technologies (Italy) and Univ. Delli Studi di dell'Insubria (Italy) . . [7437-69]

Thursday 6 August

SESSION 10

Room: Conv. Ctr. 33A Thurs. 8:20 to 10:00 am

Alignment and Mounting

Session Chair: Yuzuru Tawara, Nagoya Univ. (Japan)

8:20 am: **Stacking of silicon pore optics for IXO.** Maximilien J. Collon, Ramses Guenther, Marcelo D. Ackermann, Rakesh Partapsing, Chris Kelly, Marco W. Beijersbergen, cosine Research B.V. (Netherlands); Marcos Bavdaz, Kotska Wallace, European Space Agency (Netherlands); Mark Olde Riekerink, Micronit Microfluidics BV (Netherlands) [7437-39]

8:40 am: **Optical bench elements (petals) for IXO.** Dirk Kampf, Markus Erhard, Kayser-Threde GmbH (Germany); Marcos Bavdaz, Philippe Gondoin, Kotska Wallace, European Space Agency (Netherlands); Maximilien J. Collon, cosine Research B.V. (Netherlands) [7437-40]

9:00 am: **The problems concerning the integration of very thin mirror shells.** Stefano Basso, Oberto Citterio, Giovanni Pareschi, Francesco Mazzoleni, Gianpiero Tagliaferri, Renzo Valtolina, Osservatorio Astronomico di Brera (Italy); Giancarlo Parodi, BCV Progetti S.r.l. (Italy) [7437-41]

9:20 am: **An approach for alignment, mounting, and integration of IXO mirror segments.** Kai-Wing Chan, Univ. of Maryland, Baltimore County (United States) and NASA Goddard Space Flight Ctr. (United States); William W. Zhang, Timo T. Saha, David Robinson, NASA Goddard Space Flight Ctr. (United States); Lawrence G. Olsen, Ryan S. McClelland, James R. Mazzarella, Lawrence Lozipone, SGT, Inc. (United States); John P. Lehan, Univ. of Maryland, Baltimore County (United States); Mao-Ling Hong, Charles M. Fleetwood, Glenn Byron, SGT, Inc. (United States) [7437-42]

9:40 am: **Progress on the active alignment system for IXO mirrors.** Mark Freeman, William A. Podgorski, David C. Caldwell, Paul B. Reid, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7437-43]

Coffee Break 10:00 am

SESSION 11

Room: Conv. Ctr. 33A Thurs. 10:30 to 11:50 am

Active Optics

Session Chair: Finn E. Christensen, National Space Institute, DTU (Denmark)

10:30 am: **Generation-X: mirror technology development plan and the development of adjustable x-ray optics.** Paul B. Reid, M. Eisenhower, Harvard-Smithsonian Ctr. for Astrophysics (United States); Stephen L. O'Dell, NASA Marshall Space Flight Ctr. (United States); Daniel A. Schwartz, Harvard-Smithsonian Ctr. for Astrophysics (United States); Susan Tolier-McKinstry, The Pennsylvania State Univ. (United States); William W. Zhang, NASA Goddard Space Flight Ctr. (United States) [7437-44]

10:50 am: **First results from the testing of the thin shell adaptive optic prototype for high angular resolution X-ray telescopes.**, Charlotte H. Feldman, Richard Willingale, Univ. of Leicester (United Kingdom); Carolyn Atkins, Hongchang Wang, Peter Doel, David Brooks, Samantha J. Thompson, Univ. College London (United Kingdom); Tim W. Button, Dou Zhang, Daniel Rodriguez-Sanmartin, The Univ. of Birmingham (United Kingdom); Ady James, Craig Theobald, Univ. College London (United Kingdom); Andrew D. Smith, Science and Technology Facilities Council (United Kingdom) [7437-45]

11:10 am: **Advances in active X-ray telescope technologies.** Carolyn Atkins, Peter Doel, Hongchang Wang, David Brooks, Samantha J. Thompson, Univ. College London (United Kingdom); Charlotte H. Feldman, Richard Willingale, Univ. of Leicester (United Kingdom); Tim W. Button, Dou Zhang, Daniel Rodriguez-Sanmartin, The Univ. of Birmingham (United Kingdom); Ady James, Craig Theobald, Univ. College London (United Kingdom); Andrew D. Smith, Science and Technology Facilities Council (United Kingdom) [7437-46]

11:30 am: **EUV imaging experiment of an adaptive optics telescope.** Shunji Kitamoto, Takuma Shibata, Eri Takenaka, Masaki Yoshida, Hiroshi Murakami, Youichi Shishido, Norimitsu Gotoh, Kenta Nagasaki, Dai Takei, Mikio Morii, Rikkyo Univ. (Japan) [7437-47]

Lunch Break 11:50 am

SESSION 12

Room: Conv. Ctr. 33A Thurs. 1:20 to 3:00 pm

Performance Modeling

Session Chair: Paul B. Reid, Harvard-Smithsonian Ctr. for Astrophysics

1:20 pm: **Contamination modeling and epoxy selection and evaluation for the NuSTAR hard x-ray optics.** Charles J. Hailey, HongJun An, Columbia Univ. (United States); Finn E. Christensen, Danish National Space Ctr. (Denmark); Melania Doll, Columbia Univ. (United States); Carsten P. Jensen, Danish National Space Ctr. (Denmark); Jason E. Koglin, Kaya Mori, Gordon Tajiri, Columbia Univ. (United States) [7437-48]

1:40 pm: **Simulation of the Simbol-X telescope: imaging performance of a deformable X ray telescope.** Maxime Chauvin, Jean-Pierre Roques, Ctr. d'Etude Spatiale des Rayonnements (France) [7437-49]

2:00 pm: **Frequency-dependent analysis of the relative movement between mirrors and detectors for next-generation X-rays telescopes based on extendible benches or formation flight.** Marta M. Civitani, Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy) [7437-50]

2:20 pm: **Surface smoothness requirements for the mirrors of the IXO X-ray telescope.** Daniele Spiga, Giovanni Pareschi, Osservatorio Astronomico di Brera (Italy) [7437-51]

2:40 pm: **The performance of pore optics X-ray telescopes.** Michael Kersten, Norbert M. Pailer, EADS Astrium GmbH (Germany) [7437-52]

SESSION 13

Room: Conv. Ctr. 33A Thurs. 3:00 to 3:40 pm

Performance Testing

Session Chair: Brian D. Ramsey, NASA Marshall Space Flight Ctr.

3:00 pm: **Performance prediction and measurement of Silicon Pore Optics.** Marcelo D. Ackermann, Ramses Guenther, Rakesh Partapsing, Giuseppe Vacanti, Ernst-Jan Buis, Maximilien J. Collon, cosine Research B.V. (Netherlands); Michael Freyberg, Max-Planck-Institut für extraterrestrische Physik (Germany); Michael K. Krumrey, Physikalisch-Technische Bundesanstalt (Germany); Marco W. Beijersbergen, cosine Research B.V. (Netherlands); Marcos Bavdaz, Kotska Wallace, European Space Agency [7437-53]

3:20 pm: **Performance of the demonstration model of DIOS FXT.** Yuzuru Tawara, Ikuya Sakurai, Tatsuharu Torii, Kohji Matsushita, Tadashi Masuda, Nagoya Univ. (Japan) [7437-54]

Conference 7438

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7438

Solar Physics and Space Weather Instrumentation III

Conference Chairs: **Silvano Fineschi**, Osservatorio Astronomico di Torino (Italy); **Judy A. Fennelly**, Air Force Research Lab.

Program Committee: **Jean-Marc Defise**, Ctr. Spatiale de Liège (Belgium); **Francis G. Eparvier**, Univ. of Colorado at Boulder; **J. Daniel Moses**, Naval Research Lab.

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 1B Tues. 1:30 to 5:20 pm

Space Weather Missions

1:30 pm: **Next generation X-Ray Sensors (XRS) for the NOAA GOES-R series satellites**, Phillip C. Chamberlin, Thomas N. Woods, Francis G. Eparvier, Andrew R. Jones, Univ. of Colorado at Boulder (United States). [7438-23]

1:50 pm: **EUVS-C: The Measurement of the Magnesium II Index for GOES-R EXIS**, Martin Snow, William E. McClintock, David Crotser, Francis G. Eparvier, Univ. of Colorado at Boulder (United States) [7438-33]

2:10 pm: **The Extreme Ultraviolet Sensor (EUVS) for GOES-R**, Francis G. Eparvier, Andrew R. Jones, Phillip C. Chamberlin, Thomas N. Woods, William E. McClintock, Martin Snow, Univ. of Colorado at Boulder (United States)[7438-19]

2:30 pm: **Demonstration and Science Experiment (DSX) Space Weather Experiment (SWx)**, Judy A. Fennelly, Air Force Research Lab. (United States) [7438-32]

2:50 pm: **Calibration of a High Energy Proton Spectrometer (HEPS) for the DSX space weather mission**, Bronislaw K. Dichter, John McGarity, Gary Mullen, Don Brautigam, Assurance Technology Corp. (United States); Judy A. Fennelly, Air Force Research Lab. (United States); Robert Rdedus, Amptek, Inc. (United States). [7438-12]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Calibration of the Compact Environmental Anomaly Sensor (CEASE) for the DSX space weather mission**, Gary E. Galica, Bronislaw K. Dichter, John McGarity, Gary Mullen, Don Brautigam, Assurance Technology Corp. (United States); Judy A. Fennelly, Air Force Research Lab. (United States); Robert H. Redus, Amptek, Inc. (United States). [7438-13]

4:00 pm: **Overview of DSX LCI FSH**, David L. Voss, Avi Gunda, Anton Mavretic, Theodore Fritz, Boston Univ. (United States); Judy A. Fennelly, Air Force Research Lab. (United States). [7438-25]

4:20 pm: **Loss Cone Imager digital system design**, Douglas B. Carsow, Boston Univ. (United States); James D. Sullivan, Boston College (United States) and Air Force Reserach Lab. (United States); David L. Voss, Chad W. Parker, Anton Mavretic, Theodore Fritz, Allyn E. Hubbard, Boston Univ. (United States); Judy A. Fennelly, Air Force Research Lab. (United States). [7438-27]

4:40 pm: **DSX.LCI differential response functions**, James D. Sullivan, Boston College (United States); Judy A. Fennelly, Air Force Research Lab. (United States) [7438-10]

5:00 pm: **AFRL's Demonstration and Science Experiments mission**, Mark R. Scherbarth, Air Force Research Lab. (United States) [7438-04]

Wednesday 5 August

SESSION 2

Room: Conv. Ctr. 1B Wed. 8:30 to 9:30 am

Near-Earth Space Environment Instrumentation

8:00 am: **Doppler imagers enhance incoherent scatter radar site diagnostics**, John Noto, Steven R. Watchorn, Robert B. Kerr, Scientific Solutions, Inc. (United States); Pedrina Terra, Craig A. Tepley, Raul Garcia, Sixto Gonzalez, National Astronomy and Ionosphere Ctr. (United States) . . [7438-17]

8:20 am: **8446-Angstrom observations of neutral oxygen with the Spatial Heterodyne Spectrometer at Millstone Hill**, Steven R. Watchorn, John Noto, Scientific Solutions, Inc. (United States); Lara Waldrop, Univ. of Illinois at Urbana-Champaign (United States) [7438-08]

8:40 am: **A high sensitivity telescope for measurements of energetic particles in the Earth's radiation belts**, Charles W. Parker, Boston Univ. (United States); James D. Sullivan, Boston College (United States); Joseph M. Coombs, David L. Voss, Douglas B. Carsow, Anton Mavretic, Theodore Fritz, Boston Univ. (United States); Judy A. Fennelly, Boston College (United States) [7438-28]

SESSION 3

Room: Conv. Ctr. 1B Wed. 9:30 am to 12:00 pm

Solar Missions and Instrumentation I

9:30 am: **SDO-AIA mirror performance**, William A. Podgorski, Peter Cheimets, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7438-35]

9:50 am: **SDO-AIA telescope design**, Peter Cheimets, William A. Podgorski, David C. Caldwell, Robert Gates, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7438-36]

Coffee Break 10:10 to 10:40 am

10:40 am: **HERSCHEL suborbital Investigation**, John D. Moses, Naval Research Lab. (United States); Ester Antonucci, Osservatorio Astronomico di Torino (Italy); Jeffrey S. Newmark, Naval Research Lab. (United States); Silvano Fineschi, Osservatorio Astronomico di Torino (Italy); Marco Romoli, Univ. degli Studi di Firenze (Italy); Frédéric Auchère, Univ. Paris-Sud 11 (France). [7438-43]

11:00 am: **SCORE: calibration of the Sounding-rocket Coronagraphic Experiment**, Silvano Fineschi, Osservatorio Astronomico di Torino (Italy); Marco Romoli, Univ. degli Studi di Firenze (Italy); J. Daniel Moses, Jeffrey S. Newmark, Naval Research Lab. (United States); Giuseppe Massone, Osservatorio Astronomico di Torino (Italy); Maurizio Pancrazzi, Univ. degli Studi di Firenze (Italy); Luca Zangrilli, Osservatorio Astronomico di Torino (Italy); Federico Landini, Univ. degli Studi di Firenze (Italy); Gerardo Capobianco, Osservatorio Astronomico di Torino (Italy); Guglielmo Rossi, Mauro Focardi, Univ. degli Studi di Firenze (Italy); Lino Mastrodomenico, Osservatorio Astronomico di Torino (Italy) [7438-38]

11:20 am: **SCORE CCD visible camera calibration for the HERSCHEL suborbital mission**, Maurizio Pancrazzi, Mauro Focardi, Federico Landini, Marco Romoli, Univ. degli Studi di Firenze (Italy); Silvano Fineschi, Osservatorio Astronomico di Torino (Italy); Alessandro Gherardi, Univ. degli Studi di Firenze (Italy); Giuseppe Massone, Osservatorio Astronomico di Torino (Italy); Emanuele Pace, Dario Paganini, Guglielmo Rossi, Univ. degli Studi di Firenze (Italy). [7438-40]

11:40 am: **SCORE ICCD: UV camera opto-mechanical design and integration**, Giuseppe Massone, Osservatorio Astronomico di Torino (Italy); John D. Moses, Naval Research Lab. (United States); Oswald H. Siegmund, Sensor Sciences LLC (United States); Jeffrey S. Newmark, Naval Research Lab. (United States); Silvano Fineschi, Osservatorio Astronomico di Torino (Italy) . . [7438-42]

Lunch/Exhibition Break 12:00 pm

SESSION 4

Room: Conv. Ctr. 1B Wed. 1:30 to 3:10 pm

Solar Missions and Instrumentation II

1:30 pm: **EUV radiometric calibration of the HECOR/Herschel Sounding Rocket Coronagraph**, Frédéric Auchère, Univ. Paris-Sud 11 (France); Marie-Françoise Ravet-Krill, Lab. Charles Fabry (France); John D. Moses, Jeffrey S. Newmark, Naval Research Lab. (United States) [7438-41]

1:50 pm: **HERSCHEL extreme ultraviolet imaging telescope**, Jeffrey S. Newmark, Naval Research Lab. (United States) [7438-44]

2:10 pm: **Imaging coronal mass ejections and other heliospheric phenomena: six years of observations and implications for future capabilities**, J. C. Johnston, Air Force Research Lab. (United States); David F. Webb, Boston College (United States); D. C. Norquist, Air Force Research Lab. (United States); Thomas A. Kuchar, Boston College (United States) . . [7438-34]

2:30 pm: **Fabrication and test of a diamond-turned mirror suitable for a spaceborne photometric heliospheric imager**, Andrew Buffington, Univ. of California, San Diego (United States); Kirk G. Bach, Bernhard W. Bach, Erich K. Bach, Bach Research Corp. (United States); Mario M. Bisi, Paul Hick, Bernard V. Jackson, Univ. of California, San Diego (United States); Peter D. Klupar, NASA Ames Research Ctr. (United States) [7438-09]

2:50 pm: **A portable solar adaptive optics system**, Deqing Ren, California State Univ., Northridge (United States); Mathew J. Penn, National Solar Observatory (United States) [7438-02]

Coffee break 3:10 pm

SESSION 5

Room: Conv. Ctr. 1B Wed. 3:40 to 5:00 pm

Future Solar Missions

3:40 pm: **Reflecting coronagraphs: new concepts for future solar missions**, Silvano Fineschi, Osservatorio Astronomico di Torino (Italy) [7438-39]

4:00 pm: **High-resolution vacuum-ultraviolet spectrograph design solutions for solar space missions**, Udo H. Schuehle, Luca Teriaca, Werner Curdt, Max-Planck-Institut für Sonnensystemforschung (Germany) [7438-31]

4:20 pm: **Advanced characterization and simulation of SONNE: a fast neutron spectrometer for Solar Probe Plus**, Richard S. Woolf, James M. Ryan, Peter F. Blosser, Ulisse M. Bravar, Univ. of New Hampshire (United States); Erwin O. Flueckiger, Univ. Bern (Switzerland); Alexander L. MacKinnon, Procheta Mallik, Univ. of Glasgow (United Kingdom); Mark L. McConnell, Univ. of New Hampshire (United States); Benoit Pirard, CANBERRA France (France)[7438-18]

4:40 pm: **The Gamma Astrometric Measurement Experiment (GAME)**, Mario Gai, Alberto Vecchiato, Sebastiano Ligorì, Silvano Fineschi, Mario G. Lattanzi, Osservatorio Astronomico di Torino (Italy) [7438-37]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

A low noise ASIC electrometer for precision low current measurements, Andrew R. Jones, Univ. of Colorado at Boulder (United States); Dean D. Aalami, Space Instruments (United States) [7438-01]

Design of the mechanical housing for the LCI Energetic Particle Instrumentation Package in a Medium Earth Orbit, Joseph M. Coombs, David L. Voss, Charles W. Parker, Theodore Fritz, Anton Mavretic, Boston Univ. (United States); James D. Sullivan, Air Force Research Lab. (United States) and Boston College (United States); Judy A. Fennelly, Air Force Research Lab. (United States) [7438-29]

An IFU for diffraction-limited 3D spectroscopic imaging: laboratory and on-site tests, Deqing Ren, California State Univ., Northridge (United States); Christoph U. Keller, Univ. Utrecht (Netherlands); Claude Plymate, National Solar Observatory (United States) [7438-03]

Thursday 6 August

SESSION 6

Room: Conv. Ctr. 1B Thurs. 8:50 to 9:50 am

Solar Polarimetry

8:50 am: **Spectral calibration of the MSFC Solar Ultraviolet Magnetograph (SUMI)**, Edward A. West, Ken Kobayashi, Jonathan W. Cirtain, G. Allen Gary, John M. Davis, NASA Marshall Space Flight Ctr. (United States); Joseph Reader, National Institute of Standards and Technology (United States) [7438-14]

9:10 am: **The tandem Fabry-Perot filter imaging spectro-polarimeter for the Solar Magnetic Activity Research Telescope (SMART)**, Shin-ichi Nagata, Kenichi Otsuji, Takako T. Ishii, Kiyoshi Ichimoto, Satoru Ueno, Reizaburo Kitai, Goichi Kimura, Kazunari Shibata, Yoshikazu Nakatani, Satoshi Morita, Kyoto Univ. (Japan) [7438-30]

9:30 am: **Calibration of the EKPol K-corona Imaging Polarimeter**, Luca Zangrilli, Gerardo Capobianco, Silvano Fineschi, Osservatorio Astronomico di Torino (Italy) [7438-24]

Coffee Break 9:50 am

SESSION 7

Room: Conv. Ctr. 1B Thurs. 10:20 am to 12:00 pm

Detectors and Ground Support Equipment I

10:20 am: **The RAIDS experiment on the ISS**, Scott A. Budzien, Andrew W. Stephan, Naval Research Lab. (United States); Rebecca L. Bishop, Paul R. Straus, Andrew B. Christensen, James H. Hecht, The Aerospace Corp. (United States) [7438-21]

10:40 am: **The Remote Atmospheric and Ionospheric Detection System on the ISS: sensor performance and space weather applications from the extreme to the near ultraviolet**, Andrew W. Stephan, Scott A. Budzien, Zachary J. Van Epps, Naval Research Lab. (United States); Rebecca L. Bishop, Paul R. Straus, Andrew B. Christensen, James H. Hecht, The Aerospace Corp. (United States) [7438-05]

11:00 am: **The Remote Atmospheric and Ionospheric Detection System on the ISS: sensor performance and space weather applications from the visible to the near infrared**, Rebecca L. Bishop, Paul R. Straus, Andrew B. Christensen, James H. Hecht, The Aerospace Corp. (United States); Scott A. Budzien, Andrew W. Stephan, Zachary J. Van Epps, Naval Research Lab. (United States) [7438-20]

11:20 am: **Zone plate EUV solar irradiance monitor**, James C. Bremer, Alliant Techsystems Inc. (United States); John F. Seely, Naval Research Lab. (United States)

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States); Glenn E. Holland, Global Strategies Group North America Inc. (United States); Yan Feng, Xradia, Inc. (United States) [7438-07]

11:40 am: **Calibration of a zone plate for an EUV solar irradiance monitor**, John F. Seely, Glenn E. Holland, Michael P. Kowalski, Naval Research Lab. (United States); Benjawan Kjomrattanawanich, Universities Space Research Association (United States); James C. Bremer, Alliant Techsystems Inc. (United States); Yan Feng, Xradia, Inc. (United States) [7438-15]

Lunch Break 12:00 pm

SESSION 8

Room: Conv. Ctr. 1B Thurs. 1:30 to 2:50 pm

Detectors and Ground Support Equipment II

1:30 pm: **Prototype CMOS SSPM solar particle dosimeter with tissue-equivalent sensor**, Christopher Stapels, Erik B. Johnson, Paul S. Linsay, Sharmistha Mukhopadhyay, Eric C. Chapman, James F. Christian, Radiation Monitoring Devices, Inc. (United States) [7438-11]

1:50 pm: **Tiny ionospheric photometers on COSMIC/FORMOSAT-3: on-orbit performance**, Scott A. Budzien, Kenneth F. Dymond, Clayton Coker, Damien Chua, Naval Research Lab. (United States) [7438-22]

2:10 pm: **On-orbit calibration of the Tiny Ionospheric Photometer on the COSMIC/FORMOSAT-3 Satellites**, Kenneth F. Dymond, Scott A. Budzien, Clayton Coker, Damien Chua, Naval Research Lab. (United States) . . [7438-06]

2:30 pm: **Overview of GSE as a multifunctional GUI**, Boyan Kurtovich, David L. Voss, Douglas B. Carssow, Anton Mavretic, Boston Univ. (United States) [7438-26]

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Conference 7439A

Sunday 2 August 2009 • Proceedings of SPIE Vol. 7439A

Focal Plane Arrays for Space telescopes IV

Conference Chairs: **Penny G. Warren**, Ball Aerospace & Technologies Corp.; **Cheryl J. Marshall**, NASA Goddard Space Flight Ctr.

Sunday 2 August

Room: Conv. Ctr. 33C Sun. 8:30 to 10:20 am

SESSION 1

8:30 am: **Improving radiation tolerance in e2v CCD sensors** (*Invited Paper*), James Endicott, Peter J. Pool, David G. Morris, Paul Jerram, Ali Hussain, Pat Ezra, e2v technologies plc (United Kingdom) [7439A-01]

9:00 am: **CCD Considerations for the Visible Focal Plane on EUCLID**, Neil J. Murray, Andrew D. Holland, Jason P. Gow, George M. Seabroke, The Open Univ. (United Kingdom); Mark S. Cropper, Univ. College London (United Kingdom); David J. Burt, James Endicott, Peter J. Pool, Paul Jerram, e2v technologies plc (United Kingdom) [7439A-02]

9:20 am: **CCD radiation damage in ESA Cosmic Visions missions: assessment and mitigation**, David Lumb, European Space Agency (Netherlands) [7439A-03]

9:40 am: **Modelling electron distributions within ESA's Gaia satellite CCD pixels to mitigate radiation damage**, George M. Seabroke, Andrew D. Holland, The Open Univ. (United Kingdom); David J. Burt, Mark Robbins, e2v technologies plc (United Kingdom) [7439A-04]

10:00 am: **Selected test results for Wide Field Camera 3 IR detectors**, Augustyn Waczynski, Roger D. Foltz, Cheryl J. Marshall, Gregory S. Delo, Randy A. Kimble, Emily Kan, NASA Goddard Space Flight Ctr. (United States) [7439A-05]

Coffee Break 10:20 am

Room: Conv. Ctr. 33C Sun. 10:50 am to 12:40 pm

SESSION 2

10:50 am: **Fundamental performance differences between CMOS and CCD imagers; Part III** (*Invited Paper*), James R. Janesick, James T. Andrews, John R. Tower, Sarnoff Corp. (United States); Stythe T. Elliott, Jet Propulsion Lab. (United States); Jeff H. Pinter, Sarnoff Corp. (United States) [7439A-06]

11:20 am: **High-performance detectors for large focal plane arrays**, Michael E. Hoenk, Shouleh Nikzad, Jet Propulsion Lab. (United States) [7439A-07]

11:40 am: **Advanced staring SiPIN visible sensor chip assembly for BepiColombo mission to Mercury**, Robert E. Mills, John J. Drab, Andrew Gin, Raytheon Co. (United States) [7439A-08]

12:00 pm: **A novel CCD for application in high frame rate geostationary space-based imaging**, Richard A. Bredthauer, Semiconductor Technology Associates Inc. (United States); Earl K. Aamodt, Lockheed Martin Space Systems Co. (United States); Hugh Christian, Ryco Design (United States); Gregory R. Bredthauer, Kasey L. Boggs, Semiconductor Technology Associates Inc. (United States) [7439A-09]

12:20 pm: **Wide Field Camera 3 CCD quantum efficiency hysteresis: characterization and mitigation**, Nicholas R. Collins, Nicholas Boehm, Gregory S. Delo, Roger D. Foltz, Robert J. Hill, Emily Kan, Randy A. Kimble, Eliot M. Malumuth, Robert L. Rosenberry, Augustyn Waczynski, Yiting Wen, NASA Goddard Space Flight Ctr. (United States); Sylvia M. Baggett, Howard A. Bushouse, Susana E. Deustua, Jessica Kim-Quijano, John A. MacKenty, Andre R. Martel, Elena Sabbì, Space Telescope Science Institute (United States) [7439A-10]

Lunch Break 12:20 pm

Room: Conv. Ctr. 33C Sun. 1:20 to 2:20 pm

SESSION 3

1:20 pm: **Telescope Guiding with a HyViSi H2RG Used in Guide Mode**, Lance M. Simms, Stanford Linear Accelerator Ctr. (United States); Donald F. Figer, Brandon Hanold, Rochester Institute of Technology (United States); David K. Gilmore, Steven M. Kahn, Stanford Linear Accelerator Ctr. (United States) [7439A-11]

1:40 pm: **Laboratory and sky testing of the Raytheon Vision Systems' large format visible/near-IR GV2 CMOS-hybrid detector**, Bryan N. Dorland, Rachel Dudik, Gregory S. Hennessy, U.S. Naval Observatory (United States); Augustyn Waczynski, Peter K. Shu, NASA Goddard Space Flight Ctr. (United States) [7439A-12]

2:00 pm: **Laboratory and sky testing of the second generation Teledyne Imaging Sensor (TIS) 16.7 megapixel visible/near-IR CMOS-hybrid array (H4RG-10 A2)**, Bryan N. Dorland, Rachel Dudik, Gregory S. Hennessy, U.S. Naval Observatory (United States); Augustyn Waczynski, Bernard J. Rauscher, Peter K. Shu, NASA Goddard Space Flight Ctr. (United States); John E. Hubbs, Air Force Research Lab. (United States) [7439A-13]

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics
Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes
Jerry Nelson, Univ. of California, Santa Cruz (United States)

**Prospects for Direct Imaging and Characterization
of Exoplanets from Space**
Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session
Four Hundred Years through the Eye of the Telescope
Jerry Nelson, Univ. of California, Santa Cruz (USA)

**Peering into the Explosion: Using Stellar Archaeology to
Unlock the Mysteries of Supernovae**
Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

6:00 pm: **Gaia: operational aspects and tests of Gaia Flight Model CCDs**, Ralf Kohley, Juan-Manuel Martin-Fleitas, Frederic Raison, European Space Astronomy Ctr. (Spain) [7439A-14]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC152 Infrared Focal Plane Arrays (Dereniak, Hubbs) Wednesday, 8:30 am to 12:30 pm

SC504 Introduction to CCD and CMOS Imaging Sensors and Applications (Janesick) Monday, 8:30 am to 5:30 pm

SC916 Digital Camera and Sensor Evaluation Using Photon Transfer (Janesick) Tuesday, 8:30 am to 5:30 pm

SC959 Image Chain Modeling of Digital Camera Systems (Fiete) Wednesday, 8:30 am to 12:30 pm

Conference 7439B

Monday 3 August 2009 • Proceedings of SPIE Vol. 7439B

Astronomical Adaptive Optics Systems and Applications IV

Conference Chairs: **Robert K. Tyson**, The Univ. of North Carolina at Charlotte; **Michael Lloyd-Hart**, The Univ. of Arizona/Steward Observatory

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 1

Room: Conv. Ctr. 33C Mon. 8:00 to 10:00 am

Design and System Status

Session Chair: **Michael Lloyd-Hart**, The Univ. of Arizona

8:00 am: **NFIRAOS: the optical design of an adaptive optics system for the Thirty Meter Telescope**, Jenny Atwood, Peter W. G. Byrnes, Glen Herriot, National Research Council Canada (Canada) [7439B-15]

8:20 am: **Status update on the PALM-3000 high-order adaptive optics system**, Antonin H. Bouchez, Richard G. Dekany, California Institute of Technology (United States); John R. Angione, Jet Propulsion Lab. (United States); Christoph J. Baranec, Khanh Bui, Rick S. Burruss, California Institute of Technology (United States); Justin R. Crepp, Univ. of Florida (United States); Ernest Croner, John L. Cromer, California Institute of Technology (United States); Stephen R. Guiwits, Jet Propulsion Lab. (United States); John R. Henning, Jeffrey P. Hickey, California Institute of Technology (United States); Thang Q. Trinh, Mitchell Troy, Tuan N. Truong, Jet Propulsion Lab. (United States); J. Zolkower, [7439B-16]

8:40 am: **The plenoptic camera as a wavefront sensor for the European Solar Telescope**, Luis-Fernando Rodriguez-Ramos, Yolanda Martín-Hernando, José Javier Díaz-García, Juan-José Piqueras-Meseguer, Instituto de Astrofísica de Canarias (Spain); José-Manuel Rodríguez-Ramos, Univ. de La Laguna (Spain) [7439B-17]

9:00 am: **EAGLE: the MOAO fed near IR multi-integral field spectrograph on the E-ELT**, Jean-Gabriel Cuby, Lab. d'Astrophysique de Marseille (France); Simon M. Morris, Durham Univ. (United Kingdom); Gerard Rousset, Observatoire de Paris à Meudon (France); Richard M. Myers, Durham Univ. (United Kingdom); Thierry Fusco, ONERA (France); Tim J. Morris, Durham Univ. (United Kingdom); Pascal Jagourel, Observatoire de Paris à Meudon (France); Phil Parr-Burman, UK Astronomy Technology Ctr. (United Kingdom); Eric Gendron, Observatoire de Paris à Meudon (France); Hermine Schnettler, UK Astronomy Technology Ctr. (United Kingdom) [7439B-18]

9:20 am: **Performance of a modal zone wavefront recovery algorithm (Hudgin) implemented on FPGAs for its use in ELTs**, José Javier Díaz-García, Instituto de Astrofísica de Canarias (Spain); Alberto Davila-Gonzalez, Univ. de La Laguna (Spain); Luis-Fernando Rodríguez-Ramos, Instituto de Astrofísica de Canarias (Spain); José-Manuel Rodríguez-Ramos, Univ. de La Laguna (Spain); Yolanda Martín-Hernando, Juan-José Piqueras-Meseguer, Instituto de Astrofísica de Canarias (Spain) [7439B-19]

9:40 am: **LGS adaptive optics and integral field spectroscopy**, Katharine J. Jones, WBAO Consultant Group (United States) [7439B-20]

Coffee Break 10:00 am

SESSION 2

Room: Conv. Ctr. 33C Mon. 10:50 to 11:50 am

Novel System Optimization and Control

Session Chair: **Christoph J. Baranec**, California Institute of Technology

10:50 am: **Manufacturing by hot slumping and optical performances of a 500 mm diameter thin glass segment prototype for adaptive optics**, Mauro Ghigo, Rodolfo Canestrari, Basso Stefano, Daniele Spiga, Laura Proserpio, Osservatorio Astronomico di Brera (Italy) [7439B-22]

11:10 am: **Control of deformable mirrors in MOAO using H_∞ optimization**, Andres R. Guesalaga, Pontificia Univ. Católica de Chile (Chile); Dani Guzman, Richard M. Myers, Tim J. Morris, Nigel A. Dipper, Alastair G. Basden, Univ. of Durham (United Kingdom) [7439B-23]

11:30 am: **Improvement of science throughput of 1m class telescopes thanks to COTS A.O.**, Frédéric Rooms, Julien Charton, Laurent Jocou, ALPAO (France) [7439B-24]

Lunch Break 11:50 am

SESSION 3

Room: Conv. Ctr. 33C Mon. 1:20 to 3:00 pm

Advanced Design and Development

Session Chair: **Robert K. Tyson**, The Univ. of North Carolina at Charlotte

1:20 pm: **Advances in adaptive optics in the last decade**, Mark A. Ealey, Thomas R. Price, David D. Pearson, Northrop Grumman Corp. (United States) [7439B-25]

1:40 pm: **Advances in Xinetics deformable mirror technology**, Thomas R. Price, Jeffrey L. Cavaco, Audrey D. Plinta, Eric A. Lintz, Mark A. Ealey, Northrop Grumman Corp. (United States) [7439B-26]

2:00 pm: **PMN surface parallel modular actuator arrays**, David D. Pearson, Jeffrey L. Cavaco, Eric A. Lintz, Brian J. Metro, David K. Bowman, Northrop Grumman Corp. (United States) [7439B-27]

2:20 pm: **A novel design of a deformable mirror with the global and local correction**, Chan-Kyung Im, Sung Kie Youn, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7439B-28]

2:40 pm: **Optimized wavefront sensing for surface parallel actuation**, Allan Wirth, Jeffrey L. Cavaco, Andrew J. Jankevics, Franklin M. Landers, Northrop Grumman Corp. (United States) [7439B-29]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Advances in solar adaptive optics system at the domeless solar telescope of the Hida Observatory, Noriaki Miura, Yuuki Noto, Shuusuke Kato, Fumihito Yokoyama, Susumu Kuwamura, Kitami Institute of Technology (Japan); Naoshi Baba, Hokkaido Univ. (Japan); Yoichiro Hanaoka, National Astronomical Observatory of Japan (Japan); Shin-ichi Nagata, Satoru Ueno, Reizaburo Kitai, Kiyoshi Ichimoto, Kyoto Univ. (Japan); Hideki Takami, National Astronomical Observatory of Japan/Subaru Telescope (United States). [7439B-30]

Wave-front sensing and correction for 4-meter LAMOST, Xi Zhang, Nanjing Institute of Astronomical Optics & Technology (China) and Graduate School of Chinese Academy of Sciences (China); Deqing Ren, California State Univ., Northridge (United States) and Nanjing Institute of Astronomical Optics & Technology (China); Yongtian Zhu, Nanjing Institute of Astronomical Optics & Technology (China); Jiangpei Dou, Nanjing Institute of Astronomical Optics & Technology (China) and Graduate School of Chinese Academy of Sciences (China). [7439B-31]

Image reconstruction of Io from the bispectrum using building block method, Yuuki Yoshinoya, Susumu Kuwamura, Noriaki Miura, Kitami Institute of Technology (Japan); Fumiaki Tsumuraya, Makoto Sakamoto, Hyogo Univ. (Japan); Naoshi Baba, Hokkaido Univ. (Japan). [7439B-32]

Testbed for solar multi-conjugate adaptive optics, Dirk Schmidt, Thomas Berkefeld, Frank Heidecke, Dirk Soltau, Oskar F. H. von der Luehe II, Kiepenheuer Institut für Sonnenphysik (Germany). [7439B-33]

Enabling technologies for visible adaptive optics: the Magellan adaptive secondary VisAO camera, Derek A. Kopon, Laird M. Close, Jared Males, Victor L. Gasho, Steward Observatory, The Univ. of Arizona (United States); Tyson Hare, Alan Uomoto, Carnegie Observatories (United States). [7439B-51]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC135 Adaptive Optics (Tyson) Tuesday, 8:30 am to 5:30 pm



Conference 7439C

Monday 3 August 2009 • Proceedings of SPIE Vol. 7439C

Cryogenic Optical Systems and Instruments XIII

Conference Chairs: **James B. Heaney**, Stinger Ghaffarian Technologies, Inc.; **E. Todd Kvamme**, Lockheed Martin Space Systems Co.

Program Committee: **David M. Chaney**, Ball Aerospace & Technologies Corp.; **Raymond G. Ohi IV**, NASA Goddard Space Flight Ctr.; **Leigh Ann Ryder**, Lockheed Martin Space Systems Co.; **Mark T. Stier**, Goodrich Corp.; **Theodore D. Swanson**, NASA Goddard Space Flight Ctr.

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. 33B Mon. 8:20 to 8:40 am

Introductory Remarks

Session Chairs: **James B. Heaney**, Stinger Ghaffarian Technologies,
Inc.; **Theodore D. Swanson**, NASA Goddard Space Flight Ctr.

SESSION 1

Room: Conv. Ctr. 33B Mon. 8:40 to 10:00 am

Cryogenic Mechanisms and Systems

Session Chair: **David M. Chaney**, Ball Aerospace & Technologies Corp.

8:40 am: **Cryogenic piezoelectric actuators**, Xiaoning Jiang, TRS
Technologies, Inc. (United States). [7439C-34]

9:00 am: **Cryogenic bonding for lens mounts** (*Invited Paper*), Craig L. Hom,
Buck C. Holmes, Dennis N. Lopicz, E. Todd Kvamme, Lockheed Martin Space
Systems Co. (United States). [7439C-35]

9:20 am: **Athermalized embedding of actuators in cryogenic mirrors** (*Invited
Paper*), Craig L. Hom, Gopal Vasudevan, Mark T. Sullivan, Lockheed Martin
Space Systems Co. (United States); B. Martin Levine, Jet Propulsion Lab.
(United States). [7439C-36]

9:40 am: **Low emittance, semi-transparent coating for cryogenic window
applications**, James B. Heaney, Stinger Ghaffarian Technologies, Inc. (United
States); Maria D. Nowak, Manuel A. Quijada, Felix T. Threat, NASA Goddard
Space Flight Ctr. (United States); Joseph M. Stock, Stinger Ghaffarian
Technologies, Inc. (United States). [7439C-37]

Coffee Break 10:00 am

SESSION 2

Room: Conv. Ctr. 33B Mon. 10:30 to 11:30 am

Cryogenic Telescope Technology

Session Chair: **Mark T. Stier**, Goodrich Corp.

10:30 am: **Cryogenic stray light testing of the James Webb Space
Telescope: an easy approach**, Till W. Liepmann, Northrop Grumman Space
Technology (United States). [7439C-38]

10:50 am: **Wavefront sensor for the ESA-GAIA mission**, Amir Vosteen, Folkert
Draaisma, Willem van Werkhoven, Luud van Riel, Margreet Mol, Gerben den
Ouden, TNO (Netherlands) [7439C-39]

11:10 am: **Development and space qualification of ultra stable optics in SiC
for the GAIA mission**, Ellart A. Meijer, Fred Kamphues, TNO
(Netherlands) [7439C-40]

Lunch Break 11:30 am

Room: Conv. Ctr. 33B Mon. 1:20 to 1:40 pm

Introductory Remarks

Session Chair: **E. Todd Kvamme**, Lockheed Martin Space Systems Co.

SESSION 3

Room: Conv. Ctr. 33B Mon. 1:40 to 3:00 pm

Cryogenic Optical Instruments I

Session Chair: **Raymond G. Ohi IV**, NASA Goddard Space Flight Ctr.

1:40 pm: **WISE solid hydrogen cryostat cryogenic test results**, Brett Lloyd,
Utah State Univ. (United States); Scott H. Schick, Practical Technology
Solutions, Inc. (United States). [7439C-41]

2:00 pm: **Application of infrared optical projection systems in the cryogenic
test environment using AEDC's 7V and 10V space sensor test chambers**,
Heard S. Lowry, Randy A. Nicholson, Sidney L. Steely, Aerospace Testing
Alliance (United States). [7439C-42]

2:20 pm: **Thermal design of the IO infrared-optical camera**, Iain A. Steele,
Stuart Bates, Robert J. Smith, Liverpool John Moores Univ. (United
Kingdom). [7439C-43]

2:40 pm: **Low-cost far-IR radiometer for thermal vacuum testing**, Michael J.
DiPirro, James G. Tuttle, Thomas Hait, NASA Goddard Space Flight Ctr. (United
States). [7439C-44]

Coffee Break 3:00 pm

SESSION 4

Room: Conv. Ctr. 33B Mon. 3:30 to 5:30 pm

Cryogenic Optical Instruments II

Session Chair: **Leigh Ann Ryder**, Lockheed Martin Space Systems Co.

3:30 pm: **NIRCam mechanical support structure: from concept to qualification** (*Invited Paper*), Paul V. Mammini, Lockheed Martin Space Systems Co. (United States)[7439C-45]

3:50 pm: **NIRCam pupil imaging lens actuator assembly** (*Invited Paper*), Charles S. Clark, Lockheed Martin Space Systems Co. (United States)[7439C-46]

4:10 pm: **Cryogenic spectral performance of bandpass filters for NIRCam instrument** (*Invited Paper*), Yalan Mao, Lockheed Martin Space Systems Co. (United States); David Harrison, Todd Richardson, Bailey Schulz, Dale Taylor, Barr Associates, Inc. (United States); Lynn W. Huff, Scott D. Horner, Lockheed Martin Space Systems Co. (United States); Douglas M. Kelly, Marcia J. Rieke, The Univ. of Arizona (United States)[7439C-47]

4:30 pm: **NIRCam filter wheel optic assembly mount design** (*Invited Paper*), Bela Privari, Lockheed Martin Space Systems Co. (United States) . . [7439C-48]

4:50 pm: **Results of environmental testing the focus and alignment mechanism of the near-infrared camera on the James Webb Space Telescope** (*Invited Paper*), Bear Witherspoon, Michael S. Jacoby, Lynn W. Huff, Paul V. Mammini, Lockheed Martin Space Systems Co. (United States)[7439C-49]

5:10 pm: Cold alignment prediction of the NIRCam instrument components (*Invited Paper*), Alison A. Nordt, Michael S. Jacoby, Lockheed Martin Space Systems Co. (United States)[7439C-50]

Room: Conv. Ctr. 33B Mon. 5:30 to 5:40 pm

Closing Remarks

Session Chairs: **James B. Heaney**, Stinger Ghaffarian Technologies, Inc.; **E. Todd Kvamme**, Lockheed Martin Space Systems Co.

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC561 Optomechanics for Space Applications (Shipley) Sunday, 8:30 am to 5:30 pm

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Conference 7440

Tuesday-Wednesday 4-5 August 2009 • Proceedings of SPIE Vol. 7440

Techniques and Instrumentation for Detection of Exoplanets IV

Conference Chair: **Stuart B. Shaklan**, Jet Propulsion Lab.

Program Committee: **James B. Breckinridge**, Jet Propulsion Lab.; **Dennis C. Ebbets**, Ball Aerospace & Technologies Corp.; **Olivier Guyon**, National Astronomical Observatory of Japan/Subaru Telescope and Research Corporation of the Univ. of Hawaii and Univ. of Arizona; **Richard G. Lyon**, NASA Goddard Space Flight Ctr.; **Bruce A. Macintosh**, Lawrence Livermore National Lab.; **Remi Soummer**, Space Telescope Science Institute

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 33C Tues. 8:00 am to 12:00 pm

External Occulters

8:00 am: **Terrestrial planet finder: coda to 10 years of technology development** (*Invited Paper*), Peter R. Lawson, Jet Propulsion Lab. (United States) [7440-01]

8:30 am: **Architecting the NWO starshade**, Amy S. Lo, Tiffany Glassman, Jonathan W. Arenberg, Northrop Grumman Space Technology (United States); Webster C. Cash, Jr., Univ. of Colorado at Boulder (United States) . . . [7440-02]

8:50 am: **High contrast from the starshade testbed at NGAS**, Rocco Samuele, Rupal Varshneya, Northrop Grumman Space Technology (United States); Tiffany Glassman, Northrop Grumman Aerospace Systems (United States); Ann F. Shipley, Univ. of Colorado at Boulder (United States) . [7440-03]

9:10 am: **The design for the hybrid occulter system for Theia**, N. Jeremy D. Kasdin, Eric J. Cady, Princeton Univ. (United States); Philip J. Dumont, P. Douglas Lisman, Stuart B. Shaklan, Jet Propulsion Lab. (United States); Remi Soummer, Space Telescope Science Institute (United States); David N. Spergel, Robert J. Vanderbei, Princeton Univ. (United States) [7440-04]

9:30 am: **Progress on a hybrid occulter experiment at Princeton**, Eric J. Cady, Princeton Univ. (United States); Kunjithapatham Balasubramanian, Jet Propulsion Lab. (United States); Michael A. Carr, Princeton Univ. (United States);

Matthew R. Dickie, Pierre M. Echernach, Jet Propulsion Lab. (United States); Tyler D. Groff, N. Jeremy D. Kasdin, Michael W. McElwain, Dan Sirbu, Robert J. Vanderbei, Princeton Univ. (United States); Victor White, Jet Propulsion Lab. (United States) [7440-05]

9:50 am: **A method for modifying occulter shapes**, Eric J. Cady, Princeton Univ. (United States); Stuart B. Shaklan, Jet Propulsion Lab. (United States); N. Jeremy D. Kasdin, David N. Spergel, Princeton Univ. (United States) . [7440-06]

Coffee Break 10:10 to 10:40 am

10:40 am: **Perturbation sensitivity studies of an external occulter concept: methods and results**, Philip J. Dumont, Stuart B. Shaklan, Jet Propulsion Lab. (United States); Eric J. Cady, N. Jeremy D. Kasdin, Robert J. Vanderbei, Princeton Univ. (United States) [7440-07]

11:00 am: **Results from the automated Design Reference mission constructor for exoplanet imagers**, Dmitry Savransky, N. Jeremy D. Kasdin, David N. Spergel, Princeton Univ. (United States) [7440-08]

11:20 am: **A starshade occulter for JWST**, Remi Soummer, Space Telescope Science Institute (United States) [7440-09]

11:40 am: **The utility of astrometry as a precursor to direct detection**, Dmitry Savransky, N. Jeremy D. Kasdin, Brandt A. Belson, Princeton Univ. (United States) [7440-10]

Lunch/Exhibition Break 12:00 pm

SESSION 2

Room: Conv. Ctr. 33C Tues. 1:30 to 4:40 pm

Wavefront Correction and Pupil Remapping

1:30 pm: **Two-camera wavefront estimation with a Gerchberg-Saxton based scheme**, Jason D. Kay, Tyler D. Groff, N. Jeremy D. Kasdin, Princeton Univ. (United States) [7440-11]

1:50 pm: **Broadband wavefront correction using the Electric Field Conjugation algorithm for Phase Induced Amplitude Apodization coronagraphs**, Amir Give'on, Laurent A. Pueyo, Stuart B. Shaklan, Brian D. Kern, Jet Propulsion Lab. (United States) [7440-12]

2:10 pm: **Characterization of the chromaticity of residual speckles in a PIAA coronagraph**, Laurent A. Pueyo, Stuart B. Shaklan, Amir Give'on, Jet Propulsion Lab. (United States) and California Institute of Technology (United States) [7440-13]

2:30 pm: **Detecting and characterizing exoplanets with a 1.4-m space telescope: the Pupil mapping Exoplanet Coronagraphic Observer (PECO)**, Olivier Guyon, National Astronomical Observatory of Japan/Subaru Telescope (United States) and Univ. of Arizona (United States) [7440-14]

2:50 pm: **Science performance of the Pupil-mapping Exoplanet Coronagraphic Observer (PECO)**, Kerri L. Cahoy, Thomas P. Greene, NASA Ames Research Ctr. (United States); Olivier Guyon, Glenn H. Schneider, The Univ. of Arizona (United States); Mark S. Marley, NASA Ames Research Ctr. (United States); Michael R. Meyer, The Univ. of Arizona (United States); Stephen T. Ridgway, National Optical Astronomy Observatory (United States); James Kasting, The Pennsylvania State Univ. (United States); Wesley A. Traub, Jet Propulsion Lab. (United States); Neville J. Woolf, The Univ. of Arizona (United States) [7440-15]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Phase-Induced Amplitude Apodization (PIAA) coronagraph testing at the High Contrast Imaging Testbed**, Brian D. Kern, Jet Propulsion Lab. (United States); Ruslan Belikov, NASA Ames Research Ctr. (United States); Amir Give'on, Jet Propulsion Lab. (United States); Olivier Guyon, National Astronomical Observatory of Japan/Subaru Telescope (United States); Andreas C. Kuhnert, Marie B. Levine, Dwight C. Moody, Jr., Albert F. Niessner, Laurent A. Pueyo, Stuart B. Shaklan, Wesley A. Traub, John T. Trauger, Jet Propulsion Lab. (United States) [7440-16]

4:00 pm: **Performance sensitivity studies on the PIAA implementation of the high-contrast imaging testbed**, Erkin Sidick, John Z. Lou, Stuart B. Shaklan, Marie B. Levine, Jet Propulsion Lab. (United States) [7440-17]

4:20 pm: **First results on a new PIAA coronagraph testbed at NASA Ames**, Ruslan Belikov, NASA Ames Research Ctr. (United States); Eugene Pluzhnik, Michael S. Connelley, Dana H. Lynch, Fred C. Witteborn, NASA Ames Research Ctr. (United States); Kerri L. Cahoy, NASA Ames Research Ctr. (United States); Olivier Guyon, National Astronomical Observatory of Japan/Subaru Telescope (United States); Thomas P. Greene, Mark E. McKelvey, NASA Ames Research Ctr. (United States) [7440-18]

SESSION 3

Room: Conv. Ctr. 33C Tues. 4:40 to 5:40 pm

Ground-based Spectroscopy

4:40 pm: **Progress with the TEDI near-infrared exoplanet velocimeter**, Jerry Edelstein, David J. Erskine, Univ. of California, Berkeley (United States); Philip S. Muirhead, Cornell Univ. (United States); Matthew W. Mutterspaugh, Univ. of California, Berkeley (United States); James P. Lloyd, Jason T. Wright, Cornell Univ. (United States); Mario R. Marckwordt, Anthony Mercer, Samuel Halverson, Univ. of California, Berkeley (United States); Mary Gooding, Wells College (United States) [7440-19]

5:00 pm: **A new generation multi-object Doppler instrument for SDSS-III Multi-object APO Radial Velocity Exoplanet Large-area Survey**, Jian C. Ge, Univ. of Florida (United States) [7440-20]

5:20 pm: **A Fabry-Perot interferometer for the high accuracy calibration of radial velocities**, Francois P. Wildi, Francesco A. Pepe, Bruno Chazelas, Christophe Lovis, Observatoire Astronomique de l'Univ. de Genève (Switzerland) [7440-52]

Wednesday 5 August

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Starshade scaling relations, Tiffany Glassman, Amy S. Lo, Jonathan W. Arenberg, Northrop Grumman Space Technology (United States); Webster C. Cash, Jr., Univ. of Colorado at Boulder (United States); Martin C. Noecker, Ball Aerospace & Technologies Corp. (United States) [7440-38]

Progress on a shaped pupil apodized Lyot coronagraph at AMNH, Eric J. Cady, Princeton Univ. (United States); Remi Soummer, Space Telescope Science Institute (United States); Bruce A. Macintosh, Lawrence Livermore National Lab. (United States); N. Jeremy D. Kasdin, Princeton Univ. (United States); Sandrine J. Thomas, Darren Dillon, Univ. of California Observatories (United States); Anand Sivaramakrishnan, Ben R. Oppenheimer, American Museum of Natural History (United States) [7440-39]

An evaluation of the effects of non-uniform exo-zodiacal dust distributions on planetary observations, Dmitry Savransky, N. Jeremy D. Kasdin, Robert J. Vanderbei, Princeton Univ. (United States) [7440-40]

End-to-end simulations of different coronagraphic techniques, John E. Krist, John T. Trauger, Dwight C. Moody, Jr., Jet Propulsion Lab. (United States); Ruslan Belikov, NASA Ames Research Ctr. (United States); Dimitri Mawet, Jet Propulsion Lab. (United States); Olivier Guyon, National Astronomical Observatory of Japan/Subaru Telescope (United States); Robert J. Vanderbei, Princeton Univ. (United States); Stuart B. Shaklan, Jet Propulsion Lab. (United States) [7440-41]

Phase Induced Amplitude Apodisation (PIAA) coronagraph with square apertures, Laurent A. Pueyo, Jet Propulsion Lab. (United States); N. Jeremy D. Kasdin, Tyler D. Groff, Princeton Univ. (United States) [7440-42]

Focused ion beam machining of occulting masks for the direct imaging of extrasolar planets, Shilpa N. Raja, Michael J. Aziz, Harvard Univ. (United States); James W. Foley, The Rowland Institute at Harvard (United States); Volker Toll, Harvard-Smithsonian Ctr. for Astrophysics (United States) [7440-43]

Laboratory Experiment of a High-contrast Imaging Coronagraph with Step-transmission Filters, Jiangpei Dou, Nanjing Institute of Astronomical Optics & Technology (China) and Graduate School of the Chinese Academy of Sciences (China); Deqing Ren, California State Univ., Northridge (United States) and Nanjing Institute of Astronomical Optics & Technology (China); Yongting Zhu, Nanjing Institute of Astronomical Optics & Technology (China); Xi Zhang, Nanjing Institute of Astronomical Optics & Technology (China) and Graduate School of the Chinese Academy of Sciences (China) [7440-44]

Balloon exoplanet nulling interferometer, Richard G. Lyon, Mark C. Clampin, NASA Goddard Space Flight Ctr. (United States); Robert A. Woodruff, Gopal Vasudevan, Lockheed Martin Space Systems Co. (United States); Holland C. Ford, The Johns Hopkins Univ. (United States); Larry D. Petro, Space Telescope Science Institute (United States); Jay R. Herman, Stephen A. Rinehart, Kenneth G. Carpenter, NASA Goddard Space Flight Ctr. (United States); Joseph Marzouk, Sigma Space Corp. (United States) [7440-45]

MANIC: a robust monolithic nulling interferometer for space-based exoplanet imaging, Brian A. Hicks, Timothy A. Cook, Boston Univ. (United States); Benjamin F. Lane, Draper Labs. (United States); Supriya Chakrabarti, Boston Univ. (United States) [7440-46]

Calibrating IR optical densities for the Gemini Planet Imager Extreme Adaptive Optics Coronagraph apodizers, Anand Sivaramakrishnan, American Museum of Natural History (United States); Remi Soummer, Space Telescope Science Institute (United States); G. Lawrence Carr, Brookhaven National Lab. (United States); Christophe Dorner, Aktiwave LLC (United States); Allen T. Bolognesi, Precision Optical Imaging (United States); Neil Zimmerman, Columbia Univ. (United States); Ben R. Oppenheimer, American Museum of Natural History (United States) [7440-47]

SIM-Lite: ground and on-orbit alignment of the instrument, Frank G. Dekens, Renaud Goullioud, Jet Propulsion Lab. (United States) [7440-48]

The optical design of MARVELS spectrograph, Bo Zhao, Univ. of Florida (United States) [7440-49]

Optical design of a double pass cross-dispersed echelle spectrograph for Extremely high Precision Extrasolar planet Trackers, Bo Zhao, Univ. of Florida (United States) [7440-50]

Modeling the image distortion of echelle spectrographs with temperature and pressure changes, Frank Grupp, ShaoMing Hu, Univ.-Sternwarte München (Germany); Liang Wang, National Astronomical Observatories (China) [7440-51]

SESSION 4

Room: Conv. Ctr. 33C Wed. 8:00 to 10:10 am

Ground-based Direct Detection

8:00 am: **Ground-based direct detection (Invited Paper)**, Bruce A. Macintosh, Lawrence Livermore National Lab. (United States) [7440-21]

8:30 am: **The Subaru Coronagraphic Extreme-AO (SCEXAO) system**, Frantz Martinache, Olivier Guyon, National Astronomical Observatory of Japan/Subaru Telescope (United States) [7440-22]

8:50 am: **SPHERE: the VLT planet imager in the post FDR phase**, Francois P. Wildi, Observatoire Astronomique de l'Univ. de Genève (Switzerland); Jean-Luc Beuzit, Lab. d'Astrophysique de l'Observatoire de Grenoble (France); Markus Feldt, Max-Planck-Institut für Astronomie (Germany); David Mouillet, Lab. d'Astrophysique de l'Observatoire de Grenoble (France); Kjetil Dohlen, Observatoire Astronomique de Marseille-Provence (France); Pascal Puget, Julien Charton, Lab. d'Astrophysique de l'Observatoire de Grenoble (France); Andrea Baruffolo, Osservatorio Astronomico di Padova (Italy); Anthony Boccaletti, Observatoire de Paris à Meudon (France); Riccardo U. Claudi, Osservatorio Astronomico di Padova (Italy); Thierry Fusco, ONERA (France); Enrico Giro, Raffaele G. Gratton, Osservatorio Astronomico di Padova (Italy); Maud P. Langlois, Observatoire Astronomique de Marseille-Provence (France); Cyril Petit, ONERA (France); Johannes H. Pragt, ASTRON (Netherlands); Patrick Rabou, Lab. d'Astrophysique de l'Observatoire de Grenoble (France); Ronald Roelfsema, ASTRON (Netherlands); Michel Saisse, Observatoire Astronomique de Marseille-Provence (France); Hans Martin Schmid, ETH Zürich (Switzerland); Arthur Vigan, Observatoire Astronomique de Marseille-Provence (France) [7440-24]

Conference 7440

9:10 am: **Calibrating SPHERE, the VLT extra-solar planet imager**, Francois P. Wildi, Observatoire Astronomique de l'Univ. de Genève (Switzerland); David Mouillet, Jean-Luc Beuzit, Lab. d'Astrophysique de l'Observatoire de Grenoble (France); Andrea Baruffolo, Osservatorio Astronomico di Padova (Italy); Julien Charton, Lab. d'Astrophysique de l'Observatoire de Grenoble (France); Silvano Desidera, Osservatorio Astronomico di Padova (Italy); Kjetil Dohlen, Observatoire Astronomique de Marseille-Provence (France); Markus Feldt, Max-Planck-Institut für Astronomie (Germany); Thierry Fusco, ONERA (France); Raffaele G. Gratton, Osservatorio Astronomico di Padova (Italy); Franco Joos, ETH Zürich (Switzerland); Maud P. Langlois, Observatoire Astronomique de Marseille-Provence (France); Hans Martin Schmid, ETH Zürich (Switzerland); Arthur Vigan, Observatoire Astronomique de Marseille-Provence (France) [7440-25]

