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TECHNICAL PROGRAM

Astronomical Telescopes + Instrumentation 2018

TECHNICAL PROGRAM

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Conferences and Courses
10–15 June 2018

Exhibition
12–14 June 2018

Austin Convention Center
Austin, Texas, USA

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Astronomical Telescopes + Instrumentation 2018

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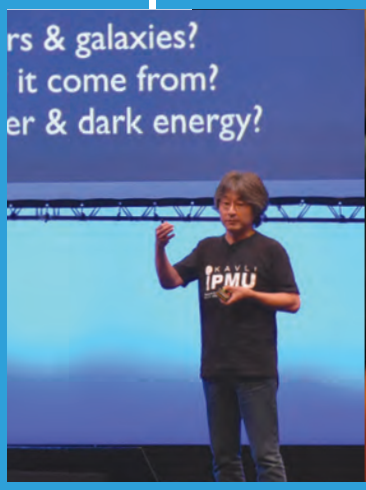
Conferences & Courses: 10–15 June 2018
Exhibition: 12–14 June 2018

Austin Convention Center, Austin, Texas, USA



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SPIE Astronomical Telescopes + Instrumentation—where collaboration brings ideas to life and technology to market. Hear the work, network with leaders in the field, and see the applications of the future. We look forward to a very productive week in the beautiful city of Austin!

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DATES
CONFERENCES & COURSES:
10–15 June 2018
EXHIBITION: 12–14 June 2018

LOCATION
Austin Convention Center
Austin, Texas, USA

SPIE. ASTRONOMICAL TELESCOPES + INSTRUMENTATION

SPIE Astronomical Telescopes + Instrumentation.
The latest research on ground- and space-based telescopes, the supporting technologies, and instrumentation.

Conference Programs

Telescopes and Systems p. 45–96

10698 Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave *(Lystrup, MacEwen, Fazio)*

10699 Space Telescopes and Instrumentation 2018: Ultraviolet to Gamma Ray *(den Herder, Nakazawa)*

10700 Ground-based and Airborne Telescopes VII *(Marshall, Spyromilio)*

10701 Optical and Infrared Interferometry and Imaging VI *(Creech-Eakman, Tuthill, Mérand)*

10702 Ground-based and Airborne Instrumentation for Astronomy VII *(Evans, Simard, Takami)*

10703 Adaptive Optics Systems VI *(Close, Schreiber, Schmidt)*

10704 Observatory Operations: Strategies, Processes, and Systems VII *(Peck, Seaman, Benn)*

10705 Modeling, Systems Engineering, and Project Management for Astronomy VIII *(Angeli, Dierickx)*

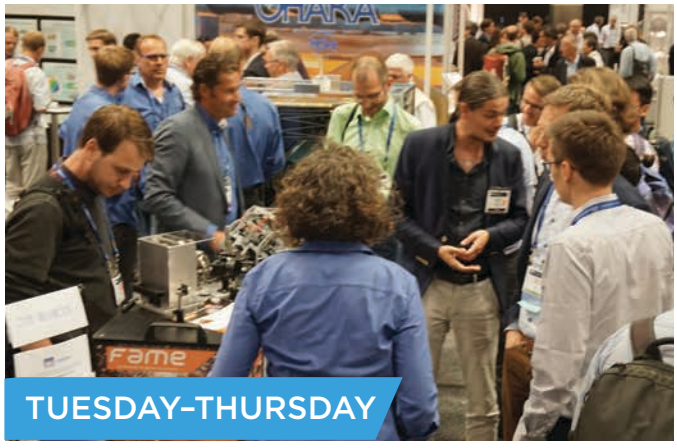
Technology Advancements p. 97–117

10706 Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation III *(Navarro, Geyl)*

10707 Software and Cyberinfrastructure for Astronomy V *(Guzman, Ibsen)*

10708 Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX *(Zmuidzinas, Gao)*

10709 High Energy, Optical, and Infrared Detectors for Astronomy VIII *(Holland, Beletic)*



Exhibition Directory p. 17–37

Meet with 120+ leading companies.

Don't miss your chance to speak face-to-face with top suppliers. Specialized researchers, engineers, product developers, and purchasers can find companies that provide everything from ground- and space-based telescopes to the most advanced instrumentation systems.

Courses p. 14–16

Build Your Skills. Find a Solution. Make an Impact.

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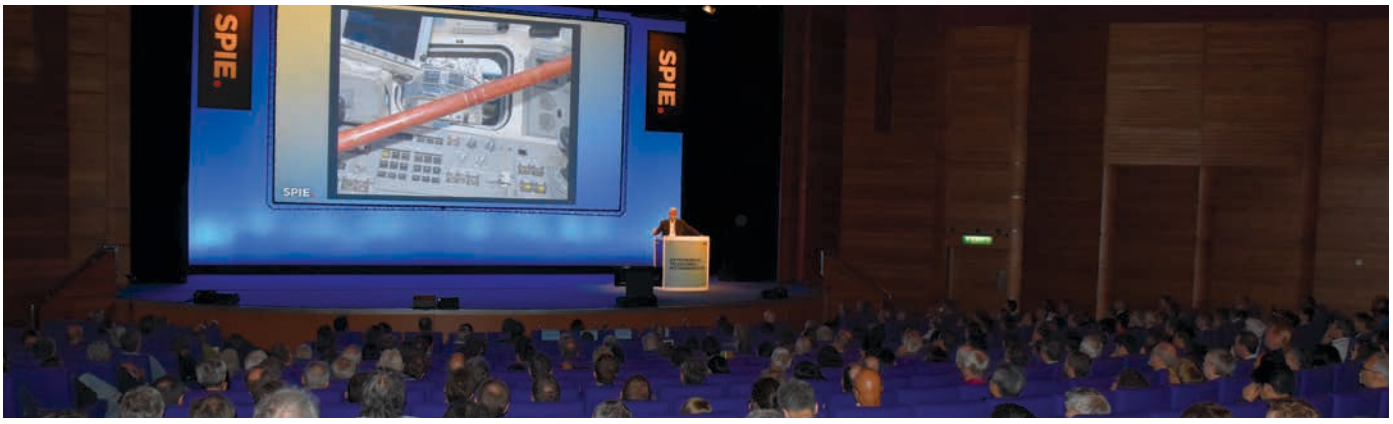
SPIE. ASTRONOMICAL TELESCOPES + INSTRUMENTATION

10–15 June 2018 · Exhibition: 12–14 June 2018

LOCATION
Austin Convention Center
Austin, Texas, USA



Plenary Session p. 9–11

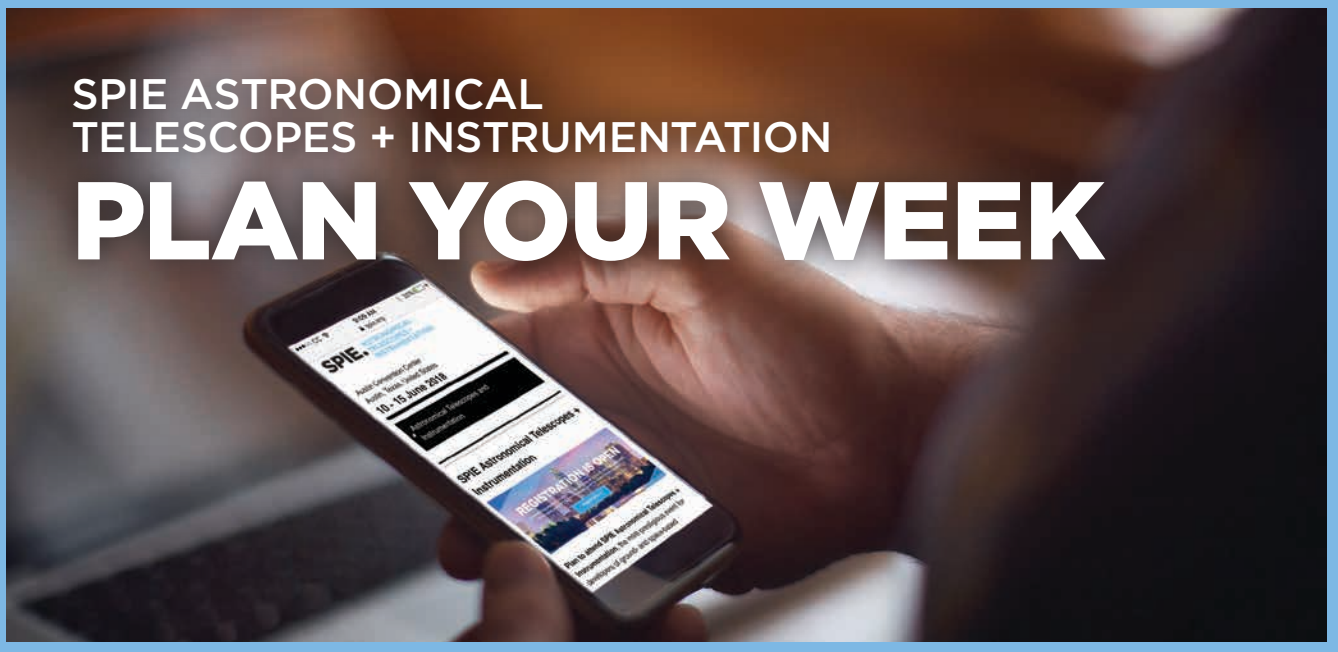
World-class speakers talking on the latest directions and most promising breakthroughs.

Technical Events p. 12

Join your peers and colleagues at the interactive poster sessions and enjoy group discussions around focused technical topics.

Social/Networking Events p. 13

Join your colleagues at these relaxed events, including the Welcome Reception—an event not to be missed!



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SPIE is the international society for optics and photonics, an educational not-for-profit organization founded in 1955 to advance light-based science and technology. The Society serves nearly 264,000 constituents from approximately 166 countries, offering conferences and their published proceedings, continuing education, books, journals, and the SPIE Digital Library in support of interdisciplinary information exchange, professional networking, and patent precedent. SPIE provided more than $4 million in support of education and outreach programs in 2017. For more information, visit www.SPIE.org.

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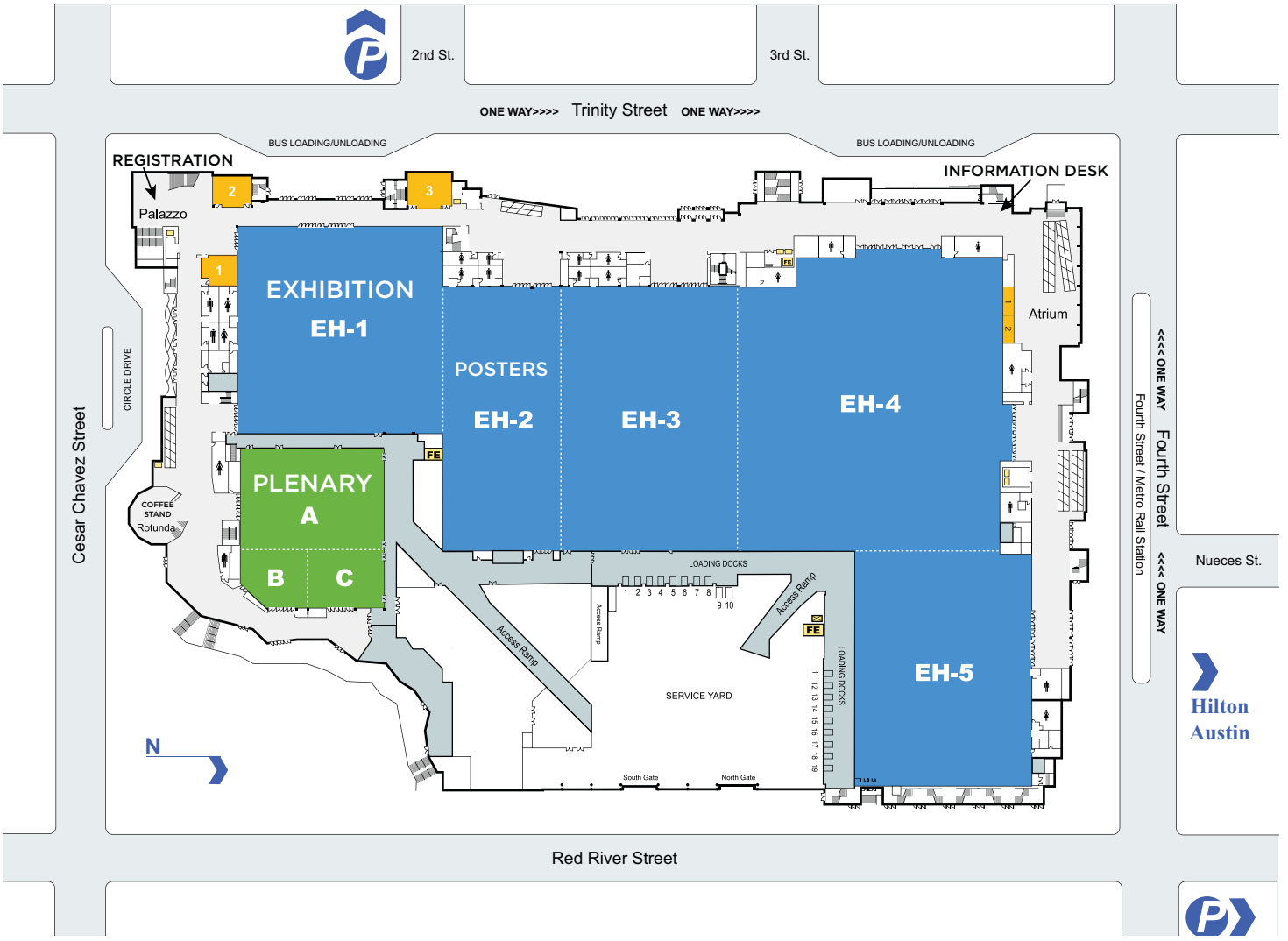
AUSTIN CONVENTION CENTER FLOOR PLANS

Level 1



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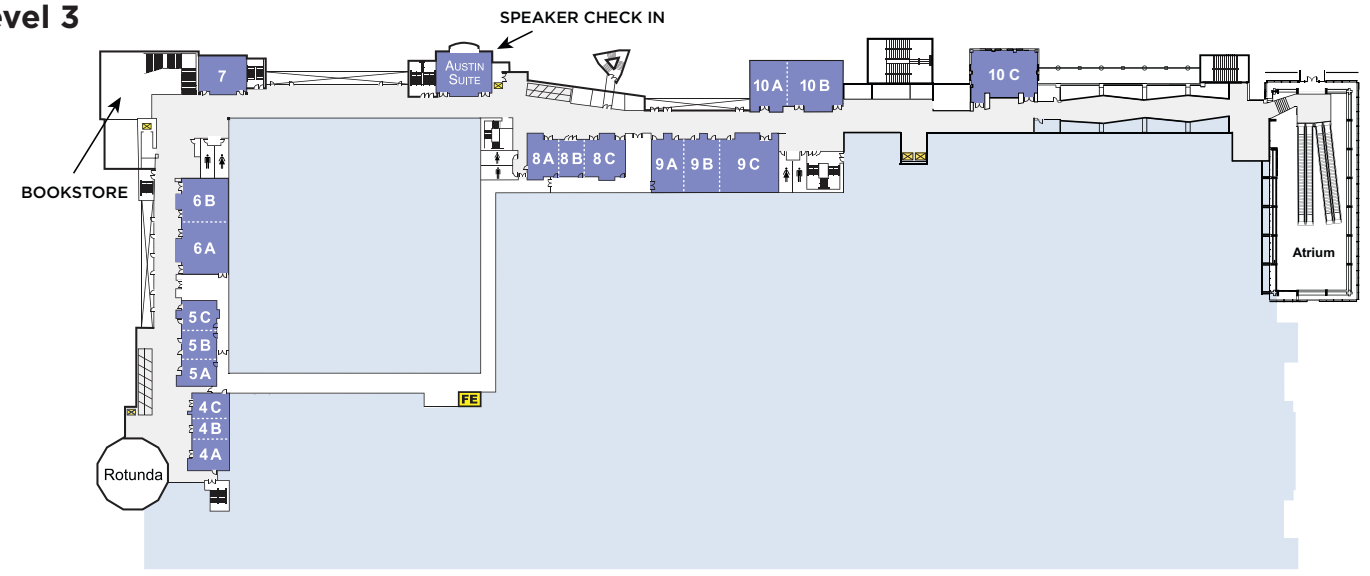

DAILY SCHEDULE

SUNDAY 10 JUNE	MONDAY 11 JUNE	TUESDAY 12 JUNE	WEDNESDAY 13 JUNE	THURSDAY 14 JUNE	FRIDAY 15 JUNE
Plenary Sessions, p. 9–11					
	An Engineering History of the JWST Telescope, *(Feinberg),* 9:00 to 9:30 am	**NICER Early Operations and Results** *(Gendreau),* 9:00 to 9:30 am	**Future Capabilities in Space Servicing and Assembly: Opportunities for the Most Ambitious Space Astrophysics Missions** *(Thronson),* 9:00 to 9:30 am	**Mapping the Nearest Stars for Habitable Worlds** *(Seager),* 8:30 to 9:00 am	
	Future Science with the James Webb Space Telescope *(Mather),* 9:30 to 10:00 am	**The Large Synoptic Survey Telescope: Construction Progress and Scientific Opportunities** *(Willman),* 9:30 to 10:00 am	**How to Diversify Engineering (And Why We Should)** *(Stierwalt),* 9:30 to 10:00 am	*Panel Discussion:* **The Instruments and Technologies that will Discover Life in the Galaxy** *(Siegler),* 9:00 to 10:00 am	
				Public Lecture: **Exoplanets and the Search for Habitable Worlds** *(Seager),* 7:30 to 8:30 pm	
				Public Lecture: **Future Science with the James Webb Space Telescope,** *(Mather),* 8:30 to 9:30 pm	
PROGRAM ON Telescopes and Systems, p. 45–96					
10698 Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave, *Conference Chairs:* **Makenzie Lystrup,** Ball Aerospace & Technologies Corp. (USA); **Howard A. MacEwen,** Reviresco LLC (USA); **Giovanni G. Fazio,** Harvard-Smithsonian Ctr. for Astrophysics (USA)					
10699 Space Telescopes and Instrumentation 2018: Ultraviolet to Gamma Ray, *Conference Chairs:* **Jan-Willem A. den Herder,** SRON Netherlands Institute for Space Research (Netherlands); **Shouleh Nikzad,** Jet Propulsion Lab. (USA); **Kazuhiro Nakazawa,** The Univ. of Tokyo (Japan)					
10700 Ground-based and Airborne Telescopes VII, *Conference Chairs:* **Heather K. Marshall,** DKIST/National Solar Observatory (USA); **Jason Spyromilio,** European Southern Observatory (Germany)					
	10701 Optical and Infrared Interferometry and Imaging VI, *Conference Chairs:* **Michelle J. Creech-Eakman,** New Mexico Institute of Mining and Technology (USA); **Peter G. Tuthill,** The Univ. of Sydney (Australia); **Antoine Mérand,** European Southern Observatory (Chile)				
10702 Ground-based and Airborne Instrumentation for Astronomy VII, *Conference Chairs:* **Christopher J. Evans,** UK Astronomy Technology Ctr. (United Kingdom); **Luc Simard,** NRC - Herzberg Astronomy & Astrophysics (Canada), Thirty Meter Telescope (USA); **Hideki Takami,** National Astronomical Observatory of Japan (Japan)					
10703 Adaptive Optics Systems VI, *Conference Chairs:* **Laird M. Close,** The Univ. of Arizona (USA); **Laura Schreiber,** INAF - Osservatorio Astronomico di Bologna (Italy); **Dirk Schmidt,** National Solar Observatory (USA)					
	10704 Observatory Operations: Strategies, Processes, and Systems VII, *Conference Chairs:* **Alison B. Peck,** Gemini Observatory (USA); **Robert L. Seaman,** Lunar and Planetary Lab., The Univ. of Arizona (USA); **Chris R. Benn,** Isaac Newton Group of Telescopes (Spain)				
10705 Modeling, Systems Engineering, and Project Management for Astronomy VIII, *Conference Chairs:* **George Z. Angeli,** GMTO Corp. (USA); **Philippe Dierickx,** European Southern Observatory (Germany)					
PROGRAM ON Technology Advancements, p. 97–117					
10706 Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation III, *Conference Chairs:* **Ramón Navarro,** NOVA Optical & Infrared Instrumentation Group at ASTRON (Netherlands); **Roland Geyl,** Safran Reosc (France)					
10707 Software and Cyberinfrastructure for Astronomy V, *Conference Chairs:* **Juan C. Guzman,** Commonwealth Scientific and Industrial Research Organisation (Australia); **Jorge Ibsen,** European Southern Observatory appointed to Atacama Large MIllimiter/Submillimiter Array (Chile)					
		10708 Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, *Conference Chairs:* **Jonas Zmuidzinas,** California Institute of Technology (USA); **Jian-Rong Gao,** SRON Netherlands Institute for Space Research (Netherlands), Delft Univ. of Technology (Netherlands)			
10709 High Energy, Optical, and Infrared Detectors for Astronomy VIII, *Conference Chairs:* **Andrew D. Holland,** e2v Ctr. for Electronic Imaging at The Open Univ. (United Kingdom); **James Beletic,** Teledyne Imaging Sensors (USA)					
Courses, p. 14–16					
SC1165: Introduction to Applied Probability for Systems Engineers in Astronomy, *(Arenberg),* 1:30 pm to 5:30 pm	**SC906: Introduction to Visible and NIR Spectrograph Design and Development for Astronomy,** *(Sheinis),* 8:30 am to 5:30 pm	**SC1120: Finite Element Analysis of Optics,** *(Doyle/Genberg),* 8:30 am to 5:30 pm	**SC1001: Systems Engineering for Astronomy Projects,** *(Schnetler),* 8:30 am to 5:30 pm	**SC1139: Systems Engineering and Large Telescope Observatories,** *(Lightsey/Arenberg),* 8:30 am to 5:30 pm	

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Monday Plenary Session

Monday 11 June 2018 · 8:50 to 10:00 AM

Location: CC Level 1, Ballroom A

8:50 to 8:55

PRESENTATION OF SPIE FELLOW AWARD TO

Adrian Russell

European Southern Observatory (Germany)

8:55 to 9:00 AM

WELCOME REMARKS

Session Chairs:

Allison Barto, Ball Aerospace & Technologies Corp. (USA)

Suzanne Ramsay, European Southern Observatory (Germany)

9:00 to 9:30 AM

AN ENGINEERING HISTORY OF THE JWST TELESCOPE

Lee Feinberg

NASA's Goddard Space Flight Ctr. (USA)

The James Webb Space Telescope Optical Telescope Element (OTE) is a deployed cryogenic telescope with a 6.5 meter diameter segmented primary mirror that aligns in space. This revolutionary telescope has been the work of over a 1000 engineers, technicians and scientists over the past 15 years and includes numerous technical innovations and first-of-a-kind achievements. This talk will look back in time at the amazing history of the telescope development including the technology, architecture, design, manufacturing, and integration and testing phases. This will include a description of the early years where three fast paced first-of-a-kind optical technologies were developed that helped enable the mission and explore how early architectural decisions played out during the recent test campaign. The presentation will walk through a visual history of the remarkable mirror development efforts, the innovative wavefront sensing and control demonstrations, and recount the intense last two years of integration and testing where the telescope underwent deployment testing, integration with the science instruments, vibration and acoustic testing, and optical testing at cryogenic temperatures at the Johnson Space Center - including through Hurricane Harvey. The talk will end by looking forward in time and discuss how the Webb telescope experience is informing our ability to build future telescopes.

Biography: **Lee Feinberg** has been the Optical Telescope Element (OTE) Manager for the James Webb Space Telescope at NASA's Goddard Space Flight Center in Greenbelt, Maryland for over 15 years. Prior to that, Lee was Assistant Chief for Technology in the Instrument Systems and Technology Division at Goddard and earlier in his career worked on the Hubble Space Telescope as part of the team that developed the optical correction and upgrade instruments for Hubble. Lee is a fellow of the Society of Photo-Optical Instrumentation Engineers (SPIE) and is an associate editor of the *Journal of Astronomical Telescopes, Instruments, and Systems* (JATIS).

9:30 to 10:00 AM

FUTURE SCIENCE WITH THE JAMES WEBB SPACE TELESCOPE

John Mather

NASA Goddard Space Flight Ctr. (USA), 2006 Nobel Laureate in Physics

Planned for launch in 2019 on an Ariane 5 from French Guiana, JWST will observe at wavelengths from 0.6 to 28 μm with a full suite of imagers, spectrometers, and coronagraphs. JWST will extend the discoveries of the Hubble and Spitzer observatories in all areas from cosmology, galaxies, stars, and exoplanets to our own Solar System. With a 6.5 m primary mirror it has a collecting area 7 times that of Hubble and 50 times that of Spitzer. The image quality is diffraction limited at 2 μm with near IR camera pixels of only 0.03 arcsec. I will outline the planned observing program, showing how the instrument capabilities enable new discoveries in new territories. What were the first objects that formed in the expanding universe? How do the galaxies grow? How are black holes made, ranging from stellar mass to supermassive, over a billion solar masses, and what is their effect on the neighborhood? How are stars and planetary system formed? What governs the evolution of planetary systems, with the possibility of life? How did the Earth become so special? But the most important discoveries will be those we have not even imagined today.

Biography: **John Mather** is the Senior Project Scientist for the James Webb Space Telescope (JWST). The JWST, planned for launch in 2018, will extend the discoveries of the great Hubble Space Telescope, reaching farther back in time, farther out into space, to show us how the expanding universe led to galaxies, stars, planets, and the possibility for life on our tiny Earth. As a 28-year-old postdoc he led the effort to propose the Cosmic Background Explorer satellite (COBE), and then served as its Project Scientist, leading the COBE team to success and to the Nobel Prize in Physics (2006). The COBE measurements started the era of precision cosmology, confirming the expanding universe theory to extraordinary accuracy. Dr. Mather speaks widely on the history of the universe and the astonishing possibilities of our shared future.

PLENARY EVENTS

Tuesday Plenary Session

Tuesday 12 June 2018 · 9:00 AM to 10:00 AM

Location: CC Level 1, Ballroom A

9:00 to 9:30 AM

NICER EARLY OPERATIONS AND RESULTS

Keith Gendreau

NASA Goddard Space Flight Ctr. (USA)

The Neutron Star Interior Composition Explorer (NICER) was launched to the International Space Station (ISS) on June 3, 2017. NICER is a pointed X-ray timing and spectroscopy instrument that provides better than 100 nanosecond measurements of the arrival times of X-ray photons while providing moderate X-ray energy resolution in the 200-12000 eV energy range. The mission focus is to understand ultra-dense matter through X-ray timing of neutron stars. In addition, NICER has demonstrated autonomous pulsar based navigation for the first time. Initial operations on the ISS as well as early science and technology results will be discussed.

Biography: **Keith Gendreau** earned his PhD in astrophysics at MIT working on X-ray CCDs for space applications and the cosmic X-ray background. He started at NASA/GSFC in 1995 working on several X-ray missions and the development of X-ray source, detector, and optics technologies for space and ground applications. He is the principal investigator of the Neutron Star Interior Composition Explorer mission on the ISS.

9:30 to 10:00 AM

THE LARGE SYNOPTIC SURVEY TELESCOPE: CONSTRUCTION PROGRESS AND SCIENTIFIC OPPORTUNITIES

Beth Willman

Large Synoptic Survey Telescope (LSST) (USA)

The mission of the Large Synoptic Survey Telescope (LSST) is to meet a broad range of science goals with a single 10-year, time-domain survey. Over the course of the survey, LSST will deliver a more than 800-frame movie of 18,000 square degrees of the sky in six optical bandpasses. LSST's observing strategy will invest ~90% of its time in this wide-fast-deep survey, with a typical single visit depth of r = 24.7 mag. The remaining ~10% of the observing time will be used to obtain improved coverage of parameter space through Deep Drilling Fields or observations of "special" regions such as the ecliptic, Galactic plane, and the Large and Small Magellanic Clouds. LSST was designed around four key science pillars: taking an inventory of our Solar System, exploring the transient and variable optical sky, mapping the Milky Way and its neighborhood, and delving into the nature of dark matter and dark energy. LSST will be a super discovery machine for an enormous number and diversity of objects across these fields (including Near Earth Objects, distant supernovae, and ultra-faint galaxies) - discoveries that will transform our view of the universe for decades to come. I will give an overview of the LSST Project and science goals, give updates on the construction progress towards first-light, and highlight ways for the scientific community to get involved now.

Biography: **Beth Willman** is the Deputy Director of the Large Synoptic Survey Telescope (LSST) and an Associate Astronomer at the University of Arizona. She earned her PhD from the University of Washington, and then held a James Arthur Fellowship at NYU's Center for Cosmology and Particle Physics and a Clay Fellowship at the Harvard-Smithsonian Center for Astrophysics. Prior to joining LSST, she spent 7 years in the Departments of Physics and Astronomy at Haverford College. Willman is known for her research in near-field cosmology, in particular her discovery of a new class of galaxies - ultra-faint dwarf galaxies.

Wednesday Plenary Session

Wednesday 13 June 2018 · 9:00 AM to 10:00 AM

Location: CC Level 1, Ballroom A

9:00 to 9:30 AM

FUTURE CAPABILITIES IN SPACE SERVICING AND ASSEMBLY: OPPORTUNITIES FOR THE MOST AMBITIOUS SPACE ASTROPHYSICS MISSIONS

Harley Thronson

NASA Goddard Space Flight Ctr. (USA) and the Future Assembly/Servicing Study Team (FASST)

Concepts for the largest future space observatories have reached the limit of the most capable launch vehicles likely to be available over the next two decades. Moreover, unless there is a paradigm change in how future "flagships" are designed, developed, and deployed, it will be a major challenge to afford them. At the same time, significant advances are taking place in the coming decades that have the potential to enable high-priority major space observatories, including (1) significant cost reduction in medium-lift vehicles; (2) continuing advances in capabilities for robotic/telerobotic servicing and assembly; (3) deployment in cis-lunar space of a human habitation and operations facility; and (4) advances in the capabilities of scientific instruments. Taken together, these developments offer in the relative near term opportunities for creative designs for future major observatories to allow sophisticated on-orbit upgrade, as well as eventual space assembly. This talk will summarize work to date on servicing and space assembly, including HST, ISS, and robotic programs, as well as near-future developments that may be the only path to the most ambitious space observatories. Finally, although at present relatively little work has been undertaken on the topic, I will note some ways in which space servicing and assembly might enable lower-cost "flagship" missions.

Biography: **Harley Thronson** is Senior Scientist for Advanced Astrophysics Concepts at NASA GSFC. Previously, while working at NASA Headquarters, he was program scientist for the Hubble and Webb Space Telescopes. In 2013, founded the annual "Achieving and Sustaining Human Exploration of Mars" community workshops. He has published more than 120 research papers and edited eleven books. He is recipient of a NASA Outstanding Leadership Medal and an Exceptional Achievement Medal. In 2017, he shared the American Astronautical Society's Carl Sagan Award for group achievement. Dr. Thronson received his Ph.D. in astrophysics in 1978 from the University of Chicago.

9:30 to 10:00 AM

HOW TO DIVERSIFY ENGINEERING (AND WHY WE SHOULD)

Sabrina Stierwalt

Caltech (USA)

Diversity is the key to the future of engineering. As the talent pool becomes increasingly diverse, the academic programs and tech companies that are able to successfully recruit this new workforce are proving to be more competitive. The inclusion of women and other minorities in technical fields has also proven to be crucial to innovation, talent recruitment, profits, and global competitiveness. While more diverse workplaces are clearly the future, some engineering programs and companies still struggle to keep up. In this talk, I will motivate why diversity and inclusion are key to success and present evidence-based examples of what works to broaden participation whether it be in an academic or corporate setting.

Biography: **Sabrina Stierwalt** is a staff scientist at the California Institute of Technology. Her research in observational extragalactic astrophysics focuses on star formation and the physics of the interstellar medium in galaxy mergers. Her work covers X-ray, UV, optical, infrared, submillimeter, and radio wavelengths.

Thursday Plenary Session

Thursday 14 June 2018 · 8:30 AM to 10:00 AM

Location: CC Level 1, Ballroom A

8:30 to 9:00 AM

MAPPING THE NEAREST STARS FOR HABITABLE WORLDS

Sara Seager

Massachusetts Institute of Technology (USA)

Thousands of exoplanets are known to orbit nearby stars and small rocky planets are established to be common. The ambitious goal of identifying a habitable or inhabited world is within reach. The race to find habitable exoplanets has accelerated with the realization that "big Earths" transiting small stars can be both discovered and characterized with current technology, such that the James Webb Space Telescope has a chance to be the first to provide evidence of biosignature gases. Transiting exoplanets require a fortuitous alignment and the fast-track approach is therefore only the first step in a long journey. The next step is sophisticated starlight suppression techniques for large ground-based telescopes now under construction and hopeful future space-based based telescopes to observe small exoplanets directly. These ideas will lead us down a path to where future generations will implement very large space-based telescopes to search thousands of all types of stars for hundreds of Earths to find signs of life amidst a yet unknown range of planetary environments. What will it take to identify habitable worlds with the telescopes available to us?

Biography: **Sara Seager** of the Massachusetts Institute of Technology is a Professor of Planetary Science, Physics, Aerospace Engineering, and holds the Class of 1941 Professor Chair. She has pioneered many now foundational research areas of characterizing exoplanets, with present focus on the search for life by way of exoplanet atmospheric "biosignature" gases. She is PI of the CubeSat ASTERIA; Deputy Science Director of the MIT-led NASA Explorer-class mission TESS; and a lead of the Starshade Rendezvous Mission (a space-based direct imaging exoplanet discovery concept under technology development). Professor Seager was elected to the US National Academy of Sciences in 2015 and is a 2013 MacArthur Fellow.

9:00 to 10:00 AM

Panel Discussion:

THE INSTRUMENTS AND TECHNOLOGIES THAT WILL DISCOVER LIFE IN THE GALAXY

Moderator: **Nick Siegler,** Jet Propulsion Laboratory/Caltech (USA)

The search for life in the Galaxy is one of the most endearing but most challenging to answer questions in science. However, we are on the cusp of developing the needed instruments and technologies to finally answer the question "Are we alone?". The SPIE has put together a distinguished panel of scientists and engineers who are conceptualizing and developing the most advanced ground- and space-based instruments and technologies. This panel and their moderator will discuss what steps remain and the challenges they're facing individually and collectively.

Panelists:

Jeremy Kasdin, Princeton Univ.

Misato Fukagawa, Nagoya Univ.

David Bennett, Goddard Space Flight Ctr.

Michael Shao, Jet Propulsion Lab.

Public Lectures

Thursday 14 June 2018 · 7:30 PM to 9:30 PM

Location: CC Level 1, Ballroom A

7:30 to 8:30 PM

EXOPLANETS AND THE SEARCH FOR HABITABLE WORLDS

Sara Seager

Massachusetts Institute of Technology (USA)

For thousands of years people have wondered, "Are there planets like Earth?" "Are such planets common?" "Do any have signs of life?" Today astronomers are poised to answer these ancient questions, having recently found thousands of planets that orbit nearby stars, called "exoplanets". Professor Sara Seager will share the latest advances in this revolutionary field.

8:30 to 9:30 PM

FUTURE SCIENCE WITH THE JAMES WEBB SPACE TELESCOPE

John Mather

NASA Godard Space Fight Ctr. (USA), 2006 Nobel Laureate in Physics

Planned for launch in 2019 on an Ariane 5 from French Guiana, JWST will observe at wavelengths from 0.6 to 28 μm with a full suite of imagers, spectrometers, and coronagraphs. JWST will extend the discoveries of the Hubble and Spitzer observatories in all areas from cosmology, galaxies, stars, and exoplanets to our own Solar System. With a 6.5 m primary mirror it has a collecting area 7 times that of Hubble and 50 times that of Spitzer. The image quality is diffraction limited at 2 μm with near IR camera pixels of only 0.03 arcsec. I will outline the planned observing program, showing how the instrument capabilities enable new discoveries in new territories. What were the first objects that formed in the expanding universe? How do the galaxies grow? How are black holes made, ranging from stellar mass to supermassive, over a billion solar masses, and what is their effect on the neighborhood? How are stars and planetary system formed? What governs the evolution of planetary systems, with the possibility of life? How did the Earth become so special? But the most important discoveries will be those we have not even imagined today.

TECHNICAL EVENTS

Poster Sessions

Location: CC Level 1, Hall 2

Conference attendees are invited to attend the poster sessions. Come view the posters, ask questions, and enjoy light refreshments. Authors of poster papers will be present during the poster sessions to answer questions concerning their papers. As part of the technical program, poster sessions are for paid registrants only. Attendees are required to wear their conference registration badges to the poster sessions.

DAILY SCHEDULE

Poster Set Up - Beginning at 10:00 AM

Extended Poster Viewing from 10:00 AM to 5:00 PM

POSTER SESSIONS (Authors Present):

Each session includes a unique set of posters. See individual conference programs for schedule.

Sunday . . . . . 6:00 to 8:00 PM

Monday . . . . . 5:30 to 7:00 PM
(followed by Welcome Reception)

Tuesday . . . . . 6:00 to 8:00 PM
(includes exhibition)

Wednesday . . . . . 6:00 to 8:00 PM

Thursday . . . . . 6:00 to 8:00 PM

POSTER AUTHOR SET-UP INSTRUCTIONS

Paper numbers will be included on the poster boards in numerical order; please find your paper number and display your poster in the designated space. Authors are encouraged to display their posters early in the day for extended viewing. A poster author or coauthor is required to stand by the poster during the scheduled interactive poster session to answer questions from attendees. Presenters who have not displayed their posters on their assigned board at least one-half hour before the interactive poster session begins will be considered a "no show" and their manuscript will not be published. 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. See poster guidelines for additional information.

Enclosure Shutter Systems Workshop

Wednesday 13 June 2018 · 7:00 PM to 9:00 PM

Location: CC Level 1, Room 2

Workshop Chairs: **Mario Tapia** (ESO), **Bruce Bigelow** (GMTO), **Chris Madden** (GMTO)

This objective of this workshop is to gather technical staff working on and interested in operation, repair, maintenance, and design of observatory enclosure shutter systems. Workshop may include presentations on observatory shutter system design characteristics, operational behavior, maintenance, modifications, upgrades, and/or repairs.

Optical Coatings Workshop

Thursday 14 June 2018 · 7:00 PM to 9:00 PM

Location: CC Level 1, Room 2

Workshop Chairs: **Ronald Holzlöhner** (ESO), **Maxime Boccas** (ESO) **Drew Phillips** (UCO Lick)

The objective of this workshop is to gather technical staff working on and interested in optical coatings in a less formal setting than conference proceedings.

Topics of interest include:

- Re-aluminizing mirrors (new findings/ideas/processes)
- Protected-Ag mirrors (status, successes/failures, new results/processes/recipes)
- Cleaning, maintenance and following the performance of coatings over time (contamination, aging)
- Reflectivity and differential polarization state change upon reflection

SPIE Hack Day

Friday 15 June 2018 · 8:00 AM to 5:00 PM

Location: CC Level 3, Room 10C

This will be an all-day open event without formal presentations to work on software, engineering, or hardware hack projects with new or existing collaborators. The goal is to bring creative minds and talented developers together to share ideas, experiment, solve problems, or create new data in innovative ways. Hack projects revolve around rapidly developing small coding prototypes that can be built in a relatively short time and can serve as the basis for a whole new community endeavor. The overlap of ideas, skills, experience, and knowledge can be used to solve problems in new ways. We hope that many budding and experienced developers, scientists, and engineers will join this event.

Speaker Check-In for Oral Presentations

If you have not already uploaded your presentation file, please bring your file(s) with you on a USB flash drive to the Speaker Check-In Room: Austin Suite (located on Floor 3). Presentation files for oral talks MUST be submitted at least 2 hours before your scheduled talk. You may NOT upload in your session room or use your own device to present. See spieuploads.com for additional information.

Women in Optics and Diversity and Inclusion Luncheon

Monday 11 June 2018 · 12:00 PM to 1:30 PM

Location: Hilton, 4th Floor, Salon D

SPIE Women in Optics is excited to partner with the SPIE Diversity & Inclusion Committee on this working luncheon. A portion of the event will be dedicated to discussing issues of gender equity within the context of table topics listed below and then the conversations will turn to addressing other forms of diversity and inclusion issues (race, religion, sexuality, age, etc.) using the same table topics. At the end of the luncheon, groups will share their proposed actions to improve gender equity, diversity, and inclusion in optics.

This event is open to all technical attendees. Do you know someone who has dealt with one of the issues listed below? Has their organization developed a program to address them? Are you interested in affecting change? Come share your suggestions and help us develop programs or systems to address these important issues.

Table topics:

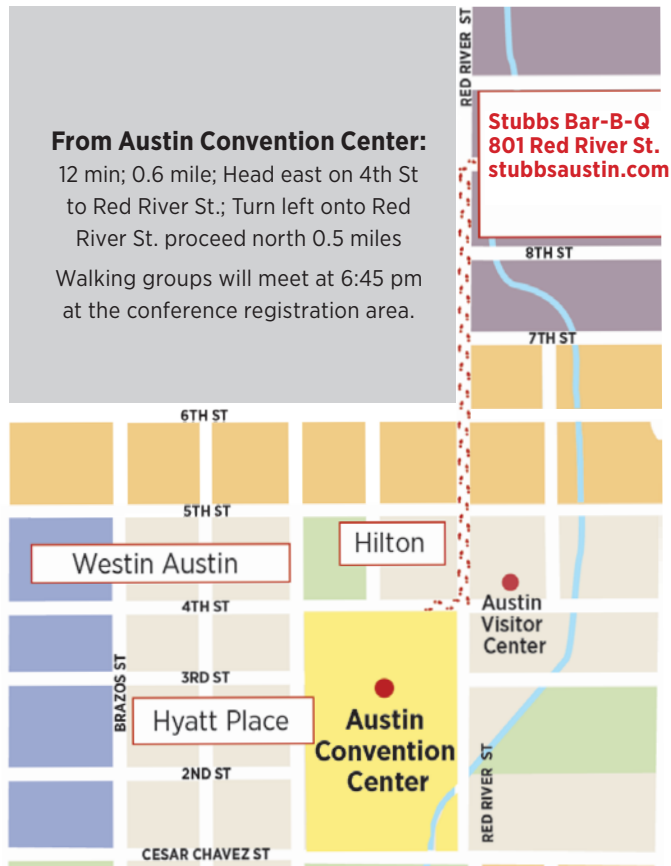
1. Improving gender equity, diversity, and inclusion in conference planning and organization
2. Improving gender equity, diversity, and inclusion in SPIE committees
3. Raising awareness for Improving gender equity, diversity, and inclusion in your workplace
4. Building gender equity, diversity, and inclusion in the optics and photonics scientific community
5. Raising awareness of gender equity, diversity, and inclusion in the optics industry
6. Identifying global issues around gender equity, diversity, and inclusion
7. Creating an infrastructure for diverse and inclusive networking
8. Making change early (K-12) in the community

Welcome Reception

Monday 11 June 2018 · 7:00 PM to 9:00 PM

Location: Stubbs BBQ, 801 Red River Street

Attendees will enjoy traditional Texas barbecue and live music at the historic Stubb's BBQ and music venue, located within walking distance of the convention center. The indoor/outdoor venue captures the rustic spirit of Austin, Texas. Walking groups will meet at 6:45 pm at the conference registration area. All paid registered conference attendees and exhibitors are welcome. Please wear your conference badge. Dress is casual. Comfortable shoes are recommended.



Lunch with the Experts— A Student Networking Event

Tuesday 12 June 2018 · 12:30 PM to 1:30 PM

Location: Hilton, 4th Floor, Salon D

Open to Student Conference Attendees.

Enjoy a casual meal with colleagues at this engaging networking opportunity. Hosted by SPIE Student Services, this event features experts willing to share their experience and wisdom on career paths in optics and photonics. Seating is limited and will be granted on a first-come, first-served basis.

All-Conference Dinner

Tuesday 12 June 2018 · 7:00 PM to 9:30 PM

Location: Hilton, 4th Floor, Salon D/E

Attendees are invited to join the symposium committee for a sit-down banquet dinner with your colleagues. Tickets for the dinner are sold separately and can be purchased during registration. Space is limited, and tickets must be purchased before 10 June to guarantee a seat.

COURSES

Advance your career.

- Learn from the best. This is your opportunity for direct instruction from recognized experts in the industry and academia
- Course topics are aligned with current industry needs and trends
- Earn CEUs for professional continuing education requirements

SPIE STUDENT MEMBERS RECEIVE DISCOUNTS ON COURSES

CONTINUING EDUCATION UNITS

SPIE is accredited by the International Association for Continuing Education and Training (IACET) and is authorized to issue the IACET CEU.

MONEY-BACK GUARANTEE

We are confident that once you experience an SPIE course for yourself you will look to us for your future education needs. However, if for any reason you are dissatisfied, we will gladly refund your money. We just ask that you tell us what you did not like; suggestions for improvement are always welcome.

Systems Engineering for Astronomy Projects

SC1001

Course Level: Introductory · CEU: 0.7
$625 Members | $735 Non-Members
$369 Student Members
Wednesday 8:30 AM to 5:30 PM

This course provides an introduction to learn systems engineering for the development of telescopes, facilities and instruments for astronomy. A primary goal of this course is to illustrate how the rigor of the systems engineering process can help us to build better astronomy products more quickly and more affordable by using the concept phase to define the product well and plan the project for success. The course will be exercise-driven, using an example of an actual instrument. During the course we will explore the various analysis methods that can be used to derive functional and performance requirements of an astronomical instrument. Participants will also learn how to write correct, clear, and concise requirements. This will be followed by working through an example to show the interaction between allocations and performance estimations. The course will conclude with a session on how to plan the project based on the product breakdown structure developed during the course.

LEARNING OUTCOMES

- develop user (science) requirements for astronomical facilities and systems
- analyze science requirements and perform a functional analysis
- implement functions, prepare concept solutions, and develop system architecture
- capture and derive functional performance and other requirements
- show the path to final acceptance during manufacturing, assembly, integration and system verification testing
- describe product breakdown structure-based project planning

INTENDED AUDIENCE

Project managers, systems engineers and lead engineers who wish to learn how to develop a system architecture that will deliver the science by deriving, capturing and manage the requirements. Engineers and Project/Instrument scientists who wish to learn more about systems engineering. Undergraduate training in engineering or science is assumed.

ABOUT THE INSTRUCTOR

Hermine Schnetler has been a Systems Engineer for more than 25 years, initially working in the Defence industry on products such as inertial navigation systems for aircraft, helmet sighting systems and helicopter mounted sighting systems. She has joined the United Kingdom Astronomy Technology Centre (UK ATC) twelve years ago and is the Head of Group: Systems Engineering. She tailored and successfully introduced systems engineering for astronomy and was also involved in a number of instrument studies. Currently Dr. Schnetler is the systems engineer for the HARMONI Integral Field Spectrograph, one of the first light instruments for the European Extremely Large Telescope and until recently she was also the lead systems engineer for the Low Frequency Aperture Array which is one of the critical systems for the Square Kilometre Array Low Telescope. She has a first degree in Electronics Engineering and an MSc in Systems Engineering. Both of these were obtained from the University of Pretoria in South Africa. She followed this with a PhD in Software Engineering from Cranfield University, UK. Dr Schnetler is a member of the International Council on Systems Engineering (INCOSE), a member of the Institute for Engineering Technology and SPIE.

Finite Element Analysis of Optics

SC1120

Course Level: Intermediate · CEU: 0.7
$695 Members | $805 Non-Members
$397 Student Members
Tuesday 8:30 AM to 5:30 PM

This course presents the use of finite element methods to model and predict the behavior of optical elements and support structures including lenses, mirrors, windows, and optical mounts in the presence of mechanical and environmental loads. Students will learn general FEA modeling strategies and guidelines specific to optical systems including how to develop low-fidelity models to quickly perform optomechanical design tradeoffs as well as the creation of high-fidelity models to support detailed design. Emphasized will be the application of FEA techniques to meet optical system error budget allocations including mounting tolerances, alignment errors, optical surface distortions, image stability, and wavefront error. In addition, use of FEA to ensure structural integrity requirements including yield, buckling, and fracture will be discussed.

LEARNING OUTCOMES

- develop optical component and system level finite element models
- model conventional and lightweight mirrors including evaluating the impact of optical coatings
- analyze optical mounts including kinematic, flexure, and optical bond designs
- predict optical alignment errors due to mechanical, assembly, and environmental loads
- perform optical surface error analyses using Zernike polynomials
- predict optical system image motion due to thermal and dynamic environments
- evaluate the effects of temperature and stress on optical performance

INTENDED AUDIENCE

This course is intended for mechanical engineers interested in learning about the application of finite element analysis in the mechanical design of optical systems. An interest in optomechanical engineering and/or familiarity with finite element software is recommended.

ABOUT THE INSTRUCTORS

Keith B. Doyle has over 25-years experience in the field of optomechanical engineering developing high-performance imaging systems for aerospace applications. He is a co-author of the book titled Integrated Optomechanical Analysis, has authored or co-authored over 40-publications in the field, is a Fellow of SPIE, and the recipient of the 2015 SPIE Technology Achievement award. He is currently employed at MIT Lincoln Laboratory as a Group Leader in the Engineering Division. Previously he served as Vice President of Sigmadyne Inc. and as a Senior Systems Engineer at Optical Research Associates. He received his Ph.D. in engineering mechanics with a minor in optical sciences from the University of Arizona.

Victor L. Genberg has over 40-years experience in the application of finite element methods to high-performance optical structures and is a recognized expert in opto-mechanics. He is currently President of Sigmadyne, Inc. and a Professor of Mechanical Engineering at the University of Rochestor where he teaches courses in optomechanics, finite element analysis, and design optimization. He is the co-author of the book titled Integrated Optomechanical Analysis has over 40 publications in this field including two chapters in the CRC Handbook of Optomechanical Engineering. Prior to founding Sigmadyne, Dr. Genberg spent 28-years at Eastman Kodak serving as a technical specialist for military and commercial optical systems.

COURSE PRICE INCLUDES the text Integrated Optomechanical Analysis, 2nd Edition (SPIE Press, 2012) by Keith Doyle, Victor Genberg, and Gregory Michels.

Systems Engineering and Large Telescope Observatories

SC1139

Course Level: Introductory · CEU: 0.7
$625 Members | $735 Non-Members |
$369 Student Members
Thursday 8:30 AM to 5:30 PM

Modern astronomical observatories are becoming larger and more complex with many components working together to achieve the common goal of gathering useful information for astro-scientists. Successful engineering of these observatories is enabled by following a systems engineering viewpoint of looking at the whole. This viewpoint requires a multidisciplinary breadth and the ability to find a balance among 1) the system user's needs and desires, 2) the manager's funding and schedule constraints, and 3) the capabilities and ambitions of the engineering specialists who develop and build the system. The system engineer is sometimes described as the person on the program who should know the partial derivative of every parameter of the system with respect to every other parameter. This course introduces the concepts and models that are used to evolve a system from an abstract vision to the final validated and verified operational system. Examples are given that provide insight into the variety of engineering disciplines and typical subsystems found in observatories for optical astronomy observatories (X-ray through IR).

LEARNING OUTCOMES

- explain the stages within a System Engineering Life Cycle Model
- create a context diagram for the system, identifying both internal and external interfaces
- construct an iterative process for flowing from Science Mission goals to system level functional and physical requirements down to component level requirements within the constraints of the development process
- demonstrate how to evaluate trades and analyses of alternatives
- conduct maturity, risk assessment and tracking analyses to identify and manage technology development and risk mitigation activities
- explain the role of technical budgets for managing requirements and the mathematics behind them
- determine the basics of probabilistic risk assessment
- provide examples of Technical Performance Metrics monitoring as a tool in requirements management
- describe the use of integrated modeling as a tool for design development and system verification

INTENDED AUDIENCE

Scientists, engineers, or managers who wish to learn more about system engineering as applied to mission definition and engineering development of large telescope astronomical observatories. The focus will be on space based observatories, but with relevant overlap with ground based systems. Undergraduate training in science or engineering is assumed.

ABOUT THE INSTRUCTORS

Paul A. Lightsey has more than 50 years' experience in Physics, Mathematics, and Engineering in the area of optical systems analysis and design. He is currently the Chief Engineer for the Webb Space Telescope program at Ball, and a member of the NASA Mission Systems Engineering Optical Leads for Webb. He has contributed to all phases of development from new business through design, fabrication, alignment, test, calibration, and on-orbit operations while at Ball. Dr. Lightsey has extensive experience working on Hubble Space Telescope (HST) instruments and was the System Engineer for the Near Infrared Camera and Multi-Object Spectrometer (NICMOS). He developed a system optical performance model for design analysis of COSTAR, the corrective optics for the Hubble Space Telescope. This model includes modeling of structural dynamics and thermal effects on the imaging performance and was also used for design analysis of NICMOS, STIS, and Webb. Dr. Lightsey has experience in modeling optical propagation through the atmosphere, atmospheric remote sensing instrumentation, pointing and tracking systems, and spacecraft orbit and attitude analyses. Before

coming to Ball, Dr. Lightsey was a professor of physics and mathematics for 14 years with an eclectic background covering low-temperature solid state physics, sports mechanics, and environmental sciences. He has taught in the Johns Hopkins University Masters of Science in Systems Engineering program; SPIE system engineering short courses; and internal courses at Ball. Dr. Lightsey received his BS in Physics with High Distinction from Colorado State University in 1966, and his Ph.D. in Physics from Cornell University in 1972. In 2003 he received the William H. Follett, Jr. Award for Excellence in System Engineering, and in 2007 he received the Distinguished Public Service Medal from NASA. He currently serves on NASA's Cosmic Origins Program Analysis Executive Committee. He is a Senior Member of OSA and is a SPIE Fellow.

Jonathan W. Arenberg is currently the Chief Engineer for the James Webb Space Telescope at Northrop Grumman Aerospace Systems and has been with the company since 1989. He started his career at Hughes Aircraft Company. His work experience includes optical, space and laser systems. Dr. Arenberg has worked on such astronomical programs as the Chandra X-ray Observatory, James Webb Space Telescope and helped develop the New Worlds Observer concept for the imaging of extra-solar planets. He has worked on major high-energy and tactical laser systems, laser component engineering and metrology issues. He is a member of the ISO sub-committee charged with writing standards for laser and electro-optic systems and components, SPIE, American Astronomical Society and AIAA. Dr. Arenberg holds a BS in physics (1983) and an MS (1985) and PhD (1987) in engineering, all from the University of California, Los Angeles. He is the author of over 100 conference presentations and publications, and holds 1 European and 11 U.S. Patents in a wide variety of areas of technology. Dr. Arenberg is a member of the SPIE Distinguished Speakers program.

Introduction to Visible and NIR Spectrograph Design and Development for Astronomy

SC906

Course Level: Introductory · CEU: 0.7
$745 Members | $855 Non-Members
$417 Student Members
Monday 8:30 AM to 5:30 PM

This course provides attendees with an introduction to aerial spectrograph design and development for astronomy. The course concentrates on system configurations and performance optimization and analysis. Specific concepts to be addressed include: image quality, throughput, flexure, performance modeling and system testing.

LEARNING OUTCOMES

- identify the fundamental optical and mechanical principles that affect spectrograph performance
- construct different first-order design configurations that achieve a desired resolution and field-of-view
- compare the relative merits of different component designs
- specify optical components for vendor quote and fabrication
- judge whether various vendor acceptance tests are sufficient
- design efficient end-to-end testing for your spectrograph

INTENDED AUDIENCE

The material presented in this course is intended for anyone who is developing an astronomical spectrograph or who wants to understand the various constraints, trade-offs and system-level decisions that go into the design of a visible/NIR spectrograph in order to optimize for performance. This course is ideal for a first-time instrument PI as well as graduate students and engineers who will be part of an astronomical-spectrograph development team.

ABOUT THE INSTRUCTOR

Andrew I. Sheinis is the Head of Instrumentation at the Australian Astronomical Observatory (AAO) in Sydney Australia. He has been involved in optical system design and engineering for over 25 years. He is currently the PI for the HERMES Spectrograph, designed primarily for the GALAH Galactic Archeology Survey and recently commissioned at the AAT. In addition, he has developed instruments for the SALT Telescope, Lick Observatory, Keck Observatory and the University of Hawaii as well as medical and defense applications in industry.

COURSE PRICE INCLUDES the text Astronomical Optics, Second Edition (Academic Press, 1999) by Daniel J. Schroeder.

Introduction to Applied Probability for Systems Engineers in Astronomy

SC1165

Course Level: Introductory · CEU: 0.4
$390 Member | $445 Non-Member
$253 Student Member
Sunday 1:30 PM to 5:30 PM

This course introduces the basic principles of probability applied to systems engineering in astronomical systems. The emphasis in this short course is on the central problem of performance budgeting. A primary goal of the course is explaining the logic, construction and application of performance and error budgeting. The first portion of the course introduces the necessary fundamental concepts and theory. The latter portion concentrate on examples taken from various problems in systems engineering of astronomical systems. Examples include statistical and "not to exceed" budgets typically seen in practice. This course will be of benefit to anyone who wants to answer the questions, "what are the chances of success of my project?", "what factors are affecting the risk the performance of my project?" and "how can I maximize the probability of success?"

LEARNING OUTCOMES

- compose a performance or error budget
- identify if the budget is statistical in nature or "not to exceed"
- calculate the distribution of likely outcomes of a design process
- identify the sensitivity of performance to system parameters
- explain the probability of the success of design project

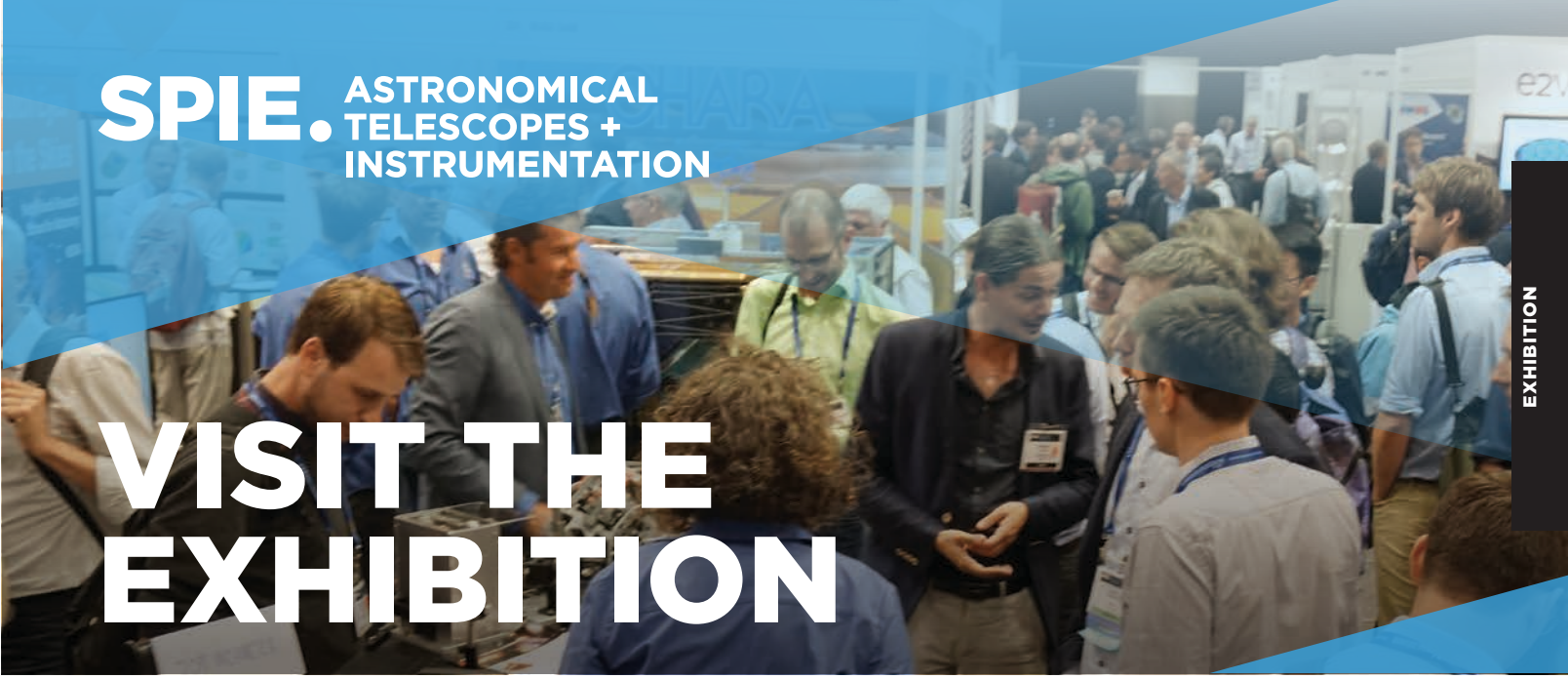
INTENDED AUDIENCE

Scientists, engineers, technicians, or managers who wish to learn more about how to apply probability to engineering problems. Undergraduate training in engineering or science is assumed.

ABOUT THE INSTRUCTOR

Jonathan W. Arenberg has been working as an optical and systems engineer for over 30 years. His work experience has included tactical and high-power laser components and systems and major space astronomical projects such as Chandra and the James Webb Space Telescope and numerous technology efforts. He holds degrees in physics and engineering from the University of California, Los Angeles and currently the Chief Engineer for Northrop Grumman Aerospace Systems on the James Webb Space Telescope and for Space Science Missions. Dr. Arenberg is an SPIE fellow.

SPIE. ASTRONOMICAL TELESCOPES + INSTRUMENTATION



EXHIBITION

VISIT THE EXHIBITION

Meet face-to-face with suppliers to find photonics innovations for your advanced applications.

Connect with the contractors, key suppliers, and dynamic startups ready to help you boost capabilities and cut costs. This free exhibition showcases the newest products, latest innovations, and cutting-edge technologies in ground- and space-based telescopes, supporting technologies, and the latest instrumentation, and more.

EXHIBITION DATES

Tuesday 12 June · 3:00 PM to 8:00 PM
(includes Poster Session)

Wednesday 13 June · 10:00 AM to 4:00 PM

Thursday 14 June · 10:00 AM to 4:00 PM

SPIE Astronomical Telescopes + Instrumentation Exhibition, the marketplace for developers of ground- and space-based telescopes, supporting technologies, and the latest instrumentation.

FEATURED TECHNOLOGIES

- **Devices and components for large ground-based telescopes**
- **Ground instruments**
- **Astronomy information technologies**
- **Space telescopes and instruments**
- **Detectors**
- **Specialized optics materials and systems**

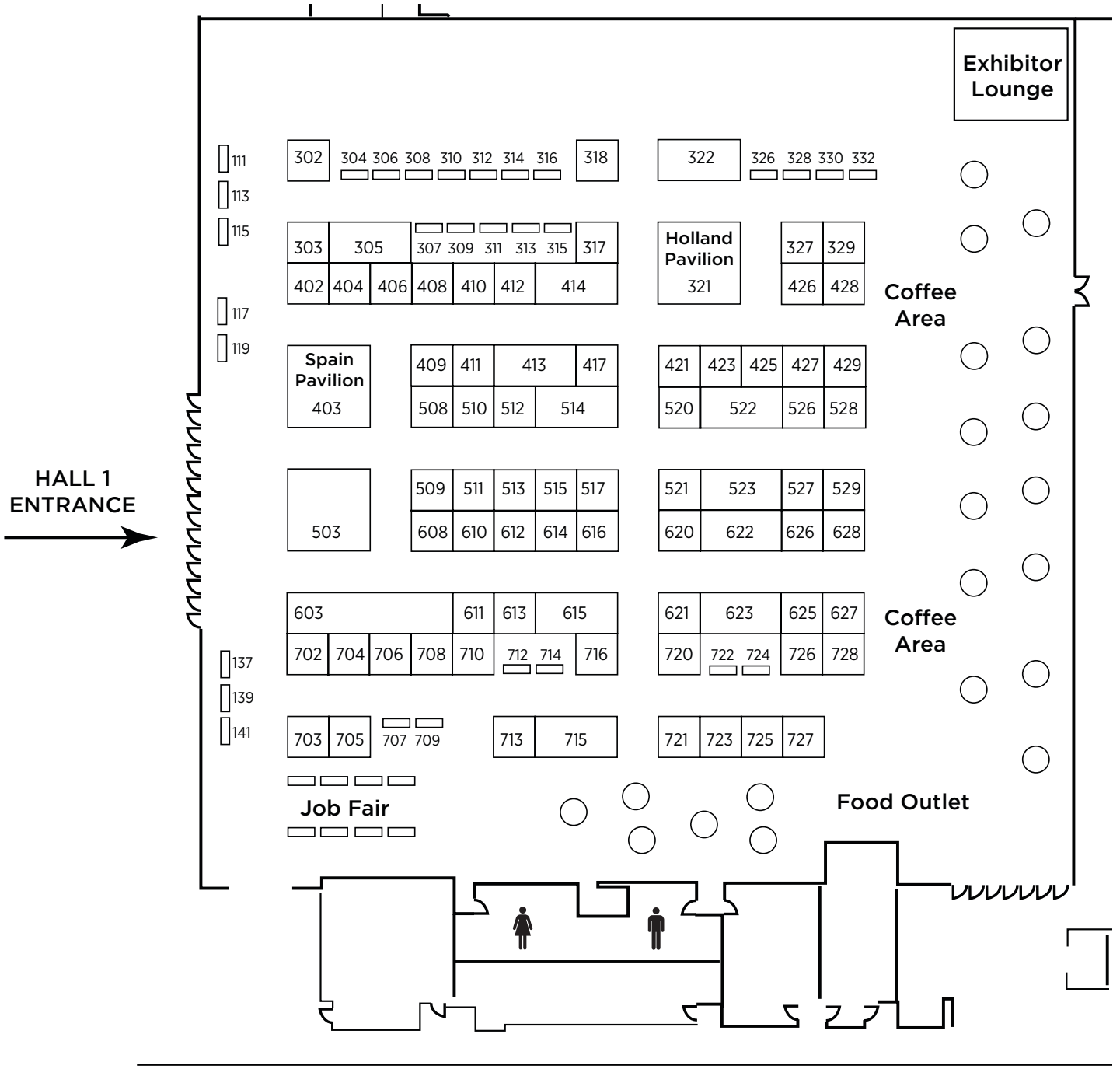
HOW TO USE THIS DIRECTORY

SPIE Astronomical Telescopes + Instrumentation exhibitors are indexed by booth number on page 19, then listed in alphabetical order with details about products or services each is exhibiting. Booth numbers may be cross-referenced with the map on p. 18

Companies are additionally cross-indexed by technology areas in the Product Category Index on pages 37–39 to allow you to quickly shop for products for your engineering and business needs, making this Exhibition Guide an excellent reference tool.

Exhibiting Company directory, as of 8 May 2018

AUSTIN CONVENTION CENTER, EXHIBITION HALL 1



Booth #	Exhibitor
517	4D Technology Corp.
141	AdTech Ceramics Co.
704	Aerotech, Inc.
713	Alluxa, Inc.
309	ALLVAR
404	ALPAO S.A.S.
411	AMOS - Advanced Mechanical & Optical Systems
414	Andor Technology Ltd.
520	Andover Corporation
117	Applied Surface Technologies
115	Äpre Instruments, LLC
705	Archer OpTx, Inc.
302	ASA Astrosysteme GmbH
426	Asahi Spectra USA Inc.
318	ASTELCO Systems GmbH
321	ASTRON
328	Astronomical Consultants & Equipment Inc.
312	Atatürk Univ. Astrophysics Research & Application Center - ATASAM
322	Australian National University
403	AVS Added Value Industrial Engineering Solutions S.L.U.
503	Ball Aerospace
529	Bertin Technologies
139	Boston Micromachines Corp.
313	Cambridge Innovations
527	Canon U.S.A., Inc.
410	Cherenkov Telescope Array
315	CILAS
321	cosine measurement systems
528	Cosylab
119	Dynamic Optics
610	Dynavac
622	EIE Group s.r.l.
703	EMF Corp.
425	EMSS Antennas
137	Energetiq Technology, Inc.
428	EOS Space Systems Pty. Ltd.
308	ETALON North America Inc.
403	Fagor Automation Scoop LDA
720	Fiberguide Industries, Inc.
310	Fibertech Optica Inc.
409	Finger Lakes Instrumentation
429	First Light Imaging
312	FMV Isik University Center for Optomechatronics Research & Application - OPAM
403	FRACTAL S.L.N.E.
706	General Dynamics Mission Systems
523	Giant Magellan Telescope
512	Gpixel Inc.
417	Harris Corporation
608	HEIDENHAIN Corporation
317	Hellma Materials
714	Hofstadter Analytical Services, LLC
725	HORIBA FRANCE SAS
403	ICEX Spanish Science Industry
623	IDOM
427	Imagine Optic Inc.
403	INEUSTAR Asociación Española de la Industria de la Ciencia
306	Infinite Optics Inc.
613	Infrared Laboratories
727	Kaiser Optical Systems, Inc.
612	Kyocera International, Inc.
614	LSST
621	Luxel Corp.
710	Mad City Labs., Inc.
626	Materion Precision Optics
708	Media Lario S.r.l.
721	Molex - Polymicro
515	MPB Communications Inc
722	MPS Micro Precision Systems AG
413	MT Mechatronics GmbH
321	Netherlands Research School for Astronomy
627	New England Optical Systems
304	New Scale Technologies, Inc.
509	Newport Corp.
709	Nikon Glass Business Unit
307	Nüvü Caméras
712	Observatory Sciences Ltd.
522	Officina Stellare SrL.
616	Ohara Corp.
314	Omega Optical Filters
423	Optical Mechanics, Inc.
603	Optics.org
620	Optimax Systems, Inc.
707	PHASICS Corp.
113	Photon Engineering LLC
716	Photonic Cleaning Technologies
615	PI (Physik Instrumente) L.P.
305	PlaneWave Instruments, Inc.
303	Princeton Infrared Technologies, Inc.
402	Princeton Instruments
421	QED Optics
316	QHYCCD
628	Raptor Photonics Ltd.
702	Safran Reosc
511	Sandvik Osprey Ltd.
514	SCHOTT North America, Inc.
403	Sener Ingenieria y Sistemas SA
526	Sigmadyne, Inc.
412	Southern African Large Telescope
521	Spectral Instruments, Inc.
326	Spectrum Thin Films
603	SPIE Career Center
603	SPIE Digital Library
611	Sunpower, Inc.
723	Swiss Industry Liaison Office
728	Symétrie
715	Teledyne
715	Teledyne Imaging - Space & Defense
513	Thales SESO
408	Thirty Meter Telescope International Observatory
625	Thorlabs, Inc.
321	TNO
515	TOPTICA Photonics, Inc.
311	TSUBAKI KABELSCHLEPP GmbH
403	TTI
510	US Fiberoptec Technology, Inc.
321	VDL Science & Technology
724	VIAVI Solutions
406	Vincent Associates
529	Winlight System & Optics
508	Zygo Corporation

EXHIBITION DIRECTORY

SPONSOR

4D Technology Corp. #517

SPIE. Corporate Member

3280 E Hemisphere Loop Ste 146, Tucson, AZ, 85706-5039 USA
+1 520 294 5600; fax +1 520 294 5601
info@4dtechnology.com; www.4dtechnology.com

Featured Product: PhaseCam 6100 Ultra-Compact Twyman-Green Laser Interferometers for visible through SWIR wavelengths

4D Technology designs and manufactures dynamic laser interferometers, optical profilers, surface gauges and polarization cameras for non-contact metrology of optics and precision surfaces, even in the presence of vibration. 4D laser interferometers acquire data in as little as 30 microsec, at wavelengths from DUV through IR, with apertures from 33 to 800mm. Applications include astronomy, aerospace, general optics, flexible electronics, displays and more. Contact: Steven J. Martinek, Director of Sales and Marketing, steve.martinek@4dtechnology.com

AdTech Ceramics Co. #141

SPIE. Corporate Member

511 Manufacturers Rd, Chattanooga, TN, 37405-3203 USA
+1 423 755 5400; fax +1 423 755 5438
sales.department@adtechceramics.com; www.adtechceramics.com

Featured Product: High Temperature Co-fired Ceramic Electronic packages and metallized precision ceramic components.

AdTech Ceramics offers a full line of multilayer co-fired ceramic packages for electronic applications. With a fully integrated manufacturing facility located in Chattanooga, TN and over 45 years' experience producing high temperature co-fire ceramics (HTCC) from alumina and aluminum nitride, we are ideally positioned to take on the most challenging packaging designs. Additionally, our injection molding operation allows for the economical production of complex ceramic components. Contact: Douglas Brown, Director of Sales and Marketing, douglas.brown@adtechceramics.com; Kyle Adams, Sales Engineer, kyle.adams@adtechceramics.com

Aerotech, Inc. #704

SPIE. Corporate Member

101 Zeta Dr, Pittsburgh, PA, 15238-2811 USA
+1 412 963 7470; fax +1 412 963 7459
sales@aerotech.com; www.aerotech.com

Aerotech manufactures motion control and positioning systems and components including direct-drive and piezo nanopositioners; hexapods; gimbals/optical mounts; planar and rotary air-bearing stages; high-speed gantries; mechanical-bearing linear, rotary, and lift stages; brushless linear and rotary servomotors and drives; stand-alone and software-based motion controllers; goniometers; and galvanometers. Custom, vacuum prepped, and cleanroom-ready positioning systems and components are available. Contact: Neal Linhart, nlinhart@aerotech.com

Alluxa, Inc. #713

SPIE. Corporate Member

3660 N Laughlin Rd, Santa Rosa, CA, 95403-1027 USA
+1 707 284 1040; fax +1 707 284 1371
info@alluxa.com; www.alluxa.com

Featured Product: ULTRA Series Thin Film Filters

Alluxa is an ISO 9001:2008 certified, ITAR registered, high performance optical filter and optical coating manufacturer located in Santa Rosa, CA. Alluxa produces its filters with a new class of custom optical thin-film coating equipment designed and built by our team. Our state-of-the-art automation, proprietary control algorithms, and our SIRRUS plasma deposition process allows the world's most difficult filters to be created in a fraction of the time required by other hard-coating methods. Contact: Haley Mellinger, haley.mellinger@alluxa.com

ALLVAR #309

501 Graham Rd, College Station, TX, 77845-9662 USA
+1 956 789 3723
www.allvar.net

ALPAO S.A.S. #404

SPIE. Corporate Member

345 rue Lavoisier, Montbonnot St Martin, 38330 France
+33 476 890 965; fax +33 476 514 532
contact@alpao.fr; www.alpao.com

Featured Product: deformable mirror, wavefront sensor, adaptive optics systems, softwares and kits

ALPAO manufactures Adaptive Optics Components and Systems. It includes very rapidly deformable mirrors with large strokes, wavefront sensors, and complete adaptive optics loops. These products are specially designed for various applications such as vision science, astronomy, microscopy, defense and space, FSO, laser and physics, and microelectronics. Our product's unrivalled performance allows users to recover very high-resolution images. Contact: Bertrand Charlet, Sales Engineer, bertrand.charlet@alpao.fr

AMOS - Advanced Mechanical & Optical Systems #411

Liege Science Park, Rue des Chasseurs Ardennais 2, Angleur, 4031 Belgium
+32 4 361 4040; fax +32 4 367 2007
info@amos.be; www.amos.be

Featured Product: Telescopes, telescopes sub-systems, mirrors, active mirror cells, mechanical structures, instruments

AMOS is specialised in design & manufacturing of very high accuracy opto-mechanical systems. They are mainly delivered professional astronomy observatories as well as space industry and are divided into 3 categories: Turn-key telescope solutions, Telescope subsystems for largest telescopes, On board satellite equipment, Instruments, Vacuum chambers, Cryostats, Equipment to test satellite on the ground. Contact: Xavier VERIANS, Business Development Director, xavier.verians@amos.be; Philippe GILSON, CEO, philippe.gilson@amos.be

SPONSOR

Andor Technology Ltd. #414

300 Baker Ave Ste 150, Concord, MA, 01742-2124 USA
+1 860 290 9211; fax +1 860 290 9566
s.cummings@andor.com; www.andor.com

Andor is a global leader in the pioneering and manufacturing of high performance scientific imaging cameras for research and OEM markets. Andor's product portfolio incorporates a range of high performance detector solutions for Astronomy, from fast time resolution EMCCDs and sCMOS cameras to the slow scan, very large area CCDs. Crucially, Andor's unparalleled commitment to superb quality and ease of maintenance is designed to maximize your observing time and to minimize cost of ownership. Contact: Susan Cummings, Global Events Coordinator, s.cummings@andor.com

Andover Corporation #520

SPIE. Corporate Member

4 Commercial Dr, Salem, NH, 03079-2800 USA
+1 603 893 6888; fax +1 603 893 6508
info@andcorp.com; www.andovercorp.com

Featured Product: Optical coatings and filters

Andover Corporation was established in 1976 with the purpose of designing and manufacturing high-quality optical filters and coatings. Over the years as the company has grown, the focus has remained on quality. Our current facility spans 44,000 square feet on 17 acres of land in Salem, NH. We manufacture filters and coatings for a wide variety of applications, including medical instrumentation, fluorescence studies, machine vision, agricultural imaging, ground-based and space-borne astronomic. Contact: Michael Tiner, Vice President, mtiner@andcorp.com; Phil Clark, Technical Sales, pclark@andcorp.com

Applied Surface Technologies #117

SPIE. Corporate Member

15 Hawthorne Dr, New Providence, NJ, 07974-1111 USA
+1 908 464 6675
co2clean@co2clean.com; www.co2clean.com

Featured Product: CO2 Snow Cleaning

We demonstrate precision cleaning using a CO2 Snow Jet, a quick and safe process capable of removing particles (visible to 5 nanometers), organic residues, solvent stains, and water spots. CO2 Snow cleans all types of substrates, optics, diamond turned optics, fiber-optics, wafers, large telescopes mirrors, and many other items. We offer manual, portable, and semi-automated units for R&D or manufacturing. Unique large telescope mirror cleaning units will be demonstrated. Contact: Robert Sherman, roberts@co2clean.com

Äpre Instruments, LLC #115

SPIE. Corporate Member

2440 Ruthrauff Rd Ste 100-120, Tucson, AZ, 85705 USA
+1 520-639-8195; fax +1 860 347 6407
sales@apre-inst.com; www.apre-inst.com

Featured Product: S-Series High Performance Fizeau Interferometers

Äpre Instruments is a leading innovator of surface and wavefront metrology tools. ÄPRE's objective is to make optical manufacturing stress-free and more cost effective. In supplying high performance interferometers for surface and wavefront measurement, we provide more confident control over ever tightening specifications from components to system test. Upgrades, peak performance interferometers and our unique innovations offer many choices from which to solve your demanding requirements. Contact: Donald Pearson II, Vice President, dpearson@apre-inst.com; Robert Smythe, President, rsmythe@apre-inst.com

Archer OpTx, Inc. #705

SPIE. Corporate Member

1208 Sigma Ct, Rockwall, TX, 75087 USA
+1 972 722 1064; fax +1 972 722 1063
sales@archeroptx.com; www.archeroptx.com

Featured Product: Design services, ultra-high precision molded glass aspheres, rapid prototyping, metrology services.