9:30 am: **The Gemini Planet Imager coronagraph testbed**, Remi Soummer, Space Telescope Science Institute (United States); Anand Sivaramakrishnan, American Museum of Natural History (United States); Alexis Carlotti, Univ. de Nice Sophia Antipolis (France); Ben R. Oppenheimer, American Museum of Natural History (United States); Brian J. Bauman, Lawrence Livermore National Lab. (United States); Leslie K. Saddlemyer, Krzysztof Caputa, National Research Council Canada (Canada); James K. Wallace, Jet Propulsion Lab. (United States) [7440-26]

9:50 am: **The Gemini Planet Imager calibration testbed**, James K. Wallace, John R. Angione, Randall D. Bartos, Santos F. Fregoso, Bijan Nemati, Laurent A. Pueyo, Jean C. Shelton, Jet Propulsion Lab. (United States) [7440-27]

Coffee Break 10:30 am

SESSION 5

Room: Conv. Ctr. 33C Wed. 11:00 am to 12:00 pm

Performance Modeling

11:00 am: **Stellar coronagraph performance impact due to particulate contamination and scatter**, Kunjithapatham Balasubramanian, Stuart B. Shaklan, Amir Give'on, Jet Propulsion Lab. (United States) [7440-28]

11:20 am: **Thermo/opto/mechanical analysis of an exoplanet coronagraph observer using Cielo and commercial tools**, Claus C. Hoff, Jet Propulsion Lab. (United States) [7440-29]

11:40 am: **A general tool for evaluating high-contrast coronagraphic telescope performance error budgets**, Luis F. Marchen, Stuart B. Shaklan, Jet Propulsion Lab. (United States) [7440-30]

Lunch/Exhibition Break 12:00 pm

SESSION 6

Room: Conv. Ctr. 33C Wed. 1:30 to 3:30 pm

Coronagraph Design, Nullers, and Transits

1:30 pm: **The JWST/NIRCam coronagraph: design and mask fabrication**, John E. Krist, John T. Trauger, Charles A. Beichman, Pierre M. Echternach, Richard Muller, Daniel W. Wilson, Eugene Serabyn, Dimitri Mawet, Jet Propulsion Lab. (United States); Yalan Mao, Stephen F. Somerstein, Scott D. Horner, Gopal Vasudevan, Lockheed Martin Space Systems Co. (United States); Douglas M. Kelly, Marcia J. Rieke, The Univ. of Arizona (United States)[7440-31]

1:50 pm: **Optical vectorial vortex coronagraph: new results and developments**, Dimitri Mawet, Eugene Serabyn, John T. Trauger, Dwight C. Moody, Jr., Kurt M. Liewer, Jet Propulsion Lab. (United States); David M. Schemo, Nada A. O'Brien, JDSU (United States) [7440-32]

2:10 pm: **Sparse aperture interferometry with a non-redundant mask on the James Webb Space Telescope**, Anand Sivaramakrishnan, American Museum of Natural History (United States); Peter G. Tuthill, Michael J. Ireland, The Univ. of Sydney (Australia); James P. Lloyd, Cornell Univ. (United States); Frantz Martinache, National Astronomical Observatory of Japan/Subaru Telescope (United States); Remi Soummer, Russell B. Makidon, Space Telescope Science Institute (United States); Rene Doyon, Univ. de Montréal (Canada) . . . [7440-33]

2:30 pm: **Current status of the assessment of the ESA Cosmic Vision mission candidate PLATO**, Ronnie N. Lindberg, Malcolm C. Fridlund, European Space Research and Technology Ctr. (Netherlands); David Lumb, European Space Agency (Netherlands); Nicola A. Rando, European Space Research and Technology Ctr. (Netherlands) [7440-35]

2:50 pm: **Advanced visible nulling facility**, Jagmit S. Sandhu, Peter R. Lawson, Jet Propulsion Lab. (United States) [7440-36]

3:10 pm: **Visible nulling coronagraph testbed results**, Richard G. Lyon, Mark C. Clampin, NASA Goddard Space Flight Ctr. (United States); Gary J. Melnick, Volker Tollu, Harvard-Smithsonian Ctr. for Astrophysics (United States); Robert A. Woodruff, Gopal Vasudevan, Lockheed Martin Space Systems Co. (United States); Maxime Rizzo, Ctr. National d'Études Spatiales (France); Patrick L. Thompson, NASA Goddard Space Flight Ctr. (United States) [7440-37]

Conference 7441A

Tuesday 4 August 2009 • Proceedings of SPIE Vol. 7441A

X-Ray, UV, Visible, and IR Instrumentation for Planetary Missions

Conference Chair: **Kurt D. Retherford**, Southwest Research Institute

Program Committee: **Michael W. Davis**, Southwest Research Institute; **Thomas K. Greathouse**, Southwest Research Institute

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

2:40 pm: **SwRI's "Alice" line of ultraviolet spectrographs**, Kurt D. Retherford, S. Alan Stern, David C. Slater, G. Randall Gladstone, Michael W. Davis, Joel W. Parker, Maarten H. Versteeg, Andrew J. Steffl, Thomas K. Greathouse, Nathaniel J. Cunningham, Southwest Research Institute (United States)[7441A-05]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **CRISM Scan System**, Kim Strohbehn, Teck Choo, John R. Hayes, Gene A. Heylar, William J. Lees, Dave A. Lohr, The Johns Hopkins Univ. Applied Physics Lab. (United States); Gordon Seagrave, NASA Goddard Space Flight Ctr. (United States)[7441A-06]

3:50 pm: **Stationary Wave Integrated Fourier Transform Spectrometer (SWIFTS)**, Jérôme Ferrand, Etienne P. Le Coarer, Lab. d'Astrophysique de l'Observatoire de Grenoble (France); Guillaume Custillon, Alain Morand, Ecole Nationale Supérieure d'Electronique et de Radioélectrique de Grenoble (France)[7441A-07]

4:10 pm: **MoonShot: a combined Raman/LIBS instrument for lunar exploration**, Erik C. Laan, TNO (Netherlands); Wim van Westrenen, Vrije Univ. (Netherlands); Arno A. Wielders, Space Horizon (Netherlands); Jeannette Hellegers, TNO (Netherlands)[7441A-08]

4:30 pm: **The Mercury Imaging X-ray Spectrometer: instrument overview**, Adrian Martindale, George W. Fraser, James F. Pearson, Univ. of Leicester (United Kingdom); James D. Carpenter, European Space Research and Technology Ctr. (Netherlands); Chris Whitford, Univ. of Leicester (United Kingdom); Ed Sclater, Ivan Delgado, Magna Parva Ltd. (United Kingdom); David A. Rothery, The Open Univ. (United Kingdom); Johannes Treis, Max-Planck-Institut für extraterrestrische Physik (Germany); Miguel Mas-Hesse, Lab. for Space Astrophysics and Theoretical Physics (Spain); Karri Muinonen, Univ. of Helsinki (Finland)[7441A-09]

4:50 pm: **DEPFET-based instrumentation for the MIXS focal plane on BepiColombo**, Johannes Treis, Max-Planck-Institut für Sonnensystemforschung (Germany) and MPI Halbleiterlabor (Germany); Laci Andricek, Max-Planck-Institut für Physik (Germany) and MPI Halbleiterlabor (Germany); Giulio de Vita, Olaf Häcker, Max-Planck-Institut für extraterrestrische Physik (Germany); Klaus Heinzinger, PNSensor GmbH (Germany) and MPI Halbleiterlabor (Germany); Sven Herrmann, Max-Planck-Institut für extraterrestrische Physik (Germany); Martin Hilchenbach, Max-Planck-Institut für Sonnensystemforschung (Germany); Thomas Lauf, Max-Planck-Institut für extraterrestrische Physik (Germany); Peter H. Lechner, Gerhard Lutz, PNSensor GmbH (Germany) and MPI Halbleiterlabor (Germany); Matteo Porro, Max-Planck-Institut für extraterrestrische Physik (Germany); Rainer H. Richter, Max-Planck-Institut für Physik (Germany) and MPI Halbleiterlabor (Germany); Gerhard Schaller, Max-Planck-Institut für extraterrestrische Physik (Germany); Martina Schneck, Max-Planck-Institut für Physik (Germany) and MPI Halbleiterlabor (Germany); Florian Schopper, Max-Planck-Institut für extraterrestrische Physik (Germany); Gabriele Segneri, PNSensor GmbH (Germany); Heike Soltau, PNSensor GmbH (Germany) and MPI Halbleiterlabor (Germany); Lothar W. Strüder, Max-Planck-Institut für extraterrestrische Physik (Germany)[7441A-10]

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 33B Tues. 1:20 to 5:10 pm

X-Ray, UV, Visible, and IR Instrumentation for Planetary Missions

Session Chair: **Kurt D. Retherford**, Southwest Research Institute

1:20 pm: **Planetary science experiments as hosted payloads on commercial satellites**, Eliot F. Young, Catherine B. Olkin, Randy Rose, Southwest Research Institute (United States); Phillip C. Kalmanson, Orbital Sciences Corp. (United States); Russell R. Mellon, Equinox Interscience Inc. (United States) [7441A-01]

1:40 pm: **In-flight performance of the New Horizons long-range reconnaissance imager**, Matthew W. Noble, Steven Conard, Harold A. Weaver, John R. Hayes, Andrew F. Cheng, The Johns Hopkins Univ. Applied Physics Lab. (United States)[7441A-02]

2:00 pm: **In-flight performance of MESSENGER's Mercury dual imaging system**, S. Edward Hawkins III, Edward H. Darlington, Matthew W. Noble, Louise M. Prockter, Scott L. Murchie, The Johns Hopkins Univ. Applied Physics Lab. (United States); Mark S. Robinson, Brett W. Denevi, Arizona State Univ. (United States); Sean C. Solomon, Carnegie Institution of Washington (United States)[7441A-03]

2:20 pm: **Radiometric performance results of the Lunar Reconnaissance Orbiter's Lyman Alpha Mapping Project (LRO/LAMP) imaging spectrograph**, Michael W. Davis, David C. Slater, G. Randall Gladstone, Southwest Research Institute (United States); Thomas K. Greathouse, Southwest Research Institute (United States) and Lunar and Planetary Institute (United States); Kurt D. Retherford, Maarten H. Versteeg, Ronald K. Black, Southwest Research Institute (United States)[7441A-04]

Conference 7441A

Wednesday 5 August

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

The Mercury Imaging X-ray Spectrometer: optics design and characterisation, Adrian Martindale, George W. Fraser, James F. Pearson, Univ. of Leicester (United Kingdom); James D. Carpenter, European Space Research and Technology Ctr. (Netherlands); Chris Whitford, Univ. of Leicester (United Kingdom); Emile Schyns, Ray Fairbend, Photonis France S.A.S. (France); Richard Willingale, Univ. of Leicester (United Kingdom); Ed Sclater, Ivan Delgado, Magna Parva Ltd. (United Kingdom); Matti Kaipainen, Oxford Instruments Analytical Oy (Finland); Julien Seguy, Photonis France S.A.S. (France) [7441A-11]

Development of a silicon drift detector array: x-ray fluorescence spectrometer for remote surface mapping, Jessica A. Gaskin, NASA Marshall Space Flight Ctr. (United States); Gabriella A. Carini, Wei Chen, Gianluigi DeGeronimo, Brookhaven National Lab. (United States); Ronald F. Elsner, NASA Marshall Space Flight Ctr. (United States); Jeffrey W. Keister, SFA, Inc. (United States); Georgiana Kramer, The Bear Fight Ctr. (United States); Zheng Li, Brookhaven National Lab. (United States); Brian D. Ramsey, NASA Marshall Space Flight Ctr. (United States); Pavel Rehak, D. Peter Siddons, Brookhaven National Lab. (United States) [7441A-12]

Conference 7441B

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7441B

Instruments, Methods, and Missions for Astrobiology XII

Conference Chairs: **Richard B. Hoover**, NASA Marshall Space Flight Ctr.; **Gilbert V. Levin**, Arizona State Univ.; **Alexei Yu. Rozanov**, Paleontological Institute (Russian Federation)

Program Committee: **Oleg N. Abramenko**, Lomonosov Moscow State Univ. (Russian Federation); **Sabit S. Abyzov**, Institute of Microbiology (Russian Federation); **Marina M. Astafieva**, Paleontological Institute (Russian Federation); **Stanley M. Awramik**, Univ. of California, Santa Barbara; **Asim Bej**, The Univ. of Alabama at Birmingham; **Adrian J. Brown**, SETI Institute; **Mark J. Burchell**, Univ. of Kent (United Kingdom); **Nathalie A. Cabrol**, NASA Ames Research Ctr.; **Julian Chela-Flores**, The Abdus Salam International Ctr. for Theoretical Physics (Italy); **Bin Chen**, NASA Ames Research Ctr.; **Michael H. Engel**, Univ. of Oklahoma; **Valery Galchenko**, Institute of Microbiology (Russian Federation); **Victor A. Gallardo**, Univ. de Concepción (Chile); **Everett J. Gibson**, NASA Johnson Space Ctr.; **Todd M. Holden**, CUNY/Queensborough Community College; **Vera M. Kolb**, Univ. of Wisconsin/Parkside; **A. Santhosh Kumar**, Mahatma Gandhi Univ. (India); **Laurence Lemelle**, École Normale Supérieure de Lyon (France); **Jere H. Lipps**, Univ. of California, Berkeley; **Godfrey Louis**, Cochin Univ. of Science & Technology (India); **David S. McKay**, NASA Johnson Space Ctr.; **P. K. Mukhopadhyay**, Global Geoenergy Research Ltd. (Canada); **Randall S. Perry**, Imperial College London (United Kingdom); **Elena V. Pikuta**, National Space Science and Technology Ctr.; **Joseph Seckbach**, The Hebrew Univ. of Jerusalem (Israel); **Michael C. Storrie-Lombardi**, Kinohi Institute; **Henry Sun**, Desert Research Institute; **George Tremberger, Jr.**, CUNY/Queensborough Community College; **Esta Van Heerden**, Univ. of the Free State (South Africa); **Nalin Chandra Wickramasinghe**, Cardiff Univ. (United Kingdom)

Sunday 2 August

Room: Conv. Ctr. Room 6A Sun. 3:30 to 5:00 pm

Astronomical Optics and Instrumentation Plenary Session

10% of the Telescope: 40 Years of Adaptive Optics

Robert K. Tyson, The Univ. of North Carolina at Charlotte
(United States)

TMT and Segmented Mirror Telescopes

Jerry Nelson, Univ. of California, Santa Cruz (United States)

Prospects for Direct Imaging and Characterization of Exoplanets from Space

Stuart B. Shaklan, Jet Propulsion Lab. (United States)

See page 12 for presentation details.

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space
Research (USA)

See page 13 for presentation details.

Tuesday 4 August

Room: Conv. Ctr. 32B Tues. 1:00 to 1:10 pm

Welcome and Introductions

Session Chairs: **Richard B. Hoover**, NASA Marshall Space Flight Ctr.;
Gilbert V. Levin, Arizona State Univ.

SESSION 1

Room: Conv. Ctr. 32B Tues. 1:10 to 2:30 pm

Microfossils and Biomarkers in Meteorites and Ancient Terrestrial Rocks I

Session Chairs: **Michael H. Engel**, Univ. of Oklahoma; **Marina M. Astafieva**, Paleontological Institute (Russian Federation)

1:10 pm: **Alh84001 and other Martian meteorites: an update and status report** (*Invited Paper*), David S. McKay, NASA Johnson Space Ctr. (United States); Kathy L. Thomas-Keprta, Lockheed Martin Space Operations (United States); Simon J. Clemett, Everett J. Gibson, NASA Johnson Space Ctr. (United States); Susan J. Wentworth, Lockheed Martin Space Operations (United States); Lauren Spencer, NASA Johnson Space Ctr. (United States). [7441B-01]

1:40 pm: **Microfossils in carbonaceous meteorites**, Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States) [7441B-02]

2:05 pm: **Microfossils and volcanic glasses in pillow-lavas (ancient and recent)**, Marina M. Astafieva, Alexei Y. Rozanov, Paleontological Institute (Russian Federation); Eugene Sharkov, Alexei Chistyakov, Maria Bogina, Institute of Geology of Ore Deposits, Petrography, Mineralogy, and Geochemistry (Russian Federation); Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States) [7441B-03]

Coffee Break 2:50 pm

SESSION 2

Room: Conv. Ctr. 32B Tues. 3:20 to 4:45 pm

Microfossils and Biomarkers in Meteorites and Ancient Terrestrial Rocks II

Session Chairs: **Vera M. Kolb**, Univ. of Wisconsin-Parkside; **Victor A. Gallardo**, Univ. de Concepción (Chile)

3:20 pm: **Partial racemization of amino acids in meteorites: implications for their possible modes of origin** (*Invited Paper*), Michael H. Engel, Univ. of Oklahoma (United States) [7441B-04]

3:50 pm: **On the search for the amino acids on the lunar surface as it relates to other extraterrestrial bodies**, Vera M. Kolb, Univ. of Wisconsin-Parkside (United States); Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States) [7441B-05]

4:15 pm: **Fossil microorganisms and formation of Early Precambrian weathering crusts** (*Invited Paper*), Marina M. Astafieva, Alexei Y. Rozanov, Paleontological Institute (Russian Federation); Alexander B. Vrevsky, Nadezhda Alfimova, Vyacheslav Matrenichev, Institute of Precambrian Geology and Geochronology (Russian Federation); Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States) [7441B-06]

Room: Marriott Hotel Marina F Tues. 8:00 to 10:00 pm

Panel Discussion: Life in the Cosmos

Panel Moderators: **Richard B. Hoover**, NASA Marshall Space Flight Ctr.; **David S. McKay**, NASA Johnson Space Ctr.

Panelists: **Asim Bej**, The Univ. of Alabama at Birmingham; **Michael H. Engel**, Univ. of Oklahoma; **Victor A. Gallardo**, Univ. de Concepción (Chile); **Gilbert V. Levin**, Arizona State Univ.; **Nilton O. Renno**, Univ. of Michigan; **Michael C. Storrie-Lombardi**, Kinohi Institute

Conference 7441B

Wednesday 5 August

SESSION 3

Room: Conv. Ctr. 32B Wed. 8:00 to 9:55 am

Instrumentation for Astrobiology

Session Chairs: **Asim Bej**, The Univ. of Alabama at Birmingham; **Nilton O. Renno**, Univ. of Michigan

8:00 am: **A spectroscopic polarimeter for detecting chiral signatures in astrobiological samples** (*Invited Paper*), Baoliang B. Wang, Hinds Instruments, Inc. (United States); William Sparks, Space Telescope Science Institute (United States); Thomas A. Germer, National Institute of Standards and Technology (United States) [7441B-07]

8:30 am: **Laser Induced Fluorescence Emission (L.I.F.E.): biodiversity in the ice cover of Lake Untersee, Dronning Maud Land, Antarctica** (*Invited Paper*), Michael C. Storrie-Lombardi, Kinohi Institute (United States); Birgit I. Sattler, Roland Psenner, Leopold-Franzens-Univ. Innsbruck (Austria); Asim Bej, The Univ. of Alabama at Birmingham (United States); Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States) [7441B-08]

9:00 am: **Integrated ray tracing simulation of spectral bio-signatures from full 3D earth model** (*Invited Paper*), Dongok Ryu, Yonsei Univ. (Korea, Republic of); Jae-Min Lee, Univ. of Oxford (United Kingdom); Jinsuk Hong, I&A Technology (Korea, Republic of); Sun Jeong Ham, Soomin Jeong, Yukyong Jeong, Sug-Whan Kim, Yonsei Univ. (Korea, Republic of) [7441B-09]

9:30 am: **A micro fluorescent activated cell sorter for astrobiology applications**, Donald Platt, Micro Aerospace Solutions, Inc. (United States); Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States) [7441B-10]

Coffee Break 9:55 am

SESSION 4

Room: Conv. Ctr. 32B Wed. 10:25 am to 12:15 pm

Mars, Venus, and Astrobiology I

Session Chairs: **Donald Platt**, Micro Aerospace Solutions, Inc.; **Michael C. Storrie-Lombardi**, Kinohi Institute

10:25 am: **The discovery of liquid water on Mars and its implications for astrobiology** (*Invited Paper*), Nilton O. Renno, Univ. of Michigan, Ann Arbor (United States); Brent J. Bos, NASA Goddard Space Flight Ctr. (United States); David Catling, Univ. of Washington (United States); Benton C. Clark, Lockheed Martin Space Systems Co. (United States); Line Drube, Niels Bohr Institute, Univ. of Copenhagen (Denmark); David Fisher, Univ. of Ottawa (Canada); Walter Goetz, Max-Planck-Institut für Sonnensystemforschung (Germany); Stubbe Hviid, Niels Bohr Institute, Univ. of Copenhagen (Denmark); Horst U. Keller, Max-Planck-Institut für Sonnensystemforschung (Germany); Jasper F. Kok, Univ. of Michigan, Ann Arbor (United States); Samuel P. Kounaves, Tufts Univ. (United States); Kristoffer Leer, Niels Bohr Institute, Univ. of Copenhagen (Denmark); Mark T. Lemmon, Texas A&M Univ. (United States); Morten Madsen, Niels Bohr Institute, Univ. of Copenhagen (Denmark); Wojciech J. Markiewicz, Max-Planck-Institut für Sonnensystemforschung (Germany); John R. Marshall, Carl Sagan Ctr., SETI Institute (United States); Christopher P. McKay, NASA Ames Research Ctr. (United States); Manish Mehta, Univ. of Michigan, Ann Arbor (United States); Miles T. Smith, Jet Propulsion Lab. (United States); M. P. Zorzano, Ctr. de Astrobiología (Spain); Peter H. Smith, The Univ. of Arizona (United States); Carol R. Stoker, NASA Ames Research Ctr. (United States); Suzanne M. M. Young, Tufts Univ. (United States) [7441B-11]

10:55 am: **Methane and life on Mars** (*Invited Paper*), Gilbert V. Levin, Arizona State Univ. (United States); Patricia A. Straat, National Institutes of Health (United States) [7441B-12]

11:25 am: **Oxidation of organic materials with perchlorates: Relevance to the chemistry on the Martian surface** (*Invited Paper*), Vera M. Kolb, Univ. of Wisconsin-Parkside (United States) [7441B-13]

11:50 am: **The mechanism of frost cracks formation and evolution in high latitudes on Mars**, Oleg N. Abramenko, Vladislav Isaev, Ilya Komarov, Lomonosov Moscow State Univ. (Russian Federation) [7441B-33]

Lunch/Exhibition Break 12:15 pm

SESSION 5

Room: Conv. Ctr. 32B Wed. 1:20 to 2:40 pm

Mars, Venus, and Astrobiology II

Session Chairs: **David S. McKay**, NASA Johnson Space Ctr.; **Charles V. Rice**, Univ. of Oklahoma

1:20 pm: **Multi-fractal property of perchlorate reductase gene sequences and DNA photonics application to UV fluorescence detection on Mars-like surfaces** (*Invited Paper*), George Tremberger, Jr., Eric Cheung, N. Gadura, Todd M. Holden, Raji Subramaniam, Regina Sullivan, Pat S. Schneider, Alex Flamholz, David H. Lieberman, Tak D. Cheung, Queensborough Community College (United States) [7441B-14]

1:50 pm: **Can Venus shed microbes**, Gregory A. Konesky, K-Plasma Ltd. (United States) [7441B-15]

2:15 pm: **Raman imaging technique for a high throughput field detections**, Bin Chen, NASA Ames Research Ctr. (United States) [7441B-34]

Coffee Break 2:40 pm

SESSION 6

Room: Conv. Ctr. 32B Wed. 3:10 to 5:30 pm

Microbial Extremophiles I

Session Chair: **Prasanta K. Mukhopadhyay**, Global Geoenergy Research Ltd. (Canada)

3:10 pm: **Differences in diversity and distribution of bacterial communities in the lakes of Schirmacher Oasis, Antarctica** (*Invited Paper*), Nazia Mojib, Jonathan Huang, The Univ. of Alabama at Birmingham (United States); Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States); Elena V. Pikuta, The Univ. of Alabama at Huntsville (United States); Michael C. Storrie-Lombardi, Kinohi Institute (United States); Dale Andersen, SETI Institute (United States); Asim Bej, The Univ. of Alabama at Birmingham (United States) [7441B-17]

3:40 pm: **Anaerobic psychrophiles from Lake Zub and Lake Untersee, Antarctica**, Alisa M. Townsend, Elena V. Pikuta, Melissa D. Guisler, Richard B. Hoover, National Space Science and Technology Ctr. (United States) [7441B-18]

4:05 pm: **Psychrotolerant anaerobes from Lake Podprudnoe, Antarctica and penguin Spheniscus demersus colony, South Africa**, Melissa D. Guisler, Elena V. Pikuta, Alisa M. Townsend, Richard B. Hoover, National Space Science and Technology Ctr. (United States) [7441B-19]

4:30 pm: **Cryoprotection from bacterial teichoic acid** (*Invited Paper*), Charles V. Rice, William Harrison, Karl Kirkpatrick, Univ. of Oklahoma (United States); Eric D. Brown, McMaster Univ. (Canada) [7441B-20]

5:00 pm: **An optical spectroscopic study correlating the yellow rain and cultured red rain microbes** (*Invited Paper*), A. Santhosh Kumar, Mahatma Gandhi Univ. (India); Godfrey Louis, Cochin Univ. of Science & Technology (India) [7441B-21]

Thursday 6 August

SESSION 7

Room: Conv. Ctr. 32B Thurs. 8:00 to 9:50 am

Microbial Extremophiles II

Session Chairs: **Melisa Guissler**, The Univ. of Alabama in Huntsville;
Gregory A. Konesky, K-Plasma Ltd.

- 8:00 am: **High throughput 454 pyrosequencing to assess benthic bacteria biodiversity off central Chile** (*Invited Paper*), Victor A. Gallardo, Homero Urrutia, Carola S. Espinoza, Univ. de Concepción (Chile) [7441B-22]
- 8:30 am: **Life in ice: implications to astrobiology**, Richard B. Hoover, NASA Marshall Space Flight Ctr. (United States) [7441B-23]
- 8:55 am: **Decomposition of alternative chirality amino acids by alkaliphilic anaerobe from Owens Lake, California**, Alisa M. Townsend, Elena V. Pikuta, Melissa D. Guisler, Richard B. Hoover, National Space Science and Technology Ctr. (United States) [7441B-24]
- 9:20 am: **Nucleotide fluctuation of radiation-resistant Halobacterium sp. NRC-1 single-stranded DNA-binding protein (RPA) genes** (*Invited Paper*), Todd M. Holden, George Tremberger, Jr., Eric Cheung, Raji Subramaniam, Regina Sullivan, N. Gadura, Pat S. Schneider, Alex Flamholz, David H. Lieberman, Tak D. Cheung, Queensborough Community College (United States) [7441B-25]
- Coffee Break 9:50 am

SESSION 8

Room: Conv. Ctr. 32B Thurs. 10:20 am to 12:55 pm

Astrobiology and Planetary Protection

Session Chairs: **Alisa M. Townsend**, National Space Science and Technology Ctr.; **A. Santhosh Kumar**, Mahatma Gandhi Univ. (India)

- 10:20 am: **Origin of petroleum within our solar system, a review: emphasis on the future prospects of major oil and gas discovery within Mars and moons of various planets** (*Invited Paper*), Prasanta K. Mukhopadhyay, Global Geoenergy Research Ltd. (Canada); David J. Mossman, James M. Ehrman, Mt. Allison Univ. (Canada) [7441B-26]
- 10:50 am: **There's more to panspermia than meets the eye**, Brig Klyce, Astrobiology Research Trust (United States) [7441B-27]
- 11:15 am: **On the applicability of the identity problem to astrobiology**, Vera M. Kolb, Univ. of Wisconsin-Parkside (United States) [7441B-28]
- 11:40 am: **Astrobiology and green chemistry: a new pedagogical connection**, Vera M. Kolb, Univ. of Wisconsin-Parkside (United States) [7441B-29]
- 12:30 pm: **The Drake Equation revisited**, Gregory A. Konesky, K-Plasma Ltd. (United States) [7441B-30]

SPIE Optics+Photonics papers are available in 2–4 weeks.



Conference 7442

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7442

Optics and Photonics for Information Processing III

Conference Chairs: **Khan M. Iftakharuddin**, The Univ. of Memphis; **Abdul Ahad Sami Awwal**, Lawrence Livermore National Lab.

Program Committee: **Henri H. Arsenault**, Univ. Laval (Canada); **George Barbastathis**, Massachusetts Institute of Technology; **David P. Casasent**, Carnegie Mellon Univ.; **H. John Caulfield**, Diversified Research Corp.; **Yeshaiahu Fainman**, Univ. of California, San Diego; **Pietro Ferraro**, Istituto Nazionale di Ottica Applicata (Italy); **Laurence G. Hassebrook**, Univ. of Kentucky; **Kazuyoshi Itoh**, Osaka Univ. (Japan); **Mohammad A. Karim**, Old Dominion Univ.; **Robert Magnusson**, Univ. of Connecticut; **Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control; **Mohammad A. Matin**, Univ. of Denver; **Osamu Matoba**, Kobe Univ. (Japan); **Alastair D. McAulay**, Lehigh Univ.; **Nasser M. Nasrabadi**, Army Research Lab.; **Thomas J. Naughton**, National Univ. of Ireland/Maynooth (Ireland); **Takanori Nomura**, Wakayama Univ. (Japan); **Ting-Chung Poon**, Virginia Polytechnic Institute and State Univ.; **Philippe Réfrégier**, Institut Fresnel (France); **Nabeel A. Riza**, College of Optics & Photonics/Univ. of Central Florida; **Joseph Rosen**, Ben-Gurion Univ. of the Negev (Israel); **Firooz A. Sadjadi**, Lockheed Martin Maritime Systems & Sensors; **John T. Sheridan**, National Univ. of Ireland, Dublin (Ireland); **Jung-Young Son**, Hanyang Univ. (Korea, Republic of); **Clay James Stanek**, DataPath, Inc.; **Enrique Tajahuerce**, Univ. Jaume I (Spain); **Jun Tanida**, Osaka Univ. (Japan); **Shyh-Lin Tsao**, Cherry Tree Consulting Co. (Taiwan); **Cardinal Warde**, Massachusetts Institute of Technology; **Frank Wyrowski**, Friedrich-Schiller-Univ. Jena (Germany); **Toyohiko Yatagai**, Utsunomiya Univ. (Japan); **Francis T. S. Yu**, The Pennsylvania State Univ.; **Maria Josefa Yzuel**, Univ. Autònoma de Barcelona (Spain)

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 17A Tues. 1:30 to 3:10 pm

Optical Switching/Communication

Session Chair: **Alastair D. McAulay**, Lehigh Univ.

1:30 pm: **A novel 2-D adaptive Wiener filter based algorithm for mitigation of atmospheric turbulence effects in deep space optical communication**, Ali J. Hashmi, Ali Asghar Eftekhar, Ali Adibi, Georgia Institute of Technology (United States); Farid Amoozegar, Jet Propulsion Lab. (United States) [7442-01]

1:50 pm: **Digital crossbar switch using nonlinear optical ring resonator**, Alastair D. McAulay, Lehigh Univ. (United States) [7442-02]

2:30 pm: **Single photon avalanche photodiode detection process study**, Josef Blazej, Ivan Prochazka, Czech Technical Univ. in Prague (Czech Republic) [7442-04]

Coffee Break 3:10 pm

SESSION 2

Room: Conv. Ctr. 17A Tues. 3:40 to 4:20 pm

Holography I

Session Chair: **H. John Caulfield**, Diversified Research Corp.

3:40 pm: **Speed up of Fresnel transforms for Digital holography using pre-computed chirp and GPU processing**, Nitesh Pandey, Bryan M. Hennelly, Damien P. Kelly, National Univ. of Ireland, Maynooth (Ireland); Thomas J. Naughton, Univ. of Oulu (Finland) and National Univ. of Ireland, Maynooth (Ireland) [7442-06]

4:00 pm: **Multispectral lensless digital holographic microscope: imaging MCF-7 and MDA-231 cancer cell cultures**, James P. Ryle, Univ. College Dublin (Ireland); Karen M. Molony, National Univ. of Ireland, Maynooth (Ireland); Susan McDonnell, National Univ. of Ireland, Dublin (Ireland); Thomas J. Naughton, Univ. College Dublin (Ireland) and Univ. of Oulu (Finland); John T. Sheridan, Univ. College Dublin (Ireland) [7442-07]

Wednesday 5 August

SESSION 3

Room: Conv. Ctr. 17A Wed. 8:00 am to 12:40 pm

Hybrid Signal/Image Processing

Session Chairs: **Robert R. Muise**, Lockheed Martin Missiles and Fire Control; **Randy S. Roberts**, Lawrence Livermore National Lab.

Joint Session with Conference 7444B: Advanced Signal Processing Algorithms, Architectures, and Implementations XIX

8:30 am: **Signal and image processing research at the Lawrence Livermore National Laboratory (Invited Paper)**, Randy S. Roberts, Lawrence Livermore National Lab. (United States) [7442-10]

9:00 am: **Feature registration and matching of intra-subject brain MRI using invariant SIFT extractor**, Dakshina R. Kisku, BCREC (India); Hunny Mehrotra, National Institute of Technology Rourkela (India); Ajita Rattani, Univ. degli Studi di Cagliari (Italy); Jamuna K. Sing, Jadavpur Univ. (India); Phalguni Gupta, Indian Institute of Technology Kanpur (India) [7442-11]

9:20 am: **Real-time Fpga implementation of rotation and scale-invariant template matching**, Henrique P. Nobre, OPTOVAC (Brazil); Hae Yong Kim, Univ. de São Paulo (Brazil) [7444B-34]

9:40 am: **Implementation of the traveling salesman problem based on pattern processing with a graphics processing unit**, Kouichi Nitta, Shinichi Ohta, Osamu Matoba, Kobe Univ. (Japan) [7442-12]

10:00 am: **Image denoising and quality assessment through the Rényi entropy**, Gabriel Cristóbal, Salvador Gabarda, Elena Gil, Consejo Superior de Investigaciones Científicas (Spain) [7444B-35]

Coffee Break 10:00 to 10:30 am

10:50 am: **Adaptive compressive sensing of specific objects (Invited Paper)**, Abhijit Mahalanobis, Robert R. Muise, Lockheed Martin Missiles and Fire Control (United States) [7442-13]

11:20 am: **A method for traveling sales man problem by use of pattern processing with image compression**, Kouichi Nitta, Shinichi Ohta, Osamu Matoba, Kobe Univ. (Japan) [7442-14]

11:40 am: **The self-synchronized iterative detection network based restoration of blurred dichromatic images obtained by CCD/CMOS camera with imperfectly adjusted lens**, Daniel Kekrt, Czech Technical Univ. in Prague (Czech Republic) [7444B-36]

12:00 pm: **Image registration using cellular simultaneous recurrent networks**, John K. Anderson, Khan M. Iftakharuddin, The Univ. of Memphis (United States) [7442-15]

12:20 pm: **Improving the accuracy of the ultra fast**, Vinay Sriram, Imperial College London (United Kingdom) [7442-16]

Lunch/Exhibition Break 12:40 pm

SESSION 4

Room: Conv. Ctr. 17A Wed. 2:10 to 3:30 pm

Optical Imaging I

Session Chair: **Khan M. Iftikharuddin**, The Univ. of Memphis

2:10 pm: **SLM-based phase-contrast filtering for single and multiple image acquisition**, Michael Warber, Tobias Haist, Susanne Zwick, Johannes Goetz, Wolfgang Osten, Univ. Stuttgart (Germany) [7442-17]

2:30 pm: **Application of the Talbot effect for three-dimensional and step-height measurement using a LCD**, Elizabeth Vela-Esparza, Univ. de las Américas Puebla (Mexico); Ponciano Rodriguez-Montero, Gustavo Ramirez-Zavaleta, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Marco Antonio Rosales-Medina, Univ. de las Américas Puebla (Mexico); Eduardo Tepichin-Rodriguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7442-18]

2:50 pm: **Influence of the temporal fluctuations phenomena on the LCoS Parallel Aligned performance**, Angel Lizana, Univ. Autònoma de Barcelona (Spain); Ignacio Soriano Moreno, Univ. Miguel Hernández de Elche (Spain); Andrés Ruiz Márquez, Univ. de Alicante (Spain); Claudio C. Lemmi, Univ. de Buenos Aires (Argentina); Elena Also, Juan Campos, María Josefa Yzuel, Univ. Autònoma de Barcelona (Spain) [7442-19]

3:10 pm: **Femtosecond laser fabrication of scattering medium by randomly distributed holes in polymers**, Osamu Matoba, Yuri Kitamura, Tomoyuki Manabe, Kouichi Nitta, Kobe Univ. (Japan); Wataru Watanabe, National Institute of Advanced Industrial Science and Technology (Japan) [7442-20]
Coffee Break 3:30 pm

SESSION 5

Room: Conv. Ctr. 17A Wed. 4:00 to 5:20 pm

Imaging II

4:00 pm: **Adaptive high-speed high-resolution quantization for image sensors**, Yefim S. Poberezhskiy, SAIC (United States) [7442-21]

4:20 pm: **Novel X - ray optics for medical diagnostic techniques**, Armen V. Kuyumchyan, Institute of Microelectronics Technology and High Purity Materials (Russian Federation); Victor Arvanian, Stony Brook Univ. (United States); David A. Kuyumchyan, Glendale College (United States); Evgeni V. Shulakov, Institute of Microelectronics Technology and High Purity Materials (Russian Federation) [7442-22]

4:40 pm: **A progressive refinement iterative algorithm for 3D cone-beam CT image reconstruction**, Xing Zhao, Capital Normal Univ. (China); Jingjing Hu, Beijing Institute of Technology (China) [7442-23]

5:00 pm: **Dual deterministic phase unwrapping method for real-time 3D shape measurement**, Nobukazu Yoshikawa, Syogo Yamazaki, Saitama Univ. (Japan) [7442-24]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Compensating algorithm of nonlinear phase errors using scan filter in SAIL, Nan Xu, Liren Liu, Wei Lu, Shanghai Institute of Optics and Fine Mechanics (China) [7442-37]

Algorithm of matched filtering overcoming nonlinear chirp effect in synthetic aperture ladar, Wei Lu, Liren Liu, Nan Xu, Yu Zhou, Jianfeng Sun, De'an Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7442-38]

Study and analysis of the performance of acousto-optic correlators, Oussama Bazzi, Lebanese Univ. (Lebanon) [7442-39]

Efficient generation of holographic crawl caption in holographic 3D TV, Seung-Cheol Kim, Eun-Soo Kim, Kwangwoon Univ. (Korea, Republic of) [7442-40]

Recognition of 3-D objects from computationally reconstructed integral images using 3-D reference image, Seung-Cheol Kim, Seok-Chan Park, Eun-Soo Kim, Kwangwoon Univ. (Korea, Republic of) [7442-41]

Study of non-linear phase error correction technique for synthetic aperture ladar, De'an Liu, Enwen Dai, Nan Xu, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7442-42]

Resolution enhancement method based on the backward computational integral imaging reconstruction using the interpolation technique, Peter-Byung-Hoon Han, Yongri Piao, Kwangwoon Univ. (Korea, Republic of); Dong-Hak Shin, Dongseo Univ. (Korea, Republic of); Eun-Soo Kim, Kwangwoon Univ. (Korea, Republic of) [7442-43]

Optical spatial processor for parallel matrix conversions, Olena V. Dronenko, Natalia I. Zabolotna, Vinnitsa State Technical Univ. (Ukraine) [7442-44]

Improvement of pattern recognition with a heuristic design of correlation filters, Oskardie Castro-Chicatti, Victor H. Diaz-Ramirez, Arnoldo Diaz-Ramirez, Instituto Tecnológico de Mexicali (Mexico); Vitaly I. Kober, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) [7442-45]

Theory, design and micron-scale implementation of fully-optical logic gates and optical clock circuits, Akbar Rahmani Nejad, Independent Researcher (Iran, Islamic Republic of) [7442-46]

Real-time 3D imaging capture and real object reconstruction, Chi-Ching Chang, MingDao Univ. (Taiwan); Ming Chung Shiu, National Defense Univ. (Taiwan) [7442-47]

Plasmonic excitation for high-efficiency photovoltaic, Bader H. Alhasson, Mohammad A. Matin, Univ. of Denver (United States) [7442-48]

Capture and projection of real world objects from an inline digital holographic setup, James P. Ryle, Guohai Situ, David S. Monaghan, Univ. College Dublin (Ireland); Unnikrishnan Gopinathan, Univ. College Dublin (Ireland) and Instrument Research and Development Establishment (India); Susan McDonnell, John T. Sheridan, Univ. College Dublin (Ireland) [7442-49]

Spatial integrating joint transform correlator for pattern recognition by use of an infinite grating filter, Jorge Luis Flores-Núñez, Univ. de Guadalajara (Mexico); Jose A. Ferrari, Univ. de la República (Uruguay); Guillermo Garcia-Torales, Jorge Sanchez Preciado, Univ. de Guadalajara (Mexico) [7442-50]

Improved design of optical ID tags for remote validation, Elisabet Pérez-Cabré, Sergi Horrillo, María S. Millán, Univ. Politècnica de Catalunya (Spain); Bahram Javidi, Univ. of Connecticut (United States) [7442-51]

A Model for Simulation of Electrically-Evoked Neural Responses, Douglas Miller, Mohammad A. Matin, Univ. of Denver (United States) [7442-52]

Avoiding the false peaks in correlation discrimination, Abdul A. S. Awwal, Lawrence Livermore National Lab. (United States) [7442-53]

Object detection in hyperspectral imagery using normalized cross-spectrum energy, Mohamed I. Elbakary, Mohammad S. Alam, Univ. of South Alabama (United States) [7442-57]

An a posteriori experiment in polarization holography: reflecting holograms, Vladimir I. Tarasashvili, Anna L. Purtseladze, Institute of Cybernetics (Georgia) [7442-08]

Design of a dynamically configurable OADM device, Cuixia Dai, Shanghai Institute of Technology (China) [7442-05]

Thursday 6 August

SESSION 6

Room: Conv. Ctr. 17A Thurs. 8:30 to 11:50 am

Optical Signal/Image Processing

Session Chair: **Mohammad S. Alam**, Univ. of South Alabama

8:30 am: **Pattern Recognition in Hyperspectral Imagery Using Spectral JTC (Invited Paper)** (Invited Paper), Mohammad S. Alam, Univ. of South Alabama (United States) [7442-25]

8:50 am: **Optical spatial-frequency correlation system for biometric authentication**, Hiroyuki Yoshimura, Kazuyuki Takeishi, Chiba Univ. (Japan) [7442-26]

9:10 am: **Applications of the programmable two-dimensional optical fractional Fourier processor**, Jose A. Rodrigo, Consejo Superior de Investigaciones Científicas (Spain); Tatiana Alieva, Univ. Complutense de Madrid (Spain); Gabriel Cristóbal, Consejo Superior de Investigaciones Científicas (Spain); María L. Calvo, Univ. Complutense de Madrid (Spain) [7442-27]

9:30 am: **Modified-hybrid optical neural network filter for multiple objects recognition within cluttered scenes**, Ioannis I. Kypraios, Rupert C. D. Young, Christopher R. Chatwin, Univ. of Sussex (United Kingdom) [7442-28]

Conference 7442

9:50 am: **High-resolution profile's defect detection using spectral-domain low coherence reflectometry**, Yongkai Zhu, Nanjing Univ. of Aeronautics and Astronautics (China) [7442-29]

10:10 am: **Long range face recognition using shifted phase joint transform correlation technique**, Trisha Ahmed, Mohammed Nazrul Islam, Vijayan K. Asari, Mohammad A. Karim, Old Dominion Univ. (United States) [7442-30]

10:30 am: **A new simultaneous compression & encryption method for images suitable to recognition form by optical correlation**, Ayman Alfalou, Marwa Elbouz, Alain Loussert, Institut Supérieur de l'Electronique et du Numerique (France) [7442-31]

10:50 am: **Simultaneous multiplexing & encoding of multiple images based on the double random phase encryption system**, Ayman Alfalou, Institut Supérieur de l'Electronique et du Numerique (France) [7442-32]

11:10 am: **A compact shape-measurement module based on a thin compound-eye camera with multi-wavelength diffractive pattern projection for intraoral diagnosis**, Keiichiro Kagawa, Hiroyuki Tanabe, Osaka Univ. (Japan); Chizuko Ogata, Osaka Dental Univ. (Japan); Ryoichi Horisaki, Yusuke Ogura, Osaka Univ. (Japan); Yoshizumi Nakao, Takashi Toyoda, Yasuo Masaki, Funai Electric Co., Ltd. (Japan); Masatoshi Ueda, Osaka Dental Univ. (Japan); Jun Tanida, Osaka Univ. (Japan) [7442-33]

11:30 am: **Photonics-based millimeter-wave generation and transmission for wireless/fiber links**, Daw Asderah, Mohammad A. Matin, Univ. of Denver (United States) [7442-03]

Lunch Break 12:10 pm

SESSION 7

Room: Conv. Ctr. 17A Thurs. 1:40 to 2:40 pm

Holography II

1:40 pm: **The performance of ferroelectric liquid crystal spatial light modulators for polarization and colour diffractive elements**, Ignacio Soriano Moreno, Maria del Mar Sánchez-López, Univ. Miguel Hernández de Elche (Spain); Pascuala García-Martínez, Univ. of Valencia (Spain); Antonio Martínez-García, José Luis Martínez, Univ. Miguel Hernández de Elche (Spain). [7442-34]

2:00 pm: **Ultrahigh-speed compact optical correlation system using holographic disc**, Eriko Watanabe, Kashiko Kodate, Japan Women's Univ. (Japan) [7442-35]

2:20 pm: **Characterization and Analysis of LCoS displays: Application to Diffractive Optics**, Angel Lizana, Univ. Autònoma de Barcelona (Spain); Andrés Ruiz Márquez, Univ. de Alicante (Spain); Ignacio Soriano Moreno, Univ. Miguel Hernández de Elche (Spain); Claudio C. Lemmi, Univ. de Buenos Aires (Argentina); Juan Campos, María Josefa Yzuel, Univ. Autònoma de Barcelona (Spain) [7442-36]

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Conference 7443

Monday-Wednesday 3-5 August 2009 • Proceedings of SPIE Vol. 7443

Applications of Digital Image Processing XXXII

Conference Chair: **Andrew G. Tescher**, AGT Associates

Program Committee: **Vasudev Bhaskaran**, Qualcomm, Inc.; **Bernard V. Brower**, ITT Corp.; **Wo L. Chang**, National Institute of Standards and Technology; **Touradj Ebrahimi**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Arianne T. Hinds**, InfoPrint Solutions Co.; **T. Russell Hsing**, Telcordia Technologies, Inc.; **Kristina M. Johnson**, The Johns Hopkins Univ.; **C.-C. Jay Kuo**, Univ. of Southern California; **Catherine Lambert-Nebout**, Ctr. National d'Études Spatiales (France); **Andre J. Oosterlinck**, Kuleuven R & D (Belgium); **Sethuraman Panchanathan**, Arizona State Univ.; **Fernando Pereira**, Instituto Superior Técnico (Portugal); **Robert A. Rossi, Jr.**, Microsoft Corp.; **John A. Saghi**, California Polytechnic State Univ.; **Peter Schelkens**, Vrije Univ. Brussel (Belgium); **Gary J. Sullivan**, Microsoft Corp.; **Pankaj Topiwala**, FastVDO Inc.; **Mihaela van der Schaar**, Univ. of California, Los Angeles; **Anthony Vetro**, Mitsubishi Electric Research Labs.

Monday 3 August

SESSION 1

Room: 5A Mon. 8:30 am to 11:40 pm

Implementation and Processing Scenarios I

Session Chair: **Andrew G. Tescher**, AGT Associates

8:30 am: **Advanced archival digital images using MPEG technologies**, Wo L. Chang, National Institute of Standards and Technology (United States) [7443-01]

8:50 am: **A novel technique for vision-based UAV navigation**, Jun Zhang, Weisong Liu, Univ. of Wisconsin-Milwaukee (United States) [7443-02]

9:10 am: **Object tracking via graph cuts**, Alexander M. Nelson, Jeremiah J. Neubert, Univ. of North Dakota (United States) [7443-03]

9:30 am: **Logo recognition using alpha-rooted phase correlation in the radon transform domain**, Stephen P. DelMarco, BAE Systems (United States) [7443-04]

9:50 am: **Probabilistic graph-based feature fusion and score fusion using SIFT features for face and ear biometrics**, Dakshina R. Kisku, BCREC (India); Hunny Mehrotra, National Institute of Technology Rourkela (India); Phalguni Gupta, Indian Institute of Technology Kanpur (India); Jamuna K. Sing, Jadavpur Univ. (India) [7443-05]

Coffee Break 10:10 to 10:40 am

10:40 am: **The election-pass filtering and image fusion algorithm based on the wavelet transform for CW terahertz image processing**, Qian Song, Yuejin Zhao, Fei Yu, Liquan Dong, Beijing Institute of Technology (China) ... [7443-06]

11:00 am: **Multiview Gabor face recognition by fusion of PCA and canonical covariate through feature weighting**, Dakshina R. Kisku, BCREC (India); Hunny Mehrotra, National Institute of Technology Rourkela (India); Ajita Rattani, Univ. degli Studi di Cagliari (Italy); Jamuna K. Sing, Jadavpur Univ. (India); Phalguni Gupta, Indian Institute of Technology Kanpur (India) [7443-07]

11:20 am: **A real-time interactive tool for image object cutout**, Chen Liu, Fengxia Li, Yan Zhang, Shouyi Zhan, Beijing Institute of Technology (China) [7443-08]

Lunch Break 11:40 pm

SESSION 2

Room: 5A Mon. 1:30 to 5:20 pm

Mobile Video and Applications

Session Chair: **Vasudev Bhaskaran**, Qualcomm, Inc.

1:30 pm: **Low complexity H.264 video encoding**, Paula Carrillo, Hari Kalva, Tao Pin, Florida Atlantic Univ. (United States) [7443-10]

1:50 pm: **Multiple bitrate video encoder for smooth streaming**, Tom Holcomb, Precision Images (United States); William Chen, Microsoft Corp. (United States); Wenfeng Gao, Univ. of Washington (United States); Chuang Gu, Bruce Lin, Microsoft Corp. (United States) [7443-11]

2:10 pm: **Scalable video coding and packet scheduling for multiuser video transmission over wireless networks**, Ehsan Maani, Peshala V. Pahalawatta, Randall Berry, Aggelos K. Katsaggelos, Northwestern Univ. (United States) [7443-12]

2:30 pm: **Delay effects of performance anomaly solutions over multirate wireless networks**, Pochiang Lin, Tsungnan Lin, National Taiwan Univ. (Taiwan) [7443-13]

2:50 pm: **Motion vector search window prediction in memory constrained systems**, Chung-Cheng Lou, Szu-Wei Lee, C.-C. Jay Kuo, Univ. of Southern California (United States) [7443-14]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Remote video file synchronization for heterogeneous mobile clients**, Hao Zhang, Chuohao Yeo, Kannan Ramchandran, Univ. of California, Berkeley (United States) [7443-15]

4:00 pm: **Automatic browsing of large images on small display**, Beomjoo Kim, Changick Kim, Korea Advanced Institute of Science and Technology (Korea, Republic of) [7443-16]

4:20 pm: **Focus recovery for extended depth-of-field mobile imaging systems**, Dan Lelescu, Kartik Venkataraman, Rob Mullis, Cheng Lu, Pravin Rao, Junqing Chen, Brian Keelan, Aptina Imaging (United States) [7443-17]

5:00 pm: **Design considerations for computationally constrained two-way real-time video communications**, Lazar M. Bivolarski, Steven E. Saunders, John D. Ralston, Droplet Technology, Inc. (United States) [7443-19]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Objective measure of thread characteristics in non closely-woven fabrics by image processing, Jaume Escofet, Miquel Ralló, Tàpias Montserrat, Univ. Politècnica de Catalunya (Spain) [7443-58]

Global rotational motion and displacement estimation of digital image stabilization based on the oblique vectors matching algorithm, Fei Yu, Mei Hui, Qian Song, Yuejin Zhao, Beijing Institute of Technology (China) . [7443-59]

The development a multi-function lens test instrument by using the computer aided variable test pattern, Chun-Jen Chen, Wen-Hong Wu, Kuo-Cheng Huang, Instrument Technology Research Ctr. (Taiwan) [7443-60]

Fast image restoration algorithm based on camera microscanning, Jose L. Lopez-Martinez, Vitaly I. Kober, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) [7443-61]

Segmentation of remote sensing images for building detection, Hamid Moayeri, Islamic Azad Univ. (Iran, Islamic Republic of) [7443-62]

High quality color representation using non-professional digital camera, Karel Fliegel, Josef Havlin, Czech Technical Univ. in Prague (Czech Republic) [7443-63]

An utilization of GMM for scientific images modeling, Jan Svihlik, Institute of Chemical Technology Prague (Czech Republic) [7443-64]

An enhanced wavelet-based scheme for near lossless satellite image compression, Chien-Wen Chen, I-Shou Univ. (Taiwan); Shi-Huang Chen, Shu-Te Univ. (Taiwan); Tsung-Ching Lin, Trieu-Kien Truong, I-Shou Univ. (Taiwan) [7443-65]

Unsupervised local defect segmentation in textures using Gabor Filters: application to industrial inspection, Miquel Ralló, Maria S. Millán, Jaume Escofet, Univ. Politècnica de Catalunya (Spain) [7443-66]

Conference 7443

- A portable stereo vision system for whole body surface imaging**, Bugao Xu, Wurong Yu, The Univ. of Texas at Austin (United States) [7443-67]
- Moving object detection using spatial coherence**, Kyungham Kim, HRL Labs., LLC (United States) [7443-68]
- Stereoscopic colorimetric analysis for the apple ripeness evaluation**, Luis Javier Villegas-Vicencio, Angel J. González-Fraga, Jesus R. Lerma-Aragon, Ricardo Montero, Juan Tapia-Mercado, Univ. Autónoma de Baja California (Mexico) [7443-69]
- A MTF computing for vibration motion and experiments.**, Alfonso Padilla-Vivanco, Univ. Politécnica de Tulancingo (Mexico); Carina Toxqui-Quitl, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Cesar Santiago-Tepantlán, Univ. Politécnica de Tulancingo (Mexico) [7443-70]
- On-orbit self-compensation of satellite optics using spatial light modulator**, Norihide Miyamura, The Univ. of Tokyo (Japan) [7443-71]
- Advanced processing of astronomical images obtained from optical systems with ultra-wide field of view**, Martin Rerabek, Petr Páta, Czech Technical Univ. in Prague (Czech Republic) [7443-72]
- Approximating shape from focus by averaging filter**, Seong-O Shim, Muhammad Tariq Mahmood, Tae-Sun Choi, Gwangju Institute of Science and Technology (Korea, Republic of) [7443-73]
- Morphological level set method with bidirectional evolution for fast image segmentation**, Guopu Zhu, Sun Yat-Sen Univ. (China); Shuqun Zhang, College of Staten Island (United States); Qingshuang Zeng, Changhong Wang, Harbin Institute of Technology (China) [7443-74]
- Two-dimensional PCA for pulmonary nodule detection**, Wook-Jin Choi, Tae-Sun Choi, Gwangju Institute of Science and Technology (Korea, Republic of) [7443-76]
- Three-dimensional visualizing cell by using shape from focus method**, Minji Lee, Ik-Hyun Lee, Tae-Sun Choi, Gwangju Institute of Science and Technology (Korea, Republic of) [7443-77]
- Image motion detection in a scene captured by a moving camera**, Nader M. Namazi, The Catholic Univ. of America (United States); William Scharpf, Naval Research Lab. (United States); James N. Caron, Research Support Instruments, Inc. (United States); Michael Fatemi, The Johns Hopkins Univ. Applied Physics Lab. (United States); David M. Huber, Research Support Instruments, Inc. (United States); Jay Obermark, Naval Research Lab. (United States) . [7443-78]
- Computational volumetric integral imaging using a novel extraction of perspectivity**, Guen-Sik Lee, Yong Seok Hwang, Eun-Soo Kim, Kwangwoon Univ. (Korea, Republic of) [7443-79]
- A gradient vector flow snake for complex object boundary detection**, Shuqun Zhang, College of Staten Island (United States) [7443-80]
- Multifocus microscope image fusion based on wavelets**, Alfonso Padilla-Vivanco, Irving Tellez-Arriaga, Univ. Politécnica de Tulancingo (Mexico); Carina Toxqui-Quitl, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7443-81]
- Comparisons of mobile TV standards and development of 3D mobile TV based on DMB**, Heung-Nam Kim, Massachusetts Institute of Technology (United States) and Electronics and Telecommunications Research Institute (Korea, Republic of); Soo-In Lee, Electronics and Telecommunications Research Institute (Korea, Republic of) [7443-83]
- Sub-Pixel processing algorithm of reducing boundary approximate error in staring FPA micro-scanning imaging**, Yan Chen, [7443-86]
- Speckle noise suppression of range gated underwater imaging system**, Hailan Li, Xia Wang, Weiqi Jin, Tingzhu Bai, Youwei Huang, Kun Ding, Beijing Institute of Technology (China) [7443-89]
- Image enhancement of range gated underwater imaging system based on least square error**, Hailan Li, Xia Wang, Tingzhu Bai, Weiqi Jin, Beijing Institute of Technology (China) [7443-90]
- Estimating best focused points through similarity matrix**, Muhammad Tariq Mahmood, Tae-Sun Choi, Gwangju Institute of Science and Technology (Korea, Republic of) [7443-18]
- OCT monitoring of diffusion of clearing agents and nanoparticles within tooth dentin**, Natalia A. Trunina, Vladislav V. Lychagov, Valery V. Tuchin, Saratov State Univ. (Russian Federation) [7443-54]
- Study of peripheral vision enhancement for the AMD impaired**, Michael Weyl, Uzi Efron, Ben-Gurion Univ. of the Negev (Israel) [7443-25]
- Image processing for wear on pantograph sliding plates in complex conditions**, Kai Yang, Southwest Jiaotong Univ. (China) [7443-52]
- The restoration of CW THz images based on phase analysis**, Qian Song, Yuejin Zhao, Fei Yu, Beijing Institute of Technology (China); Cunlin Zhang, Capital Normal Univ. (China) [7443-09]

Tuesday 4 August

SESSION 3

Room: 5A Tues. 8:40 to 11:50 am

Image Quality and Vision

Session Chair: Touradj Ebrahimi, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

8:40 am: **Ecological tests: the impact of cognitive effort in quality assessment**, Vittorio Baroncini, Cristina Delogu, E. Pallotta, Fondazione Ugo Bordoni (Italy) [7443-19]

9:00 am: **On the evaluation of video codecs for digital cinema application**, Fitri N. Rahayu, Ulrich Reiter, Norwegian Univ. of Science and Technology (Norway); Touradj Ebrahimi, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Andrew Perkiš, Peter Svensson, Norwegian Univ. of Science and Technology (Norway) [7443-20]

9:20 am: **Subjective evaluation of JPEG XR image compression**, Francesca De Simone, Frederic Dufaux, Touradj Ebrahimi, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7443-21]

9:40 am: **Perceptual encoding optimization for JPEG XR image coding using adaptive quantization step size control**, Gary J. Sullivan, Microsoft Corp. (United States) [7443-22]

Coffee Break 10:00 to 10:30 am

10:30 am: **Objective evaluation of the visual acuity in human eyes**, Maria-Guadalupe Varillas, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Marco Antonio Rosales-Medina, Univ. de las Américas Puebla (Mexico); Estela López-Olazagasti, Gustavo Ramirez-Zavaleta, Eduardo Tepichin-Rodriguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7443-23]

10:50 am: **Perceptual video quality comparison of various deinterlacing methods**, Jonghwa Lee, Sangwook Lee, Chulhee Lee, Yonsei Univ. (Korea, Republic of) [7443-24]

11:30 am: **Correlation based system to assess the completeness and correctness of cognitive stimulation activities of elders**, Angel J. González-Fraga, Alberto L. Moran, Victoria Meza-Kubo, Monica Tentori, Everardo Santiago, Univ. Autónoma de Baja California (Mexico) [7443-26]

Lunch/Exhibition Break 11:50 am

SESSION 4

Room: 5A Tues. 1:20 to 3:00 pm

3D Coding and Processing

Session Chair: Anthony Vetro, Mitsubishi Electric Research Labs.

1:20 pm: **Standards-based approaches to 3D and multiview video coding**, Gary J. Sullivan, Microsoft Corp. (United States) [7443-27]

1:40 pm: **Considerations and activities in 3D for consumer entertainment**, Walter J. Husak, Dolby Labs., Inc. (United States) [7443-28]

2:00 pm: **Joint coding of texture and depth for 3D video**, Ying Chen, Tampere Univ. of Technology (Finland); Siping Tao, Univ. of Science and Technology of China (China); Miska M. Hannuksela, Nokia Research Ctr. (Finland); Houqiang Li, Univ. of Science and Technology of China (China); Moncef Gabbouj, Tampere Univ. of Technology (Finland) [7443-29]

2:20 pm: **View synthesis techniques for 3D video**, Dong Tian, Po-Lin Lai, Patrick Lopez, Cristina Gomila, Thomson Corporate Research (United States) [7443-30]

2:40 pm: **Intermediate view generation for perceived depth adjustment of stereo video**, Zafer Arican, Sehoon Yea, Alan Sullivan, Anthony Vetro, Mitsubishi Electric Research Labs. (United States) [7443-31]

Coffee Break 3:00 pm

SESSION 5

Room: 5A Tues. 3:30 to 5:10 pm

Video Processing

Session Chair: Pankaj Topiwala, FastVDO Inc.

- 3:30 pm: **Recent developments in video coding technology and its standardization**, Gary J. Sullivan, Microsoft Corp. (United States) . . . [7443-32]
- 3:50 pm: **Video superresolution: from QVGA to HD in real-time**, Pankaj Topiwala, Zhanfeng Yue, Pramod L. Narasimha, FastVDO Inc. (United States) . . . [7443-33]
- 4:10 pm: **Motion estimation for H.264/AVC on multiple GPUs using NVIDIA CUDA**, Bart Pieters, Charles F. Hollemeersch, Peter Lambert, Rik Van de Walle, Univ. Gent (Belgium) . . . [7443-34]
- 4:30 pm: **Deinterlacing with reduced flickering**, Jonghwa Lee, Sangwook Lee, Chulhee Lee, Yonsei Univ. (Korea, Republic of) . . . [7443-35]
- 4:50 pm: **A real-time software H.264 High 4:4:4 Codec**, Pankaj Topiwala, FastVDO Inc. (United States). . . [7443-36]

Wednesday 5 August

SESSION 6

Room: 5A Wed. 8:00 to 10:40 am

Image Compression

Session Chair: Gary J. Sullivan, Microsoft Corp.

- 8:00 am: **A new resampling approach for optimal reconstruction**, Pankaj Topiwala, Lijie Liu, Trac Tran, FastVDO Inc. (United States). . . [7443-37]
- 8:20 am: **Low complexity variations of JPEG 2000**, James J. Meany, The Boeing Co. (United States) . . . [7443-38]
- 8:40 am: **Design of fast transforms for high-resolution image and video coding**, Yuriy A. Reznik, Ravi Chivukula, Qualcomm, Inc. (United States) . . . [7443-84]
- 9:00 am: **An adaptive two-stage KLT approach for spectral decorrelation in hyperspectral bandwidth compression**, John A. Saghri, Seton Schroeder, California Polytechnic State Univ., San Louis Obispo (United States); Andrew G. Tescher, AGT Associates (United States) . . . [7443-39]
- 9:20 am: **R-D based quantization in H.264**, Marta Karczewicz, Peisong Chen, Yan Ye, Qualcomm, Inc. (United States). . . [7443-85]
- 9:40 am: **Image mirroring, rotation, and interpolation in wavelet domain**, Theju Jacob, Kamisetty Rao, Do Nyeon Kim, The Univ. of Texas at Arlington (United States) . . . [7443-40]
- 10:00 am: **Interoperability in JPIP and its standardization in JPEG 2000 Part 9**, Thomas Richter, Univ. Stuttgart (Germany) . . . [7443-41]
- 10:20 am: **A combined fractal and PCA based algorithm for degraded fingerprint identification**, Mehrube Mehrübeoglu, Texas A&M Univ.-Corpus Christi (United States); Lifford McLauchlan, Texas A&M Univ.-Kingsville (United States) . . . [7443-42]
- Coffee Break . . . 10:40 am

SESSION 7

Room: 5A Wed. 11:10 am to 12:50 pm

Optical and Digital Image Processing Systems I

Session Chair: Peter Schelkens, Vrije Univ. Brussel (Belgium)

- 11:10 am: **Existing and future challenges of multi-dimensional microscopy and imaging for life sciences and biomedicine**, Jürgen Popp, IPHT Jena (Germany) . . . [7443-43]
- 11:30 am: **A complete scheme for colour morphology with perceptual integration**, Noël Richard, Anne-Sophie Capelle-Laizé, Christine Fernandez-Maloigne, Univ. de Poitiers (France) . . . [7443-44]
- 11:50 am: **Digital decoding design for phase coded imaging system**, Po-Chang Chen, Chih-Hao Liu, Chir-Weei Chang, Chuan-Chung Chang, Ludovic Angot, Industrial Technology Research Institute (Taiwan) . . . [7443-45]

12:10 pm: **Misalignment estimation for double-sided lenticular lens films based on low-dimensional signal analysis**, Chi-Tang Chen, Shu-Ping Dong, Hung-Ming Tai, Tung-Ying Wu, Industrial Technology Research Institute (Taiwan) . . . [7443-46]

12:30 pm: **Multiresolution example-based depth image restoration**, Ljubomir Jovanov, Aleksandra Pizurica, Wilfried Philips, Univ. Gent (Belgium) . . [7443-47]

Lunch/Exhibition Break . . . 12:50 pm

SESSION 8

Room: 5A Wed. 2:00 to 3:00 pm

Optical and Digital Image Processing Systems II

Session Chair: Peter Schelkens, Vrije Univ. Brussel (Belgium)

- 2:00 pm: **OCT image segmentation for differentiation of the cavernous nerves from the prostate gland**, Shahab Chitchian, Thomas P. Weldon, Nathaniel M. Fried, The Univ. of North Carolina at Charlotte (United States) . . . [7443-48]
- 2:20 pm: **PSF and MTF comparison of two different surface ablation techniques for laser visual correction.**, Angel S. Cruz Felix, Estela López Olazagasti, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Marco Antonio Rosales-Medina, Univ. de las Américas Puebla (Mexico); Jorge M. Ibarra, Eduardo Tepichin-Rodríguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . [7443-49]
- 2:40 pm: **Segmentation of biological cells from digital holographic microscopic images**, Karen M. Molony, National Univ. of Ireland, Maynooth (Ireland); James P. Ryle, Susan McDonnell, John T. Sheridan, Univ. College Dublin (Ireland); Thomas J. Naughton, National Univ. of Ireland, Maynooth (Ireland) . . . [7443-50]
- Coffee Break . . . 3:00 pm

SESSION 9

Room: 5A Wed. 3:30 to 5:30 pm

Implementation and Processing Scenarios II

Session Chair: John A. Saghri, California Polytechnic State Univ., San Louis Obispo

- 3:30 pm: **Correlation filters for object detection in nonoverlapping background noise using a noisy reference image**, Pablo M. Aguilar-Gonzalez, Vitaly I. Kober, Ctr. de Investigación Científica y de Educación Superior de Ensenada (Mexico) . . . [7443-51]
- 4:10 pm: **Optimize maximal brightness and correlated color temperature for multi-primary color displays**, Ou-Yang Mang, Ting-Wei Huang, Yao-Fang Hsieh, Yu-Ta Chen, National Central Univ. (Taiwan). . . [7443-53]
- 4:30 pm: **Phase recovery from interference fringes by Hilbert Transform**, Zehra Sarac, Zonguldak Karaelmas Univ. (Turkey); H. Gülay Birkök, Gebze Institute of Technology (Turkey); Ahmet Emir, Kocaeli Univ. (Turkey); Ali Dursun, Gebze Institute of Technology (Turkey). . . [7443-55]
- 4:50 pm: **Classification of motion-blurred images by means circular moments and a controlled vibration system**, Alfonso Padilla-Vivanco, Univ. Politécnica de Tulancingo (Mexico); Carina Toxqui-Quintl, Jose Javier Báez-Rojas, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7443-56]
- 5:10 pm: **Phase retrieval from a single interferometric pattern to determine the profile caused by laser ablation on spherical surfaces**, Eduardo Tepichin-Rodríguez, Martin Isaias Rodríguez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Marco Antonio Rosales-Medina, Univ. de las Américas Puebla (Mexico); Estela López Olazagasti, Jorge M. Ibarra, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico). . . [7443-57]

Conference 7444A

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7444A

Mathematics of Data/Image Coding, Compression, and Encryption with Applications XII

Conference Chairs: Mark S. Schmalz, Univ. of Florida; Gerhard X. Ritter, Univ. of Florida; Junior Barrera, Univ. de São Paulo (Brazil); Jaakko T. Astola, Tampere Univ. of Technology (Finland)

Program Committee: Lifford McLauchlan, Texas A&M Univ. -Kingsville; Mehrube Mehrübeoglu, Texas A&M Univ. -Corpus Cristi; Françoise J. Prêteux, TELECOM & Management SudParis (France)

Monday 3 August

Room: Conv. Ctr. 5B Mon. 8:30 to 8:35 am

Introductory Remarks

Mark Schmalz, Conference Chair

SESSION 1

Room: Conv. Ctr. 5B Mon. 8:35 to 9:50 am

Compression

Session Chair: Mark S. Schmalz, Univ. of Florida

8:35 am: **The optimum approximation of a multidimensional filter-bank having analysis-filters with small non-linear characteristics**, Yuichi Kida, Ohu Univ. (Japan); Takuro Kida, Nihon Univ. (Japan) [7444A-01]

9:00 am: **The optimum discrete running approximation of multidimensional time-limited signals**, Yuichi Kida, Ohu Univ. (Japan); Takuro Kida, Nihon Univ. (Japan) [7444A-02]

9:25 am: **Design of object-based compression algorithms for video imagery**, Mark S. Schmalz, Univ. of Florida (United States) [7444A-03]

Coffee Break 9:50 to 10:10 am

SESSION 2

Room: Conv. Ctr. 5B Mon. 10:10 to 11:25 am

Error Modeling and Analysis I

Session Chair: Lifford McLauchlan, Texas A&M Univ.-Kingsville

10:10 am: **Analysis of filtering techniques and image quality in pixel duplicated images**, Mehrube Mehrübeoglu, Texas A&M Univ.-Corpus Christi (United States); Lifford McLauchlan, Texas A&M Univ.-Kingsville (United States) [7444A-04]

10:35 am: **Spatially adaptive image quality metrics for perceptual image quality assessment**, Karel Fliegel, Czech Technical Univ. in Prague (Czech Republic) [7444A-05]

11:00 am: **Precise accounting of bit errors in floating-point computations**, Mark S. Schmalz, Univ. of Florida (United States) [7444A-06]

Lunch Break 11:25 am

SESSION 3

Room: Conv. Ctr. 5B Mon. 1:30 to 2:45 pm

Error Modeling and Analysis II

Session Chair: Mark S. Schmalz, Univ. of Florida

1:30 pm: **Error mitigation for CCSD compressed imager data**, Irina Gladkova, Michael D. Grossberg, Srikanth Gottipati, The City College of New York (United States) [7444A-07]

1:55 pm: **Compression of turbulence-affected video signals**, Shahar S. Mahfud, Yitzhak Yitzhaky, Ben-Gurion Univ. of the Negev (Israel) [7444A-08]

2:20 pm: **The influence of camera vibrations on video compression performances**, Ofer Hadar, Ben-Gurion Univ. of the Negev (Israel) [7444A-09]

Coffee Break 2:45 pm

SESSION 4

Room: Conv. Ctr. 5B Mon. 3:05 to 4:00 pm

Compressive Computing and Security

Session Chair: Mehrube Mehrübeoglu, Texas A&M Univ.-Corpus Christi

3:05 pm: **Compression for data archiving and backup revisited**, Corneliu Constantinescu, IBM Almaden Research Ctr. (United States) [7444A-10]

3:30 pm: **Evidence of tampering in watermark identification**, Lifford McLauchlan, Texas A&M Univ.-Kingsville (United States); Mehrube Mehrübeoglu, Texas A&M Univ.-Corpus Christi (United States) [7444A-12]

Room: Conv. Ctr. 5B Mon. 4:45 to 5:00 pm

Panel Discussion

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Digital watermarking using computer-generated hologram based on joint DWT and DCT, Jianzhong Li, Shou Liu, Xiangsu Zhang, Xiamen Univ. (China) [7444A-16]

Hyperspectral image compression using low complexity integer KLT and three-dimensional asymmetric significance tree, Jing Huang, Nanjing Univ. of Posts and Telecommunications (China); Ri-hong Zhu, Nanjing Univ. of Science & Technology (China) [7444A-17]

Dynamic calibrating of UAV array CCD camera, Ling Zhu, Wuming Zhang, Beijing Normal Univ. (China); Ruoming Shi, Beijing Univ. of Civil Engineering and Architecture (China) [7444A-18]

Design of distributed sub-band networks having the minimum total weighted energy based on the concept of generating function of networks, Yuichi Kida, Ohu Univ. (Japan); Takuro Kida, Nihon Univ. (Japan) [7444A-11]

Tuesday 4 August

Room: Conv. Ctr. 5B Tues. 8:30 to 8:35 am

Introductory Remarks

Gerhard Ritter, Conference Chair

SESSION 5

Room: Conv. Ctr. 5B Tues. 8:35 to 9:50 am

Pattern Recognition with Applications

Session Chair: Françoise J. Prêteux, TELECOM & Management SudParis (France)

8:35 am: **Algorithms for recognition of chewing behaviors in dietary monitoring**, Mark S. Schmalz, Andres Mendez-Vasquez, Abdelsalam S. Helal, Univ. of Florida (United States) [7444A-13]

9:00 am: **BiFS based approaches to remote display for mobile thin clients**, Mihai P. Mitrea, Institut National des Télécommunications (France); Pieter Simoens, IBBT (Belgium); Bojan Joveski, Institut National des Télécommunications (France); Abdelham Taguengayte, Prologue (France); Françoise J. Prêteux, Institut National des Télécommunications (France) [7444A-14]

9:25 am: **A generic approach to haptic modeling of textile artifacts**, Hooman Shidanshidi, Fazel Naghdy, Golshah A. Naghdy, Diana Wood Conroy, Univ. of Wollongong (Australia) [7444A-15]

Room: Conv. Ctr. 5B Tues. 9:45 to 10:00 am

Panel Discussion

Conference 7444B

Sunday 2 August 2009 • Proceedings of SPIE Vol. 7444B

Advanced Signal Processing Algorithms, Architectures, and Implementations XIX

Conference Chair: **Franklin T. Luk**, Hong Kong Baptist Univ. (Hong Kong, China)

Program Committee: **Leon Cohen**, Hunter College/CUNY; **Milos D. Ercegovac**, Univ. of California, Los Angeles; **Patrick J. Loughlin**, Univ. of Pittsburgh; **Nikos P. Pitsianis**, Duke Univ.; **Daniel V. Rabinkin**, MIT Lincoln Lab.; **Xiaobai Sun**, Duke Univ.; **Alexandre F. Tenca**, Synopsys, Inc.

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 19 Sun. 8:20 to 11:50 am

Computer Arithmetic

Session Chairs: **Milos D. Ercegovac**, Univ. of California, Los Angeles; **Alexandre F. Tenca**, Synopsys, Inc.

8:20 am: **Implementation of a speculative Ling adder**, Malhar Mehta, Amith Kumar, Earl E. Swartzlander, Jr., The Univ. of Texas at Austin (United States) [7444B-19]

8:40 am: **A design of complex square root for FPGA implementation**, Milos D. Ercegovac, Dong Wang, Univ. of California, Los Angeles (United States) [7444B-20]

9:00 am: **Floating-point arithmetic in embedded and reconfigurable computing systems**, Syed Z. Gilani, Neil Hockert, Katherine Compton, Michael J. Schulte, Univ. of Wisconsin-Madison (United States) [7444B-21]

9:20 am: **Optimizing elliptic curve scalar multiplication for small scalars**, Pascal Giorgi, Univ. Montpellier 2 (France); Laurent Imbert, Univ. of Calgary (Canada) and Univ. Montpellier 2 (France); Thomas Izard, Univ. Montpellier 2 (France) [7444B-22]

9:40 am: **High-speed floating-point divider with reduced area**, Kyung-Nam Han, Alexandre F. Tenca, David Tran, Synopsys, Inc. (United States) [7444B-23]

10:00 am: **On the design of a Radix 10 online floating-point multiplier**, Robert D. McIlhenny, California State Univ., Northridge (United States); Milos D. Ercegovac, Univ. of California, Los Angeles (United States) [7444B-24]

Coffee Break 10:20 to 10:50 am

10:50 am: **Pseudo-random generator based on Chinese remainder theorem over GF(2^k)**, Jean-Claude Bajard, Heinrich Hördegen, Univ. Montpellier 2 (France) [7444B-25]

11:10 am: **Implementation of sort-based counters**, Ryan Nett, Jay B. Fletcher, Earl E. Swartzlander, Jr., The Univ. of Texas at Austin (United States) [7444B-26]

11:30 am: **Arithmetic operators for on-the-fly evaluation of TRNGs**, Renaud Santoro, Arnaud Tisserand, Olivier Sentieys, Institut de Recherche en Informatique et Systèmes Aléatoires (France); Sebastien Roy, Univ. Laval (Canada) [7444B-33]

Lunch Break 11:50 am

SESSION 2

Room: Conv. Ctr. 19 Sun. 1:20 to 3:50 pm

Time Frequency

Session Chairs: **Leon Cohen**, Hunter College; **Patrick J. Loughlin**, Univ. of Pittsburgh

1:20 pm: **Wigner phase space approach to scattering**, Leon Cohen, Hunter College (United States) [7444B-37]

1:40 pm: **Moment feature variability in uncertain propagation channels**, Greg Okopal, Patrick J. Loughlin, Univ. of Pittsburgh (United States) [7444B-38]

2:00 pm: **GMSK co-channel demodulation**, Douglas J. Nelson, Joseph R. Hopkins, David C. Smith, National Security Agency (United States) [7444B-30]

2:20 pm: **A comparison of two methods for demodulating a target AIS signal through a collision with an interfering AIS signal**, David C. Smith, Douglas J. Nelson, National Security Agency (United States) [7444B-31]

Coffee Break 2:40 to 3:10 pm

3:30 pm: **All-pole and all-zero models of human and cat head related transfer functions**, Bahaa W. Al-Sheikh, Mohammad A. Matin, Univ. of Denver (United States); Daniel J. Tollin, Univ. of Colorado Denver School of Medicine (United States) [7444B-29]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 3

Room: Conv. Ctr. 19 Mon. 8:20 to 9:20 am

Implementation I

Session Chair: **Daniel V. Rabinkin**, MIT Lincoln Lab.

8:20 am: **Real-time noncoherent high-bandwidth detector processing using a novel multi-FPGA architecture**, James Haupt, Daniel V. Rabinkin, MIT Lincoln Lab. (United States) [7444B-41]

8:40 am: **A color imaging device with electrically tunable color filters**, Federico Zaraga, Giacomo Langfelder, Antonio F. Longoni, Politecnico di Milano (Italy) [7444B-28]

9:00 am: **STAP with adaptive state estimation in non-stationary heterogeneous systems**, Obaidul Malek, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Bhashyam Balaji, Michael K. McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7444B-32]

SESSION 4

Room: Conv. Ctr. 19 Mon. 10:30 am to 12:30 pm

Implementation II

Session Chairs: **Nikos P. Pitsianis**, Duke Univ.; **Xiaobai Sun**, Duke Univ.

10:30 am: **Fast computation of local correlation coefficients on graphics processing units**, Ioannis Karafyllias, Isaak Manolis, Nikos P. Pitsianis, Xiaobai Sun, Duke Univ. (United States) [7444B-40]

10:50 am: **Automated optimization of look-up table implementation for function evaluation on FPGAs**, L. Deng, Nikos P. Pitsianis, Xiaobai Sun, C. Chakrabarti, Duke Univ. (United States) [7444B-43]

11:10 am: **Memory-aware FPGA architecture for 3D FFT**, C.-L. Yu, C. Chakrabarti, Kevin M. Irick, V. Narayanan, Duke Univ. (United States) [7444B-44]

11:30 am: **Memory latency analysis for large non-uniform FFTs**, Nihshanka Debroy, Xiaobai Sun, Duke Univ. (United States) [7444B-45]

11:50 am: **A scalable multi-FPGA framework for real-time digital signal processing**, Kevin M. Irick, Michael DeBole, Sungho Park, N. Vijaykrishnan, Duke Univ. (United States) [7444B-39]

12:10 pm: **Convergence properties of the LLL algorithm**, Franklin T. Luk, The Chinese Univ. of Hong Kong (Hong Kong, China); Sanzheng Qiao, McMaster Univ. (Canada) [7444B-42]

Conference 7444B

Wednesday 5 August

SESSION 5

Room: Conv. Ctr. 17A Wed. 8:00 am to 12:00 pm

Hybrid Signal/Image Processing

Joint Session with Conference 7442: Optics and Photonics for Information Processing III

8:00 am: **Video sensor network for crop safety enforcement**, N. Semenov, J. Apodaca Madrid, K. E. Newman, Univ. of Denver (United States) [7442-09]

8:30 am: **Signal and image processing research at the Lawrence Livermore National Laboratory** (*Invited Paper*), Randy S. Roberts, Lawrence Livermore National Lab. (United States) [7442-10]

9:00 am: **Feature registration and matching of intra-subject brain MRI using invariant SIFT extractor**, Dakshina R. Kisku, BCREC (India); Hunny Mehrotra, National Institute of Technology Rourkela (India); Ajita Rattani, Univ. degli Studi di Cagliari (Italy); Jamuna K. Sing, Jadavpur Univ. (India); Phalguni Gupta, Indian Institute of Technology Kanpur (India) [7442-11]

9:20 am: **Real-time Fpga implementation of rotation and scale-invariant template matching**, Henrique P. Nobre, OPTOVAC (Brazil); Hae Yong Kim, Univ. de São Paulo (Brazil) [7444B-34]

9:40 am: **Implementation of the traveling salesman problem based on pattern processing with a graphics processing unit**, Kouichi Nitta, Shinichi Ohta, Osamu Matoba, Kobe Univ. (Japan) [7442-12]

10:00 am: **Image denoising and quality assessment through the Rényi entropy**, Gabriel Cristóbal, Salvador Gabarda, Elena Gil, Consejo Superior de Investigaciones Científicas (Spain) [7444B-35]

Coffee Break 10:20 to 10:50 am

10:50 am: **Adaptive compressive sensing of specific objects** (*Invited Paper*), Abhijit Mahalanobis, Robert R. Muise, Lockheed Martin Missiles and Fire Control (United States) [7442-13]

11:20 am: **A method for traveling sales man problem by use of pattern processing with image compression**, Kouichi Nitta, Shinichi Ohta, Osamu Matoba, Kobe Univ. (Japan) [7442-14]

11:40 am: **The self-synchronized iterative detection network based restoration of blurred dichromatic images obtained by CCD/CMOS camera with imperfectly adjusted lens**, Daniel Kekrt, Czech Technical Univ. in Prague (Czech Republic) [7444B-36]

12:00 pm: **Image registration using cellular simultaneous recurrent networks**, John K. Anderson, Khan M. Iftakharuddin, The Univ. of Memphis (United States) [7442-15]

12:20 pm: **Improving the accuracy of the ultra fast**, vinay sriram, imperial college london (United Kingdom) [7442-16]

Conference 7445

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7445

Signal and Data Processing of Small Targets 2009

Conference Chair: **Oliver E. Drummond**, Consulting Engineer

Conference Co-Chair: **Richard D. Teichgraeber**, Consultant

Program Committee: **Liyi Dai**, U.S. Army Research Office; **Darren K. Emge**, U.S. Army Edgewood Chemical Biological Ctr.; **Charles W. Glover**, Oak Ridge National Lab.; **Lawrence E. Hoff**, Hoff Engineering; **Denise L. Jones**, U.S. Army Space and Missile Defense Command; **Rabinder N. Madan**, Office of Naval Research; **Steven W. Waugh**, Defense Threat Reduction Agency

Tuesday 4 August

Luncheon Dialogues

Lunch breaks on Wednesday, and Thursday will provide an opportunity to meet in a small group with one or two distinguished individuals who will lead discussions on a topic of signal and data processing algorithms. Tables will be reserved for a no-host lunch. Make reservations at the entrance to the main conference room beginning Wednesday Morning, 5 August.

Conference Location Will Alternate Each Year

In the year 2009, this conference is located in San Diego. Thereafter, it will alternate between San Diego in the Summer in odd years and on the east coast in the Spring in even years.

Internet Web Posting

Program changes, announcements, and the latest information about this conference will be posted on the Internet World Wide Web at <http://home.att.net/~drummond/>

SESSION 1

Room: Conv. Ctr. 19 Tues. 1:30 to 5:00 pm

Small Target Signal and Data Processing

Session Chairs: **Lawrence E. Hoff**, Hoff Engineering; **Richard D. Teichgraeber**, Consultant

1:30 pm: **MIMO vs. multistatic radar for target localization and tracking**, Aliakbar Gorji Daronkolaei, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Peter Moo, Zhen J. Ding, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada)[7445-01]

1:55 pm: **Space target tracking with delayed measurement**, Huimin Chen, Univ. of New Orleans (United States); Genshe Chen, DCM Research Resources, LLC (United States); Erik P. Blasch, Khanh D. Pham, Air Force Research Lab. (United States) [7445-02]

2:20 pm: **Interacting multiple model forward filtering and backward smoothing for maneuvering target tracking**, Nandakumaran Nadarajah, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Thomas Lang, General Dynamics Canada Ltd. (Canada); Michael K. McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-03]

2:45 pm: **Ultra-scale vehicle tracking in low spatial-resolution and low frame-rate overhead imagery**, Carmen J. Carrano, Lawrence Livermore National Lab. (United States) [7445-04]

Coffee Break 3:10 to 3:45 pm

3:45 pm: **Event-based characterization and simulation of sea clutter**, Michael K. McDonald, Defence Research and Development Canada (Canada); Darcy Dunne, McMaster Univ. (Canada); Anthony Damini, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-05]

4:10 pm: **Adaptive feature learning for object tracking**, Mun Wai Lee, Geoff Taylor, Niels Haering, Tae Eun Choe, ObjectVideo, Inc. (United States)[7445-06]

4:35 pm: **Resolving transmitter-of-opportunity origin uncertainty in passive coherent location systems**, Ratnasingham Tharmarasa, Nandakumaran Nadarajah, McMaster Univ. (Canada); Michael K. McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-07]

Wednesday 5 August

SESSION 2

Room: Conv. Ctr. 19 Wed. 8:30 am to 12:00 pm

Signal and Extended Object Processing

Session Chairs: **Darren K. Emge**, U.S. Army Edgewood Chemical Biological Ctr.; **Lawrence E. Hoff**, Hoff Engineering

8:30 am: **Noise resistant algorithm for radar images recognition and classification**, Vesna Zeljkovic, Quiang Li, Robert Vincelette, Claude M. Tameze, Fengshan Liu, Delaware State Univ. (United States) [7445-08]

8:55 am: **Context-aware tracking of small targets in video**, Jialue Fan, Jiang Xu, Ying Wu, Northwestern Univ. (United States) [7445-09]

9:20 am: **Detection of suspicious activity using incremental outlier detection algorithms**, Dragoljub Pokrajac, Natasa Reljin, Nebojsa Pejicic, Samantha McDaniel, Tia Vance, Delaware State Univ. (United States); Aleksandar M. Lazarevic, Univ. of Minnesota (United States); Roland Mieziako, Honeywell Labs. (United States) [7445-10]

9:45 am: **Photoacoustic imaging of a subcutaneous anomaly tissue phantom: preliminary results**, Juan David Martinez-Ramirez, Francisco J. Gonzalez, Univ. Autónoma de San Luis Potosi (Mexico); Gerardo Gutierrez-Juarez, Raul Alberto Reyes-Villagrana, A. Gonzalez, Univ. de Guanajuato (Mexico) [7445-11]

Coffee Break 10:10 to 10:45 am

10:45 am: **Featured-points method of amplitude recovery**, Qiang Li, Zhaofa Zeng, Jiguang Sun, Fengshan Liu, Delaware State Univ. (United States)[7445-12]

11:10 am: **Nonlinear estimation for chemical sensor arrays**, Randy C. Paffenroth, Jason Yosinski, Numerica Corp. (United States) [7445-13]

11:35 am: **Extraction, categorization and unusual motion signaling of small moving objects**, Levente Kovács, Ákos Utasi, Tamás Szirányi, Computer and Automation Research Institute (Hungary) [7445-14]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 19 Wed. 1:30 to 5:00 pm

Probability Hypothesis Density Processing

Session Chairs: **Liyi Dai**, U.S. Army Research Office; **Oliver E. Drummond**, Consulting Engineer

1:30 pm: **Assignment-based particle labelling for probability hypothesis density filters**, Daniel G. Danu, Thamas Ratnasingam, McMaster Univ. (Canada); Thomas Lang, General Dynamics Canada Ltd. (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-15]

1:55 pm: **CPHD filters for superpositional sensors**, Ronald P. Mahler, Lockheed Martin Maritime Systems & Sensors (United States) [7445-16]

2:20 pm: **Seamless track labeling without peak extraction in SMC-PHD filters**, Darcy Dunne, General Dynamics Canada Ltd. (Canada) and McMaster Univ. (Canada); Ratnasingham Tharmarasa, McMaster Univ. (Canada); Thomas Lang, General Dynamics Canada Ltd. (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-17]

2:45 pm: **Regularized multisensor PHD intensity filters**, Roy L. Streit, Joshua Hughes, Metron, Inc. (United States) [7445-18]

Coffee Break 3:10 to 3:45 pm

Conference 7445

Thursday 6 August

SESSION 4

3:45 pm: **Distributed tracking with probability hypothesis density filters using efficient measurement encoding**, Ampikathasan Aravinthan, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Thomas Lang, General Dynamics Canada Ltd. (Canada); Michael K. McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-19]

4:10 pm: **"Second-generation" PHD/CPHD filters and multitarget calculus**, Ronald P. Mahler, Lockheed Martin Maritime Systems & Sensors (United States) [7445-20]

4:35 pm: **Approximate conditional mean probability hypothesis density filtering for linear/nonlinear models**, Sivagnanam Sutharsan, Nandakumaran Nadarajah, Ratnasingham Tharmarasa, Thiagalingam Kirubarajan, McMaster Univ. (Canada); Thomas Lang, General Dynamics Canada Ltd. (Canada) [7445-21]

Room: Conv. Ctr. 19 Wed. 5:30 to 7:00 pm

Oral Standby/Poster Presentations

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Further analysis of the track repulsion effect in automatic tracking, Stefano P. Coraluppi, Craig Carthel, NATO Undersea Research Ctr. (Italy); Peter K. Willett, Univ. of Connecticut (United States) [7445-36]

Estimation of laser system pointing parameters using a near-Gaussian irradiance profile, Sreedhar Aeddy, Deva K. Borah, David G. Voelz, New Mexico State Univ. (United States) [7445-37]

Integrated clutter estimation, target detection, and tracking, Xin CHEN, Ratnasingham Tharmarasa, Thiagalingam Kirubarajan, McMaster Univ. (Canada); Michel Pelletier, ICx Radar Systems (Canada) [7445-39]

Modified TBM method for target classification, Wei Mei, Ganlin Shan, Shijiazhuang Mechanical Engineering College (China) [7445-40]

Multiple model smooth variable structure filter for nonlinear state estimation, Stephen A. Gadsden, Saeid Habibi, Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-41]

Multipath-assisted multitarget tracking using multiframe assignment, Maheswaran Subramaniam, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Michel Pelletier, ICx Radar Systems (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-42]

Unbiased Kalman filter using converted measurements: revisit, Wei Mei, Yaakov Bar-Shalom, Univ. of Connecticut (United States) [7445-38]

Tracking move-stop-move targets with state-dependent mode transition probabilities, Shuo Zhang, Yaakov Bar-Shalom, Univ. of Connecticut (United States) [7445-47]

Room: Conv. Ctr. 19 Wed. 5:30 to 7:00 pm

Poster Presentations

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Segmentation of suspicious objects in an x-ray image using automated region filling approach, Kenneth Fu, Pankaj K. Das, Clark C. Guest, Univ. of California, San Diego (United States) [7445-43]

Tracking dismounted combatants: a comparison of different trackers, Dimitry Akselrod, McMaster Univ. (Canada); Michael K. McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-44]

Feasibility of using transmitters of opportunity for precision multitarget tracking, Nandakumaran Nadarajah, Ratnasingham Tharmarasa, McMaster Univ. (Canada); Michael K. McDonald, Defence Research and Development Canada (Canada); Thiagalingam Kirubarajan, McMaster Univ. (Canada) [7445-45]

A novel algorithm for target material discrimination using dual energy x-ray imaging system, Kenneth Fu, Univ. of California, San Diego (United States) and SAIC (United States); Dale Ranta, SAIC (United States); Pankaj K. Das, Clark C. Guest, Univ. of California, San Diego (United States) [7445-46]

Room: Conv. Ctr. 19 Thurs. 8:30 am to 12:00 pm

Processing with Multiple Sensor Data

Session Chairs: Rabinder N. Madan, Office of Naval Research; Liyi Dai, U.S. Army Research Office

8:30 am: **Multiple-target tracking via kinematics, shape, and appearance based data association**, Shunguang Wu, Yi Tan, Subhudev Das, Christopher Broaddus, Ming-Yee Chiu, Sarnoff Corp. (United States) [7445-22]

8:55 am: **Self-organizing network-centric resource management for multifunction radars**, Brad S. Weir, The Johns Hopkins Univ. Applied Physics Lab. (United States) [7445-23]

9:20 am: **Target tracking using compressed sensing for multistatic radar**, Sora Choi, Christian R. Berger, David F. Crouse, Shengli Zhou, Peter K. Willett, Univ. of Connecticut (United States) [7445-24]

9:45 am: **Covariance consistency compensation performance**, Oliver E. Drummond, CyberRnD, Inc. (United States) [7445-25]

Coffee Break 10:10 to 10:45 am

10:45 am: **Maneuverable threat defeat with Distributed Sensor Concept (DISCO)**, Michael K. Rafailov, RICHER International LLC (United States) [7445-26]

11:10 am: **Angle-only tracking in networked sensor environments**, Randy C. Paffenroth, Numerica Corp. (United States); Louis L. Scharf, Colorado State Univ. (United States); Jason Yosinski, Numerica Corp. (United States) [7445-27]

11:35 am: **Sensor bias estimation in the presence of data association uncertainty**, David F. Crouse, Yaakov Bar-Shalom, Peter K. Willett, Univ. of Connecticut (United States) [7445-28]

Lunch Break 12:00 to 1:30 pm

SESSION 5

Room: Conv. Ctr. 19 Thurs. 1:30 to 5:00 pm

Small Target Tracking

Session Chairs: Oliver E. Drummond, Consulting Engineer; Richard D. Teichgraeber, Consultant

1:30 pm: **A performance comparison of nonlinear filtering techniques using recorded radar datasets**, Bhashyam Balaji, Zhen J. Ding, Defence Research and Development Canada (Canada) [7445-29]

1:55 pm: **Nonlinear filters with particle flow**, Frederick E. Daum, Jim Huang, Raytheon Co. (United States) [7445-30]

2:20 pm: **Integration of a road network into a radar ground moving target tracking(GMTT) system and its performance evaluation**, Samuel S. Blackman, Kathy Fong, Douglas Carroll, Justin A. Lancaster, Raytheon Space & Airborne Systems (United States); Robert J. Dempster, Private Contractor (United States) [7445-31]

2:45 pm: **Design of an adaptive passive collision warning system for UAVs**, Richard W. Osborne III, Yaakov Bar-Shalom, Peter K. Willett, Univ. of Connecticut (United States); Glenn Baker, BWT Lighting Inc. (United States) [7445-32]

Coffee Break 3:10 to 3:45 pm

3:45 pm: **Passive ranging: optimal maneuvers and performance bounds**, Paul F. Singer, Raytheon Co. (United States) [7445-33]

4:10 pm: **Seventeen dubious methods to approximate the gradient for nonlinear filters with particle flow**, Frederick E. Daum, Talia Kohen, Raytheon Co. (United States) [7445-34]

Conference 7446

Sunday-Tuesday 2-4 August 2009 • Proceedings of SPIE Vol. 7446

Wavelets XIII

Conference Chairs: **Vivek K. Goyal**, Massachusetts Institute of Technology; **Manos Papadakis**, Univ. of Houston; **Dimitri Van de Ville**, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

Program Committee: **Akram Aldroubi**, Vanderbilt Univ.; **Radu V. Balan**, Univ. of Maryland, College Park; **John J. Benedetto**, Univ. of Maryland, College Park; **Bernhard G. Bodmann**, Univ. of Houston; **Emmanuel J. Candes**, California Institute of Technology; **Peter G. Casazza**, Univ. of Missouri, Columbia; **Jalal M. Fadili**, CNRS-ENSICAen, Unif. of Caen (France); **Nicholas G. Kingsbury**, Univ. of Cambridge (United Kingdom); **Gitta Kutyniok**, Univ. Osnabrück (Germany); **Demetrio Labate**, North Carolina State Univ.; **Andrew F. Laine**, Columbia Univ.; **Michael Liebling**, Univ. of California/Santa Barbara; **Jean-Christophe Olivo-Marin**, Institut Pasteur (France); **Jean-Luc Starck**, Commissariat à l'Énergie Atomique (France); **Michael A. Unser**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Pierre Vandergheynst**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Yves Wiaux**, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

Sunday 2 August

Room: Conv. Ctr. 7B Sun. 8:40 to 8:50 am

Welcome

Session Chair: **Vivek K. Goyal**, Massachusetts Institute of Technology

SESSION 1

Room: Conv. Ctr. 7B Sun. 8:50 to 10:10 am

Wavelets in Bio-Imaging

Session Chairs: **Amina Chebira**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Michael Liebling**, Univ. of California, Santa Barbara; **Jean-Christophe Olivo-Marin**, Institut Pasteur (France)

8:50 am: **Wavelet domain mutual information synchronization of multimodal cardiac microscopy image sequences**, Michael Liebling, Hiranmayi Ranganathan, Univ. of California, Santa Barbara (United States) [7446-03]

9:10 am: **Multiresolution multiscale active mask segmentation of fluorescence microscope images**, Gowri Srinivasa, PES School of Engineering (India); Matthew C. Fickus, Air Force Institute of Technology (United States); Jelena Kovacevic, Carnegie Mellon Univ. (United States) [7446-04]

9:30 am: **Sparse algebraic reconstruction for Fluorescence Mediated Tomography**, Arrate Muñoz-Barutia, Carlos Pardo-Martin, Thomas Pengo, Carlos Ortiz-de-Solórzano, Univ. de Navarra (Spain) [7446-05]

9:50 am: **Compressed sensing in biological microscopy**, Marcio de Moraes Marim, Institut Pasteur (France); Elsa D. Angelini, Ecole Nationale Supérieure des Télécommunications (France); Jean-Christophe Olivo-Marin, Institut Pasteur (France) [7446-06]

Coffee Break 10:10 am

SESSION 2

Room: Conv. Ctr. 7B Sun. 10:40 am to 12:00 pm

Compressed Sensing and its Applications

Session Chair: **Justin K. Romberg**, Georgia Institute of Technology

10:40 am: **Multiple channel estimation and compressive sensing**, Justin K. Romberg, Georgia Institute of Technology (United States) [7446-07]

11:00 am: **A sparsity detection framework for on-off random access channels**, Alyson K. Fletcher, Univ. of California, Berkeley (United States); Sundeeep Rangan, Flarion Technologies, Inc. (United States); Vivek K. Goyal, Massachusetts Institute of Technology (United States) [7446-08]

11:20 am: **Sparse approximation methods for wireless source localization**, Andrew E. Waters, Volkan Cevher, Richard G. Baraniuk, Rice Univ. (United States) [7446-09]

11:40 am: **Optimal algorithms for support recovery**, Venkatesh Saligrama, Boston Univ. (United States) [7446-10]

Lunch Break 12:00 pm

SESSION 3

Room: Conv. Ctr. 7B Sun. 1:30 to 3:10 pm

Directional Multidimensional Data Representations

Session Chair: **Demetrio Labate**, North Carolina State Univ.

1:30 pm: **Three-dimensional steerlets: a novel tool for extracting textural and structural features in 3D images**, Manos Papadakis, Robert Azencott, Bernhard G. Bodmann, Univ. of Houston (United States) [7446-11]

1:50 pm: **Digital shearlet transform**, Gitta Kutyniok, Univ. Osnabrück (Germany); David L. Donoho, Morteza Shahram, Stanford Univ. (United States) [7446-12]

2:10 pm: **Inverse halftoning using a shearlet representation**, Glenn R. Easley, System Planning Corp. (United States); Vishal Patel, Dennis M. Healy, Jr., Univ. of Maryland, College Park (United States) [7446-13]

2:30 pm: **Signal restoration with overcomplete wavelet transforms: comparison of analysis and synthesis priors**, Ivan W. Selesnick, Polytechnic Institute of NYU (United States); Mario A. T. Figueiredo, Instituto Superior Técnico (Portugal) [7446-14]

2:50 pm: **A curve representation of human behavior**, Sheng Yi, Hamid Krim, North Carolina State Univ. (United States) [7446-15]

Coffee Break 3:10 pm

SESSION 4

Room: Conv. Ctr. 7B Sun. 3:40 to 5:20 pm

Sparsity in Physics

Session Chairs: **Pierre Vandergheynst**, Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Yves Wiaux**, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

3:40 pm: **Sparsity and persistence in time-frequency sound representations**, Bruno Torrèsani, Matthieu Kowalski, Univ. de Provence (France) [7446-16]

4:00 pm: **Efficient analysis and representation of geophysical processes using localized basis functions**, Frederik J. Simons, Jessica C. Hawthorne, Dong V. Wang, Princeton Univ. (United States) [7446-17]

4:20 pm: **Wavelets, sparsity and SLEs in fluids and plasmas: examining the coexistence of coherent structures and random, locally scale invariant multifractality**, Bedros Afeyan, Polymath Research Inc. (United States); Jean-Luc Starck, Commissariat à l'Énergie Atomique (France); Ilya Gruzberg, The Univ. of Chicago (United States); Peter Jones, Yale Univ. (United States); George R. McKee, Jr., Univ. of Wisconsin-Madison (United States); C. Frederick Driscoll, Univ. of California, San Diego (United States) [7446-18]

4:40 pm: **Compressed sensing and the ESA Herschel Project**, Jerome Bobin, California Institute of Technology (United States); Jean-Luc Starck, Marc Sauvage, Commissariat à l'Énergie Atomique (France); N. Barbey, . . . [7446-19]

5:00 pm: **Compressed sensing for radio interferometry: prior-enhanced Basis Pursuit imaging techniques**, Yves Wiaux, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Laurent Jacques, Ecole Polytechnique Fédérale de Lausanne (Switzerland) and Univ. Catholique de Louvain (Belgium); Gilles Puy, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Anna Scaiffe, Univ. of Cambridge (United Kingdom); Pierre Vandergheynst, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7446-20]

Conference 7446

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope
Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 5

Room: Conv. Ctr. 7B Mon. 8:30 to 10:30 am

Frames: Theory and Applications

Session Chairs: Radu V. Balan, Univ. of Maryland, College Park; Bernhard G. Bodmann, Univ. of Houston

8:30 am: **Duals of frame sequences**, Christopher E. Heil, Yoo Young Kim, Georgia Institute of Technology (United States); Jae Kun Lim, Hankyong National Univ. (Korea, Republic of) [7446-21]

8:50 am: **A family of GU equiangular tight frames**, Kasso A. Okoudjou, Univ. of Maryland, College Park (United States) [7446-22]

9:10 am: **Lapped tight frame transforms**, Aliaksei Sandryhaila, Carnegie Mellon Univ. (United States); Amina Chebira, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Markus Pueschel, Jelena Kovacevic, Carnegie Mellon Univ. (United States) [7446-23]

9:30 am: **Distribution of quantization noise**, Yang Wang, Michigan State Univ. (United States) [7446-24]

9:50 am: **Signal reconstruction with erasures**, Peter G. Casazza, Steven Senger, Univ. of Missouri, Columbia (United States); Bernhard G. Bodmann, Univ. of Houston (United States); Gitta Kutyniok, Univ. Osnabrück (Germany) [7446-25]

10:10 am: **Nested frames as fountain codes**, Gitta Kutyniok, Univ. Osnabrück (Germany); Bernhard G. Bodmann, Univ. of Houston (United States); Ali Pezeshki, Colorado State Univ. (United States) [7446-26]

Coffee Break 10:30 am

Room: Conv. Ctr. 7B Mon. 11:00 am to 12:00 pm

Keynote I

Session Chair: Dimitri Van De Ville, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

11:00 am: **Compressed Sensing: what works, what doesn't, and what's still in store**, Thomas Strohmer, Univ. of California, Davis (United States). [7446-01]

Lunch/Exhibition Break 12:00 pm

SESSION 6

Room: Conv. Ctr. 7B Mon. 1:30 to 3:10 pm

Design of Overcomplete Multidimensional Decompositions

Session Chair: Nicholas G. Kingsbury, Univ. of Cambridge (United Kingdom)

1:30 pm: **Optimality in the design of overcomplete decompositions**, Nicholas G. Kingsbury, Univ. of Cambridge (United Kingdom); H. Joel Trussell, North Carolina State Univ. (United States) [7446-27]

1:50 pm: **Learning real and complex overcomplete representations from the statistics of natural images**, Bruno A. Olshausen, Charles F. Cadieu, Univ. of California, Berkeley (United States); David K. Warland, Univ. of California, Davis (United States). [7446-28]

2:10 pm: **Gabor wavelet analysis and the fractional Hilbert transform**, Kunal N. Chaudhury, Michael A. Unser, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7446-29]

2:30 pm: **Solving inverse problems with overcomplete transforms and convex optimization techniques**, Lotfi Chaàri, Nelly Pustelnik, Caroline Chau, Jean-Christophe Pesquet, Univ. Paris-Est Marne-la-Vallée (France) . . [7446-30]

2:50 pm: **Oscillatory and transient signal decomposition using overcomplete rational-dilation wavelet transforms**, Ivan W. Selesnick, Ilker Bayram, Polytechnic Institute of NYU (United States) [7446-31]

Coffee Break 3:10 pm

SESSION 7

Room: Conv. Ctr. 7B Mon. 3:40 to 5:20 pm

Wavelet Constructions and Applications

Session Chair: Manos Papadakis, Univ. of Houston

3:40 pm: **Wavelet primal sketch representation using Marr wavelet pyramid and its reconstruction**, Dimitri Van De Ville, Michael A. Unser, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7446-32]

4:00 pm: **Texture synthesis using Marr wavelet pyramid**, Dimitri Van De Ville, Matthieu Guerin-Kern, Michael A. Unser, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7446-33]

4:20 pm: **Self-similar random vector fields and their wavelet analysis**, Pouya D. Tafti, Michael A. Unser, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7446-34]

4:40 pm: **Monogenic wavelet frames**, Stefan Held, Martin Storath, Technische Univ. München (Germany). [7446-35]

5:00 pm: **Dual frame symmetric wavelets with limited redundancy**, Farras Abdelnour, Univ. of Pittsburgh Medical Ctr. (United States). [7446-36]

Tuesday 4 August

SESSION 8

Room: Conv. Ctr. 7B Tues. 8:30 to 10:30 am

From Frames to Fusion Frames

Session Chairs: Peter G. Casazza, Univ. of Missouri, Columbia; Gitta Kutyniok, Univ. Osnabrück (Germany)

8:30 am: **Stable subspace splittings and fusion frames**, Peter Oswald, Jacobs Univ. Bremen (Germany) [7446-37]

8:50 am: **Parseval fusions frames**, Robert A. Calderbank, Princeton Univ. (United States); Peter G. Casazza, Univ. of Missouri, Columbia (United States); Gitta Kutyniok, Univ. Osnabrück (Germany); Ali Pezeshki, Colorado State Univ. (United States). [7446-38]

9:10 am: **Constructing tight fusion frames**, Peter G. Casazza, Univ. of Missouri, Columbia (United States); Matthew C. Fickus, Air Force Institute of Technology (United States); Yang Wang, Zhenfang Zhou, Michigan State Univ. (United States). [7446-39]

9:30 am: **Compressed sensing for fusion frames**, Petros T. Boufounos, Rice Univ. (United States); Gitta Kutyniok, Univ. Osnabrück (Germany). . . . [7446-40]

9:50 am: **Discriminative \mathcal{S}_k -metrics**, Arthur Szlam, Univ. of California, Los Angeles (United States); Guillermo Sapiro, Univ. of Minnesota (United States) [7446-41]

10:10 am: **When are frames close to equal-norm Parseval frames?**, Bernhard G. Bodmann, Univ. of Houston (United States); Peter G. Casazza, Univ. of Missouri, Columbia (United States). [7446-42]

Coffee Break 10:30 am

Room: Conv. Ctr. 7B Tues. 11:00 am to 12:00 pm

Keynote II

Session Chair: Manos Papadakis, Univ. of Houston

11:00 am: **Sparcity on the prowl: Extending further into the real world**, Onur G. Guleryuz, DoCoMo Communications Labs. USA, Inc. (United States) [7446-02]

Lunch/Exhibition Break 12:00 pm

SESSION 9

Room: Conv. Ctr. 7B Tues. 1:30 to 2:30 pm

Wavelet-aided Inference

Session Chair: **Vivek K. Goyal**, Massachusetts Institute of Technology

1:30 pm: **Classification of hyperspectral colon tissue samples using MCMC with wavelet transforms**, Khalid Masud, Irfan T. Butt, The Univ. of Warwick (United Kingdom). [7446-43]

1:50 pm: **Reliable structural information from multi-scale decomposition with the Mellor-Brady filter**, Tuende Szilagyi, J. Michael Brady, Univ. of Oxford (United Kingdom). [7446-44]

2:10 pm: **Poisson denoising on the sphere**, Jérémy Schmitt, Jean-Luc Starck, Commissariat à l'Énergie Atomique (France); Jalal M. Fadili, Ctr. National de la Recherche Scientifique (France); Isabelle Grenier, Jean-Marc Casandjian, Commissariat à l'Énergie Atomique (France) [7446-45]

SESSION 10

Room: Conv. Ctr. 7B Tues. 2:30 to 3:10 pm

Sparsity in Multidimensional Inverse Problems I

Session Chairs: **Jalal M. Fadili**, Service d'aéronomie (France); **Jean-Luc Starck**, Commissariat à l'Énergie Atomique (France)

2:30 pm: **Poisson noise removal in multivariate count data**, Jalal M. Fadili, Ctr. National de la Recherche Scientifique (France); Jean-Luc Starck, Commissariat à l'Énergie Atomique (France); Bo Zhang, Institut Pasteur (France); Seth Digel, Stanford Linear Accelerator Ctr. (United States) [7446-46]

2:50 pm: **Three-dimensional inpainting using sparse representations**, Arnaud Woiselle, Jean-Luc Starck, Commissariat à l'Énergie Atomique (France); Jalal M. Fadili, Ctr. National de la Recherche Scientifique (France) . . . [7446-47]

Coffee Break 3:10 pm

SESSION 11

Room: Conv. Ctr. 7B Tues. 3:40 to 5:00 pm

Sparsity in Multidimensional Inverse Problems II

Session Chairs: **Jalal M. Fadili**, Service d'aéronomie (France); **Jean-Luc Starck**, Commissariat à l'Énergie Atomique (France)

3:40 pm: **Sparsity and morphological diversity for multivalued data analysis**, Jerome Bobin, California Institute of Technology (United States); Jean-Luc Starck, Yassir Moudden, Commissariat à l'Énergie Atomique (France); Jalal M. Fadili, Ctr. National de la Recherche Scientifique (France). [7446-48]

4:00 pm: **An aggregator view of NL-Means**, Erwan Le Pennec, Joseph Salmon, Univ. Paris 7-Denis Diderot (France). [7446-49]

4:20 pm: **Distributed compressed sensing for sensor networks using p-thresholding**, Mohammad Golbabaee, Pierre Vandergheynst, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [7446-50]

4:40 pm: **Compressive photon-limited imaging**, Rebecca M. Willett, Duke Univ. (United States) [7446-51]

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Conference 7447

Sunday-Monday 2-3 August 2009 • Proceedings of SPIE Vol. 7447

Videometrics, Range Imaging, and Applications X

Conference Chairs: **Fabio Remondino**, FBK Trento (Italy); **Mark R. Shortis**, RMIT Univ. (Australia); **Sabry F. El-Hakim**, National Research Council Canada (Canada)

Program Committee: **J. Angelo Beraldin**, National Research Council Canada (Canada); **Jan Boehm**, Univ. Stuttgart (Germany); **Hirofumi Chikatsu**, Tokyo Denki Univ. (Japan); **Nicola D'Apuzzo**, Homometrica Consulting (Switzerland); **Armin Gruen**, ETH Zürich (Switzerland); **Gabriele Guidi**, Politecnico di Milano (Italy); **Henrik G. A. Haggren**, Helsinki Univ. of Technology (Finland); **Derek D. Lichti**, Univ. of Calgary (Canada); **Hans-Gerd Maas**, Technische Univ. Dresden (Germany); **Norbert Pfeifer**, Technische Univ. Wien (Austria); **Stuart Robson**, Univ. College London (United Kingdom)

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 31C Sun. 9:00 to 10:20 am

Range Systems I

Session Chair: **Mark R. Shortis**, RMIT Univ. (Australia)

9:00 am: **Range calibration for terrestrial laser scanners and range cameras** (*Invited Paper*), Norbert Pfeifer, Camillo Ressler, Technische Univ. Wien (Austria); Wilfried Karel, Technische Univ. Wien (Austria) and Institute of Photogrammetry and Remote Sensing, Vienna University of Technology (Austria) [7447-01]

9:40 am: **Range imaging of marble surfaces: quantitative evaluation of artefacts**, Gabriele Guidi, Politecnico di Milano (Italy); Fabio Remondino, FBK Trento (Italy); Michele Russo, Politecnico di Milano (Italy) [7447-02]

10:00 am: **Proposed traceable spatial resolution protocols for 3D imaging systems**, David K. MacKinnon, J. Angelo Beraldin, Luc Cournoyer, Francois Blais, National Research Council Canada (Canada) [7447-03]

Coffee Break 10:20 am

SESSION 2

Room: Conv. Ctr. 31C Sun. 10:50 am to 12:10 pm

Systems Development

Session Chair: **Fabio Remondino**, FBK Trento (Italy)

11:10 am: **Real-time phase-stamp range finder with improved accuracy**, Akira Kimachi, Osaka Electro-Communication Univ. (Japan) [7447-05]

11:30 am: **Application of inverse square law for 3D sensing**, Sabri Gurbuz, Advanced Telecommunications Research Institute International (Japan) [7447-06]

11:50 am: **RGB grating projection profilometry based on empirical mode decomposition algorithm**, Xiang Zhou, Hong Zhao, Xi'an Jiaotong Univ. (China) [7447-07]

Lunch Break 12:10 pm

SESSION 3

Room: Conv. Ctr. 31C Sun. 2:00 to 3:20 pm

Industrial/System Metrology

Session Chair: **Mark R. Shortis**, RMIT Univ. (Australia)

2:00 pm: **Performance study of non-contact surface measurement technology for use in an experimental fusion device**, Andrew D. Brownhill, Univ. College London (United Kingdom); Robert Brade, United Kingdom Atomic Energy Authority (United Kingdom); Stuart Robson, Univ. College London (United Kingdom) [7447-08]

2:20 pm: **High-speed inspection of 3D deformable parts**, Andres Jaramillo, Univ. Nacional de Colombia (Colombia); Pierre Boulanger, Univ. of Alberta (Canada); Flavio Prieto, Univ. Nacional de Colombia (Colombia) [7447-10]

2:40 pm: **Efficient embedded plate position measurement system for large plant construction**, Hiroshi Yokoyama, Yuichi Yamamoto, Shinichi Ebata, Tatsuo Makita, Hitachi Plant Technologies, Ltd. (Japan) [7447-11]

3:00 pm: **A real-time 3D scanning system for pavement rutting, pothole, and punchout**, Qingguang Li, Ming Yao, Xun Yao, Bugao Xu, The Univ. of Texas at Austin (United States) [7447-12]

Coffee Break 3:20 pm

SESSION 4

Room: Conv. Ctr. 31C Sun. 3:50 to 4:30 pm

Range Systems II

Session Chair: **Norbert Pfeifer**, Technische Univ. Wien (Austria)

3:50 pm: **DTM generation in forested area using multiple return pulses from airborne laser scanner**, Tsutomu Kakiuchi, Aero Asahi Corp. (Japan); Hirofumi Chikatsu, Tokyo Denki Univ. (Japan) [7447-13]

4:10 pm: **Classification of mobile terrestrial laser point clouds using semantic constraints**, Shi Pu, International Institute for Geo-Information Science and Earth Observation (Netherlands); Qingming Zhan, Wuhan Univ. (China) [7447-16]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

SESSION 5

Room: Conv. Ctr. 31C Mon. 8:30 to 9:50 am

Image Sequence Analysis/Tracking

Session Chair: **Fabio Remondino**, FBK Trento (Italy)

8:30 am: **markerless motion capture: the challenge of accuracy in general environments through model based approaches**. (*Invited Paper*), Stefano Corazza, Emiliano Gambaretto, Animation Inc. (United States) [7447-17]

9:10 am: **Automated tracking of figure skater by using PTZ camera**, Tomohiko Haraguchi, Tsuyoshi Taki, Junichi Hasegawa, Chukyo Univ. (Japan) [7447-18]

9:30 am: **Dense point tracking in video sequences by orientation code matching (OCM)**, Nicola D'Apuzzo, Hometrica Consulting (Switzerland); Nobuo Kochi, Mitsuharu Yamada, Topcon Corp. (Japan) [7447-19]