Maximize your potential with ultra-high optical precision that will produce optimal outcome. Archer OpTx offers the optics industry what could be its most exceptional resource yet: comprehensive solutions to meet your needs by providing engineering design services, ultra-high precision molded glass aspheres, traditional optical components, SIVA series of lens assemblies, subassemblies, and more. Archer OpTx is a strategic resource for your competitiveness. Contact: Janeil Lorin, International Sales Manager, janeil.lorin@archeroptx.com; Colby Freeman, US Sales Manager, colbycfreeman@archeroptx.com

ASA Astrosysteme GmbH #302

SPIE. Corporate Member

Galgenau 19, Kefermarkt, 4212 Austria
+43 7242 77811500
office@astrosysteme.at; www.astrosysteme.com

Featured Product: Telescopes, tracking platforms-direct drive, mirrors up to 2 meter, turnkey optical ground stations

ASA is specialised in design and manufacturing of very high accuracy opto-mechanical systems on the ground. One main objective is Turn-key telescope solutions for professional astronomy observatories. For customers we provide solutions for optical communication and quantum key distribution. Space junk and laser ranging stations are also among our customers. ASA Products: Telescopes, tracking platforms-direct drive, mirrors up to 2 meter, turnkey optical ground stations. Contact: Dietmar Weinzinger, Head of Sales, d.weinzinger@astrosysteme.at; Egon Döberl, CEO, office@astrosysteme.at

EXHIBITION DIRECTORY

Asahi Spectra USA Inc. #426

SPIE. Corporate Member

21151 South Western Ave, Ste 211, Torrance, CA, 90501 USA
+1 310 782 7086; fax +1 310 347 4431
info@asahi-spectra.com; www.asahi-spectra.com

Featured Product: ZTF 491 x 448mm i-band filter, DECam 620mm Halpha filter, ODI 445 x 428mm NB422 filter

Asahi has provided broad, narrow band filters, or dichroic beam splitters to world's well-known observatories in Chile, Hawaii, Canary, Arizona, South Africa, Australia, etc. since 1995. We are always excited and willing to challenge new technologies for unique instruments and the progress of science. UV pass filter for UV telescope, UBVRcIc and SDSS filters with all dielectric coating design, IR dichroic based on CaF2 will be introduced on site. Stop by our booth #426 and let's discuss together! Contact: Toshihiko Kimura, Overseas Sales Manager, t-kimura@asahi-spectra.co.jp

ASTELCO Systems GmbH #318

Fraunhoferstr 14, Martinsried / Muenchen, 82152 Germany
+49 89 8583 6650
info@astelco.com; www.astelco.com

Featured Product: Telescopes, Telescope Control Systems, Software, Domes, Enclosures, Satellite-tracking, space-debris

ASTELCO Systems, founded in 2004, is engaged in telescopes, telescope control systems, domes/enclosures and related technology, usually supplied as turnkey systems. The entire ASTELCO team consists of people that have been involved with astronomy, telescopes and telescope control systems for a very long time. Our software engineers have more than 20 years' experience in telescope control. All ASTELCO products are Made in Germany and are built in one of the ASTELCO facilities in Germany. Contact: Mario Costantino, Managing Director, info@astelco.com; Peter Aniol, Managing Director, info@astelco.com

ASTRON #321

Oude Hoogeveensedijk 4, Dwingeloo, 7991 PD Netherlands
+31 521 59 51 00; fax +31 521 59 51 01
secretaryrd@astron.nl; www.astron.nl

SPONSOR

Astronomical Consultants & Equipment Inc. #328

PO Box 91946, Tucson, AZ, 85752-1946 (USA)
+1 520 219 8722; fax +1 520 219 7989
purchasing@astronomical.com; www.astronomical.com

Atatürk Univ. Astrophysics Research & Application Center - ATASAM #312

ATASAM Building, Atatürk Univ. Campus, Erzurum, 25240 Turkey
+90 442 236 3144; fax +90 442 236 3145
atasam@atauni.edu.tr; atasam.atauni.edu.tr

Featured Product: DAG (Eastern Anatolia Observatory) Project and ODA (DAG - Focal Plane Instruments) Project.

Atatürk Univ. Astrophysics Research & Application Center (ATASAM) is a research center established primarily for the management and realization of DAG, ODA and other related Projects on 2012, and will serve the space sciences and technologies. Also, ATASAM is an observatory where telescopes of different sizes or types could be found, has a large observatory site with the robust infrastructure. In the near future, ATASAM will have an optomecatronic research laboratory and a mirror coating unit. Contact: Cahit Yesilyaprak, Director of ATASAM, cahity@atauni.edu.tr

The Australian National University #322

Mt Stromlo Observatory Cotter Rd, ACT 2611, Australia
+ 61 2 6125 5111; fax + 61 2 6125 5931
www.anu.edu.au

AVS Added Value Industrial Engineering Solutions S.L.U. #403

Polígono Industrial Sigma, Xixilion Kalea 2, Bajo Pabellón 10, Elgoibar, Gipuzkoa, 20870 Spain
+34 943 821 841; fax +34 943 821 842
avs@a-v-s.es; www.a-v-s.es

We are experts in the design and development of high quality equipment for research infrastructures worldwide. AVS conceives high precision mechanisms, micromechanisms, opto-mechanics, cryogenic and vacuum mechanisms for astrophysics and other fields, from concept to turnkey projects. In astronomy we have worked on the design and development of multi-object spectrographs, focal plane, robots positioning optical fibers, optomechanical & mechatronics for IR and cryogenic & fiber units IFUs. Contact: Sergio Salata, Project Manager, salata@a-v-s.es; Xabier Arrillaga, Project Manager, xarrillaga@a-v-s.es

Ball Aerospace #503

SPIE. Corporate Member

1600 Commerce St, Boulder, CO, 80301 USA
+1 303 939 4000; fax +1 303 939 6104
info@ball.com; www.ball.com/aerospace

Featured Product: We design and build instruments that deliver some of the most accurate data available.

Ball Aerospace pioneers discoveries that enable our customers to perform beyond expectation and protect what matters most. We create innovative space solutions, enable more accurate weather forecasts, drive insightful observations of our planet, deliver actionable data and intelligence, and ensure those who defend our freedom go forward bravely and return home safely. Contact: Makenzie Lystrup, Dir. Civil Space Business Development, mlystrup@ball.com; Peggy Irwin, Sr. Mgr, Marketing & Comms, pirwin@ball.com

Bertin Technologies #529

Parc d'activités du Pas du Lac, 10 bis ave Ampère, Montigny-le-Bretonneux, 78180 France
+33 1 39 30 60 00; fax +33 1 39 30 09 50
aerospace@bertin.fr; www.bertin.fr

Bertin's team (optical, high precision mechanics, space electronics, control center, thermal engineering, physical modeling, system engineering, etc.) offers services to assist customers in designing & supplying high-tech equipment and large-scale experiments such as the Megajoule Laser or ITER. Optical, opto-mechanical & electronic instruments are developed up to the assembly, integration, testing & validation phases. Contact: Jean-Baptiste Haumonte, Sales Manager, aerospace@bertin.fr

Boston Micromachines Corp. #139

SPIE. Corporate Member

30 Spinelli Pl, Ste 103, Cambridge, MA, 02138-1046 USA
+1 617 868 4178; fax +1 617 868 7996
moreinfo@bostonmicromachines.com;
www.bostonmicromachines.com

Boston Micromachines Corporation is the leading provider of MEMS deformable mirrors. The company's DM products is the most cost-effective, highest performance mirrors in the market. BMC devices can be used in a variety of applications for current and next-generation ground-based and space-based telescopes. Located in Cambridge, MA, BMC is privately held and offers custom-designed manufacturing services in addition to its portfolio of standard DM products and adaptive optics systems. Contact: Philip Zeng, Marketing and Sales Engineer, pzeng@bostonmicromachines.com; Michael Feinberg, Vice President of Marketing and Sales, mrf@bostonmicromachines.com

Cambridge Innovations #313

209 W Central St Ste 305A
Natick, MA, 01760 (USA)
+1 508 545 2622; fax +1 508 545 2623
info@camb-innov.com; www.camb-innov.com

Canon USA #527

SPIE. Corporate Member

1 Canon Park, Melville, NY, 11747-3036 (USA)
+1 516 330 5000; fax +1 516 328 4639
pr@cusa.canon.com; www.usa.canon.com

Cherenkov Telescope Array #410

Saupfercheckweg 1, Heidelberg, 69117 Germany
+49 6221 516 471
info@cta-observatory.org; www.cta-observatory.org

Featured Product: CTA is building 100+ Cherenkov telescopes split between two array sites to detect gamma rays.

The Cherenkov Telescope Array (CTA) is a global initiative to build the world's largest and most sensitive high-energy gamma-ray observatory. More than 1,350 scientists and engineers from 32 countries are engaged in the scientific and technical development of CTA. The construction and implementation of the Observatory will be managed by the CTAO GmbH, which is governed by Shareholders and Associate Members from a growing number of countries. Contact: Megan Grunewald, Outreach and Communications Officer, mgrunewald@cta-observatory.org

CILAS #315

CS16319, 8 ave Buffon, Orléans, 45063 France
+33 2 38 64 15 55; fax +33 2 38 76 02 49
www.cilas.com

CILAS is an expert in laser and optical technologies. CILAS develops, industrializes and markets a wide range of products and systems. Defense, security and civil devices, scientific and industrial instrumentation, cutting-edge optical components and major scientific laser programs are its main markets. CILAS is improving the latest technologies to meet emerging needs. Flagship products include space qualified optical coatings, large optical coatings up to 2mx2m, and deformable mirrors.

cosine measurement systems #321

Oosteinde 36, 2361 HE Warmond, Netherlands
+31 71 528 4962
sales@cosine.nl; www.cosine.nl

Cosylab #528

Gerbicheva ulica 64, Ljubljana, Osrednjeslovenska, 1000 Slovenia
+386 1 477 6676; fax +386 1 426 1879
info@cosylab.com; www.cosylab.com

Featured Product: Control System Solutions for Radio telescopes

Cosylab provides system integration and engineering solutions, covering the complete area of control systems and instrumentation for large scientific research facilities such as accelerators, tokamaks and radio telescopes. Project directors, group leaders and engineers on such projects often face tight deadlines and engage us to achieve better performance, while reducing commissioning time, manpower and cost. Our 150+ engineers are expert developers of state-of-the-art electronics and software. Contact: Rok Hrovatin, Senior Business Development Advisor, rok.hrovatin@cosylab.com; Miroslav Pavleski, VP Scientific Domain, miroslav.pavleski@cosylab.com

Dynamic Optics #119

SPIE. Corporate Member

1580-C Kingsway Ave, Port Coquitlam, BC, V3C 3Y9 Canada
+1 604 813 5794; fax +1 604 294 4550
p.wangsness@outlook.com; dynamicstructures-optics.webs.com

Featured Product: Economical lightweight mirror substrates

Design and manufacture of economical lightweight glass (primarily borosilicate) mirror substrates from 20mm to >2,400mm+ in diameter. Unusual shapes and dimensions are possible. Low mass and high stiffness complement, low inertia and rapid thermalization. Quantities range from single prototype to OEM. Areal densities as low as 8kg/m^2 have been fabricated. Complete systems available. Optical Telescopes, Lidar systems, scanners, active primary and secondary optics and airborne optical systems. Contact: Peter Wangsness, Astronomy Technologist, p.wangsness@outlook.com

Dynavac #610

SPIE. Corporate Member

110 Industrial Park Rd, Hingham, MA, 02043-4369 USA
+1 781 740 8600; fax +1 781 740 9996
sales@dynavac.com; www.dynavac.com

Featured Product: EOS Large Astronomical Telescope Coating System

Dynavac designs and manufactures thin film deposition systems for a variety of applications including precision optics, astronomical telescopes, and lighting. We offer batch and high-volume production systems, custom engineering, and unmatched installation and support services for our worldwide customer base. Dynavac's global reputation for excellence is rooted in unparalleled engineering expertise, single-source manufacturing capabilities, and an unrelenting commitment to customer satisfaction. Contact: Steven Chiavaroli, Product Manager-Thin Film Systems, SChiavaroli@dynavac.com; Patty Katsaros, Director of Marketing, pkatsaros@dynavac.com

EXHIBITION DIRECTORY

EIE Group s.r.l. #622

Via Torino 151A, Mestre Venezia, VE, 30172 Italy
+39 41 5317906; fax +39 41 5317757
info@eie.it; www.eie.it

Featured Product: Engineering and turn key solutions for Ground based Telescopes and large scientific facilities.

EIE Group is an International EPCC - Engineering, Procurement, Construction and Commissioning - Company, specialized in management & contracting, engineering & design and production & services. The company, operates globally and can easily be referenced worldwide for its expertise in leading and managing complex engineering projects, delivering complete turn-key systems and mechanism-structure subsystems for Domes and Main Structures. Contact: Gianpietro Marchiori, President and CEO, gmarchiori@eie.it; Jessica Carraro, The Office of the President, jcarraro@eie.it

EMF Corp. #703

SPIE. Corporate Member

239 Cherry St, Ithaca, NY, 14850-5024 USA
+1 800 456 7070; fax +1 800 456 3227
information@emf-corp.com; www.emf-corp.com

Featured Product: AG99 Durable Silver, Complex BBAR coatings, Large Optic Capability

EMF is the most established thin film coating house in US-founded in 1936. Get the EMF Edge. On time delivery > 99%. Product quality > 99. Application/Technical engineering support. Precision custom coatings. Very high volume coatings and large optic capability. Capability to coat both small & large optics ranging from 2mm to 2.6 meters. Accomplishments include: BBAR on 5 WEAVE lenses, Correction window for Palomar Telescope, PanSTARRS2 mirrors, LBT. Contact: Michelle Henderson, Sales Account Manager, michelle@emf-corp.com; John McCartney, Sales Engineer, jmccartney@emf-corp.com

EMSS Antennas #425

18 Techno Ave, Technopark, Stellenbosch, 7600 South Africa
+27 21 880 1188; fax +27 21 880 1982
info.antennas@emss.co.za ; www.emssantennas.com

Featured Product: Sensitive cryogenic radio receivers & RFI-quiet support equipment. EM design dish reflector surfaces

We've been designing optimised reflector surfaces and producing extremely sensitive cryogenic radio astronomy receivers with RFI-quiet support equipment for the South African MeerKAT and international SKA projects since 2006. We believe our L- & UHF-band receivers developed for MeerKAT to be best-on-planet in terms of additive noise -- 8.5K (L-band) and 5.5K (UHF), from radome to RF output averaged over the 60% frequency bandwidth and 100+ operational units and we expect similar results for SKA. Contact: Dawid Botha, Managing Director, dhbotha@emss.co.za; Jean Kotze, Business Developer, jkotze@emss.co.za

Energetiq Technology, Inc. #137

SPIE. Corporate Member

7 Constitution Way, Woburn, MA, 01801-1024 USA
+1 781 939 0763; fax +1 781 939 0769
info@energetiq.com; www.energetiq.com

Featured Product: EQ-77 LDLS™ Laser Driven Light Source

Energetiq Technology is the world's leading developer and manufacturer of ultra-bright broadband light sources for a wide variety of advanced applications in life and materials sciences, semiconductor manufacturing, and R&D. Energetiq's Laser-Driven Light Sources (LDLS™) are based on a revolutionary technology that generates high brightness across the spectrum, with high reliability and long life. Contact: Samuel Gunnell, Technical Sales Engineer, sgunnell@energetiq.com

EOS Space Systems Pty. Ltd. #428

55a Monaro Street, Queanbeyan, NSW, 2620 Australia
+61 2 6222 7900
general-space@eos-aus.com; www.eos-aus.com

Featured Product: Large aperture telescopes, lasers, enclosures and observatory systems

EOS Space Systems (EOS) is a leading manufacturer of large aperture beam directors and astronomical telescopes, lasers, enclosures and observatory systems. EOS provides robust, industrial grade control systems for remote and robotic telescope and observatory control. EOS observatory products are found in many astronomical and military space sensing systems around the world. EOS also owns and operates a network of telescopes for satellite and astrometric observation and research. Contact: Craig Smith, Chief Executive Officer, csmith@eosspacesystems.com; Lexa Graham, Logistics Officer, lgraham@eosspacesystems.com

ETALON North America Inc. #308

11234 NE 68th St #6, Kirkland, WA, 98033 USA
+1 425 985 5223
northamerica@etalon-ag.com; www.etalon-na.com

Featured Product: Absolute Multiline laser measurement system

Etalon manufactures high precision laser measurement systems. Contact: Bruce Fiander, General Manager, bruce.fiander@etalon-na.com; Heinrich Schwenke, President, heinrich.schwenke@etalon-ag.com

Fagor Automation Scoop LDA #403

Bº San Andrés 19 Apdo 144, Arrasate-Mondragón, Gipuzkoa, 20500 Spain
+34 943 039 800; fax +34 943 791 712
info@fagorautomation.es; www.fagorautomation.com

Featured Product: High accuracy and resolution linear and angular encoders for fine positioning in close loop control

Fagor Automation develops and manufactures products for automation and control from light sources to synchrotron facilities, measuring and testing equipment or machine tools the product catalog offers solutions that fit into the most diverse applications. The product catalog comprises: Feedback system (enclosed linear and angular encoders, open linear encoder) - with its own technologies in mechanical, optical, electronics and software; CNC systems; drives and motors. Contact: Jose Oscar, Marketing Manager Encoder Business, ofernandez@fagorautomation.es

Fiberguide Industries, Inc. #720

SPIE. Corporate Member

3409 E Linden St, Caldwell, ID, 83605-6077 USA
+1 908 647 6601; fax +1 908 647 8464
info@fiberguide.com; www.fiberguide.com

Featured Product: Optical Switching, Arrays, RARe Motheye Fiber, Fiber Bragg Gratings

For more than three decades Fiberguide Industries has been a reliable, long-term, strategic partner with OEM manufacturers in providing efficient, cost-effective, practical fiber optic solutions engineered to meet their specific needs. We specialize in manufacturing large core specialty optical fiber, high temperature metalized optical fibers, and we package these fibers in a variety of assemblies / bundles used for optical power delivery and optical sensing applications. Contact: Rosina Gocek, Business Development Manager, rgocek@fiberguide.com; Catherine Sutton, Customer Service Representative, csutton@fiberguide.com

Fibertech Optica Inc. #310

SPIE. Corporate Member

330 Gage Ave, Unit 1, Kitchener, ON, N2M 5C6 Canada
+1 519 745 2763; fax +1 519 342 0128
info@fto.ca; www.fto.ca

Featured Product: Specialty fiber optic1D and 2D arrays with very tight tolerances.

A leader in the design and manufacture of integrated specialty fiber optic solutions, FTO offers precision micro optical assemblies, 1D and 2D arrays, Raman & reflectance probes, high power laser cables and vacuum feed through for use from Deep UV to MIR wavelengths. From prototype through production quantities, FTO supports applications in astronomy, aerospace, military, academia, analytical instrumentation, biomedical imaging, spectroscopy, laser power delivery and research. Contact: Jeff Dupuis, VP Sales & Marketing, jeffdup@fto.ca; Cheryl Provost, Technical Sales Specialist, cprovost@fto.ca

Finger Lakes Instrumentation #409

PO Box 19A, 7287 W Main St, Lima, NY, 14485 USA
+1 585 624 3760; fax +1 585 624 9879
sales@flicamera.com; www.flicamera.com

Featured Product: FLI's new Kepler sCMOS cameras

FLI designs and manufactures high performance sCMOS and CCD cameras for astronomical applications. The Kepler KL400's imaging attributes include 95% quantum efficiency, 1.5e- read noise, deep sensor cooling and fast frame rates. For applications requiring a larger imaging areas, the KL4040 (52mm diagonal) and the KL6060 (87mm diagonal) are available. All Kepler cameras are supported by a robust SDK (Windows, LINUX). FLI Pilot software is included. ASCOM, MATLAB®, and LabVIEW® are supported. Contact: Gregory Terrance, General Manager, Sales@flicamera.com

First Light Imaging #429

SPIE. Corporate Member

Europarc Ste Victoire, Bât 6 Rte de Valbrillant Le Canet, Meyreuil, 13590 France
+33 4 42 61 29 20
contact@first-light.fr; www.first-light.fr

Featured Product: Ultra fast and low noise scientific Visible and SWIR cameras for Astronomy applications and more

First Light Imaging designs and builds high-end scientific cameras that combine extreme sensitivity and ultra-high speed for both visible and infrared spectra. First Light Imaging offers 4 cameras:OCAM^{2}K, EMCCD visible camera, 2000 FPS FF, <1 electron RON; OCAM^{2}S, same performances with an embedded shutter and minimal pulse width lower than 300 ns; C-RED One, e-APD MCT Infrared (SWIR) camera, 3500 FPS FF, <1 electron RON; C-RED 2, InGaAs Infrared (SWIR), >400 FPS FF, <10 electrons RON. Contact: David Boutolleau, CEO, david.boutolleau@first-light.fr; Cecile Brun, Marketing Manager, cecile.brun@first-light.fr

FMV Isik University Center for Optomechatronics Research & Application - OPAM #312

OPAM, Kumbaba Mevkii, Sile Istanbul, 34980 Turkey
+90 216 5287060; fax +90 216 7102874
opam@isikun.edu.tr; www.isikun.edu.tr/en/index.php

Featured Product: TROIA (TuRkish adaptive Optics system for Infrared Astronomy) & DAG - Derotator System

FMV Isik University Center for Optomechatronics Research & Application (OPAM) Commercial Enterprise is established to provide OEM / VAR optomechanical design & manufacturing, R&D, prototyping and project management for local and international companies in the area of optics and engineering. First established on 2016, OPAM provided: Optomechanical design of DAG& TUG telescopes, the Adaptive Optics System and the two derotators of DAG telescope one of which is placed inside the telescope flange. Contact: Onur Keskin, Director of OPAM, onur.keskin@isikun.edu.tr; Ercan Solak, Isık University Vice Rector, ercan.solak@isikun.edu.tr

FRACTAL S.L.N.E. #403

Calle Tulipán 2 portal 13 1-A, Las Rozas de Madrid, 28231 Spain
+34 916 379640; fax +34 917917113
info@fractal-es.com; www.fractalslne.es

Featured Product: Astronomical Instrumentation and Software. Project Management and System Engineering services

FRACTAL S.L.N.E. is a private technological company founded in 2005. We provide consultancy engineering services for professional Astronomy. We develop custom instrumentation and telescopes and Control software. We provide professional Management and System Engineering services to international and geographically distributed Consortia. FRACTAL has a license agreement on the use of the ESO Continuous flow cryostat technology. Contact: Marisa Garcia-Vargas, General Manager and owner, marisa.garcia@fractal-es.com; Pedro Gomez-Alvarez, Head of Software Group and owner, pedro.gomez@fractal-es.com

EXHIBITION DIRECTORY

General Dynamics Mission Systems #706

12450 Fair Lakes Cir, Fairfax, VA, 22033 USA
+1 703 263 2800
info@gd-ms.com; www.gdmissionsystems.com/satcom

General Dynamics SATCOM Technologies provides the full spectrum of satellite ground communications products, systems engineering, project integration and installation services. Since 1968, we have been a global leader designing and building some of the world's most advanced optical telescope mirror structures and radio telescope antennas. Our telescope structures and antennas can be found throughout North America, South America, Australia, Europe, India, the Arctic Circle and the South Pole. Contact: Dave Porter, Director of Business Development, Dave.Porter@gd-ms.com; Gerbert Lagerweij, Director Markting & Sales

SPONSOR

Giant Magellan Telescope #523

465 N Halstead St Ste 250, Pasadena, CA, 91107 USA
+1 626 204 0500; fax +1 626 204 0504
info@gmto.org; www.gmto.org

The Giant Magellan Telescope (GMT) Project is a collaboration of US and international research institutions constructing a next-generation extremely large optical/infrared telescope. The GMT will have a seven-segment primary mirror 25 meters in diameter and will be sited at Las Campanas Observatory in Chile. It is designed with integrated adaptive optics and an advanced suite of instruments to support a program of key scientific investigations. Visit GMTO.org. Contact: Amanda Kocz, Director of Communications, akocz@gmto.org

SPONSOR

Gpixel Inc. #512

SPIE. Corporate Member

Economical and Technological Development Zone, No 588 Yingkou Rd, Changchun, 130033 China
+86 43186176682; fax +86 43186176683
info@gpixelinc.com; www.gpixelinc.com

Featured Product: The BSI Compatible CMOS Image Sensor GSENSE6060 for Demanding Astronomical and Scientific Imaging

Gpixel Inc. is a design house located in Changchun, China, specialized in providing high-end CMOS image sensor solutions for industrial, medical and scientific applications. Gpixel offers standard off-the-shelf image sensors, as well as customer-design products. Gpixel's design capabilities include extremely high resolution full-frame sensor, very low noise (<2e-), high dynamic range (>100dB) and ultra-high speed (>2Gpix/s) CMOS Image sensors. Contact: Xinyang Wang, CEO & Founder, xinyang.wang@gpixelinc.com; Yanxia Zhang, Director of Sales and Marketing Department, yanxia.zhang@gpixelinc.com

SPONSOR

Harris Corporation #417

400 Initiative Dr, Rochester, NY, 14624-6219 USA
+1 585 269 5600
www.harris.com

From ocean to orbit and everywhere in between, Harris provides mission-critical solutions to connect, inform and protect the world. Harris is a proven leader in tactical communications, electronic warfare, avionics, air traffic management, space and intelligence, and weather solutions. We manufacture and deliver a full range of optics and optical systems including mirrors, mounts and metering structures for ground, sea, air and space-based platforms and systems for a variety of industries. Contact: Lynn Allen, Senior New Business / Capture Manager, Civil and C, lynn.allen@harris.com

HEIDENHAIN Corporation #608

SPIE. Corporate Member

333 E State Pkwy, Schaumburg, IL, 60173-5337 USA
+1 847 490 1191; fax +1 847 490 3931
marketing01@heidenhain.com; www.heidenhain.us

HEIDENHAIN Corporation is the North American subsidiary of the German company Dr. Johannes Heidenhain GmbH, a leading international manufacturer of precision measurement and control equipment. This superior technology is utilized within high precision motion control and machining systems worldwide. The product lines include linear and angle encoders, rotary encoders, length gauges digital readouts (DROs), numerical controls (TNCs), and touch probes for demanding positioning tasks. Contact: Kevin Kaufenberg, Product Manager, kkauafenberg@heidenhain.com

Hellma Materials #317

Moritz-von-Rohr-Str 1, Jena, 07745 Germany
+49 3641 28770; fax +49 3641 2877 200
info.materials@hallma.com; www.hellma-materials.com

Featured Product: Calcium Fluoride crystals for optics, Cerium Bromide crystals for Gamma ray detection

Hellma Materials and its subsidiary CVD Ceramics produce optical materials for multispectral applications covering UV, VIS and IR. Zinc Sulfide, Cleartran, Zinc Selenide, CaF2 and BaF2 feature wide band transmission enabling advanced applications in thermal imaging, night vision and surveillance imaging using integrated VIS and IR detector channels. Hellma Materials radiation detection materials (Scintillator crystals) enable advanced detection of high energy radiation and particles. Contact: Gordon von der Goenna, Director Sales and Business Development, gordon.goenna@hellma.com

Hofstadter Analytical Services, LLC #714

SPIE. Corporate Member

10 N Norton Ave Ste 120, Tucson, AZ, 85719-6038 USA
+1 520 747 3282; fax +1 520 747 3282
info@hofstadteranalytical.com; www.hofstadteranalytical.com

Hofstadter Analytical Services provides thermal, structural, and multi-physics analysis to the astronomical equipment, optical, electronics, and sensor communities. Contact: Daniel Hofstadter, Principal, dan@hofstadteranalytical.com; Kathryn Shallcross, Lead Engineer, kathryn@hofstadteranalytical.com

HORIBA FRANCE SAS #725

HORIBA Europe Research Ctr, Avenue de la Vauve - Passage Jobin Yvon - CS45002, Palaiseau, 91120 France
+33 1 69 74 72 00; fax +33 1 69 31 32 20
oemsales.jyfr@horiba.com; www.horiba.com/scientific

Featured Product: Transmission Holographic Gratings, ruled grating, astronomy grating, diffraction gratings

HORIBA Scientific, with its unique Jobin Yvon technology, is a world leading company of Scientific Diffraction Gratings. As a pioneer in the field of Holography, we continue to develop advanced manufacturing processes for Custom high-performances diffraction gratings adressing various markets such as Astronomy, Space, Synchrotron, and Laser. We design and produce the World Largest Gratings (up to 1500mm). Contact: Arnaud Cotel, Sales & Marketing, arnaud.cotel@horiba.com; Sophie Fantacci, Sales Assitant, sophie.fantacci@horiba.com

ICEX Spanish Science Industry #403

Spanish Science Industry, Paseo de la Castellana, 278, Madrid, 28046 Spain
+34 91 349 61 94
info@icex.com; www.icex.es

IDOM #623

ADA, Avda Zarandoa 23, Bilbao, 48015 Spain
+34 944797600; fax +34 944761804
info@idom.com; www.idom.com

Featured Product: Full engineering and complete procurement, construction and commissioning services for astronomy.

IDOM is an international firm specializing in Engineering, Architecture and Consulting. IDOM operates globally in areas such as power generation, oil & gas, renewable and alternative energies, manufacturing industry, civil infrastructures, nuclear plants, large technological and scientific facilities, architecture and unique challenging engineering projects. Contact: Gaizka Murga, gzk@idom.com

Imagine Optic Inc. #427

SPIE. Corporate Member

16th Fl, 50 Milk St, Boston, MA, 02109-5002 USA
+1 617 401 2198; fax +1 617 588 0460
contact@imagine-optic.com; www.imagine-optic.com

Featured Product: HASO R-FLEX VIS-NIR : High performance Shack Hartmann wavefront sensor

Imagine Optic is a leading provider of wavefront sensors for optical metrology and adaptive optics for Laser and Microscopy. The HASO is available for applications in the X-EUV- UV-VIS- NIR and come with a calibration offering unequaled level of performance. The RFlex is an accessory that expands the capability of the HASO for the characterization of large instruments. The company has expertise in the alignment and characterization of Telescopes and related instruments. Contact: Jerome Ballesta, US Sales Manager, jballesta@imagine-optic.com

INEUSTAR Asociación Española de la Industria de la Ciencia #403

1ª planta Oficina 5ª, Polígono Industrial SIGMA C/Xixilion 2, ELGOIBAR Gipuzkoa, 20870 Spain
+34 943 20 18 36
ineustar@ineustar.com; www.ineustar.com

Featured Product: Collaboration promotion between Spanish Science Industry sector and similar ones in other countries

INEUSTAR is a private, non profit, Spanish association promoting the industrial companies which design, manufacture and give services to systems, components and installations needed in the Grand Scientific Research Facilities, all over the world. Our associated companies participate from the early stages of concept development through all the manufacturing and implementation phases. Our products can be found in many relevant facilities, telescopes, radio antennas and related instrumentation. Contact: Fco Javier Cáceres, General Manager, fjcaceres@ineustar.com; Leonor Mendoza, Head of Collaborative Projects, lmendoza@ineustar.com

Infinite Optics Inc. #306

SPIE. Corporate Member

1712 Newport Cir Ste F, Santa Ana, CA, 92705-5118 USA
+1 714 557 2299; fax +1 714 557 2170
info@infiniteoptics.com; www.infiniteoptics.com

Featured Product: High Efficiency AR Coatings from .9-14nm on various Chalcogenite glass

Infinite Optics specializes in optical thin-film coatings ranging from 193nm's to 20 microns. We support astronomical, industrial, medical and military markets by fabricating and coating optics required for telescopes, lasers and optoelectronic devices. Our services include special applications, development, production runs and quality control. We are DDTC registered and ITAR compliant. Contact: Stan King, stan@infiniteoptics.com; Geza Keller, geza@infiniteoptics.com

Infrared Laboratories #613

1808 E 17th St, Tucson, AZ, 85719-6505 USA
+1 520 622 7074; fax +1 520 623 0765
sales@irlabs.com; www.infraredlaboratories.com

For over 50 years Infrared Labs has built a strong reputation by solving the advanced instrumentation challenges of our customers. We have collaborated with scientists and organizations from all over the world, and have participated in the creation of thousands of systems; ranging from basic LN2 dewar to IR cameras systems for ground based telescopes. We are positioned to help bring your scientific instrumentation needs from concept to engineering thru manufacturing, quickly and efficiently. Contact: Steve Zoltowski, Technical Sales Manager, stevez@irlabs.com

Kaiser Optical Systems, Inc. #727

371 Parkland Plz, Ann Arbor, MI, 48103-6202 USA
+1 734 665 8083; fax +1 734 665 8199
sales@kosi.com; www.kosi.com

Featured Product: Volume Phase Holographic (VPH) Gratings and Grisms

Kaiser Optical Systems Inc., an Endress+Hauser company is recognized as a world leader in the design and production of volume phase holographic (VPH) transmission gratings and grisms. Kaiser applies more than thirty-five years of experience to the development of custom designed, high-performance holographic elements to visible and near infrared instruments for the next generation astronomical telescopes. Contact: Jim Arns, Senior Optical Systems Engineer, sales@kosi.endress.com

Kyocera International, Inc. #612

Fine Ceramics Group, 220 Davidson Ave Ste 104, Somerset, NJ, 08873-4144 USA
+1 908 227 6714
webmaster.fc@kyocera.jp; www.global.kyocera.com/prdct/fc/index.html

Kyocera offers a wide range of advanced industrial grade ceramic materials such as alumina, silicon nitride, silicon carbide, zirconia, sapphire and others. When you need a part that won't melt, bend, stretch, corrode or wear out, you need ceramics. Contact: Julia Abada, Senior Marketing, julia.abada@kyocera.com; John Mastrogiacomo, Senior Business Development Manager

LSST #614

950 N Cherry Av, Tucson, AZ, 85719-4933 USA
+1 520 881 2626; fax +1 520 881 2627
contact@lsst.org; www.lsst.org

Featured Product: Information about the Large Synoptic Survey Telescope

Currently under construction in Chile, LSST will conduct a ten-year optical survey of the southern sky, opening a window of discovery on the dynamic universe. LSST is the top-ranked large-scale ground-based project for the next decade as recommended by the US National Research Council's Astronomy and Astrophysics decadal survey (Astro2010). Contact: Ranpal Gill, Senior Manager, rgill@lsst.org; Suzanne Jacoby, Senior Consultant for Communications, sjacoby@lsst.org

Luxel Corp. #621

SPIE. Corporate Member

60 Saltspring Drive, Friday Harbor, WA, 98250-9062 USA
+1 360 378 4137; fax +1 360 378 4266
luxel@luxel.com; www.luxel.com

Featured Product: Soft X-Ray Filters for Princeton Instruments' PI-MTE Camera

Luxel is the world's leading producer of ultra-thin freestanding filters for soft x-ray & EUV transmission. We offer more than 70 different materials, with thicknesses ranging from 8nm to 20micron, & custom 2D and 3D apertures. Luxel products, including spaceflight filters, pressure windows, and sensor protectors, are assembled in Class 5 cleanrooms. We offer extensive technical support with thin film modeling, characterization, & CAD capabilities. Lead times as short as 1 week. Contact: Travis Ayers, President, Travis.Ayers@Luxel.com; Ben Zeiger, Chief Scientist, Ben.Zeiger@Luxel.com

Mad City Labs., Inc. #710

SPIE. Corporate Member

2524 Todd Dr, Madison, WI, 53713-2317 USA
+1 608 298 0855
sales@madcitylabs.com; www.madcitylabs.com

Mad City Labs designs & manufactures high precision piezo nanopositioners, micropositioners, and microscopes suitable for inspection, metrology, microscopy, interferometry, and astronomy. Our nanopositioners include proprietary PicoQ® position sensors yielding picometer scale precision, low noise performance, and high stability. We provide innovative motion control solutions from the micro-to-pico scale with special emphasis on ultra-high vacuum applications and extreme custom solutions Contact: Shannon Ghorbani, Technical Sales, shannon@madcitylabs.com; European Sales, Director, sales@madcitylabs.eu

SPONSOR

Materion Precision Optics #626

SPIE. Corporate Member

2 Lyberty Way, Westford, MA, 01886-3616 USA
+1 978 692 7513
mpo@materion.com; www.materion.com/precisionoptics

Featured Product: Astronomical Filters, Large Area Optical Coatings, Optical Filters, Wafer Level Coatings

Materion Precision Optics is the world's leading provider of precision optical filters and custom thin film coating services. We employ innovative process technologies to produce a broad array of products including complex optical filters, filter arrays, wafer level coatings, thin film getters, mirrors, color wheels, and complex optical sub-assemblies.