SESSION 6

Room: Conv. Ctr. 31C Mon. 9:50 to 11:10 am

System Calibration and Characterization

Session Chair: Mark R. Shortis, RMIT Univ. (Australia)

9:50 am: **Comparative evaluation of consumer grade cameras and mobile phone cameras for close range photogrammetry**, Hirofumi Chikatsu, Tokyo Denki Univ. (Japan) [7447-20]

10:10 am: **Statistical analysis of measurement processes for time-of-flight cameras**, Faisal Mufti, Robert Mahony, The Australian National Univ. (Australia) [7447-21]

10:30 am: **Performance evaluation of macro lens in digital close range photogrammetry**, Hideharu Yanagi, Hirofumi Chikatsu, Tokyo Denki Univ. (Japan) [7447-22]

10:50 am: **Three-dimensional object recognition using a monoscopic camera system and CAD geometry information**, Alessandro Cefalu, Jan Boehm, Univ. Stuttgart (Germany) [7447-23]

SESSION 7

Room: Conv. Ctr. 31C Mon. 11:30 am to 12:30 pm

Applications

Session Chair: Norbert Pfeifer, Technische Univ. Wien (Austria)

11:30 am: **Payload systems and tracking algorithms for photogrammetric measurement of parachute shape**, Mark R. Shortis, RMIT Univ. (Australia); Stuart Robson, Univ. College London (United Kingdom); Tom W. Jones, Benny Lunsford, NASA Langley Research Ctr. (United States); Joao F. Oliveira, Instituto de Novas Tecnologias (Portugal) [7447-24]

11:50 am: **Combined use of computer vision and photogrammetric techniques for automatic orientation of markerless image blocks**, Luigi Barazzetti, Marco Scaioni, Politecnico di Milano (Italy); Fabio Remondino, FBK Trento (Italy) [7447-25]

12:10 pm: **Analysis of kertoscope images for detecting fixation eye movements and ocular surface deformation**, Malgorzata A. Kowalska, Wroclaw Univ. of Technology (Poland); David Mas, Univ. de Alicante (Spain); Henryk T. Kasprzak, Wroclaw Univ. of Technology (Poland) [7447-26]

Conference 7448

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7448

Advances in X-Ray/EUV Optics and Components IV

Conference Chairs: **Ali M. Khounsary**, Argonne National Lab.; **Christian Morawe**, European Synchrotron Radiation Facility (France); **Shunji Goto**, Japan Synchrotron Radiation Research Institute (Japan)

Program Committee: **Lahsen Assoufid**, Argonne National Lab.; **Stefan Braun**, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany); **Shih-Lin Chang**, National Tsing Hua Univ. (Taiwan); **Sultan B. Dabagov**, Istituto Nazionale di Fisica Nucleare (Italy); **Ralf D. Geckeler**, Physikalisch-Technische Bundesanstalt (Germany); **Hans M. Hertz**, Kungliga Tekniska Högskolan (Sweden); **Werner H. Jark**, Sincrotrone Trieste S.C.p.A. (Italy); **Alexander Yu. Kazimirov**, Cornell Univ.; **George A. Kyrala**, Los Alamos National Lab.; **Carolyn A. MacDonald**, SUNY/Univ. at Albany; **Howard A. Padmore**, Lawrence Berkeley National Lab.; **Ladislav Pina**, Czech Technical Univ. in Prague (Czech Republic); **Michael J. Pivovarov**, Lawrence Livermore National Lab.; **Yuriy Ya Platonov**, Rigaku Innovative Technologies, Inc.; **Kawal J. S. Sawhney**, Diamond Light Source Ltd. (United Kingdom); **Regina Soufli**, Lawrence Livermore National Lab.; **Makina Yabashi**, Japan Synchrotron Radiation Research Institute (Japan); **Kazuto Yamauchi**, Osaka Univ. (Japan); **Brian W. Yates**, Canadian Light Source Inc. (Canada)

Monday 3 August

SESSION 1

Room: Conv. Ctr. 4 Mon. 8:40 to 10:00 am

Metrology and Applications

Session Chairs: **Lahsen Assoufid**, Argonne National Lab.; **Ralf D. Geckeler**, Physikalisch-Technische Bundesanstalt (Germany)

8:40 am: **Methods to improve the accuracy of the surface reconstruction with a Fizeau interferometer**, Josep Vidal, CELLS - ALBA (Spain); Juan Campos, Univ. Autònoma de Barcelona (Spain); Josep Nicolàs, CELLS - ALBA (Spain) [7448-28]

9:00 am: **Binary pseudo-random gratings and arrays for calibration of the modulation transfer function of surface profilometers: recent developments**, Samuel K. Barber, Lawrence Berkeley National Lab. (United States); Paul Soldate, Rensselaer Polytechnic Institute (United States); Erik H. Anderson, Rossana Cambie, Wayne R. McKinney, Lawrence Berkeley National Lab. (United States); Peter Z. Takacs, Brookhaven National Lab. (United States); Dmytro L. Voronov, Valeriy V. Yashchuk, Lawrence Berkeley National Lab. (United States) [7448-02]

9:20 am: **High-precision profile measurement of a small radius lens by surface gradient integrated profiler**, Yasuo Higashi, Tatsuya Kume, Kazuhiro Enami, High Energy Accelerator Research Organization (Japan); Katsuyoshi Endo, Junichi Uchikoshi, Osaka Univ. (Japan); Kazushi Nomura, Takashi Miyawaki, Nikon Corp. (Japan); Shigeki Tachibanada, Yomohiro Ueno, Osaka Univ. (Japan) [7448-03]

9:40 am: **Improved efficiency of materials processing by dual action of XUV/Vis-NIR ultrashort laser pulses and comprehensive study of high-order harmonic XUV source at PALS**, Krzysztof Jakubczak, Tomas Mocek, Bedrich Rus, Jan Hrebicek, Magdalena Sawicka, Institute of Physics (Czech Republic); I Jong Kim, Chul Min Kim, Gye Hwang Lee, Chang Hee Nam, Korea Advanced Institute of Science and Technology (Korea, Republic of); Jaromir Chalupsky, Vera Hajkova, Libor Juha, Institute of Physics (Czech Republic); Jaroslav Sobota, Tomas Forst, Institute of Scientific Instruments (Czech Republic) [7448-04]

Coffee Break 10:00 am

SESSION 2

Room: Conv. Ctr. 4 Mon. 10:30 am to 12:10 pm

Mirrors and Applications

Session Chairs: **Ali M. Khounsary**, Argonne National Lab.; **Kazuto Yamauchi**, Osaka Univ. (Japan)

10:30 am: **Modeling of heat-bump formation in x-ray optics under SR beams**, Peter Revesz, Alexander Y. Kazimirov, Cornell Univ. (United States); Emmett L. Windisch, Wayne State Univ. (United States); Christopher J. MacGahan, James Savino, Cornell Univ. (United States) [7448-05]

10:50 am: **The fabrication and characterisation of piezoelectric actuators for active x-ray optics**, Dou Zhang, Daniel Rodriguez-Sanmartin, Tim W. Button, Carl Meggs, The Univ. of Birmingham (United Kingdom); Carolyn Atkins, Hongchang Wang, Peter Doel, David Brooks, Univ. College London (United Kingdom); Charlotte H. Feldman, Richard Willingale, Univ. of Leicester (United Kingdom); Alan G. Michette, Slawka J. Pfauntsch, Shahin Sahraei, King's College London (United Kingdom); Ady James, Univ. College London (United Kingdom); Camelia Dunare, Tom Stevenson, William Parkes, The Univ. of Edinburgh (United Kingdom); Andy Smith, Science and Technology Facilities Council (United Kingdom) [7448-06]

11:10 am: **Progress on the development of active micro-structured optical arrays for X-ray optics**, Daniel Rodriguez-Sanmartin, Dou Zhang, Tim W. Button, The Univ. of Birmingham (United Kingdom); Alan G. Michette, King's College London (United Kingdom); Carolyn Atkins, David Brooks, Univ. College London (United Kingdom); Camelia Dunare, The Univ. of Edinburgh (United Kingdom); Peter Doel, Univ. College London (United Kingdom); Charlotte H. Feldman, Univ. of Leicester (United Kingdom); Ady James, Univ. College London (United Kingdom); Slawka J. Pfauntsch, King's College London (United Kingdom); William Parkes, Tom Stevenson, The Univ. of Edinburgh (United Kingdom); Andy Smith, Daresbury Lab. (United Kingdom); Shahin Sahraei, King's College London (United Kingdom); Hongchang Wang, Univ. College London (United Kingdom); Richard Willingale, Univ. of Leicester (United Kingdom) [7448-07]

11:30 am: **Optical path function calculation of a Diaboloid for an incoming spherical wave**, Wayne R. McKinney, James M. Glossinger, Howard A. Padmore, Malcolm R. Howells, Lawrence Berkeley National Lab. (United States) [7448-08]

11:50 am: **Improvement of the angular resolution of the thin-foil-nested X-ray telescope**, Takayuki Hayashi, Takuro Sato, Tokyo Metropolitan Univ. (Japan); Manabu Ishida, Yoshitomo Maeda, Hideyuki Mori, Ryoko Nakamura, Kentaro Someya, Japan Aerospace Exploration Agency (Japan); Takayuki Shirata, Tokyo Metropolitan Univ. (Japan) [7448-09]

Lunch Break 12:10 pm

SESSION 3

Room: Conv. Ctr. 4 Mon. 1:20 to 3:20 pm

Focusing Optics and Applications

Session Chairs: **Shunji Goto**, Japan Synchrotron Radiation Research Institute (Japan); **Alexander Yu. Kazimirov**, Cornell Univ.

1:20 pm: **Nested mirrors for X-rays and Neutrons**, Gene E. Ice, Oak Ridge National Lab. (United States); Rozaliya I. Barabash, Oak Ridge National Lab. (United States) and The Univ. of Tennessee at Knoxville (United States) [7448-10]

1:40 pm: **Graded multilayer mirror for sub-10nm hard x-ray focusing**, Hidekazu Mimura, Souichiro Handa, Takashi Kimura, Osaka Univ. (Japan); Hirokatsu Yumoto, Japan Synchrotron Radiation Research Institute (Japan); Satoshi Matsuyama, Yasuhisa Sano, Osaka Univ. (Japan); Kenji Tamasaku, Yoshinori Nishino, Makina Yabashi, Tetsuya Ishikawa, RIKEN/Spring-8 (Japan); Kazuto Yamauchi, Osaka Univ. (Japan) [7448-11]

2:00 pm: **Absolute efficiency measurement of high-performance zone plates**, Sharon Chen, Alan F. Lyon, Srivatsan Seshadri, Yan Feng, Michael Feser, Simone Sassolini, Xradia, Inc. (United States) [7448-12]

2:20 pm: **New imaging applications by polycapillary optics**, Dariush Hampai, Istituto Nazionale di Fisica Nucleare (Italy); Sultan B. Dabagov, Istituto Nazionale di Fisica Nucleare (Italy) and Ras (Russian Federation); Giorgio Cappuccio, Istituto Nazionale di Fisica Nucleare (Italy); Cibin Giannantonio, Diamond Light Source Ltd. (United Kingdom) [7448-13]

2:40 pm: **Fabrication and characterization of capillary condensers for x-ray microscopy**, Erxiang Huang, Xianghui Zeng, Andrei Tkachuk, Michael Feser, Wenbing Yun, Xradia, Inc. (United States) [7448-14]

3:00 pm: **X-ray filter on the base of refractive lenses**, Nikolai N. Kolchevsky, Pavel Petrov, Belarusian State Univ. (Belarus) [7448-15]

Coffee Break 3:20 pm

SESSION 4

Room: Conv. Ctr. 4 Mon. 3:50 to 5:10 pm

Multilayer Optics and Applications I

Session Chairs: **Regina Soufli**, Lawrence Livermore National Lab.;
George A. Kyrala, Los Alamos National Lab.

3:50 pm: **Thickness control of large area x-ray multilayers**, Christian Morawe, Jean-Christophe Peffen, European Synchrotron Radiation Facility (France) [7448-16]

4:10 pm: **Large total-reflection x-ray optics and multilayer optics for tomography beamlines**, Frank Hertlein, Jörg Wiesmann, Carsten Michaelsen, Incoatec GmbH (Germany); Mark Mاتيake, Michael Störmer, GKSS-Forschungszentrum Geesthacht (Germany) [7448-17]

4:30 pm: **Ultra-high density multilayer sliced grating for EUV and Soft X-rays: Recent Developments**, Dmitriy L. Voronov, Erik H. Anderson, Rossana Cambie, Julia Meyer-Ilse, Eric M. Gullikson, Valeriy V. Yashchuk, Howard A. Padmore, Lawrence Berkeley National Lab. (United States); Minseung Ahn, Chih-Hao Chang, Ralf K. Heilmann, Mark L. Schattenburg, Massachusetts Institute of Technology (United States) [7448-18]

4:50 pm: **One-dimensional grazing incidence imaging for 4.75keV rays using double-periodic multilayer**, Baozhong Mu, Zhanshan Wang, Shengzhen Yi, Jingtao Zhu, Li Jiang, Xin Wang, Qiushi Huang, Shengling Huang, Tongji Univ. (China); Yuhong Bai, Changchun Institute of Optics, Fine Mechanics and Physics (China) [7448-19]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

X-ray communications for high altitude platforms, Bradley S. Tice, Advanced Human Design (United States) [7448-30]

Monochromatic X-ray imaging of Z-pinch plasmas with a pinhole and a logarithmic spiral Bragg mirror, Qingguo Yang, Zeren Li, Qixian Peng, Guanghua Chen, Chinese Academy of Engineering Physics (China) . . [7448-31]

Zone plate tilt study in transmission X-ray microscope, Fu-Han Chao, National Chiao Tung Univ. (Taiwan); Gung-Chian Yin, Keng S. Liang, National Synchrotron Radiation Research Ctr. (Taiwan); Yin-Chieh Lai, National Chiao Tung Univ. (Taiwan) [7448-32]

Development of high-precision slit for x-ray beamline at SPring-8, Tomoyuki Takeuchi, Masayuki Tanaka, Takanori Miura, Yasunori Senba, Haruhiko Ohashi, Shunji Goto, Japan Synchrotron Radiation Research Institute (Japan) [7448-33]

Design optimization of highly accurate elliptical mirrors for hard-x-ray micro focusing probes at SPring-8, Hirokatsu Yumoto, Japan Synchrotron Radiation Research Institute (Japan); Kunio Hirata, Atsushi Nisawa, Go Ueno, RIKEN SPring-8 Ctr. (Japan); Masugu Sato, Jin-Young Son, Tomoyuki Koganezawa, Masatake Machida, Takayuki Muro, Ichiro Hirosawa, Motohiro Suzuki, Naomi Kawamura, Masaichiro Mizumaki, Japan Synchrotron Radiation Research Institute (Japan); Haruhiko Ohashi, Japan Synchrotron Radiation Research Institute (Japan) and RIKEN SPring-8 Ctr. (Japan); Masaki Yamamoto, RIKEN SPring-8 Ctr. (Japan); Yoshio Watanabe, Japan Synchrotron Radiation Research Institute (Japan); Shunji Goto, Japan Synchrotron Radiation Research Institute (Japan) and RIKEN SPring-8 Ctr. (Japan) [7448-34]

Comparative study of X-Ray scattering by first-order perturbation theory and generalized Harvey-Shack theory, Yonggang Wang, Changchun Institute of Optics, Fine Mechanics and Physics (China) [7448-35]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. 4 Tues. 9:00 to 10:00 am

Multilayer Optics and Applications II

Session Chairs: **Christian Morawe**, European Synchrotron Radiation Facility (France); **Sultan B. Dabagov**, Istituto Nazionale di Fisica Nucleare (Italy)

9:00 am: **Beam shaping by means of multilayer optics in combination with laboratory X-ray sources**, Reiner M. Dietsch, Thomas Holz, AXO DRESDEN GmbH (Germany) [7448-20]

9:20 am: **Multilayer optics for fs-diffractometry**, Jörg Wiesmann, Frank Hertlein, Carsten Michaelsen, Incoatec GmbH (Germany) [7448-22]

9:40 am: **Narrowband reflectance mirrors for the EUV spectral region near 80 nm**, Mónica Fernández-Perea, Manuela Vidal-Dasilva, Juan Ignacio Larraquert, José Antonio Aznarez Candao, José Antonio Méndez Morales, Consejo Superior de Investigaciones Científicas (Spain) [7448-23]

Coffee Break 10:00 am

SESSION 6

Room: Conv. Ctr. 4 Tues. 10:30 to 11:50 am

Optics and Applications I

Session Chairs: **Carolyn A. MacDonald**, Univ. at Albany; **Brian W. Yates**, Canadian Light Source Inc. (Canada)

10:30 am: **A fixed included angle monochromator for the 4th generation light source at FERMI@elettra**, Cristian Svetina, Daniele Cocco, Sincrotrone Trieste S.C.p.A. (Italy); Marco Zangrando, Lab. TASC INFN-CNR (Italy) [7448-24]

10:50 am: **Diffraction of X-ray beam focused by planar refractive lenses from perfect Si and GaAs crystals**, Alexander Y. Kazimirov, Cornell Univ. (United States); Victor G. Kohn, Russian Research Ctr. Kurchatov Institute (Russian Federation); Anatoly A. Snigirev, Irina I. Snigireva, European Synchrotron Radiation Facility (France) [7448-25]

11:10 am: **New microfocus source for X-ray diffractometry of thin films and nano-sized materials**, Jörg Wiesmann, Bernd Hasse, Carsten Michaelsen, Incoatec GmbH (Germany) [7448-26]

11:30 am: **Polished Beryllium X-ray Windows**, Ali M. Khounsary, Barry P. Lai, Argonne National Lab. (United States) [7448-27]

Lunch/Exhibition Break 11:50 am

SESSION 7

Room: Conv. Ctr. 4 Tues. 1:20 to 2:00 pm

Optics and Applications II

Session Chairs: **Shunji Goto**, Japan Synchrotron Radiation Research Institute (Japan); **Christian Morawe**, European Synchrotron Radiation Facility (France)

1:20 pm: **Noise spectrum in gated MCPs**, George A. Kyrala, John A. Oertel, Thomas N. Archuleta, Los Alamos National Lab. (United States); Joe P. Holder, Lawrence Livermore National Lab. (United States) [7448-28]

1:40 pm: **Evaluation of data storage layer thickness best fitted for digital data read-out procedure from hard x-ray optical memory**, Hakob P. Bezirganyan, Yerevan State Univ. (Armenia); Siranush E. Bezirganyan, Yerevan State Medical Univ. (Armenia); Petros H. Bezirganyan, Jr., State Engineering Univ. of Armenia (Armenia); Hayk H. Bezirganyan, Jr., Yerevan State Univ. (Armenia) [7448-29]

Wednesday 5 August

Room: Conv. Ctr. 31C Wed. 1:30 to 5:00 pm

X-Ray, Gamma Ray, and Particle Technologies Plenary Session

1:30 pm: **MeV and higher photons and neutron applications**, Ralph B. James, Brookhaven National Lab. (United States)

2:15 pm: **Coherence and X-ray Imaging**, Keith A. Nugent, The Univ. of Melbourne (Australia)

3:30 pm: **Sources and optics for laboratory x-ray micro imaging**, H. M. Hertz, Royal Institute of Technology (Sweden)

4:15 pm: **Compact Soft X-ray Lasers: a Doorway to Coherent Soft X-ray Science on a Table-top**, Jorge J. Rocca, Colorado State Univ. (United States)

Conference 7449

Monday-Thursday 3-6 August 2009 • Proceedings of SPIE Vol. 7449

Hard X-Ray, Gamma-Ray, and Neutron Detector Physics XI

Conference Chairs: **Ralph B. James**, Brookhaven National Lab.; **Larry A. Franks**, U.S. Dept. of Energy; **Arnold Burger**, Fisk Univ.

Program Committee: **Toru Aoki**, Shizuoka Univ. (Japan); **H. Bradford Barber**, The Univ. of Arizona; **Zane W. Bell**, Oak Ridge National Lab.; **Lynn A. Boatner**, Oak Ridge National Lab.; **Aleksey E. Bolotnikov**, Brookhaven National Lab.; **Henry Chen**, Redlen Technologies (Canada); **Nerine J. Cherepy**, Lawrence Livermore National Lab.; **Jeffrey J. Derby**, Univ. of Minnesota; **F. Patrick Doty**, Sandia National Labs.; **Martine C. Duff**, Savannah River National Lab.; **Michael Fiederle**, Albert-Ludwigs-Univ. Freiburg (Germany); **Jonathan E. Grindlay**, Harvard-Smithsonian Ctr. for Astrophysics; **Yoshinori Hatanaka**, Aichi Univ. of Technology (Japan); **Zhong He**, Univ. of Michigan; **Keitaro Hitomi**, Tohoku Institute of Technology (Japan); **Alan Janos**, U.S. Dept. of Homeland Security; **Warnick J. Kernan**, Pacific Northwest National Lab.; **Glenn F. Knoll**, Univ. of Michigan; **Henric S. Krawczynski**, Washington Univ. in St. Louis; **Patty Lee**, Brookhaven National Laboratory; **Longxia Li**, Yinnel Tech, Inc.; **Kelvin G. Lynn**, Washington State Univ.; **Manoj Mahajan**, Brookhaven National Laboratory; **Krishna C. Mandal**, EIC Labs., Inc.; **Jim L. Matteson**, Univ. of California, San Diego; **Douglas S. McGregor**, Kansas State Univ.; **Ann M. Parsons**, NASA Goddard Space Flight Ctr.; **Raulf M. Polichar**, SAIC; **Michael M. Schieber**, The Hebrew Univ. of Jerusalem (Israel); **Carolyn E. Seifert**, Pacific Northwest National Lab.; **Paul J. Sellin**, Univ. of Surrey (United Kingdom); **Michael R. Squillante**, Radiation Monitoring Devices, Inc.; **Csaba Szeles**, eV Products; **Tumay O. Tumer**, Nova R&D, Inc.; **Sergey E. Ulin**, Moscow Engineering Physics Institute (Russian Federation); **Lodewijk van den Berg**, Constellation Technology Corp.; **Peter E. Vanier**, Brookhaven National Lab.; **Nikolay B. Zaltaev**, Orion Research and Production Association (Russian Federation)

Monday 3 August

SESSION 1

Room: Conv. Ctr. 16A Mon. 8:30 to 10:10 am

CZT Detectors I

Session Chair: **Michael R. Squillante**, Radiation Monitoring Devices, Inc.

8:30 am: **CZT device with improved sensitivity for medical imaging and homeland security applications** (*Invited Paper*), Henry Chen, Pram Marthandam, Salah A. Awadalla, Pinghe Lu, Kris Iniewski, Glenn K. Bindley, Redlen Technologies (Canada) [7449-01]

9:00 am: **Recent development of large volume 3-D CdZnTe gamma-ray spectrometers** (*Invited Paper*), Zhong He, Feng Zhang, Yuefeng Zhu, William Kaye, Yvan Boucher, Cedric Herman, Univ. of Michigan (United States) [7449-02]

9:30 am: **Dual anode contact geometries for x-ray and gamma-ray spectroscopy and 3D localization**, Jerrad Martin, Alfred B. Garson III, Qiang Li, Washington Univ. in St. Louis (United States); Michael Groza, Vladimir Buliga, Arnold Burger, Fisk Univ. (United States); Henric S. Krawczynski, Washington Univ. in St. Louis (United States) [7449-03]

9:50 am: **Readout ASIC for 3D position sensitive detectors**, Emerson Vernon, Gianluigi DeGeronimo, Kim Ackley, Jack Fried, Brookhaven National Lab. (United States); Zhong He, Cedric Herman, Feng Zhang, Univ. of Michigan (United States) [7449-04]

Coffee Break 10:10 am

SESSION 2

Room: Conv. Ctr. 16A Mon. 10:40 to 11:50 am

CZT Characterization I

Session Chair: **Krishna C. Mandal**, EIC Labs., Inc.

10:40 am: **Charge transport characterisation of CdZnTe wafers grown by the Multi-Tube Physical Vapour Transport technique** (*Invited Paper*), Paul J. Sellin, V. Perumal, M. E. Ozsan, G. Prekas, Univ. of Surrey (United Kingdom); Andy W. Brinkman, Ashutosh Choubey, Durham Univ. (United Kingdom); R. Cernik, The Univ. of Manchester (United Kingdom); Paul Seller, Matthew C. Veale, Science and Technology Facilities Council (United Kingdom) [7449-05]

11:10 am: **Measurements of performance and uniformity of CZT detectors**, Giuseppe S. Camarda, Aleksey E. Bolotnikov, Yonggang Cui, Anwar M. Hossain, Ki Hyun Kim, Ge Yang, Ralph B. James, Brookhaven National Lab. (United States) [7449-06]

11:30 am: **Charge collection efficiency characterizing of CdZnTe Frisch collar spectrometer with collimated high-energy gamma-ray**, Alireza Kargar, Adam C. Brooks, Mark J. Harrison, Douglas S. McGregor, Kansas State Univ. (United States); Henry Chen, Glenn K. Bindley, Salah A. Awadalla, Redlen Technologies (Canada) [7449-07]

Lunch Break 11:50 am

SESSION 3

Room: Conv. Ctr. 16A Mon. 1:20 to 3:00 pm

CZT Detectors II

Session Chair: **Alan Janos**, U.S. Dept. of Homeland Security

1:20 pm: **Characterization of a 14-mm-long virtual Frisch-grid CZT detector array** (*Invited Paper*), Aleksey E. Bolotnikov, Giuseppe S. Camarda, Yonggang Cui, Anwar M. Hossain, Ge Yang, Ki Hyun Kim, Ralph B. James, Brookhaven National Lab. (United States) [7449-08]

1:50 pm: **Simulation of electric field profile in semi insulating Metal/CdZnTe/Metal structure under flux** (*Invited Paper*), Jan Franc, Roman Grill, Charles Univ. in Prague (Czech Republic); Ralph B. James, Brookhaven National Lab. (United States); Jan Kubat, Eduard Belas, Pavel Moravec, Pavel Hoschl, Petr Praus, Charles Univ. in Prague (Czech Republic) [7449-09]

2:20 pm: **Optimum applied bias in CZT detectors**, Salah A. Awadalla, Redlen Technologies (Canada) [7449-10]

2:40 pm: **Electric field distribution of cadmium zinc telluride (CZT) detectors**, Ge Yang, Aleksey E. Bolotnikov, Giuseppe S. Camarda, Yonggang Cui, Anwar M. Hossain, Walter Yao, Ki Hyun Kim, Ralph B. James, Brookhaven National Lab. (United States) [7449-11]

Coffee Break 3:00 pm

SESSION 4

Room: Conv. Ctr. 16A Mon. 3:30 to 5:00 pm

Scintillators I

Session Chair: **Nerine J. Cherepy**, Lawrence Livermore National Lab.

3:30 pm: **Towards understanding of nonlinearity in scintillator detector materials** (*Invited Paper*), Fei Gao, Sebastien Kerisit, Luke W. Campbell, Yulong Xie, Bret D. Cannon, Kevin M. Rosso, William J. Weber, Pacific Northwest National Lab. (United States) [7449-12]

4:00 pm: **Dual gamma neutron detection with Cs₂LiLaCl₆**, Jarek Glodo, William M. Higgins, Edgar V. D. van Loef, Kanai S. Shah, Radiation Monitoring Devices, Inc. (United States) [7449-13]

4:20 pm: **Strontium iodide scintillator for gamma-ray spectroscopy**, Nerine J. Cherepy, Stephen A. Payne, Larry Ahle, Steven Sheets, Lawrence Livermore National Lab. (United States); Rastgo H. Hawrami, Arnold Burger, Fisk Univ. (United States); Lynn A. Boatner, Oak Ridge National Lab. (United States); Edgar V. D. van Loef, Kanai S. Shah, Radiation Monitoring Devices, Inc. (United States); William W. Moses, Lawrence Berkeley National Lab. (United States) [7449-14]

4:40 pm: **Angular resolution obtained with a LaBr₃-based rotational modulator**, Brent Budden, Gary L. Case, Michael Cherry, Louisiana State Univ. (United States) [7449-15]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Bismuth tri-iodide radiation detector development, Azaree T. Lintereur, Wei Qiu, Juan C. Nino, James E. Baciak, Jr., Univ. of Florida (United States)[7449-58]

Characterization of Medipix2 assemblies with CdTe and GaAs sensors, Dominic Greiffenberg, Andreas Zwerger, Alex Fauler, Michael Fiederle, Albert-Ludwigs-Univ. Freiburg (Germany) [7449-59]

Properties of polycrystalline CdTe thick film structures, Ralf Sorgenfrei, Tina Trautnitz, Dominic Greiffenberg, Alex Fauler, Karl-Heinz Bachem, Michael Fiederle, Albert-Ludwigs-Univ. Freiburg (Germany) [7449-60]

A comparison of neutron sensitive scintillators for use with a solid-state optical detector., Christopher Stapels, Eric B. Johnson, Sharmistha Mukhopadhyay, Eric C. Chapman, Paul S. Linsay, Radiation Monitoring Devices, Inc. (United States); Thomas H. Prettyman, Planetary Sciences Institute (United States); James F. Christian, Michael R. Squillante, Radiation Monitoring Devices, Inc. (United States) [7449-61]

Improvements of CZT single crystals growth, Oleh V. Kopach, Petro M. Fochuk, Larysa P. Shcherbak, Yuriy Fedkovych Chernivtsi National Univ. (Ukraine) [7449-62]

Generic materials property data storage and retrieval for the semiconducting materials knowledge base, Dumont M. Jones, Proximate Technologies, LLC (United States); Kim F. Ferris, Bobbie-Jo M. Webb-Robertson, Pacific Northwest National Lab. (United States); Joan T. Muellerleile, Proximate Technologies, LLC (United States); Roger W. Hyatt, Battelle Memorial Institute (United States) [7449-63]

Investigation of carrier transport properties of CdTe detectors by photon probe method, Takaharu Okunoyama, Akifumi Koike, Bunji Shinomiya, Yoichiro Neo, Hidenori Mimura, Toru Aoki, Shizuoka Univ. (Japan) [7449-64]

Gamma-ray nonvolatile sensor by using SONOS capacity device with different nitride thickness, Wen-Ching Hsieh, Ming Hsin Univ. of Science and Technology (Taiwan); Shich-Chuan Wu, National Nano Device Labs. (Taiwan); Hao-Tien D. Lee, ETOMS Electronics Corp. (Taiwan) [7449-65]

HgS: a rugged, environmentally stable semiconductor radiation detector material, Michael R. Squillante, William M. Higgins, Hadong Kim, Kanai S. Shah, Radiation Monitoring Devices, Inc. (United States) [7449-66]

Relationship between surface passivation and spectral energy resolution in CdMnTe detectors, Ki Hyun Kim, Brookhaven National Lab. (United States) and Korea Univ. (Korea, Republic of); Giuseppe S. Camarda, Aleksey E. Bolotnikov, Ge Yang, Anwar M. Hossain, Yonggang Cui, Ralph B. James, Brookhaven National Lab. (United States) [7449-67]

Design and modeling of a lateral a-Se MSM photoconductor as indirect conversion X-ray imager, Kai Wang, Feng Chen, Univ. of Waterloo (Canada); George Belev, Safa O. Kasap, Univ. of Saskatchewan (Canada); Karim S. Karim, Univ. of Waterloo (Canada) [7449-68]

Study of cooling processes in CdTe crystals, Petro M. Fochuk, Ihor Nakonechnyj, Oleh E. Panchuk, Chernivtsi National Univ. (Ukraine); Aleksey E. Bolotnikov, Ralph B. James, Brookhaven National Lab. (United States)[7449-69]

Tuesday 4 August

SESSION 5

Room: Conv. Ctr. 16A Tues. 8:10 to 10:10 am

CdTe

Session Chair: **Michael Fiederle**, Albert-Ludwigs-Univ. Freiburg (Germany)

8:10 am: **Material identification imaging by CdTe detector array**, Akifumi Koike, Takaharu Okunoyama, Bunji Shinomiya, Toru Aoki, Shizuoka Univ. (Japan) [7449-16]

8:30 am: **A novel energy-resolved photon-counting gamma-ray retractor**, Ling-Jian Meng, Jia Wei Tan, Univ. of Illinois at Urbana-Champaign (United States); Konstantinos E. Spartiotis, Tom G. Schulman, Oy AJAT Ltd. (Finland) [7449-17]

8:50 am: **High-speed photon counting processing for CdTe detector**, Bunji Shinomiya, Takaharu Okunoyama, Akifumi Koike, Yoichiro Neo, Hidenori Mimura, Toru Aoki, Shizuoka Univ. (Japan) [7449-18]

9:10 am: **CdTe and CdZnTe semiconductor detector arrays for fast spectroscopic x-ray imaging**, Andrea Brambilla, Patrice Ouvrier-Bufferet, Lab. d'Electronique de Technologie de l'Information (France); Caroline Boudou, Thales Electron Devices (France); George Gonon, Jean Rinkel, Loick Verger, Lab. d'Electronique de Technologie de l'Information (France) [7449-19]

9:30 am: **Far-IR reflectance spectra analysis of CdTe CdZnTe and relative materials**, Tzuen-Rong Yang, National Taiwan Normal Univ. (Taiwan); Zhe Chuan Feng, Fu-Chung Hou, Yu-Chang Yang, National Taiwan Univ. (Taiwan); Piotr Becla, Massachusetts Institute of Technology (United Kingdom) [7449-20]

9:50 am: **Stability of CdTe radiation detectors with laser-induced p-n junction**, Volodymyr A. Gnatyuk, Oleksandr I. Vlasenko, Sergiy N. Levytyskiy, V.E. Lashkaryov Institute of Semiconductor Physics (Ukraine); Toru Aoki, Shizuoka Univ. (Japan); Charalambos P. Lambropoulos, Technological Educational Institute of Chalkida (Greece) [7449-21]

Coffee Break 10:10 am

SESSION 6

Room: Conv. Ctr. 16A Tues. 10:40 am to 12:10 pm

CZT Characterization II

10:40 am: **Characterization of secondary phases in modified vertical Bridgman growth CZT (Invited Paper)**, Martine C. Duff, Savannah River National Lab. (United States); Kelvin G. Lynn, Kelly A. Jones, Rajeswari Soundararajan, Washington State Univ. (United States); Zurong R. Dai, John Bradley, Giles A. Graham, Nick E. Teslich, Lawrence Livermore National Lab. (United States); Arnold Burger, Michael Groza, Vladamir Buliga, Fisk Univ. (United States) [7449-22]

11:10 am: **Surface characterization of CdZnTe crystals for fabricating radiation detectors**, Anwar M. Hossain, Brookhaven National Lab. (United States); Oluseyi S. Babalola, Fisk Univ. (United States); Aleksey E. Bolotnikov, Giuseppe S. Camarda, Yonggang Cui, Ge Yang, Ki Hyun Kim, Ralph B. James, Brookhaven National Lab. (United States) [7449-23]

11:30 am: **Defect level measurements in CZT detectors**, Rubi Gul, Zheng Li, Brookhaven National Lab. (United States); Rene Rodriguez, Kara Keeter, Idaho State Univ. (United States); Aleksey E. Bolotnikov, Ralph B. James, Brookhaven National Lab. (United States) [7449-24]

11:50 am: **X-ray absorption fine-structure study on CdZnTe ternary alloys**, Zhe Chuan Feng, Yu Li Wu, Yen-Ting Chen, National Taiwan Univ. (Taiwan); Tzuen-Rong Yang, National Taiwan Normal Univ. (Taiwan); Jyh-Fu Lee, National Synchrotron Radiation Research Ctr. (Taiwan); Weijie Lu, Fisk Univ. (United States) [7449-25]

Lunch/Exhibition Break 12:10 pm

SESSION 7

Room: Conv. Ctr. 16A Tues. 1:20 to 3:10 pm

Crystal Growth

Session Chair: **Robert D. McLaren**, Consultant

1:20 pm: **The application of vapour grown CdTe and CdZnTe to liquid explosive detection (Invited Paper)**, Ian Radley, Kromek (United Kingdom) [7449-26]

1:50 pm: **Growth of large electron mobility-lifetime for CdZnTe using vertical Bridgman (Invited Paper)**, Kelvin G. Lynn, Kelly A. Jones, Santosh Swain, Raji Soundararajan, Amlan Datta, Washington State Univ. (United States) [7449-27]

2:20 pm: **Annealing of detectorgrade CdTe crystals (Invited Paper)**, Michael Fiederle, Alex Fauler, Lamine Sylla, Albert-Ludwigs-Univ. Freiburg (Germany) [7449-28]

2:50 pm: **Unseeded growth of CdZnTe:In by THM technique**, Utpal N. Roy, Stephen Weiller, Juergen Stein, Andrey K. Gueorguiev, ICx Technologies, Inc. (United States) [7449-29]

Coffee Break 3:10 pm

Conference 7449

SESSION 8

Room: Conv. Ctr. 16A Tues. 3:40 to 5:30 pm

Imaging Applications

Session Chair: **Henry Chen**, Redlen Technologies (Canada)

3:40 pm: **Detection and imaging of high-energy radiation by CdTe detectors** (*Invited Paper*), Toru Aoki, Bunji Shinomiya, Hisashi Morii, Takaharu Okunoyama, Akifumi Koike, Hidenori Mimura, Shizuoka Univ. (Japan) [7449-30]

4:10 pm: **Photon counting using amorphous selenium: Achieving hole dispersion limited count-rate using the Frisch grid detector design**, Amir H. Goldan, Karim S. Karim, Univ. of Waterloo (Canada) [7449-31]

4:30 pm: **The ECLAIRs telescope onboard the SVOM mission for gamma-ray burst studies**, Henri E. Triou, Bertrand Cordier, Michel Fesquet, Stephane Schanne, Thierry Tournette, Commissariat à l'Énergie Atomique Saclay (France); Pierre Mandrou, Roger Pons, Olivier Godet, Nadege Remoue, Didier Barret, Ctr. d'Etude Spatiale des Rayonnements (France) [7449-32]

4:50 pm: **A quantum-limited CMOS-sensor-based high-speed imaging system for time-resolved x-ray scattering**, Brian G. Rodricks, Fairchild Imaging (United States) [7449-33]

5:10 pm: **Characterisation of an asymmetric AGATA detector**, Carl Unsworth, Andrew J. Boston, Helen C. Boston, Sam Colosimo, John P. Cresswell, Matthew R. Dimmock, Fay Filmer, Dan Judson, Paul J. Nolan, The Univ. of Liverpool (United Kingdom); Ian H. Lazarus, John Simpson, Science and Technology Facilities Council (United Kingdom) [7449-34]

Wednesday 5 August

SESSION 9

Room: Conv. Ctr. 16A Wed. 8:10 to 10:10 am

Neutron Detectors

Session Chair: **Zane W. Bell**, Oak Ridge National Lab.

8:10 am: **Neutron detector based on TimePix pixel device with micrometer spatial resolution** (*Invited Paper*), Jan Jakubek, Czech Technical Univ. in Prague (Czech Republic) [7449-35]

8:40 am: **Neutron detection with single crystal organic scintillators** (*Invited Paper*), Natalia P. Zaitseva, Jason Newby, M. Leslie Carman, Nerine J. Cherepy, Stephen A. Payne, Lawrence Livermore National Lab. (United States) [7449-36]

9:10 am: **Praseodymium activation detector for measuring bursts of 14 MeV neutrons**, Bernard T. Meehan, Edward C. Hagen, National Security Technologies, LLC (United States) [7449-37]

9:30 am: **Neutron energy measurements in emergency response applications**, Sanjoy Mukhopadhyay, National Security Technologies, LLC (United States) [7449-38]

9:50 am: **Multi-element neutron energy spectrometer**, Sanjoy Mukhopadhyay, National Security Technologies, LLC (United States) [7449-39]

Coffee Break 10:10 am

SESSION 10

Room: Conv. Ctr. 16A Wed. 10:40 am to 12:10 pm

Chalcogenide Detectors

Session Chair: **Paul J. Sellin**, Univ. of Surrey (United Kingdom)

10:40 am: **Development and performance characteristics of III-VI chalcogenide layered semiconductors for radiation detectors** (*Invited Paper*), Krishna C. Mandal, Alket Mertiri, Gary W. Pabst, Ronald G. Roy, Michael Choi, Sung Hoon Kang, EIC Labs., Inc. (United States); P. Bhattacharya, Yunlong Cui, Michael Groza, Arnold Burger, Fisk Univ. (United States); Adam M. Conway, B. W. Sturm, Rebecca J. Nikolic, Art J. Nelson, Stephen A. Payne, Lawrence Livermore National Lab. (United States) [7449-40]

11:10 am: **Characterization of surface electronic properties of GaSeTe and GaTe materials using scanning probe microscopy**, Goutam Koley, Univ. of South Carolina (United States); Krishna C. Mandal, EIC Labs., Inc. (United States); Jie Liu, Univ. of South Carolina (United States) [7449-41]

11:30 am: **Electronic and elastic properties of pure GaSe and GaSe doped with isovalent impurities**, Zsolt Rak, S. D. Mahanti, Michigan State Univ. (United States); Krishna C. Mandal, EIC Labs., Inc. (United States) . . . [7449-42]

11:50 am: **Properties of novel crystals for gamma-ray detectors: TiGaSe2 system**, David J. Knuteson, David A. Kahler, Brian P. Wagner, Andre Berghmans, Sean McLaughlin, Ken Schwartz, Narsingh B. Singh, Northrop Grumman Electronic Systems (United States) [7449-43]

Lunch/Exhibition Break 12:10 pm

Room: Conv. Ctr. 31C Wed. 1:30 to 5:00 pm

X-Ray, Gamma Ray, and Particle Technologies Plenary Session

1:30 pm: **MeV and higher photons and neutron applications**, Ralph B. James, Brookhaven National Lab. (United States)]

2:15 pm: **Coherence and X-ray imaging**, Keith A. Nugent, The Univ. of Melbourne (Australia)]

3:30 pm: **Sources and optics for laboratory x-ray micro imaging**, H. M. Hertz, Royal Institute of Technology (Sweden)

4:15 pm: **Compact Soft X-ray Lasers: a Doorway to Coherent Soft X-ray Science on a Table-top**, Jorge J. Rocca, Colorado State Univ. (United States)]

Thursday 6 August

SESSION 11

Room: Conv. Ctr. 16A Thurs. 8:30 to 10:10 am

CMT and TIBr

Session Chair: **Keitaro Hitomi**, Tohoku Institute of Technology (Japan)

8:30 am: **Advances in thallium bromide gamma-ray spectrometer development** (*Invited Paper*), Kanai S. Shah, Hadong Kim, Alexei V. Churilov, Guido Ciampi, Leonard J. Cirignano, William M. Higgins, Radiation Monitoring Devices, Inc. (United States); Fred Olschner, Cremat, Inc. (United States) [7449-44]

8:50 am: **Effect of Te inclusions on internal electric field of CdMnTe gamma-ray detector**, Oluseyi S. Babalola, Vanderbilt Univ. (United States) and Fisk Univ. (United States) and Brookhaven National Lab. (United States); Aleksey E. Bolotnikov, Stephen U. Egarievwe, Anwar M. Hossain, Brookhaven National Lab. (United States); Michael Groza, Arnold Burger, Fisk Univ. (United States); Ralph B. James, Brookhaven National Lab. (United States) [7449-45]

9:10 am: **Charge transport characterisation of single crystal CdMnTe for x-ray detection**, James M. Parkin, Univ. of Surrey (United Kingdom) and Lab. Impex Systems (United Kingdom); Paul J. Sellin, Annika Lohstroh, Spyros Gkoumas, Matthew C. Veale, Univ. of Surrey (United Kingdom) [7449-46]

9:30 am: **Characterization of (Cd,Mn)Te crystals with high-purity Mn and indium/vanadium doping**, Yonggang Cui, Anwar M. Hossain, Aleksey E. Bolotnikov, Giuseppe S. Camarda, Brookhaven National Lab. (United States); Andrzej Mycielski, Institute of Physics (Poland); Ge Yang, Ki Hyun Kim, Brookhaven National Lab. (United States); Dominika Kochanowska, Marta Witkowska-Baran, Institute of Physics (Poland); Ralph B. James, Brookhaven National Lab. (United States) [7449-47]

9:50 am: **Fabrication of TIBr strip detectors**, Keitaro Hitomi, Tohoku Institute of Technology (Japan); Youhei Kikuchi, Mohammad Nakhostin, Tohoku Univ. (Japan); Tadayoshi Shoji, Tohoku Institute of Technology (Japan); Keizo Ishii, Tohoku Univ. (Japan) [7449-48]

Coffee Break 10:10 am

SESSION 12

Room: Conv. Ctr. 16A Thurs. 10:40 am to 12:00 pm

Scintillators II

Session Chair: **Zhong He**, Univ. of Michigan

10:40 am: **Cerium trichloride methanol adduct single-crystal scintillators for neutron and gamma-ray detection** (*Invited Paper*), Lynn A. Boatner, Dariusz J. Wisniewski, John S. Neal, Zane W. Bell, Joanne O. Ramey, James A. Kolopus, Bryan C. Chakoumakos, Monika Wisniewska, Radu Custelcean, Oak Ridge National Lab. (United States). [7449-49]

11:10 am: **LSO scintillators: past and future** (*Invited Paper*), Charles L. Melcher, The Univ. of Tennessee (United States); Lars Eriksson, Siemens Medical Solutions USA, Inc. (United States); Merry A. Spurrier, The Univ. of Tennessee (United States) [7449-50]

11:40 pm: **High-resolution x-ray and gamma-ray imaging using a scintillator-coupled electron-multiplying CCD**, David J. Hall, Andrew D. Holland, The Open Univ. (United Kingdom); David J. Burt, Mark Robbins, e2v technologies plc (United Kingdom) [7449-52]

Lunch Break 12:00 pm

SESSION 13

Room: Conv. Ctr. 16A Thurs. 1:40 to 2:40 pm

Other Novel Detector Materials

Session Chair: **Giuseppe S. Camarda**, Brookhaven National Lab.

1:40 pm: **Informatics-based selection of semiconductor gamma radiation detectors**, Kim F. Ferris, Summer L. Ziegler, Pacific Northwest National Lab. (United States); Dumont M. Jones, Proximate Technologies, LLC (United States) [7449-53]

2:00 pm: **Flexible radiation dosimeters incorporating thick films of semiconducting polymer**, Christopher Mills, Akarin Intaniwet, Joseph Keddie, Paul J. Sellin, Univ. of Surrey (United Kingdom) [7449-54]

2:20 pm: **Development of heteroepitaxial single-crystalline CVD diamond for particle detection**, Richard J. Anderson, Sandia National Labs. (United States); Brage Golding, Michigan State Univ. (United States) [7449-55]

Coffee Break 2:40 pm

SESSION 14

Room: Conv. Ctr. 16A Thurs. 3:10 to 4:00 pm

Post-Deadline Session

3:10 pm: **Improvements of Cd_{1-x}Zn_xTe single crystal growth**, Oleh V. Kopach, Petro M. Fochuk, Larysa P. Shcherbak, Yuriy Fedkovych Chernivtsi National Univ. (Ukraine) [7449-56]

3:30 pm: **On the role of boron oxide in the growth of CZT crystals by the encapsulated vertical Bridgman method** (*Invited Paper*), Maura Pavesi, Univ. of Parma (Italy); Andrea Zappettini, Ming Zheng Zha, Laura Marchini, Consiglio Nazionale delle Ricerche (Italy); Massimiliano Zanichelli, Univ. of Parma (Italy) [7449-57]

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Thursday 6 August 2009 • Proceedings of SPIE Vol. 7450

Penetrating Radiation Systems and Applications X

Conference Chairs: **F. Patrick Doty**, Sandia National Labs.; **H. Bradford Barber**, The Univ. of Arizona; **Hans Roehrig**, The Univ. of Arizona; **Richard C. Schirato**, Los Alamos National Lab.

Wednesday 5 August

Room: Conv. Ctr. 31C. Wed. 1:30 to 5:00 pm

X-Ray, Gamma Ray, and Particle Technologies Plenary Session

- 1:30 pm: **MeV and higher photons and neutron applications**, Ralph B. James, Brookhaven National Lab. (United States)
- 2:15 pm: **Coherence and X-ray Imaging**, Keith A. Nugent, The Univ. of Melbourne (Australia)
- 3:30 pm: **Sources and optics for laboratory x-ray micro imaging**, H. M. Hertz, Royal Institute of Technology (Sweden)
- 4:15 pm: **Compact Soft X-ray Lasers: a Doorway to Coherent Soft X-ray Science on a Table-top**, Jorge J. Rocca, Colorado State Univ. (United States)

Room: Conv. Ctr. Exhibit Hall D. Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Development of receiving-detecting circuit for digital radiographic systems with improved spatial resolution, Volodymyr D. Ryzhikov, Oleksandr D. Opolonin, Sergey M. Galkin, Yevgeniy F. Voronkin, Olena K. Lysetska, Institute for Single Crystals (Ukraine); Sergej O. Kostyukevych, V. Lashkaryov Institute of Semiconductor Physics (Ukraine) [7450-18]

Grating based, phase contrast radiography with bremsstrahlung source., Fletcher J. Goldin, National Security Technologies, LLC (United States)[7450-19]

Measuring the mobility-lifetime product of semiconductor detectors, H. Bradford Barber, Center for Gamma-Ray Imaging, The Univ. of Arizona (United States) [7450-20]

Thursday 6 August

SESSION 1

Room: Conv. Ctr. 14B Thurs. 8:00 to 9:40 am

Scintillators I

- 8:00 am: **New scintillators for SPECT**, Kanai Shah, Jarek Glodo, Edgar V. D. van Loef, Rastgo H. Hawrami, William M. Higgins, Radiation Monitoring Devices, Inc. (United States) [7450-01]
- 8:20 am: **Characterization of vapor deposited Lu2O3:Eu3+ scintillator for x-ray imaging applications**, Vivek V. Nagarkar, S. R. Miller, B. Singh, Radiation Monitoring Devices, Inc. (United States); S. G. Topping, C. H. Park, V. K. Sarin, Boston Univ. (United States); C. Brecher, ALEM Associates (United States) [7450-02]
- 8:40 am: **Crystal structure and thermal properties of elpasolite halide scintillators**, Pin Yang, Christopher B. DiAntonio, Mark A. Rodriguez, Margaret S. Sanchez, F. P. Doty, Sandia National Labs. (United States); Kanai Shah, Radiation Monitoring Devices, Inc. (United States) [7450-03]
- 9:00 am: **Study of mechanical properties of scintillator compounds using variable charge, embedded ion method-based atomistic simulations**, Xiaowang Zhou, F. P. Doty, Sandia National Labs. (United States) [7450-04]
- 9:20 am: **Polycrystalline and columnar growth of LaBr3:Ce scintillator**, Vivek V. Nagarkar, Stuart R. Miller, Bipin Singh, Samta Thacker, Valeriy Gaysinskiy, Radiation Monitoring Devices, Inc. (United States); Brian Miller, H. Bradford Barber, Center for Gamma-Ray Imaging, The Univ. of Arizona (United States) [7450-05]
- Coffee Break 10:10 am

SESSION 2

Room: Conv. Ctr. 14B Thurs. 10:30 am to 12:10 pm

Medical

- 10:30 am: **Radiation source considerations relevant to x-ray diffraction imaging for security screening applications**, Geoffrey Harding, Helmut Strecker, Dirk Kosciesza, GE Global Research (Germany); Jeffrey S. Gordon, GE Global Research (United States) [7450-06]
- 10:50 am: **Image systems for crystallography**, Hans Roehrig, The Univ. of Arizona (United States); William V. Schempp, Michael A. Damento, Wayne Maher, Alonzo Pickett, Rigaku Innovative Technologies, Inc. (United States) [7450-07]
- 11:10 am: **LCD spatial noise suppression: comparing simulation and experiment**, William J. Dallas, Hans Roehrig, The Univ. of Arizona (United States); Jiahua Fan, GE Healthcare (United States); Elizabeth A. Krupinski, The Univ. of Arizona (United States); Jeffrey P. Johnson, Siemens Corporate Research (United States) [7450-08]
- 11:30 am: **Reducing noise of medical grade Liquid Crystal Displays and the detection of micro-calcification**, Hans Roehrig, The Univ. of Arizona (United States); Jiahua Fan, GE Healthcare (United States); William J. Dallas, Elizabeth A. Krupinski, The Univ. of Arizona (United States) [7450-09]
- 11:50 am: **Ultra high frequency - full digital imaging system: from signal to image through signal conditioning**, Igor Rubashov, Howard Kay, High Med Technologies (United States) [7450-10]
- Lunch Break 12:20 pm

SESSION 3

Room: Conv. Ctr. 14B Thurs. 1:30 to 2:50 pm

NIF and Security

1:30 pm: **Developments in prompt radiochemistry for the National Ignition Facility**, Gary P. Grim, Thomas N. Archuleta, Paul A. Bradley, Todd A. Bredeweg, David D. Clark, Scott C. Evans, Malcolm M. Fowler, Felix P. Garcia, Jeffrey R. Griego, Anna C. Hayes, Gerard Jungman, Andrew W. Obst, Robert S. Rundberg, Phillip G. Sanchez, David J. Vieira, Jerry B. Wilhelmy, Yongqiang Wang, Los Alamos National Lab. (United States) [7450-11]

1:50 pm: **Status of the National Ignition Facility neutron imaging system**, Carl H. Wilde, Robert D. Day, David D. Clark, Gary P. Grim, Valerie E. Fatherley, Felix P. Garcia, Andrew J. Montoya, George L. Morgan, John A. Oertel, Jeremy R. Payton, Peter D. Pazuchanics, Derek W. Schmidt, Adelaida C. Valdez, Mark D. Wilke, Los Alamos National Lab. (United States) [7450-12]

2:10 pm: **Precision flash x-ray radiography for dynamic experiments**, T. J. Haines, N. S. P. King, T. Kwan, J. Smith, E. Rose, L. Thode, T-S. Wang, W. M. Wood, Los Alamos National Lab. (United States); M. Berninger, D. Droemer, S. Lutz, National Security Technologies, LLC (United States); B. Oliver, Sandia National Labs. (United States) [7450-13]

2:30 pm: **Medical color displays and their calibration**, Hans Roehrig, The Univ. of Arizona (United States); Jiahua Fan, Ge Healthcare (United States); William J. Dallas, Elizabeth A. Krupinski, The Univ. of Arizona (United States) [7450-14]

Coffee Break 3:10 pm

SESSION 4

Room: Conv. Ctr. 14B Thurs. 3:30 to 4:30 pm

Scintillators II

3:30 pm: **Nuclear reaction tandem-type gamma generator**, Arlyn J. Antolak, K.-N. Leung, D. H. Morse, A. Persaud, T. Raber, Sandia National Labs. (United States); N. Tanaka, Tohoku Univ. (Japan) [7450-15]

3:50 pm: **Synthesis of scintillating metal organic frameworks**, Ronald J. T. Houk, Noel N. Chang, K. R. Bhakta, D. M. Allendorf, Sandia National Labs. (United States) [7450-16]

4:10 pm: **Characterization of scintillating metal organic frameworks**, F. P. Doty, Ronald J. T. Houk, Noel N. Chang, K. R. Bhakta, D. M. Allendorf, Sandia National Labs. (United States) [7450-17]

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Conference 7451

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7451

Soft X-Ray Lasers and Applications VIII

Conference Chairs: **James Dunn**, Lawrence Livermore National Lab.; **Gregory J. Tallents**, The Univ. of York (United Kingdom)

Program Committee: **Hiroyuki Daido**, Japan Atomic Energy Agency (Japan); **Sylvie Jacquemot**, Ecole Polytechnique (France); **Annie Klisnick**, Univ. Paris-Sud 11 (France); **Do-Kyeong Ko**, Gwangju Institute of Science and Technology (Korea, Republic of); **Ciaran L. S. Lewis**, Queen's Univ. Belfast (United Kingdom); **Peter V. Nickles**, Max-Born-Institut (Germany); **Joseph Nilsen**, Lawrence Livermore National Lab.; **Geoffrey J. Pert**, The Univ. of York (United Kingdom); **Jorge J. Rocca**, Colorado State Univ.; **Szymon Suckewer**, Princeton Univ.; **Alexander V. Vinogradov**, P.N. Lebedev Physical Institute (Russian Federation)

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 31C Tues. 8:30 to 10:10 am

Harmonics and Short Wavelength Lasers

Session Chair: **James Dunn**, Lawrence Livermore National Lab.

- 8:30 am: **Water window high harmonic x-ray lasers** (*Invited Paper*), Katsumi Midorikawa, Eiji Takahashi, The Institute of Physical and Chemical Research (Japan) [7451-01]
- 9:00 am: **Prospective schemes for next generation X-ray lasers**, Vyacheslav N. Shlyaptsev, Lawrence Livermore National Lab. (United States); Jorge J. Rocca, Colorado State Univ. (United States) [7451-02]
- 9:20 am: **Table-top ultrafast nanoscale imaging using coherent diffraction**, Hamed Merdji, Commissariat à l'Énergie Atomique (France) [7451-03]
- 9:40 am: **Chirp compensation for attosecond pulse trains using two-color field** (*Invited Paper*), Zhinan Zeng, Shanghai Institute of Optics and Fine Mechanics (China) [7451-04]
- Coffee Break 10:10 am

SESSION 2

Room: Conv. Ctr. 31C Tues. 10:40 am to 12:40 pm

High Repetition Rate Lasers

Session Chair: **Gregory J. Tallents**, The Univ. of York (United Kingdom)

- 10:40 am: **Progress in the development of compact high-repetition-rate soft x-ray lasers** (*Invited Paper*), Jorge J. Rocca, Yong Wang, David Alessi, Bradley M. Luther, Fede Furch, Brendan A. Reagan, Dale H. Martz, Mark Berrill, Francesco Pedaci, Vyacheslav N. Shlyaptsev, Mario C. Marconi, Dinesh Patel, Carmen S. Menoni, Colorado State Univ. (United States) [7451-05]
- 11:10 am: **Source development and novel applications of x-ray lasers for probing materials** (*Invited Paper*), Tetsuya Kawachi, Maki Kishimoto, Masataka Kado, Momoko Tanaka, Noboru Hasegawa, Yoshihiro Ochi, Masaharu Nishikino, Masahiko Ishino, Takashi Imazono, Toshiyuki Ohba, Takeshi Kaihori, Japan Atomic Energy Agency (Japan) [7451-06]
- 11:40 am: **Characterization of a 10Hz double-pulse non-normal incidence pumped transient collisional Ni-like molybdenum soft x-ray laser for applications**, Daniel Zimmer, Gesellschaft für Schwerionenforschung GmbH (Germany); Bernhard Zielbauer, Olivier A. Guilbaud, Jamil Habib, Sophie Kazamias, Moana Pittman, David R. Ros, Univ. Paris-Sud 11 (France); Vincent Bagnoud, Boris Ecker, Daniel Hochhaus, Thomas Kuehl, Gesellschaft für Schwerionenforschung GmbH (Germany) [7451-07]
- 12:00 pm: **X-ray laser takes the 100 Hz barrier**, Holger Stiel, Johannes Tuemmler, Robert Jung, Peter V. Nickles, Wolfgang Sandner, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany) [7451-08]
- 12:20 pm: **Prospectives of development of XUV sources on LASERIX facility and ILE and ELI projects**, David R. Ros, Univ. Paris-Sud 11 (France) . [7451-09]
- Lunch/Exhibition Break 12:40 pm

SESSION 3

Room: Conv. Ctr. 31C Tues. 2:10 to 3:40 pm

Free Electron Lasers

Session Chair: **Joseph Nilsen**, Lawrence Livermore National Lab.

- 2:10 pm: **LCLS: a unique tool for science** (*Invited Paper*), Jerome B. Hastings, Stanford Linear Accelerator Ctr. (United States) [7451-10]
- 2:40 pm: **An atomic inner-shell x-ray laser pumped by an x-ray free-electron laser**, Nina Rohringer, Richard A. London, Lawrence Livermore National Lab. (United States) [7451-11]
- 3:00 pm: **Soft X-Ray Thomson Scattering in Warm Dense Matter at FLASH**, Roland R. Faeustlin, Sven Toilekis, Deutsches Elektronen-Synchrotron (Germany); Bin Li, Univ. of Oxford (United Kingdom); Thomas Bornath, Univ. Rostock (Germany); Leifeng Cao, Friedrich-Schiller-Univ. Jena (Germany); Tilo Döppner, Lawrence Livermore National Lab. (United States); Stefan Düsterer, Deutsches Elektronen-Synchrotron (Germany); Eckhart Förster, Friedrich-Schiller-Univ. Jena (Germany); Carsten Fortmann, Univ. Rostock (Germany); Siegfried H. Glenzer, Lawrence Livermore National Lab. (United States); Sebastian Göde, Univ. Rostock (Germany); Gianluca Gregori, Univ. of Oxford (United Kingdom); Arne Höll, Robert Irsig, Univ. Rostock (Germany); Tim Laarmann, Deutsches Elektronen-Synchrotron (Germany); Hae Ja Lee, Univ. of California, Berkeley (United States); Meiwes-Broer Karl-Heinz, Andreas Przystawik, Univ. Rostock (Germany); Paul Radcliffe, Deutsches Elektronen-Synchrotron (Germany); Ronald Redmer, Heidi Reinholz, Gerd Röpke, Univ. Rostock (Germany); Franz Tavella, Deutsches Elektronen-Synchrotron (Germany); Robert Thiele, Josef Tiggesbäumker, Nguyen Xuan Truong, Univ. Rostock (Germany); Ingo Uschmann, Ulf Zastra, Friedrich-Schiller-Univ. Jena (Germany); Thomas Tschentscher, Deutsches Elektronen-Synchrotron (Germany) [7451-12]
- 3:20 pm: **Transmission studies at high-energy density studies using XUV free-electron lasers**, Richard W. Lee, Lawrence Livermore National Lab. (United States); Bob Nagler, Univ. of Oxford (United Kingdom); Ulf Zastra, Friedrich-Schiller-Univ. Jena (Germany); Roland R. Faeustlin, Deutsches Elektronen-Synchrotron (Germany); Sam Vinko, Thomas Whitcher, Univ. of Oxford (United Kingdom); Ryszard Sobierajski, Institute of Physics (Poland); Jacek Krzywinski, Stanford Linear Accelerator Ctr. (United States); Libor Juha, Institute of Physics of the ASCR, v.v.i. (Czech Republic); Art J. Nelson, Lawrence Livermore National Lab. (United States); Sasha Bajt, Deutsches Elektronen-Synchrotron (Germany); Thomas Bornath, Univ. Rostock (Germany); Tomas Burian, Institute of Physics of the ASCR, v.v.i. (Czech Republic) [7451-13]
- Coffee Break 3:40 pm

SESSION 4

Room: Conv. Ctr. 31C Tues. 4:10 to 5:20 pm

Applications I

Session Chair: **Karol A. Janulewicz**, Gwangju Institute of Science and Technology (Korea, Republic of)

- 4:10 pm: **Applications of soft x-ray lasers and HHG in plasma probing, high-energy density in matter experiments, and ablation of solids** (*Invited Paper*), Bedrich Rus, Tomas Mocek, Michaela Kozlova, Jiri Polan, Krzysztof Jakubczak, Pavel Homer, Jaroslav Nejd, David Snopek, Institute of Physics (Czech Republic); Marta Fajardo, Instituto Superior Técnico (Portugal); Richard W. Lee, Mark E. Ford, Hyun-Kyung Chung, Stephen J. Moon, Lawrence Livermore National Lab. (United States); Gregory J. Tallents, Matthew H. Edwards, Nicola Booth, Zirong Zhai, The Univ. of York (United Kingdom) [7451-14]
- 4:40 pm: **Laboratory measurements of iron opacities in solar plasmas using plasma-based soft X-ray lasers**, Erik Wagenaars, Nicola Booth, Lauren Gartside, Andrew Rossall, David Whittaker, Matthew H. Edwards, Gregory J. Tallents, The Univ. of York (United Kingdom) [7451-15]

Conference 7451

5:00 pm: **Using collective x-ray Thomson scattering to measure temperature and density of warm dense matter**, Tilo Döppner, P. Davies, Lawrence Livermore National Lab. (United States); Hae Ja Lee, Univ. of California, Berkeley (United States); Andrea Kritcher, Paul Neumayer, Otto Landen, Siegfried H. Glenzer, Lawrence Livermore National Lab. (United States) [7451-16]

Wednesday 5 August

SESSION 5

Room: Conv. Ctr. 31C Wed. 8:30 to 10:10 am

Applications II

Session Chair: Annie Klisnick, Univ. Paris-Sud 11 (France)

8:30 am: **Advances in full field microscopy with table-top soft x-ray lasers** (*Invited Paper*), Carmen S. Menoni, Colorado State Univ. (United States) and NSF Engineering Research Ctr. for Extreme Ultraviolet Science and Technology (United States); Fernando Brizuela, Yong Wang, Courtney A. Brewer, Bradley M. Luther, Francesco Pedaci, Przemyslaw W. Wachulak, Mario C. Marconi, Jorge J. Rocca, Colorado State Univ. (United States) and NSF Engineering Research Ctr. for Extreme Ultraviolet Science and Technology (United States); Weilun Chao, Erik H. Anderson, Yanwei Liu, Lawrence Berkeley National Lab. (United States) and NSF Engineering Research Ctr. for Extreme Ultraviolet Science and Technology (United States); Kenneth A. Goldberg, Lawrence Berkeley National Lab. (United States); David T. Attwood, Jr., Lawrence Berkeley National Lab. (United States) and Univ. of California, Berkeley (United States) and NSF Engineering Research Ctr. for Extreme Ultraviolet Science and Technology (United States); Alexander V. Vinogradov, Igor A. Artyukov, P.N. Lebedev Physical Institute (Russian Federation); Yuri P. Pershyn, Viktor Kondratenko, National Technical Univ. (Ukraine) [7451-17]

9:00 am: **Tabletop soft x-ray mask-less lithography**, Mario C. Marconi, Przemyslaw W. Wachulak, Lukasz Urbanski, Colorado State Univ. (United States); Artak Isoyan, Jiang Fan, Yang-Chun Cheng, Univ. of Wisconsin-Madison (United States); Jorge J. Rocca, Carmen S. Menoni, Colorado State Univ. (United States); Franco Cerrina, Univ. of Wisconsin-Madison (United States) [7451-18]

9:20 am: **Density profile measurements of line plasmas using X-ray laser backlighter and wavefront distortion technique**, Michaela Kozlova, Jaroslav Nejd, Bedrich Rus, Tomas Mocek, Jiri Polan, Pavel Homer, David Snopek, Krzysztof Jakubczak, Institute of Physics (Czech Republic); Marta Fajardo, A. Barszczak Sardinha, Instituto Superior Técnico (Portugal) [7451-19]

9:40 am: **Elucidating the collimation of laboratory plasma jets using soft x-ray interferometry** (*Invited Paper*), Michael A. Purvis, Jonathan Grava, Jorge Filevich, Duncan P. Ryan, Jorge J. Rocca, Colorado State Univ. (United States); James Dunn, Stephen J. Moon, Lawrence Livermore National Lab. (United States); Vyacheslav N. Shlyaptsev, Colorado State Univ. (United States) [7451-20]

Coffee Break 10:10 am

SESSION 6

Room: Conv. Ctr. 31C Wed. 10:40 to 11:50 am

X-Ray Laser Development

Session Chair: Sylvie Jacquemot, Ecole Polytechnique (France)

10:40 am: **X-ray laser developments at PHELIX** (*Invited Paper*), Thomas Kuehl, Daniel Zimmer, Vincent Bagnoud, Boris Ecker, Udo Eisenbarth, Gesellschaft für Schwerionenforschung GmbH (Germany); Jamil Habib, Univ. Paris-Sud 11 (France); Daniel Hochhaus, Dasa Javorkova, Gesellschaft für Schwerionenforschung GmbH (Germany); Sophie Kazamias, David R. Ros, Univ. Paris-Sud 11 (France); Daniel Ursescu, National Institute for Lasers, Plasma and Radiation Physics (Romania); Bernhard Zielbauer, Univ. Paris-Sud 11 (France) [7451-21]

11:10 am: **Using short pulse lasers to drive x-ray lasers**, Joseph Nilsen, Lawrence Livermore National Lab. (United States) [7451-22]

11:30 am: **Gain saturation in Ni-like lasers**, Jürg E. Balmer, Christoph Imesch, Felix Staub, Univ. Bern (Switzerland) [7451-23]

Lunch/Exhibition Break 11:50 am

Room: Conv. Ctr. 31C Wed. 1:30 to 5:00 pm

X-Ray, Gamma Ray, and Particle Technologies Plenary Session

1:30 pm: **MeV and higher photons and neutron applications**, Ralph B. James, Brookhaven National Lab. (United States)

2:15 pm: **Coherence and X-ray imaging**, Keith A. Nugent, The Univ. of Melbourne (Australia)

3:30 pm: **Sources and optics for laboratory x-ray micro imaging**, H. M. Hertz, Royal Institute of Technology (Sweden)

4:15 pm: **Compact Soft X-ray Lasers: a Doorway to Coherent Soft X-ray Science on a Table-top**, Jorge J. Rocca, Colorado State Univ. (United States)

Room: Conv. Ctr. Exhibit Hall D Wed. 6:00 to 7:30 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge.

Authors of poster papers will be present to answer questions concerning their papers. Poster Authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Spatial resolution of circular and sector Fresnel zone plates, Igor A. Artyukov, Alexander N. Mitrofanov, Alexander V. Vinogradov, P.N. Lebedev Physical Institute (Russian Federation) [7451-40]

A K-alpha x-ray source using high energy and high repetition rate laser system for phase contrast imaging, Cristina Serbanescu, Sylvain Fourmaux, Jean-Claude Kieffer, Univ. du Québec (Canada); Russell E. Kincaid, Syracuse Univ. (United States); Andrzej Krol, SUNY Upstate Medical Univ. (United States) [7451-41]

Assessment of surface roughness by use of soft x-ray scattering, Yanli Meng, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate Univ. of Chinese Academy of Sciences (China) and Northeast Normal Univ. (China); Yonggang Wang, Changchun Institute of Optics, Fine Mechanics and Physics (China) and Graduate Univ. of Chinese Academy of Sciences (China); Shuyan Chen, Harbin Engineering Univ. (China); Bo Chen, Changchun Institute of Optics, Fine Mechanics and Physics (China) [7451-42]

Plasma density-gradient measurements using XRL wave-front distortion, Jaroslav Nejd, Michaela Kozlova, Institute of Physics of the ASCR, v.v.i. (Czech Republic) [7451-43]

Thursday 6 August

SESSION 7

Room: Conv. Ctr. 31C Thurs. 8:00 to 9:30 am

Applications III

Session Chair: Do-Kyeong Ko, Gwangju Institute of Science and Technology (Korea, Republic of)

8:00 am: **X-ray laser research and applications at c-FAST** (*Invited Paper*), Karol A. Janulewicz, Gwangju Institute of Science and Technology (Korea, Republic of) [7451-24]

8:30 am: **Soft x-ray laser ionization mass spectrometry of aluminum carbide, a potential hydrogen storage material**, Elliot R. Bernstein, Jorge J. Rocca, Feng Dong, Scott C. Heinbuch, Colorado State Univ. (United States) [7451-25]

8:50 am: **Nanometer-scale machining with soft x-ray lasers**, Herman Bravo, Colorado State Univ. (United States) and NSF ERC for Extreme Ultraviolet Science & Technology (United States); Benito T. Szapiro, Sewanee: The Univ. of the South (United States); Przemyslaw W. Wachulak, Colorado State Univ. (United States); Mario C. Marconi, Colorado State Univ. (United States) and NSF ERC for Extreme Ultraviolet Science & Technology (United States); Weilun Chao, Erik H. Anderson, Lawrence Berkeley National Lab. (United States) and NSF ERC for Extreme Ultraviolet Science & Technology (United States); David T. Attwood, Jr., Lawrence Berkeley National Lab. (United States); Carmen S. Menoni, Jorge J. Rocca, Colorado State Univ. (United States) and NSF ERC for Extreme Ultraviolet Science & Technology (United States) [7451-26]

9:10 am: **Large area x-ray interference nano-lithography for photonic applications**, Stefano Prezioso, Univ. degli Studi dell'Aquila (Italy); Paola Zuppella, Univ. degli Studi di Padova (Italy); Domenico Luciani, Univ. degli Studi dell'Aquila (Italy); Paola Tucceri, Univ. degli Studi di Perugia (Italy); Patrizia De Marco, Angelo Gaudieri, Univ. degli Studi dell'Aquila (Italy); Jozef Kaiser, Brno Univ. of Technology (Czech Republic); Stefano Penna, Andrea Reale, Univ. degli Studi di Roma Tor Vergata (Italy); Sandro Santucci, Luca Ottaviano, Univ. degli Studi dell'Aquila (Italy) [7451-27]

SESSION 8

Room: Conv. Ctr. 31C Thurs. 9:30 to 11:30 am

Seeding of X-Ray Lasers

Session Chair: Thomas Kuehl, Gesellschaft für Schwerionenforschung GmbH (Germany)

9:30 am: **Recent progress on the LASERIX facility** (*Invited Paper*), Olivier A. Guilbaud, Univ. Paris-Sud 11 (France) [7451-28]

10:00 am: **Simulations of ASE and seeded transient X-ray lasers using the COLAX code**, Annie Klisnick, Univ. Paris-Sud 11 (France); Olivier Larroche, Commissariat à l'Énergie Atomique (France); François De Dortan, Jamil Habib, Olivier A. Guilbaud, Univ. Paris-Sud 11 (France) [7451-29]

Coffee Break 10:20 to 10:50 am

10:50 am: **Temporal and frequency output of seeded and unseeded x-ray lasers**, Gregory J. Tallents, Il'dar R. Al'miev, The Univ. of York (United Kingdom) [7451-30]

11:10 am: **Seeding of an x-ray lasing medium with a high-energy harmonic pulse**, Hyung Taek Kim, Karol A. Janulewicz, Chul Min Kim, I Jong Kim, Kyung Taec Kim, Tae Jun Yu, Seong Ku Lee, Gwangju Institute of Science and Technology (Korea, Republic of); Holger Stiel, Johannes F. Tümmler, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); Tomas Mocek, Institute of Physics (Czech Republic); Jongmin Lee, Gwangju Institute of Science and Technology (Korea, Republic of) [7451-31]

SESSION 9

Room: Conv. Ctr. 31C Thurs. 11:30 am to 12:20 pm

X-Ray Source Development

11:30 am: **Developments and applications of optical-field-ionization x-ray lasers at IAMS** (*Invited Paper*), Jiunn-Yuan Lin, National Chung Cheng Univ. (Taiwan); Ming-Chang Chou, Ping-Hsun Lin, Institute of Atomic and Molecular Sciences (Taiwan); Ru-Ping Huang, Chang-Tai Huang, National Chung Cheng Univ. (Taiwan); Hsu-Hsin Chu, Szu-Yuan Chen, Jyh-Yang Wang, Institute of Atomic and Molecular Sciences (Taiwan) [7451-32]

12:00 pm: **Optimized soft x-ray amplifier by tailoring plasma hydrodynamics**, Eduardo Oliva, Univ. Politécnica de Madrid (Spain) . [7451-33]

Lunch Break 12:20 pm

SESSION 10

Room: Conv. Ctr. 31C Thurs. 2:10 to 4:00 pm

Applications IV

Session Chair: Jorge J. Rocca, Colorado State Univ.

2:10 pm: **Double-strand breaks in DNA samples induced with LASERIX** (*Invited Paper*), Sandrine Lacombe, Univ. Paris-Sud 11 (France) [7451-35]

2:40 pm: **Focusing of hard x-rays with SU-8 resist planar parabolic refractive lenses**, Chengchao Huang, Baozhong Mu, Zhanshan Wang, Tongji Univ. (China); Yangchao Tian, Gang Liu, Guoqiang Pan, Univ. of Science and Technology of China (China) [7451-36]

3:00 pm: **Monochromatic X-ray imaging with spherical compound X-ray lens at National Synchrotron Radiation Laboratory in Hefei**, Chengchao Huang, Tongji Univ. (China); Yury I. Dudchik, Belarusian State Univ. (Belarus); Baozhong Mu, Zhanshan Wang, Tongji Univ. (China); Guoqiang Pan, Univ. of Science and Technology of China (China) [7451-37]

3:20 pm: **Gradient multilayer mirrors for the "carbon window" wavelengths**, Igor A. Artyukov, P.N. Lebedev Physical Institute (Russian Federation); Yegor A. Bugayev, Oleksandr Y. Devizenko, Valeriy V. Kondratenko, Kharkov Polytechnic Institute (Ukraine); Alexander V. Vinogradov, P.N. Lebedev Physical Institute (Russian Federation) [7451-38]

3:40 pm: **3-D refractive X-ray lens**, Nickolai N. Kolchevsky, Pavel Petrov, Belarusian State Univ. (Belarus) [7451-39]

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Conference 7452

Monday-Wednesday 3-5 August 2009 • Proceedings of SPIE Vol. 7452

Earth Observing Systems XIV

Conference Chairs: **James J. Butler**, NASA Goddard Space Flight Ctr.; **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr.

Conference Co-Chair: **Xingfa Gu**, Institute of Remote Sensing Applications (China)

Program Committee: **Philip E. Ardanuy**, Raytheon Intelligence & Information Systems; **Robert A. Barnes**, NASA Goddard Space Flight Ctr. and Science Applications International Corp.; **Jeffrey S. Czapla-Myers**, College of Optical Sciences, The Univ. of Arizona; **Armin W. Doerry**, Sandia National Labs.; **Thomas S. Pagano**, Jet Propulsion Lab.; **Carl F. Schueler**, Orbital Sciences Corp.

Monday 3 August

SESSION 1

Room: Conv. Ctr. 17B Mon. 8:20 to 10:00 am

Prelaunch Calibration

Session Chair: **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr.

8:20 am: **High-accuracy telescope calibration facility at NIST**, John T. Woodward, Steven W. Brown, Allan W. Smith, Colleen A. Jenkins, Chungsan Lin, Keith R. Lykke, National Institute of Standards and Technology (United States) [7452-01]

8:40 am: **Spectral features: how to reduce them**, Hedser H. van Brug, TNO Science and Industry (Netherlands) [7452-02]

9:00 am: **The extension of the NIST BRDF scale from 1100 nm to 2500 nm**, Howard W. Yoon, David W. Allen, Benjamin K. Tsai, George P. Eppeldauer, National Institute of Standards and Technology (United States) [7452-03]

9:20 am: **BRDF calibration of sintered PTFE in the SWIR**, Georgi T. Georgiev, Science Systems and Applications, Inc. (United States); James J. Butler, NASA Goddard Space Flight Ctr. (United States) [7452-04]

9:40 am: **Development of a filter radiometer monitor system for integrating sphere sources**, Leibo Ding, Matthew G. Kowalewski, John W. Cooper, Gilbert Smith, Science Systems and Applications, Inc. (United States); James J. Butler, NASA Goddard Space Flight Ctr. (United States) [7452-05]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 17B Mon. 10:30 to 11:50 am

NPOESS Preparatory Project

Session Chair: **Carl F. Schueler**, Orbital Sciences Corp.

10:30 am: **Radiometric calibration of the OMPS instruments for NPOESS**, Stephen C. Bennett, Ball Aerospace & Technologies Corp. (United States) [7452-06]

10:50 am: **Radiometric calibration of 100 cm sphere integrating source for Visible/Infrared Imager/Radiometer Suite (VIIRS)**, Bruce W. Guenther, National Oceanic and Atmospheric Administration (United States); Eugene D. Kim, John R. Moore, Reinhard W. Menzel, Vijay Murgai, Raytheon Space & Airborne Systems (United States) [7452-07]

11:10 am: **VIIRS polarization testing**, Eugene Waluschka, NASA Goddard Space Flight Ctr. (United States) [7452-08]

11:30 am: **A VIIRS data simulator**, Wayne D. Robinson, Fredrick S. Patt, Bryan A. Franz, SAIC (United States); Charles R. McClain, NASA Goddard Space Flight Ctr. (United States) [7452-09]

Lunch Break 11:50 am to 1:20 pm

SESSION 3

Room: Conv. Ctr. 17B Mon. 1:20 to 3:00 pm

New Missions

Session Chair: **Armin W. Doerry**, Sandia National Labs.

1:20 pm: **Five years of on-orbit radiometric calibration of FORMOSAT-2 remote sensing instrument**, Kuo-Hsien Hsu, Nai-Yu Chen, An-Ming Wu, National Space Organization (Taiwan) [7452-10]

1:40 pm: **On-orbit radiometric studies in support of Orbiting Carbon Observatory (OCO)**, Carol J. Bruegge, Jet Propulsion Lab. (United States); Vijay Natraj, California Institute of Technology (United States); Francisco J. Martin-Torres, Jet Propulsion Lab. (United States) [7452-11]

2:00 pm: **SENTINEL-2 image quality and level 1 processing**, Aimé Meygret, Simon Baillarin, Ctr. National d'Études Spatiales (France); Ferran Gascon, European Space Agency (Netherlands); Emmanuel Hillairet, Magellium (France); Cécile Dechoz, Ctr. National d'Études Spatiales (France); Philippe Martimort, François Spoto, European Space Agency (Netherlands); Patrice J. Henry, Ctr. National d'Études Spatiales (France); Riccardo Duca, European Space Agency (Italy) [7452-12]

2:20 pm: **ESA's Sentinel 3 mission: overview on optical payload and processor development**, Jens Nieke, European Space Research and Technology Ctr. (Netherlands) [7452-13]

2:40 pm: **In-orbit imaging and radiometric performance prediction for flight model Geostationary Ocean Color Imager**, Soomin Jeong, Yukyong Jeong, Dongok Ryu, Sun Jeong Ham, Yonsei Univ. (Korea, Republic of); Seonghui Kim, Korea Aerospace Research Institute (Korea, Republic of); Seongick Cho, Korea Ocean Research and Development Institute (Korea, Republic of); Heong-Sik Youn, Korea Aerospace Research Institute (Korea, Republic of); Sug-Whan Kim, Yonsei Univ. (Korea, Republic of) [7452-14]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. 17B Mon. 3:30 to 4:50 pm

Earth Observing System Sensors I

Session Chair: **Robert A. Barnes**, Science Applications International Corp. and NASA Goddard Space Flight Ctr.

3:30 pm: **Improving weather and climate prediction with the AIRS on Aqua**, Thomas S. Pagano, Jet Propulsion Lab. (United States) [7452-15]

3:50 pm: **Spectral calibration in hyperspectral sounders**, Evan M. Manning, Hartmut H. Aumann, Jet Propulsion Lab. (United States) and California Institute of Technology (United States); Larrabee Strow, Scott Hannon, Univ. of Maryland, Baltimore County (United States) [7452-16]

4:10 pm: **Sensor performance of Clouds and the Earth's Radiant Energy System (CERES) instruments aboard EOS Terra and Aqua spacecraft based on post-launch calibration studies**, Susan Thomas, Science Systems and Applications, Inc. (United States); Kory J. Priestley, NASA Langley Research Ctr. (United States); Phillip C. Hess, Robert S. Wilson, Science Systems and Applications, Inc. (United States); Melody A. Avery, NASA Langley Research Ctr. (United States); Suzanne L. Maddock, Mohan Shankar, Science Systems and Applications, Inc. (United States) [7452-17]

4:30 pm: **On-orbit solar calibrations using the Clouds and Earth's Radiant Energy System (CERES) in-flight Mirror Attenuator Mosaic (MAM) calibration system**, Robert S. Wilson, Science Systems and Applications, Inc. (United States) [7452-18]

SESSION 5

Room: Conv. Ctr. 17B Mon. 4:50 to 6:10 pm

Earth Observing System Sensors II

Session Chair: **James J. Butler**, NASA Goddard Space Flight Ctr.

4:50 pm: **MODIS solar reflective calibration traceability**, Xiaoxiong Xiong, James J. Butler, NASA Goddard Space Flight Ctr. (United States) . . . [7452-19]

5:10 pm: **Trends in MODIS geolocation error analysis**, Robert E. Wolfe, NASA Goddard Space Flight Ctr. (United States); Masahiro Nishihama, NASA Goddard Space Flight Ctr. (United States) and Raytheon Co. (United States) . . [7452-20]

5:30 pm: **On-orbit operation and performance of MODIS blackbody**, Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States); Jiejun Chang, Science Systems and Applications, Inc. (United States); Willam Barnes, Univ. of Maryland, Baltimore County (United States) [7452-21]

5:50 pm: **Detector dependency of MODIS polarization sensitivity derived from on-orbit characterization**, Gerhard Meister, Futuretech Corp. (United States); Bryan A. Franz, Science Systems and Applications, Inc. (United States); Ewa J. Kwiatkowska, European Space Agency (Netherlands); Charles R. McClain, NASA Goddard Space Flight Ctr. (United States) [7452-22]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

An enhanced vegetation cover method for automatic generation of land surface emissivity maps, Eduardo Caselles, Univ. de València (Spain) and Univ. Politècnica de València (Spain); Francisco Abad, Univ. Politècnica de València (Spain); Enric Valor, Joan M. Galve, Vicente Caselles, Univ. de València (Spain) [7452-23]

Characterization of MODIS SD screen vignetting function using observations from spacecraft yaw maneuvers, Zhipeng Wang, Univ. of Maryland, Baltimore County (United States) and NASA Goddard Space Flight Ctr. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States) [7452-40]

MODIS solar diffuser stability monitor: function and applications, Hongda Chen, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States) [7452-41]

Time-dependent response versus scan angle for MODIS reflective solar bands, Junqiang Sun, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States); Hongda Chen, Amit Angal, Aisheng Wu, Xu Geng, Science Systems and Applications, Inc. (United States) [7452-43]

Long-term monitoring of radiometer sensitivity for radiometric comparisons among optical laboratories, Gerhard Meister, Futuretech Corp. (United States); Giulietta S. Fargion, San Diego State Univ. (United States); Charles R. McClain, NASA Goddard Space Flight Ctr. (United States) [7452-44]

The simulator of single photon counting planetary altimeter map gadget, Josef Blazej, Ivan Prochazka, Dana Lewova, Czech Technical Univ. in Prague (Czech Republic) [7452-45]

Tuesday 4 August

SESSION 6

Room: Conv. Ctr. 17B Tues. 8:20 to 9:40 am

Sensors, Technologies, and Measurement Techniques

Session Chair: **Thomas S. Pagano**, Jet Propulsion Lab.

8:20 am: **Staggered arrays for high-resolution Earth observing systems**, Christophe Latry, Jean Marc Delvit, Ctr. National d'Études Spatiales (France) [7452-23]

8:40 am: **Transmittance measurement of a heliostat facility used in the preflight radiometric calibration of Earth observing sensors**, Jeffrey S. Czaplá-Myers, College of Optical Sciences, The Univ. of Arizona (United States); Kurtis J. Thome, NASA Goddard Space Flight Ctr. (United States); Nikolaus Anderson, Joel T. McCorkel, College of Optical Sciences, The Univ. of Arizona (United States); William S. Good, Sandra Collins, Ball Aerospace & Technologies Corp. (United States) [7452-24]

9:00 am: **Remote sensing capabilities of the Airborne Compact Atmospheric Mapper**, Matthew G. Kowalewski, Science Systems and Applications, Inc. (United States); Scott J. Janz, Paul Newman, NASA Goddard Space Flight Ctr. (United States) [7452-27]

9:20 am: **A sampling technique in the star-based monitoring of GOES imager visible-channel responsivities**, I-Lok Chang, Charles Dean, Perot Systems Corp. (United States); Michael P. Weinreb, Riverside Technology, Inc. (United States); Xiangqian Wu, National Oceanic and Atmospheric Administration (United States) [7452-28]

Coffee Break 9:40 to 10:30 am

SESSION 7

Room: Conv. Ctr. 17B Tues. 10:30 am to 12:10 pm

Land Remote Sensing

Session Chair: **Jeffrey S. Czaplá-Myers**, College of Optical Sciences, The Univ. of Arizona

10:30 am: **Landsat-7 and Landsat-5 thermal band calibration updates**, Julia A. Barsi, Brian L. Markham, NASA Goddard Space Flight Ctr. (United States); Simon J. Hook, Jet Propulsion Lab. (United States); John R. Schott, Rochester Institute of Technology (United States) [7452-29]

10:50 am: **Performance summary of the Landsat OLI spectral filters**, John W. Figoski, Neal H. Zaun, Ball Aerospace & Technologies Corp. (United States); Tom Mooney, Barr Associates, Inc. (United States) [7452-30]

11:10 am: **The increased potential for the Landsat Data Continuity mission to contribute to case 2 water quality studies**, Aaron D. Gerace, John R. Schott, Rochester Institute of Technology (United States) [7452-31]

11:30 am: **Using satellite imagery for identifying climate change and its impacts on coastal zone of Nile Delta, Egypt**, Alaa H. El Nahry, National Authority for Remote Sensing and Space Sciences (Egypt) [7452-32]

11:50 am: **An overview of crop condition monitoring in China Agriculture Remote Sensing Monitoring System**, Qing Huang, Qing-bo Zhou, Chinese Academy of Agriculture Sciences (China) [7452-33]

Lunch/Exhibition Break 12:10 to 1:30 pm

Room: Conv. Ctr. 6A Tues. 1:30 to 3:30 pm

Remote Sensing Plenary

Join this collaborative plenary session to hear presentations from a cross-section of remote sensing applications.

1:30 pm: **Virtual dimensionality for hyperspectral imagery** (*Presentation Only*), Chein-I Chang, Univ. of Maryland, Baltimore County (United States)

2:10 pm: **Satellite data assimilation: traditional and innovative applications** (*Presentation Only*), Xiaolei Zou, Florida State Univ. (United States)

2:50 pm: **The accomplishments and future direction of the Global Space-based InterCalibration System (GSICS)** (*Presentation Only*), Mitchell D. Goldberg, National Oceanic and Atmospheric Administration (United States)

See page 20 for presentation details.

Coffee Break 3:30 to 3:50 pm

Conference 7452

SESSION 8

Room: Conv. Ctr. 17B Tues. 3:50 to 5:10 pm

Cross-calibration

Session Chair: **Philip E. Ardanuy**, Raytheon Intelligence & Information Systems

3:50 pm: **The cross-calibration of SeaWiFS and MODIS using on-orbit observations of the Moon**, Robert E. Eplee, Jr., SAIC (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States); Junqiang Sun, Science Systems and Applications, Inc. (United States); Gerhard Meister, Futuretech Corp. (United States); Charles R. McClain, NASA Goddard Space Flight Ctr. (United States) [7452-35]

4:10 pm: **Characterization of MODIS and SeaWiFS solar diffuser on-orbit degradation**, Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States); Robert E. Eplee, Jr., SAIC (United States); Junqiang Sun, Fredrick S. Patt, Amit Angal, Science Systems and Applications, Inc. (United States); Charles R. McClain, NASA Goddard Space Flight Ctr. (United States) [7452-36]

4:30 pm: **Uncertainty sources for sensor cross-calibration**, Kurtis J. Thome, NASA Goddard Space Flight Ctr. (United States) [7452-37]

4:50 pm: **Radiometric characterization of hyperspectral imagers using multispectral sensors**, Joel T. McCorkel, College of Optical Sciences, The Univ. of Arizona (United States); Kurtis J. Thome, NASA Goddard Space Flight Ctr. (United States); Nathan P. Leisso, Nikolaus Anderson, Jeffrey S. Czaplmyers, College of Optical Sciences, The Univ. of Arizona (United States) [7452-38]

Wednesday 5 August

SESSION 9

Room: Conv. Ctr. 17B Wed. 8:30 to 11:30 am

Earth Observation Systems and Applications in China

Session Chair: **Xingfa Gu**, Institute of Remote Sensing Applications (China)

8:30 am: **Earth observations and their applications in China** (*Invited Paper*), Xingfa Gu, Institute of Remote Sensing Applications (China); Baoli Song, Defense Industry Program Evaluation Ctr. of SASTIND (China) [7452-46]

9:10 am: **The development of imaging spectrometer technology in China**, Jianyu Wang, Yueming Wang, Shanghai Institute of Technical Physics (China) [7452-47]

9:40 am: **The microwave sensor developing plan in next-generation FY series meteorological satellites of China**, Hu Yang, National Satellite Meteorological Ctr. (China) [7452-48]

Coffee Break 10:10 to 10:30 am

10:30 am: **Development and applications of Beijing-1 small satellite**, Zhiyong Wang, Beijing Twenty-First Century Science & Technology Development Co., Ltd. (China); Zheng Wei, Institute of Remote Sensing Applications (China) [7452-49]

11:00 am: **Ocean observation satellites and applications in China**, Mingsen Lin, National Satellite Ocean Application Ctr. of China (China) [7452-50]

Conference 7453

Wednesday-Thursday 5-6 August 2009 • Proceedings of SPIE Vol. 7453

Infrared Spaceborne Remote Sensing and Instrumentation XVII

Conference Chair: **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

Program Committee: **John Antoniadis**, BAE Systems; **Gail E. Bingham**, Utah State Univ.; **David A. Cardimona**, Air Force Research Lab.; **Catherine J. Cesarsky**, European Southern Observatory (Germany); **Jam Farhoomand**, TechnoScience Corp.; **Gerald T. Fraser**, National Institute of Standards and Technology; **John C. Gille**, National Ctr. for Atmospheric Research; **Sarath D. Gunapala**, Jet Propulsion Lab.; **Dietrich Lemke**, Max-Planck-Institut für Astronomie (Germany); **Gonzalo Paez**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Jan L. Williams**, e-Systems Management Consultants; **Juergen Wolf**, NASA Ames Research Ctr.

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 33B Wed. 8:40 to 10:00 am

IR Missions Looking into Space

Session Chair: **Eric E. Becklin**, NASA Ames Research Ctr.

8:40 am: **Stratospheric Observatory for Infrared Astronomy (SOFIA)** (*Invited Paper*), Eric E. Becklin, NASA Ames Research Ctr. (United States) . . . [7453-01]

9:10 am: **On sky testing of the SOFIA telescope in preparation for the first science observations** (*Invited Paper*), Franziska Harms, Juergen Wolf, Ulrich Lampater, Andreas Reinacher, Holger Jakob, Thomas Kellig, Univ. Stuttgart (Germany); Edward W. Dunham, Lowell Observatory (United States); Patrick G. Waddell, Allan W. Meyer, Sybil Adams, Randy Grashuis, Universities Space Research Association (United States) [7453-02]

9:40 am: **EXIST IRT imager-spectrometer**, Alexander S. Kutryev, Harvey S. Moseley, NASA Goddard Space Flight Ctr. (United States); Craig Golisano, ITT Corp. (United States); Qian Gong, NASA Goddard Space Flight Ctr. (United States); Branden T. Allen, Joshua Grindlay, Jae Sub Hong, Harvard-Smithsonian Ctr. for Astrophysics (United States); Bruce E. Woodgate, NASA Goddard Space Flight Ctr. (United States) [7453-03]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 33B Wed. 10:30 to 11:50 am

IR Missions Looking Down

Session Chairs: **Gonzalo Paez**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

10:30 am: **Thermal infrared imaging of Mercury (MERTIS): a new remote sensing technology**, Gabriele E. Arnold, Westfaelische Wilhelms Univ. (Germany) and Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Harald Hiesinger, Westfaelische Wilhelms Univ. (Germany); Jörn Helbert, Carsten Paproth, Thomas Säuberlich, Gisbert Peter, Ingo Walter, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) [7453-06]

10:50 am: **MERTIS: background signal removal and signal simulation**, Thomas Säuberlich, Carsten Paproth, Jörn Helbert, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Harald Hiesinger, Westfaelische Wilhelms Univ. (Germany) [7453-07]

11:10 am: **MISTIGRI instrumental concept for high-resolution thermal infrared imaging**, Francisc Tinto, Ctr. National d'Études Spatiales (France); Guy Fargant, Claude Israbian, Jean Claude Mathieu, Thales Alenia Space (France); Olivier Hagolle, Joel Michaud, Alain Bardoux, Ctr. National d'Études Spatiales (France) [7453-08]

11:30 am: **Performances of the SAC-D NIRST first flight model radiometer**, Mélanie R. Leclerc, Linda E. Marchese, Patrice Côté, François Châteauneuf, Claude Chevalier, INO (Canada); Hugo G. Marraco, Comision Nacional de Actividades Espaciales (Argentina); Ngo-Phong Linh, Canadian Space Agency (Canada) [7453-09]

Lunch/Exhibition Break 11:50 am to 1:20 pm

SESSION 3

Room: Conv. Ctr. 33B Wed. 1:20 to 3:40 pm

IR Missions Looking at the Atmosphere

Session Chair: **John C. Gille**, National Ctr. for Atmospheric Research

1:20 pm: **HIRDLS as a pathfinder for future upper troposphere/lower stratosphere observing systems** (*Invited Paper*), John C. Gille, Univ. of Colorado at Boulder (United States) and National Ctr. for Atmospheric Research (United States); Steven T. Massie, Thomas D. Eden, Jr., Helen M. Worden, Bruno Nardi, Valery A. Yudin, National Ctr. for Atmospheric Research (United States) [7453-10]

1:50 pm: **Science objectives and requirements for the Advanced Limb Infrared Chemistry Experiment (ALICE)**, Helen M. Worden, John C. Gille, Steven T. Massie, Thomas D. Eden, Jr., Cheryl Craig, Gene L. Francis, Christopher Halvorson, Rashid Khosravi, Douglas Kinnison, National Ctr. for Atmospheric Research (United States); Joanne L. Loh, Univ. of Colorado at Boulder (United States); Bruno Nardi, Valery A. Yudin, National Ctr. for Atmospheric Research (United States); Brian R. Johnson, NEON, Inc. (United States) [7453-11]

2:10 pm: **Instrument design overview of the Advanced Limb Infrared Chemistry Experiment (ALICE)**, John C. Gille, Helen M. Worden, Bruno Nardi, Gene L. Francis, Christopher Halvorson, National Ctr. for Atmospheric Research (United States); Brian R. Johnson, NEON, Inc. (United States); Rashid Khosravi, National Ctr. for Atmospheric Research (United States); James W. Leitch, Ball Aerospace & Technologies Corp. (United States); Steven T. Massie, National Ctr. for Atmospheric Research (United States); Jennifer A. Turner-Valle, Tim Valle, Ball Aerospace & Technologies Corp. (United States); Valery A. Yudin, National Ctr. for Atmospheric Research (United States) [7453-12]

2:30 pm: **Meteosat Third Generation: mission and system concepts**, Antonio Rodriguez, Rolf Stuhlmann, Stephen Tjemkes, European Organisation for the Exploitation of Meteorological Satellites (Germany); Donny M. Aminou, Hendrik Stark, Paul Blythe, European Space Agency (Netherlands) [7453-13]

2:50 pm: **The evolution of the performance of the AVHRR, HIRS, and AMSU-A instruments onboard MetOp-A after over two years in orbit**, Douglas R. Battles, Robert W. Lambeck, Perot Systems Government Service (United States); Abelardo Perez-Albinana, Francois Montagner, Helmut Bauch, European Organisation for the Exploitation of Meteorological Satellites (Germany); Roberto M. Aleman, NASA Goddard Space Flight Ctr. (United States); Conrad Jackson, National Oceanic and Atmospheric Administration (United States) [7453-14]

3:10 pm: **Assessing the information content of the Tropospheric Infrared Mapping Spectrometers (TIMS) if applied at 9.6 micrometers in the GEO-CAPE mission for vertically resolved ozone measurement in the troposphere and lower stratosphere** (*Invited Paper*), John B. Kumer, Aidan E. Roche, Richard L. Rairden, Lockheed Martin Space Systems Co. (United States); Sergio G. De Souza-Machado, Univ. of Maryland, Baltimore County (United States) [7453-15]

Coffee Break 3:40 to 4:10 pm

Conference 7453

SESSION 4

Room: Conv. Ctr. 33B Wed. 4:10 to 6:00 pm

IR Technologies

Session Chairs: **Marija Strojnik**, Ctr. de Investigaciones en Óptica, A.C. (Mexico); **Gonzalo Paez**, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

4:10 pm: **Improved determination of surface and atmospheric temperatures using only shortwave AIRS channels** (*Invited Paper*), Joel Susskind, NASA Goddard Space Flight Ctr. (United States) [7453-16]

4:40 pm: **Data assimilation experiments using quality controlled AIRS Version 5 temperature soundings**, Joel Susskind, NASA Goddard Space Flight Ctr. (United States) [7453-17]

5:00 pm: **The BroadBand Radiometer on the EarthCARE spacecraft**, Kotska Walla, European Space Agency (Netherlands); Nigel Wright, David Spilling, SEA Ltd. (United Kingdom); A. Kim Ward, Martin E. Caldwell, Science and Technology Facilities Council (United Kingdom) [7453-18]

5:20 pm: **Efficient characterization of an LWIR imaging spectrometer**, Tim Valle, Paula Wamsley, Holden Chase, Glenn E. Taudien, Gary L. Mills, Peter T. Spuhler, Peter B. Johnson, Ball Aerospace & Technologies Corp. (United States); Thomas U. Kampe, NEON, Inc. (United States) [7453-19]

5:40 pm: **Photoconductive response of PbSnTe(In) in the terahertz spectral range**, Dmitry R. Khokhlov, Dmitry Dolzhenko, Ludmila I. Ryabova, Lomonosov Moscow State Univ. (Russian Federation); Andrey V. Nicorici, Institute of Applied Physics (Moldova); Sergey D. Ganichev, Sergey G. Danilov, Vasily V. Bel'kov, Univ. Regensburg (Germany) [7453-20]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Proposal of a stitching interferometer to measure the segments of a large primary mirror, Enoch Gutierrez-Herrera, Ctr. de Investigaciones en Óptica, A.C. (Mexico); Paul R. Shore, Cranfield Univ. (United Kingdom); Marija Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico); Paul M. Morantz, Cranfield Univ. (United Kingdom); Gonzalo Paez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7453-05]

Cross-talking analysis in evaluation of oxygen saturation, Camille Vazquez-Jacaud, Gonzalo Paez, Marija Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7453-31]

Thermal characterization and evaluation of photoluminescence properties of quantum dots, Mariana Alfaro, Gonzalo Paez, Marija Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7453-32]

Analysis of rotational shearing interferometers to detect extrasolar planets, Maximiliano Galan, Marija Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7453-33]

Tissue characterization with ballistic photons, Gonzalo Paez, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7453-34]

Point-Spread Function for multiple Bracewell interferometric configurations, Marija Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico) [7453-35]

Thursday 6 August

SESSION 5

Room: Conv. Ctr. 33B Thurs. 8:00 to 10:30 am

Radiometric Standards at NIST

Session Chair: **Gerald T. Fraser**, National Institute of Standards and Technology

8:00 am: **A proposed global atmospheric monitoring network based on standard stars** (*Invited Paper*), Gerald T. Fraser, Steven W. Brown, Keith R. Lykke, National Institute of Standards and Technology (United States); John T. McGraw, The Univ. of New Mexico (United States); Allan W. Smith, National Institute of Standards and Technology (United States); Christopher W. Stubbs, Harvard Univ. (United States); John T. Woodward, National Institute of Standards and Technology (United States); Peter C. Zimmer, The Univ. of New Mexico (United States) [7453-21]

8:30 am: **New NIST capability for infrared spectral characterization of high-temperature sources**, Sergey N. Mekhontsev, Vladimir Khromchenko, Charles Gibson, National Institute of Standards and Technology (United States) [7453-22]

8:50 am: **Comparison of infrared spectral radiance scales of the NIST FTIS and AIRI facilities**, Leonard M. Hanssen, Boris Wilthan, Sergey N. Mekhontsev, Vladimir Khromchenko, National Institute of Standards and Technology (United States) [7453-23]

9:10 am: **Detector-based NIST-traceable validation and calibration of infrared collimators**, Howard W. Yoon, George P. Eppeldauer, Jinan Zeng, National Institute of Standards and Technology (United States) [7453-24]

9:30 am: **Comparative BRDF study of several surfaces as potential MWIR diffuse reflectance standards**, Bradley L. Balling, Michael A. Marciniak, Air Force Institute of Technology (United States) [7453-25]

9:50 am: **IR test chamber calibrations using the NIST MDXR**, Adriaan C. Carter, Raju U. Datla, National Institute of Standards and Technology (United States); Timothy M. Jung, Stephen M. Carr, Solomon I. Woods, Jung Research and Development Corp. (United States) [7453-26]

10:10 am: **Development of IR optical scattering instrument from 1 to 5 μm** , Jinan Zeng, Leonard M. Hanssen, National Institute of Standards and Technology (United States) [7453-27]

Coffee Break 10:30 to 11:00 am

SESSION 6

Room: Conv. Ctr. 33B Thurs. 11:00 am to 12:10 pm

Applications of IR Technologies

Session Chair: **Sergey N. Mekhontsev**, National Institute of Standards and Technology

11:00 am: **IV-VI mid-IR tunable lasers and detectors with external resonant cavities** (*Invited Paper*), Hans Zogg, Mohamed Rahim, Amir Khair, Matthias Fill, Ferdinand Felder, N. Quack, ETH Zürich (Switzerland) [7453-28]

11:30 am: **The EarthCARE broadband radiometer detectors**, Christian Proulx, Fraser J. Williamson, Georges S. Baldenberger, David Gay, Sonia Garcia-Blanco, Patrice Côté, Louis Martin, Timothy D. Pope, Institut National d'Optique (Canada); Martin E. Caldwell, A. Kim Ward, John Delderfield, Rutherford Appleton Lab. (United Kingdom) [7453-29]

11:50 am: **Numerical and experimental evaluation of road infrastructure perception in fog and/or night conditions using infrared and photometric vision systems**, Jean Dumoulin, Lab. Central des Ponts et Chaussées Nantes (France); Vincent Boucher, Florian Greffier, Lab. Régional des Ponts et Chaussées d'Angers (France) [7453-30]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC152 Infrared Focal Plane Arrays (Dereniak, Hubbs) Wednesday, 8:30 am to 12:30 pm

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

SC835 Infrared Systems - Technology & Design (Daniels) Monday-Tuesday, 8:30 am to 3:30 pm

Conference 7454

Wednesday-Thursday 5-6 August 2009 • Proceedings of SPIE Vol. 7454

Remote Sensing and Modeling of Ecosystems for Sustainability VI

Conference Chair: **Wei Gao**, Colorado State Univ.

Conference Co-Chair: **Thomas J. Jackson**, USDA Agricultural Research Service

Program Committee: **Gregory Paul Asner**, Stanford Univ.; **Ni-Bin Chang**, Univ. of Central Florida; **Xiuwan Chen**, Peking Univ. (China); **John A. Gamon**, California State Univ., Los Angeles; **E. Raymond Hunt, Jr.**, USDA Agricultural Research Service; **John M. Melack**, Univ. of California, Santa Barbara; **Dennis Ojima**, Colorado State Univ.; **Jeffrey L. Privette**, National Climatic Data Ctr.; **Jianguo Qi**, Michigan State Univ.; **John J. Qu**, George Mason Univ.; **Daniel L. Schmoldt**, U.S. Dept. of Agriculture; **Jiong Shu**, East China Normal Univ. (China); **Susan L. Ustin**, Univ. of California, Davis; **Hongjie Xie**, The Univ. of Texas at San Antonio; **Denghua Yan**, China Institute of Water Resources and Hydropower Research (China); **Xiaobing Zhou**, Montana Tech of the Univ. of Montana

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 1A Wed. 8:30 to 11:40 am

Ecological Remote Sensing Theory, Techniques, and Applications I

Session Chairs: **Thomas J. Jackson**, USDA Agricultural Research Service; **Brian R. Johnson**, NEON, Inc.

8:30 am: **NEON: the first continental-scale ecological observatory with airborne remote sensing of vegetation canopy biochemistry and structure** (*Invited Paper*), Brian R. Johnson, Thomas U. Kampe, Michele A. Kuester, NEON, Inc. (United States) [7454-01]

9:00 am: **Remote sensing techniques to monitor nitrogen-driven carbon dynamics in vegetation**, Lawrence A. Corp, Science Systems and Applications, Inc. (United States); Elizabeth M. Middleton, NASA Goddard Space Flight Ctr. (United States); Yen-Ben Cheng, Science Systems and Applications, Inc. (United States); Petya K. E. Campbell, Karl F. Huemmrich, NASA Goddard Space Flight Ctr. (United States); Craig S. T. Daughtry, U.S. Dept. of Agriculture (United States) [7454-02]

9:20 am: **A study of time series of AVHRR NDMI and land cover products for detecting climate changes over continental U.S.**, Di Wu, John J. Qu, Lingli Wang, Xianjun Hao, George Mason Univ. (United States) [7454-03]

9:40 am: **An evaluation of image fusion techniques for SPOT5 data**, Filiz Bektas Balcik, Cigdem Goksel, Istanbul Teknik Univ. (Turkey) [7454-04]

Coffee Break 10:00 to 10:30 am

10:30 am: **Validation of microwave vegetation indices using field experiment data sets** (*Invited Paper*), Thomas J. Jackson, USDA Agricultural Research Service (United States); Jiancheng Shi, Univ. of California, Santa Barbara (United States); Jing Tao, Beijing Normal Univ. (China); Rajat Bindlish, U.S. Dept. of Agriculture (United States) [7454-05]

11:00 am: **NOAA's approach to providing sustained climate data records (CDRs)** (*Invited Paper*), Jeffrey L. Privette, John J. Bates, Thomas Karl, National Climatic Data Ctr. (United States); David Markham, National Climatic Data Ctr. (United States) and Scientific Research Corp. (United States); Ed Kearns, National Climatic Data Ctr. (United States) [7454-67]

11:20 am: **Using a partial least squares (PLS) method in predicting cyanobacterial pigments in eutrophic inland waters**, Anthony L. Robertson, Lin Li, Lenore Tedesco, Jeffrey Wilson, Indiana Univ.-Purdue Univ. Indianapolis (United States); Emmanuel Soyeux, Veolia Environnement (France) . . [7454-07]

Lunch/Exhibition Break 11:40 am to 1:30 pm

SESSION 2

Room: Conv. Ctr. 1A Wed. 1:30 to 5:40 pm

Ecological Remote Sensing Theory, Techniques, and Applications II

Session Chairs: **E. Raymond Hunt, Jr.**, USDA Agricultural Research Service; **Michael L. Whiting**, Univ. of California, Davis

1:30 pm: **Remote sensing of canopy water content: scaling from leaf data to MODIS** (*Invited Paper*), E. Raymond Hunt, Jr., USDA Agricultural Research Service (United States); John J. Qu, Xianjun Hao, Lingli Wang, George Mason Univ. (United States) [7454-09]

2:00 pm: **The use of change detection techniques to monitor high-risk forest ecosystems: the case study of the Mata Atlantica (Brazil)**, Andrea Cappelli, Silvano Simoni, Leo Fiorini, Univ. degli Studi di Roma, La Sapienza (Italy) [7454-10]

2:20 pm: **Discrimination of vegetation types and soil in a semiarid environment using IKONOS satellite data**, Xiaobing Zhou, Montana Tech of the Univ. of Montana (United States); Geoffrey Marshall, Water Resources Authority (Jamaica); Ni-Bin Chang, Univ. of Central Florida (United States) [7454-11]

2:40 pm: **A research on IKONOS shadow extraction in urban region based on the principal component fusion information distort**, Cunjun Li, Jihua Wang, Xingang Xu, National Engineering Research Ctr. for Information Technology in Agriculture (China) [7454-12]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Measuring surface water in soil with light reflectance** (*Invited Paper*), Michael L. Whiting, Univ. of California, Davis (United States) . [7454-13]

4:00 pm: **Heat island effect and urban ecosystem of San Antonio downtown area by MODIS/AQUA temperature sensor**, Ni-Bin Chang, Univ. of Central Florida (United States) [7454-14]

4:20 pm: **A regional Earth System modeling tool for sustainable resource management**, Raghu Murtugudde, Univ. of Maryland (United States) [7454-69]

4:40 pm: **Vulnerability assessment of climate change on ecosystems in Shiyang River region**, Landong Sun, Cold and Arid Regions Environmental and Engineering Research Institute (China); Li Yue, Lanzhou Univ. (China) [7454-15]

5:00 pm: **Research on Beijing human settlement in district level by GIS spatial analyzing**, Xiaojun Zhang, Institute of Geographical Sciences and Natural Resources Research (China); Weihong Yin, Beijing Union Univ. (China); Suocheng Dong, Institute of Geographical Sciences and Natural Resources Research (China) [7454-16]

5:20 pm: **Regional differences and determinants of city and country land use mode in China**, Lifeng Zhu, Chongqing Technology and Business Univ. (China); Wenzuo Zhou, Yongzhong Tian, Southwest Univ. (China) . . . [7454-17]



Conference 7454

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Interferometric sensor for plant fluorescence, Elena M. Georgieva, William S. Heaps, Elizabeth M. Middleton, Petya K. E. Campbell, Emily L. Wilson, NASA Goddard Space Flight Ctr. (United States); Lawrence A. Corp, Science Systems and Applications, Inc. (United States) [7454-06]

Climatic changes and the estimate and counterplan of the agriculture and the ecosystem environment influence in the Chinese northeast, Nanping Xu, Meteorological Bureau of Heilongjiang (China) [7454-08]

Effects of diabatic heating on the short-term position variation of the west Pacific subtropical high during persistent heavy rain event in South China, Lijuan Wang, Zhaoyong Guan, Bo Yu, Gang Zeng, Jielin He, Nanjing Univ. of Information Science & Technology (China) [7454-34]

Study of regional land cover classification and dynamic-information mining based on the MODIS data, Ran Meng, Zhiqiang Gao, Institute of Geographical Sciences and Natural Resources Research (China) [7454-35]

100a climate change and its impact on vegetation ecological zoning in China, Zhiqiang Gao, Institute of Geographical Sciences and Natural Resources Research (China) [7454-36]

Atmospheric correction model of Landsat images, Chaoshun Liu, East China Normal Univ. (China) [7454-37]

Impact of climate change on precipitation in the upstream of Liujiaxia Reservoir, Landong Sun, Jingjing Lin, Cold and Arid Regions Environmental and Engineering Research Institute (China) [7454-38]

Effects of land use and land cover change on ecosystem service values in oasis region of northwest China, Qing Huang, Xiaoping Xin, Qing-bo Zhou, Chinese Academy of Agriculture Sciences (China) [7454-39]

Estimating photosynthetic light-use efficiency of Changbai Mountain by using MODIS-derived photochemical reflectance index, Xiaoping Xie, Institute of Geographical Sciences and Natural Resources Research (China); Wei Gao, Colorado State Univ. (United States); Zhiqiang Gao, Institute of Geographical Sciences and Natural Resources Research (China) [7454-40]

Using remote sensing data to estimate land surface variables over the Tibetan Plateau, Jianmao Guo, Institute of Plateau Meteorology (China) and Nanjing Univ. of Information Science & Technology (China); Shuanghe Shen, Shenbin Yang, Nanjing Univ. of Information Science & Technology (China) [7454-41]

Research of revising air temperature data based on remote sensing and geographic information systems: a case study of Anhui Province in China, Ke Liu, East China Normal Univ. (China); Zhiqiang Gao, Institute of Geographical Sciences and Natural Resources Research (China); Wei Gao, East China Normal Univ. (China) [7454-42]

Construction and validation of a new model for Crop Soil Moisture Index based on EOS-MODIS data-abstract(CHL), Huailiang Chen, Hongwei Zhang, Henan Institute of Meteorological Science (China) [7454-43]

Spatial/temporal features of SSTA in Kuroshio current region and its relations to general circulation, Donghong Ni, Zhaobo Sun, Haishan Chen, Weijun Zhu, Gang Zeng, Nanjing Univ. of Information Science & Technology (China) [7454-44]

Natural variability of East Asian summer monsoon simulated by NCAR Cam3 model, Gang Zeng, Nanjing Univ. of Information Science & Technology (China); Wei-Chyung Wang, Univ. at Albany, SUNY (United States); Zhaobo Sun, Nanjing Univ. of Information Science & Technology (China); Zhaohui Lin, Institute of Atmospheric Physics (China) [7454-45]

Quality assessment for human settlement of urban community based on remote sensing technology, Yan Sun, Huazhong Univ. of Science and Technology (China) [7454-46]

A research on accessing method of frost damage in winter wheat in Huanghuai area, Weidong Yu, Henan Institute of Meteorological Science (China) [7454-48]

Crop types discrimination using MODIS EVI series in North China, Maosi Chen, Colorado State Univ. (United States) [7454-49]

Soil water monitoring of cotton farmland with Landsat™ images, Xingang Xu, Institute of Mountain Hazards and Environment (China); Wenjiang Huang, Cunjun Li, National Engineering Research Ctr. for Information Technology in Agriculture (China) [7454-51]

Crop land suitability analysis for the Yellow River Delta, China, Wenzuo Zhou, Southwest Univ. (China) [7454-52]

Study on soil water indexes of growth and development for winter wheat, Wensong Fang, Ronghua Liu, Likui Shi, Henan Institute of Meteorological Science (China) [7454-53]

Validation of crop model for simulating summer maize in the Huang-Huai Plain of China and its application on analyzing drought effects, Shuyuan Li, Ronghua Liu, Lin Cheng, Henan Institute of Meteorological Science (China) [7454-54]

Dynamic monitoring of coal resources exploitation based on the fusion of RS and GIS data, Yuliang Qiao, Taiyuan Univ. of Science and Technology (China) [7454-55]

Analyzing the relationship between urban heat island and land use/cover changes in Beijing using remote sensing images, Xiaoyan Zhao, Shenbin Yang, Shuanghe Shen, Nanjing Univ. of Information Science & Technology (China); Yulong Hai, Beijing Meteorological Bureau (China); Yongxia Fang, Nanjing Univ. of Information Science & Technology (China) [7454-56]

Based on MODIS the evapotranspiration estimating of Qitai County, Xinjiang, China, Zhihui Liu, Hong Jiang, Shifeng Fang, Wei Dai, Xinjiang Univ. (China) [7454-57]

Design and implementation for satellite remote sensing forest fire-point automatic monitoring system, Chunhui Zou, Huailiang Chen, Henan Institute of Meteorological Science (China) [7454-58]

Forest crown closure assessment and tree species classification using multispectral imagery, Juwairia Mahboob, Institute of Geographical Information Systems (Pakistan) [7454-59]

The effects of surface downward solar radiation on the ground temperature simulation, Lanjun Zou, Shanghai Meteorological Ctr. (China); Wei Gao, Colorado State Univ. (United States); Tongwen Wu, Chinese Meteorological Administration (China); Jianfeng Gu, Shanghai Meteorological Ctr. (China) [7454-63]

A study of retrieval land surface temperature and evapotranspiration in response to LUCC based on remote sensing data in Sanggong River, Xiaoming Cao, Graduate Univ. of Chinese Academy of Sciences (China) [7454-64]

Assessing regional surface evapotranspiration by utilizing MODIS products, Chaoshun Liu, East China Normal Univ. (China) [7454-65]

Estimating vertical error of SRTM and map-based DEMs using ICESat data in Tibetan Plateau, Hongjie Xie, The Univ. of Texas at San Antonio (United States); Xiaodong Huang, Tiangang Liang, Lanzhou Univ. (China); Donghui Yi, SGT, Inc. (United States) [7454-66]

Thursday 6 August

SESSION 3

Room: Conv. Ctr. 1A Thurs. 8:10 am to 12:00 pm

Agricultural and Forest Remote Sensing and Applications

Session Chairs: Ni-Bin Chang, Univ. of Central Florida; Min Xu, Univ. of Illinois at Urbana-Champaign

8:10 am: **Monitoring the algal bloom event in Lake Okeechobee, Florida, under Hurricane Fay impacts using MODIS/Terra images (Invited Paper)**, Ni-Bin Chang, Univ. of Central Florida (United States) [7454-18]

8:40 am: **Implementation of DSSAT CERES maize model in CWRP and off-line preliminary results**, Min Xu, Xin-Zhong Liang, Univ. of Illinois at Urbana-Champaign (United States); Wei Gao, Colorado State Univ. (United States) [7454-19]

9:00 am: **Monitoring forest phenological variation caused by climate change in contiguous United States using MODIS**, Min Li, John J. Qu, George Mason Univ. (United States) [7454-20]

- 9:20 am: **Crop yield and CO₂ fixation monitoring in Asia by a photosynthetic-sterility model comparing with MODIS PSN and carbon in field grains**, Daijro Kaneko, Matsue National College of Technology (Japan); Peng Yang, Chinese Academy of Agriculture Sciences (China); Toshiro Kumakura, Nagaoka Univ. of Technology (Japan) [7454-21]
- 9:40 am: **Canopy modeling and validation for row planted crops of key growth stages**, Yanjuan Yao, Peking Univ. (China) [7454-22]
- Coffee Break 10:00 to 10:30 am
- 10:30 am: **The sensitivity of RADARSAT-2 quad polarization SAR data to crop biomass** (*Invited Paper*), Xianfeng Jiao, Heather McNairn, Elizabeth Pattey, Jiali Shang, Catherine Champaign, Agriculture and Agri-Food Canada (Canada) [7454-23]
- 11:00 am: **Partial least squares modeling of hyperion image spectra for mapping agricultural soil properties**, Tingting Zhang, Indiana Univ.-Purdue Univ. Indianapolis (United States); Baojuan Zheng, Virginia Polytechnic Institute and State Univ. (United States); Lin Li, Indiana Univ.-Purdue Univ. Indianapolis (United States) [7454-24]
- 11:20 am: **Comparison of forest LAI estimated from LiDAR and hyperspectral data**, Yong Pang, Chinese Academy of Forestry (China) [7454-25]
- 11:40 am: **Forest canopy leaf area index retrieval using multisensor synergy observations**, Zhuo Fu, Jindi Wang, Jinling Song, Hongmin Zhou, Beijing Normal Univ. (China); Yong Pang, Chinese Academy of Forestry (China) [7454-26]
- Lunch/Exhibition Break 12:00 to 2:10 pm

SESSION 4

Room: Conv. Ctr. 1A Thurs. 2:10 to 4:30 pm

Ecological Remote Sensing Theory, Techniques, and Applications III

Session Chairs: **Hongjie Xie**, The Univ. of Texas at San Antonio;
John J. Qu, George Mason Univ.