Media Lario S.r.l. #708

Localita' Pascolo, Bosisio Parini LC, 23842 Italy
+39 31 867 111; fax +39 31 876 595
info@media-lario.com; www.media-lario.com

Featured Product: Metallic aspheric mirror, Repli-formed optic and telescope, Light-weighted laminated glass mirror

Media Lario supplies advanced high specification optical systems and optical components. Main products: Hyperspectral Earth Observation Optical Payloads for small satellites; Laser Communication Space and Ground Terminals; High-Precision Metallic Mirrors and Glass Mirrors/Lenses in aspheric or freeform designs; Repli-formed™ optics with 1 mirror-per-day cycle time for cost-sensitive applications; Light-weight laminated metallic reflectors and glass mirrors for Ground telescopes. Contact: Giovanni Bianucci, VP, Sales & Marketing, giovanni.bianucci@medialario.com; Giuseppe Valsecchi, Chief Technology Officer, giuseppe.valsecchi@medialario.com

Molex - Polymicro #721

18019 N 25th Ave, Phoenix, AZ, 85023-1200 USA
+1 602 375 4100; fax +1 630 813 9995
polymicrosales@molex.com; www.molex.com/polymicro

Featured Product: Molex - Polymicro now tests and validates best FRD fiber for the Astronomy market (FBP-Fiber)

In the last 15 years FBP fiber produced by Molex - Polymicro has become the standard for system designers. In addition to the traditional tests, real-time geometry measurements, online tensile strength and optical testing, Molex now offers FRD testing and validation of all fibers made specifically for Astronomy applications. FRD tested optical fibers reduce the cost and the time for end users by eliminating testing and ensuring high quality optical fibers. Contact: Teo Tichindelean, Global Fiber Product Manager, teo.tichindelean@molex.com

MPB Communications Inc #515

SPIE. Corporate Member

147 Hymus Blvd, Pointe-Claire, QC, H9R 1E9 Canada
+1 514 694 8751; fax +1 514 694 6869
info@mpbc.ca; www.mpbcommunications.com

Featured Product: Raman fiber amplifiers and lasers for Laser Guide Star, OGS and Research.

Founded in 1977, MPB is a privately held company that provides high reliability laser systems for the scientific, life sciences, medical, entertainment, commercial and military markets; customized fiber optic systems and sensors for the aerospace and military sector; and high-performance optical amplifiers and Raman fiber lasers for telecommunications network equipment. MPB's commitment to excellence is evidenced in both the dedication of its people and the performance of its products. Contact: Claudette Linton, Business Development, claudette.linton@mpbc.ca

MPS Micro Precision Systems AG #722

Ch du Long-Champ 95, Biel/Bienne, 2504 Switzerland
+41 32 344 43 00; fax +41 32 344 43 01
info@mpsag.com; www.mpsag.com

MPS develops and manufactures electro-mechanical microsystems used in different fields of applications such as Medical, Automation, Optics, Aerospace and Science. MPS microsystems are characterised by their miniaturisation, their very accurate and smooth movement (even over long distances), their extremely low friction and their extreme stiffness. More specifically MPS technology suits very well the requirements for optical fibre positioners used in telescope for the observation of galaxies. Contact: Grégoire Bagnoud, Director Business Development, gregoire.bagnoud@mpsag.com; Markus Hug, Project Manager, markus.hug@mpsag.com

MT Mechatronics GmbH #413

Weberstrasse 21, Mainz, 55130 Germany
+49 6131 2777 0; fax +49 6131 2777 205
info@mt-mechatronics.de; www.mt-mechatronics.de

Featured Product: Training, maintenance, operations for communication and deep space antennas, radio and optical telescopes.

MT Mechatronics, located in Mainz, Germany, provides mechatronic equipment for research institutions, launching facilities for the European space program, and large medical systems for the next generation of particle cancer therapies. With over fifty years' experience, MT has assembled a highly qualified team of engineers and experts with all relevant capabilities and experience to provide the best value and highest quality for your Mechatronic product. Contact: Nivart Holsworth, Head of PR and Communication, nivart.holsworth@mt-holding.de; Lutz Stenvers, Managing Director, lutz.stenvers@mt-mechatronics.de

Netherlands Research School for Astronomy #321

PO Box 9513, Leiden, 2300 RA Netherlands
+31 71 527 5835
nova@strw.leidenuniv.nl; www.nova-astronomy.nl

Featured Product: METIS, The mid-infrared ELT imager and spectrograph.

NOVA is the joint organisation of the astronomical institutes of the universities of Amsterdam, Groningen, Leiden & Nijmegen. NOVA is the beneficiary of dedicated funding to promote top-level astronomical research in the Netherlands. A large fraction of the NOVA budget is reserved for the development of state-of-the-art astronomical instrumentation for observatories both on the ground and in space. NOVA instruments cover the wavelength range from the optical, through infrared to sub-mm. Contact: Michiel Rodenhuis, Instrumentation coordinator, rodenhuis@strw.leidenuniv.nl; Ramon Navarro, Head, optical-IR instrumentation group, navarro@astron.nl

New England Optical Systems #627

SPIE. Corporate Member

237 Cedar Hill St, Marlborough, MA, 01752-3004 USA
+1 508 460 0019; fax +1 508 460 0098
info@neos-inc.com; www.neos-inc.com

Featured Product: Spectrograph Optics

NEOS is the premier engineering and manufacturing company for optical systems working in the near IR to infrared wavebands. NEOS has built a team with expertise in optical, mechanical, electrical, and software design, as well as system integration critical for alignment and stability. NEOS has been serving the Astronomical community since their founding in 2008. They have supported major projects such as SDSS APOGEE (N & S), NEID, Triplespec, MIRADAS and Habitable Zone Planet Finder (HPF). Contact: Peter Kornik, Director of Business Development, pkornik@neos-inc.com

New Scale Technologies, Inc. #304

SPIE. Corporate Member

121 Victor Heights Pkwy, Victor, NY, 14564-8938 USA
+1 585 924 4450; fax +1 585 924 4468
NSTsales@newscaletech.com; www.newscaletech.com

Featured Product: COBRA Fiber Positioner - custom SCARA robot for precision positioning

New Scale develops precision positioning systems with embedded controllers, for smallest system size. We provide standard micro stages and focus modules, as well as custom positioning systems. For example, we worked with Caltech to develop the Cobra fiber positioner for the Prime Focus Spectrograph of the Subaru telescope. The theta-phi style positioner contains two rotary piezo SQUIGGLE motors and can place a fiber with 5 µm precision anywhere in a 9.5 mm diameter patrol region. Contact: Heidi Quinlivan, nstsales@newscaletech.com; Dave Henderson, nstsales@newscaletech.com

EXHIBITION DIRECTORY

Newport Corp. #509

SPIE. Corporate Member

1791 Deere Ave, Irvine, CA, 92606-4814 USA
+1 949 863 3144; fax +1 949 253 1680
sales@newport.com; www.newport.com

Newport, now part of MKS Instruments, is the world's largest photonics company providing innovative solutions and industry leading product brands to multiple markets. Our combined product portfolio includes Corion®, ILX Lightwave™, New Focus™, Ophir, Oriel® Instruments, Richardson Gratings™, and Spectra-Physics® Lasers. We provide complete photonic solutions to make, manage and measure light. Contact: Tom Miller, tom.miller@newport.com

Nikon Glass Business Unit #709

1399 Shoreway Rd, Belmont, CA, 94002-4107 USA
+1-650-454-7360
Glass.Sales@nikon.com; nikon.com

Featured Product: Synthetic Silica Glass, Calcium Fluoride, Optical Glass, i-line Glass and more.

Nikon began research, development and production of optical glass materials in 1918, the year after the establishment of Nippon Kogaku K.K. (Nikon Corporation). By leveraging this vast history of technology, Nikon produces industry-leading synthetic silica glass and calcium fluoride materials. As well as the most advanced optical components for many oemanding applications are also contributing to our customers' quality assurance needs in a variety of applications. Contact: Naoyasu Uehara, Sales & Marketing, naoyasu.uehara@nikon.com

Nüvü Caméras Inc. #307

SPIE. Corporate Member

355 Peel St Ste 603, Montreal, Quebec, H3C 2G9 Canada
+1 514 733 8666; fax +1 514 394 9452
info@nuvucameras.com; www.nuvucameras.com

Observatory Sciences Ltd. #712

Office 4, 1 New Rd, St. Ives, Cambridgeshire, PE27 5BG United Kingdom
+44 1223 508257; fax +44 1223 508258
info@observatorysciences.co.uk; www.observatorysciences.co.uk

Featured Product: Bespoke control software for large astronomical projects

Observatory Sciences is a leading developer and supplier of software for the control of 'big science' systems and instruments, including large astronomical telescopes. We have a reputation for completing complex projects on time and to budget. Meeting the needs of scientific, research and technical clients across the globe, Observatory Sciences is behind some of the world's high-profile astronomy projects, including the Large Synoptic Survey Telescope and the ESO VLT. Contact: Philip Taylor, Director, pbt@observatorysciences.co.uk; Alan Greer, Director, ajg@observatorysciences.co.uk

Officina Stellare SrL. #522

Via della Tecnica 87/89, Sarcedo, VI, 36030 Italy
+39 0445 370540; fax +39 0445 1922009
info@officinastellare.com; www.officinastellare.com

Featured Product: Instruments for professional astronomical research and applications.

Officina Stellare is an Italian company with a proven background in the design and manufacturing of optomechanical instrumentation for ground and space based professional applications. Our range includes astronomy, space situational awareness, laser communication and space payloads for earth observation. The internal optical lab can design, manufacture and test space and ground-based optical systems up to 1 m diameter aperture. Our facilities are equipped with metrological and integration tools. Contact: Gino Bucciol, COO, gino.bucciol@officinastellare.com

Ohara Corp. #616

SPIE. Corporate Member

23141 Arroyo Vista Ste 200, Rancho Santa Margarita, CA, 92688-2613 USA
+1 949 858 5700; fax +1 949 858 5455
sales@oharacorp.com; www.oharacorp.com

Manufacturer of precision optical glasses: strip/slab, cut/molded blanks, high homogeneity blanks, fine gobs, polished ball lenses, near UV transmitting i-Line glass, glass ceramic substrates, CaF2, UV & IR materials, quartz, Fused Silica (standard and excimer grade). Ohara ClearCeram-Z ultralow expansion glass (excellent CTE uniformity; large sizes). NANOCERAM. Supplier of double side polished substrates (excellent flatness/low surface roughness). Contact: Brion Hoffman, President, brionhoffman@oharacorp.com; Chris Ghio, Director of Sales, chrisghio@oharacorp.com

Omega Optical Filters #314

21 Omega Dr, Brattleboro, VT, 05301 USA
+1 802 251 7300
sales@omegafilters.com; www.omegafilters.com

Featured Product: Linear Variable Filters, Ultra Narrow Band Filters to 1 Å, Hydrophobic Coatings, Broadband Mirrors

ISO 9001, ITAR Registered and SBA member; Omega designs and produces the most diverse offering of interference filters in the industry. Whether your application is Space, Industrial, Aerospace, Defense or Machine Vision, we have the solution you need. We bring a corporate commitment to understand and refine your filter needs. This support originates with our team of scientists, engineers, & Industry experts. Our goal: to assure the most appropriate solution will be provided to our customer. Contact: tina hoppock, thoppock@omegafilters.com

Optical Mechanics, Inc. #423

2224 Heinz Rd, Iowa City, IA, 52240-2600 USA
+1 319 351 3960; fax +1 319 351 3943
info@opticalmechanics.com; www.opticalmechanics.com

Featured Product: Precision Optics, Coatings,Telescopes, Gimbals, Collimators, Lidar, Precision Manufacturing

OMI develops and produces high-precision optics and optical-mechanical assemblies for the science, aerospace and defense markets. We create products through internal research and development using our core technologies in optics, telescopes, gimbals, collimators, optical coatings and precision manufacturing. Our in-house production capability enables us to carefully test components and assemblies to ensure they meet or exceed the specifications our customers require. Contact: James Mulherin, President, Optical Engineer, james@opticalmechanics.com; Jill Roskam, Executive Assistant, jill@opticalmechanics.com

Optics.org #603

Ffordd Pengam, 2 Alexandra Gate, Cardiff, CF24 2SA United Kingdom
44 29 2089 4747; fax 44 29 2089 4750
sales@optics.org; www.optics.org

optics.org is the leading online resource for professionals working and using photonics in application. optics.org delivers the latest photonics business news, market trends and product applications. You can also find the latest photonics jobs, events and a comprehensive buyers guide. With thousands of users visiting the site every month it is an effective place to find news and get your products to market. Contact: Rob Fisher, Head of Sales and Marketing, rob.fisher@optics.org

SPONSOR

Optimax Systems, Inc. #620

SPIE. Corporate Member

6367 Dean Pkwy, Ontario, NY, 14519-8939 USA
+1 585 265 1020; fax +1 585 265 1033
sales@optimaxsi.com; www.optimaxsi.com

Featured Product: Adaptive Optics – we use engineered manufacturing solutions that result in high precision optics.

Optimax makes optics for demanding applications – aspheres, cylinders, prisms, spheres, and freeforms. While remaining committed to small volume, high quality, and quick delivery, we support many prototype and research projects each year. We use engineered manufacturing processes that result in high precision optics that are lightweight, require fewer elements and increase the overall flexibility of your most advanced systems. We enjoy a good challenge – how can we help you? Contact: Joe Spilman, Director of Sales & Marketing, sales@optimaxsi.com

PHASICS Corp. #707

SPIE. Corporate Member

11th Floor, 600 California St, San Francisco, CA, 94109 USA
+1 415 610 9741
contact@phasics.com; www.phasicscorp.com

Featured Product: Wavefront sensors (193nm-14µm) for laser beam testing, optical alignment and lens and mirror testing

Phasics high resolution wavefront sensors cover the whole light spectrum from UV (193 nm) to far IR (14µm). They offer comprehensive laser beam characterization and enable precisely aligning complex optical set-up. They also apply to lens, telescope and mirror testing in single or double pass. Their patented technology ensures accuracy (high resolution and high sensitivity) and ease of use (compactness, measurement with no relay lens). Expert software packages deliver insightful analysis. Contact: Yoann Priol, Sales manager US, priol@phasics.com; Valentin Genuer, Sales engineer, genuer@phasics.com

Photon Engineering LLC #113

SPIE. Corporate Member

310 S Williams Blvd No 222, Tucson, AZ, 85711 USA
+1 520 733 9557; fax +1 520 733 9609
info@photonengr.com; www.photonengr.com

Featured Product: FRED Optical Engineering software

Photon Engineering, LLC is a consulting and software development firm based in Tucson, Arizona. Photon Engineering develops and markets FRED, the premier proven software to solve today's challenging optical engineering problems. Users working within FRED's 3D virtual prototyping CAD environment can model and analyze virtually any optomechanical system containing arbitrary coherent, incoherent, and partially coherent sources. Engineering consulting and short courses are offered worldwide. Contact: Donata Pfisterer, Sales, donatap@photonengr.com

Photonic Cleaning Technologies #716

SPIE. Corporate Member

Bldg 1, 1895 Short Ln, Platteville, WI, 53818-8977 USA
+1 608 467 5396; fax +1 608 467 5397
sales@photoniccleaning.com; www.photoniccleaning.com

Featured Product: First Contact Polymers™. Only no-residue strip coat available to clean & protect sensitive surfaces

Manufacturer of First Contact Polymers™. The Cleaning and Protection System. Apply liquid polymer and peel the dried film leaving the surface nearly atomically clean. Independent XPS/ESCA and laser damage threshold testing shows no residue to the molecular level! Safe with high power laser optics. Remove dust & fingerprints. Reduce waste: non-toxic inert polymers. Clean nanostructures, gratings & phase masks! Protect and clean microscope objectives & CCD sensors. Safe. Low adhesion. No residue. Contact: David Giesen, Operations and Manufacturing Manager, davidg@photoniccleaning.com; James Hamilton, CTO, hamiltonj@photonicleaning.com

EXHIBITION DIRECTORY

PI (Physik Instrumente) L.P. #615

SPIE. Corporate Member

Piezo Nano Positioning, 16 Albert St, Auburn, MA, 01501-1304 USA
+1 508 832 3456; fax +1 508 832 0506
info@pi-usa.us; www.pi-usa.us

ISO-9001-Certified, Global Leader in Precision Motion Solutions. Piezo Mechanisms, Air Bearings, Hexapods, Photonics Alignment, Nanopositioning, Micropositioning, Piezo Positioning Systems, Linear Motors & Rotary Stages for OEM & Research. Products: Nanopositioning Systems; 6-Axis Hexapod Alignment Systems, Microscopy Stages; Lens Positioners; Tip/Tilt Mirrors; Piezo Transducers, Piezo Actuators; Piezo Motors, Piezo Drivers & Digital Motion Controllers; Voice Coil Actuators, MicroMotion Robots.

PlaneWave Instruments, Inc. #305

1819 Kona Dr, Rancho Dominguez, CA, 90220-5416 (USA)
+1 310 639 1662; fax: +1 310 634 0439
info@planewaveinstruments.com; www.planewave.com

SPONSOR

Princeton Infrared Technologies, Inc. #303

SPIE. Corporate Member

9 Deerpark Dr J-5, Monmouth Junction, NJ, 08852 USA
+1 609 917 3380
sales@princetonirtech.com; www.princetonirtech.com

Featured Product: 1280SciCam High Resolution NIR/SWIR InGaAs Camera

PIRT, the InGaAs image sensor specialists, is demonstrating the 1280SciCam, 1280x1024 NIR/SWIR camera. The 1280SciCam is sensitive to the wavelength range of 400 to 1700nm and is capable of exposures as long as 2 minutes. The full feature set of this camera outputs 14bits thorough Camera Link. Deep cooling to -40 degrees in air or -60 degrees with water fitting provides ultra-low noise performance. The 1280SciCam ships in 30 days or less at a price that is more affordable than you will expect. Contact: Robert Struthers, VP, robert.struthers@princetonirtech.com

Princeton Instruments #402

SPIE. Corporate Member

3660 Quakerbridge Rd, Trenton, NJ, 08619-1208 USA
+1 609 587 8787; fax +1 609 587 1970
info@princetoninstruments.com; www.princetoninstruments.com

Featured Product: SOPHIA cameras deliver an unprecedented combination of sensitivity, speed, and flexibility.

Princeton Instruments provides advanced solutions for astronomical imaging and spectroscopy. From high-speed imaging to long exposures, ultraviolet to infrared, Princeton Instruments has you covered. Our cameras utilize the most advanced detector cooling technologies, which enable you to stare at the universe for hours, while our fast readout and high frame rates are perfect for time-resolved photometry and speckle imaging. Whatever your application, Princeton Instruments has the right solution! Contact: Mike Melle, Imaging Product Manager, mmelle@princetoninstruments.com; Alan Lichty, Sales Engineer, alichty@princetoninstruments.com

QED Optics #421

1040 University Ave, Rochester, NY, 14607 USA
+1 585 256 6540
info@qedmrf.com; www.qedoptics.com

Featured Product: Precision optics manufacturing services from prototype to volume production.

QED Optics can help you meet tough specifications and lead times on the most demanding, high precision optical components. We'll work together to understand your needs and produce your optics on time and in spec. QED Optics' manufacturing services range from polishing and measuring small lenses to large mirrors in a variety of shapes and sizes, to make-to-print services. QED Optics maintains high quality standards on every job while achieving specifications and customer expectations. Contact: Michael DeMarco, Business Manager, demarco@qedmrf.com; Christopher Hall, Senior Engineer, hall@qedmrf.com

QHYCCD #316

Xinyuan Science Park A810, Changping Rd No 97
Changping, Beijing, 102200 China
+86 10 53953350 602; fax +86 10 53953350 602
cdm@qhyccd.com; www.qhyccd.com

Raptor Photonics Ltd. #628

SPIE. Corporate Member

Willowbank Business Park, Larne N Ireland, BT40 2SF United Kingdom
+44 2828 270141; fax +44 2828 275685
sales@raptorphotonics.com; www.raptorphotonics.com

Featured Product: Ninox Cooled 1280 SWIR camera, Low dark current.

Raptor Photonics aims to provide world class low light level camera solutions to industrial, research and governmental organisations around the globe. Raptor Photonics Limited is a high tech company based in Northern Ireland, which was established in September 2006. Our main focus is to design, manufacture and sell the next generation of high performance, cutting edge, low light level digital cameras. Contact: Derek Craig, sales@raptorphotonics.com

Safran Reosc #702

ave de la Tour Maury, St Pierre du Perray, 91280 France
+33 1 69 89 72 00; fax +33 1 69 89 76 50
roland.geyl@safrangroup.com; www.safran-reosc.com

Featured Product: Large & segmented optics, high tech optics & coatings for instrumentation, space optics

Safran Reosc is a world leader in large optics for astronomy. After ESO VLT 8-m mirrors and GTC 36 1.8-m segments Safran Reosc is now starting the optical manufacturing of the ELT: 931 M1 hexagonal segments, 4-m class M2 and M3 mirrors, Thin glass shells for the M4 Unit Safran Reosc also offer design, manufacturing, coating and AIT of Advanced optical equipment for space, laser and scientific instrumentation. Contact: Roland Geyl, VP Business Development, roland.geyl@safrangroup.com; Vinod Ravindran, Sales Manager, Vinod.ravindran@safrangroup.com

Sandvik Osprey Ltd. #511

Red Jacket Works, Milland Rd, Neath, Port Talbot, SA11 1NJ United Kingdom
+44 1639 634121; fax +44 1639 630100
cealloys.osprey@sandvik.com

Featured Product: Controlled Expansion (CE) Alloys

Sandvik Osprey manufactures a range of binary silicon-aluminum alloys for thermal management applications. By controlling the ratio of silicon and aluminum the co-efficient of thermal expansion (CTE) can be modified to suit customer requirements anywhere in the range of 17ppm/K to 5ppm/K. The alloys are lightweight, have high thermal conductivity and specific stiffness making them an ideal material of choice for many applications. Contact: Andrew Coleman, CEA Group Manager, cealloys.osprey@sandvik.com

SCHOTT North America, Inc. #514

SPIE. Corporate Member

400 York Ave, Duryea, PA, 18642-2036 USA
+1 570 457 7485; fax +1 570 457 7330
info.optics@us.schott.com; www.us.schott.com

Featured Product: Infrared Material

SCHOTT is a leading international technology group in the areas of specialty glass and glass ceramics. The company has more than 130 years of outstanding development, materials, and technology expertise, and they offer a broad portfolio of high-quality products. SCHOTT is an innovative enabler for many industries, including the home appliance, pharmaceutical, electronics, optics, automotive, and aviation industries. Visit us at: www.us.schott.com.

Sener Ingenieria y Sistemas SA #403

Avda de Zugazarte 56, Las Arenas Vizcaya, 48930 Spain
+34 944 817 500; fax +34 944 817 501
www.aerospace.sener; www.aerospace.sener

Featured Product: Active Optics: high precision custom mechatronics, Optical Systems and Telescope Systems.

SENER is an international private engineering and technology group with over 2,500 professionals and its turnover exceeds 910 million Euros. In the field of Astronomy, SENER is recognized for its capability to perform multi-disciplinary projects in opto-mechanics, large mobile structures, instrumentation including optics, mechanics, electronics and SW and actuators and control infrastructures. These activities are developed in parallel for Space missions and Ground Astronomy telescopes. Contact: Joan Manel Casalta, Science and Astronomy Business Development, joanmanel.casalta@sener.es

Sigmadyne, Inc. #526

SPIE. Corporate Member

803 West Ave Ste 311, Rochester, NY, 14611-2447 USA
+1 585 235 6892; fax +1 585 235 6931
michels@sigmadyne.com; www.sigmadyne.com

Featured Product: Optomechanical analysis services and software

Sigmadyne is an engineering consulting firm specializing in optomechanical analysis services and software. Our specialty is integrating mechanical predictions with optical predictions for photonic applications in a wide array of industries. Our consulting services offer optomechanical analysis effective in the design development and testing of precision optical systems. SigFit is a software product enabling engineers to link mechanical analysis with optical analysis. Contact: Gregory Michels, Vice President, michels@sigmadyne.com

Southern African Large Telescope #412

PO Box 9, Observatory Rd, Cape Town, Western Cape, 7925 South Africa
+27 23 571 1205; fax +27 23 571 2456
salt@salt.ac.za; www.salt.ac.za

Featured Product: Southern African Large Telescope

SALT's mission is to provide a world-class large telescope research facility cost-effectively to astronomers in an international community and to lead the advancement and development of optical astronomy on the African continent. It also aims to inspire and educate new generations of scientists and engineers worldwide. SALT's strategic objectives are: Enable world-leading astrophysical research. Pursue instrumentation development. Drive human capital development and science engagement. Contact: David Buckley, dibnob@saao.ac.za; Anja Schroeder, anja@hartrao.ac.za

Spectral Instruments, Inc. #521

SPIE. Corporate Member

420 N Bonita Ave, Tucson, AZ, 85745-2747 USA
+1 520 884 8821; fax +1 520 884 8803
info@specinst.com; www.specinst.com

Spectral Instruments is showing CMOS and CCD cameras for ultra-high performance scientific application. Our expertise in CCD camera development provides a background for the finest in cooled, state of the art, CMOS camera platforms supporting large area, front and back illuminated, high Q.E. sensors. A new non-destructive readout camera which has been tested for astronomical use will be shown, a new CMOS guide camera announced, and custom OEM camera and sensor designs offered. Contact: Charles Slaughter, System Specialist, cdslaughter@specinst.com

Spectrum Thin Films #326

SPIE. Corporate Member

135 Marcus Blvd, Hauppauge, NY 11788 (USA)
sales@spectrumthinfilms.com; www.spectrumthinfilms.com
+1 631 901 1010; fax +1 631 236 4309

EXHIBITION DIRECTORY

SPIE Career Center #603

1000 20th St, Bellingham, WA, 98225-6705 USA
+1 360 685 5551; fax +1 360 647 1445
sales@spiecareercenter.org; www.spiecareercenter.org

Featured Product: Online Job Board; Recruitment Advertising; Job Fairs

The SPIE Career Center is the leading recruitment resource for companies and professionals in the optics and photonics community. Whether you're looking for a new job or searching for top candidates, our resources will help you find the perfect match for your needs. Job seekers can post their resumes, search our online job board and access additional resources for career advancement. Employers can advertise jobs online, access the SPIE searchable resume database and exhibit in SPIE Job Fairs. Contact: Lacey Barnett, Career Center Manager, laceyb@spie.org; Robert Dentel, Sales and Business Development, robertd@spie.org

SPIE Digital Library #603

PO Box 10, Bellingham, WA, 98227-0010 USA
+1 360 676 3290; fax +1 360 647 1445
spiedlhelp@spie.org; www.spiedigitallibrary.org

Featured Product: SPIE Digital Library

The SPIE Digital Library is the world's largest collection of optics and photonics applied research. The Digital Library contains over 470,000 research papers from the Proceedings of SPIE, the Society's 10 peer-reviewed journals, and more than 325 eBooks from SPIE Press. Approximately 18,000 new research papers and 25 eBook titles are added annually. SPIE Digital Library papers are cited in more than 120,000 patents. Contact: Patrick Franzen, Director, SPIE Digital Library Sales, patrickf@spie.org

Sunpower, Inc. #611

2005 E State St Ste 104, Athens, OH, 45701-2125 USA
+1 740 590 3063
sunpower.info@ametek.com; www.sunpowerinc.com

For temperature requirements between 40 K and 200 K there is no better alternative with respect to small size, efficient operation, and price. CryoTel cryocoolers are particularly well suited to telescopes as they are highly efficient, reliable, and do not require transfer lines or high input power. In addition, the new Active Vibration Control system will significantly reduce vibration even further for sensitive applications. Contact: Jimmy Wade, Business Development, jimmy.wade@ametek.com

Swiss Industry Liaison Office #723

EPFL, Station 13, Lausanne, CH-1015 Switzerland
41 (0) 21 693 34 91; fax 41 (0) 21 693 51 76
michel.hubner@epfl.ch; www.swissilo.ch

Featured Product: Scientific Instrumentation, High Precision Mechanisms, Opto-mechatronics, Metrology

The Swiss Industry Liaison Office supports Swiss companies to achieve commercial supply or provide service contracts at international research organisations. The responsibilities of the office include promoting Swiss technology capabilities inside astronomy related organisations and arranging discussions between Swiss and international companies interested in bidding on future tenders at astronomy related organisations. Contact: Michel Hübner, Industry Liaison Officer - Switzerland, michel.hubner@epfl.ch; Peter Spanoudakis, Senior Project Manager, peter.spanoudakis@csem.ch

SPONSOR

Symétrie #728

10 allée Charles Babbage, Nimes, 30000 France
+33 4 66 29 43 88
info@symetrie.fr; www.symetrie.fr

Featured Product: Hexapods, 6DOF high precision positioning systems for alignment or calibration

The hexapod kinematics enable extremely precise motion with high resolution and stiffness. Our hexapods are particularly adequate to align mirrors or subreflectors on ground-based telescopes and during mounting and testing phases of space telescopes. Experience: ARIES, OAJ, NOEMA and Pan-STARRS-2 telescopes, JWST, Gaia and BepiColombo satellites. SYMETRIE has more than 18-year experience in providing complete ready-to-use systems with ergonomic control software. Contact: Anne Duget, Marketing and Sales Manager, anne.duget@symetrie.fr; Olivier Lapierre, CEO, olivier.lapierre@symetrie.fr

SPONSOR

Teledyne #715

SPIE. Corporate Member

221 Commerce Dr, Montgomeryville, PA, 18936-9641 USA
+1 805 373 4545
information@teledynejudson.com; www.teledynejudson.com

Teledyne Imaging - Space & Defense #715

Teledyne Imaging - Space & Defense, 1049 Camino dos Rios, Thousand Oaks, CA, 91360-2362 USA
+1 805 373 4545; fax +1 805 373 4775
www.teledyne.com/

Thales SESO #513

Pôle d'Activités d'Aix-en Provence Les Milles, 530 Rue Frederic Joliot, Aix-en-Provence Cedex 3, 13593 France
+33 4 42 16 85 00; fax +33 4 42 16 85 85
info.tseso@fr.thalesgroup.com; www.seso.com

Featured Product: Optical components; Opto-mechanical systems ; Light-weighted aspherical mirrors; X-Rays mirrors

Thales SESO, part of Thales group, is specialized since more than 50 years in design, development and manufacturing of challenging optical components and/or high performance customized opto-mechanical systems. Fields of business are ground based Astronomy, space born telescope (i.e. large light-weighed spherical mirrors), general industry (civil, military, nuclear), optics for high power laser and X-Rays mirrors for synchrotrons. Our facilities are located in Aix-en-Provence (France). Contact: Denis Fappani, Sales Manager, denis.fappani@fr.thalesgroup.com; Gilles Borsoni, VP Sales, gilles.borsoni@fr.thalesgroup.com

SPONSOR

Thirty Meter Telescope International Observatory #408

100 W Walnut St, Ste 300, Pasadena, CA, 91124-0001 USA
+1 636 395 1600
inquiry@tmt.org; www.tmt.org

Featured Product: TMT Thirty Meter Telescope actuators, sensors, VR

TMT project has been established to design, build and operate an Extremely Large Telescope (ELT) with a primary mirror diameter of 30 meters. When complete TMT will be one of the largest ground based optical/infrared telescope in the world providing the capability to study exciting astronomical problems from the nature of extra-solar planets to the first stars in the universe. TMT - International collaboration consisting of the University of California, Caltech, Canada, Japan, India and China. Contact: Christophe Dumas, Head of Operations, cdumas@tmt.org; Warren Skidmore, System Scientist, was@tmt.org

Thorlabs, Inc. #625

SPIE. Corporate Member

56 Sparta Ave
Newton, NJ 07860-2402 (USA)
+1 973 300 3000; fax +1 973 300 3600
sales@thorlabs.com; www.thorlabs.com

Featured Product: Woofer-Tweeter Adaptive Optics

Thorlabs provides the products you need to enable your experiments, as well as the expertise you need to get your application working. We design, develop, and manufacture system level solutions as well as components including optical components, cameras, detectors, optomechanics, fiber, laser diodes, tunable lasers, and vibration isolation systems. Visit our booth to see our Woofer-Tweeter Adaptive Optics Demo! Contact: Jamie LaCouture, Trade Show Supervisor, jlacouture@thorlabs.com; Anjul Loiacono, Business Development, aloiacono@thorlabs.com.

TNO #321

Stieltjesweg 1, Delft, Zuid-Holland, 2628 CK Netherlands
+31 88 866 20 00
www.tno.nl

TOPTICA Photonics, Inc. #515

SPIE. Corporate Member

5847 County Road 41, Farmington, NY, 14425-9105 USA
+1 585 657 6663; fax +1 877 277 9897
office@toptica-usa.com; www.toptica.com

Featured Product: Sodium Guide Star Laser "SodiumStar 20/2"

TOPTICA Projects GmbH, a subsidiary of TOPTICA Photonics AG, was founded in 2016. TOPTICA Projects focuses on customized laser solutions, innovation and technology development. This includes all activities related to the award-winning Guide Star Laser, which is used by several major astronomy facilities worldwide and has also been selected for ESO's next generation Extremely Large Telescope (ELT). The TOPTICA team has recently received the OSA Forman Award for the Guide Star Laser. Contact: Frank Lison, CEO TOPTICA Projects GmbH, frank.lison@toptica-projects.com; Bernhard Ernstberger, Project Manager, bernhard.ernstberger@toptica-projects.com

TSUBAKI KABELSCHLEPP GmbH #311

Daimlerstr 2, Wenden-Gerlingen, 57482 Germany
+49 2762 4003 0
info@kabelschlepp.de; www.kabelschlepp.de/en/company/index.html

TTI #403

Parque Tecnologico de Cantabria, Calle de Albert Einstein 14,
Santander, Cantabria, 39011 Spain
+34 942 291212
www.ttinorte.es

TTI works at the cutting edge of technology for radio astronomy, aerospace, telecom and science. TTI is a world renowned supplier of Cryogenic Low Noise Amplifiers (Cryo LNAs) and Warm LNAs based upon InP & GaAs technologies, and has delivered several thousand units in the last decade. TTI also develops Cryostats, Feeders and RF systems as well as turnkey geodetic VLBI receivers (including Antenna feeders, Polarisers, Cryogenics, IF, Phase Calibration Units, M&C, Installation and Commissioning).

US Fiberoptec Technology, Inc. #510

SPIE. Corporate Member

175 Bernal Rd Ste 15, San Jose, CA, 95119-1343 USA
+1 408 834 7410; fax +1 408 834 7430
info@usfiberoptec.com; www.usfiberoptec.com

Featured Product: Silica/Silica Non Circular Core Fiber

USFiberOptec's® non circular core silica optical fibers show the same exceptional performance and transmission as Optran UV/WF fibers with circular core geometry. With its good image scrambling and low focal ratio degradation it is ideal for astronomy applications. When used with diode lasers which give a square shaped output, the square core fibers offer greater coupling efficiencies than circular fibers. The square output beam reduces the need for beam shaping optics. Contact: Ilya Rotenstein, Business Development Manager, ilya@usfiberoptec.com

VDL Science & Technology #321

De Schakel 22, Eindhoven, NB, 5651 GH Netherlands
+31 653 126 709
info@vdletg.com; www.vdletg.com

Featured Product: Optical components, Mirror manipulators

VDL is a global supplier of advanced mechanical components, modules and complete systems and has built a track record in the markets of semiconductor capital equipment, thin film deposition equipment for photovoltaic solar systems, analytical instruments, medical systems aerospace and defense parts and systems and mechanization projects. We, at VDL Science and Technology, believe that cooperating with science, the world can create breakthroughs in understanding fundamental physics. Contact: Hans Priem, New Business Development Manager, Hans.Priem@vdletg.com; Mathieu Breukers, Manufacturing Engineer, mathieu.breukers@vdletg.com

EXHIBITION DIRECTORY

VIAVI Solutions #724

SPIE. Corporate Member

1402 Mariner Way, Santa Rosa, CA, 95407 USA
+1 707 525 9200; fax +1 707 525 7028
ospcustomerservice@viavisolutions.com; viavisolutions.com/osp

Featured Product: Custom optical coatings

VIAVI Solutions, Optical Coating Labs (OCLI) is a leading supplier of custom thin-film coated optical coatings with space heritage. From prototype to production, our expertise, technology, and processes give customers a competitive advantage. Our solutions are critical to a variety of space applications, including optics for space based and terrestrial telescopes, laser protection, and infrared spectrometer instruments. Learn more at viavisolutions.com/osp. Contact: Shawn Cullen, Product Line Manager, shawn.cullen@viavisolutions.com; Connie Heinse, Communications/Marketing Manager, Connie.heinse@viavisolutions.com

Vincent Associates #406

803 Linden Ave, Rochester, NY, 14625-2709 USA
+1 585 385 5930; fax +1 585 385 6004
info@uniblitz.com; www.uniblitz.com

Featured Product: The new ES6B, 6mm aperture bi-stable laser shutter with industry first 25 million cycle guarantee.