- 2:10 pm: **A study of vegetation drought and fire activities over Georgia (United States) from space**, Lingli Wang, John J. Qu, George Mason Univ. (United States) [7454-29]
- 2:30 pm: **Band mapping approach for fundamental climate data records generation**, Xianjun Hao, John J. Qu, George Mason Univ. (United States) [7454-30]
- Coffee Break 2:50 to 3:20 pm
- 3:20 pm: **MODIS/Terra-Aqua snow cover products, validation, and applications** (*Invited Paper*), Hongjie Xie, The Univ. of Texas at San Antonio (United States); Xianwei Wang, Univ. of California, Irvine (United States); Tiangang Liang, Lanzhou Univ. (China) [7454-31]
- 3:50 pm: **Estimation of canopy water content with MODIS spectral indexes**, Zuoning Jiang, Lin Li, Indiana Univ.-Purdue Univ. Indianapolis (United States); Susan L. Ustin, Univ. of California, Davis (United States) [7454-32]
- 4:10 pm: **Toward the development of a passive microwave sea ice extent/concentration climate data record**, Walter N. Meier, Florence Fetterer, Ruth Duerr, Julienne Stroeve, Univ. of Colorado at Boulder (United States) [7454-68]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

SPIE Optics+Photonics papers are available in 2–4 weeks.



Conference 7455

Tuesday-Wednesday 4-5 August 2009 • Proceedings of SPIE Vol. 7455

Satellite Data Compression, Communication, and Processing V

Conference Chairs: **Bormin Huang**, Univ. of Wisconsin, Madison; **Antonio J. Plaza**, Univ. de Extremadura (Spain); **Raffaele Vitulli**, European Space Agency (Netherlands)

Conference Co-Chairs: **Chulhee Lee**, Yonsei Univ. (Korea, Republic of); **Shen-En Qian**, Canadian Space Agency (Canada); **Chengke Wu**, Xidian Univ. (China)

Program Committee: **Isidore Paul Akam Bit**, LUXSPACE Sarl (Luxembourg); **Chein-I Chang**, Univ. of Maryland, Baltimore County; **Qian Du**, Mississippi State Univ.; **LingJia Gu**, Jilin Univ. (China); **Shuxu Guo**, Jilin Univ. (China); **Mingyi He**, Northwestern Polytechnical Univ. (China); **Roger W. Heymann**, National Oceanic and Atmospheric Administration; **Yu-Hen Hu**, Univ. of Wisconsin, Madison; **Matthew A. Klimesh**, Jet Propulsion Lab.; **Weibin Li**, Xianyang Normal Univ. (China); **Yunsong Li**, Xidian Univ. (China); **Enrico Magli**, Politecnico di Torino (Italy); **Jarno S. Mielikainen**, Univ. of Kuopio (Finland); **Jordi Portell**, Univ. de Barcelona (Spain); **Jeffery J. Puschell**, Raytheon Space & Airborne Systems; **Ana María Clara Ruedin**, Univ. de Buenos Aires (Argentina); **Joan Serra-Sagristà**, Univ. Autònoma de Barcelona (Spain); **Zhiping Shi**, University of Electronic Science and Technology of China (China); **Carole Thiebaud**, Ctr. National d'Études Spatiales (France); **Shuai Wan**, Northwestern Polytechnical Univ. (China); **Shih-Chieh Wei**, Tamkang Univ. (Taiwan)

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 3 Tues. 8:10 to 10:00 am

Satellite Data Compression I

Session Chair: **Bormin Huang**, Univ. of Wisconsin, Madison

8:10 am: **Hyperspectral information compression** (*Invited Paper*), Chein-I Chang, Univ. of Maryland, Baltimore County (United States) [7455-01]

8:40 am: **Multicomponent compression with the latest CCSDS recommendation**, Carole Thiebaud, Ctr. National d'Études Spatiales (France) [7455-02]

9:00 am: **Hyperspectral image lossless compression algorithm based on AP adaptive band regrouping**, Mingyi He, Lin Bai, Yuchao Dai, Jing Zhang, Northwestern Polytechnical Univ. (China) [7455-03]

9:20 am: **A resilient and quick data compression method of prediction errors for space missions**, Jordi Portell, Univ. de Barcelona (Spain) and Institut d'Estudis Espacials de Catalunya (Spain); Alberto G. Villafranca, Institut d'Estudis Espacials de Catalunya (Spain); Enrique Garcia-Berro, Univ. Politècnica de Catalunya (Spain) and Institut d'Estudis Espacials de Catalunya (Spain) [7455-04]

9:40 am: **Point-to-line vector quantization**, Bormin Huang, Univ. of Wisconsin-Madison (United States) [7455-05]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 3 Tues. 10:30 to 11:50 am

Satellite Data Processing I

Session Chair: **Antonio J. Plaza**, Univ. de Extremadura (Spain)

10:30 am: **Bit allocation for 2D compression of hyperspectral images for classification**, Sangwook Lee, Chulhee Lee, Yonsei Univ. (Korea, Republic of) [7455-06]

10:50 am: **Progressive dimensionality reduction for hyperspectral imagery**, Haleh Safavi, Chein-I Chang, Univ. of Maryland, Baltimore County (United States) [7455-07]

11:10 am: **An automatic ship detection scheme for synthetic aperture radar images**, Weibin Li, Bormin Huang, Univ. of Wisconsin-Madison (United States); Mingyi He, Northwestern Polytechnical Univ. (China) [7455-08]

11:30 am: **Impact of lossy compression on spatial and spectral endmember extraction**, Antonio J. Plaza, Univ. de Extremadura (Spain); Juan P. Ortiz, Vicente G. Ruiz, Inmaculada Garcia, Univ. de Almería (Spain) [7455-09]

Lunch/Exhibition Break 11:50 am to 1:30 pm

Room: Conv. Ctr. 6A Tues. 1:30 to 3:30 pm

Remote Sensing Plenary

Join this collaborative plenary session to hear presentations from a cross-section of remote sensing applications.

1:30 pm: **Virtual dimensionality for hyperspectral imagery** (*Presentation Only*), Chein-I Chang, Univ. of Maryland, Baltimore County (United States)

2:10 pm: **Satellite data assimilation: traditional and innovative applications** (*Presentation Only*), Xiaolei Zou, Florida State Univ. (United States)

2:50 pm: **The accomplishments and future direction of the Global Space-based InterCalibration System (GSICS)** (*Presentation Only*), Mitchell D. Goldberg, National Oceanic and Atmospheric Administration (United States)

See page 20 for presentation details.

Coffee Break 3:30 to 4:00 pm

SESSION 3

Room: Conv. Ctr. 3 Tues. 4:00 to 6:00 pm

FPGA- or GPU-based Data Compression

Session Chairs: **Raffaele Vitulli**, European Space Agency (Netherlands); **Jeffery J. Puschell**, Raytheon Space & Airborne Systems

Joint session between conference 7455, Satellite Data Compression, Communication, and Processing V, and conference 7458, Remote Sensing System Engineering II.

4:00 pm: **Development of a new fast minimum-redundancy prefix coding and its FPGA implementation for universal lossless data compression**, Bormin Huang, Chia-Hsiung Chen, Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States) [7455-10]

4:20 pm: **GPUs for data parallel spectral image compression**, Jarno S. Mielikainen, Risto Honkanen, Pekka Toivanen, Univ. of Kuopio (Finland) [7455-11]

4:40 pm: **Low-cost wavelet image compression for FPGAs**, John R. Hayes, Kim Strohbehn, Graham A. Murphy, The Johns Hopkins Univ. Applied Physics Lab. (United States) [7455-12]

5:00 pm: **VLSI architecture of wavelet transform based on basic lifting elements**, Jie Guo, Yunsong Li, Keyan Wang, Chengke Wu, Xidian Univ. (China) [7455-13]

5:20 pm: **Lossy hyperspectral image compression tuned for spectral mixture analysis applications on NVIDIA graphics processing units**, Antonio J. Plaza, Javier Plaza, Sergio Sanchez, Abel Paz, Univ. de Extremadura (Spain) [7455-14]

5:40 pm: **FPGA implementation of a predictor-guided lookup table method for lossless compression of 3-dimensional spectral data**, Bormin Huang, Chia-Hsiung Chen, Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States) [7455-15]

Wednesday 5 August

SESSION 4

Room: Conv. Ctr. 3 Wed. 8:10 to 10:00 am

Satellite Data Compression II

Session Chair: **Chulhee Lee**, Yonsei Univ. (Korea, Republic of)

8:10 am: **Data compression activities in ESA** (*Invited Paper*), Raffaele Vitulli, European Space Agency (Netherlands) [7455-16]

8:40 am: **Segmented PCA and JPEG2000 for hyperspectral image compression**, Qian Du, Wei Zhu, Mississippi State Univ. (United States) [7455-17]

9:00 am: **JPEG2000 rate-control for improved transmission of windows-of-interest in remote sensing scenarios**, José L. Monteagudo-Pereira, Joan Bartrina-Rapesta, Francesc Aulí-Llinàs, Joan Serra-Sagristà, Univ. Autònoma de Barcelona (Spain) [7455-18]

9:20 am: **Optimal wavebands searching prediction for lossless compression of hyperspectral imagery**, Lang Wang, Shuxu Guo, Jilin Univ. (China) [7455-19]

9:40 am: **Study of the codeword assignment for a revised Tunstall coding**, Shih-Chieh Wei, Tamkang Univ. (Taiwan); Bormin Huang, Univ. of Wisconsin-Madison (United States) [7455-20]

Coffee Break 10:00 to 10:30 am

SESSION 5

Room: Conv. Ctr. 3 Wed. 10:30 to 11:50 am

Satellite Data Processing II

Session Chair: **Shen-En Qian**, Canadian Space Agency (Canada)

10:30 am: **Design and analysis of real-time endmember extraction algorithms for hyperspectral imagery**, Chein-I Chang, Chao-Cheng Wu, Univ. of Maryland, Baltimore County (United States) [7455-21]

10:50 am: **Road extraction in remote sensing images based on PCNN and mathematical morphology**, Ximing Wang, Hongrui Zhao, Tsinghua Univ. (China) [7455-22]

11:10 am: **Massively parallel processing of remotely sensed hyperspectral images**, Javier Plaza, Antonio J. Plaza, Abel Paz, Univ. de Extremadura (Spain) [7455-23]

11:30 am: **Systematic study of SAR image fusion via lifting-based wavelets and directional templates**, Weibin Li, Bormin Huang, Univ. of Wisconsin-Madison (United States); Mingyi He, Northwestern Polytechnical Univ. (China) [7455-24]

Lunch/Exhibition Break 11:50 am to 1:30 pm

SESSION 6

Room: Conv. Ctr. 3 Wed. 1:30 to 3:30 pm

Satellite Data Compression III

Session Chair: **Carole Thiebaud**, Ctr. National d'Études Spatiales (France)

1:30 pm: **Remote sensing stereo image pair compression based on the combination of feature-based and area-based image matching**, Ruo-mei Yan, Yunsong Li, Chengke Wu, Keyan Wang, Xidian Univ. (China) ... [7455-25]

1:50 pm: **A lossless compression method based on mix coding and IWT for MODIS image**, Ruizhi Ren, Shuxu Guo, LingJia Gu, Jilin Univ. (China) [7455-27]

2:10 pm: **A new image compression algorithm based on classification and block-displacement**, Jingyuan Lv, Yunsong Li, Chengke Wu, Keyan Wang, Xidian Univ. (China) [7455-28]

2:30 pm: **Adaptive GOP structure based on motion coherence**, Yanzhuo Ma, Xidian Univ. (China); Shuai Wan, Northwestern Polytechnical Univ. (China); Yilin Chang, Fuzheng Yang, Xidian Univ. (China) [7455-29]

2:50 pm: **Lossy compression of MERIS image with exogenous quasi optimal coding transforms**, Isidore Paul Akam Bita, LUXSPACE Sarl (Luxembourg); Michel Barret, SUPELEC (France); Florio Dalla Vedova, LUXSPACE Sarl (Luxembourg); Jean-Louis Gutzwiller, SUPELEC (France) [7455-30]

3:10 pm: **Effects of image compression on the accuracy of Digital Terrain Model (DTM) automatically derived from satellite images**, Wang Yu, Hu Xin, Yang Zhe, Niu Rui, Xi'an Research Institute of Surveying and Mapping (China) [7455-26]

Coffee Break 3:30 to 4:00 pm

SESSION 7

Room: Conv. Ctr. 3 Wed. 4:00 to 6:00 pm

Satellite Data Processing III

Session Chair: **Jarno S. Mielikainen**, Univ. of Kuopio (Finland)

4:00 pm: **An ad-hoc approach for quality assessment of hyperspectral datacubes in target detection**, Reza Rashidi Far, Shen-en Qian, Canadian Space Agency (Canada) [7455-31]

4:20 pm: **Comparative analysis of different implementations of a parallel algorithm for automatic target detection and classification of hyperspectral images**, Abel Paz, Antonio J. Plaza, Javier Plaza, Univ. de Extremadura (Spain) [7455-32]

4:40 pm: **Automated display of hyperspectral images with unsupervised segmentation**, Sangwook Lee, Chulhee Lee, Yonsei Univ. (Korea, Republic of) [7455-33]

5:00 pm: **An effective method for the detection and removal of thin clouds from MODIS images**, Ruizhi Ren, LingJia Gu, Shuxu Guo, Jilin Univ. (China) [7455-34]

5:20 pm: **A novel adaptive noise filtering method for SAR images**, Weibin Li, Bormin Huang, Univ. of Wisconsin-Madison (United States); Mingyi He, Northwestern Polytechnical Univ. (China) [7455-35]

5:40 pm: **Joint design of Q-ary LDPC codes and Signal Space Diversity for fading channels**, Zhiping Shi, Zhongpei Zhang, Zhenzhou Ma, Univ. of Electronic Science and Technology of China (China) [7455-36]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Weighted Zeroblock Coder (WZBC) for satellite image compression, Jiaji Wu, Yan Xing, Xidian Univ. (China) [7455-37]

Hyperspectral image compression based on the framework of DSC using 3D-wavelet and LDPC, Jiaji Wu, Kun Jiang, Xidian Univ. (China); Yong Fang, Northwest A&F Univ. (China) [7455-38]

Adjacency effect correction for vertical viewing angle remote sensing imagery, Xiaoyu Song, Beijing Normal Univ. (China) and National Engineering Research Ctr. for Information Technology in Agriculture (China) and Ministry of Agriculture (China); Jihua Wang, Cunjun Li, Wengjiang Huang, Xingang Xu, National Engineering Research Ctr. for Information Technology in Agriculture (China) and Ministry of Agriculture (China); Guangjian Yan, Beijing Normal Univ. (China) [7455-42]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

Conference 7456

Wednesday-Thursday 5-6 August 2009 • Proceedings of SPIE Vol. 7456

Atmospheric and Environmental Remote Sensing Data Processing and Utilization V: Readiness for GEOSS III

Conference Chairs: **Mitchell D. Goldberg**, National Oceanic and Atmospheric Administration; **Hal J. Bloom**, National Oceanic and Atmospheric Administration, GOES-R Program

Conference Co-Chairs: **Philip E. Ardanuy**, Raytheon Intelligence & Information Systems; **Allen H.-L. Huang**, Univ. of Wisconsin, Madison

Program Committee: **John J. Bates**, NOAA/NESDIS National Climatic Data Ctr.; **James J. Butler**, NASA Goddard Space Flight Ctr.; **Changyong Cao**, National Oceanic and Atmospheric Administration; **Wei Gao**, Colorado State Univ.; **Steve Goodman**, National Oceanic and Atmospheric Administration; **John F. Le Marshall**, Bureau of Meteorology (Australia); **Johannes Schmetz**, European Organisation for the Exploitation of Meteorological Satellites (Germany); **William L. Smith, Jr.**, NASA Langley Research Ctr.; **Karen St. Germain**, National Oceanic and Atmospheric Administration; **Xiaolei Zou**, Florida State Univ.

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 7B Wed. 8:00 to 10:00 am

Calibration Approaches and Systems

Session Chair: **Mitchell D. Goldberg**, National Oceanic and Atmospheric Administration

8:00 am: **Climate change and sounder radiometric stability**, Thomas S. Pagano, Hartmut H. Aumann, Jet Propulsion Lab. (United States) . . . [7456-01]

8:20 am: **Assessment of Midnight Blackbody Calibration Correction (MBCC) using the Global Space-based Inter-Calibration System (GSICS)**, Rama Varma Raja Mundakkare Kovilakom, Xiangqian Wu, National Oceanic and Atmospheric Administration (United States); Fangfang Yu, Earth Resources Technology, Inc. (United States) [7456-02]

8:40 am: **GSICS GEO-LEO baseline algorithm**, Xiangqian Wu, National Oceanic and Atmospheric Administration (United States); Tim J. Hewison, European Organisation for the Exploitation of Meteorological Satellites (Germany); Yoshihiko Tahara, Japan Meteorological Agency (Japan) . [7456-03]

9:00 am: **Using BRDF derived from MODIS observations over Dome C to characterize calibration stability and consistency of POS sensors**, Aisheng Wu, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States); Changyong Cao, National Oceanic and Atmospheric Administration (United States) [7456-04]

9:20 am: **Using the Sonoran Desert test site to track the long-term radiometric stability of the Landsat TM/ETM+ and MODIS sensors**, Amit Angal, Taeyoung Choi, Science Systems and Applications, Inc. (United States); Gyanesh Chander, SAIC (United States); Aisheng Wu, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States) [7456-05]

9:40 am: **Preparations for calibration and validation of the NPOESS preparatory project data products**, Heather Kilcoyne, Karen St. Germain, National Oceanic and Atmospheric Administration (United States) . . . [7456-06]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 7B Wed. 10:30 to 11:30 am

Data Utilization I

Session Chair: **James J. Gurka**, National Oceanic and Atmospheric Administration

10:30 am: **Day-2 product developments for Metop-A**, K. Dieter Klaes, Jörg Ackermann, Rosemary Munro, Axel von Engeln, Hans Bonekamp, Craig Anderson, Peter Schlüssel, Thomas August, Olusoji Oduleye, Johannes Schmetz, European Organisation for the Exploitation of Meteorological Satellites (Germany) [7456-07]

10:50 am: **Early warnings of malaria in Bangladesh using AVHRR-based vegetation health indices**, Mohammad Nizamuddin, Atiqur Rahman, Leonid M. Roytman, The City College of New York (United States); Felix N. Kogan, Al M. Powell, Jr., National Oceanic and Atmospheric Administration (United States) [7456-08]

11:10 am: **GSICS GEO-LEO operation at NOAA/NESDIS**, Fangfang Yu, Earth Resources Technology, Inc. (United States) [7456-09]

Lunch/Exhibition Break 11:30 am to 1:20 pm

SESSION 3

Room: Conv. Ctr. 7B Wed. 1:20 to 3:00 pm

Data Utilization II

Session Chair: **Allen H.-L. Huang**, Univ. of Wisconsin, Madison

1:20 pm: **Development of urban surface models for improved aerosol retrieval**, Min Oo, Matthias Jerg, Ana J. Picon, Eduardo Hernandez, Barry M. Gross, Fred Moshary, Samir A. Ahmed, The City College of New York (United States) [7456-11]

1:40 pm: **Rich client data exploration and research prototyping for NOAA**, Michael D. Grossberg, Irina Gladkova, The City College of New York (United States); Ingrid Guch, National Oceanic and Atmospheric Administration (United States); Jamal Goddard, The City College of New York (United States) [7456-12]

2:00 pm: **Remote sensing for bridge health monitoring**, Wanqiu Liu, Shen Chen, Edd Hauser, The Univ. of North Carolina at Charlotte (United States) [7456-13]

2:20 pm: **The NOAA global vegetation processing systems**, Hanjun Ding, National Oceanic and Atmospheric Administration (United States) . . . [7456-14]

2:40 pm: **A three-measurement model developed for evaluating satellite land surface temperature product**, Yunyue Yu, National Oceanic and Atmospheric Administration (United States); Ming Chen, I.M. Systems Group, Inc. (United States); Konstantin Y. Vinnikov, Univ. of Maryland, College Park (United States); Dan Tarpley, Short and Associates, Inc. (United States); Hui Xu, I.M. Systems Group, Inc. (United States) [7456-15]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. 7B Wed. 3:30 to 5:10 pm

Data Utilization III

Session Chair: **Hal J. Bloom**, National Oceanic and Atmospheric Administration, GOES-R Program

3:30 pm: **Diurnal drift corrections for constructing consistent MSU/AMSU temperature climate data records**, Cheng-Zhi Zou, Wenhui Wang, National Oceanic and Atmospheric Administration (United States) [7456-16]

3:50 pm: **Empirical normalization for the effect of volcanic stratospheric aerosols on AVHRR NDVI**, Marco Vargas, Felix N. Kogan, Wei Guo, National Oceanic and Atmospheric Administration (United States) [7456-17]

4:10 pm: **Impact of sensor calibration accuracy on microwave soil moisture retrievals**, Xiwu Zhan, National Oceanic and Atmospheric Administration (United States) [7456-18]

4:30 pm: **Combining ENVISAT ASAR and DMC+4 data for monitoring tobacco sown area**, DaiHu Wu, Wenjie Fan, Binyan Yan, Yuyang Shao, Xin Tao, Xiru Xu, Peking Univ. (China) [7456-19]

4:50 pm: **Glacier surface velocity derivation on mountain glacier from optical satellite imagery: a case study in Iran, Alamchal glacier**, Mahsa Moussavi, Mohammad Javad Valadan Zouj, Mahmoud Reza Sahebi, Yousef Rezaei, K.N.Toosi Univ. of Technology (Iran, Islamic Republic of) . . . [7456-22]

Conference 7456

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

Assessment and refinement of GASP AOD retrieval algorithm over NYC, Julia He, Matthias Jerg, Ana J. Picon, Eduardo Hernandez, Barry M. Gross, Fred Moshary, Samir A. Ahmed, City College, CUNY (United States) [7456-10]

Features of the short-term position variation of the West Pacific subtropical high during the torrential rain in Yangtze-Huaihe river valley and its possible cause, Zhaoyong Guan, Bo Yu, Lijuan Wang, Jieli He, Gang Zeng, Nanjing Univ. of Information Science & Technology (China) [7456-20]

Possible influence of stratospheric circulation on January surface air temperature over China, Guirong Tan, Weijun Zhu, Gang Zeng, Zhaobo Sun, Nanjing Univ. of Information Science & Technology (China) [7456-21]

Atmospheric thermal sources over the Tibetan Plateau: comparison of calculations based on reanalysis from different sources, Shanshan Zhong, Jinhai He, Nanjing Univ. of Information Science & Technology (China) [7456-23]

Thursday 6 August

SESSION 5

Room: Conv. Ctr. 7B Thurs. 8:00 to 10:20 am

Preparations for GOES-R

Session Chair: **Hal J. Bloom**, National Oceanic and Atmospheric Administration, GOES-R Program

8:00 am: **GOES-R Proving Ground: ensuring user readiness**, James J. Gurka, Steve Goodman, Timothy J. Schmit, Anthony Mostek, National Oceanic and Atmospheric Administration (United States); Steve D. Miller, Cooperative Institute for Research in the Atmosphere (United States); A. Scott Bachmeier, Univ. of Wisconsin-Madison (United States); Mark DeMaria, National Oceanic and Atmospheric Administration (United States) [7456-25]

8:20 am: **GOES-R program overview**, Satya Kalluri, National Oceanic and Atmospheric Administration (United States) [7456-26]

8:40 am: **The next-generation geostationary operational environmental satellite: GOES-R instrument operations status**, Hal J. Bloom, Timothy J. Walsh, National Oceanic and Atmospheric Administration (United States) [7456-27]

9:00 am: **Development of IDEA product for GOES-R aerosol data**, Hai Zhang, Raymond M. Hoff, Univ. of Maryland, Baltimore County (United States); Shobha Kondragunta, National Oceanic and Atmospheric Administration (United States) [7456-28]

9:20 am: **GOES-R Algorithm Working Group (AWG)**, Jaime Daniels, Mitchell D. Goldberg, Walter W. Wolf, Lihang Zhou, Kenneth Lowe, National Oceanic and Atmospheric Administration (United States) [7456-29]

9:40 am: **CIMSS participation in the GOES-R algorithm working group, risk reduction, proving ground, calibration/validation, and sensor tradeoff activities**, Allen H. -L. Huang, Univ. of Wisconsin-Madison (United States) [7456-30]

10:00 am: **McIDAS-V developments and applications**, Thomas D. Rink, Thomas H. Achtor, Univ. of Wisconsin-Madison (United States) [7456-31]

Coffee Break 10:20 to 10:50 am

SESSION 6

Room: Conv. Ctr. 7B Thurs. 10:50 am to 12:30 pm

Hyperspectral Data Utilization

Session Chair: **Hartmut H. Aumann**, Jet Propulsion Lab.

10:50 am: **Global comparison of radiances from the Atmospheric Infrared Sounder (AIRS) and the Infrared Atmospheric Sounding Interferometer (IASI)**, Denis A. Elliott, Jet Propulsion Lab. (United States); Larrabee Strow, Univ. of Maryland, Baltimore County (United States); Hartmut H. Aumann, Jet Propulsion Lab. (United States) [7456-32]

11:10 am: **An anomaly correlation skill score for the evaluation of the performance of hyperspectral sounders**, Hartmut H. Aumann, Evan M. Manning, Jet Propulsion Lab. (United States); Christopher D. Barnett, Eric S. Maddy, National Oceanic and Atmospheric Administration (United States) [7456-33]

11:30 am: **Capturing vertical variability of hurricanes with AIRS data**, Haidao Lin, Xiaolei Zou, Florida State Univ. (United States) [7456-34]

11:50 am: **Applications of McIDAS-V to multi- and hyperspectral data analysis**, Thomas H. Achtor, Thomas D. Rink, Thomas M. Whittaker, Univ. of Wisconsin-Madison (United States) [7456-35]

12:10 pm: **Development of a GPU-based high-performance radiative transfer model for the NASA Atmospheric Infrared Sounder (AIRS)**, Bormin Huang, Chia-Hsiung Chen, Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States) [7456-36]

Lunch/Exhibition Break 12:30 to 2:00 pm

SESSION 7

Room: Conv. Ctr. 7B Thurs. 2:00 to 3:40 pm

Data Assimilation

Session Chair: **Xiaolei Zou**, Florida State Univ.

2:00 pm: **Assimilation of MODIS direct broadcast products**, Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States) [7456-37]

2:20 pm: **Study of ENVISAT ASAR data assimilation in rice growth model for yield estimation**, Shenbin Yang, Shuanghe Shen, Nanjing Univ. of Information Science & Technology (China); Bingbai Li, Jiangsu Academy of Agricultural Sciences (China); Bingxiang Tan, Chinese Academy of Forestry (China); Thuy Le Toan, Ctr. d'Etudes Spatiales de la Biosphère (France) [7456-38]

2:40 pm: **Low-frequency oscillations in assimilated global datasets using TRMM rainfall observations**, Li Tao, Shuangjun Li, Nanjing Univ. of Information Science & Technology (China); Song Yang, National Oceanic and Atmospheric Administration (United States) [7456-43]

3:00 pm: **Seasonal predictability of the ensemble seasonal prediction by tier-1 and tier-1.5 models**, Li Tao, Nanjing Univ. of Information Science & Technology (China); Bin Wang, Xiouhua Fu, Univ. of Hawai'i (United States) [7456-44]

3:20 pm: **Comparing GPS RO temperatures and lapse rates within clouds with ECMWF and NCEP analysis**, Lin Lin, Xiaolei Zou, Florida State Univ. (United States) [7456-46]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

Conference 7457

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7457

Imaging Spectrometry XIV

Conference Chairs: **Sylvia S. Shen**, The Aerospace Corp.; **Paul E. Lewis**, U.S. Government

Conference Co-Chair: **Robert T. Kroutil**, Los Alamos National Lab.

Program Committee: **Christoph C. Borel**, Ball Aerospace & Technologies Corp.; **Chein-I Chang**, Univ. of Maryland, Baltimore County; **Thomas W. Cooley**, Air Force Research Lab.; **Eustace L. Dereniak**, College of Optical Sciences, The Univ. of Arizona; **Michael J. Escuti**, North Carolina State Univ.; **David B. Gillis**, Naval Research Lab.; **Terrence S. Lomheim**, The Aerospace Corp.; **Anthony Ratowski**, Air Force Research Lab.; **Luc Rochette**, LR Tech (Canada); **Bernhard Sang**, Kayser-Threde GmbH (Germany); **John R. Schott**, Rochester Institute of Technology

Monday 3 August

SESSION 1

Room: Conv. Ctr. 1B Mon. 9:30 to 11:50 am

Next-Generation Spectrometer Systems

Session Chair: **Paul E. Lewis**, U.S. Government

9:30 am: **Atmospheric sounder spectrometer for infrared spectral technology: latest development and improvement in the atmospheric sounding technology** (*Invited Paper*), Luc Rochette, LR Tech (Canada); William L. Smith, Sr., Hampton Univ. (United States); Michael E. Howard, National Security Technologies, LLC (United States); Timothy Bratcher, Ionetrics, Inc. (United States) [7457-01]

10:00 am: **The Mapping Reflectance Energy Sensor-MaRS: a new level of hyperspectral technology** (*Invited Paper*), Christopher Simi, Ernest Reith, National Geospatial-Intelligence Agency (United States); Robert Green, Michael Eastwood, Jet Propulsion Lab. (United States); Fred Olchowski, Logos Technologies, Inc. (United States) [7457-02]

10:30 am: **EnMAP hyperspectral imager: instrument design status, calibration, and operation approaches**, Bernhard Sang, Stefan Hofer, Klaus-Peter Förster, Josef Schubert, Valery Mogulsky, Kayser-Threde GmbH (Germany); Hermann J. Kaufmann, GeoForschungsZentrum Potsdam e.V. (Germany); Andreas Neumann, Andreas Müller, Christian Chlebek, Thomas Eversberg, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) [7457-03]

10:50 am: **Hyperspectral-LIDAR system and data product integration for terrestrial applications**, Lawrence A. Corp, Yen-Ben Cheng, Science Systems and Applications, Inc. (United States); Elizabeth M. Middleton, NASA Goddard Space Flight Ctr. (United States); Geoffrey H. Parker, Smithsonian Environmental Research Ctr. (United States); Karl F. Huemrich, Petya K. E. Campbell, NASA Goddard Space Flight Ctr. (United States) [7457-04]

11:10 am: **Toward HyTES: an airborne thermal imaging spectroscopy instrument**, William R. Johnson, Simon J. Hook, Pantazis Z. Mouroulis, Daniel W. Wilson, Sarath D. Gunapala, Cory J. Hill, Bjorn T. Eng, Jet Propulsion Lab. (United States) [7457-05]

11:30 am: **A new spaceborne hyperspectral instrument (Hyper-Spectrum Imager, HSI) aboard HJ-1-A satellite: application in retrieving atmospheric water vapor**, Zifeng Wang, Liangfu Chen, Institute of Remote Sensing Applications (China); Qing Li, Ministry of Environmental Protection (China); Lin Su, Dong Han, Institute of Remote Sensing Applications (China) [7457-06]

Lunch Break 11:50 am to 1:10 pm

SESSION 2

Room: Conv. Ctr. 1B Mon. 1:10 to 3:10 pm

Spectral Data Analysis Techniques

Session Chair: **John R. Schott**, Rochester Institute of Technology

1:10 pm: **Novel methods for panchromatic sharpening of multi/hyperspectral image data**, Christoph C. Borel, Clyde H. Spencer, Charles C. Wamsley, Kenneth R. Ewald, Ball Aerospace & Technologies Corp. (United States) [7457-07]

1:30 pm: **Progressive band selection**, Kevin Fisher, Chein-I Chang, Univ. of Maryland, Baltimore County (United States) [7457-08]

1:50 pm: **SPECCHIO: a free spectral data management and processing system**, Andreas Hueni, Mathias Kneubuehler, Univ. of Zürich (Switzerland) [7457-09]

2:10 pm: **Spectral angle mapper (SAM) for anisotropy class indexing in hyperspectral imagery**, Joerg Weyermann, Univ. of Zürich (Switzerland); Daniel R. Schläpfer, RESE Applications Schläpfer (Switzerland); Andreas Hueni, Mathias Kneubuehler, Michael Schaepman, Univ. of Zürich (Switzerland) [7457-10]

2:30 pm: **Comparison of basis-vector selection methods for structural modeling of hyperspectral imagery**, Carolina Peña-Ortega, Miguel Velez-Reyes, Univ. de Puerto Rico Mayagüez (United States) [7457-29]

2:50 pm: **A novel approach in endmember extraction in hyperspectral imagery**, Yousef Rezaei, Mohammad Reza Mobasher, Mohammad Javad Valadan Zouj, K.N.Toosi Univ. of Technology (Iran, Islamic Republic of) [7457-11]

Coffee Break 3:10 to 3:40 pm

SESSION 3

Room: Conv. Ctr. 1B Mon. 3:40 to 5:20 pm

Spectral Methodologies and Applications

Session Chair: **Luc Rochette**, LR Tech (Canada)

3:40 pm: **Hyperspectral clustering for the study of Zapotec state formation**, Justin D. Kwong, David W. Messinger, Rochester Institute of Technology (United States) and Digital Imaging and Remote Sensing Lab. (United States); William D. Middleton, Rochester Institute of Technology (United States) [7457-12]

4:00 pm: **Understanding and overcoming scene-change artifacts in imaging Fourier-transform spectroscopy of a turbulent jet engine exhaust plume**, Kevin C. Gross, Glen P. Perram, Air Force Institute of Technology (United States); Pierre Tremblay, Vincent Farley, Telops (Canada) [7457-13]

4:20 pm: **Hyperspectral monitoring of chemically sensitive plant sentinels**, Danielle A. Simmons, Nina G. Raqueno, John P. Kerekes, Rochester Institute of Technology (United States) [7457-14]

4:40 pm: **Vegetation water content at 970 nm: estimation using hyperspectral vegetation indices**, Eric A. Salas, Geoffrey M. Henebry, South Dakota State Univ. (United States) [7457-15]

5:00 pm: **Underwater unmixing and water optical properties retrieval using HyCIAT**, Maria C. Torres-Madronero, Miguel Velez-Reyes, James A. Goodman, Univ. de Puerto Rico Mayagüez (United States) [7457-30]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Smart hyperspectral imaging detection based on electrically tunable liquid crystal Fabry-Perot microstructure array, Kan Liu, Dehua Li, Hui Li, XinYu Zhang, Tianxu Zhang, Huazhong Univ. of Science and Technology (China) [7457-26]

Tuesday 4 August

SESSION 4

Room: Conv. Ctr. 1B Tues. 8:10 to 10:30 am

Innovative Spectrometer Technology

Session Chair: **Bernhard Sang**, Kayser-Threde GmbH (Germany)

- 8:10 am: **Demonstration of polarization grating imaging spectropolarimeter (PGIS)**, Jihwan Kim, Michael J. Escuti, North Carolina State Univ. (United States) [7457-16]
- 8:30 am: **Scene-based adaptive spectral sensing systems based on quantum dots infrared photodetectors**, Zhipeng Wang, Univ. of Maryland, Baltimore County (United States) and Goddard Earth Science & Technology Ctr. (United States); J. Scott Tyo, College of Optical Sciences, The Univ. of Arizona (United States) [7457-17]
- 8:50 am: **High-spectral resolution Fourier transform imaging spectroscopy in a Michelson interferometer with homodyne laser metrology control**, Melvin S. Ni, Greg Feller, J. Wes Irwin, Lockheed Martin Space Systems Co. (United States) [7457-18]
- 9:10 am: **Single- and dual-wavelength monolithic spatial heterodyne spectrometers for Fraunhofer line discrimination spectroscopy**, Steven R. Watchorn, John Noto, Scientific Solutions, Inc. (United States); John E. Anderson, U.S. Army Corps of Engineers (United States); Christopher Sioris, Sioris Consulting (United States) [7457-19]
- 9:30 am: **A portable solid-state high-spectral resolution hyperspectral imager**, John Noto, Steven R. Watchorn, Robert B. Kerr, Scientific Solutions, Inc. (United States) [7457-20]
- 9:50 am: **VNIR HyperSensor camera system**, David Cavanaugh, James M. Lorenz, Mark S. Dombrowski, Nora Unwin, Surface Optics Corp. (United States) [7457-28]
- 10:10 am: **Instrumentation and metrology for in vivo laser fluorescent diagnostics in medicine**, Vladimir V. Tchernyi, A. M. Prokhorov General Physics Institute (Russian Federation); Dmitrii A. Rogatkin, The M. Vladimirovsky Moscow Regional Research and Clinical Institute (Russian Federation) [7457-21]
- Coffee Break 10:30 to 11:00 am

SESSION 5

Room: Conv. Ctr. 1B Tues. 11:00 am to 12:20 pm

Target Detection and Identification

Session Chair: **Sylvia S. Shen**, The Aerospace Corp.

- 11:00 am: **Hyperspectral detection algorithms: use covariances or subspaces?**, Dimitris G. Manolakis, MIT Lincoln Lab. (United States); Ronald B. Lockwood, Thomas W. Cooley, John Jacobson, Air Force Research Lab. (United States) [7457-22]
- 11:20 am: **Algorithms for the categorization and identification of IR military signatures**, Simon Turbide, Tracy L. Smithson, Daniel St-Germain, Pierre Fournier, Defence Research and Development Canada (Canada) [7457-23]
- 11:40 am: **Soft-decision hyperspectral measures for target discrimination and classification**, Chao-Cheng Wu, Chein-I Chang, Univ. of Maryland, Baltimore County (United States) [7457-24]
- 12:00 pm: **A neural network approach for improved detector performance of spectral matched filters in hyperspectral imagery**, Robert S. Rand, National Geospatial-Intelligence Agency (United States) [7457-25]
- Lunch/Exhibition Break 12:20 to 1:30 pm

Room: Conv. Ctr. 6A Tues. 1:30 to 3:30 pm

Remote Sensing Plenary

Join this collaborative plenary session to hear presentations from a cross-section of remote sensing applications.

- 1:30 pm: **Virtual dimensionality for hyperspectral imagery** (*Presentation Only*), Chein-I Chang, Univ. of Maryland, Baltimore County (United States)
 - 2:10 pm: **Satellite data assimilation: traditional and innovative applications** (*Presentation Only*), Xiaolei Zou, Florida State Univ. (United States)
 - 2:50 pm: **The accomplishments and future direction of the Global Space-based InterCalibration System (GSICS)** (*Presentation Only*), Mitchell D. Goldberg, National Oceanic and Atmospheric Administration (United States)
- See page 20 for presentation details.

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

SC194 Multispectral and Hyperspectral Image Sensors (Lomheim) Wednesday, 8:30 am to 12:30 pm

Conference 7458

Tuesday-Wednesday 4-5 August 2009 • Proceedings of SPIE Vol. 7458

Remote Sensing System Engineering II

Conference Chairs: **Philip E. Ardanuy**, Raytheon Intelligence & Information Systems; **Jeffery J. Puschell**, Raytheon Space & Airborne Systems

Conference Co-Chairs: **Hal J. Bloom**, National Oceanic and Atmospheric Administration, GOES-R Program; **Allen H.-L. Huang**, Univ. of Wisconsin, Madison

Program Committee: **Stephen A. Cota**, The Aerospace Corp.; **William B. Gail**, Microsoft Corp.; **Wei Min Hao**, U.S.D.A. Forest Service; **Gerard Jansson**, Intelsat Global Service Corp.; **Carl Anthony Nardell**, MIT Lincoln Lab.; **Lars-Peter Riishoigaard**, Joint Ctr. for Satellite Data Assimilation; **Carl F. Schueler**, Orbital Sciences Corp.; **Donald L. Thoma**, Iridium Satellite LLC

Tuesday 4 August

Room: Conv. Ctr. 6A Tues. 1:30 to 3:30 pm

Remote Sensing Plenary

Join this collaborative plenary session to hear presentations from a cross-section of remote sensing applications.

1:30 pm: **Virtual dimensionality for hyperspectral imagery** (*Presentation Only*), Chein-I Chang, Univ. of Maryland, Baltimore County (United States)

2:10 pm: **Satellite data assimilation: traditional and innovative applications** (*Presentation Only*), Xiaolei Zou, Florida State Univ. (United States)

2:50 pm: **The accomplishments and future direction of the Global Space-based InterCalibration System (GSICS)** (*Presentation Only*), Mitchell D. Goldberg, National Oceanic and Atmospheric Administration (United States)

See page 20 for presentation details.

Coffee Break 3:30 to 4:00 pm

SESSION 3

Room: Conv. Ctr. 3 Tues. 4:00 to 6:00 pm

FPGA- or GPU-based Data Compression

Session Chairs: **Raffaele Vitulli**, European Space Agency (Netherlands); **Jeffery J. Puschell**, Raytheon Space & Airborne Systems

Joint session between conference 7455, Satellite Data Compression, Communication, and Processing V, and conference 7458, Remote Sensing System Engineering II.

4:00 pm: **Development of a new fast minimum-redundancy prefix coding and its FPGA implementation for universal lossless data compression**, Bormin Huang, Chia-Hsiung Chen, Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States) [7455-10]

4:20 pm: **GPUs for data parallel spectral image compression**, Jarno S. Miellikainen, Risto Honkanen, Pekka Toivanen, Univ. of Kuopio (Finland) [7455-11]

4:40 pm: **Low-cost wavelet image compression for FPGAs**, John R. Hayes, Kim Strohhenn, Graham A. Murphy, The Johns Hopkins Univ. Applied Physics Lab. (United States) [7455-12]

5:00 pm: **VLSI architecture of wavelet transform based on basic lifting elements**, Jie Guo, Yunsong Li, Keyan Wang, Chengke Wu, Xidian Univ. (China) [7455-13]

5:20 pm: **Lossy hyperspectral image compression tuned for spectral mixture analysis applications on NVIDIA graphics processing units**, Antonio J. Plaza, Javier Plaza, Sergio Sanchez, Abel Paz, Univ. de Extremadura (Spain) [7455-14]

5:40 pm: **FPGA implementation of a predictor-guided lookup table method for lossless compression of 3-dimensional spectral data**, Bormin Huang, Chia-Hsiung Chen, Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States) [7455-15]

Wednesday 5 August

SESSION 1

Room: Conv. Ctr. 2 Wed. 8:00 to 10:10 am

Future Space-based Remote Sensing Systems

Session Chair: **Jeffery J. Puschell**, Raytheon Space & Airborne Systems

8:00 am: **The Next Generation Geostationary Operational Environmental Satellite: GOES-R the United States advanced weather sentinel** (*Invited Paper*), Hal J. Bloom, National Oceanic and Atmospheric Administration (United States) [7458-01]

8:30 am: **Earth observation missions to monitor global climate change on Iridium NEXT**, Om P. Gupta, Donald L. Thoma, Iridium Satellite LLC (United States); Bill Simpson, Trident Sensors Ltd. (United Kingdom) [7458-02]

8:50 am: **SeaWiFS 2: an ocean color data continuity mission to address climate change**, Jeffery J. Puschell, Raytheon Space & Airborne Systems (United States); Gregory Hammann, GeoEye, Inc. (United States) [7458-03]

9:10 am: **Early test results of the imaging spectrometer APEX**, Jens Nieke, European Space Research and Technology Ctr. (Netherlands) [7458-04]

9:30 am: **Development of the Compact InfraRed Camera (CIRC) for wildfire detection**, Haruyoshi Katayama, Masataka Naitoh, Masahiro Suganuma, Yoshihiko Okamura, Yoshio Tange, Koji Nakau, Japan Aerospace Exploration Agency (Japan) [7458-05]

9:50 am: **Complex instrumentation systems engineering best practices and lessons**, Carl F. Schueler, Orbital Sciences Corp. (United States) [7458-06]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Conv. Ctr. 2 Wed. 10:40 to 11:50 am

Future Processing and Decision Support Architectures

Session Chair: **Philip E. Ardanuy**, Raytheon Intelligence & Information Systems

10:40 am: **Adaption of FPGA and GPU in real-time remote sensing** (*Invited Paper*), Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States) [7458-07]

11:10 am: **Earth observation and decision support system-of-systems enterprise**, Philip E. Ardanuy, Raytheon Intelligence & Information Systems (United States); Jeffery J. Puschell, Raytheon Space & Airborne Systems (United States) [7458-08]

11:30 am: **Fusion of airborne radar and FLIR sensors for runway incursion detection**, Joseph White, RTI International (United States); Cynthia I. Archer, FLIR Systems (United States); Charles L. Britt, Jr., Consultant (United States); James G. Haidt, RTI International (United States); Robert T. Neece, NASA Langley Research Ctr. (United States) [7458-09]

Lunch/Exhibition Break 11:50 am to 1:20 pm

SESSION 3

Room: Conv. Ctr. 2 Wed. 1:20 to 2:00 pm

Remote Sensing of Fire: Science and Applications

Session Chair: **Wei Min Hao**, U.S.D.A. Forest Service

- 1:20 pm: **Real-time fuel moisture and fire danger monitoring with satellite remote sensing measurements**, John J. Qu, Xianjun Hao, George Mason Univ. (United States) [7458-10]
- 1:40 pm: **Production of fire proxy datasets in support of GOES-R ABI algorithm development**, Manajit Sengupta, Colorado State Univ. (United States) [7458-11]

SESSION 4

Room: Conv. Ctr. 2 Wed. 2:00 to 3:00 pm

Advanced Technology

Session Chair: **Carl F. Schueler**, Orbital Sciences Corp.

- 2:00 pm: **Hyperspectral Airborne Tactical Instrument (HATI): a low-cost compact airborne hyperspectral imager**, Brian K. Baldauf, Stephanie R. Sandor-Leahy, Northrop Grumman Space Technology (United States) [7458-12]
- 2:20 pm: **First space qualified digital image sensor enters moon orbit**, Robert Sikora, Bill Wang, Sam Lin, CMOS Sensor Inc. (United States) [7458-13]
- 2:40 pm: **Toward real-time reconfigurable optical mirrors**, Pavel M. Chaplya, Jeffrey W. Martin, Sandia National Labs. (United States) [7458-14]
- Coffee Break 3:00 to 3:30 pm

SESSION 5

Room: Conv. Ctr. 2 Wed. 3:30 to 5:10 pm

Modeling and Simulation Methods

Session Chair: **Stephen A. Cota**, The Aerospace Corp.

- 3:30 pm: **EVEREST: an end-to-end simulation for assessing the performance of weather data products produced by environmental satellite systems**, Merit Shoucri, Bruce I. Hauss, Northrop Grumman Aerospace Systems (United States) [7458-15]
- 3:50 pm: **The use of the general image quality equation in the design and evaluation of imaging systems**, Stephen A. Cota, Christopher J. Florio, David J. Duvall, Michael A. Leon, The Aerospace Corp. (United States) [7458-16]
- 4:10 pm: **Predicting top-of-atmosphere radiance for arbitrary viewing geometries from the visible to thermal infrared**, Stephen A. Cota, Linda S. Kalman, The Aerospace Corp. (United States) [7458-17]
- 4:30 pm: **SAILS: Synthetic Aperture Imaging without Lenses Simulation for nanoantenna arrays**, Jeffery J. Puschell, Raytheon Space & Airborne Systems (United States) [7458-18]
- 4:50 pm: **Macroscopical scatter and reflection behavior of convex bodies in free flight**, Cornelius F. Hahlweg, Hendrik Rothe, Helmut-Schmidt Univ. (Germany) [7458-20]

Room: Conv. Ctr. Exhibit Hall D Wed. 5:30 to 7:00 pm

Posters-Wednesday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Wednesday.

The theory of fiber grating array OFDR-FS, FanYong Meng, Zhigang Li, Bin Yang, Hebei Univ. of Technology (China); Susan X. Dong, AT Photonics, Inc. (United States) [7458-21]

Multispectral imitator of the pinhole optical radiation source, Nadezhda K. Maltseva, St. Petersburg State Univ. of Information Technologies, Mechanics and Optics (Russian Federation); Alexander V. Ilyinsky, STC Pribor (Russian Federation) [7458-22]

A novel digital image sensor with row wise gain compensation for Hyper Spectral Imager (HySI) application, Sam Lin, CMOS Sensor Inc. (United States); Chi Pin Lin, CMOS Sensor Inc. (Taiwan); Weng-Lyang Wang, CMOS Sensor Inc. (United States); Feng-Ke Hsiao, CMOS Sensor Inc. (Taiwan) [7458-23]

Introduction to Infrared Spectrometer (IRS) aboard HJ-1-B satellite: characteristics and potentials of fire detection, Zifeng Wang, Liangfu Chen, Institute of Remote Sensing Applications (China); Qing Li, Ministry of Environmental Protection (China); Lin Su, Baohua He, Institute of Remote Sensing Applications (China) [7458-24]

Infrared electro-optical detector to rescue humans II, Jorge Castro-Ramos, Gabriel Gordiano-Alvarado, Paolo Ysi-Zarco, Sergio Vázquez Montiel, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) [7458-25]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

Conference 7459

Sunday 2 August 2009 • Proceedings of SPIE Vol. 7459

Ocean Remote Sensing: Methods and Applications

Conference Chair: **Robert J. Frouin**, Scripps Institution of Oceanography

Sunday 2 August

SESSION 2

Room: Conv. Ctr. 32BSun. 8:20 to 8:30 am

Welcome Address

Session Chair: **Robert J. Frouin**, Scripps Institution of Oceanography

SESSION 1

Room: Conv. Ctr. 32BSun. 8:30 to 11:20 am

Atmospheric Correction of Ocean Color Imagery

Session Chair: **Robert J. Frouin**, Scripps Institution of Oceanography

8:30 am: **Retrieving coastal optical properties from MERIS**, Sherwin D. Ladner, Planning Systems Inc. (United States); Paul E. Lyon, Robert A. Arnone, Richard W. Gould, Jr., Timothy Lawson, Naval Research Lab. (United States); Paul M. Martinolich, Planning Systems Inc. (United States) [7459-01]

8:50 am: **Influence of thin cirrus clouds on ocean color products**, Gerhard Meister, Futuretech Corp. (United States); Bryan A. Franz, SAIC (United States); Charles R. McClain, NASA Goddard Space Flight Ctr. (United States) [7459-03]

9:10 am: **Assessment of 412-nm bio-optical reflectance estimator for use in atmospheric correction**, Marco Vargas, Barry M. Gross, Jing Zhou, Alex Gilerson, Fred Moshary, Samir A. Ahmed, The City College of New York (United States) [7459-04]

9:30 am: **Noise and model uncertainties in ocean color remote sensing**, Bruno Pelletier, Univ. Montpellier 2 (France); Robert J. Frouin, Scripps Institution of Oceanography (United States) [7459-05]

Coffee Break 9:50 to 10:20 am

10:20 am: **Environmental effects in satellite ocean color remote sensing**, Robert J. Frouin, Scripps Institution of Oceanography (United States) [7459-06]

10:40 am: **Analysis of ocean color from high-resolution FORMOSAT-2 archive**, Nadège Martiny, Univ. Bordeaux 1 (France) [7459-07]

11:00 am: **Geostationary ocean color: mapping suspended matter with SEVIRI applications**, Griet J. Neukermans, Royal Belgian Institute of Natural Sciences (Belgium); Emilien Bernard, Didier Ramon, Hygeos (France); Bouchra Nechad, Royal Belgian Institute of Natural Sciences (Belgium); Pierre-Yves Deschamps, Hygeos (France); Kevin G. Ruddick, Royal Belgian Institute of Natural Sciences (Belgium) [7459-23]

Room: Conv. Ctr. 32B Sun. 11:20 am to 12:40 pm

Modeling and Inversion of Marine Optical Properties

Session Chair: **Hubert Loisel**, Univ. du Littoral Côte d'Opale (France)

11:20 am: **Inversion of inherent optical properties of water using artificial neural network techniques for coastal water**, Ioannis Ioannou, Jing Zhou, Alex Gilerson, Barry M. Gross, Fred Moshary, Samir A. Ahmed, The City College of New York (United States) [7459-08]

11:40 am: **IOP from remote sensing reflectance measurements to invert Kd coefficients: application to Gabon and Congo coastal waters**, Jean-Marie Froidefond, Univ. Bordeaux 1 (France); Frédéric Jourdain, Service Hydrographique et Oceanographique de la Marine (France); Nadège Martiny, Univ. Bordeaux 1 (France) [7459-09]

12:00 pm: **Evaluation of solar-stimulated CDOM fluorescence and its impact on the closure of remote sensing reflectance**, Jing Zhou, Ioannis Ioannou, Soe-Min Hlaing, Alex Gilerson, Barry M. Gross, Fred Moshary, Samir A. Ahmed, The City College of New York (United States) [7459-10]

12:20 pm: **A model for the diffuse attenuation coefficient for use in coastal ecosystem models**, Florence C. Lahet, Kevin G. Ruddick, Royal Belgian Institute of Natural Sciences (Belgium) [7459-11]

Lunch Break 12:40 to 1:40 pm

SESSION 3

Room: Conv. Ctr. 32BSun. 1:40 to 3:00 pm

Applications from Existing Satellite Missions

Session Chair: **Cécile Dupouy**, Institut de Recherche pour le Développement (New Caledonia)

1:40 pm: **A cross-calibrated multiple platform ocean surface wind data set**, Robert M. Atlas, National Oceanic and Atmospheric Administration (United States); Ross N. Hoffman, Atmospheric and Environmental Research, Inc. (United States); Joseph Ardizzone, NASA Goddard Space Flight Ctr. (United States) [7459-12]

2:00 pm: **Satellite observation and model simulation of water turbidity in the Chesapeake Bay**, Xiaoming Liu, Menghua Wang, Wei Shi, National Oceanic and Atmospheric Administration (United States) [7459-13]

2:20 pm: **Remote sensing to monitor the qualitative state of waters: the case of the Guanabara Bay (Rio de Janeiro, Brazil)**, Andrea Cappelli, Silvano Simoni, Daniele Sequino, Univ. degli Studi di Roma, La Sapienza (Italy) [7459-14]

2:40 pm: **Ocean color of the New Caledonian lagoon**, Cécile Dupouy, Institut de Recherche pour le Développement (New Caledonia); Rüdiger Röttgers, GKSS-Forschungszentrum Geesthacht (Germany); Jacques Neveux, Univ. Paris 6 (France) [7459-15]

Coffee Break 3:00 to 3:30 pm

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

SESSION 4

Room: Conv. Ctr. 32B Sun. 3:30 to 5:50 pm

New Sensors and Measurement Concepts

Session Chair: Yu-Hwan Ahn, Korea Ocean Research and Development Institute (Korea, Republic of)

3:30 pm: **Development of the GOCI data processing system and establishment of Korea Ocean Satellite Center**, Yu-Hwan Ahn, Seongick Cho, Hee-Jeong Han, Chan-Su Yang, Korea Ocean Research and Development Institute (Korea, Republic of) [7459-16]

3:50 pm: **Prelaunch characterization of the Geostationary Ocean Color Imager(GOCI)**, Seongick Cho, Yu-Hwan Ahn, Hee-Jeong Han, Joo-Hyung Ryu, Korea Ocean Research and Development Institute (Korea, Republic of)[7459-17]

4:10 pm: **An adaptive polarization lidar**, Victor G. Oshlakov, Institute of Atmospheric Optics (Russian Federation) [7459-18]

4:30 pm: **Analyse of in-situ polarized remote sensing reflectances spectra for remote sensing applications**, Hubert Loisel, Karin Nordkvist, Lucile Duforêt Gaurier, Univ. du Littoral Côte d'Opale (France) [7459-19]

4:50 pm: **Passive measurement of wave-slope with imaging polarimetry**, David B. Chenault, J. Larry Pezzaniti, Polaris Sensor Technologies, Inc. (United States); Howard J. Schultz, Univ. of Massachusetts, Amherst (United States) [7459-20]

5:10 pm: **Ball experimental sea surface temperature radiometer**, Jennifer A. Turner-Valle, William S. Good, Tony Lin, Paul Kaptchen, Raymund To, Michelle Narciso, Ball Aerospace & Technologies Corp. (United States) [7459-21]

5:30 pm: **Beyond the first optical depth: optical data fusion between ocean color imagery and gliders**, M. A. Montes-Hugo, Rutgers Univ. (United States); H. Ducklow, The Ecosystems Ctr. (United States); K. Carder, D. English, Univ. of South Florida (United States); O. Schofield, J. Kerfoot, Rutgers Univ. (United States) [7459-24]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope
Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae
Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Monday 3 August

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Deep water chlorophyll concentration global time series fluctuation, Todd M. Holden, Paul J. Marchese, Eric Cheung, Don Cotten, David Klaberg, George Tremberger, Jr., Del Sunil, James Taylor, Tak D. Cheung, Queensborough Community College (United States) [7459-22]

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Conference 7460

Monday 3 August 2009 • Proceedings of SPIE Vol. 7460

Lidar Remote Sensing for Environmental Monitoring X

Conference Chair: **Upendra N. Singh**, NASA Langley Research Ctr.