Since 1969 Vincent Associates has been designing and manufacturing precision shutter systems for use in laser safety, microscopy, biomedical research, camera systems, industrial, astronomy and defense applications. Our UNIBLITZ products are known for their reliability and long lifetimes. Contact us today to see how we can help you with your next project. Contact: Stephen Pasquarella, President, spasq@uniblitz.com; Stephanie Schaffer, Sales Manager, sschaffer@uniblitz.com

Winlight System & Optics #529

135 rue Benjamin Franklin ZA St Martin, Pertuis, 84120 France
+33 490077860; fax +33 490777631
info@winlight-system.com; www.winlight-system.com

Featured Product: Spectrographs; Image slicers; Optical components (lenses, mirrors, prisms).

Winlight has been involved in many instruments such as : MUSE (24 spectrographs + 24 images slicers + 48 transport doublets + derotator + Field Splitter Optics). Winlight is presently involved in-PFS-SUMIRE, DESI, MOONS, 4MOST, WFIRST. Winlight can supply optics and sub-systems based on your design, or assist you for the design of the spectrograph or camera optics or slicer taken into account manufacturing constraints. Optics are polished, mounted, and aligned in our lab. Contact: Philippe Godefroy, Chief Operating Officer, philippe.godefroy@winlight-system.com; Yves Salaun, Technical Director, yves.salaun@winlight-optics.com

Zygo Corporation #508

SPIE. Corporate Member

21 Laurel Brook Rd, Middlefield, CT, 06455-1291 USA
+1 860 347 8506; fax +1 860 347 8372
inquire@zygo.com; www.zygo.com

Featured Product: ZYGO's ZeGage™ Surface Profiler and ZYGO's DynaFiz™ Laser Interferometer

For nearly 50 years, the world's leading manufacturers have relied on ZYGO products for critical production testing, quality control, research & development. Unmatched commitment to superior quality has established ZYGO as the industry leader for precision measurement products, optical system design and assembly, and high-precision optical fabrication. ZYGO delivers advanced optical metrology tools for precise, noncontact measurement of surfaces and material characteristics. Contact: Justin Turner, Business Development, jturner@zygo.com; David Melton, Director Sales & Support, dmelton@zygo.com

EXHIBITOR PRODUCT LISTING

ASTRONOMY
4D Technology Corp.
AdTech Ceramics Co.
AMOS - Advanced Mechanical & Optical Systems
Andor Technology Ltd.
Applied Surface Technologies
ASA Astrosysteme GmbH
Asahi Spectra USA Inc.
ASTELCO Systems GmbH
Atatürk Univ. Astrophysics Research & Application Center - ATASAM
AVS Added Value Industrial Engineering Solutions S.L.U.
Ball Aerospace
Boston Micromachines Corp.
Cherenkov Telescope Array
Cosylab
Dynamic Optics
Dynavac
EIE Group s.r.l.
EMF Corp.
EMSS Antennas
Energetiq Technology, Inc.
EOS Space Systems Pty. Ltd.
Fagor Automation Scoop LDA
Fibertech Optica Inc.
First Light Imaging
FMV Isik University Center for Optomechatronics Research & Application - OPAM
Giant Magellan Telescope
Gpixel Inc.
Hellma Materials
Hofstadter Analytical Services, LLC
Imagine Optic Inc.
Kaiser Optical Systems, Inc.
LSST
Luxel Corp.
Mad City Labs., Inc.
Materion Precision Optics
Media Lario S.r.l.
Molex - Polymicro
MPB Communications Inc
MPS Micro Precision Systems AG
Netherlands Research School for Astronomy
New England Optical Systems
New Scale Technologies, Inc.
Nikon Glass Business Unit
Observatory Sciences Ltd.
Officina Stellare SrL.
Photon Engineering LLC
Photonic Cleaning Technologies
PI (Physik Instrumente) L.P.
Princeton Infrared Technologies, Inc.
Princeton Instruments
QED Optics
Raptor Photonics Ltd.
Safran Reosc
Sigmadyne, Inc.
Symétrie
Thales SESO
Thirty Meter Telescope International Observatory
TOPTICA Photonics, Inc.
US Fiberoptec Technology, Inc.
VDL Science & Technology
VIAVI Solutions
Vincent Associates

BASIC RESEARCH, SCIENCE
Andor Technology Ltd.
Applied Surface Technologies
Atatürk Univ. Astrophysics Research & Application Center - ATASAM
AVS Added Value Industrial Engineering Solutions S.L.U.
Cherenkov Telescope Array
EOS Space Systems Pty. Ltd.
FMV Isik University Center for Optomechatronics Research & Application - OPAM
Hellma Materials
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PI (Physik Instrumente) L.P.
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Thales SESO
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BIOMEDICAL, MEDICAL IMAGING, HEALTH CARE
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First Light Imaging
Gpixel Inc.
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Princeton Instruments
Raptor Photonics Ltd.
TOPTICA Photonics, Inc.
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VIAVI Solutions
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CAMERAS AND IMAGING SYSTEMS
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Ball Aerospace
Cherenkov Telescope Array
EIE Group s.r.l.
Finger Lakes Instrumentation
First Light Imaging
Gpixel Inc.
Hofstadter Analytical Services, LLC
Media Lario S.r.l.
MPS Micro Precision Systems AG
Netherlands Research School for Astronomy
Officina Stellare SrL.
Photonic Cleaning Technologies
Princeton Infrared Technologies, Inc.
Princeton Instruments
Raptor Photonics Ltd.
Thirty Meter Telescope International Observatory
Vincent Associates

CHEMICAL AND BIOLOGICAL ANALYSIS
Asahi Spectra USA Inc.
Fibertech Optica Inc.
Gpixel Inc.
Hellma Materials
Mad City Labs., Inc.
Princeton Instruments
Raptor Photonics Ltd.

COMMUNICATIONS & NETWORKING
AMOS - Advanced Mechanical & Optical Systems
FMV Isik University Center for Optomechatronics Research & Application - OPAM
Media Lario S.r.l.
MPB Communications Inc
SPIE Career Center

COMPUTING SYSTEMS, DATA PROCESSING
Cherenkov Telescope Array

COMPUTING, DATA PROCESSING HARDWARE
Cherenkov Telescope Array

CONSULTING SERVICES
Archer OpTx, Inc.
Atatürk Univ. Astrophysics Research & Application Center - ATASAM
EMSS Antennas
FMV Isik University Center for Optomechatronics Research & Application - OPAM
Netherlands Research School for Astronomy
Officina Stellare SrL.
Photon Engineering LLC
QED Optics
Sigmadyne, Inc.

CONSUMER ELECTRONICS
VIAVI Solutions

DEFENSE, SECURITY, LAW ENFORCEMENT
AdTech Ceramics Co.
AMOS - Advanced Mechanical & Optical Systems
Archer OpTx, Inc.
Asahi Spectra USA Inc.
EOS Space Systems Pty. Ltd.
First Light Imaging
Materion Precision Optics
Officina Stellare SrL.
PI (Physik Instrumente) L.P.
QED Optics
Raptor Photonics Ltd.
Safran Reosc
Symétrie
Thales SESO
VIAVI Solutions

DETECTORS, SENSORS
AdTech Ceramics Co.
Andor Technology Ltd.
Ball Aerospace
Cherenkov Telescope Array
EMF Corp.
Energetiq Technology, Inc.
EOS Space Systems Pty. Ltd.
Fagor Automation Scoop LDA
Gpixel Inc.
Hellma Materials
Hofstadter Analytical Services, LLC
Imagine Optic Inc.
Luxel Corp.
Materion Precision Optics
Officina Stellare SrL.
Princeton Infrared Technologies, Inc.
Princeton Instruments
Thirty Meter Telescope International Observatory
VIAVI Solutions

DISPLAYS
EMF Corp.

DISPLAYS: CONSUMER, INFORMATION, ENTERTAINMENT
EMF Corp.
Optimax Systems, Inc.

DISTRIBUTOR, RESELLER, INTEGRATOR
EMSS Antennas

EARTH SCIENCES, ENVIRONMENTAL MONITORING, CLIMATE
Atatürk Univ. Astrophysics Research & Application Center - ATASAM
Ball Aerospace
EOS Space Systems Pty. Ltd.
Hellma Materials
Media Lario S.r.l.
Raptor Photonics Ltd.

EXHIBITOR PRODUCT LISTING

EDUCATION AND TRAINING
FMV Isik University Center for Optomechatronics Research & Application - OPAM
Photon Engineering LLC
PI (Physik Instrumente) L.P.
SPIE Career Center
SPIE Digital Library
Symétrie

ELECTRICAL/SIGNAL ANALYSIS EQUIPMENT
Cherenkov Telescope Array

ELECTRONIC COMPONENTS
AdTech Ceramics Co.
Cosylab
EOS Space Systems Pty. Ltd.
Molex - Polymicro

ELECTRONIC, DIGITAL IMAGING
AdTech Ceramics Co.
EIE Group s.r.l.
Thirty Meter Telescope International Observatory

EMERGING PHOTONICS TECHNOLOGIES
Molex - Polymicro

FIBER OPTICS AND ACCESSORIES
Aerotech, Inc.
Archer OpTx, Inc.
AVS Added Value Industrial Engineering Solutions S.L.U.
Energetiq Technology, Inc.
Fibertech Optica Inc.
Molex - Polymicro
Thirty Meter Telescope International Observatory
US Fiberoptec Technology, Inc.

INDUSTRIAL SENSING AND MEASUREMENT
Äpre Instruments, LLC
Fibertech Optica Inc.
First Light Imaging
Gpixel Inc.
Princeton Infrared Technologies, Inc.
Symétrie
TOPTICA Photonics, Inc.
US Fiberoptec Technology, Inc.

LASER COMPONENTS AND ACCESSORIES
AdTech Ceramics Co.
EOS Space Systems Pty. Ltd.
Infinite Optics Inc.
Luxel Corp.
Mad City Labs., Inc.
Materion Precision Optics
Nikon Glass Business Unit
Photonic Cleaning Technologies
QED Optics
Thales SESO
US Fiberoptec Technology, Inc.
Vincent Associates

LASER INDUSTRY
AdTech Ceramics Co.
Aerotech, Inc.
Archer OpTx, Inc.
EOS Space Systems Pty. Ltd.
MPS Micro Precision Systems AG
Nikon Glass Business Unit
Sigmadyne, Inc.
Vincent Associates

LASERS AND SYSTEMS
ASTELCO Systems GmbH
Energetiq Technology, Inc.
MPB Communications Inc
MPS Micro Precision Systems AG
Thirty Meter Telescope International Observatory
TOPTICA Photonics, Inc.

LED, OLED, NON-LASER LIGHT SOURCES
AdTech Ceramics Co.
Asahi Spectra USA Inc.
Energetiq Technology, Inc.
Fibertech Optica Inc.

LIGHTING AND ILLUMINATION
Asahi Spectra USA Inc.
Dynavac
EMF Corp.
Energetiq Technology, Inc.
Hofstadter Analytical Services, LLC
Infinite Optics Inc.
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Sunday–Friday 10–15 June 2018 • Proceedings of SPIE Vol. 10698

Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave

Conference Chairs: **Makenzie Lystrup,** Ball Aerospace & Technologies Corp. (USA); **Howard A. MacEwen,** Reviresco LLC (USA); **Giovanni G. Fazio,** Harvard-Smithsonian Ctr. for Astrophysics (USA)

Program Committee: **Natalie Batalha,** NASA Ames Research Ctr. (USA); **Beth A. Biller,** The Royal Observatory, Edinburgh (United Kingdom); **James B. Breckinridge,** Breckinridge Associates (USA); **Denis Burgarella,** Observatoire Astronomique de Marseille-Provence (France); **Richard W. Capps,** Jet Propulsion Lab. (USA); **Mark Clampin,** NASA Goddard Space Flight Ctr. (USA); **Mattheus W. M. de Graauw,** P.N. Lebedev Physical Institute (Russian Federation); **Lee D. Feinberg,** NASA Goddard Space Flight Ctr. (USA); **Andreas Glindemann,** European Southern Observatory (Germany); **Qian Gong,** NASA Goddard Space Flight Ctr. (USA); **James C. Green,** Univ. of Colorado at Boulder (USA); **Matthew J. Griffin,** Cardiff Univ. (United Kingdom); **Astrid Heske,** European Space Research and Technology Ctr. (Netherlands); **Robert A. Laskin,** Jet Propulsion Lab. (USA); **David T. Leisawitz,** NASA Goddard Space Flight Ctr. (USA); **Charles F. Lillie,** Lillie Consulting (USA); **Jean-Pierre Maillard,** Institut d'Astrophysique de Paris (France); **Gary W. Matthews,** Harris Corp. (USA); **Takao Nakagawa,** Institute of Space and Astronautical Science (Japan); **Jacobus M. Oschmann,** Ball Aerospace & Technologies Corp. (USA); **Ronald S. Polidan,** Polidan Science Systems & Technologies, LLC (USA); **David C. Redding,** Jet Propulsion Lab. (USA); **Giorgio Savini,** Univ. College London (United Kingdom); **Bernard D. Seery,** NASA Goddard Space Flight Ctr. (USA); **Nicholas Siegler,** Jet Propulsion Lab. (USA); **H. Philip Stahl,** NASA Marshall Space Flight Ctr. (USA); **Giovanna Tinetti,** Univ. College London (United Kingdom); **Edward C. Tong,** Harvard-Smithsonian Ctr. for Astrophysics (USA); **Gillian S. Wright,** UK Astronomy Technology Ctr. (United Kingdom); **Toru Yamada,** Japan Aerospace Exploration Agency (Japan)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 3, ROOM 6A/B ..... SUN 9:00 AM TO 10:20 AM

JWST I

Session Chair: **Makenzie Lystrup,** Ball Aerospace (USA)

9:00 am: **The James Webb Space Telescope: observatory status and preparations for launch**, Michael W. McElwain, Malcolm B. Niedner, Charles W. Bowers, Randy A. Kimble, Erin C. Smith, Mark Clampin, NASA Goddard Space Flight Ctr. (USA). . . . . [10698-1]

9:20 am: **Performance of the center-of-curvature optical assembly during cryogenic testing of the James Webb Space Telescope**, James B. Hadaway, The Univ. of Alabama in Huntsville (USA), et al. . . . . [10698-2]

9:40 am: **James Webb Space Telescope optical performance predictions post cryogenic vacuum tests**, Paul A. Lightsey, J. Scott Knight, Allison Barto, Koby Z. Smith, Ball Aerospace (USA), et al.. . . . . [10698-3]

10:00 am: **James Webb Space Telescope (JWST) optical telescope element and integrated science instrument module (OTIS) cryogenic optical test results**, Randy Kimble, Lee D. Feinberg, Mark Voyton, Juli Lander, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-4]

Coffee Break . . . . . .Sun 10:20 am to 10:50 am

SESSION 2

LOCATION: CC LEVEL 3, ROOM 6A/B ..... SUN 10:50 AM TO 12:10 PM

JWST II

Session Chair: **Makenzie Lystrup,** Ball Aerospace (USA)

10:50 am: **Optomechanical modeling of the optical telescope element and integrated science instrument module (OTIS) cryo-vacuum test for the James Webb Space Telescope (JWST)**, Ryan G. Irvin, Photon Engineering LLC (USA), et al.. . . . . [10698-5]

11:10 am: **JWST's near infrared spectrograph status and first OTIS test results**, Maurice te Plate, Stephan M. Birkmann, Marco Sirianni, Timothy D. Rawle, Catarina Alves de Oliveira, Torsten Böker, Elena Puga, Nora Lützgendorf, Anthony Marston, European Space Agency (USA), et al.. . . . . [10698-6]

11:30 am: **James Webb Space Telescope mirror and actuator performance at cryo-vacuum**, Benjamin B. Gallagher, Koby Z. Smith, J. Scott Knight, Joseph Sullivan, Andrew Rudeen, Kevin Babcock, Bruce Hardy, Allison Barto, Ball Aerospace (USA) . . . . . [10698-7]

11:50 am: **Updated optical modeling of JWST coronagraph performance, contrast, and stability**, Marshall D. Perrin, Laurent Pueyo, Space Telescope Science Institute (USA), et al. . . . . [10698-8]

Lunch Break . . . . . Sun 12:10 pm to 1:30 pm

SESSION 3

LOCATION: CC LEVEL 3, ROOM 6A/B ..... SUN 1:30 PM TO 3:30 PM

Missions

Session Chair: **Howard A. MacEwen,** Reviresco, LLC (USA)

1:30 pm: **SPICA: a joint infrared space observatory**, Peter R. Roelfsema, SRON Netherlands Institute for Space Research (Netherlands) and Kapteyn Astronomical Institute (Netherlands), et al. . . . . [10698-9]

1:50 pm: **Thermal and mechanical design of SPICA payload module**, Hiroyuki Ogawa, Takao Nakagawa, Hideo Matsuhara, Chihiro Tokoku, Mitsunobu Kawada, Ken Goto, Shinsuke Takeuchi, Masaru Saijo, Institute of Space and Astronautical Science (Japan) and Japan Aerospace Exploration Agency (Japan), et al.[10698-10]

2:10 pm: **SPICA mid-infrared instrument (SMI): conceptual design and feasibility studies**, Hidehiro Kaneda, Daisuke Ishihara, Shinki Oyabu, Misato Fukagawa, Takuma Kokusho, Toyoaki Suzuki, Nagoya Univ. (Japan), et al.. . . . . [10698-11]

2:30 pm: **Status of development the Millimetron Space Observatory key components**, Evgeny Golubev, Andrey Smirnov, Mikhail Arkhipov, Victor Pyshnov, Astro Space Ctr., P.N. Lebedev Physical Institute (Russian Federation), et al.. . . . . [10698-12]

2:50 pm: **Stray-light analysis and testing of the SoloHI (solar orbiter heliospheric imager) and WISPR (wide field imager for solar probe) heliospheric imagers**, Arnaud F. R. Thernisien, Russell A. Howard, Robin C. Colaninno, U.S. Naval Research Lab. (USA). . . . . [10698-13]

3:10 pm: **A submm-wave comet explorer for water isotopic composition measurements,** Imran Mehdi, Paul von Allmen, Jacob Kooi, Mathieu Choukroun, Paul F. Goldsmith, Darren Hayton, Bruce Bumble, Goutam Chattopadhyay, Shanshan Yu, Sabrina Feldman, Jet Propulsion Lab. (USA). . . . . [10698-14]

Coffee Break . . . . . Sun 3:30 pm to 4:00 pm

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

CONFERENCE 10698

SESSION 4

LOCATION: CC LEVEL 3, ROOM 6A/B ..... SUN 4:00 PM TO 6:00 PM

Probe Study Overviews

Session Chair: **Giovanni Fazio,** Harvard-Smithsonian Ctr. for Astrophysics (USA)

4:00 pm: **Precision astrometry mission for exoplanet detection around binary stars**, Eduardo A. Bendek, NASA Ames Research Ctr. (USA), et al. . . . . [10698-15]

4:20 pm: **The ARIEL space mission**, Enzo Pascale, Sapienza Univ. di Roma (Italy), et al.. . . . . [10698-16]

4:40 pm: **ATLAS probe for the study of galaxy evolution with 300,000,000 galaxy spectra**, Robert Content, Australian Astronomical Observatory (Australia), et al.. . . . . [10698-17]

5:00 pm: **The NASA probe-class mission concept: CETUS**, Sara R. Heap, William C. Danchi, NASA Goddard Space Flight Ctr. (USA) . . . . . [10698-18]

5:20 pm: **CHEOPS: the ESA mission for exo-planets characterization**, Nicola Rando, Joel Asquier, Carlos Corral Van Damme, Francesco Ratti, Kate Isaak, Frederic Safa, European Space Research and Technology Ctr. (Netherlands), et al.. . . . . [10698-19]

5:40 pm: **The galaxy evolution probe: a concept for an astronomical far-infrared space observatory**, Jason Glenn, Univ. of Colorado Boulder (USA), et al.. . . . . [10698-20]

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A .....8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 5

LOCATION: CC LEVEL 3, ROOM 6A/B .....MON 10:30 AM TO 12:10 PM

Decadal Study Overviews

JOINT SESSION WITH CONFERENCES 10698 AND 10699

Session Chair: **James C. Green,** Univ. of Colorado Boulder (USA)

10:30 am: **The habitable exoplanet imaging mission (HabEx): science goals and projected capabilities,** Scott Gaudi, The Ohio State Univ. (USA), et al. . [10698-21]

10:55 am: **The Lynx x-ray observatory: concept study overview and status**, Jessica A. Gaskin, Alexandra Dominguez, Karen Gelmis, John A. Mulqueen, NASA Marshall Space Flight Ctr. (USA), et al.. . . . . [10699-21]

11:20 am: **Overview of the Origins Space Telescope: science drivers to observatory requirements**, Margaret Meixner, Space Telescope Science Institute (USA) and Johns Hopkins Univ. (USA) and NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10698-22]

11:45 am: **The large UV/optical/infrared (LUVOIR) surveyor: decadal mission study update**, Matthew R. Bolcar, Jason E. Hylan, Julie A. Crooke, NASA Goddard Space Flight Ctr. (USA) . . . . . [10698-23]

Lunch Break . . . . . Mon 12:10 pm to 1:20 pm

SESSION 6

LOCATION: CC LEVEL 3, ROOM 6A/B .....MON 1:20 PM TO 3:00 PM

HABEX I

Session Chair: **James B. Breckinridge,** Caltech (USA)

1:20 pm: **The habitable exoplanet imaging mission (HabEx)**, Bertrand Mennesson, Jet Propulsion Lab. (USA), et al.. . . . . [10698-24]

1:40 pm: **Overview of the 4m baseline architecture concept of the habitable exoplanet imaging mission (HabEx) study**, Gary M. Kuan, Rashied Amini, Keith Warfield, Bertrand Mennesson, Alina Kiessling, Jet Propulsion Lab. (USA), et al.. . . . . [10698-25]

2:00 pm: **The HabEx workhorse camera**, Daniel Stern, Jet Propulsion Lab. (USA), et al.. . . . . [10698-26]

2:20 pm: **Technology maturity for the habitable-zone exoplanet imaging mission (HabEx) concept**, Rhonda M. Morgan, Keith Warfield, Jet Propulsion Lab. (USA), et al. . . . . [10698-27]

2:40 pm: **HabEx Space Telescope exoplanet instruments**, Stefan R. Martin, Mayer Rud, Jet Propulsion Lab. (USA), et al. . . . . [10698-28]

Coffee Break . . . . . Mon 3:00 pm to 3:30 pm

SESSION 7

LOCATION: CC LEVEL 3, ROOM 6A/B ..... MON 3:30 PM TO 4:50 PM

HABEX II

Session Chair: **Denis Burgarella,** Lab. d'Astrophysique de Marseille (France)

3:30 pm: **HabEx: high precision pointing architecture using micro-thrusters and fine steering mirror**, Milan Mandic, Oscar S. Alvarez-Salazar, Jet Propulsion Lab. (USA) . . . . . [10698-29]

3:50 pm: **Numerically optimized coronagraph designs for the habitable exoplanet imaging mission (HabEx)**, A.J. Eldorado Riggs, Jet Propulsion Lab. (USA), et al. . . . . [10698-30]

4:10 pm: **Overview and performance prediction of the baseline 4-meter telescope concept design for the habitable-zone exoplanet direct imaging mission**, H. Philip Stahl, NASA Marshall Space Flight Ctr. (USA) . . . . . [10698-31]

4:30 pm: **HabEx Lite: a starshade-only habitable exoplanet imager alternative**, David C. Redding, Eric Cady, Keith Coste, Joel A. Nissen, Otto R. Polanco, Jet Propulsion Lab. (USA), et al.. . . . . [10698-32]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 ..... 5:30 PM TO 7:00 PM

Posters: Monday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Monday evening from 5:30 to 7:00 PM (followed by the Welcome Reception). Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

CORONAGRAPH

Review of high-contrast imaging systems for current and future ground- and space-based telescopes I: coronagraph design methods and optical performance metrics, Garreth Ruane, Caltech (USA), et al.. . . . . [10698-98]

Straylight analysis for the hybrid externally occulted Lyot solar coronagraph ASPIICS, Raphaël Rougeot, Damien Galano, Volker Kirschner, European Space Agency (Netherlands), et al. . . . . [10698-99]

Accelerated modeling of near and far-field diffraction for coronagraphic optical systems, Ewan S. Douglas, Massachusetts Institute of Technology (USA), et al.. . . . . [10698-100]

Fast linearized coronagraph optimizer (FALCO) I: a software toolbox for rapid coronagraphic design and wavefront correction, A.J. Eldorado Riggs, Jet Propulsion Lab. (USA), et al. . . . . [10698-101]

Apodized pupil Lyot coronagraphs designs for future segmented space telescopes, Kathryn St. Laurent, Kevin Fogarty, Rémi Soummer, Space Telescope Science Institute (USA), et al. . . . . [10698-102]

Optimized operational modes for visible emission line coronagraph on ADITYA-L1, Amit S. Kumar, Madhur Juneja, B. Raghavendra Prasad Prasad, Indian Institute of Astrophysics (India), et al. . . . . [10698-103]

Development of ASPIICS:, a coronagraph based on Proba-3 formation flying mission, Damien Galano, European Space Research and Technology Ctr. (Netherlands), et al. . . . . [10698-104]

Visible-light channel for the Metis/Solar Orbiter coronagraph: polarimetric calibration, Silvano Fineschi, Marta Casti, Gerardo Capobianco, Giuseppe Massone, INAF - Astrophysical Observatory of Torino (Italy), et al. . . . . [10698-250]

Wide field-of-view liquid crystals-based modulator for the polarimeter of the Metis/Solar Orbiter, Gerardo Capobianco, Marta Casti, Silvano Fineschi, Giuseppe Massone, INAF - Astrophysical Observatory of Torino (Italy), et al. . . . . [10698-251]

Calibration of the liquid crystal visible-light polarimeter for the Metis/Solar Orbiter coronagraph, Marta Casti, Silvano Fineschi, Gerardo Capobianco, Giuseppe Massone, INAF - Astrophysical Observatory of Torino (Italy), et al.. . . . . [10698-252]

CUBE SATS

Cubesat interferometry for THz astrophysics, Christopher E. Groppi, Arizona State Univ. (USA), et al.. . . . . [10698-105]

EUCLID

The Euclid STM VIS focal plane assembly thermal balance tests: an original method to measure the heat load at instrument thermal interface level, Jérôme Martignac, CEA-Ctr. de SACLAY (France), et al. . . . . [10698-106]

The application software of the instrument control unit of Euclid-NISP: ready for qualification tests, Sebastiano Ligori, Leonardo Corcione, Vito Capobianco, Donata Bonino, INAF - Osservatorio Astronomico di Torino (Italy), et al. [10698-107]

EUCLID: design, analysis, fabrication, and test of a 1.3 m collimator for the on-ground characterization of the EUCLID payLoad module, Grégory P. Lousberg, Virgile Monamy, Katja Rieth, Fabien Lemagne, Pierre Gloesener, Carlo Flebus, AMOS Ltd. (Belgium). . . . . [10698-108]

Focal plane mechanical assembly of the NISP/Euclid instrument, Anne Bonnefoi, William Bon, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10698-109]

The Euclid STM VIS focal plane assembly metrology: description of the method to measure the CCDs position and the flatness of the full camera, Benoît Horeau, Jérôme Martignac, Michel Berthé, Jean Fontignie, Thierry Tourrette, François Visticot, CEA-Ctr. de SACLAY (France), et al. . . . . [10698-110]

The WFE and PSF verification system for the NI-OA optical system of the NISP instrument on board the ESA EUCLID spacecraft, Christof Bodendorf, Norbert Geis, Andreas Bode, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10698-111]

Test results of the NI-OA optical subsystem performance as part of the NISP instrument on board of the ESA EUCLID spacecraft, Frank U. Grupp, Univ.-Sternwarte München (Germany) and Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10698-112]

Snowballs in Euclid and WFIRST detectors, Analia N. Cillis, Univ. of Maryland, Balitmore County (USA), et al.. . . . . [10698-113]

EXOPLANETS

A comparison between the opto-thermo-mechanical model and lab measurements for CHEOPS, Demetrio Magrin, Valentina Viotto, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10698-115]

EarthFinder: A Probe Mission Concept Study for the Precise Radial Velocity Detection of Earth-mass Exoplanets, Peter P. Plavchan, George Mason Univ (USA), et al. . . . . [10698-249]

HABEX

Laser-metrology for an ultra-stable HabEx coronagraph, Joel A. Nissen, Alireza Azizi, Feng Zhao, Jet Propulsion Lab. (USA). . . . . [10698-116]

HabEx space Telescope optical system overview, Stefan R. Martin, Mayer Rud, Jet Propulsion Lab. (USA), et al. . . . . [10698-117]

Overview and performance prediction fo the alternative 6.5-meter telescope concept design for the habitable-zone exoplanet direct imaging mission, H. Philip Stahl, NASA Marshall Space Flight Ctr. (USA) . . . . . [10698-118]

HabEx Telescope WFE stability specification derived from coronagraph starlight leakage, Bijan Nemati, The Univ. of Alabama in Huntsville (USA), et al.. . . . . [10698-119]

HabEx polarization ray trace and aberration analysis, Jeffrey Davis, James B. Breckinridge, Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (USA) . . . . . [10698-120]

Mirror design study for a segmented HabEx system, James T. Mooney, Matthew J. East, Bruce Rottner, Chistopher Sullivan, David Wideman, Harris Corp. (USA), et al.. . . . . [10698-121]

INSTRUMENTS

The filter wheel assembly for the ATHENA wide field imager, Miroslaw Rataj, Szymon Polak, Tomasz Palgan, Space Research Ctr. (Poland), et al. . . [10698-122]

ISSA

Design rules for in situ assembly of space telescopes, Jonathan W. Arenberg, Northrop Grumman Aerospace Systems (USA), et al. . . . . [10698-123]

JWST

Spectrum extraction from detector plane images for the medium-resolution spectrometer (MRS) of the mid-infrared instrument (MIRI) on-board the James Webb Space Telescope, Ioannis Argyriou, KU Leuven (Belgium), et al. [10698-124]

JWST OTE center of curvature test, Ritva Keski-Kuha, Babak N. Saif, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-125]

James Webb Space Telescope optical simulation testbed V: comparison of wide-field phase retrieval techniques, Iva Laginja, Gregory R. Brady, Rémi Soummer, Sylvain Egron, Charles-Philippe Lajoie, Space Telescope Science Institute (USA), et al. . . . . [10698-126]

Fringing solution for the mid-infrared instrument (MIRI) on-board the James Webb Space Telescope, Ioannis Argyriou, Bart Vandenbussche, KU Leuven (Belgium), et al. . . . . [10698-127]

Wavefront sensing and controls demo during the cryo-vac testing of JWST, D. Scott Acton, J. Scott Knight, Taylor S. Chonis, Laura E. Coyle, Koby Smith, Eric Coppock, Ball Aerospace (USA), et al. . . . . [10698-128]

Operability assessment concept for the JWST/NIRSpec micro-shutter array (MSA), Timothy D. Rawle, Space Telescope Science Institute (USA), e t al.. . . . . [10698-129]

JWST cryo fine guidance closed loop test results, Maria Begona Vila Costas, NASA Goddard Space Flight Ctr. (USA) and SGT, Inc. (USA), et al. . . . [10698-130]

Characterization and calibration of the James Webb Space Telescope mirror actuators fine stage motion, Taylor S. Chonis, Benjamin B. Gallagher, J. Scott Knight, D. Scott Acton, Ball Aerospace (USA), et al. . . . . [10698-131]

Wavefront sensing and controls demo during the cryo-vacuum test ofJWST: exercising the science and operations center, Charles-Philippe Lajoie, Carey Myers, Thomas Comeau, Christopher Hanley, Margaret Jordan, Bernard Kulp, Heather Livingston, Marshall D. Perrin, John Scott, Christopher C. Stark, Space Telescope Science Institute (USA), et al. . . . . [10698-132]

Time series observations with the mid-infrared instrument (MIRI) on JWST, Sarah Kendrew, European Space Agency (USA), et al. . . . . [10698-133]

Making good use of JWST coronagraphs: tools and strategies from a user's perspective, Julien H. Girard, Laurent Pueyo, William P. Blair, Brian Brooks, Keira Brooks, Robert Brown, Howard Bushouse, Alicia Canipe, Christine Chen, Space Telescope Science Institute (USA), et al. . . . . [10698-134]

Thermal distortion measurements of the JWST optical telescope element, Charles B. Atkinson, Northrop Grumman Aerospace Systems (USA), et al.. . . . . [10698-135]

Setting the James Webb Space Telescope primary mirror radius of curvature and conic constant during cryogenic testing, Joseph Cosentino, Conrad Wells, Gene Olczak, Harris Corp. (USA), et al.. . . . . [10698-136]

LUVOIR

Telescope line-of-sight slew control and agility with non-contact vibration isolation for the large ultraviolet/optical/infrared (LUVOIR) surveyor concept, Larry D. Dewell, Kiarash Tajdaran, Raymond M. Bell Jr., Lockheed Martin Space Systems Co. (USA), et al. . . . . [10698-137]

Optical design and status of the large ultra-violet optical infrared surveyor (LUVOIR), Garrett J. West, James A. Corsetti, Qian Gong, Matthew R. Bolcar, Jason E. Hylan, Julie A. Crooke, NASA Goddard Space Flight Ctr. (USA) . . . . . [10698-138]

LUVOIR primary mirror segment alignment control with joint edge and laser metrology sensing, John Z. Lou, David C. Redding, Joel A. Nissen, Chris Shelton, Jet Propulsion Lab. (USA) . . . . . [10698-139]

Picometer differential wavefront metrology by nonlinear Zernike wavefront sensing for LUVOIR, Dustin B. Moore, David C. Redding, Jet Propulsion Lab. (USA) and Caltech (USA). . . . . [10698-140]

Preliminary jitter stability results for the large UV/optical/infrared (LUVOIR) surveyor concept using a non-contact vibration isolation and precision pointing system, Lia W. Sacks, Kuo-Chia Liu, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-141]

LYNX

Lynx Program mirror assembly (LMA) production modeling, Lynn N. Allen, James T. Mooney, Matthew J. East, Harris Corp. (USA), et al.. . . . . [10698-142]

ORIGINS

OST wavefront error budget flowdown, J. Scott Knight, Ball Aerospace (USA), et al.. . . . . [10698-199]

A high stable spectrophotometric capability for the origins space telescope (OST) mid-infrared imager, spectrometer, oronagraph (MISC), Taro Matsuo, Osaka Univ. (Japan), et al.. . . . . [10698-200]

Stray Light overview for the Origins Space Telescope, Paul A. Lightsey, Ball Aerospace (USA), et al. . . . . [10698-201]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

CONFERENCE 10698

SESSION 8

LOCATION: CC LEVEL 3, ROOM 6A/B ..... TUE 10:30 AM TO 11:50 AM

LUVOIR I

Session Chair: **Richard W. Capps,** Jet Propulsion Lab. (USA)

10:30 am: **LUVOIR mirror system**, Lynn N. Allen, James T. Mooney, Matthew J. East, Chistopher Sullivan, Harris Corp. (USA). . . . . [10698-33]

10:50 am: **The LUVOIR coronagraph instrument**, Laurent Pueyo, Space Telescope Science Institute (USA) . . . . . [10698-34]

11:10 am: **Modelling exoplanet detection with the LUVOIR coronagraph**, Roser Juanola-Parramon, Neil T. Zimmerman, Maxime J. Rizzo, Hari Subedi, Giada Arney, Tyler D. Groff, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-35]

11:30 am: **Picometer metrology for LUVOIR**, Babak N. Saif, Space Telescope Science Institute (USA) . . . . . [10698-36]

Lunch/Exhibition Break . . . . . .Tue 11:50 am to 1:20 pm

SESSION 9

LOCATION: CC LEVEL 3, ROOM 6A/B .....TUE 1:20 PM TO 2:20 PM

LUVOIR II

Session Chair: **Mark Clampin,** NASA Goddard Space Flight Ctr. (USA)

1:20 pm: **Optical design of exo-planet coronagraph, integral field spectrograph, and high resolution spectrometer for LUVOIR study**, Qian Gong, Matthew R. Bolcar, Julie A. Crooke, Tyler D. Groff, Avi M. Mandell, Neil T. Zimmerman, NASA Goddard Space Flight Ctr. (USA) . . . . . [10698-37]

1:40 pm: **Optical budgeting for LUVOIR**, Paul A. Lightsey, J. Scott Knight, Ball Aerospace (USA), et al. . . . . [10698-38]

2:00 pm: **LUVOIR thermal architecture**, Jonathan W. Arenberg, John Pohner, George Harpole, Northrop Grumman Aerospace Systems (USA), et al.. . [10698-39]

SESSION 10

LOCATION: CC LEVEL 3, ROOM 6A/B ..... TUE 2:20 PM TO 3:00 PM

OST I

Session Chair: **Mark Clampin,** NASA Goddard Space Flight Ctr. (USA)

2:20 pm: **The Origins Space Telescope: mission concept overview**, David T. Leisawitz, Edward G. Amatucci, Ruth C. Carter, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-40]

2:40 pm: **Thermal considerations and architecture for Origins Space Telescope**, Jonathan W. Arenberg, John Pohner, George Harpole, Northrop Grumman Aerospace Systems (USA), et al. . . . . [10698-41]

Coffee Break . . . . . .Tue 3:00 pm to 3:30 pm

SESSION 11

LOCATION: CC LEVEL 3, ROOM 6A/B ..... TUE 3:30 PM TO 5:30 PM

OST II

Session Chair: **Lee D. Feinberg,** NASA Goddard Space Flight Ctr. (USA)

3:30 pm: **The mid-infrared imager/spectrometer/coronagraph instrument (MISC) for the Origins Space Telescope**, Itsuki Sakon, The Univ. of Tokyo (Japan), et al.. . . . . [10698-42]

3:50 pm: **The Origins Survey Spectrometer (OSS): a far-IR discovery machine for the Origins Space Telescope**, Charles M. Bradford, Bruce Cameron, Bradley D. Moore, Jet Propulsion Lab. (USA), et al.. . . . . [10698-43]

4:10 pm: **The Origins Space Telescope cryogenic-thermal architecture**, Michael J. DiPirro, NASA Goddard Space Flight Ctr. (USA). . . . . [10698-44]

4:30 pm: **Origins Space Telescope: the far infrared imager and polarimeter FIP**, Johannes G. Staguhn, NASA Goddard Space Flight Ctr. (USA) and Johns Hopkins Univ. (USA), et al. . . . . [10698-45]

4:50 pm: **HERO: heterodyn receiver for the Origins Space Telescope**, Martina C. Wiedner, Observatoire de Paris (France) and Lab. d'Études du Rayonnement et de la Matière en Astrophysique et Atmosphères (France) and Ctr. National de la Recherche Scientifique (France), et al. . . . . [10698-46]