Program Committee: **Farzin Amzajerdian**, NASA Langley Research Ctr.; **Kazuhiro Asai**, Tohoku Institute of Technology (Japan); **Theresa J. Axenson**, Lockheed Martin Missiles and Fire Control; **Timothy J. Carrig**, Lockheed Martin Coherent Technologies; **Floyd E. Hovis**, Fibertek, Inc.; **Achuthan Jayaraman**, National Atmospheric Research Lab. (India); **George J. Komar**, NASA Goddard Space Flight Ctr.; **Shiv K. Sharma**, Univ. of Hawai'i; **Jinxue Wang**, Raytheon Co.; **Thomas D. Wilkerson**, Space Dynamics Lab.; **David M. Winker**, NASA Langley Research Ctr.

Monday 3 August

SESSION 2

Room: Conv. Ctr. 33A Mon. 8:40 to 9:00 am

Room: Conv. Ctr. 33A Mon. 1:40 to 3:10 pm

Introductory Remarks

Doppler Lidar

Session Chair: **Upendra N. Singh**, NASA Langley Research Ctr.

Session Chair: **George J. Komar**, NASA Goddard Space Flight Ctr.

SESSION 1

Room: Conv. Ctr. 33A Mon. 9:00 to 11:50 am

New Lidar Technology and Techniques

Session Chair: **Upendra N. Singh**, NASA Langley Research Ctr.

9:00 am: **New remote sensing concepts to advance future mission capabilities** (*Invited Paper*), Brian K. Baldauf, Chris Bracikowski, Northrop Grumman Space Technology (United States). [7460-01]

9:30 am: **An injection seeded high-repetition pulsed 2-micron laser for remote sensing atmospheric CO₂ concentration** (*Invited Paper*), Jirong Yu, Yingxin Bai, Bo Trieu, Mulugeta Petros, Paul Petzar, Upendra N. Singh, NASA Langley Research Ctr. (United States) [7460-02]

Coffee Break 10:00 to 10:30 am

10:30 am: **Wavelength beam combining of quantum cascade lasers arrays for remote sensing**, Benjamin G. Lee, Harvard Univ. (United States); Jan E. Kinsky, Anish K. Goyal, MIT Lincoln Lab. (United States); Christian J. Pflugl, Laurent Diehl, Mikhail A. Belkin, Harvard Univ. (United States); Antonio Sanchez-Rubio, MIT Lincoln Lab. (United States); Federico Capasso, Harvard Univ. (United States). [7460-03]

10:50 am: **Design and testing of a compact diode-laser-based differential absorption lidar (DIAL) for water vapor profiling in the lower troposphere**, Amin R. Nehrir, Kevin S. Repasky, John L. Carlsten, Montana State Univ., Bozeman (United States). [7460-04]

11:10 am: **Path averaged atmospheric CO₂ measurement using a 1.57 μ m active remote sensor compared with multi-positioned in-situ sensors**, D. Sakaizawa, S. Kawakami, M. Nakajima, Japan Aerospace Exploration Agency (Japan); S. Kameyama, M. Imaki, Y. Hirano, S. Ueno, Mitsubishi Electric Co., Ltd. (Japan); Y. Sawa, H. Matsueda, Meteorological Research Institute (Japan). [7460-05]

11:30 am: **Skeleton-based botanic tree diameter estimation from dense LiDAR data**, Alexander K. Bucksch, Roderik Lindenbergh, Massimo Menenti, Muhammad Z. Abd Rahman, Delft Univ. of Technology (Netherlands) [7460-06]

Lunch Break 11:50 am to 1:40 pm

1:40 pm: **2-micron coherent Doppler wind lidar measurement during intercomparison** (*Invited Paper*), Upendra N. Singh, Grady J. Koch, Michael J. Kavaya, Jefferey Y. Beyon, NASA Langley Research Ctr. (United States) [7460-07]

2:10 pm: **An inexpensive rapid response system for wind profile assessment, particularly regarding shear layer detection and wind turbine location**, Thomas D. Wilkerson, Bill Bradford, Alan B. Marchant, Thomas Apedaile, Eve Day, Allen Q. Howard, Jr., Tom Naini, Space Dynamics Lab. (United States). [7460-08]

2:30 pm: **Characterization of high-resolution range and Doppler chaotic LADAR**, Benjamin C. Flores, Berenice Verdin, The Univ. of Texas at El Paso (United States). [7460-09]

2:50 pm: **Numerical simulation of random error in wind profiles in planetary boundary layer for Doppler lidar measurements**, Alexander P. Shelekhov, Evgeniya A. Shelekhova, Institute of Atmospheric Optics (Russian Federation); Alexander V. Starchenko, Dmitry A. Belikov, Tomsk State Univ. (Russian Federation) [7460-10]

Coffee Break 3:10 to 3:40 pm

SESSION 3

Room: Conv. Ctr. 33A Mon. 3:40 to 5:00 pm

Aerosol and Cloud Observations

Session Chair: **Thomas D. Wilkerson**, Space Dynamics Lab.

3:40 pm: **Using airborne high-spectral resolution lidar data to evaluate combined active plus passive retrievals of aerosol extinction profiles**, Sharon P. Burton, Science Systems and Applications, Inc. (United States); Richard A. Ferrare, NASA Langley Research Ctr. (United States); Chieko Kittaka, Science Systems and Applications, Inc. (United States); Chris A. Hostetler, John W. Hair, Michael D. Obland, Ray R. Rogers, Anthony L. Cook, David B. Harper, NASA Langley Research Ctr. (United States); Lorraine A. Remer, NASA Goddard Space Flight Ctr. (United States). [7460-11]

4:00 pm: **Standoff detection and classification of biological aerosols using polarization diversity**, Robert G. Nichols, Tahllee Baynard, Lockheed Martin Coherent Technologies (United States). [7460-20]

4:20 pm: **Comparisons of aerosol-cloud observations between a ground-based Raman-Mie lidar and CALIPSO over U.S. East Coast**, Yonghua Wu, Barry M. Gross, Fred Moshary, Samir A. Ahmed, The City College of New York (United States). [7460-13]

4:40 pm: **Monitoring low-level clouds with boundary layer lidar at Chennai lat 13.04N lan 80.17E**, Vinjanampaty S. Murty III, Indian Institute of Technology Madras (India) [7460-14]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Using MIE Raman S ratio lidar measurements to explore cloud droplet properties and the aerosol indirect effect, Shuki Chaw, Barry M. Gross, Erika Garafolo, Yonghua Wu, Fred Moshary, Samir A. Ahmed, The City College of New York (United States) [7460-12]

Raman lidar measurements used to explore, Viviana Vladutescu, Erika Garafolo, Barry M. Gross, Fred Moshary, Samir A. Ahmed, The City College of New York (United States) . [7460-15] **DIAL sensed C₂H₄ and C₂H₄-O₃ mutual coherence**, Taieb Gasmi, Saint Louis Univ., Madrid Campus (Spain) . [7460-16]

Capability of Raman lidar for monitoring the atmospheric air in Cubatão City, Juliana Steffens, Roberto Guardani, Escola Politécnica da Univ. de São Paulo (Brazil); Eduardo Landulfo, Instituto de Pesquisas Energéticas e Nucleares (Brazil) [7460-17]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

Conference 7461

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7461

Polarization Science and Remote Sensing IV

Conference Chairs: **Joseph A. Shaw**, Montana State Univ.; **J. Scott Tyo**, College of Optical Sciences, The Univ. of Arizona

Program Committee: **Alan J. Ames**, Ball Aerospace & Technologies Corp.; **David B. Chenault**, Polaris Sensor Technologies, Inc.; **Russell A. Chipman**, College of Optical Sciences, The Univ. of Arizona; **Aristide C. Dogariu**, College of Optics & Photonics, Univ. of Central Florida; **Michael J. Duggin**, Air Force Research Lab.; **Dennis H. Goldstein**, Polaris Sensor Technologies, Inc.; **Brian G. Hoover**, Advanced Optical Technologies; **Yoav Yosef Schechner**, Technion-Israel Institute of Technology (Israel)

Monday 3 August

SESSION 1

Room: Conv. Ctr. 32B Mon. 8:10 to 9:30 am

Polarization in Remote Sensing Instruments

Session Chair: **Russell A. Chipman**, College of Optical Sciences, The Univ. of Arizona

8:10 am: **VIIRS polarization sensitivity testing and analysis**, Eric C. Fest, Raytheon Missile Systems (United States) [7461-01]

8:30 am: **CIV polarization measurements using a vacuum ultraviolet Fabry-Perot**, Edward A. West, G. Allen Gary, Jonathan W. Cirtain, John M. Davis, Ken Kobayashi, NASA Marshall Space Flight Ctr. (United States) [7461-02]

8:50 am: **Design and development of the PolZero Time Domain Polarization Scrambler**, Rainer M. E. Illing, Ball Aerospace & Technologies Corp. (United States) [7461-03]

9:10 am: **Polarimetry performance and model calculations of a depolarizer for use in the Ocean Radiometer for Carbon Assessment instrument**, Manuel A. Quijada, Eugene Waluschka, Mark E. Wilson, NASA Goddard Space Flight Ctr. (United States) [7461-04]

SESSION 2

Room: Conv. Ctr. 32B Mon. 9:30 to 11:00 am

Atmospheric Polarization Effects

Session Chair: **Joseph A. Shaw**, Montana State Univ.

9:30 am: **Aerosol refractive index retrievals with atmospheric polarization measuring data**, Kohei Arai, Saga Univ. (Japan) [7461-05]

9:50 am: **All-sky imaging polarimeter measurements of visible and NIR skylight at Mauna Loa, Hawaii**, Andrew R. Dahlberg, Nathan J. Pust, Joseph A. Shaw, Montana State Univ., Bozeman (United States) [7461-08]

Coffee Break 10:10 to 10:40 am

10:40 am: **Reflectance based vicarious calibration of ASTER/VNIR with aerosol refractive index and size distribution estimation using measured atmospheric polarization irradiance**, Kohei Arai, Saga Univ. (Japan) [7461-42]

SESSION 3

Room: Conv. Ctr. 32B Mon. 11:00 am to 12:00 pm

Phenomenology and Modeling

Session Chair: **Dennis H. Goldstein**, Polaris Sensor Technologies, Inc.

11:00 am: **Texture and polarization**, Hannah D. Noble, Wai Sze Lam, Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (United States) [7461-09]

11:20 am: **Measured comparison of the inversion periods for polarimetric and conventional thermal LWIR imagery**, Melvin A. Felton, Jr., Kristan P. Gurton, Army Research Lab. (United States) [7461-10]

11:40 am: **How good is a single-scattering model of visible-NIR atmospheric skylight polarization?**, Nathan J. Pust, Joseph A. Shaw, Montana State Univ., Bozeman (United States) [7461-38]

Lunch Break 12:00 to 1:40 pm

SESSION 4

Room: Conv. Ctr. 32B Mon. 1:40 to 2:20 pm

Polarization in Biological Systems

Session Chair: **J. Scott Tyo**, College of Optical Sciences, The Univ. of Arizona

1:40 pm: **Polarization signals in mantis shrimps**, Thomas W. Cronin, Univ. of Maryland, Baltimore County (United States); Tsyr-Huei Chiou, The Univ. of Queensland (Australia); Roy L. Caldwell, Univ. of California, Berkeley (United States); Nicholas Roberts, The Univ. of Manchester (United Kingdom); Justin Marshall, The Univ. of Queensland (Australia) [7461-12]

2:00 pm: **Depolarization properties of the normal human fovea measured by the GDx-MM**, Wai Sze Lam, Russell A. Chipman, Karen Twietmeyer, College of Optical Sciences, The Univ. of Arizona (United States); Ann E. Elsner, Stephen A. Burns, Indiana Univ. (United States) [7461-13]

SESSION 5

Room: Conv. Ctr. 32B Mon. 2:20 to 3:20 pm

Imaging Polarimetry I

Session Chair: **J. Scott Tyo**, College of Optical Sciences, The Univ. of Arizona

2:20 pm: **Exploitation of polarimetric imagery**, David B. Chenault, Mike H. Rodgers, Jason Heym, Rich P. Edmondson, Dennis H. Goldstein, Polaris Sensor Technologies, Inc. (United States) [7461-14]

2:40 pm: **Initial results and field applications of a polarization imaging camera**, Richard C. Olsen, Michael Eyler, Angela M. Puetz, Naval Postgraduate School (United States) [7461-15]

3:00 pm: **High-speed imaging acquisition of Stokes linearly polarized components using a single ferroelectric liquid crystal modulator**, Luc Gendre, Alban Foulonneau, Laurent Bigue, Univ. de Haute Alsace (France) [7461-16]

Coffee Break 3:20 to 3:50 pm

SESSION 6

Room: Conv. Ctr. 32B Mon. 3:50 to 5:30 pm

Imaging Polarimetry II

Session Chair: **Michael J. Duggin**, Air Force Research Lab.

3:50 pm: **Examining IFOV error and demodulation strategies for infrared microgrid polarimeter imagery**, Bradley M. Ratliff, J. Scott Tyo, Charles F. LaCasse, Wiley T. Black, College of Optical Sciences, The Univ. of Arizona (United States) [7461-17]

4:10 pm: **Improvement of imaging polarimetry using birefringent prism pairs**, Kazuhiko Oka, Tomohiro Mizuno, Yongwoo Bae, Atsushi Taniguchi, Hokkaido Univ. (Japan); Hiroshi Okabe, Omron Corp. (Japan) [7461-18]

4:30 pm: **First imaging polarimetry observations of boosting rocket exhaust plumes**, Jason D. Mudge, Miguel Virgen, Lockheed Martin Space Systems Co. (United States); David W. Tyler, Lockheed Martin Space Systems Co. (United States) and College of Optical Sciences, The Univ. of Arizona (United States); Peter Dean, Jeff A. Dank, David A. Bennett, Lockheed Martin Space Systems Co. (United States); Adam M. Phenis, AOpx Technologies, Inc. (United States); Alan B. Tietjen, Jason Lehmann, Rolf Algren, Dan Hand, Computer Sciences Corp. (United States) [7461-19]

4:50 pm: **Exploiting motion-based redundancy to enhance microgrid polarimeter imagery**, Bradley M. Ratliff, J. Scott Tyo, Charles F. LaCasse, Wiley T. Black, College of Optical Sciences, The Univ. of Arizona (United States) [7461-20]

5:10 pm: **Polarization-holographic diffraction element-based real-time Stokes spectropolarimetry**, George A. Kakauridze, Barbara N. Kilosanidze, Institute of Cybernetics (Georgia) [7461-21]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Assessment of combined Lidar and polarimetric measurements for aerosol retrieval, Alexander Tserkii, Barry M. Gross, Fred Moshary, Samir A. Ahmed, The City College of New York (United States) [7461-06]

Concurrent polarimetric measurements of painted metal and illuminating skylight compared with a microfacet model, Nathan J. Pust, Andrew R. Dahlberg, Joseph A. Shaw, Montana State Univ., Bozeman (United States) [7461-11]

The high-stability polarization-sensitive media for polarization, Valentina G. Shaverdova, Svetlana Petrova, Georgian Academy of Sciences (Georgia) [7461-33]

Variations on the display of polarimetric data, Bradley M. Ratliff, Wiley T. Black, Charles F. LaCasse, J. Scott Tyo, College of Optical Sciences, The Univ. of Arizona (United States) [7461-34]

Basic optical properties of the photoelastic modulator part II: birefringence in the optical element, Baoliang B. Wang, Hinds Instruments, Inc. (United States) [7461-35]

Methods for displaying all-sky polarization imager data, Nathan J. Pust, Andrew R. Dahlberg, Joseph A. Shaw, Montana State Univ., Bozeman (United States) [7461-36]

Features of inverse problem arise from structure of a general pure Mueller matrix, Sergey N. Savenkov, Yevgen A. Oberemok, Vladimir N. Nikonov, National Taras Shevchenko Univ. of Kyiv (Ukraine) [7461-37]

Near-infrared simultaneous Stokes imaging polarimeter, Jason D. Mudge, Lockheed Martin Space Systems Co. (United States) [7461-39]

Evaluation of the polarization properties of a Phillips prism for the construction of imaging polarimeters, Roberto A. Fernandez Borda, Univ. of Maryland, Baltimore County (United States) and NASA Goddard Space Flight Ctr. (United States); Eugene Waluschka, NASA Goddard Space Flight Ctr. (United States); Samuel F. Pellicori, Pellicori Optical Consulting (United States); Vanderlei J. Martins, Univ. of Maryland, Baltimore County (United States) and NASA Goddard Space Flight Ctr. (United States); Patrick L. Thompson, NASA Goddard Space Flight Ctr. (United States) [7461-40]

Polarization-encoded photometer and polarimeter, Catarina Ubach, Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (United States); Dan E. Potter, The Univ. of Arizona (United States) [7461-41]

Setup on the basis of a polarization-holographic element for the demonstration of polarization properties of light (Presentation Only), George A. Kakauridze, Barbara N. Kilosanidze, Institute of Cybernetics (Georgia) [7461-43]

Detection of disturbed earth using passive LWIR polarimetric imaging, Kristan P. Gurton, Melvin A. Felton, Jr., Army Research Lab. (United States) [7461-44]

8:40 am: **Spectroscopic Stokes polarimeter with dual rotating retarder and analyzer for optical rotation measurement**, Masanosuke Tanaka, Yoshinori Nakashima, Hideyuki Amamiya, Atago Co., Ltd. (Japan); Makoto Chujo, Yukitoshi Otani, Tokyo Univ. of Agriculture and Technology (Japan) . . [7461-24]

9:00 am: **Polarization properties of traditional and crossover-free fiber optic gyroscope coils**, Arthur Lompado, David B. Chenault, John E. Reinhardt, Polaris Sensor Technologies, Inc. (United States); L. Chris Heaton, Jeff L. Williams, Stanley Associates, Inc. (United States); Paul B. Ruffin, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. (United States) [7461-25]

9:20 am: **Spectroscopic Mueller matrix polarimeter by double liquid crystal phase modulator**, Yukitoshi Otani, Makoto Chujo, Tokyo Univ. of Agriculture and Technology (Japan) [7461-26]

9:40 am: **Real-time precision measurement of an angle of rotation of polarization plane by polarization-holographic gratings**, George A. Kakauridze, Barbara N. Kilosanidze, Institute of Cybernetics (Georgia) [7461-27]

Coffee Break 10:00 to 10:30 am

SESSION 8

Room: Conv. Ctr. 32B Tues. 10:30 to 11:50 am

Calibration, Compensation, and Optimization

Session Chair: David B. Chenault, Polaris Sensor Technologies, Inc.

10:30 am: **Retardance in three-dimensional ray trace**, Garam Yun, Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (United States) [7461-29]

10:50 am: **Spectrally resolved p-BRDF measurement of calibration materials for imaging polarimeters**, Brent D. Bartlett, Chabitha Devaraj, Michael G. Gartley, Carl Salvaggio, Rochester Institute of Technology (United States) [7461-30]

11:10 am: **Optimized polarimetry with massively parallel polarization sampling**, Thomas W. Kohlgraf-Owens, Aristide C. Dogariu, College of Optics & Photonics, Univ. of Central Florida (United States) [7461-31]

11:30 am: **Designing partial Mueller matrix polarimeters**, J. Scott Tyo, Zhipeng Wang, Sergio J. Johnson, College of Optical Sciences, The Univ. of Arizona (United States); Brian G. Hoover, Advanced Optical Technologies (United States) [7461-32]

Lunch/Exhibition Break 11:50 am to 1:30 pm

Room: Conv. Ctr. 6A Tues. 1:30 to 3:30 pm

Remote Sensing Plenary

Join this collaborative plenary session to hear presentations from a cross-section of remote sensing applications.

1:30 pm: **Virtual dimensionality for hyperspectral imagery (Presentation Only)**, Chein-I Chang, Univ. of Maryland, Baltimore County (United States)

2:10 pm: **Satellite data assimilation: traditional and innovative applications (Presentation Only)**, Xiaolei Zou, Florida State Univ. (United States)

2:50 pm: **The accomplishments and future direction of the Global Space-based InterCalibration System (GSICS) (Presentation Only)**, Mitchell D. Goldberg, National Oceanic and Atmospheric Administration (United States)

See page 20 for presentation details.

Tuesday 4 August

SESSION 7

Room: Conv. Ctr. 32B Tues. 8:00 to 10:00 am

Polarization Metrology and Components

Session Chair: Nathan J. Pust, Montana State Univ.

8:00 am: **Axisymmetrical Mueller matrix polarimeter**, Toshitaka Wakayama, Saitama Medical Univ. (Japan); Yukitoshi Otani, Tokyo Univ. of Agriculture and Technology (Japan); Toru Yoshizawa, Saitama Medical Univ. (Japan). [7461-22]

8:20 am: **Polarization and fold mirrors in application of the Leica absolute distance meter**, Derek S. Sabatke, Robert J. von Handorf, Joseph F. Sullivan, Ball Aerospace & Technologies Corp. (United States) [7461-23]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

SC180 Imaging Polarimetry (Dereniak, Miles, Sabatke) Tuesday, 1:30 to 5:30 pm

SC206 Polarized Light: A Practical Hands-on Introduction (Fisher) Sunday, 8:30 am to 5:30 pm

SC792 Polarization in Optical Design (Chipman) Sunday, 1:30 to 5:30 pm

Conference 7462

Monday 3 August 2009 • Proceedings of SPIE Vol. 7462

Ultraviolet and Visible Ground- and Space-based Measurements, Trace Gases, Aerosols and Effects VI

Conference Chairs: **Jay R. Herman**, NASA Goddard Space Flight Ctr.; **Wei Gao**, Colorado State Univ.

Monday 3 August

SESSION 1

Room: Conv. Ctr. 19 Mon. 1:00 to 3:00 pm

UV and VIS Ground and Space I

Session Chair: **Jay R. Herman**, NASA Goddard Space Flight Ctr.

1:00 pm: **Air Mass Factor calculations from satellite measurements based on Support Vector Machine**, Dong Han, Institute of Remote Sensing Applications (China) and Graduate Univ. of the Chinese Academy of Sciences (China) and Qingdao Univ. (China); Liangfu Chen, Institute of Remote Sensing Applications (China); Guojiang Chen, Qingdao Univ. (China); Zifeng Wang, Shenshen Li, Institute of Remote Sensing Applications (China) and Graduate Univ. of the Chinese Academy of Sciences (China) [7462-01]

1:20 pm: **The sensitivity analysis in the nitrogen dioxide retrieval from satellite remote sensing data**, Ying Zhang, Institute of Remote Sensing Applications (China) and Graduate Univ. of The Chinese Academy of Sciences (China); Liangfu Chen, Institute of Remote Sensing Applications (China) and State Key Lab. of Remote Sensing Science (China); Dong Han, Institute of Remote Sensing Applications (China) [7462-02]

1:40 pm: **MAX-DOAS tropospheric column observations of NO₂ used for validation of OMI and SCIAMACHY**, Tim Vlemmix, Koninklijk Nederlands Meteorologisch Instituut (Netherlands) and Eindhoven Univ. of Technology (Netherlands); Ankie Piters, Piet Stammes, Ping Wang, Koninklijk Nederlands Meteorologisch Instituut (Netherlands); Pieternel F. Levelt, Koninklijk Nederlands Meteorologisch Instituut (Netherlands) and Eindhoven Univ. of Technology (Netherlands) [7462-03]

2:00 pm: **MAX-DOAS observations from ground, ship, and research aircraft**, Rainer M. Volkamer, Barbara Dix, Sean Coburn, Roman Sinreich, Univ. of Colorado at Boulder (United States) [7462-04]

2:20 pm: **BREDOM: using MAX-DOAS measurements for long-term observations of tropospheric trace gases**, Folkard Witrock, Henning Kirk, Enno Peters, Andreas Richter, Anja Schoenhardt, John P. Burrows, Univ. Bremen (Germany) [7462-05]

2:40 pm: **Determining column aerosol absorption optical properties in UV and visible wavelengths using co-located UV-MFRSR and AERONET CIMEL measurements**, Nickolay A. Krotkov, Jay R. Herman, NASA Goddard Space Flight Ctr. (United States); Gordon J. Labow, Science Systems and Applications, Inc. (United States); Jim R. Slusser, Roger M. Tree, George T. Janson, Bill S. Durham, Colorado State Univ. (United States); Thomas F. Eck, Brent N. Holben, NASA Goddard Space Flight Ctr. (United States) [7462-06]

Coffee Break 3:00 to 3:30 pm

SESSION 2

Room: Conv. Ctr. 19 Mon. 3:30 to 4:50 pm

UV and VIS Ground and Space II

Session Chairs: **Wei Gao**, Colorado State Univ.; **Nickolay A. Krotkov**, NASA Goddard Space Flight Ctr.

3:30 pm: **Global increases in UVB irradiance from changes in ozone and cloud-aerosol amounts 1979 to 2008**, Jay R. Herman, NASA Goddard Space Flight Ctr. (United States) [7462-08]

3:50 pm: **Effects of Lunar Zenith Angle on nocturnal ozone monitoring by spectrophotometer Brewer**, Claudio Rafanelli, Sara De Simone, Alessandro Damiani, Elena Benedetti, Veronica Gallo, Piero Diego, Institute of Acoustics O. M. Corbino (Italy) [7462-09]

4:10 pm: **Nitrogen detection in the vegetation of prototype constructed wetlands using chlorophyll fluorescence**, Edison J. Rosero, Lucero Plazas, Efrain Solarte, Adrian Fernandez, Enrique Peña, Miguel Peña, Univ. del Valle (Colombia) [7462-10]

4:30 pm: **Haze optical depth retrieval in North China Plain**, Shenshen Li, Institute of Remote Sensing Applications (China) and Computer and Information Engineering College, Henan Univ. (China); Liangfu Chen, Dong Han, Institute of Remote Sensing Applications (China) [7462-07]

Room: Conv. Ctr. Exhibit Hall D. Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Aerosol single-scattering albedo retrieval with various techniques in the UV and visible wavelength range, Andreas Kazantzidis, Aristotle Univ. of Thessaloniki (Greece); Nickolay A. Krotkov, Univ. of Maryland, Baltimore County (United States); Mario Blumthaler, Innsbruck Medical Univ. (Austria); Alkiviadis F. Bais, Aristotle Univ. of Thessaloniki (Greece); Stelios Kazadzis, Finnish Meteorological Institute (Finland); Dimitris S. Balis, Aristotle Univ. of Thessaloniki (Greece); Rahel Schmidhauser, Paul Scherrer Institut (Switzerland); Natalia Kouremeti, Elina Giannakaki, Aristotle Univ. of Thessaloniki (Greece); Antti Arola, Finnish Meteorological Institute (Finland) [7462-11]

Ozone Monitoring Instrument satellite irradiance product correction using a global aerosol climatology, Antti Arola, Stelios Kazadzis, Anders V. Lindfors, Jukka Kujanpää, Niilo Kalakoski, Finnish Meteorological Institute (Finland); Alkiviadis F. Bais, Aristotle Univ. of Thessaloniki (Greece) [7462-12]

NO₂ retrieval from UV-Vis measurements of Phaethon spectrograph using the DOAS method, Natalia Kouremeti, Alkiviadis F. Bais, Aristotle Univ. of Thessaloniki (Greece); Michel Van Roozendael, Belgian Institute of Space Aeronomy (Belgium); Alexander M. Cede, Univ. of Maryland (United States); Stelios Kazadzis, Finnish Meteorological Institute (Finland) [7462-13]

Dissemination of data from the National Science Foundation's UV monitoring network, Germar Bernhard, Charles R. Booth, James C. Eshamjian, Vi V. Quang, Biospherical Instruments Inc. (United States) [7462-14]

Effects of terrestrial UV radiation on selected outdoor materials: an interdisciplinary approach, Anu M. Heikkilä, Outi Tolonen-Kivimäki, Outi Meinander, Anders V. Lindfors, Kaisa Lakkala, Tapani V. Koskela, Jussi Kaurola, Jarkko Koskinen, Finnish Meteorological Institute (Finland); Aleksii Sormanen, Petri O. Kärhå, Helsinki Univ. of Technology (Finland); Annamäija Naula-Iltanen, Seppo Syrjälä, Tampere Univ. of Technology (Finland); Merja Kaunismaa, Johanna Juhola, Timo Ture, Elastopoli Oy (Finland); Uwe Feister, Deutscher Wetterdienst (Germany); Natalia Kouremeti, Stelios Kazadzis, Alkiviadis F. Bais, Aristotle Univ. of Thessaloniki (Greece); José Manuel Vilaplana, Instituto Nacional de Técnica Aeroespacial (Spain); Juan Jose Rodriguez, Carmen Guirado, Emilio Cuevas, Instituto Nacional de Meteorología (Spain) .. [7462-15]

Light Emitting Diode Cavity Enhanced Differential Optical Absorption Spectroscopy (LED-CE-DOAS): a novel technique for monitoring atmospheric trace gases, Ryan M. Thalman, Univ. of Colorado at Boulder (United States); Rainer M. Volkamer, Univ. of Colorado at Boulder (United States) and Chemical Science Div. NOAA-ESRL (United States) and Cooperative Institute for Research in Environmental Studies (CIRES) (United States)[7462-16]

The CLEO spectrometer system: first results, Nader K. Abuhassan, Univ. of Maryland, Baltimore County (United States) and NASA Goddard Space Flight Ctr. (United States); Alexander M. Cede, Jay R. Herman, Nickolay A. Krotkov, NASA Goddard Space Flight Ctr. (United States) [7462-17]

Remote leak monitoring of gaseous uranium hexafluoride by UV-DIAL, Gholamreza Shayeganrad, Islamic Azad Univ. - Karaj Branch (Iran, Islamic Republic of) [7462-18]

A simulation of stratospheric ozone in response to the increased surface CFCs emissions, Chunhua Shi, Nanjing Univ. of Information Science & Technology (China); Bin Zheng, Chinese Meteorological Administration (China) [7462-19]

Study of the losses in the fluorescent tracer used in hydrodynamic modeling of constructed wetlands by laser-induced fluorescence, Lucero Plazas, Edison J. Rosero, Efrain Solarte, Jhon Sandoval, Miguel Peña, Univ. del Valle (Colombia) [7462-20]

Courses of Related Interest

See SPIE Cashier for information and to register.

SC567 Introduction to Optical Remote Sensing Systems (Shaw) Wednesday, 1:30 to 5:30 pm

Conference 7463

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7463

Atmospheric Optics: Models, Measurements, and Target-in-the-Loop Propagation III

Conference Chairs: **Stephen M. Hammel**, Space and Naval Warfare Systems Ctr., San Diego; **Alexander M. J. van Eijk**, TNO Defense, Security and Safety (Netherlands); **Mikhail A. Vorontsov**, Army Research Lab.

Program Committee: **Matthew M. Bold**, Lockheed Martin Space Systems Co.; **Frank D. Eaton**, Air Force Research Lab.; **Charles Higgs**, MIT Lincoln Lab.; **Vladimir B. Markov**, MetroLaser, Inc.; **Vincent Michau**, ONERA (France); **Jennifer C. Ricklin**, Defense Advanced Research Projects Agency; **Jim F. Riker**, Air Force Research Lab.; **Michael C. Roggemann**, Michigan Technological Univ.; **Don D. Seeley**, High Energy Laser Joint Technology Office; **Alexander M. Sergeev**, Institute of Applied Physics (Russian Federation); **Michael T. Valley**, Sandia National Labs.; **Thomas Weyrauch**, Univ. of Maryland, College Park

Monday 3 August

SESSION 1

Room: Conv. Ctr. 2 Mon. 1:20 to 3:00 pm

Optical Turbulence Characterization and Link Modeling

Session Chairs: **Alexander M. J. van Eijk**, TNO Defence, Security and Safety (Netherlands); **Christopher C. Davis**, Univ. of Maryland, College Park

Joint session between conference 7463, Atmospheric Optics: Models, Measurements, and Target-in-the-Loop Propagation III, and conference 7464, Free-Space Laser Communications IX.

1:20 pm: **Attenuation measurement on dual-wavelength optical free-space link**, Ondrej Fiser, Jaroslav Svoboda, Institute of Atmospheric Physics (Czech Republic); Zdenek Kolka, Otakar Wilfert, Brno Univ. of Technology (Czech Republic); Jaroslav Fisak, Institute of Atmospheric Physics (Czech Republic) [7463-01]

1:40 pm: **Level crossings and turbulence in free-space laser communications**, Haris J. Catrakis, Adam J. Wachtor, Jennifer Shockro, Aaron P. Freeman, Ryan C. Sokolowski, Univ. of California, Irvine (United States) [7464-28]

2:00 pm: **Experiment to characterize optical turbulence along a 2.33-km free-space laser path via differential image motion measurements**, Arnold Tunick, Army Research Lab. (United States) [7463-02]

2:20 pm: **Wave optics simulation of partially coherent and partially polarized beam propagation in turbulence**, Xifeng Xiao, David G. Voelz, New Mexico State Univ. (United States) [7464-30]

2:40 pm: **Modeling channel interference in an orbital angular momentum-multiplexed laser link**, Jaime A. Anguita, Univ. de Los Andes (Chile); Mark A. Neifeld, Bane V. Vasic, The Univ. of Arizona (United States) [7464-31]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Multiple filament plasma channels as a guiding system for microwave radiation in air, Alexander E. Dormidonov, Valerii P. Kandidov, Svyatoslav A. Slenov, Lomonosov Moscow State Univ. (Russian Federation) [7463-18]

Tuesday 4 August

SESSION 2

Room: Conv. Ctr. 2 Tues. 9:00 am to 12:10 pm

Optical Turbulence

Session Chair: **Mikhail A. Vorontsov**, Army Research Lab.

9:00 am: **Weak and strong beam scintillations for the ground-to-space propagation**, Mikhail I. Charnotskii, Zel Technologies, LLC (United States) [7463-03]

9:20 am: **Laser guide star scintillometer (LAGUSS) for profiling atmospheric turbulence**, Anatoliy Khizhnyak, Vladimir B. Markov, MetroLaser, Inc. (United States) [7463-04]

9:40 am: **A new technique for probing length scales in clear air turbulence**, Joseph D. Harris, Robert W. Gammon, Christopher C. Davis, Univ. of Maryland, College Park (United States) [7463-05]

10:00 am: **Imaging and communications through non-Kolmogorov turbulence**, Norman S. Kopeika, Arkadi Zilberman, Ephim Golbraikh, Ben-Gurion Univ. of the Negev (Israel) [7463-06]

Coffee Break 10:20 to 10:50 am

10:50 am: **The balloon ring: a high-performance low-cost instrumentation platform for measuring atmospheric turbulence profiles**, Demos T. Kyrazis, R-Cubed, Inc. (United States); Frank D. Eaton, Air Force Research Lab. (United States); Don G. Black, Wiley Black, Ridgeline, LLC (United States); Alastair Black, R-Cubed, Inc. (United States) [7463-07]

11:10 am: **Preliminary VHF radar and high-data-rate optical turbulence profile observations using a balloon-ring platform**, Frank D. Eaton, Air Force Research Lab. (United States); Gregory D. Nastrom, St. Cloud State Univ. (United States); Demos T. Kyrazis, R-Cubed, Inc. (United States); Don G. Black, Wiley Black, Ridgeline, LLC (United States); Alastair Black, R-Cubed, Inc. (United States) [7463-08]

11:30 am: **Comparison of some optical propagation statistics implied by recent atmospheric measurements to those of CLEAR I**, Timothy Clark, Tan Technologies, LLC (United States); Demos T. Kyrazis, R-Cubed, Inc. (United States); Frank D. Eaton, Air Force Research Lab. (United States) [7463-09]

11:50 am: **Determination of uplink quality for shipboard applications**, Stephen M. Hammel, Brooke Bachmann, Daniel Kichura, Space and Naval Warfare Systems Ctr., San Diego (United States) [7463-10]

Lunch/Exhibition Break 12:10 to 1:40 pm

Conference 7463

SESSION 3

Room: Conv. Ctr. 2 Tues. 1:40 to 3:00 pm

Beam Propagation and Image Quality

Session Chair: **Stephen M. Hammel**, Space and Naval Warfare Systems Ctr., San Diego

1:40 pm: **Image fusion from a stream of atmospherically distorted short-exposure images with automatic parameterization**, Mathieu Aubailly, Univ. of Maryland, College Park (United States); Mikhail A. Vorontsov, Gary W. Carhart, Army Research Lab. (United States); Michael T. Valley, Sandia National Labs. (United States) [7463-11]

2:00 pm: **Analysis and deconstruction of mirages to assess environmental features**, Marianne A. C. Degache, Alexander M. J. van Eijk, TNO Defence, Security and Safety (Netherlands); Stephen M. Hammel, Dimitri Tsintikidis, Space and Naval Warfare Systems Ctr., San Diego (United States) . . [7463-12]

2:20 pm: **Influence of aerosols on off-axis laser detection capabilities**, Jolanta Kusmierczyk-Michulec, Ric H. M. A. Schleijsen, TNO Defence, Security and Safety (Netherlands) [7463-13]

2:40 pm: **Wavelet-based phase determination in optical turbulence**, Katharine J. Jones, WBAO Consultant Group (United States) [7463-14]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. 2 Tues. 3:30 to 4:30 pm

Atmospheric Effects

Session Chair: **Alexander M. J. van Eijk**, TNO Defence, Security and Safety (Netherlands)

3:30 pm: **The Ångström coefficient as an indicator of nonmarine particles in ANAM (Advanced Navy Aerosol Model)**, Jolanta Kusmierczyk-Michulec, Alexander M. J. van Eijk, TNO Defence, Security and Safety (Netherlands) [7463-15]

3:50 pm: **Laser tracker TSPI uncertainty quantification via centrifuge trajectory**, Edward F. Romero, Thomas L. Paez, Timothy L. Brown, Timothy J. Miller, Jr., Sandia National Labs. (United States) [7463-16]

4:10 pm: **Parallel algorithms for numerical simulation of femtosecond laser pulse filamentation in atmosphere**, Alexander A. Dergachev, Svyatoslav A. Slenov, Lomonosov Moscow State Univ. (Russian Federation) [7463-19]

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Conference 7464

Sunday-Monday 2-3 August 2009 • Proceedings of SPIE Vol. 7464

Free-Space Laser Communications IX

Conference Chairs: **Arun K. Majumdar**, Naval Air Warfare Ctr.; **Christopher C. Davis**, Univ. of Maryland, College Park

Program Committee: **Larry C. Andrews**, Univ. of Central Florida; **Shlomi Arnon**, Ben-Gurion Univ. of the Negev (Israel); **Mikhail S. Belen'kii**, Trex Enterprises Corp.; **Don M. Boroson**, MIT Lincoln Lab.; **Naresh Chand**, BAE Systems; **Frank D. Eaton**, Air Force Research Lab.; **Bernhard Epple**, DLR Standort Oberpfaffenhofen (Germany); **G. Charmaine Gilbreath**, Naval Research Lab.; **Hennes Henniger**, DLR Standort Oberpfaffenhofen (Germany); **Anton Kohnle**, Forschungsgesellschaft für Angewandte Naturwissenschaften e.V. (Germany); **Stuart D. Milner**, Univ. of Maryland, College Park; **Michela Muñoz Fernández**, Jet Propulsion Lab.; **Dominic C. O'Brien**, Univ. of Oxford (United Kingdom); **Jacobus M. Oschmann, Jr.**, Ball Corp.; **Narasimha S. Prasad**, NASA Langley Research Ctr.; **William S. Rabinovich**, Naval Research Lab.; **Marcos Reyes Garcia-Talavera**, Instituto de Astrofísica de Canarias (Spain); **Jennifer C. Ricklin**, Defense Advanced Research Projects Agency; **Thomas M. Shay**, Air Force Research Lab.; **Larry B. Stotts**, Defense Advanced Research Projects Agency

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 2 Sun. 8:30 to 10:30 am

FSO System Performance I

Session Chair: **Christopher C. Davis**, Univ. of Maryland, College Park

8:30 am: **Underwater optical wireless communication (Invited Paper)**, Shlomi Arnon, Ben-Gurion Univ. of the Negev (Israel) [7464-01]

9:00 am: **Laser communications results through a turbulent atmosphere (Invited Paper)**, Larry B. Stotts, Defense Advanced Research Projects Agency (United States) [7464-02]

9:30 am: **Architecture overview of a 5.4-km free-space laser communication experiment**, John D. Moores, Frederick G. Walther, MIT Lincoln Lab. (United States) [7464-03]

9:50 am: **Summary of link performance and channel availability for the MIT Lincoln Laboratory 5.4-km free-space laser communication experiment**, John D. Moores, Frederick G. Walther, Joseph A. Greco, Steven S. Michael, William E. Wilcox, Jr., Alicia M. Volpicelli, Richard J. Magliocco, Scott R. Henion, MIT Lincoln Lab. (United States) [7464-04]

10:10 am: **Adaptive optics and ESA's optical ground station**, Zoran Sodnik, European Space Agency (Netherlands) [7464-05]

Coffee Break 10:30 to 11:00 am

SESSION 2

Room: Conv. Ctr. 2 Sun. 11:00 am to 12:20 pm

FSO System Performance II

Session Chair: **Arun K. Majumdar**, Naval Air Warfare Ctr.

11:00 am: **Power spectra measured in a free-space optical link in a maritime environment**, Rita Mahon, Harris R. Burris, Jr., Christopher I. Moore, William S. Rabinovich, Linda M. Thomas, Michele R. Suite, Naval Research Lab. (United States) [7464-06]

11:20 am: **Free-space optical data link to a small robot using modulating retroreflectors**, William S. Rabinovich, James L. Murphy, Michele R. Suite, Michael S. Ferraro, Rita Mahon, Peter G. Goetz, Naval Research Lab. (United States); Kurt A. Hacker, Naval Explosive Ordnance Disposal Technology Div. (United States); Wade T. Freeman, Smart Logic, Inc. (United States); Eric Saint Georges, Stan Uecke, John Sender, NOVASOL (United States) [7464-07]

11:40 am: **Design of the high-speed framing, FEC, and interleaving hardware used in a 5.4-km free-space optical communication experiment**, Joseph A. Greco, MIT Lincoln Lab. (United States) [7464-08]

12:00 pm: **Analysis of fog events at 850-nm measured on an 850-m path**, Vaclav Kvicera, Martin Grabner, Czech Metrology Institute (Czech Republic); Ondrej Fiser, Institute of Atmospheric Physics (Czech Republic) [7464-09]

Lunch Break 12:20 to 1:50 pm

SESSION 3

Room: Conv. Ctr. 2 Sun. 1:50 to 3:20 pm

Indoor Optical Wireless and Non-Line-of-Sight FSO Communication I

Session Chairs: **Zhengyuan Xu**, Univ. of California, Riverside; **Geoffrey L. Burdge**, Harris Corp.

1:50 pm: **Indoor optical wireless communications: recent developments and future challenges (Invited Paper)**, Dominic C. O'Brien, Univ. of Oxford (United Kingdom) [7464-10]

2:20 pm: **Indoor optical wireless communication: a Giga Ethernet network prototype at 60 dB link margin**, Olivier Bouchet D.D.S., Gilles Launay, France Telecom R&D (France); Pascal Besnard, Ecole Nationale Supérieure des Sciences Appliquées et de Technologie (France) [7464-11]

2:40 pm: **Indoor optical wireless communication by ultraviolet and visible light**, Kaiyun Cui, Gang Chen, Benjamin Guan, Qunfeng He, Zhengyuan Xu, Univ. of California, Riverside (United States) [7464-12]

3:00 pm: **Free-space optical data transmission using wavelength-division-multiplexing with a dedicated CMOS image sensor for indoor optical wireless LAN**, Keiichi Kagawa, Jun Tanida, Osaka Univ. (Japan) .. [7464-13]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Conv. Ctr. 2 Sun. 3:50 to 5:10 pm

Indoor Optical Wireless and Non-Line-of-Sight FSO Communication II

Session Chair: **Dominic C. O'Brien**, Univ. of Oxford (United Kingdom)

3:50 pm: **Free-space optical sensor network for fixed infrastructure sensing**, Navik Agrawal, Stuart D. Milner, Christopher C. Davis, Univ. of Maryland, College Park (United States) [7464-14]

4:10 pm: **Channel modeling for FSO communications and sensor networking inside structures**, Christopher C. Davis, Mohammed Eslami, Navik Agrawal, Univ. of Maryland, College Park (United States) [7464-15]

4:30 pm: **Range extension for non-line-of-sight ultraviolet communication**, Qunfeng He, Univ. of California, Riverside (United States); Brian M. Sadler, Army Research Lab. (United States); Zhengyuan Xu, Univ. of California, Riverside (United States) [7464-16]

4:50 pm: **Non-line-of-sight ultraviolet communication channel characterization: modeling and validation**, Haipeng Ding, Gang Chen, Univ. of California, Riverside (United States); Arun K. Majumdar, Naval Air Warfare Ctr. (United States); Brian M. Sadler, Army Research Lab. (United States); Zhengyuan Xu, Univ. of California, Riverside (United States) [7464-17]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

Conference 7464

Monday 3 August

SESSION 5

Room: Conv. Ctr. 2 Mon. 8:40 to 10:00 am

Fade Mitigation, Coding, and Networking I

Session Chair: **Stuart D. Milner**, Univ. of Maryland, College Park

8:40 am: **Optical communication through the turbulent atmosphere with transmitter and receiver diversity, wavefront control, and coherent detection**, Andrew Puryear, MIT Lincoln Lab. (United States); Vincent W. Chan, Massachusetts Institute of Technology (United States) [7464-18]

9:00 am: **Chase combining for on-off-keying FSO communications**, Kamran Kiasaleh, The Univ. of Texas at Dallas (United States) [7464-20]

9:20 am: **Design of acousto-optic chaos-based secure free-space optical communication links**, Anjan K. Ghosh, Pramode Verma, Robert C. Huck, Sam Cheng, Univ. of Oklahoma (United States); Monish R. Chatterjee, Mohammed Al-Saedi, Univ. of Dayton (United States) [7464-21]

9:40 am: **Efficient channel coding for pulse position modulation in terrestrial FSO systems**, Fang Xu, Mohammad Ali Khalighi, Salah Bourennane, Institut Fresnel (France) [7464-22]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Conv. Ctr. 2 Mon. 10:30 am to 12:10 pm

Fade Mitigation, Coding, and Networking II

Session Chairs: **Shlomi Arnon**, Ben-Gurion Univ. of the Negev (Israel); **Michele R. Suite**, Naval Research Lab.

10:30 am: **Performance of a FSO augmented RF mesh network**, Robert Peach, Geoffrey L. Burdge, Jerry Sonnenberg, Mike Oyler, Harris Corp. (United States); David Wayne, Larry C. Andrews, Ronald Phillips, Univ. of Central Florida (United States) [7464-23]

10:50 am: **The use of statistical channel models, full-field propagation codes, and field data to predict Lasercom link availability**, Steven S. Michael, Ronald R. Parenti, John D. Moores, William E. Wilcox, Jr., Timothy M. Yarnall, Alicia M. Volpicelli, John A. Taylor, MIT Lincoln Lab. (United States) [7464-24]

11:10 am: **A conical scan free-space optical tracking system for fading channels**, Robert J. Murphy, Alicia M. Volpicelli, William E. Wilcox, Jr., David A. Crucioli, Timothy H. Williams, MIT Lincoln Lab. (United States) [7464-25]

11:30 am: **A novel spatial tracking for FSO communications through turbulent atmosphere**, Kamran Kiasaleh, The Univ. of Texas at Dallas (United States) [7464-26]

11:50 am: **Results of atmospheric compensation techniques on the performance of synchronous receivers**, Aniceto Belmonte, Univ. Politècnica de Catalunya (Spain); Joseph M. Kahn, Stanford Univ. (United States) [7464-27]

Lunch Break 12:10 to 1:20 pm

SESSION 7

Room: Conv. Ctr. 2 Mon. 1:20 to 3:00 pm

Optical Turbulence Characterization and Link Modeling

Session Chairs: **Alexander M. J. van Eijk**, TNO Defence, Security and Safety (Netherlands); **Christopher C. Davis**, Univ. of Maryland, College Park

Joint session between conference 7463, Atmospheric Optics: Models, Measurements, and Target-in-the-Loop Propagation III, and conference 7464, Free-Space Laser Communications IX.

1:20 pm: **Attenuation measurement on dual-wavelength optical free-space link**, Ondrej Fiser, Jaroslav Svoboda, Institute of Atmospheric Physics (Czech Republic); Zdenek Kolka, Otakar Wilfert, Brno Univ. of Technology (Czech Republic); Jaroslav Fisek, Institute of Atmospheric Physics (Czech Republic) [7463-01]

1:40 pm: **Level crossings and turbulence in free-space laser communications**, Haris J. Catrakis, Adam J. Wachtor, Jennifer Shockro, Aaron P. Freeman, Ryan C. Sokolowski, Univ. of California, Irvine (United States) [7464-28]

2:00 pm: **Experiment to characterize optical turbulence along a 2.33-km free-space laser path via differential image motion measurements**, Arnold Tunick, Army Research Lab. (United States) [7463-02]

2:20 pm: **Wave optics simulation of partially coherent and partially polarized beam propagation in turbulence**, Xifeng Xiao, David G. Voelz, New Mexico State Univ. (United States) [7464-30]

2:40 pm: **Modeling channel interference in an orbital angular momentum-multiplexed laser link**, Jaime A. Anguita, Univ. de Los Andes (Chile); Mark A. Neifeld, Bane V. Vasic, The Univ. of Arizona (United States) [7464-31]

Coffee Break 3:00 to 3:50 pm

SESSION 8

Room: Conv. Ctr. 2 Mon. 3:50 to 5:30 pm

Components and System Design and Analysis

Session Chairs: **Rita Mahon**, Naval Research Lab.; **William S. Rabinovich**, Naval Research Lab.

3:50 pm: **A process for free-space laser communications system design**, Frederick G. Walther, John D. Moores, Robert J. Murphy, Steven S. Michael, George A. Nowak, MIT Lincoln Lab. (United States) [7464-32]

4:10 pm: **A free-space optical terminal for fading channels**, Timothy H. Williams, Robert J. Murphy, Frederick G. Walther, Alicia M. Volpicelli, William E. Wilcox, Jr., David A. Crucioli, MIT Lincoln Lab. (United States) [7464-33]

4:30 pm: **Beam wander measurement using cone modulation**, Eric Saint Georges, NOVASOL (United States) [7464-34]

4:50 pm: **Evaluation of a cone tracking algorithm for free-space optical communication in direct mode**, Eric Saint Georges, NOVASOL (United States) [7464-35]

5:10 pm: **Compact Lasercom Terminal**, Robert T. Carlson, BAE Systems (United States) [7464-36]

Room: Conv. Ctr. Exhibit Hall D Mon. 6:00 to 7:30 pm

Posters-Monday

Conference attendees are invited to attend the poster session to network, enjoy light refreshments, and view the poster papers. Attendees are required to wear their conference registration badge. Authors of poster papers will be present to answer questions concerning their papers. Poster authors must set up their poster between 10:00 am and 5:00 pm on Monday.

Optical birefringent 90° hybrid for coherent receiver, Ya'nan Zhi, Yu Zhou, De'an Liu, Jianfeng Sun, Aimin Yan, Zhu Luan, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7464-37]

Modeling and analysis of optical wireless communication environment for visible light communication, Chung-Ghiu Lee, N. Q. Huy, Joon-Ho Choi, Moonsoo Kang, Chosun Univ. (Korea, Republic of); Tae-Gyu Kang, Electronics and Telecommunications Research Institute (Korea, Republic of) [7464-38]

Conference 7465

Tuesday-Thursday 4-6 August 2009 • Proceedings of SPIE Vol. 7465

Quantum Communications and Quantum Imaging VII

Conference Chairs: **Ronald E. Meyers**, Army Research Lab.; **Yanhua Shih**, Univ. of Maryland, Baltimore County; **Keith S. Deacon**, Army Research Lab.

Program Committee: **Stefania A. Castelletto**, The Univ. of Melbourne (Australia); **Milena D'Angelo**, Univ. degli Studi di Bari (Italy); **Richard J. Hughes**, Los Alamos National Lab.; **Yoon-Ho Kim**, Pohang Univ. of Science and Technology (Korea, Republic of); **Todd B. Pittman**, Univ. of Maryland, Baltimore County; **Barry C. Sanders**, Univ. of Calgary (Canada); **Alexander V. Sergienko**, Boston Univ.; **Dmitry V. Strekalov**, Jet Propulsion Lab.; **Shigeki Takeuchi**, Hokkaido Univ. (Japan); **Zhi Zhao**, Oak Ridge National Lab.