5:10 pm: **An architecture for space-based exoplanet spectroscopy in the mid-infrared**, Joseph J. Green, Erkin Sidick, Gautam Vasisht, Jet Propulsion Lab. (USA) . . . . . [10698-47]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 ..... 6:00 PM TO 8:00 PM

Posters: Tuesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Tuesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

MISSIONS

Optical design of PICO: a concept for a space mission to probe inflation and cosmic origins, Karl Young, Univ. of Minnesota, Twin Cities (USA), et al.. . . . . [10698-143]

Electrical system design of the payload of LiteBIRD, Masahiro Tsujimoto, Institute of Space and Astronautical Science (Japan), et al.. . . . . [10698-144]

Development of optical system for the NISS onboard NEXTSat-1, Sung-Joon Park, Bong-Kon Moon, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10698-145]

Development of data storage system and GSE for cosmic infrared background experiment 2 (CIBER-2), Won-Kee Park, Seung-Cheol Bang, Korea Astronomy and Space Science Institute (Korea, Republic of), et al.. . . . . [10698-146]

The telescope optical units prototype and AIV in the framework of the PLATO ESA mission, Gabriele Umbriaco, Univ. degli Studi di Padova (Italy), et al.. . . . . [10698-147]

In-flight telescope surface measurement system for millimetron space mission, Andrey Baryshev, Kapteyn Astronomical Institute (Netherlands) and Univ. of Groningen (Netherlands), et al. . . . . [10698-148]

A Mercury surface radiometric model for SIMBIO-SYS instrument suite on board of BepiColombo mission, Alessandra Slemer, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10698-149]

Europa imaging system wide angle camera the effect of gamma radiation on the refractive index and transmission of radiation resistant glasses, Joseph Centurelli, Zibi P. Turtle, Steven N. Osterman, Kim A. Slack, Johns Hopkins Univ. Applied Physics Lab., LLC (USA) . . . . . [10698-150]

Instrumentation for the galaxy evolution probe (GEP), Charles M. Bradford, Jet Propulsion Lab. (USA), et al. . . . . [10698-151]

PICO: the probe of inflation and cosmic origins, Brian M. Sutin, Jet Propulsion Lab. (USA), et al. . . . . [10698-152]

The design of the instrument control unit and its role within the data processing system of the ESA PLATO Mission, Mauro Focardi, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10698-153]

Thermal architecture of the ARIEL payload, Gianluca Morgante, Luca Terenzi, Davide D'Ascanio, INAF - IASF Bologna (Italy), et al. . . . . [10698-154]

mxCSM: the massively-multiplexed coronal spectromagnetometer for space tomographic observation of the solar corona, Haosheng Lin, Univ. of Hawai'i (USA) . . . . . [10698-155]

Integration and instrument characterization of the cosmic infrared background experiment 2 (CIBER-2), Chi H. Nguyen, Rochester Institute of Technology (USA), et al. . . . . [10698-156]

The optical design and physical optics analysis of a cross-Dragonian telescope for LiteBIRD, Hiroaki Imada, Tadayasu Dotani, Takashi Hasebe, Institute of Space and Astronautical Science (Japan) and Japan Aerospace Exploration Agency (Japan), et al. . . . . [10698-157]

Optical/mechanical design of the focal plane receiver of the Ganymede laser altimeter (GALA) for the Jupiter icy moon explorer (JUICE) mission, Keigo Enya, Institute of Space and Astronautical Science (Japan). . . . . [10698-158]

Optimal starshade observation scheduling, Gabriel Soto, Daniel Garrett, Cornell Univ. (USA), et al. . . . . [10698-159]

The high resolution telescope of the polarimetric and helioseismic imager onboard solar orbiter, Achim M. Gandorfer, Bianca Grauf, Jan Staub, Joachim Woch, Sami K. Solanki, Jörg Bischoff, Max-Planck-Institut für Sonnensystemforschung (Germany), et al. . . . . [10698-160]

The optical configuration of the telescope for the ARIEL mission, Vania Da Deppo, CNR-IFN Padova (Italy) and INAF – Osservatorio Astronomico di Padova (Italy), et al. . . . . [10698-161]

Design of the instrument and telescope control units integrated subsystem of the ESA-ARIEL payload, Mauro Focardi, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10698-162]

Performance overview of the near infrared detectors in Korean space missions NISS and LIRS, Dae-Hee Lee, Won-Kee Park, Youngsik Park, Jeonghyun Pyo, Bongkon Moon, Woong-Seob Jeong, Sung-Joon Park, Il-Joong Kim, Korea Astronomy and Space Science Institute (Korea, Republic of), et al.. . . . [10698-163]

Optomechanical structure development of the NISS flight model for the NEXTSat-1 mission, Bongkon Moon, Sung-Joon Park, Woong-Seob Jeong, Duk-Hang Lee, Kyeong Yeon Ko, Dae-Hee Lee, Youngsik Park, Jeonghyun Pyo, Won-Kee Park, Il-Joong Kim, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10698-164]

Fast linearized coronagraph optimizer (FALCO) II: optical model validation and time savings over other methods, Erkin Sidick, A.J. Eldorado Riggs, Garreth Ruane, John E. Krist, Carl T. Coker, Jet Propulsion Lab. (USA) . . . . . [10698-165]

Development of a miniaturized deformable mirror controller for Picture-C, Eduardo A. Bendek, NASA Ames Research Ctr. (USA), et al. . . . . [10698-166]

Fast linearized coronagraph optimizer (FALCO) IV: coronagraph design survey for obstructed and segmented apertures, Garreth Ruane, Caltech (USA), et al.. . . . . [10698-167]

Modeling the JANUS stray-light behavior, Davide Greggio, INAF - Osservatorio Astronomico di Padova (Italy) and ADONI - Lab. Nazionale di Ottica Adattiva (Italy), et al.. . . . . [10698-168]

Preflight performance verification and calibration of the PLATO mission cameras, Bart Vandenbussche, KU Leuven (Belgium), et al.. . . . . [10698-169]

PLATO: the ESA mission for exo-planets discovery, Demetrio Magrin, Roberto Ragazzoni, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . [10698-170]

Characterisation of the analogue read-out chain for the CCDs onboard the mesospheric airglow/aerosol tomography and spectroscopy (MATS) satellite, Gabriel Giono, Georgi Olentsenko, Nickolay Ivchenko, KTH Royal Institute of Technology (Sweden), et al. . . . . [10698-171]

SAFARI-POL: an imaging-polarimeter on SPICA, Vincent Révéret, Louis Rodriguez, Albrecht Poglitsch, Obaïd-Allah Adami, Sophie Bounissou, Didier Dubreuil, Jérôme Martignac, CEA-IRFU (France) and Univ. Paris-Saclay (France) . . . . . [10698-172]

The pre-launch distortion definition of SIMBIO-SYS/STC stereo camera by rational function models, Emanuele T. Simioni, INAF - Osservatorio Astronomico di Padova (Italy), et al.. . . . . [10698-173]

Fast linearized coronagraph optimizer (FALCO) III: optimization of key coronagraph design parameters, Carl T. Coker, A.J. Eldorado Riggs, Erkin Sidick, Byoung-Joon Seo, Brian D. Kern, David S. Marx, Stuart B. Shaklan, Jet Propulsion Lab. (USA) . . . . . [10698-174]

The far-infrared space interferometer study IRASSI: principle design and navigational aspects, Hendrik Linz, Max-Planck-Institut für Astronomie (Germany), et al.. . . . . [10698-175]

High-contrast imager for complex aperture telescopes (HiCAT): 6. software control infrastructure and calibration, Christopher Moriarty, Keira Brooks, Rémi Soummer, Thomas Comeau, Gregory R. Brady, Rob Gontrum, Peter Petrone, Space Telescope Science Institute (USA). . . . . [10698-176]

From a demonstration model to the flight model: AIV procedures and results for CHEOPS Telescope, Maria Bergomi, Federico Biondi, Demetrio Magrin, Luca Marafatto, Roberto Ragazzoni, Valentina Viotto, Marco Dima, Davide Greggio, Jacopo Farinato, Luigi Lessio, INAF - Osservatorio Astronomico di Padova (Italy), et al.. . . . . [10698-177]

PILOT flight 2: optical alignment and performances, Baptiste Mot, Institut de Recherche en Astrophysique et Planétologie (France), et al. . . . . [10698-178]

Microwave kinetic inductance detectors for the PICTURE-C balloon mission, Clinton Bockstiegel, Benjamin A. Mazin, Univ. of California, Santa Barbara (USA), et al.. . . . . [10698-179]

The deformable mirror demonstration mission (DeMi) CubeSat: optomechanical design validation and laboratory calibration, Ewan S. Douglas, Derek Barnes, Ashley K. Carlton, Christian Haughwout, Bobby G. Holden, Roedolph A. Opperman, Abigail J. Stein, Kerri L. Cahoy, Massachusetts Institute of Technology (USA) . . . . . [10698-180]

Thermal architecture of the galaxy evolution probe, Bradley D. Moore, Jet Propulsion Lab. (USA), et al. . . . . [10698-181]

Wide swath and high resolution optical imager for Earth observation satellite ALOS-3, Haruyoshi Katayama, Hidenori Watarai, Tomoya Niwa, Masakazu Sagisaka, Japan Aerospace Exploration Agency (Japan). . . . . [10698-182]

Recent progress on the NEOCam LWIR focal plane modules and detectors, Andre Wong, Amanda K. Mainzer, Jet Propulsion Lab. (USA), et al. . . . [10698-183]

OBSERVING TOOLS

pyNRC: a NIRCam ETC and simulation toolset, Jarron M. Leisenring, Everett A. Schlawin, Marcia Rieke, The Univ. of Arizona (USA), et al.. . . . . [10698-184]

Feasibility study of a filter polarimeter dedicated to the measurement of the scattering polarization and Hanle effect in the SrI line at 4607 Å for DKIST, Sajal Kumar Dhara, Emilia Capozzi, Michele Bianda, Renzo Ramelli, Istituto Ricerche Solari Locarno (Switzerland) . . . . . [10698-185]

Improving the astrometric calibration of the infrared array camera on the Spitzer Space Telescope, Carl J. Grillmair, Sean J. Carey, William J. Glaccum, James G. Ingalls, Jessica E. Krick, Seppo J. Laine, Patrick Lowrance, IPAC, Caltech (USA) . . . . . [10698-186]

Spitzer/IRAC precision photometry using machine learning techniques, James G. Ingalls, Jessica E. Krick, IPAC, Caltech (USA), et al. . . . . [10698-187]

The role of narrow-angle forward surface scatter and particulate scatter in exoplanet exploration, James E. Harvey, Richard N. Pfisterer, Photon Engineering LLC (USA), et al. . . . . [10698-188]

Effects of thermal and exozodiacal background on space telescope observations of exoearths, Carl T. Coker, Jet Propulsion Lab. (USA), et al.. . . . . [10698-189]

Post-processing for high-contrast imaging with the James Webb Space Telescope, Marie Ygouf, Charles Beichman, Caltech (USA) and Infrared Processing and Analysis Ctr. (USA), et al. . . . . [10698-190]

Scheduling and target selection optimization for exoplanet imaging spacecraft, Dean Keithly, Dmitry Savransky, Daniel Garrett, Cornell Univ. (USA), et al.. . . . . [10698-191]

Measurement of the intra-pixel response function of the Kepler photometer, Dmitry Vorobiev, Zoran Ninkov, Rochester Institute of Technology (USA), et al.. . . . . [10698-193]

Image processing methods for exoplanet detection in Starshade observations, Mengya Hu, Anthony Harness, N. Jeremy Kasdin, Robert Vanderbei, Princeton Univ. (USA) . . . . . [10698-194]

Realistic WFIRST-Starshade imaging simulation tool, Sergi Hildebrandt, Caltech (USA), et al. . . . . [10698-195]

Method for the on board optoelectronical autofocus device for telescopes, Vsevolod Muravev, ITMO Univ. (Russian Federation) . . . . . [10698-196]

The contrast performance of the NIRSpec micro shutters and its impact on integral field observations, Anurag Deshpande, European Space Research and Technology Ctr. (Netherlands), et al.. . . . . [10698-197]

Compressive sampling for multispectral imaging in the vis-NIR-TIR: optical design of space telescopes, Giorgio Pariani, Alessio Zanutta, Stefano Basso, Andrea Bianco, INAF - Osservatorio Astronomico di Brera (Italy), et al.. [10698-198]

SCIENCE

Limits on debris disk albedos from HST-NICMOS non-detections, Élodie Choquet, Jet Propulsion Lab. (USA), et al. . . . . [10698-203]

WFIRST exoplanet data challenge: atmospheric retrieval results, Sergi Hildebrandt, Caltech (USA), et al. . . . . [10698-204]

SMALLSATS

CUBESPEC: low-cost astronomical spectroscopy from a nanosatellite, Gert Raskin, Tjorven Delabie, Wim De Munter, Hugues Sana, Bart Vandenbussche, Dirk Vandepitte, Bram Vandoren, KU Leuven (Belgium) . . . . . [10698-205]

Synthetic aperture telescope by small satellite formation flying, Norihide Miyamura, Meisei Univ. (Japan) . . . . . [10698-206]

VAMOS: a smallsat mission concept for remote sensing of Venusian seismic activity from orbit, Brian M. Sutin, James A. Cutts, Alan M. Didion, Jet Propulsion Lab. (USA), et al. . . . . [10698-207]

Testing and calibrating an advanced cubesat attitude determination and control system, Tjorven Delabie, Bram Vandoren, Wim De Munter, Gert Raskin, Bart Vandenbussche, Dirk Vandepitte, KU Leuven (Belgium). . . . . [10698-208]

SPITZER

Hysteresis in Spitzer/IRAC arrays: calibration, trends, and a model using only reset times, William J. Glaccum, Sean J. Carey, Patrick Lowrance, Peter Capak, Seppo J. Laine, Carl J. Grillmair, James G. Ingalls, Jessica E. Krick, IPAC, Caltech (USA) . . . . . [10698-209]

TECHNOLOGY

Smart starting guesses from machine learning for phase retrieval, Scott W. Paine, James R. Fienup, Univ. of Rochester (USA). . . . . [10698-210]

Characterization of microdot apodizers for imaging exoplanets with next-generation space telescopes, Manxuan (Rebecca) Zhang, Garreth Ruane, Jacques-Robert Delorme, Dimitri Mawet, Nemanja Jovanovic, Caltech (USA), et al.. . . . . [10698-211]

Using the science archive for instrument trending on Spitzer IRAC, Jessica E. Krick, James G. Ingalls, Patrick Lowrance, Sean J. Carey, William J. Glaccum, Carl J. Grillmair, Seppo J. Laine, IPAC, Caltech (USA). . . . . [10698-213]

Hexapod actuated focal plane for high-resolution suborbital and ground-based exploration, Alexander D. Miller, Paul Scowen, Rhonda Holton, Arizona State Univ. (USA), et al.. . . . . [10698-214]

Laser Guide star for large aperture segmented space telescopes, Jared Males, The Univ. of Arizona (USA), et al. . . . . [10698-215]

Development of an alignment platform for ESO's mid-infrared E-ELT imager and spectrograph (METIS), André Boné, António Amorim, Paulo Gordo, Tiago Frederico, Univ. de Lisboa (Portugal), et al. . . . . [10698-216]

Technology and strategy transfer from ground based AO for future large space telescopes, Runa Briguglio, Marco Xompero, Enrico Pinna, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10698-217]

Validation of a physical model for particle energy deposition in bolometers via experimental pulse analysis at 100 mK, Samantha Stever, Institut d'Astrophysique Spatiale (France) and Lab de l'Accélérateur Linéaire (France), et al.. . . . . [10698-218]

Thermal design utilizing radiative cooling for the payload module of LiteBIRD, Takashi Hasebe, Institute of Space and Astronautical Science (Japan) and Japan Aerospace Exploration Agency (Japan), et al.. . . . . [10698-219]

Status of sub-scale starshade testing and model validation at the Princeton starshade testbed, Anthony Harness, N. Jeremy Kasdin, Michael Galvin, Princeton Univ. (USA) . . . . . [10698-220]

Recent advancements in coronagraph mask fabrication technologies, Kunjithapatham Balasubramanian, Eric J. Cady, Richard Muller, A.J. Eldorado Riggs, Victor White, Daniel Wilson, Karl Yee, Jet Propulsion Lab. (USA) [10698-221]

Optical design of a modified Maksutov-Cassegrain Telescope, Bo Zhao, Rafael Guzman, Sidney Schofield, Charles M. Telesco, Joseph Ulseth, Univ. of Florida (USA) . . . . . [10698-222]

Recent progress in the fabrication of starshade masks for laboratory demonstration of concepts, Kunjithapatham Balasubramanian, Victor White, Karl Yee, Seneca Velling, Richard Muller, Jet Propulsion Lab. (USA) . . . . . [10698-224]

Edge sensor concept for segment stabilization, Laura E. Coyle, J. Scott Knight, Michael Adkins, Sara Tucker, Ball Aerospace (USA) . . . . . [10698-225]

Apodized Pupil Lyot coronagraphs with arbitrary aperture telescopes: novel designs using hybrid focal plane masks, Mamadou N'Diaye, Rémi Soummer, Space Telescope Science Institute (USA), et al.. . . . . [10698-226]

Hierarchical Bayesian filter for focal plane wavefront estimation, He Sun, Christian Delacroix, N. Jeremy Kasdin, Princeton Univ. (USA). . . . . [10698-227]

An active optics system for large UVOIR space telescopes, Fiona Kenny, National Univ. of Ireland, Galway (Ireland), et al.. . . . . [10698-228]

Raman laser spectrometer optical head: flight model performance verification, Amaia Santiago, Ingeniería de Sistemas para la Defensa de España (Spain), et al.. . [10698-229]

TRL-5 EMCCD controller for space applications, Olivier Daigle, Jérémy Turcotte, Nüvü Caméras Inc. (Canada), et al.. . . . . [10698-230]

Real-time full alignment and phasing of multiple-aperture imagers using focal-plane sensors on unresolved objects, Sébastien Vievard, Subaru Telescope, NAOJ (USA), et al.. . . . . [10698-231]

High contrast imaging test bench to its limits: the THD2 bench, Axel Potier, Pierre Baudoz, Raphaël Galicher, Fabien Patru, Simone Thijs, Observatoire de Paris (France) . . . . . [10698-232]

Sensitivity analysis for high-contrast imaging with segmented space telescopes, Lucie Leboulleux, Space Telescope Science Institute (USA) and Lab. d'Astrophysique de Marseille (France) and ONERA (France), et al. . . . . [10698-233]

Phase-retrieval-based wavefront metrology for high contrast coronagraphy, Gregory R. Brady, Christopher Moriarty, Peter Petrone, Iva Laginja, Keira Brooks, Thomas Comeau, Space Telescope Science Institute (USA), et al. . . . . [10698-235]

NASA's physics of the cosmos and cosmic origins programs manage strategic astrophysics technology development in preparation for the 2020 decadal survey, Thai Pham, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-236]

Using energy consistency to improve phase retrievals with DFT cropping, Joseph Tang, James R. Fienup, Univ. of Rochester (USA). . . . . [10698-237]

Automatized alignment of the focal plane assemblies on the PLATO cameras, Lionel Clermont, Jean-Philippe Halain, Jérôme Jacobs, Pascal Blain, Ctr. Spatial de Liège (Belgium), et al. . . . . [10698-238]

Segmented aperture interferometric nulling testbed (SAINT) III: control systems analysis and preliminary results, Brian A. Hicks, Univ. of Maryland, College Park (USA) and NASA Goddard Space Flight Ctr. (USA), et al.. [10698-239]

WFIRST

Utilizing the planetary spectrum generator for WFIRST CGI simulations, Prabal Saxena, Geronimo L. Villanueva, Avi M. Mandell, Maxime J. Rizzo, Neil T. Zimmerman, Tyler D. Groff, Michael W. McElwain, NASA Goddard Space Flight Ctr. (USA) . . . . . [10698-240]

Lessons learned for WFIRST CGI from ground-based high-contrast instruments, Vanessa P. Bailey, Jet Propulsion Lab. (USA) and Caltech (USA), et al.. . . . . [10698-241]

Fast linearized coronagraph optimizer (FALCO) V: robust hybridized coronagraph designs for the WFIRST CGI, A.J. Eldorado Riggs, Jet Propulsion Lab. (USA), et al. . . . . [10698-242]

Deformable mirror strategies for WFIRST CGI wavefront control, John Trauger, Christian Lindensmith, Frank Greer, Jet Propulsion Lab. (USA) . . . . . [10698-243]

WFIRST CGI: performance predictions for an active space coronagraph, Ilya Y. Poberezhskiy, Brian D. Kern, Jet Propulsion Lab. (USA), et al. . . . . [10698-244]

Laboratory testbed verification of data post-processing strategies for the WFIRST coronagraph instrument, Neil T. Zimmerman, NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10698-245]

WFIRST CGI integral field spectrograph performance and post-processing in the OS6 observing scenario, Maxime J. Rizzo, Neil T. Zimmerman, Tyler D. Groff, Avi M. Mandell, Qian Gong, Prabal Saxena, Michael W. McElwain, Aki Roberge, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-246]

New Insights from NASA's WFIRST for reducing the correlated uncertainties of near-infrared detector systems, Bernard J. Rauscher, NASA Goddard Space Flight Ctr. (USA). . . . . [10698-247]

WFIRST coronagraph: digging dark-holes with partially corrected pupil phase, Erkin Sidick, John E. Krist, Ilya Y. Poberezhskiy, Jet Propulsion Lab. (USA) . . . . . [10698-248]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 12

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . WED 10:30 AM TO 12:10 PM

Technology I

Session Chair: **Qian Gong,** NASA Goddard Space Flight Ctr. (USA)

10:30 am: **Terrestrial exoplanet coronagraph image quality: study of polarization aberrations in Habex and LUVOIR update**, James B. Breckinridge, Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (USA) . . . . . [10698-48]

10:50 am: **Shaped pupil coronagraph: disk science mask experimental verification and testing**, David S. Marx, Eric J. Cady, A.J. Eldorado Riggs, Camilo Prada, Brian D. Kern, Byoung-Joon Seo, Fang Shi, Jet Propulsion Lab. (USA) . . . . . [10698-49]

11:10 am: **Laboratory testing of coronagraphs for future space telescopes on the Caltech high contrast spectroscopy testbed for segmented telescopes (HCST)**, Garreth Ruane, Dimitri Mawet, Jacques-Robert Delorme, Nemanja Jovanovic, Daniel Echeverri, Jorge D. Llop Sayson, Manxuan (Rebecca) Zhang, Caltech (USA), et al. . . . . [10698-50]

11:30 am: **System level performance of parabolic deformable mirrors for coronagraphy**, Tyler D. Groff, NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10698-51]

11:50 am: **Design and performance analysis of a PIAACMC coronagraph on a segmented aperture**, Ruslan Belikov, Stephen Bryson, Dan Sirbu, NASA Ames Research Ctr. (USA), et al.. . . . . [10698-52]

Lunch/Exhibition Break . . . . . Wed 12:10 pm to 1:40 pm

SESSION 13

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . WED 1:40 PM TO 3:20 PM

Technology II

Session Chair: **Jim M. Oschmann,** Ball Aerospace (USA)

1:40 pm: **Optical realization of ideal coronagraphs with advanced photonic devices**, Jeffrey B. Jewell, Jet Propulsion Lab. (USA) . . . . . [10698-53]

2:00 pm: **Optimal deformable mirror and pupil apodization combinations for coronagraphs with obstructed pupils**, Kevin Fogarty, Space Telescope Science Institute (USA), et al. . . . . [10698-54]

2:20 pm: **Membrane mirror evaluation of APERTURE: a precise extremely large reflective telescope using re-configurable elements**, Turgut B. Baturalp, Texas Tech Univ. (USA), et al. . . . . [10698-55]

2:40 pm: **Wide field of view wave-front sensor for active optics correction chain for future space telescopes**, Lazar Staykov, Tim Morris, Richard Meyers, Ariadna Calcines, Urban Bitenc, Durham Univ. (United Kingdom), et al. . [10698-56]

3:00 pm: **Sparse wave front control: a new approach to high-contrast imaging**, Eduardo A. Bendek, Dan Sirbu, Ruslan Belikov, NASA Ames Research Ctr. (USA), et al.. . . . . [10698-57]

Coffee Break . . . . . Wed 3:20 pm to 3:50 pm

SESSION 14

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . WED 3:50 PM TO 5:50 PM

Technology III

Session Chair: **Matthew J. Griffin,** Cardiff Univ. (United Kingdom)

3:50 pm: **Materials for large far-IR telescope mirrors**, Lynn N. Allen, Matthew J. East, James T. Mooney, Harris Corp. (USA), et al. . . . . [10698-58]

4:10 pm: **High-contrast imager for complex aperture telescopes (HiCAT): 5. first results with segmented-aperture coronagraph and wavefront control**, Rémi Soummer, Gregory R. Brady, Keira Brooks, Thomas Comeau, Space Telescope Science Institute (USA), et al. . . . . [10698-59]

4:30 pm: **Exoplanet telescope diffracted light minimized: the pinwheel-pupil solution**, James B. Breckinridge, Caltech (USA), et al. . . . . [10698-61]

4:50 pm: **Diffraction analysis of large segmented mirror concepts for exoplanet exploration**, James E. Harvey, Ryan G. Irvin, Richard N. Pfisterer, Photon Engineering LLC (USA), et al. . . . . [10698-60]

5:10 pm: **Neural network control of the high-contrast imaging system**, He Sun, N. Jeremy Kasdin, Princeton Univ. (USA) . . . . . [10698-62]

5:30 pm: **Impact of ionizing radiations on ZERODUR**, Antoine Carré, Thomas Westerhoff, SCHOTT AG (Germany), et al. . . . . [10698-253]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 15

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . THU 10:30 AM TO 12:10 PM

Small Sats I

Session Chair: **Ikuru Iwata,** Subaru Telescope, NAOJ (USA)

10:30 am: **Cubesats for infrared astronomy**, Wayne S. Holland, Steve Watson, Colin Cunningham, UK Astronomy Technology Ctr. (United Kingdom), et al.. . . . . [10698-63]

10:50 am: **SPHEREx: an all-sky NIR spectral survey**, Phillip Korngut, James J. Bock, Caltech (USA), et al. . . . . [10698-64]

11:10 am: **The HOSTS survey for exo-zodiacal dust: survey status and first statistics**, Steve Ertel, Phil Hinz, The Univ. of Arizona (USA), et al. . . . . [10698-65]

11:30 am: **A space interferometer on a 6U Cubesat: FIRST-S**, Vincent Lapeyrère, Observatoire de Paris (France) and Lab. d'Etudes Spatiales et d'Instrumentation en Astrophysique (France) and Ctr. National de la Recherche Scientifique (France), et al.. . . . . [10698-66]

11:50 am: **Design of the Didymos reconnaissance and asteroid camera for OpNav on the double asteroid redirection test**, Zachary J. Fletcher, Kyle J. Ryan, Bryan J. Maas, Johns Hopkins Univ. Applied Physics Lab., LLC (USA), et al.. . . . . [10698-67]

Lunch/Exhibition Break . . . . . Thu 12:10 pm to 1:40 pm

SESSION 16

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . THU 1:40 PM TO 3:20 PM

Small Sats II

Session Chair: **Ikuru Iwata,** Subaru Telescope, NAOJ (USA)

1:40 pm: **Concept design of the LiteBIRD satellite for CMB B-mode polarization**, Yutaro Sekimoto, Institute of Space and Astronautical Science (Japan) and Japan Aerospace Exploration Agency (Japan), et al. . . . . [10698-68]

2:00 pm: **Two-stage attitude control for direct imaging of exoplanets with a CubeSat Telescope**, Connor Beierle, Andrew Norton, Bruce Macintosh, Simone D'Amico, Stanford Univ. (USA) . . . . . [10698-69]

2:20 pm: **PSF photometry for BRITE nano-satellite mission**, Adam Popowicz, Silesian Univ. of Technology (Poland) . . . . . [10698-70]

2:40 pm: **Precision photometry and exoplanet transit detection with a nanosat: on sky results of the PicSat mission**, Mathias Nowak, Sylvestre Lacour, Antoine Crouzier, Lester David, Vincent Lapeyrère, Guillaume Schworer, Observatoire de Paris à Meudon (France) . . . . . [10698-71]

3:00 pm: **Development of near-infrared imaging spectrometer (NISS) onboard NEXTSat-1**, Woong-Seob Jeong, Sung-Joon Park, Bong-Kon Moon, Dae-Hee Lee, Jeonghyun Pyo, Won-Kee Park, Il-Joong Kim, Youngsik Park, Kyeong Yeon Ko, Mingyu Kim, Dukhang Lee, Minjin Kim, Jongwan Ko, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10698-72]

Coffee Break . . . . . Thu 3:20 pm to 3:50 pm

SESSION 17

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . THU 3:50 PM TO 5:30 PM

In: Space Assembly

Session Chair: **Charles F. Lillie,** Consultant (USA)

3:50 pm: **Breaking the cost curve: applying lessons learned from the James Webb Space Telescope development to build more cost effective large space telescopes in the future**, Lee D. Feinberg, NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10698-73]

4:10 pm: **Advantages to reusing the James Webb design for 2020 decadal missions**, Jonathan W. Arenberg, Charles B. Atkinson, Northrop Grumman Aerospace Systems (USA), et al.. . . . . [10698-74]

4:30 pm: **Servicing and assembly: enabling the most ambitious future space observatories**, Ronald S. Polidan, Polidan Science Systems & Technologies, LLC (USA), et al. . . . . [10698-75]

4:50 pm: **In-space assembly application and technology: NASA's future science observatory and platform missions**, Lynn Bowman, W. K. Belvin, Erik E. Komendera, John T. Dorsey, Bill R. Doggett, NASA Langley Research Ctr. (USA) . . . . . [10698-76]

5:10 pm: **Ensuring the enduring viability of large space science missions**, Jonathan W. Arenberg, Charles B. Atkinson, Alberto Conti, Northrop Grumman Aerospace Systems (USA) . . . . . [10698-77]

FRIDAY 15 JUNE

SESSION 18

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . FRI 8:30 AM TO 9:50 AM

EUCLID

Session Chair: **Howard A. MacEwen,** Reviresco LLC (USA)

8:30 am: **VIS: the visible imager for Euclid,** Mark S. Cropper, Sabrina Pottinger, Ruymán Azzollini, Magdalena Szafraniec, Saeeda Awan, Mullard Space Science Lab., Univ. College London (United Kingdom), et al. . . . . [10698-78]

8:50 am: **The Euclid STM VIS focal plane assembly: from the integration to the qualification tests**, Jérôme Martignac, Benoît Horeau, François Visticot, Michael Carty, Jean Fontignie, Jean-Yves Roussé, Thierry Tourrette, Thierry Orduna, Damien Bachet, Michel Berthé, Jérôme Amiaux, Philippe Ferrando, Luc Dumaye, Duc-Dat Huynh, Diana Renaud, Vincent Hennion, Pascal Contrepois, Patrice Charon, Arnaud Roger, Jean-Michel Joubert, Dominique Gibier, Nicolas Solenne, CEA-Ctr. de SACLAY (France), et al. . . . . [10698-79]

9:10 am: **Euclid near infrared spectrometer and photometer instrument description frozen at the critical design review**, Thierry Maciaszek, Ctr. National d'Études Spatiales (France). . . . . [10698-80]

9:30 am: **The EUCLID NISP grisms flight models performance**, Anne Costille, Amandine Caillat, Lab. d'Astrophysique de Marseille (France), et al.. . . . [10698-81]

SESSION 19

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . .FRI 9:50 AM TO 12:00 PM

WFIRST I

Session Chair: **Giovanni Fazio,** Harvard-Smithsonian Ctr. for Astrophysics (USA)

9:50 am: **The Wide-Field Infrared Survey Telescope (WFIRST) observatory: design formulation (phase-A) overview**, Thomas M. Casey, ASRC Federal Holding Co. (USA), et al. . . . . [10698-82]

10:10 am: **Wide-Field Infrared Survey Telescope (WFIRST): optical telescope assembly (OTA) status**, Jeffrey Scott Smith, Lisa Bartusek, NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10698-83]

Coffee Break . . . . . .Fri 10:30 am to 11:00 am

11:00 am: **WFIRST integral field spectrograph design and operations concept**, Tyler D. Groff, Maxime J. Rizzo, Qian Gong, Neil T. Zimmerman, Avi M. Mandell, Michael W. McElwain, Prabal Saxena, NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10698-84]

11:20 am: **Multi-star wavefront control for the Wide-Field Infrared Survey Telescope coronagraph instrument**, Dan Sirbu, Ruslan Belikov, Eduardo A. Bendek, NASA Ames Research Ctr. (USA), et al. . . . . [10698-85]

11:40 am: **Wide-Field Infrared Survey Telescope (WFIRST): composite structure verification for operational temperature**, Paul Baird, Lisa Bartusek, David A. Content, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10698-86]

Lunch Break . . . . . Fri 12:00 pm to 1:30 pm

SESSION 20

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . .FRI 1:30 PM TO 3:10 PM

WFIRST II

Session Chair: **Makenzie Lystrup,** Ball Aerospace (USA)

1:30 pm: **The WFIRST coronagraph instrument: technology demonstration and science potential**, N. Jeremy Kasdin, Princeton Univ. (USA), et al. . . . . [10698-87]

1:50 pm: **The WFIRST coronagraph instrument: a major step in the exploration of sun-like planetary systems via direct imaging**, Bertrand Mennesson, Jet Propulsion Lab. (USA), et al. . . . . [10698-88]

2:10 pm: **Review and update of WFIRST coronagraph instrument design and technology**, Richard T. Demers, Jet Propulsion Lab. (USA) . . . . . [10698-89]

2:30 pm: **WFIRST coronagraph flight performance modeling**, John E. Krist, Jet Propulsion Lab. (USA) . . . . . [10698-90]

2:50 pm: **Hybrid Lyot coronagraph instrument (CGI) design for high tolerance to WFIRST telescope aberrations**, John Trauger, John E. Krist, Dwight Moody, Byoung-Joon Seo, Jet Propulsion Lab. (USA) . . . . . [10698-91]

Coffee Break . . . . . Fri 3:10 pm to 3:40 pm

SESSION 21

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . .FRI 3:40 PM TO 5:40 PM

WFIRST III

Session Chair: **Makenzie Lystrup,** Ball Aerospace (USA)

3:40 pm: **High accuracy coronagraph flight model for WFIRST-CGI raw contrast sensitivity analysis**, Hanying Zhou, John E. Krist, Eric J. Cady, Ilya Y. Poberezhskiy, Jet Propulsion Lab. (USA) . . . . . [10698-92]

4:00 pm: **Enabling super-nyquist wavefront control on WFIRST,** Eduardo A. Bendek, Dan Sirbu, Ruslan Belikov, NASA Ames Research Ctr. (USA), et al.. . . . . [10698-93]

4:20 pm: **WFIRST low order wavefront sensing and control performance under low photon flux**, Fang Shi, Eric J. Cady, Brian D. Kern, Raymond Lam, David S. Marx, Keith Patterson, Camilo Mejia Prada, Byoung-Joon Seo, Jean C. Shelton, Joel Shields, Hong Tang, Tuan Truong, Robert Zimmer, Jet Propulsion Lab. (USA) . . . . . [10698-94]

4:40 pm: **Hybrid Lyot coronagraph for WFIRST: high contrast testbed demonstration in flight-like environment**, Byoung-Joon Seo, Kunjithapatham Balasubramanian, Eric J. Cady, Brian Gordon, Raymond Lam, David S. Marx, Dwight Moody, Richard Muller, Keith Patterson, Ilya Y. Poberezhskiy, Camilo Mejia Prada, A.J. Eldorado Riggs, Fang Shi, John Trauger, Daniel Wilson, Jet Propulsion Lab. (USA) . . . . . [10698-95]

5:00 pm: **Superpolished OAPs for WFIRST CGI**, Mélanie Roulet, Marc Ferrari, Lab. d'Astrophysique de Marseille (France) and Aix-Marseille Univ. (France) and Ctr. National de la Recherche Scientifique (France), et al.. . . . . [10698-96]

5:20 pm: **Starshade rendezvous probe mission concept**, N. Jeremy Kasdin, Princeton Univ. (USA), et al. . . . . [10698-97]

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

CONFERENCE 10699

Sunday–Friday 10–15 June 2018 • Proceedings of SPIE Vol. 10699

Space Telescopes and Instrumentation 2018: Ultraviolet to Gamma Ray

Conference Chairs: **Jan-Willem A. den Herder,** SRON Netherlands Institute for Space Research (Netherlands); **Shouleh Nikzad,** Jet Propulsion Lab. (USA); **Kazuhiro Nakazawa,** The Univ. of Tokyo (Japan)

Program Committee: **Hisamitsu Awaki,** Ehime Univ. (Japan); **Didier Barret,** Institut de Recherche en Astrophysique et Planétologie (France); **Marshall Bautz,** Massachusetts Institute of Technology (USA); **Marcos Bavdaz,** European Space Research and Technology Ctr. (Netherlands); **Steven E. Boggs,** Univ. of California, Berkeley (USA); **Jin Chang,** Purple Mountain Observatory (China); **Wei Cui,** Tsingua Univ. (China), Purdue Univ. (USA); **Marco Feroci,** INAF - Istituto di Fisica dello Spazio Interplanetario (Italy); **Luigi Gallo,** Saint Mary's Univ. (Canada); **Varoujan Gorjian,** Jet Propulsion Lab. (USA); **James C. Green,** Univ. of Colorado at Boulder (USA); **Walter M. Harris,** The Univ. of Arizona (USA); **Fiona Harrison,** California Institute of Technology (USA); **Margarita Hernanz,** Consejo Superior de Investigaciones Científicas (Spain); **Brian D. Jackson,** SRON Netherlands Institute for Space Research (Netherlands); **Caroline A. Kilbourne,** NASA Goddard Space Flight Ctr. (USA); **Olivier Limousin,** CEA-Ctr. de SACLAY (France); **Grzegorz M. Madejski,** Kavli Institute for Particle Astrophysics & Cosmology (USA); **Hironori Matsumoto,** Nagoya Univ. (Japan); **Mark L. McConnell,** The Univ. of New Hampshire (USA); **Kirpal Nandra,** Max-Planck-Institut für extraterrestrische Physik (Germany); **Takaya Ohashi,** Tokyo Metropolitan Univ. (Japan); **Stéphane Paltani,** Observatoire de Genève (Switzerland); **Giovanni Pareschi,** INAF - Osservatorio Astronomico di Brera (Italy); **Biswajit Paul,** Raman Research Institute (India); **Mikhail N. Pavlinsky,** Space Research Institute (Russian Federation); **Paul S. Ray,** U.S. Naval Research Lab. (USA); **Taro Sakao,** Institute of Space and Astronautical Science (Japan); **Hiroyasu Tajima,** Nagoya Univ. (Japan); **Tadayuki Takahashi,** Japan Aerospace Exploration Agency (Japan); **Vincent Tatischeff,** Institut National de Physique Nucléaire et de Physique des Particules (France); **Hiroshi Tsunemi,** Osaka Univ. (Japan); **Sarah E. Tuttle,** Univ. of Washington (USA); **Martin C. Weisskopf,** NASA Marshall Space Flight Ctr. (USA); **Richard Willingale,** Univ. of Leicester (United Kingdom); **Jörn Wilms,** Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); **Shuangnan Zhang,** Institute of High Energy Physics (China); **William W. Zhang,** NASA Goddard Space Flight Ctr. (USA)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 3, ROOM 5A/C ..... SUN 9:00 AM TO 10:20 AM

UV I

Session Chair: **Shouleh Nikzad,** Jet Propulsion Lab. (USA)

9:00 am: **Ultrathin protective coatings by atomic layer engineering for far ultraviolet aluminum mirrors**, John Hennessy, Jet Propulsion Lab. (USA), et al.. . . . . [10699-1]

9:20 am: **A study of ultrathin fluoride and removable barrier films on aluminum for space-observatories with far UV observations.**, David D. Allred, Brigham Young Univ. (USA), et al.. . . . . [10699-2]

9:40 am: **New far-UV instrumentation enabled by recent advances in mirror coating processes**, Emily Witt, Brian T. Fleming, Kevin C. France, Univ. of Colorado Boulder (USA), et al. . . . . [10699-3]

10:00 am: **HabEx ultraviolet spectrograph design and DRM**, Paul A. Scowen, Arizona State Univ. (USA), et al. . . . . [10699-4]

Coffee Break . . . . . .Sun 10:20 am to 10:50 am

SESSION 2

LOCATION: CC LEVEL 3, ROOM 5A/C ..... SUN 10:50 AM TO 12:10 PM

UV II

Session Chair: **Taro Sakao,** Institute of Space and Astronautical Science (Japan)

10:50 am: **POLLUX: a UV spectopolarimeter for the future LUVOIR space telescope,** Eduard R. Muslimov, Aix-Marseille Univ., Ctr. National de la Recherche Scientifique, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10699-5]

11:10 am: **Solid state detectors for the Habitable Exoplanet imaging mission (HabEx) and the large UV/optical/infrared (LUVOIR) surveyor mission concepts**, Shouleh Nikzad, John Hennessy, Michael E. Hoenk, Alina Kiessling, Jet Propulsion Lab. (USA), et al.. . . . . [10699-6]

11:30 am: **Optical GSE for verification of the TESS camera performance,** Gabor Furesz, MIT Kavli Institute for Astrophysics and Space Research (USA), et al.. . . . . [10699-7]

11:50 am: **The NASA probe-class mission concept: CETUS**, Sara R. Heap, Retired (USA), et al.. . . . . [10699-8]

Lunch Break . . . . . Sun 12:10 pm to 1:30 pm

SESSION 3

LOCATION: CC LEVEL 3, ROOM 5A/C ..... SUN 1:30 PM TO 3:30 PM

UV III

Session Chair: **Walter M. Harris,** The Univ. of Arizona (USA)

1:30 pm: **The CETUS probe mission concept 1.5m optical telescope assembly: A high A-Omega approach for ultraviolet astrophysics**, Tony B. Hull, The Univ. of New Mexico (USA), et al.. . . . . [10699-9]

1:50 pm: **Next generation of high-resolution spectrometers for lunar exosphere OH line mapping**, Sona Hosseini, Jet Propulsion Lab. (USA), et al. . . . . [10699-10]

2:10 pm: **The Colorado ultraviolet transit experiment (CUTE): a construction and characterization update**, Arika Egan, Brian T. Fleming, Kevin C. France, Stefan Ulrich, Nicholas Nell, Nicholas DeCicco, Richard Kohnert, Univ. of Colorado Boulder (USA) . . . . . [10699-11]

2:30 pm: **Conceptual design of a wide-field near UV transient survey in a 6U CubeSat**, Yoichi Yatsu, Toshiki Ozawa, Hideo Mamiya, Nobuyuki Kawai, Yuhei Kikuya, Masanori Matsushita, Saburo Matunaga, Tokyo Institute of Technology (Japan), et al.. . . . . [10699-12]

2:50 pm: **CubeSat based UV spectrograph for studying atmospheres of planets orbiting M-dwarfs**, Binukumar G. Nair, Indian Institute Of Astrophysics (India). . . . . [10699-13]

3:10 pm: **Monitoring the high-energy radiation environment of exoplanets around low-mass stars with SPARCS (star-planet activity research CubeSat)**, Paul A. Scowen, Evgenya Shkolnik, Arizona State Univ. (USA), et al. . . . [10699-14]

Coffee Break . . . . . Sun 3:30 pm to 4:00 pm

SESSION 4

LOCATION: CC LEVEL 3, ROOM 5A/C ..... SUN 4:00 PM TO 6:00 PM

UV IV

Session Chair: **Sarah E. Tuttle,** Univ. of Washington (USA)

4:00 pm: **The EUI flight instrument of Solar Orbiter: from optical alignment to end-to-end calibration**, Jean-Philippe A. Halain, Etienne Renotte, Univ. de Liège (Belgium), et al. . . . . [10699-15]

4:20 pm: **An innovative far UV telescope for space weather and solar variability studies**, Luc Damé, Mustapha Meftah, Nicolas Rouanet, Pierre Gilbert, LATMOS (France), et al. . . . . [10699-16]

4:40 pm: **Stray and scattered light properties of the Juno ultraviolet spectrograph**, Michael W. Davis, George R. Gladstone, Thomas K. Greathouse, Vincent Hue, Maarten H. Versteeg, Southwest Research Institute (USA). [10699-17]

5:00 pm: **Development of VUV multilayer coatings for SMILE-UVI instrument: theoretical study**, Jérôme Loicq, Damien Baron, Karl Fleury-Frenette, Pascal Blain, Alexandra Mazzoli, Ctr. Spatial de Liège (Belgium), et al.. . . . . [10699-105]

5:20 pm: **The fourth flight of CHESS: spectral resolution enhancements in high-resolution FUV spectroscopy**, Nicholas Kruczek, Nicholas Nell, Kevin C. France, Brian T. Fleming, Stefan Ulrich, Lab. for Atmospheric and Space Physics (USA) . . . . . [10699-19]

5:40 pm: **FIREBall-2: final ground calibration**, Vincent Picouet, Bruno Milliard, Didier Vibert, Robert Grange, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10699-20]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Sunday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Sunday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

UV

Design of a non-rotationally symmetrical vacuum-UV stray-light rejection system to calibrate the UVI-SMILE instrument, Jérôme Loicq, Pascal Blain, Ctr. Spatial de Liège (Belgium), et al.. . . . . [10699-18]

COS2025: A strategy to extend the lifetime of the FUV detector on the cosmic origins spectrograph, David J. Sahnow, Gisella de Rosa, John W. MacKenty, Cristina M. Oliveira, Steven V. Penton, Julia Roman-Duval, Space Telescope Science Institute (USA) . . . . . [10699-100]

Opto-mechanical assembly and ground calibration of LUCI, Joice Mathew, Sriram S., Binukumar G. Nair, Ajin Prakash, Mayuresh N. Sarpotdar, Ambily Suresh, Nirmal K., Indian Institute of Astrophysics (India), et al. . . . . [10699-101]

Optical alignment of the high-precision UV spectro-polarimeter (CLASP2), Donguk Song, Ryoko Ishikawa, Ryouhei Kano, Masaki Yoshida, Toshihiro Tsuzuki, Fumihiro Uraguchi, Kazuya Shinoda, Hirohisa Hara, Takenori J. Okamoto, National Astronomical Observatory of Japan (Japan), et al.. . . . . [10699-102]

E-beam generated plasma processing for developing high-reflectance mirrors for far-ultraviolet astronomical instrument application, Manuel A. Quijada, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10699-103]

Broad band EUV/FUV coatings for a solar spectrograph mission, Luca Teriaca, Max-Planck-Institut für Sonnensystemforschung (Germany), et al. . . . . [10699-104]

Performance and design of MgF2 + Au coatings on aluminum mirrors: enabling far-ultraviolet solar occultation measurements for Europa-UVS, Preston L. Karnes, Ujjwal Raut, Kurt D. Retherford, Michael W. Davis, Elizabeth Czajka, George R. Gladstone, Southwest Research Institute (USA). . . . [10699-106]

Wave-front error measurements and alignment of CLASP2 Telescope with a dual-band pass cold mirror coated primary mirror, Masaki Yoshida, Graduate Univ. for Advanced Studies, National Astronomical Observatory of Japan (Japan), et al.. . . . . [10699-107]

In-flight characterization and calibration of NASA's Juno-Ultraviolet Spectrograph (Juno-UVS), Vincent Hue, Joshua A. Kammer, George R. Gladstone, Thomas K. Greathouse, Maarten H. Versteeg, Michael W. Davis, Southwest Research Institute (USA) . . . . . [10699-108]

CUTE data simulator and reduction pipeline, Sreejith Aickara Gopinathan, Institut für Weltraumforschung, Österreichische Akademie der Wissenschaften (Austria), et al.. . . . . [10699-109]

Reflectometry of surfaces of 1.7-m mirror of WSO-UV space telescope, Oleg Vlasenko, Institute of Astronomy, Russian Academy of Sciences (Russian Federation), et al.. . . . . [10699-110]

The solar orbiter Metis and EUI intensified CMOS-APS detectors: concept, main characteristics and performance, Luca Teriaca, Udo H. Schuehle, Max-Planck-Institut für Sonnensystemforschung (Germany), et al. . . . . [10699-111]

The new focal camera unit imaging instrument onboard WSO-UV, Mikhail Sachkov, Institute of Astronomy of the Russian Academy of Sciences (Russian Federation) . . . . . [10699-112]

Rosetta-Alice II: An upgraded UV spectrograph for a Rosetta-type mission, Philippa Molyneux, Michael W. Davis, Kurt D. Retherford, Joel Parker, Southwest Research Institute (USA) . . . . . [10699-113]

Near-UV sky survey instrument for transient detections, Joice Mathew, Ambily Suresh, Mayuresh N. Sarpotdar, Ajin Prakash, Nirmal K., Binukumar G. Nair, Indian Institute of Astrophysics (India), et al. . . . . [10699-114]

Instrument prototypes for near-UV imaging spectro-polarimetry for observations of solar magnetism, Phillip H. Oakley, Roberto Casini, Scott Sewell, National Ctr. for Atmospheric Research (USA) . . . . . [10699-115]

UV capabilities of the CETUS multi-object spectrometer and NUV/FUV camera, Stephen E. Kendrick, Kendrick Aerospace Consulting LLC (USA), et al.. . . . . [10699-116]

Instrument planning and operation in the high-radiation environment of Jupiter: optimization strategies from Juno-UVS, Joshua A. Kammer, Vincent Hue, Thomas K. Greathouse, George R. Gladstone, Michael W. Davis, Maarten H. Versteeg, Southwest Research Institute (USA) . . . . . [10699-117]

The case for POLLUX: a high-resolution UV spectropolarimeter onboard LUVOIR, Jean-Claude Bouret, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10699-118]

UV observations from high altitude balloon platform, Joice Mathew, Mayuresh N. Sarpotdar, Ambily Suresh, Nirmal K., Binukumar G. Nair, Ajin Prakash, Indian Institute of Astrophysics (India), et al. . . . . [10699-119]

Theoretical study of filter design for UV-bandpass filters for the CETUS probe mission study, Ulf Brauneck, SCHOTT Suisse SA (Switzerland), et al. . [10699-120]

PIONS: a CubeSat imager to observe variable UV sources, Ambily Suresh, Joice Mathew, Mayuresh N. Sarpotdar, Jayant Murthy, Indian Institute of Astrophysics (India), et al. . . . . [10699-121]

CubeSat ultraviolet bright spectrograph (CUBS), Joice Mathew, Indian Institute of Astrophysics (India), et al. . . . . [10699-122]

World Space Observatory ultraviolet mission: instrumentation and the core program, Mikhail Sachkov, Boris Shustov, Institute of Astronomy of the Russian Academy of Sciences (Russian Federation), et al. . . . . [10699-123]

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 5

LOCATION: CC LEVEL 3, ROOM 6A/B . . . . . MON 10:30 AM TO 12:10 PM

Decadal Study Overviews

JOINT SESSION WITH CONFERENCES 10698 AND 10699

Session Chair: **James C. Green,** Univ. of Colorado Boulder (USA)

10:30 am: **The habitable exoplanet imaging mission (HabEx): science goals and projected capabilities,** Scott Gaudi, The Ohio State Univ. (USA), et al. . [10698-21]

10:55 am: **The Lynx x-ray observatory: concept study overview and status**, Jessica A. Gaskin, Alexandra Dominguez, Karen Gelmis, John A. Mulqueen, NASA Marshall Space Flight Ctr. (USA), et al.. . . . . [10699-21]

11:20 am: **Overview of the Origins Space Telescope: science drivers to observatory requirements**, Margaret Meixner, Space Telescope Science Institute (USA) and Johns Hopkins Univ. (USA) and NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10698-22]

11:45 am: **The large UV/optical/infrared (LUVOIR) surveyor: decadal mission study update**, Matthew R. Bolcar, Jason E. Hylan, Julie A. Crooke, NASA Goddard Space Flight Ctr. (USA) . . . . . [10698-23]

Lunch Break . . . . . Mon 12:10 pm to 1:40 pm

SESSION 6

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . MON 1:40 PM TO 3:20 PM

Optics I

Session Chair: **Marcos Bavdaz,** European Space Research and Technology Ctr. (Netherlands)

1:40 pm: **Next generation astronomical x-ray optics: high resolution, light weight, and low cost**, William W. Zhang, NASA Goddard Space Flight Ctr. (USA) . . . . . [10699-22]

2:00 pm: **Fabrication of lightweight silicon x-ray mirrors for high-resolution x-ray optics**, Raul E. Riveros, NASA Goddard Space Flight Ctr. (USA) and Univ. of Maryland, Baltimore County (USA), et al. . . . . [10699-23]

2:20 pm: **Development of adjustable x-ray optics for the Lynx mission concept**, Paul B. Reid, Harvard-Smithsonian Ctr. for Astrophysics (USA) . . . . . [10699-24]

2:40 pm: **Advancements in x-ray reflection gratings,** Randall L. McEntaffer, The Pennsylvania State Univ. (USA). . . . . [10699-25]

3:00 pm: **Laboratory progress towards quality control and alignment of CAT grating spectrometers**, Jungki Song, Ralf K. Heilmann, MIT Kavli Institute for Astrophysics and Space Research (USA), et al. . . . . [10699-26]

Coffee Break . . . . . Mon 3:20 pm to 3:50 pm

SESSION 7

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . MON 3:50 PM TO 5:10 PM

Optics II

Session Chair: **William W. Zhang,** NASA Goddard Space Flight Ctr. (USA)

3:50 pm: **Progress in ion beam figuring of very thin slumped glass plates for lightweight x-ray telescope**, Marta M. Civitani, Mauro Ghigo, Stefano Basso, Joanna Holyszko, Gabriele Vecchi, INAF - Osservatorio Astronomico di Brera (Italy), et al.. . . . . [10699-28]

4:10 pm: **Sub-arcsecond imaging with multi-image x-ray interferometer module (MIXIM) for very small satellite,** Kiyoshi Hayashida, Tomoki Kawabata, Takashi Hanasaka, Hiroshi Nakajima, Hironori Matsumoto, Shota Inoue, Hiroshi Tsunemi, Osaka Univ. (Japan). . . . . [10699-29]

4:30 pm: **Small missions with MEMS x-ray telescopes for x-ray astronomy and solar system exploration**, Yuichiro Ezoe, Tokyo Metropolitan Univ. (Japan), et al. . [10699-30]

4:50 pm: **Microchannel plate x-ray optics on the Mercury imaging x-ray spectrometer**, Adrian Martindale, James F. Pearson, Charlotte H. Feldman, Gillian I. Butcher, Richard Willingale, Univ. of Leicester (United Kingdom), et al. [10699-31]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . .5:30 PM TO 7:30 PM

Posters: Monday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Monday evening from 5:30 to 7:00 PM (followed by the Welcome Reception). Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

ATHENA OPTICS

Progress in the realization of the beam expander testing x-ray facility (BEaTriX) for testing ATHENA's SPO modules, Bianca Salmaso, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . . . [10699-124]

The Geant4 mass model of the ATHENA silicon pore optics and its effect on soft proton scattering, Valentina Fioretti, Andrea A. Bulgarelli, INAF - IASF Bologna (Italy), et al. . . . . [10699-125]

Performance and stability of coatings for the ATHENA x-ray telescope, Desiree Della Monica Ferreira, Sonny Massahi, Atefeh Jafari, Sara Svendsen, Paschalis Dalampiras, Finn E. Christensen, DTU Space (Denmark), et al. . . . . [10699-126]

Silicon pore optics manufacturing plan and schedule for ATHENA, Eric Wille, Marcos Bavdaz, Ivo Ferreira, Mark Ayre, European Space Research and Technology Ctr. (Netherlands), et al.. . . . . [10699-127]

ATHENA optics metrology and analysis, Giuseppe Vacanti, cosine Science & Computing B.V. (Netherlands), et al.. . . . . [10699-128]

Simulating the optical performances of the ATHENA x-ray telescope optics, Giorgia Sironi, INAF - Osservatorio Astronomico di Brera (Italy), et al.. . [10699-129]

ATHENA outer radii mirror module design and first tests, Nicolas M. Barrière, Giuseppe Vacanti, Maximilien J. Collon, Boris Landgraf, Ramses Günther, Mark Vervest, Sjoerd Verhoeckx, Roy van der Hoeven, Kim van Straeten, Abdel Chatbi, David Girou, Jessica Sforzini, cosine B.V. (Netherlands), et al. . . . . [10699-130]

Back passivation development for large-area CCDs at Lincoln Laboratory, Kevin K. Ryu, Christopher W. Leitz, Barry E. Burke, Harry R. Clark, Michael J. Cooper, Vyshnavi Suntharalingam, Mike Zhu, Renee Lambert, Douglas J. Young, Xiaoyan Chen, Bradley J. Felton, Kay Johnson, James A. Gregory, MIT Lincoln Lab. (USA) . . . . . [10699-203]

OPTICS

Fabrication of x-ray reflection gratings using grayscale electron-beam lithography and selective polymer reflow, Jake A. McCoy, Randall L. McEntaffer, The Pennsylvania State Univ. (USA) . . . . . [10699-131]

Development of a lightweight x-ray mirror using thin carbon-fiber-reinforced plastic (CFRP), Hisamitsu Awaki, Ehime Univ. (Japan), et al. . . . . [10699-132]

The McXtrace AstroX toolbox: a general ray tracing software package for end to end simulation of x-ray optics for astronomical instrumentation, Erik B. Knudsen, Technical Univ. of Denmark (Denmark), et al.. . . . . [10699-133]

AHEAD joint research activity on x-ray optics, Vadim Burwitz, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10699-134]

Optical design of the off-plane grating rocket experiment, Benjamin D. Donovan, Randall L. McEntaffer, James H. Tutt, Ted B. Schultz, Drew M. Miles, The Pennsylvania State Univ. (USA), et al.. . . . . [10699-135]

Fabrication of radially profiled x-ray reflection gratings, Ningxiao Zhang, Randall L. McEntaffer, Jake A. McCoy, The Pennsylvania State Univ. (USA) . . . . . [10699-136]

Recent developments in the fabrication of astronomical gratings, Fabien Grise, Randall L. McEntaffer, Jake A. McCoy, Ningxiao Zhang, Drew M. Miles, The Pennsylvania State Univ. (USA). . . . . [10699-137]

Evaluation of x-ray reflectors by optical diffraction patterns, Takayuki Hayashi, Takashi Okajima, Yang Soong, NASA Goddard Space Flight Ctr. (USA) [10699-138]

The effect of nitrogen incorporation in boron carbide and iridium thin films, Sonny Massahi, Finn E. Christensen, Desiree Della Monica Ferreira, Paschalis Dalampiras, Sara Svendsen, Atefeh Jafari, DTU Space (Denmark) . . . . [10699-139]

The FEA modeling of MPO plate, Xue Yang, National Astronomical Observatories, Chinese Academy of Sciences (China) and Univ. of Chinese Academy of Sciences (China), et al. . . . . [10699-140]

Alignment and bonding of silicon mirrors for high-resolution x-ray optics, Kai-Wing Chan, NASA Goddard Space Flight Ctr. (USA) and Univ. of Maryland, Baltimore County (USA), et al.. . . . . [10699-141]

Reflective coatings for the future x-ray mirror substrates, Hideyuki Mori, Takashi Okajima, William W. Zhang, Kai-wing Chan, Richard G. Koenecke, James R. Mazzarella, Ai Numata, Lawrence G. Olsen, Raul E. Riveros, Mihoko Yukita, NASA Goddard Space Flight Ctr. (USA) . . . . . [10699-142]

Thermal oxide patterning: a stable and low cost figure correction method for x-ray telescope silicon mirrors, Youwei Yao, Brandon D. Chalifoux, Ralf K. Heilmann, Mark L. Schattenburg, MIT Kavli Institute for Astrophysics and Space Research (USA) . . . . . [10699-143]

Recent progress in x-ray optic mounting and alignment using ThermoYield actuators, Michael D. DeTienne, MIT Kavli Institute for Astrophysics and Space Research (USA) and Izentis LLC (USA), et al. . . . . [10699-144]

TIMING

The science case of the enhanced x-ray timing and polarimetry (eXTP) mission, Andrea Santangelo, Eberhard Karls Univ. Tübingen (Germany), et al.. . . . . [10699-145]

The polarimetric focusing array onboard the eXTP mission, Hua Feng, Tsinghua Univ. (China), et al. . . . . [10699-146]

The data control unit design for PFA on eXTP, Bin Meng, Institute of High Energy Physics, Chinese Academy of Sciences (China). . . . . [10699-147]

The filters wheel assembly of the polarimetry focusing array onboard eXTP, Weichun Jiang, Sheng Yang, Xiaojing Liu, Yuanyuan Du, Bin Meng, Chunlei Zhang, Yudong Gu, Liang Sun, Xian Li, Ying Tan, Jiawei Yang, Xuelei Cao, Yupeng Xu, Fangjun Lu, Shuangnan Zhang, Institute of High Energy Physics, Chinese Academy of Sciences (China), et al. . . . . [10699-148]

The wide field monitor onboard the eXTP mission, Søren K. Brandt, DTU Space (Denmark), et al. . . . . [10699-149]

The design of SFA onboard eXTP, Yong Chen, Yu Peng Xu, Wei Wei Cui, Yusa Wang, Zi Liang Zhang, Da Wei Han, Wei Li, Juan Wang, Jia Huo, Tian Xiang Chen, Yanji Yang, Wei Hu, Bo Lu, Yi Zhang, Mao Shun Li, Yu Xuan Zhu, Xiao Fan Zhao, Jia Qi Xue, Institute of High Energy Physics, Chinese Academy of Sciences (China) . . . . . [10699-150]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . .9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . .Tue 10:00 am to 10:30 am

SESSION 8

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . .TUE 10:30 AM TO 12:10 PM

Optics: Athena + Lynx

Session Chair: **Giovanni Pareschi,** INAF - Osservatorio Astronomico di Brera (Italy)

10:30 am: **Development of the ATHENA mirror**, Marcos Bavdaz, Eric Wille, Mark Ayre, Ivo Ferreira, Brian Shortt, Sebastiaan Fransen, European Space Research and Technology Ctr. (Netherlands), et al.. . . . . [10699-32]

10:50 am: **Silicon pore optics mirror module production and testing**, Maximilien J. Collon, Giuseppe Vacanti, Nicolas M. Barrière, Boris Landgraf, Ramses Günther, Mark Vervest, Roy van der Hoeven, Abdel Chatbi, David Girou, Jessica Sforzini, Marco W. Beijersbergen, cosine B.V. (Netherlands), et al. . . . . [10699-33]

11:10 am: **Results of SPO mirror modules optical integration in the ATHENA Telescope**, Giuseppe Valsecchi, Giovanni Bianucci, Media Lario Technologies S.r.l. (Italy), et al. . . . . [10699-34]

11:30 am: **Integration of the ATHENA mirror modules: development status of the indirect and direct x-ray methods**, Dervis Vernani, Thales Alenia Space Switzerland (Switzerland), et al. . . . . [10699-35]

11:50 am: **Lynx optics based on full monolithic shells: design and development**, Marta M. Civitani, Stefano Basso, Mauro Ghigo, Joanna Holyszko, Giovanni Pareschi, Gabriele Vecchi, INAF - Osservatorio Astronomico di Brera (Italy), et al.. . . . . [10699-36]

Lunch/Exhibition Break . . . . . .Tue 12:10 pm to 1:30 pm

SESSION 9

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . .TUE 1:30 PM TO 3:30 PM

Lynx

Session Chair: **Marco Feroci,** INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy)

1:30 pm: **The high definition x-ray imager (HDXI) instrument on the Lynx x-ray surveyor**, Abraham D. Falcone, The Pennsylvania State Univ. (USA), et al.. . . . . [10699-37]

1:50 pm: **The Design of the Lynx x-ray microcalorimeter (LXM)**, Simon R. Bandler, Michael J. DiPirro, Megan E. Eckart, Kazuhiro Sakai, Stephen J. Smith, Wonsik Yoon, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10699-38]

2:10 pm: **An x-ray transmission grating spectrometer for Lynx**, Hans Moritz Günther, Ralf K. Heilmann, Massachusetts Institute of Technology (USA)[10699-39]

2:30 pm: **The Lynx off-plane x-ray grating spectrograph**, Randall L. McEntaffer, The Pennsylvania State Univ. (USA) . . . . . [10699-40]

2:50 pm: **Considerations for the development of Lynx**, Jonathan W. Arenberg, Northrop Grumman Aerospace Systems (USA), et al. . . . . [10699-41]

3:10 pm: **Toward fast, low-noise, low-power digital CCDs for Lynx and other high-energy astrophysics missions**, Marshall W. Bautz, Andrew Malonis, Richard F. Foster, Beverly J. LaMarr, Gregory Y. Prigozhin, Catherine E. Grant, Eric D. Miller, Massachusetts Institute of Technology (USA) . . . . . [10699-42]

Coffee Break . . . . . .Tue 3:30 pm to 4:00 pm

SESSION 10

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . .TUE 4:00 PM TO 5:40 PM

Timing and Program

Session Chair: **Marshall W. Bautz,** Massachusetts Institute of Technology (USA)

4:00 pm: **The AHEAD program for integrating activities in high energy astrophysics**, Lorenzo Natalucci, Luigi Piro, INAF - IASF Roma (Italy) . . [10699-43]

4:20 pm: **STROBE-X: x-ray timing and spectroscopy on dynamical timescales from microseconds to years,** Paul S. Ray, U.S. Naval Research Lab. (USA) . . . . . [10699-44]

4:40 pm: **The enhanced x-ray timing and polarimetry mission**, Shuangnan Zhang, Institute of High Energy Physics, Chinese Academy of Sciences (China), et al.. . . . . [10699-45]

5:00 pm: **Current progress of x-ray multilayer telescope optics based on thermally slumping glass for eXTP mission,** Zhengxiang Shen, Jun Yu, Bin Ma, Zhong Zhang, Qiushi Huang, Xiaoqiang Wang, Kun Wang, Tongji Univ. (China), et al.. . . . . [10699-46]

5:20 pm: **The large area detector onboard the eXTP mission**, Marco Feroci, INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy), et al.. . [10699-47]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . .9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 11

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . .WED 10:30 AM TO 12:10 PM

Athena I

Session Chair: **Paul S. Ray,** U.S. Naval Research Lab. (USA)

10:30 am: **ATHENA: observing the hot and energetic universe with ESA's next generation x-ray observatory**, Kirpal Nandra, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-48]

10:55 am: **ATHENA: system studies and optics accommodation**, Mark Ayre, Marcos Bavdaz, Ivo Ferreira, Eric Wille, Alexander Stefanescu, Martin Linder, Tim Oosterbroek, European Space Research and Technology Ctr. (Netherlands) . . . . . [10699-49]

11:20 am: **Development of the wide field imager instrument for ATHENA**, Norbert Meidinger, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-50]

11:45 am: **The ATHENA x-ray integral field unit (X-IFU)**, Didier Barret, Institut de Recherche en Astrophysique et Planétologie (France), et al. . . . . [10699-51]

Lunch/Exhibition Break . . . . . .Wed 12:10 pm to 1:40 pm

SESSION 12

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . WED 1:40 PM TO 3:00 PM

Athena WFI

Session Chair: **Brian D. Jackson,** SRON Netherlands Institute for Space Research (Netherlands)

1:40 pm: **First tests of large prototype DEPFET detectors for ATHENA's wide field imager**, Michael Bonholzer, Annika Behrens, Valentin Emberger, Norbert Meidinger, Johannes Müller-Seidlitz, Wolfgang Treberspurg, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-52]

2:00 pm: **Evaluation of the ATHENA/WFI instrumental background**, Andreas von Kienlin, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . [10699-53]

2:20 pm: **The ATHENA WFI science products module**, David N. Burrows, The Pennsylvania State Univ. (USA), et al.. . . . . [10699-54]

2:40 pm: **Status of the ATHENA WFI optical blocking filter development at the end of the phase A**, Marco Barbera, Univ. degli Studi di Palermo (Italy), et al.. . . . . [10699-55]

Coffee Break . . . . . .Wed 3:00 pm to 3:30 pm

SESSION 13

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . WED 3:30 PM TO 5:30 PM

Athena X-IFU

Session Chair: **Didier Barret,** Institut de Recherche en Astrophysique et Planétologie (France)

3:30 pm: **Transition-edge sensor array development for the ATHENA x-ray itegral field unit**, Stephen J. Smith, Joseph S. Adams, Simon R. Bandler, James A. Chervenak, Megan E. Eckart, Fred Finkbeiner, Richard L. Kelley, Caroline A. Kilbourne, Antoine R. Miniussi, F. Scott Porter, John E. Sadleir, Kazuhiro Sakai, Nicholas A. Wakeham, Edward J. Wassell, Wonsik Yoon, NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10699-56]

3:45 pm: **Development of TiAu TES x-ray calorimeters for the X-IFU on ATHENA space observatory,** Pourya Khosropanah, E. Taralli, Luciano G. Gottardi, Cor P. de Vries, K. Nagayoshi, M.L. Ridder, Hiroki Akamatsu, Marcel P. Bruijn, Jian-Rong Gao, SRON Netherlands Institute for Space Research (Netherlands) . . . . . [10699-57]

4:00 pm: **Development of frequency domain multiplexing for the x-ray Integral Field Unit (X-IFU)**, Hiroki Akamatsu, Luciano G. Gottardi, Jan van der Kuur, Cor P. de Vries, Marcel P. Bruijn, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10699-58]

4:15 pm: **The focal plane assembly for the ATHENA x-ray integral field unit instrument**, Brian D. Jackson, Roland H. den Hartog, Jan van der Kuur, Henk J. van Weers, Hiroki Akamatsu, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10699-59]

4:30 pm: **Time- and code-division SQUID multiplexing options for ATHENA X-IFU**, Joel N. Ullom, National Institute of Standards and Technology (USA), et al.. . . . . [10699-60]

4:45 pm: **Estimates for the background of the ATHENA X-IFU instrument: the Cosmic Rays contribution,** Simone Lotti, INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy), et al.. . . . . [10699-61]

5:00 pm: **Status of the ATHENA X-IFU thermal filters development at the end of the phase A**, Marco Barbera, Univ. degli Studi di Palermo (Italy), et al. . [10699-62]

5:15 pm: **From TRL 2 to TRL 3-4: the first demonstrator model for the ATHENA X-IFU aperture cylinder**, Jean-Philippe A. Halain, Lionel Jacques, Tanguy Thibert, Univ. de Liège (Belgium), et al. . . . . [10699-63]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Wednesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Wednesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

ATHENA

Minimisation of the charged particle background on the ATHENA mission, Ivo Ferreira, Mark Ayre, Marcos Bavdaz, Matteo Guainazzi, Alexander Stefanescu, European Space Agency (Netherlands) . . . . . [10699-151]

A magnetic repeller to impact the ATHENA/WFI background level: concept and preliminary feasibility study, Emanuele Perinati, Eberhard Karls Univ. Tübingen (Germany), et al. . . . . [10699-152]

Structural modelling and mechanical tests supporting the design of the ATHENA X-IFU thermal filters and WFI optical blocking filter, Giancarlo Parodi, BCV Progetti S.r.l. (Italy), et al. . . . . [10699-153]

ATHENA/WFI science and science requirements, Arne Rau, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-154]

ATHENA WFI: development of detector electronics and instrument control and power-distribution unit, Markus Plattner, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-155]

Low energy response of ATHENA WFI prototype detectors, Wolfgang Treberspurg, Johannes Müller-Seidlitz, Norbert Meidinger, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-156]

Characterizing particle background of ATHENA WFI for the science products module: Swift XRT and XMM-PN full frame observations, Esra Bulbul, Ralph P. Kraft, Paul Nulsen, Smithsonian Astrophysical Observatory (USA), et al.[10699-157]

Reducing the ATHENA WFI background with the science products module: lessons from Chandra ACIS, Catherine E. Grant, Massachusetts Institute of Technology (USA) . . . . . [10699-158]

Studies of operation modes for the ATHENA WFI detectors, Annika Behrens, Robert Andritschke, Michael Bonholzer, Valentin Emberger, Günter Hauser, Norbert Meidinger, Johannes Müller-Seidlitz, Wolfgang Treberspurg, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-159]

The demonstration model of cryogenic anticoincidence detector for ATHENA X-IFU: design and fabrication, Michele Biasotti, Univ. degli Studi di Genova (Italy), et al.. . . . . [10699-160]

The performance of the ATHENA x-ray integral field unit, Philippe Peille, Ctr. National d'Études Spatiales (France), et al. . . . . [10699-161]

Simulating X-ray observations of galaxy clusters with the X-ray Integral Field Unit, Edoardo Cucchetti, Institut de Recherche en Astrophysique et Planétologie (France), et al. . . . . [10699-162]

Energy scale calibration and drift correction of the X-IFU, Edoardo Cucchetti, Institut de Recherche en Astrophysique et Planétologie (France), et al.. [10699-163]

Reproducibility and monitoring of the instrumental particle background for the x-ray integral field unit, Edoardo Cucchetti, Etienne Pointecouteau, Didier Barret, Institut de Recherche en Astrophysique et Planétologie (France), et al.. [10699-164]

Validation of the X-IFU calibration requirements: an example for quantum efficiency and energy resolution, Edoardo Cucchetti, François P. Pajot, Etienne Pointecouteau, Institut de Recherche en Astrophysique et Planétologie (France), et al.. . . . . [10699-165]

Development of the WFEE subsystem for the X-IFU instrument of the ATHENA space observatory, Si Chen, Damien Prêle, Fabrice Voisin, Cyril Beillimaz, Kuo Kwan Chan, Philippe Laurent, Andrea Goldwurm, AstroParticule et Cosmologie (France) . . . . . [10699-166]

Crosstalk in the readout chain of the X-IFU instrument, Roland H. den Hartog, SRON Netherlands Institute for Space Research (Netherlands), et al. . . [10699-167]

Radio Frequency shielding of thin aluminized plastic filters investigated for the ATHENA X-IFU detector, Francesco Cuttaia, INAF - IASF Bologna (Italy), et al.. . . . . [10699-168]

ATHENA x-ray integral field unit on-board event processor: analysis of the triggering algorithms, Beatriz Cobo, Univ. de Cantabria (Spain), et al. [10699-169]

The cyogenic anticoincidence detector for ATHENA X-IFU: preliminary test of the demonstration model, Matteo D'Andrea, Claudio Macculi, INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy), et al. . . . . [10699-170]

FPAsim: a FPGA-based simulator for frequency multiplexed TES arrays, Antoine Clénet, Microtec (France), et al.. . . . . [10699-171]

First results of the ATHENA/X-IFU digital readout electronics prototype, Laurent Ravera, Paul Gumuchian, Institut de Recherche en Astrophysique et Planétologie (France) and Univ. Paul Sabatier (France), et al. . . . . [10699-172]

Numerical simulation and validation of ATHENA/X-IFU/digital readout electronics, Gumuchian Paul, François P. Pajot, Laurent Ravera, Didier Barret, Antoine Clénet, Christophe Oziol, Bernard Bertrand, David Murat, Institut de Recherche en Astrophysique et Planétologie (France), et al. . . . . [10699-173]

The effect of TES transition models on ATHENA X-IFU performance estimates, Philippe Peille, Ctr. National d'Études Spatiales (France), et al.. . . . . [10699-174]

The thermal/mechanical design of the focal plane assembly development model for X-IFU, Henk J. van Weers, Brian D. Jackson, Johannes P. C. Dercksen, Dennis van Loon, Sander Kwast, SRON Netherlands Institute for Space Research (Netherlands) . . . . . [10699-175]

Properties of the SQUID readout chain for the X-IFU, Jan van der Kuur, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10699-176]

Thermal modelling of the ATHENA X-IFU filters, Luisa Sciortino, Univ. degli studi di Palermo (Italy), et al. . . . . [10699-177]

LYNX

Jitter analysis of Lynx: a proposed future large astrophysics facility, Joseph B. Knight, Jessica A. Gaskin, NASA Marshall Space Flight Ctr. (USA) . . . . [10699-178]

Analysis of the NGXO telescope x-ray Hartmann data, Timo T. Saha, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10699-179]

Options for the implementation of the Lynx mirror assembly, Jonathan W. Arenberg, Northrop Grumman Aerospace Systems (USA), et al.. . . . . [10699-180]