Tuesday 4 August

SESSION 1

Room: Conv. Ctr. 12 Tues. 1:30 to 3:30 pm

Quantum Imaging I

1:30 pm: **Quantum imaging: technology of the future?** (*Invited Paper*), Robert W. Boyd, Univ. of Rochester (United States) [7465-01]

2:00 pm: **Entangled-photon coincidence fluorescence imaging**, Giuliano Scarcelli, Seok-Hyun Yun, Harvard Medical School (United States) . . . [7465-02]

2:30 pm: **Sub-shot-noise spatial correlation for quantum imaging of weak objects**, Marco Genovese, Istituto Nazionale di Ricerca Metrologica (Italy) [7465-03]

3:00 pm: **Controlling ghost interference visibility by manipulating reference beam's coherence**, Eduardo J. S. Fonseca, Univ. of California, Santa Barbara (United States); Itamar Vidal, Ghislaine Beltrand, Dilson Pereira Caetano, Jandir M. Hickmann, Univ. Federal de Alagoas (Brazil) [7465-04]

Coffee Break 3:30 to 4:00 pm

SESSION 2

Room: Conv. Ctr. 12 Tues. 4:00 to 5:30 pm

Quantum Imaging II

4:00 pm: **The observation of nontrivial correlation and nonclassical anti-correlation of a pulsed chaotic-thermal radiation**, Sanjit Karmakar, Zhenda Xie, Hui Chen, Yanhua Shih, Univ. of Maryland, Baltimore County (United States) [7465-05]

4:30 pm: **Thermal light ghost imaging: What is Quantum? What is Classical?** (*Invited Paper*), Yanhua Shih, Univ. of Maryland, Baltimore County (United States) [7465-06]

5:00 pm: **Quantum ghost imaging experiments**, Ronald E. Meyers, Keith S. Deacon, Army Research Lab. (United States) [7465-07]

Wednesday 5 August

SESSION 3

Room: Conv. Ctr. 12 Wed. 8:00 to 10:20 am

Quantum Communications

8:00 am: **Experiments of 10 G bit/sec quantum stream cipher applicable to optical Ethernet and optical satellite links** (*Invited Paper*), Katsuyoshi Harasawa, Makoto Honda, Shigeto Akutsu, Tamagawa Univ. (Japan); Kenichi Ohhata, Kiichi Yamashita, Kagoshima Univ. (Japan); Osamu Hirota, Tamagawa Univ. (Japan) [7465-08]

8:30 am: **Error profile of intensity modulation-based quantum stream cipher by Yuen 2000 protocol with nonlinear pseudorandom number generator**, Kentaro Kato, National Tsing Hua Univ. (Taiwan) [7465-09]

9:00 am: **Convertible quantum encodings and hybrid entanglement on a real-world fiber link**, Wolfgang Tittel, Univ. of Calgary (Canada); Felix Bussieres, Univ. of Calgary (Canada) and Ecole Polytechnique de Montréal (Canada); Joshua A. Slater, Univ. of Calgary (Canada); Nicolas Godbout, Ecole Polytechnique de Montréal (Canada); Steve Hosier, Southern Alberta Institute of Technology (Canada) [7465-10]

9:30 am: **Proof-of-principle demonstration of quantum key distribution with quantum frames**, Xiaofan Mo, Itzel Lucio Martinez, Philip Chan, Univ. of Calgary (Canada); Steve Hosier, Southern Alberta Institute of Technology (Canada); Wolfgang Tittel, Univ. of Calgary (Canada) [7465-11]

10:00 am: **Three-photon temporal and spatial correlations of thermal light**, Yu Zhou, Yanhua Shih, Univ. of Maryland, Baltimore County (United States) [7465-12]

Coffee Break 10:20 to 10:50 am

SESSION 4

Room: Conv. Ctr. 12 Wed. 10:50 am to 12:50 pm

Entanglement and Entanglement Technology

10:50 am: **High-fidelity source of entangled photons**, Alexander Ling, Jun Chen, Jingyun Fan, Alan L. Migdall, National Institute of Standards and Technology (United States) [7465-13]

11:20 am: **High-efficiency quantum state engineering**, Paul G. Kwiat, Kevin McCusker, Radhika Rangarajan, Univ. of Illinois at Urbana-Champaign (United States) [7465-14]

11:50 am: **Time-bin entangled photon holes** (*Invited Paper*), Junlin Liang, James D. Franson, Todd B. Pittman, Univ. of Maryland, Baltimore County (United States) [7465-15]

12:20 pm: **Nonlocal dispersion cancellation using entangled photons** (*Invited Paper*), So-Young Baek, Young-Wook Cho, Yoon-Ho Kim, Pohang Univ. of Science and Technology (Korea, Republic of) [7465-16]

Lunch/Exhibition Break 12:50 to 1:50 pm

SESSION 5

Room: Conv. Ctr. 12 Wed. 1:50 to 3:10 pm

Quantum Technology I

1:50 pm: **Realization of optical quantum circuits: an entanglement filter** (*Invited Paper*), Shigeki Takeuchi, Hokkaido Univ. (Japan) [7465-17]

2:20 pm: **Pump power dependence of second order correlation in nondegenerate SPDC**, Charles C. Kim, Gary S. Kanner, Northrop Grumman Electronic Systems (United States) [7465-18]

2:50 pm: **TBD** [7465-19]

Coffee Break 3:10 to 3:40 pm

SESSION 6

Room: Conv. Ctr. 12 Wed. 3:40 to 5:30 pm

Quantum Technology II

3:40 pm: **Waveguide source of correlated photon-pairs for chip-scale quantum information processing** (*Invited Paper*), Jun Chen, Aaron Pearlman, Alexander Ling, Jingyun Fan, Alan L. Migdall, National Institute of Standards and Technology (United States) [7465-20]

4:10 pm: **Experimental implementation of a C-NOT gate using polarization and orbital angular momentum degrees of freedom**, Jose Henrique Andrade, Willamys Soares, Dilson Pereira Caetano, Jandir M. Hickmann, Univ. Federal de Alagoas (Brazil) [7465-21]

4:40 pm: **Chirped-pulse interferometry**, Kevin Resch, Rainer Kaltenbaek, Jonathan Lavoie, Devon Biggerstaff, Univ. of Waterloo (Canada) . . . [7465-22]

5:00 pm: **TBD** [7465-23]

Conference 7465

Thursday 6 August

SESSION 7

Room: Conv. Ctr. 12 Thurs. 8:00 to 10:30 am

Quantum Information Technology

- 8:00 am: **Continuous-variable measurement-based quantum computing** (*Invited Paper*), Matthias Ohliger, Jens S. Eisert, Univ. Potsdam (Germany) [7465-24]
- 8:30 am: **Quantum private data sampling**, David A. Fattal, Marco Fiorentino, Raymond G. Beausoleil, Hewlett-Packard Labs. (United States) [7465-25]
- 9:00 am: **Optical approach to quantum computing using quantum switching logic**, Bryan C. Jacobs, The Johns Hopkins Univ. Applied Physics Lab. (United States) [7465-26]
- 9:30 am: **TBD** [7465-27]
- 10:00 am: **TBD** [7465-28]
- Coffee Break 10:30 to 11:00 am

SESSION 8

Room: Conv. Ctr. 12 Thurs. 11:00 am to 12:30 pm

Quantum Technology III

- 11:00 am: **Exponential sums algorithm based on optical interference: factorization of different numbers in a single run**, Vincenzo Tamma, Univ. of Maryland, Baltimore County (United States) and Univ. degli Studi di Bari (Italy); Heyi Zhang, Xuehua He, Univ. of Maryland, Baltimore County (United States); Augusto Garuccio, Univ. degli Studi di Bari (Italy); Yanhua Shih, Univ. of Maryland, Baltimore County (United States) [7465-29]
- 11:30 am: **Integrated quantum photonics circuits** (*Invited Paper*), Jonathan C. Matthews, Alberto Politi, Andre Stefanov, Alberto Peruzzo, Maria Rodas, Xiao-Qi Zhou, Pruet Kalasuwan, Mark Thompson, Anthony Laing, Martin J. Cryan, Siyuan Yu, John G. Rarity, Univ. of Bristol (United Kingdom); Graham D. Marshall, Martin Ams, Peter Dekker, Michael J. Withford, Macquarie Univ. (Australia); Jeremy L. O'Brien, Univ. of Bristol (United Kingdom) [7465-30]
- 12:00 pm: **Low noise up-conversion single photon detector and its applications in quantum information systems**, Lijun Ma, Oliver T. Slattery, Alan Mink, Xiao Tang, National Institute of Standards and Technology (United States) [7465-31]
- Lunch/Exhibition Break 12:30 to 2:00 pm

SESSION 9

Room: Conv. Ctr. 12 Thurs. 2:00 to 3:30 pm

Quantum Technology IV

- 2:00 pm: **Investigations of entangled two-photon active materials**, Michael R. Harpham, Theodore G. Goodson III, Univ. of Michigan (United States) [7465-32]
- 2:20 pm: **Quantum optical memory protocol using a reversible spin inhomogeneous broadening**, Byoung S. Ham, Inha Univ. (Korea, Republic of) [7465-33]
- 2:50 pm: **Birefringence compensation in Sagnac and its quantum communication applications**, Jan J. Bogdanski, Johan Ahrens, Mohamed Bourennane, Stockholm Univ. (Sweden) [7465-34]
- 3:10 pm: **Quantum-enhanced phase estimation in the presence of losses** (*Invited Paper*), Marcin Kacprowicz, Rafal Demkowicz-Dobrzanski, Konrad Banaszek, Nicolaus Copernicus Univ. (Poland); Wojciech Wasilewski, Univ. of Warsaw (Poland); Uwe Dörner, Brian J. Smith, Jeff S. Lundeen, Ian A. Walmsley, Univ. of Oxford (United Kingdom) [7465-35]
- Coffee Break 3:30 to 4:00 pm

SESSION 10

Room: Conv. Ctr. 12 Thurs. 4:00 to 6:10 pm

Quantum Technology V

- 4:00 pm: **Double electromagnetically induced transparency in rubidium vapor**, Andrew J. MacRae, Geoff Campbell, Anna Ordog, Alexander I. Lvovsky, Univ. of Calgary (Canada) [7465-36]
- 4:30 pm: **Low-bias ultra-fast quantum random number generator** (*Invited Paper*), Michael A. Wayne, Paul G. Kwiat, Univ. of Illinois at Urbana-Champaign (United States) [7465-37]
- 4:50 pm: **Analysis of errors in linear-optics C-NOT gates**, Tomohisa Nagata, Ryo Okamoto, Hokkaido Univ. (Japan) and Osaka Univ. (Japan); Keiji Sasaki, Hokkaido Univ. (Japan); Shigeki Takeuchi, Hokkaido Univ. (Japan) and Osaka Univ. (Japan) [7465-38]
- 5:10 pm: **Shaping the phase of a single photon** (*Invited Paper*), Eden Figueroa, Holger Specht, Joerg Bochmann, Martin Muecke, Christian Noelleke, Stephan Ritter, David Moehring, Gerhard Rempe, Max-Planck-Institut für Quantenoptik (Germany) [7465-39]
- 5:40 pm: **TBD** [7465-40]

Conference 7466

Thursday 6 August 2009 • Proceedings of SPIE Vol. 7466

Advanced Wavefront Control: Methods, Devices, and Applications VII

Conference Chairs: **Richard A. Carreras**, Air Force Research Lab.; **Troy A. Rhoadarmer**, SAIC; **David C. Dayton**, Applied Technology Associates

Program Committee: **Geoff P. Andersen**, U.S. Air Force Academy; **Jeffrey D. Barchers**, Nutronics, Inc.; **Charles C. Beckner, Jr.**, Air Force Research Lab.; **Thomas G. Bifano**, Boston Univ.; **Philip J. Bos**, Kent State Univ.; **James M. Brase**, Lawrence Livermore National Lab.; **Keith A. Bush**, AgilOptics, Inc.; **Tanya Cherazova**, Lomonosov Moscow State Univ. (Russian Federation); **Lewis F. DeSandre**, Office of Naval Research (United Kingdom); **Sergey Alexandrovich Dimakov**, S.I. Vavilov State Optical Institute (Russian Federation); **Matthew E. Goda**, Air Force Institute of Technology; **Mark T. Gruneisen**, Air Force Research Lab.; **Alexis V. Kudryashov**, Moscow State Open Univ. (Russian Federation); **Gordon D. Love**, Durham Univ. (United Kingdom); **Justin D. Mansell**, MZA Associates Corp.; **Dan K. Marker**, Air Force Research Lab.; **Aaron J. Masino**, MZA Associates Corp.; **Kent L. Miller**, Air Force Office of Scientific Research; **Dennis A. Montera**, Air Force Research Lab.; **Scot S. Olivier**, Lawrence Livermore National Lab.; **Jim F. Riker**, Air Force Research Lab.; **James R. Rotgé**, Boeing LTS, Inc.; **Darryl J. Sanchez**, Air Force Research Lab.; **Jason D. Schmidt**, Air Force Institute of Technology; **Don D. Seeley**, High Energy Laser Joint Technology Office; **Vladimir Yu. Venediktov**, Research Institute for Laser Physics (Russian Federation)

Thursday 6 August

SESSION 1

Room: Conv. Ctr. 2 Thurs. 8:00 to 10:00 am

Advanced Wavefront Sensing

Session Chair: **Darryl J. Sanchez**, Air Force Research Lab.

8:00 am: **Designing and testing a high-bandwidth 2D wavefront sensor for aero-optics**, Shaddy Abado, Stanislav Gordeyev, Eric J. Jumper, Univ. of Notre Dame (United States) [7466-01]

8:20 am: **Photon-noise-limited performance for a hybrid wavefront sensor operating in strong turbulence**, Troy R. Ellis, Jason D. Schmidt, Air Force Institute of Technology (United States) [7466-02]

8:40 am: **Experimental analysis of the effects of perspective elongation using a laser guidestar in an adaptive optics system**, Kevin P. Vitayaudom, Charles C. Beckner, Jr., Darryl J. Sanchez, Denis W. Oesch, Patrick R. Kelly, Carolyn M. Tewksbury-Christle, Nathan E. Glauvitz, Julie C. Smith, Air Force Research Lab. (United States) [7466-03]

9:00 am: **Using the creation and evolution of branch points to estimate three-dimensional atmospheric turbulence: part 1**, Darryl J. Sanchez, Denis W. Oesch, Charles C. Beckner, Jr., Patrick R. Kelly, Nathan E. Glauvitz, Kevin P. Vitayaudom, Carolyn M. Tewksbury-Christle, Air Force Research Lab. (United States) [7466-04]

9:20 am: **The use of branch points in characterizing three-dimensional atmospheric turbulence: part 2**, Denis W. Oesch, SAIC (United States) and Air Force Research Lab. (United States); Darryl J. Sanchez, Air Force Research Lab. (United States) [7466-05]

9:40 am: **Creation and evolution of branch points, part 3: use of the measured position and velocity in closed-loop AO**, Carolyn M. Tewksbury-Christle, Darryl J. Sanchez, Denis W. Oesch, Charles C. Beckner, Jr., Patrick R. Kelly, Nathan E. Glauvitz, Kevin P. Vitayaudom, Julie C. Smith, Air Force Research Lab. (United States) [7466-06]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 2 Thurs. 10:30 to 11:30 am

Advanced Adaptive Optics Control

Session Chair: **Jason D. Schmidt**, Air Force Institute of Technology

10:30 am: **Adaptive control in an adaptive optics experiment with simulated turbulence-induced optical wavefronts**, Salman Monirabbasi, Steve Gibson, Univ. of California, Los Angeles (United States) [7466-07]

10:50 am: **Dynamic spatial filtering of deformable mirror commands for mitigation of the waffle mode**, Kevin P. Vitayaudom, Charles C. Beckner, Jr., Darryl J. Sanchez, Denis W. Oesch, Patrick R. Kelly, Carolyn M. Tewksbury-Christle, Nathan E. Glauvitz, Julie C. Smith, Air Force Research Lab. (United States) [7466-08]

11:10 am: **Misregistration in adaptive optics systems**, Nathan D. Engstrom, Jason D. Schmidt, Air Force Institute of Technology (United States) . . [7466-09]

SESSION 3

Room: Conv. Ctr. 2 Thurs. 11:30 am to 12:10 pm

Multiple Mirror Adaptive Optics

Session Chair: **Jason D. Schmidt**, Air Force Institute of Technology

11:30 am: **Adaptive control of woofer-tweeter adaptive optics**, Jimmie J. Perez, Gregory J. Toussaint, Jason D. Schmidt, Air Force Institute of Technology (United States) [7466-10]

11:50 am: **Resolution effects for multiconjugate adaptive optics**, Thomas Corej, Jason D. Schmidt, Air Force Institute of Technology (United States) [7466-11]

Lunch/Exhibition Break 12:10 to 1:50 am

SESSION 4

Room: Conv. Ctr. 2 Thurs. 1:50 to 3:10 pm

Advanced Deformable Mirror Technologies

Session Chair: **Richard A. Carreras**, Air Force Research Lab.

1:50 pm: **Temporal and spatial characterization of polymer membrane deformable mirrors**, Justin D. Mansell, Brian G. Henderson, MZA Associates Corp. (United States) [7466-12]

2:10 pm: **The Iris AO S163-X, a 489 actuator, 163-piston/tip/tilt-segment MEMS DM**, Michael A. Helmbrecht, Min He, Carl J. Kempf, Patrick Rhodes, Iris AO, Inc. (United States) [7466-13]

2:30 pm: **Initial results from implementing and testing a MEMS adaptive optics system**, Julie C. Smith, Darryl J. Sanchez, Denis W. Oesch, Charles C. Beckner, Jr., Nathan E. Glauvitz, Jeff Richey, Loretta Arguello, Carolyn M. Tewksbury-Christle, Kevin P. Vitayaudom, Patrick R. Kelly, Air Force Research Lab. (United States) [7466-14]

2:50 pm: **Deformable mirrors: design fundamentals for force actuation of continuous facesheets**, Simon Ravensbergen, Technische Univ. Eindhoven (Netherlands); Roger Hamelincq, TNO Science and Industry (Netherlands); Nick Rosielle, Maarten Steinbuch, Technische Univ. Eindhoven (Netherlands) [7466-16]

Coffee Break 3:10 to 3:40 pm

Conference 7466

SESSION 5

Room: Conv. Ctr. 2 Thurs. 3:40 to 4:40 pm

Beam Control, Pointing, and Tracking

Session Chair: **David C. Dayton**, Applied Technology Associates

3:40 pm: **Large high-performance fast steering mirrors with FPGA-embedded controls**, Felix E. Morgan, Steven R. Wasson, Jamison London, Joshua Kern, Martin Smith, Rebecca Sullivan, Richard Owen, Applied Technology Associates (United States). [7466-17]

4:00 pm: **A compact optical inertial reference unit for optical stabilization**, Richard Owen, Dan Eckelkamp-Baker, Steven R. Wasson, Jamison London, Applied Technology Associates (United States) [7466-18]

4:20 pm: **A new beam steering concept: Risley gratings**, Chul Woo Oh, John F. Muth, Michael J. Escuti, North Carolina State Univ. (United States) [7466-19]

SESSION 6

Room: Conv. Ctr. 2 Thurs. 4:40 to 5:40 pm

Adaptive Optics Systems and Applications

Session Chair: **Troy A. Rhoadarmer**, SAIC

4:40 pm: **Scene-based blind deconvolution in the presence of anisoplanatism**, David C. Dayton, Applied Technology Associates (United States). [7466-20]

5:00 pm: **The effect of jitter-induced anisoplanatism on long-exposure laser propagation**, Matthew J. Krizo, Air Force Institute of Technology (United States); Matthew R. Whiteley, MZA Associates Corp. (United States); Partha P. Banerjee, Univ. of Dayton (United States). [7466-21]

5:20 pm: **Arm locking control for the Laser Interferometer Space Antenna**, Peiman G. Maghami, NASA Goddard Space Flight Ctr. (United States)[7466-22]

Courses of Related Interest

See *SPIE Cashier* for information and to register.

SC135 Adaptive Optics (Tyson) Tuesday, 8:30 am to 5:30 pm

Conference 7467

Monday-Tuesday 3-4 August 2009 • Proceedings of SPIE Vol. 7467

Nanophotonics and Macrophotonics for Space Environments III

Conference Chairs: **Edward W. Taylor**, International Photonics Consultants, Inc.; **David A. Cardimona**, Air Force Research Lab.

Program Committee: **Mansoor Alam**, Nuferr; **Koen J. Clays**, Katholieke Univ. Leuven (Belgium); **Douglas M. Craig**, Air Force Research Lab.; **Raluca Dinu**, Lumera Corp.; **Alexandre I. Fedoseyev**, CFD Research Corp.; **Allan Hahn**, Air Force Research Lab.; **Michael J. Hayduk**, Air Force Research Lab.; **Danhong Huang**, Air Force Research Lab.; **Mark G. Kuzyk**, Washington State Univ.; **Narasimha S. Prasad**, NASA Langley Research Ctr.; **Kelly Simmons-Potter**, The Univ. of Arizona

Monday 3 August

Room: Conv. Ctr. 1A Mon. 8:00 to 8:10 am

Opening Remarks

Session Chair: **Edward W. Taylor**, International Photonics Consultants, Inc.

SESSION 1

Room: Conv. Ctr. 1A Mon. 8:10 to 10:00 am

Materials and Components for Space Environments I

Session Chair: **Narasimha S. Prasad**, NASA Langley Research Ctr.

8:10 am: **Topographic mapping from space**, Anthony W. Yu, NASA Goddard Space Flight Ctr. (United States) [7467-01]

8:30 am: **Development of a low SWAP laser transmitter**, Alex Rosiewicz, EM4, Inc. (United States) [7467-02]

8:50 am: **The effects of ionizing radiation, temperature, and space contamination effects on photonic coatings** (*Invited Paper*), Ronald G. Pirich, Northrop Grumman Aerospace Systems (United States) [7467-03]

9:20 am: **Space radiation effects modeling and analysis in quantum dot-based photovoltaic cells**, Alexandre I. Fedoseyev, Marek Turowski, CFD Research Corp. (United States); Edward W. Taylor, International Photonics Consultants, Inc. (United States); Ashok Raman, CFD Research Corp. (United States); Seth Hubbard, Stephen Polly, Rochester Institute of Technology (United States); Alexander A. Balandin, Qinghui Shao, Univ. of California, Riverside (United States) [7467-04]

9:40 am: **Beam combining of high-power fiber laser arrays for airborne and space applications**, Thomas M. Shay, Craig A. Robin, Air Force Research Lab. (United States) [7467-05]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 1A Mon. 10:30 am to 12:00 pm

Materials and Components for Space Environments II

Session Chair: **Koen J. Clays**, Katholieke Univ. Leuven (Belgium)

10:30 am: **The effects of gamma-ray irradiation on organic materials of different conjugation lengths** (*Invited Paper*), Cheng Zhang, Norfolk State Univ. (United States); Edward W. Taylor, International Photonics Consultants, Inc. (United States) [7467-06]

11:00 am: **Optical switching materials with high damage threshold for space environments** (*Invited Paper*), Abhijit Sarkar, Salma Rahman, Shamim Mirza, Petar R. Dvornic, Michigan Molecular Institute (United States); George W. Rayfield, Univ. of Oregon (United States); Edward W. Taylor, International Photonics Consultants, Inc. (United States) [7467-07]

11:30 am: **The physics of self-healing after photodegradation in a dye-doped polymer** (*Invited Paper*), Mark G. Kuzyk, Shiva K. Ramini, Urszula Szafruga, Rosanne Garcia, Benjamin Anderson, Washington State Univ. (United States); G. Logan DesAutels, Wright-Patterson Air Force Base (United States) [7467-08]

Lunch Break 12:00 to 1:30 pm

Room: Conv. Ctr. 1A Mon. 1:30 to 2:15 pm

Keynote Address

1:30 pm: **Roll-to-roll manufacture of active photonic crystals** (*Keynote Presentation*), Kenneth D. Singer, Case Western Reserve Univ. (United States) [7467-09]

SESSION 4

Room: Conv. Ctr. 1A Mon. 2:15 to 3:35 pm

Innovative Organic/Polymer Materials I

Session Chair: **Mark G. Kuzyk**, Washington State Univ.

2:15 pm: **Magnetic field sensing based on Faraday rotation in inorganic/polymer hybrid materials** (*Invited Paper*), Thierry Verbiest, Jelle Wouters, Ventsislav Valev, Katholieke Univ. Leuven (Belgium) [7467-10]

2:45 pm: **Faraday rotation in magnetic colloidal photonic crystals** (*Invited Paper*), Koen J. Clays, Katholieke Univ. Leuven (Belgium) [7467-11]

3:15 pm: **Space radiation hardening of polymer/organic materials**, Edward W. Taylor, Linda R. Taylor, International Photonics Consultants, Inc. (United States) [7467-12]

Coffee Break 3:35 to 4:05 pm

SESSION 5

Room: Conv. Ctr. 1A Mon. 4:05 to 5:05 pm

Innovative Organic/Polymer Materials II

Session Chair: **Douglas M. Craig**, Air Force Research Lab.

4:05 pm: **Testing of laser materials by NASA LaRC under MISSE 6 and MISSE 7 missions**, Narasimha S. Prasad, NASA Langley Research Ctr. (United States) [7467-13]

4:25 pm: **Nanoscale control to achieve radiation hardened materials**, Joseph D. Lichtenhan, Hybrid Plastics (United States) [7467-15]

4:45 pm: **Fiber optic systems evolving in military and space platforms**, Chuck Tabbert, Ultra Communications, Inc. (United States) [7467-14]

Tuesday 4 August

Room: Conv. Ctr. 1A Tues. 8:00 to 8:05 am

Chair Introduction

Session Chair: **David A. Cardimona**, Air Force Research Lab.

Room: Conv. Ctr. 1A Tues. 8:05 to 8:50 am

Keynote Address

8:05 am: **Surface plasmon polariton analogues of volume electromagnetic effects** (*Keynote Presentation*), Alexei A. Maradudin, Tamara A. Leskova, Univ. of California, Irvine (United States) [7467-16]

Conference 7467

SESSION 7

Room: Conv. Ctr. 1A Tues. 8:50 to 11:00 am

Devices for Space Applications

Session Chair: Paul M. Alsing, Air Force Research Lab.

8:50 am: **Nanowire and metallic nanostructure lasers** (*Invited Paper*), Cun-Zheng Ning, Arizona State Univ. (United States) [7467-17]

9:20 am: **Three-dimensional nanomachining of microphotonic materials**, Z. Ryan Tian, Univ. of Arkansas (United States) [7467-18]

9:40 am: **Multi-spectral image analysis for improved space object characterization**, William R. Glass, Michael J. Duggin, Raymond A. Motes, Stephanie Whalen, Air Force Research Lab. (United States); David Rosprim, Keith A. Bush, Schafer Corp. (United States); Meiling Klein, Northrop Grumman Corp. (United States) [7467-19]

Coffee Break 10:00 to 10:20 am

10:20 am: **Hyperspectral pixels in 2D imaging FPAs**, Paul D. LeVan, Air Force Research Lab. (United States); Brian P. Beecken, Bethel Univ. (United States) [7467-20]

10:40 am: **Interference effects in a cavity for optical amplification**, David A. Cardimona, Paul M. Alsing, Air Force Research Lab. (United States) [7467-21]

SESSION 8

Room: Conv. Ctr. 1A Tues. 11:00 to 11:40 am

THz for Space Communications I

Session Chair: Danhong Huang, Air Force Research Lab.

11:00 am: **Bloch oscillations in lateral periodic nanostructure arrays**, Wei Pan, Sandia National Labs. (United States) [7467-22]

11:20 am: **Current-driven plasma instabilities for a bilayer two-dimensional electron system with a gated metal grating**, Antonios Balassis, Fordham Univ. (United States); Godfrey A. Gumbs, Hunter College (United States); Danhong Huang, Air Force Research Lab. (United States) [7467-23]

Lunch/Exhibition Break 11:40 am to 1:00 pm

SESSION 9

Room: Conv. Ctr. 1A Tues. 1:00 to 2:00 pm

THz for Space Communications II

Session Chair: Danhong Huang, Air Force Research Lab.

1:00 pm: **Terahertz quantum well devices and their potential for free-space communication** (*Invited Paper*), Hui Chun Liu, National Research Council Canada (Canada) [7467-24]

1:30 pm: **Tunable THz plasmonic detector in InGaAs/InP HEMT** (*Invited Paper*), Robert E. Peale, Himanshu Saxena, Univ. of Central Florida (United States); Walter R. Buchwald, Air Force Research Lab. (United States); Greg C. Dyer, S. James Allen, Jr., Univ. of California, Santa Barbara (United States) [7467-25]

SESSION 10

Room: Conv. Ctr. 1A Tues. 2:00 to 4:50 pm

Detectors for Space Situational Awareness

Session Chair: David A. Cardimona, Air Force Research Lab.

2:00 pm: **Demonstration of megapixel mid- and long-wave infrared dual-band QWIP focal plane array** (*Invited Paper*), Sarath D. Gunapala, Jet Propulsion Lab. (United States) [7467-26]

2:30 pm: **A LWIR quantum dot infrared photodetector working at 298K**, Puminun Vasinajindakaw, Univ. of Massachusetts, Lowell (United States); Jarrod Vaillancourt, Applied NanoFemto Technologies, LLC (United States); Xuejun Lu, Xifeng Qian, William D. Goodhue, Univ. of Massachusetts, Lowell (United States) [7467-27]

Coffee Break 2:50 to 3:20 pm

3:20 pm: **State-of-the-art type II antimonide-based superlattice photodiodes for infrared detection and imaging** (*Invited Paper*), Manijeh Razeghi, Binh-Minh Nguyen, Pierre-Yves Delaunay, Edward K. W. Huang, Paritosh Manukar, Simeon Bogdanov, Northwestern Univ. (United States) [7467-28]

3:50 pm: **Infrared focal plane arrays using type-II InAs/GaSb superlattices**, Ha Sul Kim, Elena A. Plis, Stephen A. Myers, Arezou Khoshakhlagh, Nutan Gautam, Maya N. Kutty, Yagya D. Sharma, Ralph Dawson, Sanjay Krishna, The Univ. of New Mexico (United States) [7467-29]

4:10 pm: **Investigation of multistack quantum dot-in-a-well infrared detectors**, Maya Narayanan Kutty, Yagya D. Sharma, Rajeev V. Shenoi, Jiayi Shao, Sanjay Krishna, The Univ. of New Mexico (United States) [7467-30]

4:30 pm: **Effects of Al fraction on the capacitance characteristics of n+-GaN/AlxGa1-xN IR detectors**, Laura E. Byrum, Gamini Ariyawansa, Ranga Jayasinghe, Nikolaus Dietz, Unil A. Perera, Georgia State Univ. (United States); Steven Matsik, NDP Optronics LLC (United States); Ian T. Ferguson, Georgia Institute of Technology (United States); Andrew Bezinger, Hui Chun Liu, National Research Council Canada (Canada) [7467-31]

Conference 7468A

Sunday 2 August 2009 • Proceedings of SPIE Vol. 7468

Adaptive Coded Aperture Imaging and Non-Imaging Sensors III

Conference Chairs: **David P. Casasent**, Carnegie Mellon Univ.; **Stanley Rogers**, Air Force Research Lab.

Conference Co-Chairs: **Timothy Clark**, Defense Advanced Research Projects Agency; **Keith L. Lewis**, Electro Magnetic Remote Sensing Defence Technology Ctr. (United Kingdom)

Program Committee: **David J. Brady**, Duke Univ.; **Michael T. Eismann**, Air Force Research Lab.; **Stephen R. Gottesman**, Northrop Grumman Electronic Systems; **Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control; **Mark E. McNie**, QinetiQ Ltd. (United Kingdom); **Mark A. Neifeld**, The Univ. of Arizona; **Demetri Psaltis**, California Institute of Technology; **Christopher W. Slinger**, QinetiQ Ltd. (United Kingdom); **LaVern A. Starman**, Air Force Institute of Technology; **Nikola S. Subotic**, Michigan Tech Research Institute; **Rebecca A. Wilson**, QinetiQ Ltd. (United Kingdom)

Sunday 2 August

SESSION 1

Room: Conv. Ctr. 1A Sun. 8:00 to 10:00 am

Imaging and Non-Imaging Sensor Needs

Session Chairs: **Stanley Rogers**, Air Force Research Lab.; **David P. Casasent**, Carnegie Mellon Univ.

8:00 am: **Airborne IR persistent surveillance imaging requirements for Army aircraft** (*Keynote Presentation*), Michael Groenert, U.S. Army Night Vision & Electronic Sensors Directorate (United States) [7468A-01]

8:30 am: **Hybrid computational imaging techniques** (*Invited Paper*), Keith L. Lewis, Sciovis Ltd. (United Kingdom) [7468A-02]

9:00 am: **Modified light field architecture for reconfigurable multimode imaging** (*Invited Paper*), Ravindra A. Athale, Roarke Horstmeyer, Gary W. Euliss, MITRE Corp. (United States) [7468A-03]

9:30 am: **Optical sensing data processing and management** (*Invited Paper*), Timothy Clark, Defense Advanced Research Projects Agency (United States) [7468A-04]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Conv. Ctr. 1A Sun. 10:30 am to 12:00 pm

Imaging and Non-Imaging Diffraction System Concepts

Session Chairs: **Stephen R. Gottesman**, Northrop Grumman Electronic Systems; **Timothy Clark**, Defense Advanced Research Projects Agency

10:30 am: **Sub-pixel super-resolution by decoding frames from a reconfigurable coded aperture: theory and experimental verification** (*Invited Paper*), Geoff D. De Villiers, Neil T. Gordon, Douglas A. Payne, Ian K. Proudler, Kevin D. Ridley, Rebecca A. Wilson, Christopher W. Slinger, QinetiQ Ltd. (United Kingdom) [7468A-05]

11:00 am: **Adaptive feature-specific imaging**, Mark A. Neifeld, The Univ. of Arizona (United States); Pawan K. Baheti, Qualcomm Inc. (United States) [7468A-06]

11:20 am: **Differential combinatorial group testing for highly compressive change-detection**, Michael E. Gehm, The Univ. of Arizona (United States); Michael D. Stenner, MITRE Corp. (United States) [7468A-07]

11:40 am: **Visible band lens-free imaging using coded aperture techniques**, Kevin D. Ridley, Geoff D. De Villiers, Douglas A. Payne, Rebecca A. Wilson, Christopher W. Slinger, QinetiQ Ltd. (United Kingdom) [7468A-08]

Lunch Break 12:00 to 1:30 pm

SESSION 3

Room: Conv. Ctr. 1A Sun. 1:30 to 3:00 pm

Imaging and Non-Imaging Algorithms

Session Chairs: **Nikola S. Subotic**, Michigan Tech Research Institute; **Christopher W. Slinger**, QinetiQ Ltd. (United Kingdom)

1:30 pm: **Tracking in coded information space** (*Invited Paper*), Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control (United States) [7468A-09]

2:00 pm: **Coded aperture computed tomography**, Kerkil Choi, David J. Brady, Duke Univ. (United States) [7468A-10]

2:20 pm: **Enhancement of vector imaging for point source separation and tracking using space-time phase modulated optics**, Denis C. Braunreiter, SAIC (United States) [7468A-11]

2:40 pm: **An analysis of coded aperture acquisition and reconstruction using multiframe code sequences for relaxed optical design constraints**, Joseph W. Stayman, Nikola S. Subotic, Michigan Tech Research Institute (United States) [7468A-12]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Conv. Ctr. 1A Sun. 3:30 to 4:30 pm

Diffraction Imaging Hardware I

Session Chairs: **Derrick Langley**, Air Force Institute of Technology; **Oren Sternberg**, Booz Allen Hamilton

3:30 pm: **A scalable multichip architecture to realise large-format microshutter arrays for coded aperture applications**, Mark E. McNie, David O. King, Steven M. Stone, Alan G. Brown, Kevin D. Ridley, QinetiQ Ltd. (United Kingdom); Kevin Cannon, Steve Riches, GE Aviation Systems (United Kingdom); Stanley Rogers, Air Force Research Lab. (United States) [7468A-14]

3:50 pm: **Chip-to-chip optical interconnection using MEMS mirrors**, Tod Laurvick, LaVern A. Starman, Ronald A. Couto, Jr., Air Force Institute of Technology (United States); Stanley Rogers, Air Force Research Lab. (United States) [7468A-15]

4:10 pm: **Utilizing micro-electro-mechanical systems (MEMS) micro-shutter designs for adaptive coded aperture imaging (ACAI) technologies**, Mary M. Ledet, LaVern A. Starman, Ronald A. Couto, Jr., Air Force Institute of Technology (United States); Stanley Rogers, Air Force Research Lab. (United States) [7468A-18]

OPTICS

Conference 7468A

SESSION 5

Room: Conv. Ctr. 1A Sun. 4:30 to 5:30 pm

Diffraction Imaging Hardware II

Session Chairs: **Mark E. McNie**, QinetiQ Ltd. (United Kingdom); **Ronald A. Coutu, Jr.**, Air Force Institute of Technology

4:30 pm: **Optical metamaterials for photonics applications**, Derrick Langley, Ronald A. Coutu, Jr., LaVern A. Starman, Air Force Institute of Technology (United States); Stanley Rogers, Air Force Research Lab. (United States) [7468A-16]

4:50 pm: **Optimized retroreflector for photonic Doppler velocimetry**, Thomas J. Lagoski, LaVern A. Starman, Ronald A. Coutu, Jr., Air Force Institute of Technology (United States) [7468A-17]

5:10 pm: **Lenless imaging: alternatives to lens**, Oren Sternberg, Booz Allen Hamilton (United States); Esko Jaska, Consultant (United States) . . [7468A-19]

Room: Conv. Ctr. Room 6A Sun. 6:00 to 7:30 pm

All-Conference Plenary Session

Four Hundred Years through the Eye of the Telescope

Jerry Nelson, Univ. of California, Santa Cruz (USA)

Peering into the Explosion: Using Stellar Archaeology to Unlock the Mysteries of Supernovae

Tracey Delaney, MIT Kavli Institute for Astrophysics and Space Research (USA)

See page 13 for presentation details.

SPIE Optics+Photonics papers
are available in 2–4 weeks.



Conference 7468B

Monday 3 August 2009 • Proceedings of SPIE Vol. 7468

Unconventional Imaging V

Conference Chairs: **Jean J. Dolne**, The Boeing Co.; **Thomas J. Karr**, Northrop Grumman Corp.; **Victor L. Gamiz**, Air Force Research Lab.

Program Committee: **James Fienup**, Univ. of Rochester; **Liren Liu**, Shanghai Institute of Optics and Fine Mechanics (China); **Timothy J. Schulz**, Michigan Technological Univ.; **Robert K. Tyson**, The Univ. of North Carolina at Charlotte; **David G. Voelz**, New Mexico State Univ.

Monday 3 August

SESSION 1

Room: Conv. Ctr. 3 Mon. 8:00 to 10:20 am

Wide Field-of-View and Turbid Media Imaging

Session Chair: **Jean J. Dolne**, The Boeing Co.

8:00 am: **Observations of a geosynchronous satellite with optical interferometry** (*Invited Paper*), Sergio R. Restaino, J. Tom Armstrong, Robert B. Hindsley, Naval Research Lab. (United States); Robert T. Zavala, Jim A. Benson, Frederick J. Vrba, Don J. Hutter, U.S. Naval Observatory (United States); Steve A. Gregory, Boeing LTS Inc. (United States); Henrique R. Schmitt, Interferometrics, Inc. (United States) [7468B-01]

8:30 am: **Wide-field astronomical image compensation with multiple-laser-guided adaptive optics** (*Invited Paper*), Michael Hart, Mark Milton, The Univ. of Arizona (United States); Christoph J. Baranec, California Institute of Technology (United States); Thomas E. Stalcup, Jr., W. M. Keck Observatory (United States); Keith B. Powell, Eduardo A. Bendek, Donald W. McCarthy, Jr., Craig A. Kulesa, The Univ. of Arizona (United States) [7468B-02]

9:00 am: **The key technologies research on the large field-of-view and high-resolution optical synthesis telescope**, Haitao Wang, Qiu Feng Luo, Yongkai Zhu, Wangtai Ma, Nanjing Univ. of Aeronautics and Astronautics (China) [7468B-03]

9:20 am: **Analytic versus adaptive image formation using optical phased arrays**, Richard L. Kendrick, Lockheed Martin Space Systems Co. (United States); Joseph C. Marron, Lockheed Martin Coherent Technologies (United States) [7468B-04]

9:40 am: **Wavefront correction using a Fourier-based image sharpness metric**, Kristin N. Walker, Robert K. Tyson, The Univ. of North Carolina at Charlotte (United States) [7468B-05]

10:00 am: **MIMO imaging through turbid and turbulent atmosphere**, Zeinab Hajjarian Kashany, Mohsen Kavehrad, Jarir M. Fadlullah, The Pennsylvania State Univ. (United States) [7468B-06]

Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Conv. Ctr. 3 Mon. 10:50 to 11:50 am

Synthetic Aperture and Super-resolution

Session Chair: **Thomas J. Karr**, Northrop Grumman Corp.

10:50 am: **Optical synthetic aperture imaging with spatial heterodyne interferometry**, Melvin S. Ni, J. Wes Irwin, Lockheed Martin Space Systems Co. (United States) [7468B-07]

11:10 am: **Antenna aperture and imaging resolution of synthetic aperture imaging lidar**, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7468B-08]

11:30 am: **A multipurpose SAIL demonstrator design and its principle experimental verification**, Yu Zhou, Aimin Yan, Nan Xu, Lijuan Wang, Zhu Luan, Jianfeng Sun, Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China) [7468B-09]

SESSION 3

Room: Conv. Ctr. 3 Mon. 11:50 am to 12:10 pm

THz and Photon Counting Imaging

Session Chair: **Victor L. Gamiz**, Air Force Research Lab.

11:50 am: **Active terahertz imaging with neon indicator lamp detector arrays**, Norman S. Kopeika, Ben-Gurion Univ. of the Negev (Israel); Amir Abramovich, Ariel Univ. Ctr. of Samaria (Israel); Orly Yadid-Pecht, Yitzhak Yitzhaky, Ben-Gurion Univ. of the Negev (Israel) [7468B-12]

Courses of Related Interest

See SPIE Cashier for information and to register.

OP518 7468B Unconventional Imaging V

SC135 Adaptive Optics (Tyson) Tuesday, 8:30 am to 5:30 pm

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 Visit the SPIE Marketplace for science and optics related gifts for the little (and not so little) ones at home.

- Games
- Toys
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General Information

Registration

Registration Hours

Convention Center, Exhibition Hall D

Sunday 2 August	7:00 am to 5:00 pm
Monday 3 August	7:15 am to 5:00 pm
Tuesday 4 August	7:30 am to 5:00 pm
Wednesday 5 August	7:30 am to 5:00 pm
Thursday 6 August	7:45 am to 4:00 pm

Exhibition

Convention Center, Exhibition Hall C

Tuesday 4 August	10:00 am to 5:00 pm
Wednesday 5 August	10:00 am to 5:00 pm
Thursday 6 August	10:00 am to 2:00 pm

SPIE Receipts, Badge Corrections, Cashier

Receipts - Preregistered attendees who did not receive a receipt prior to the meeting may obtain a new copy of their registration receipt onsite at the Badge Corrections and Receipts counter in the registration area.

Badge Corrections - Attendees who need a correction to their badge information onsite may do so at the Badge Corrections and Receipts counter in the registration area. Please have your badge removed from the badge holder, marked with your changes, and ready to hand to the attendant upon approaching the counter.

Cashier Station - If you are paying by cash or check as part of your onsite registration, wish to add a course, workshop, or special event requiring payment, or have questions regarding your registration, please see the onsite cashier at the Cashier station in the registration area.

Author/Presenter Services

Poster Setup

Convention Center Hall D

Poster presenters must set up between 10:00 am to 4:00 pm on the day of their assigned presentation. Poster presenters who have not set up by 4:00 pm on the day of their presentation will be considered a "no show" and their manuscript will not be published. Presenters must remove their posters immediately after the poster session. Posters not removed will be considered unwanted and will be discarded. SPIE assumes no responsibility for posters left up after the end of each poster session.

Speaker Check-in Desk

Convention Center Ballroom 6 Lobby

Sunday through Thursday	7:30 am to 5:00 pm
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All Conference rooms will have a computer workstation, LCD projector, screen, lapel microphone, and laser pointer.

All presenters are requested to come to the Speaker Check-in Desk to confirm display settings of their presentations from their memory devices or laptops with the audiovisual equipment being used at this symposium.

Food and Beverage

Coffee Breaks

Complimentary coffee will be served twice each day of the conference.

Convention Center, Upper Level Lobby, Mezzanine Level

Sunday and Monday	10:00 to 11:00 am; 3:00 to 4:00 pm
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Convention Center, Exhibition Hall C

Tuesday and Wednesday	10:00 to 11:00 am; 3:00 to 4:00 pm
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Convention Center, Exhibition Hall C

Thursday	10:00 to 11:00 am
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Convention Center, Upper Level Lobby, Mezzanine Level

Thursday	3:00 to 4:00 pm
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Refreshment Purchases

For attendee purchase of light refreshments, including continental breakfast, specialty carts will be set up throughout the Convention Center Sunday through Thursday.

Cash Lunches and Exhibition Concessions

A cash sandwich bar will be available in the Convention Center at the Mezzanine Lobby on Sunday and Monday from 11:30 am to 2:00 pm. Visit the Café Express located in the back of the exhibition halls on Tuesday, Wednesday, and Thursday featuring domestic and international cuisine. They will serve hot and cold snacks, beverages, deli-type sandwiches, salads, hot entrees, and pastries and will be open daily 11:00 am to 2:00 pm.

Desserts

Exhibition Hall C

Tuesday and Wednesday	3:00 to 3:30 pm
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Complimentary tickets for the dessert snacks will be included in attendee registration packets.

Restaurant Reservations and Information Desk

Convention Center, Hall B Lobby

Sunday through Thursday	9:00 am to 6:00 pm
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The San Diego Convention Center Corporation operates a Restaurant Reservations and Information Desk in the Hall B Lobby of the Convention Center.

If you wish to pre-plan your individual or group dining arrangements, you may call Laurie Peters at 619-525-5291.

Onsite Services

Guest Hospitality Suite

Marriott, South Tower, Suite #2573

Monday-Thursday, 3-6 August 2009 8:30 to 10:00 am

Guests of attendees are invited to meet, relax, and enjoy a cup of coffee and breakfast breads in the SPIEs Guest Hospitality Suite. This suite is for guests of attendees only. The hotel concierge will be available during a portion of this time to answer travel, shopping, and tourist questions.

Press Room

Convention Center, Hall D

The onsite Press Room provides media representatives with conference space, refreshments, convenient one-stop-shopping for press releases, and allows news to be communicated via phone, and high-speed internet connections. Credentialed members of the press are urged to pre-register by e-mailing: name, organization, and contact information to media@spie.org. Registration and exhibition fees are waived for media representatives. For more information about SPIE media services, see <http://spie.org/x2997.xml>

Internet Café

Convention Center, across from Registration in Lobby D

Open during Registration hours

Complimentary Internet services are available from Sunday through Thursday. Attendees can use provided workstations or hook up their laptop to an Ethernet connection to access the Internet. Please limit Internet sessions to 10 minutes.

Wireless access is also available in Internet Café area. Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop as well as potentially introduce viruses to your computer and/or presentation.

SPIE Copy Center

Convention Center, Hall D

Sunday through Thursday during Registration hours

San Diego Copy will provide a copy service during the week for symposium attendees. The rates are 5 cents per copy. The Copy Center is located near registration.

Business Center

Fedex Kinko's is the in-house business center for the San Diego Convention Center. It is located inside Lobby D. The company provides small package Fedex shipping, packing supplies, color copying services, fax services and office supplies. Phone (619) 525-5450, Fax (619) 525-5477. Email usa1324@fedexkinkos.com.

Cashier

Convention Center, Hall D

Sunday through Thursday during Registration hours

SPIE cashier can assist with registration payments, receipts, and badge corrections.

Course Materials Desk

Convention Center, Hall D

Located near the SPIE Registration Area

Open during Registration hours

If you have registered to attend a course, please stop by the Course Materials Desk AFTER you pick up your badge. You must obtain your course notes to find out class location. Ask at the Course Materials Desk about the latest Education Services catalog (includes all SPIE courses, videos, and CD-ROMs) as well as customized in-company courses.

Marketplace and Souvenirs

Convention Center, Exhibit Hall D Lobby near Registration.

The SPIE Marketplace is your source for the latest SPIE Press books, Proceedings, and Educational and Professional Development materials. You can become a member of SPIE, explore the Digital Library, and take home a souvenir.

Luggage and Coat Check

Convention Center, Hall D Lobby

Sunday through Thursday

Complimentary luggage/package and coat storage available to all attendees.

Please note hours of operation posted onsite.

If you intend to stay later than closing time, you will need to claim your checked items before it closes.

Child Care Services

The San Diego Marriott Hotel & Marina does not provide child care services; however, a child sitting service is available in San Diego and recommended by the San Diego Marriott Hotel & Marina:

Marion's Child Care

Email amy@hotelchildcare.com

Telephone (619) 303-4379 or 1-888-891-5029

Visit their website: hotelchildcare.com

SPIE does not imply an endorsement or recommendation of this service. It is provided on an "information only" basis for your further analysis and decision. Other services may be available.

Support of Green Meetings

SPIE supports the efforts of The San Diego Convention Center Corporation (SDCCC) in its commitment to encourage sustainable practices. We invite Optics+Photonics attendees to help minimize the impact of our large meeting by seeking out clearly marked bins throughout the building for mixed recyclables (paper, plastic, aluminum, glass). The bins are collected daily and recycled appropriately. Complete information about SDCCC efforts can be found at <http://www.visitsandiego.com/meetingplanners/greenmeetings.cfm>

General Information

Parking and Car Rental

Parking

(NOTE: ALL RATES ARE SUBJECT TO CHANGE)

At San Diego Convention Center

Convention Center: For underground parking, the Convention Center parking entrance is at the north end of Harbor Drive off Convention Center Way. Currently a special convention parking rate of \$8 per day will be in effect at the San Diego Convention Center for the duration of the meeting. During Padre baseball season, parking rates increase by \$10 during home games. **However, please note that parking rates are subject to change.** Exhibitors may purchase a parking permit at the parking office inside the garage, which allows in and out privileges for move-in/move-out days only. Exhibitors should purchase their \$8 parking ticket at the gate, proceed to the parking office inside, hand in the \$8 parking ticket along with an additional \$4 to receive the \$12 Parking Pass (with in and out privileges only on move-in/move-out days). Exhibitor badge ID is necessary to obtain the permit. They are open from 5:00 am to 11:00 pm, with no overnight parking. For further information contact Ace Parking at 619-237-0399.

Parking at Applicable Hotels

(Note: All rates are subject to change.)

SAN DIEGO MARRIOTT HOTEL & MARINA

For guests: Self \$21, Valet \$30

For non-guests: Self \$4 per hour, (\$22 max.); Valet \$8 for 1st hour, \$4 for each additional hour (\$30 max.)

HILTON SAN DIEGO BAYFRONT

For guests: Self \$21, Valet \$32

THE SOFIA HOTEL

Valet only: \$28

THE WESTGATE HOTEL

24-hour valet parking for hotel and dining guests available on the Lower Lobby level. Overnight guest parking \$27. Visitors pay \$8 for first hour, plus \$2 every additional hour, daily maximum \$30. Le Grand Café and the Plaza Bar validate parking for 2 hours for \$2. Le Fontainebleau validates parking for 3 hours for \$3. No self parking available.

Valet parking attendants are available from 8:00 am to 10:00 pm in front of the hotel on Second Avenue. Before 8:00 am and after 10:00 pm proceed to end of Second Avenue and turn right immediately before trolley tracks, ignoring the "Left turn only" signs, turn right into hotel. Proceed down the ramp to the valet desk.

OMNI SAN DIEGO HOTEL

Self \$16, Valet \$30

TOWN AND COUNTRY RESORT & CONVENTION CENTER

Self: \$7

COURTYARD BY MARRIOTT

Valet only: \$24

RAMADA INN & SUITES-GASLAMP

Valet only: \$20

Parking in Downtown San Diego

Many parking lots in Downtown San Diego are within walking distance of the Center. Lots and garages are individually owned and operated; prices vary by location.

Directly across the street at the east end of the Center is a 2,000-space parking structure.

Metered street parking is available in some areas. Parking meters are enforced Monday through Saturday, from 8:00 am until 6:00 pm, unless otherwise posted. Metered spots are free on Sunday and designated holidays. Meters accept nickels, dimes, quarters, and prepaid electronic debit cards.

Car Rental



Hertz Car Rental has been selected as the official car rental agency for this Symposium. To reserve a car, identify yourself as an SPIE Optics and Photonics Conference attendee using the Hertz Meeting Code CV# 029B0012. Note: When booking from International Hertz locations, the CV # must be entered with the letters CV before the number, i.e. CV029B0012. Call 1-800-654-2240.

Policies

Audio, Video, Digital Recording Policy

In the Meeting Rooms and Poster Sessions: For copyright reasons, recordings of any kind are strictly prohibited without prior written consent of the presenter in any conference session, course, or of posters presented. Each presenter being taped must file a signed written consent form. Individuals not complying with this policy will be asked to leave a given session and asked to surrender their film or recording media. Consent forms are available at the SPIE Speaker Check-in Desk.

In the Exhibition Hall: For security and courtesy reasons, photographing or videotaping individual booths and displays in the exhibit hall is allowed ONLY with explicit permission from onsite company representatives. Individuals not complying with this policy will be asked to surrender their film and to leave the exhibit hall.

Laser Pointer Safety Information

SPIE supplies tested and safety approved laser pointers for all conference meeting rooms, and for short course rooms if instructors request one. For safety reasons, SPIE requests that presenters use our provided laser pointers available in each meeting room.

If using your personal laser pointer:

- Please have it tested at your facility to make sure it has <5 mW power output. Laser pointers in Class II and IIIa (<5 mW) are eye safe if power output is correct - but don't automatically trust the labeling. Commercially available laser pointers, red or green (or any color), could be incorrectly labeled as to their wavelength and power output.
- We require that you to come to the Audiovisual Desk onsite and test your pointer on our power meter. If the pointer fails the safe power level you may not use the pointer at the conference. You will be required to sign a waiver releasing SPIE of any liability for use of potentially non-safe laser pointers.
- Use of a personal laser pointer at an SPIE event represents user's acceptance of liability for use of a non-SPIE supplied laser pointer device. Misuse of any laser pointer could lead to eye damage. In California, it is a criminal misdemeanor to shine a laser pointer at individuals "who perceive they are at risk."

Underage Persons on Exhibition Floor

For safety and insurance reasons, no persons under the age of 16 will be allowed in the exhibition area during move-in and move-out. During open exhibition hours, only children over the age of 12 accompanied by an adult will be allowed in the exhibition area.

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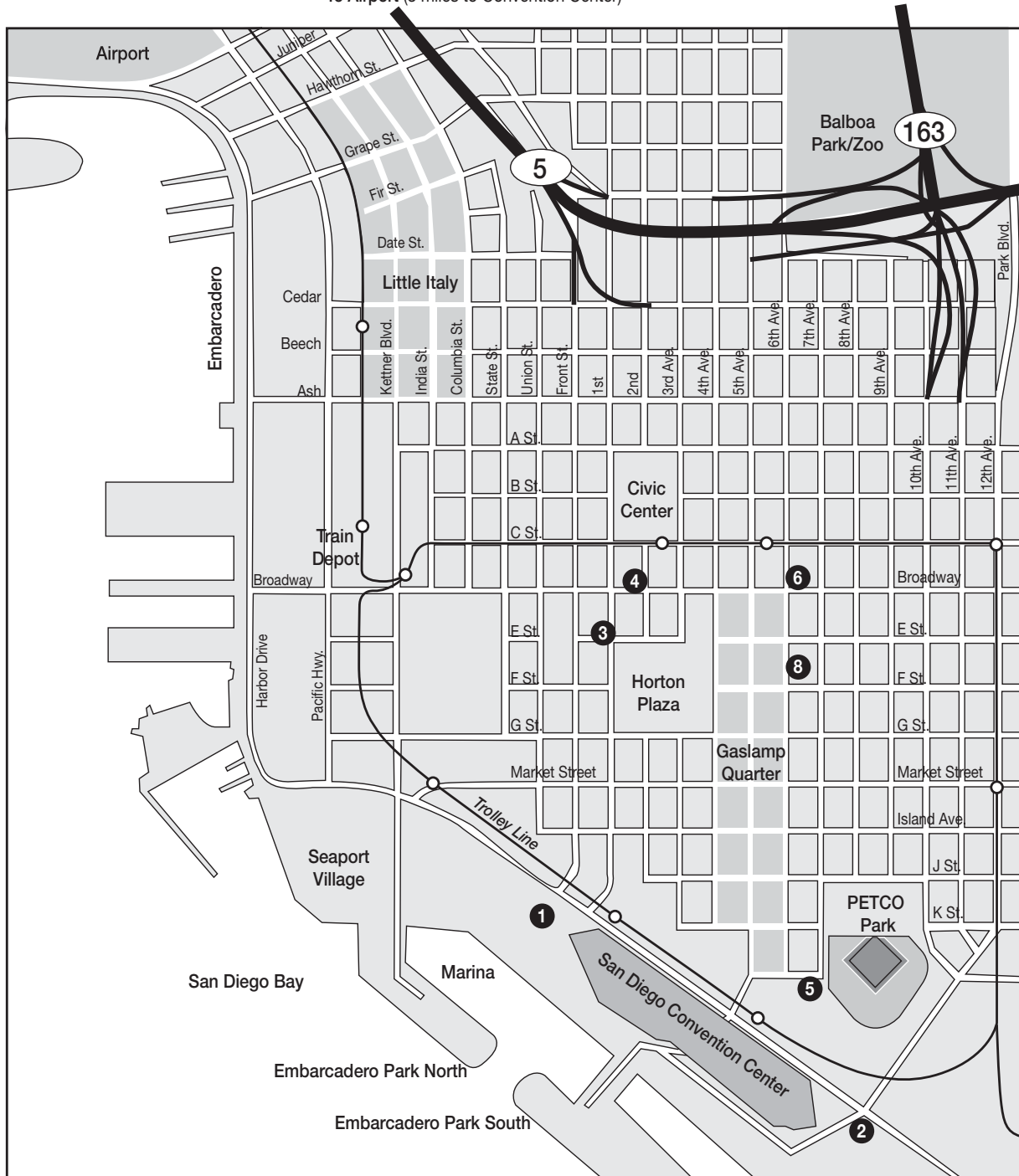
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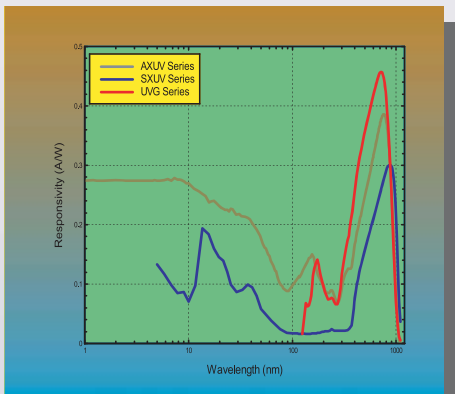
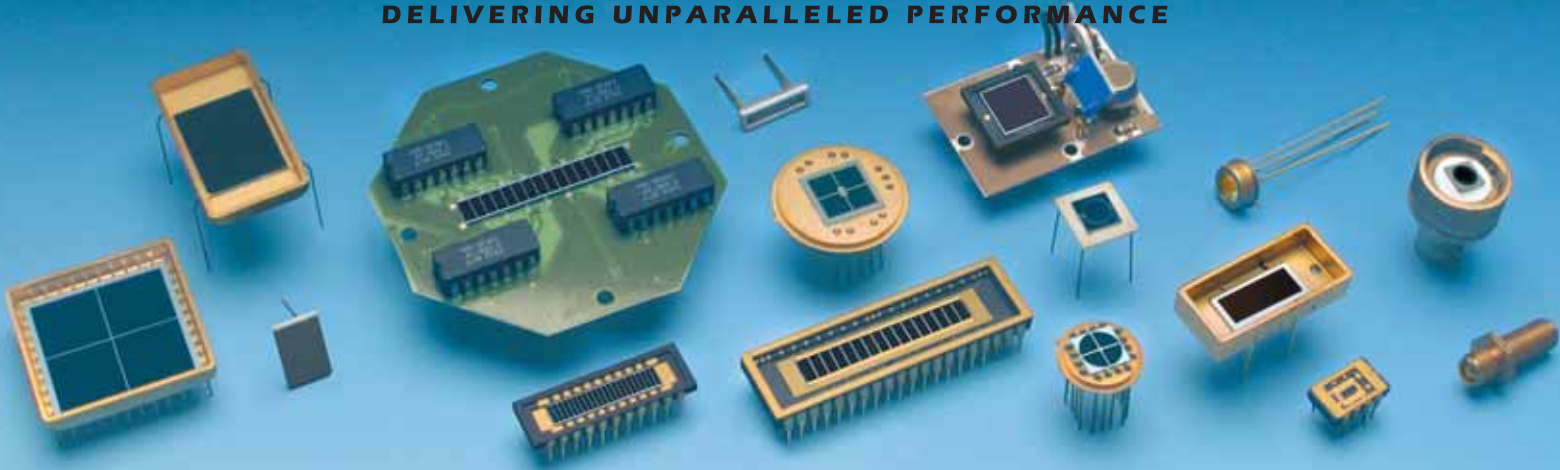
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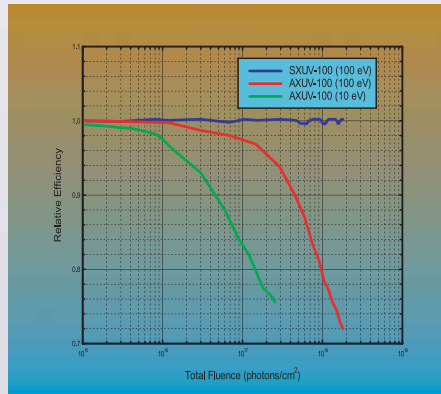
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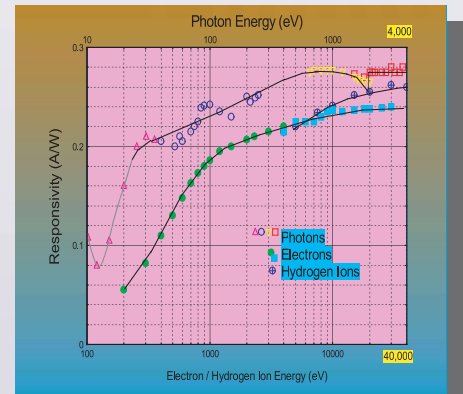
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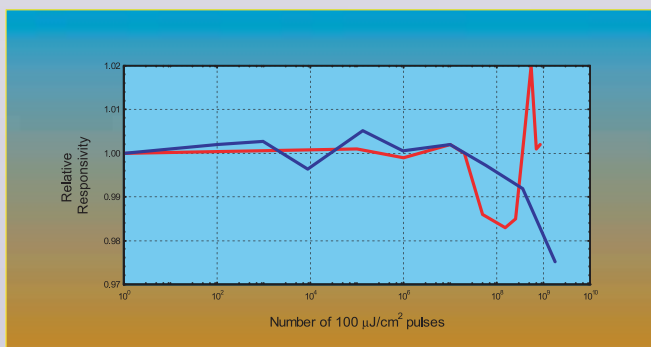
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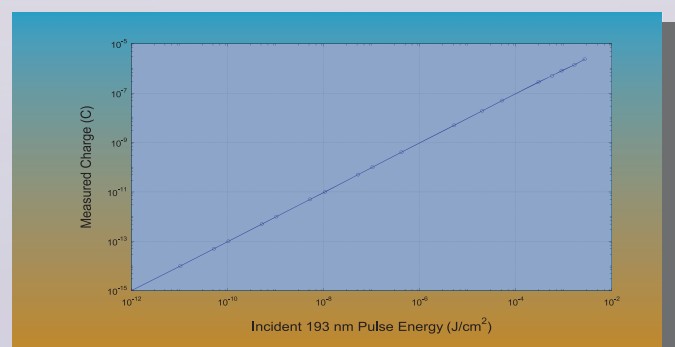
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