Femtosecond laser micro-stressing of thin fused silica optics for the Lynx x-ray telescope mission, Heng E. Zuo, Brandon D. Chalifoux, Massachusetts Institute of Technology (USA), et al. . . . . [10699-181]

Automated alignment of an optical axis reference for meta-shell x-ray mirror assembly, Zachary M. Awtry, The George Washington Univ. (USA), et al.. . . . . [10699-182]

Figure correction of a piezoelectrically adjustable slumped glass Wolter segment, Casey T. DeRoo, Vincenzo Cotroneo, Vanessa Marquez, Harvard-Smithsonian Ctr for Astrophysics (USA), et al. . . . . [10699-183]

Adjustable x-ray mirrors based on plastic electroactive polymer actuators for the Lynx mission, Manel Errando, Henric Krawczynski, Washington Univ. in St. Louis (USA) . . . . . [10699-184]

Manufacturing of thermally formed glass substrates for Lynx adjustable optics prototypes, Vincenzo Cotroneo, Paul B. Reid, Eric D. Schwartz, Casey T. DeRoo, Daniel A. Schwartz, Harvard-Smithsonian Ctr. for Astrophysics (USA) . [10699-185]

Compensating film stress in silicon substrates for the Lynx x-ray telescope mission concept using ion implantation, Brandon D. Chalifoux, Youwei Yao, Heng E. Zuo, Ralf K. Heilmann, Mark L. Schattenburg, Massachusetts Institute of Technology (USA) . . . . . [10699-186]

CONFERENCE 10699

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 14

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . THU 10:30 AM TO 11:50 AM

Operational

Session Chair: **Kirpal Nandra,** Max-Planck-Institut für extraterrestrische Physik (Germany)

10:30 am: **Two decades of Chandra high resolution camera operations: lessons learned and future prospects**, Ralph P. Kraft, Harvard-Smithsonian Ctr. for Astrophysics (USA), et al.. . . . . [10699-64]

10:50 am: **The insight-HXMT mission and its recent progresses**, Shu Zhang, Institute of High Energy Physics, Chinese Academy of Sciences (China), et al.. . . . . [10699-65]

11:10 am: **The neutron star interior composition explorer (NICER): commissioning and calibration**, Zaven Arzoumanian, Craig B. Markwardt, Keith C. Gendreau, Takashi Okajima, NASA Goddard Space Flight Ctr. (USA), et al.. . . . . [10699-66]

11:30 am: **Effective area calibration of the nuclear spectroscopic telescope array**, Kristin Madsen, Brian W. Grefenstette, Hiromasa Miyasaka, Walter R. Cook, Karl W. Forster, Fiona A. Harrison, Sean M. Pike, Caltech (USA) . . . . . [10699-67]

SESSION 15

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . THU 11:50 AM TO 12:10 PM

Approved I

Session Chair: **Kirpal Nandra,** Max-Planck-Institut für extraterrestrische Physik (Germany)

11:50 am: **The imaging x-ray polarimetry explorer (IXPE): overview**, Stephen L. O'Dell, NASA Marshall Space Flight Ctr (USA), et al. . . . . [10699-68]

Lunch/Exhibition Break . . . . . Thu 12:10 pm to 1:40 pm

SESSION 16

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . THU 1:40 PM TO 3:20 PM

Approved II

Session Chair: **Takaya Ohashi,** Tokyo Metropolitan Univ. (Japan)

1:40 pm: **ART-XC / SRG overview**, Mikhail N. Pavlinsky, Vasiliy Levin, Valeriy V. Akimov, Alexander Krivchenko, Alexey Rotin, Maria M. Kuznetsova, Igor Y. Lapshov, Alexey Tkachenko, Roman Krivonos, Nikolay P. Semena, Mikhail Buntov, Alexander Glushenko, Vadim A. Arefiev, Alexander Yaskovich, Sergei Grebenev, Sergey Sazonov, Alexander A. Lutovinov, Sergey Molkov, Dmitry Serbinov, Mikhail Kudelin, Tatyana Drozdova, Sergey Voronkov, Space Research Institute (Russian Federation), et al.. . . . . [10699-69]

2:00 pm: **How eROSITA was made**, Josef Eder, Peter Predehl, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10699-70]

2:20 pm: **SVOM: a French/Chinese cooperation for a GRB mission**, Francois Gonzalez, Ctr. National d'Études Spatiales (France), et al.. . . . . [10699-71]

2:40 pm: **MXT instrument on-board the SVOM French-Chinese mission**, Karine Mercier, Francois Gonzalez, Ctr. National d'Études Spatiales (France), et al.. . . . . [10699-72]

3:00 pm: **Concept of the x-ray astronomy recovery mission**, Makoto S. Tashiro, Saitama Univ. (Japan) and Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (Japan), et al.. . . . . [10699-73]

Coffee Break . . . . . Thu 3:20 pm to 3:50 pm

SESSION 17

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . THU 3:50 PM TO 4:50 PM

Approved III

Session Chair: **Mikhail P. Pavlinskiy,** Space Research Institute (Russian Federation)

3:50 pm: **Soft x-ray imaging telescope Xtend on the x-ray astronomy recovery mission,** Kiyoshi Hayashida, Osaka Univ. (Japan), et al. . . . . [10699-74]

4:10 pm: **Status of resolve instrument for x-ray astronomy recovery mission**, Yoshitaka Ishisaki, Tokyo Metropolitan Univ. (Japan), et al.. . . . . [10699-75]

4:30 pm: **Einstein Probe: a lobster-eye telescope for monitoring the x-ray sky**, Weimin Yuan, Chen Zhang, Zhixing Ling, Donghua Zhao, Wenxin Wang, National Astronomical Observatories, Chinese Academy of Sciences (China), et al.. . . . . [10699-76]

SESSION 18

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . THU 4:50 PM TO 5:30 PM

Proposed I

Session Chair: **Mikhail P. Pavlinskiy,** Space Research Institute (Russian Federation)

4:50 pm: **Arcus: the x-ray grating spectrometer explorer**, Andrew F. Ptak, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10699-77]

5:10 pm: **The Marshall grazing incidence x-ray spectrometer (MaGIXS)**, Ken Kobayashi, Amy R. Winebarger, Sabrina L. Savage, Patrick Champey, NASA Marshall Space Flight Ctr. (USA), et al.. . . . . [10699-78]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Thursday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Thursday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

APPROVED

Performances of the gas pixel detector to a continuum and highly polarized x-ray beam, Paolo Soffitta, INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy) . . . . . [10699-187]

Dependence on temperature of the response of a gas pixel detector to polarized and unpolarized radiation, Sergio Fabiani, INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy) . . . . . [10699-188]

Calibration of the IXPE instrument, Fabio Muleri, INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy) . . . . . [10699-189]

Overview of the detector and its readout on board the imaging x-ray polarimetry explorer, Hikmat Nasimi, Istituto Nazionale di Fisica Nucleare (Italy) . . . . . [10699-190]

On-ground calibration of the ART-XC/SRG instrument, Alexey Tkachenko, Mikhail N. Pavlinsky, Igor Y. Lapshov, Vasily Levin, Valeriy V. Akimov, Alexander Krivchenko, Alexey Rotin, Maria M. Kuznetsova, Nikolay P. Semena, Andrey Semena, Dmitry Serbinov, Roman Krivonos, Andrey Shtykovsky, Alexander Yascovich, Vladimir Oleinikov, Alexander Glushenko, Ilya Mereminskiy, Sergey Molkov, Sergey Sazonov, Vadim A. Arefiev, Space Research Institute (Russian Federation) . . . . . [10699-191]

eROSITA system functionality and operation, Diogo Coutinho, Walter Bornemann, Maria Fürmetz, Walter Kink, Norbert Meidinger, Siegfried Müller, Peter Predehl, Roland Gaida, Gisela Hartner, Vadim Burwitz, Bernd Budau, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10699-192]

eROSITA ground operations, Hermann Brunner, Thomas Boller, Diogo Coutinho, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10699-193]

eROSITA mated with SRG, Peter Predehl, Walter Bornemann, Heinrich Bräuninger, Hermann Brunner, Vadim Burwitz, Diogo Coutinho, Konrad Dennerl, Josef Eder, Peter Friedrich, Maria Fürmetz, Gisela Hartner, Andreas von Kienlin, Walter Kink, Norbert Meidinger, Benjamin Mican, Siegfried Müller, Kirpal Nandra, Elmar Pfeffermann, Christian Rohé, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10699-194]

DETECTORS

GAMMA

OPERATIONAL

PROPOSED

CONFERENCE 10699

FRIDAY 15 JUNE

SESSION 19

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . FRI 8:30 AM TO 10:30 AM

Proposed II

Session Chair: **Margarita Hernanz,** Consejo Superior de Investigaciones Científicas (Spain)

8:30 am: **Super DIOS: future x-ray spectroscopic mission to search for dark baryons**, Takaya Ohashi, Yoshitaka Ishisaki, Yuichiro Ezoe, Shinya Yamada, Tokyo Metropolitan Univ. (Japan), et al.. . . . . [10699-79]

8:50 am: **AXIS: a probe class next generation high angular resolution x-ray imaging satellite,** Richard F. Mushotzky, Univ. of Maryland (USA). . . . . [10699-80]

9:10 am: **The advanced surveyor of transient events and nuclear astrophysics (ASTENA) mission within the AHEAD project**, Piero Rosati, Enrico Virgilli, Filippo Frontera, Cristiano Guidorzi, Univ. degli Studi di Ferrara (Italy), et al. . . . [10699-81]

9:30 am: **The high-energy x-ray probe (HEX-P)**, Fiona A. Harrison, Kristin Madsen, Brian W. Grefenstette, Caltech (USA), et al.. . . . . [10699-82]

9:50 am: **The FOXSI-3 sounding rocket experiment,** P. Subramania Athiray, Lindsay Glesener, Univ. of Minnesota, Twin Cities (USA), et al.. . . . . [10699-83]

10:10 am: **The FORCE mission: science aims and instrument parameters for broadband x-ray imaging spectroscopy with good angular resolution**, Kazuhiro Nakazawa, The Univ. of Tokyo (Japan), et al.. . . . . [10699-84]

Coffee Break . . . . . .Fri 10:30 am to 11:00 am

SESSION 20

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . FRI 11:00 AM TO 12:00 PM

Detectors I

Session Chair: **Caroline A. Kilbourne,** NASA Goddard Space Flight Ctr. (USA)

11:00 am: **X-ray hybrid CMOS detectors: recent progress in development and characterization**, Tanmoy Chattopadhyay, Abraham D. Falcone, David N. Burrows, Samuel V. Hull, Mitchell Wages, Evan Bray, Maria McQuaide, Jessica O'Dell, Lazar Buntic, The Pennsylvania State Univ. (USA) . . . . . [10699-85]

11:20 am: **A new spectroscopic imager for x-rays from 0.5 keV to 150 keV combining a fully depleted pnCCD coupled to a columnar CsI(Tl) scintillator with Fano limited energy resolution and deep subpixel spatial resolution**, Lothar W. Strueder, Robert Hartmann, Alois Bechteler, PNSensor GmbH (Germany), et al.. . . . . [10699-86]

11:40 am: **Proton radiation tolerance of x-ray SOI pixel sensors for space use**, Takayoshi Kohmura, Kouichi Hagino, Keigo Yarita, Kenji Oono, Kosuke Negishi, Koki Tamasawa, Tokyo Univ. of Science (Japan), et al. . . . . [10699-87]

Lunch Break . . . . . Fri 12:00 pm to 1:30 pm

SESSION 21

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . .FRI 1:30 PM TO 2:10 PM

Detectors II

Session Chair: **Caroline A. Kilbourne,** NASA Goddard Space Flight Ctr. (USA)

1:30 pm: **Performance tests for D2R1: a CdTe based 2 dimensional fine-pitched x-ray imaging spectrometer**, Daniel Maier, Olivier Limousin, David Baudin, Olivier Gevin, Diana Renaud, CEA-Ctr. de SACLAY (France) . . . [10699-88]

1:50 pm: **First results onto a 32x32 silicon doped sensors matrix associated with its HEMT/SiGe cryo-electronics**, Jean-Luc Sauvageot, Xavier de la Broïse, Thomas Charvolin, Romain Thibon, Francis Lugiez, Alain Le Coguie, Commissariat à l'Énergie Atomique (France) . . . . . [10699-89]

SESSION 22

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . .FRI 2:10 PM TO 3:10 PM

Gamma-ray I

Session Chair: **Mark McConnell,** The Univ. of New Hampshire (USA)

2:10 pm: **The e-ASTROGAM gamma-ray space mission**, Vincent Tatischeff, Ctr. de Sciences Nucléaires et de Sciences de la Matière - CSNSM (France), et al.. . . . . [10699-90]

2:30 pm: **The polarimetric performance of the Compton spectrometer and imager (COSI)**, Chien-Ying Yang, National Tsing Hua Univ. (Taiwan), et al.. . . . . [10699-91]

2:50 pm: **The lunar occultation explorer (LOX): a new paradigm in nuclear astrophysics**, Richard S. Miller, The Univ. of Alabama in Huntsville (USA), et al.. . . . . [10699-92]

Coffee Break . . . . . Fri 3:10 pm to 3:40 pm

SESSION 23

LOCATION: CC LEVEL 3, ROOM 5A/C . . . . . .FRI 3:40 PM TO 6:00 PM

Gamma-ray II

Session Chair: **Kazuhiro Nakazawa,** The Univ. of Tokyo (Japan)

3:40 pm: **AdEPT: the advanced energetic pair telescope (AdEPT) for medium-energy gamma-ray polarimetry**, Stanley D. Hunter, NASA Goddard Space Flight Ctr. (USA). . . . . [10699-93]

4:00 pm: **The Narrow Field Telescope on board the ASTENA mission**, Enrico Virgilli, Piero Rosati, Filippo Frontera, Univ. degli Studi di Ferrara (Italy), et al.. . . . . [10699-94]

4:20 pm: **The continued development of a low energy Compton imager for GRB polarization studies**, Mark L. McConnell, Peter F. Bloser, Jason S. Legere, James M. Ryan, The Univ. of New Hampshire (USA) . . . . . [10699-95]

4:40 pm: **Monitoring of gamma-ray bursts with a fleet of nanosatellites**, Norbert Werner, Eötvös Loránd Univ. (Hungary), et al. . . . . [10699-96]

5:00 pm: **HERMES: a swarm of nano-satellites for high energy astrophysics and fundamental physics**, Fabrizio Fiore, INAF - Osservatorio Astronomico di Roma (Italy), et al. . . . . [10699-97]

5:20 pm: **The SAGE Experiment: detecting gravitational waves with CubeSats**, Sylvestre Lacour, Lab. d'Etudes Spatiales et d'Instrumentation en Astrophysique, Observatoire de Paris à Meudon (France), et al.. . . . . [10699-98]

5:40 pm: **The Micro Astrophysical MeV Background Observatory (MAMBO): a CubeSat for gamma-ray astronomy**, W. Thomas Vestrand, Andrew S. Hoover, Lucas P. Parker, Los Alamos National Lab. (USA) . . . . . [10699-99]

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

CONFERENCE 10700

Sunday–Friday 10–15 June 2018 • Proceedings of SPIE Vol. 10700

Ground-based and Airborne Telescopes VII

Conference Chairs: **Heather K. Marshall,** DKIST/National Solar Observatory (USA); **Jason Spyromilio,** European Southern Observatory (Germany)

Program Committee: **Bruce C. Bigelow,** GMTO Corp. (USA); **Emanuela Ciattaglia,** European Southern Observatory (Germany); **Matthew Colless,** Research School of Astronomy & Astrophysics, The Australian National Univ. (Australia); **Jean-Gabriel Cuby,** Lab. d'Astrophysique de Marseille (France); **Frank W. Kan,** Simpson Gumpertz & Heger Inc. (USA); **Victor L. Krabbendam,** Large Synoptic Survey Telescope (USA); **Jeffrey R. Kuhn,** Univ. of Hawai'i (USA); **Amir Sadjadpour,** Thirty Meter Telescope (USA); **Predrag Sekulic,** National Solar Observatory (USA); **Tim Stevenson,** SKA Organisation (United Kingdom); **Tomonori Usuda,** National Astronomical Observatory of Japan (Japan); **Jürgen Wolf,** Deutsches SOFIA Institut (Germany); **Yongtian Zhu,** Nanjing Institute of Astronomical Optics & Technology (China)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 1, BALLROOM A ..... SUN 11:00 AM TO 12:00 PM

Optical Coatings

Session Chairs: **Bruce C. Bigelow,** GMTO Corp. (USA); **Frank W. Kan,** Simpson Gumpertz & Heger Inc. (USA)

11:00 am: **Impact of ion assisted process on protected silver coatings for telescopic mirror applications**, Srinivas A., Lakshmi Prasad, Ramakrishna S., Sreenivasan M. G., K. Mohanachandran, Prasanth Sakhamuri, Hind High Vacuum Co. Pvt. Ltd. (India) . . . . . [10700-1]

11:20 am: **Lessons learned from wet washing the 6.5m MMT primary mirror in-situ**, Ricardo Ortiz, Joseph T. Williams, William Goble, MMT Observatory (USA) . . . . . [10700-2]

11:40 am: **Instrumental polarization of the off-axis main optics of the Goode Solar Telescope**, Shu Yuan, Yunnan Observatories (China), et al. . . . . [10700-3]

Lunch Break . . . . . Sun 12:00 pm to 1:30 pm

SESSION 2

LOCATION: CC LEVEL 1, BALLROOM A ..... SUN 1:30 PM TO 3:30 PM

Infrastructure, Facilities, and Enclosures

Session Chairs: **Heather K. Marshall,** National Solar Observatory (USA); **Amir Sadjadpour,** Thirty Meter Telescope (USA)

1:30 pm: **Designing an effective SALT building management system (BMS)**, Paul Rabe, Keith R. J. Browne, Eben Wiid, Jonathan Love, Janus D. Brink, Hitesh Gajjar, Chris Coetzee, Martin Wilkinson, Southern African Large Telescope (South Africa) . . . . . [10700-4]

1:50 pm: **Design and construction of the SST Australia Observatory in a cyclonic region,** Jose Teran, Derek Hill, M3 Engineering & Technology Corp. (USA), et al. . . . . [10700-5]

2:10 pm: **The LSST dome: manufacturing and erection status**, William J. Gressler, Douglas R. Neill, LSST (USA), et al. . . . . [10700-6]

2:30 pm: **Procurement of the dome and the telescope structure of the ESO ELT: status report**, Stefano Stanghellini, Pascal Martinez, Maximilian Kraus, European Southern Observatory (Germany) . . . . . [10700-7]

2:50 pm: **GMT site, enclosure, and facilities: design and construction update**, Bruce C. Bigelow, William S. Burgett, GMTO Corp. (USA), et al. . . . . [10700-8]

3:10 pm: **Lessons learned from design, analysis, and rehabilitation of wheel and track systems**, Frank W. Kan, Andrew Sarawit, Simpson Gumpertz & Heger Inc. (USA). . . . . [10700-9]

Coffee Break . . . . . Sun 3:30 pm to 4:00 pm

SESSION 3

LOCATION: CC LEVEL 1, BALLROOM A .....SUN 4:00 PM TO 5:30 PM

Project Reviews: Early Operations

Session Chairs: **Jürgen Wolf,** Deutsches SOFIA Institut (Germany); **Tomonori Usuda,** National Astronomical Observatory of Japan (Japan); **Jean-Gabriel Cuby,** Lab. d'Astrophysique de Marseille (France)

4:00 pm: **The Large Millimeter Telescope Alfonso Serrano: scientific operation of the LMT 50-m, first results and next steps** *(Invited Paper)*, David H. Hughes, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al. . . . [10700-10]

4:30 pm: **Commissioning and first scientific operations of the wide-field 2.5m Javalambre Survey Telescope** *(Invited Paper)*, A. Javier Cenarro Lagunas, Antonio Marín-Franch, Alessandro Ederoclite, Axel Yanes Díaz, David Cristóbal-Hornillos, Jesús Varela, Héctor Vázquez-Ramió, Mariano Moles, Néstor M. Lasso-Cabrera, Sergio Rueda-Teruel, Fernando Rueda-Teruel, Sergio Chueca, César Íñiguez García, Guillermo López-Alegre, Rafael Bello Ferrer, Juan Luís Antón-Bravo, Samuel Bielsa de Toledo, Mikel Domínguez-Martínez, Raul Milla Español, Alberto Moreno-Signes, Ramón Iglesias-Marzoa, Miguel Chioare Díaz-Martín, Tamara Civera Lorenzo, Javier Hernández-Fuertes, David Muniesa-Gallardo, Juan Castillo, Ángel López-Sáinz, Ctr. de Estudios de Física del Cosmos de Aragón (Spain) . . . . . [10700-11]

5:00 pm: **SOFIA in the era of JWST and ALMA** *(Invited Paper)*, Harold Yorke, SOFIA / USRA (USA) . . . . . [10700-12]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 ..... 6:00 PM TO 8:00 PM

Posters: Sunday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Sunday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

ASSEMBLY, INTEGRATION, AND VERIFICATION

Design of semi-physical fault simulation platform for Antarctic Telescopes, Shihai Yang, Dandan Xu, Jiajia Wu, Yun Li, Nanjing Institute of Astronomical Optics & Technology (China) . . . . . [10700-71]

The astronomical telescope of the University of Stuttgart (ATUS): commissioning and first results, Karsten Schindler, Jürgen Wolf, Deutsches SOFIA Institut, Univ. Stuttgart (Germany) and NASA Ames Research Ctr. (USA), et al. . . . . [10700-72]

Technical documentation for the construction, operation and maintenance of the Large Synoptic Survey Telescope, Ulrike Angela Hautmann, National Optical Astronomy Observatory (USA) . . . . . [10700-73]

The fault analysis method of FAST actuator based on feedback data, Lichun Zhu, National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10700-74]

Lessons learned from the investigation of an anomalous termination of BETTII, Todd J. Veach, Southwest Research Institute (USA), et al. . . . . [10700-75]

Commissioning status of the Greenland Telescope, Satoki Matsushita, Keiichi Asada, Johnson C. C. Han, Hiroaki Nishioka, Shoko Koyama, Chih-Wei L. Huang, Lupin C. C. Lin, Kuan-Yu Liu, Chen-Yu Yu, Ming-Tang Chen, Paul T. P. Ho, Institute of Astronomy and Astrophysics - Academia Sinica (Taiwan), et al. . . . . [10700-76]

CALIBRATION, METROLOGY AND ALIGNMENT

The fiber view metrology system research for spectral survey telescope, Zengxiang Zhou, Jianping Wang, Hongzhuan Hu, Zhigang Liu, Jiaru Chu, Univ. of Science and Technology of China (China) . . . . . [10700-77]

CONFERENCE 10700

CONSTRUCTION PROJECT REVIEWS

ENCLOSURES

FACILITIES AND INFRASTRUCTURE

MAJOR OBSERVATORY UPGRADES

MODELING AS A DRIVER OF OBSERVATORY DESIGN

OPTICAL AND OPTO-MECHANICAL DESIGNS

OPTICAL COATINGS

PATHFINDERS/CONCEPTS FOR FUTURE TELESCOPES

PROJECT REVIEWS: EARLY OPERATIONS

ROBOTIC TELESCOPES AND ARRAYS

CONFERENCE 10700

SITE CHARACTERIZATION, TESTING AND DEVELOPMENT

TELESCOPE CONTROL

TELESCOPE STRUCTURES

WAVEFRONT CONTROL, WAVEFRONT SENSING, AND SEGMENTED MIRROR ALIGNMENT

High accuracy tip sensing of a segmented ring solar telescope, Yichun Dai, Zhenyu Jin, Tai Guo, Zhong Liu, Yunnan Observatories (China) . . . . . [10700-229]

Upgraded wavefront sensor control and analysis software for the MMT Observatory, Timothy E. Pickering, MMT Observatory (USA) . . . . . [10700-230]

Mechanisms in the GMT acquisition guiding and wavefront sensing system, Daniel Catropa, Joseph D'Arco, Daniel Durusky, Jan Kansky, Derek Kopon, Kenneth McCracken, Brian A. McLeod, Stuart McMuldroch, William Podgorski, Harvard-Smithsonian Ctr. for Astrophysics (USA) . . . . . [10700-231]

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 4

LOCATION: CC LEVEL 1, BALLROOM A . . . . . MON 10:30 AM TO 11:50 AM

Project Reviews: Assembly, Integration, and Verification

Session Chairs: **Jason Spyromilio,** European Southern Observatory (Germany); **Tomonori Usuda,** National Astronomical Observatory of Japan (Japan)

10:30 am: **The Balloon Experimental Twin Telescope for infrared interferometry (BETTII): first flight** *(Invited Paper)*, Stephen A. Rinehart, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10700-232]

11:00 am: **Progress in the commissioning of Five-hundred-meter Aperture Spherical Radio Telescope** *(Invited Paper)*, Jinghai Sun, Peng Jiang, Youling Yue, National Astronomical Observatories (China), et al. . . . . [10700-233]

11:30 am: **The Greenland Telescope**, Ming-Tang Chen, Philippe A. Raffin, Paul T. P. Ho, Institute of Astronomy and Astrophysics - Academia Sinica (Taiwan), et al. . . . . [10700-234]

Lunch Break . . . . . Mon 11:50 am to 1:20 pm

SESSION 5

LOCATION: CC LEVEL 1, BALLROOM A . . . . . MON 1:20 PM TO 3:20 PM

Modeling as a Driver of Observatory Design I

JOINT SESSION WITH CONFERENCES 10700 AND 10705

Session Chairs: **Jeffrey R. Kuhn,** Institute for Astronomy (USA); **Amir Sadjadpour,** Thirty Meter Telescope (USA); **Jean-Gabriel Cuby,** Lab. d'Astrophysique de Marseille (France); **Mitchell Troy,** Jet Propulsion Lab. (USA); **George Z. Angeli,** GMTO Corp. (USA)

1:20 pm: **Stray light and thermal self-emission minimization at the ELT**, Ronald Holzlöhner, Johan Kosmalski, European Southern Observatory (Germany) . . . . . [10700-13]

1:40 pm: **Integrated modeling under uncertainty for the James Webb Space Telescope**, Giuseppe Cataldo, Gary E. Mosier, NASA Goddard Space Flight Ctr. (USA) . . . . . [10705-24]

2:00 pm: **Direct measurements of wind disturbances forces on the CTIO Blanco 4m Telescope Mount and its effect in tracking jitter**, Michael Warner, Norman Diaz, Cerro Tololo Inter-American Observatory (Chile) . . . . . [10700-14]

2:20 pm: **A new finite element model of the SOFIA primary mirror cell to investigate dynamical behavior**, Benjamin Greiner, Bernhard Malicek, Michael Lachenmann, Alfred Krabbe, Jörg Wagner, Deutsches SOFIA Institut, Univ. Stuttgart (Germany) . . . . . [10700-15]

2:40 pm: **Vibration measurements in the Daniel K. Inouye Solar Telescope**, William R. McBride II, Mackenzie Stratton, National Solar Observatory (USA) . . . . . [10700-16]

3:00 pm: **Monitoring the LSST system performance during construction**, Bo Xin, Charles F. Claver, Brian M. Selvy, LSST (USA), et al. . . . . [10705-25]

Coffee Break . . . . . Mon 3:20 pm to 3:50 pm

SESSION 6

LOCATION: CC LEVEL 1, BALLROOM A . . . . . MON 3:50 PM TO 5:30 PM

Modeling as a Driver of Observatory Design II

JOINT SESSION WITH CONFERENCES 10700 AND 10705

Session Chairs: **Yongtian Zhu,** Nanjing Institute of Astronomical Optics & Technology (China); **Victor L. Krabbendam,** LSST (USA); **Roberto Biasi,** Microgate S.r.l. (Italy); **Sebastian G. Els,** Gulf Solutions (United Arab Emirates)

3:50 pm: **JWST structural-thermal-optical stability model validation**, Joseph M. Howard, Kong Q. Ha, Garrett J. West, Jeffrey S. Smith, Timothy M. Carnahan, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10705-26]

4:10 pm: **Interferometric characterization of Keck segment edge errors,** Mitchell Troy, Jet Propulsion Lab. (USA), et al. . . . . [10700-17]

4:30 pm: **The Giant Magellan Telescope phasing strategy and performance**, Fernando Quirós-Pacheco, Antonin H. Bouchez, Rodolphe Conan, GMTO Corp. (USA), et al. . . . . [10700-18]

4:50 pm: **Optical performance prediction of the Thirty Meter Telescope after initial alignment using optical modeling**, Byoung-Joon Seo, Carl Nissly, Mitchell Troy, Jet Propulsion Lab. (USA), et al. . . . . [10705-27]

5:10 pm: **Computational fluid dynamics modeling of GMT,** Konstantinos Vogiatzis, Kaushik Das, George Z. Angeli, Bruce C. Bigelow, William Burgett, GMTO Corp. (USA) . . . . . [10705-28]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 7

LOCATION: CC LEVEL 1, BALLROOM A . . . . . TUE 10:30 AM TO 12:30 PM

Major Observatory Upgrades

Session Chairs: **Matthew M. Colless,** The Australian National Univ. (Australia); **Emanuela Ciattaglia,** European Southern Observatory (Germany)

10:30 am: **Progress on the W.M. Keck Observatory segment repair project**, Dennis McBride, Allen Agliam, Ben Bergin, Jake Bilyk, Steve Doyle, John S. Hudek, Danya Jacob, Robert Meeks, Cailean O'Sullivan, Kuochou Tai, Tod Von Boeckmann, Leslie Wold, Truman Wold, W. M. Keck Observatory (USA) [10700-19]

10:50 am: **Completion and performance of the Hobby-Eberly Telescope wide field upgrade,** Gary J. Hill, Niv Drory, John M. Good, Hanshin Lee, Brian L. Vattiat, Herman Kriel, Jason Ramsey, Randy Bryant, James Fowler, The Univ. of Texas at Austin (USA), et al. . . . . [10700-20]

11:10 am: **Dome seeing monitor and its results for the 4m Blanco Telescope**, Edison Bustos, Andrei Tokovinin, National Optical Astronomy Observatory (Chile). . . . . [10700-21]

11:30 am: **NOEMA: a powerful millimeter wave interferometer using next generation technology**, Karl F. Schuster, Roberto Neri, Frederic Gueth, Arancha Castro-Carrizo, Jerome Pety, Bertrand Gautier, Bastien Lefranc, Sebastien Blanchet, Patrick Dumontroty, Dominique Broguière, Olivier Gentaz, Sylvain Mahieu, Vincent Pietu, Jeremy Boissier, Michael Bremer, Melanie Krips, Jan-Martin Winters, Roberto García, IRAM-Domaine Univ. de Grenoble (France) . . . [10700-22]

11:50 am: **Mini-tracker concepts for the Southern African Large Telescope (SALT) transient follow-up program**, John A. Booth, Large Telescope Consulting Engineering (USA), et al. . . . . [10700-23]

12:10 pm: **DESI installation: preparations and progress**, Lori Allen, D. Sprayberry, M. Evatt, R. Marshall, B. Abareshi, T. Lavoie, R. Joyce, R. Probst, A. Dey, R. Blum, National Optical Astronomy Observatory (USA), et al. . . . . [10700-24]

Lunch Break . . . . . Tue 12:30 pm to 2:00 pm

SESSION 8

LOCATION: CC LEVEL 1, BALLROOM A . . . . . TUE 2:00 PM TO 3:30 PM

Project Reviews: Observatories Under Construction

Session Chairs: **Tomonori Usuda,** National Astronomical Observatory of Japan (Japan); **Jason Spyromilio,** European Southern Observatory (Germany)

2:00 pm: **The Large Synoptic Survey Telescope construction status in 2018** *(Invited Paper)*, Victor L. Krabbendam, LSST (USA), et al. . . . . [10700-25]

2:30 pm: **Construction update of the Daniel K. Inouye Solar Telescope project** *(Invited Paper)*, Mark Warner, National Solar Observatory (USA) . . . . . [10700-26]

3:00 pm: **Overview and construction status of the University of Tokyo Atacama Observatory 6.5m Telescope** *(Invited Paper)*, Mamoru Doi, Yuzuru Yoshii, Takashi Miyata, Kotaro Kohno, Masuo Tanaka, Kentaro Motohara, Takeo Minezaki, Shigeyuki Sako, Tomoki Morokuma, Toshihiko Tanabe, Bunyo Hatsukade, Hidenori Takahashi, Masahiro Konishi, Takafumi Kamizuka, Natsuko Kato, Tsutomu Aoki, Takao Soyano, Ken'ichi Tarusawa, The Univ. of Tokyo (Japan), et al. . . . [10700-27]

Coffee Break . . . . . .Tue 3:30 pm to 4:00 pm

SESSION 9

LOCATION: CC LEVEL 1, BALLROOM A . . . . . TUE 4:00 PM TO 5:30 PM

Project Reviews: Early Construction

Session Chairs: **Predrag Sekulic,** National Solar Observatory (USA); **Yongtian Zhu,** Nanjing Institute of Astronomical Optics & Technology (China)

4:00 pm: **Cherenkov Telescope array (CTA): building the world's largest ground-based gamma-ray observatory** *(Invited Paper)*, Wolfgang Wild, Cherenkov Telescope Array Observatory GmbH (Italy) . . . . . [10700-28]

4:30 pm: **SKA telescope progress and status** *(Invited Paper)*, Alistair M. McPherson, SKA Organisation (United Kingdom). . . . . [10700-29]

5:00 pm: **The telescopio San Pedro Mártir project** *(Invited Paper)*, Michael G. Richer, William H. Lee, Univ. Nacional Autónoma de México (Mexico), et al.. . . . . [10700-30]

SESSION 10

LOCATION: CC LEVEL 1, BALLROOM A . . . . . TUE 5:30 PM TO 6:10 PM

Pathfinder Projects

Session Chairs: **Predrag Sekulic,** National Solar Observatory (USA); **Yongtian Zhu,** Nanjing Institute of Astronomical Optics & Technology (China)

5:30 pm: **Final characterisation and design of the Gamma-ray Cherenkov Telescope (GCT) for the Cherenkov Telescope array**, Oriane Le Blanc, Observatoire de Paris (France) . . . . . [10700-32]

5:50 pm: **The Vivaldi feed design for the HERA Telescope**, Eloy de Lera Acedo, Nicolas Fagnoni, Univ. of Cambridge (United Kingdom). . . . . [10700-33]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 11

LOCATION: CC LEVEL 1, BALLROOM A . . . . WED 10:30 AM TO 12:20 PM

Project Reviews: Extremely Large Telescopes

Session Chairs: **Emanuela Ciattaglia,** European Southern Observatory (Germany); **Bruce C. Bigelow,** GMTO Corp. (USA)

10:30 am: **Overview and status of the Giant Magellan Telescope project** *(Invited Paper)*, James L. Fanson, GMTO Corp. (USA), et al. . . . . [10700-34]

11:00 am: **Thirty Meter Telescope projectstatus** *(Invited Paper)*, Fengchuan Liu, Gary Sanders, Thirty Meter Telescope (USA) . . . . . [10700-35]

11:30 am: **The ESO's ELT construction status** *(Invited Paper)*, Roberto Tamai, Bertrand Koehler, Michele Cirasuolo, Fabio Biancat-Marchet, Mauro Tuti, Juan Carlos Gonzáles Herrera, European Southern Observatory (Germany) . . [10700-36]

12:00 pm: **The Exo-Life Finder (ELF) Telescope: design and beam synthesis concepts**, Jeffrey R. Kuhn, Ian Cunnyngham, Institute for Astronomy (USA), et al.. . . . . [10700-37]

Lunch Break . . . . . Wed 12:20 pm to 1:30 pm

SESSION 12

LOCATION: CC LEVEL 1, BALLROOM A . . . . . WED 1:30 PM TO 2:30 PM

Gravitational Wave Observatories

Session Chairs: **Heather K. Marshall,** National Solar Observatory (USA); **Predrag Sekulic,** National Solar Observatory (USA)

1:30 pm: **Engineering behind the Laser Interferometer Gravitational-wave Observatory (LIGO)** *(Invited Paper)*, Dennis Coyne, Caltech (USA). . . . . [10700-38]

2:00 pm: **Status of the advanced Virgo gravitational wave detector** *(Invited Paper)*, Henrich Heitmann, Observatoire de la Côte d'Azur (France) and Ctr. National de la Recherche Scientifique (France) . . . . . [10700-39]

SESSION 13

LOCATION: CC LEVEL 1, BALLROOM A . . . . . WED 2:30 PM TO 3:30 PM

Opto-Mechanical Systems

Session Chairs: **Heather K. Marshall,** National Solar Observatory (USA); **Predrag Sekulic,** National Solar Observatory (USA)

2:30 pm: **ESO ELT optomechanics: construction status**, Marc Cayrel, European Southern Observatory (Germany) . . . . . [10700-40]

2:50 pm: **LSST secondary mirror assembly**, William J. Gressler, LSST (USA) . . . . . [10700-41]

3:10 pm: **Prototype segmented mirror telescope: a pathfinder of India's Large Optical-NIR Telescope project**, Padmakar Singh S. Parihar, Prasanna Deshmukh, Annu Jacob, Varun Kumar, Abhishek Goudar, S. Sriram, S. Nagabhusan, K. V. Govinda, D.S. Sandeep, P.M.M. Kemkar, G.C. Anupama, Indian Institute of Astrophysics (India) . . . . . [10700-42]

Coffee Break . . . . . Wed 3:30 pm to 4:00 pm

SESSION 14

LOCATION: CC LEVEL 1, BALLROOM A . . . . . WED 4:00 PM TO 6:00 PM

Phasing

Session Chairs: **Jeffrey R. Kuhn,** Institute for Astronomy (USA); **Jason Spyromilio,** European Southern Observatory (Germany)

4:00 pm: **Extremely Large telescope prefocal station A system concept**, Steffan A. Lewis, Enzo Brunetto, Andreas Förster, Christoph Frank, Ivan Guidolin, Stéphane Guisard, Peter Hammersley, Ronald Holzlöhner, Paul Jolley, Johan Kosmalski, Ulrich Lampater, Enrico Marchetti, Paolo La Penna, Thomas Pfrommer, European Southern Observatory (Germany) . . . . . [10700-43]

4:20 pm: **SALT: results of active primary mirror segment alignment using inductive edge sensors**, Hitesh Gajjar, John Menzies, Jonathan Love, Chris Coetzee, South African Astronomical Observatory (South Africa) . . . . . [10700-44]

4:40 pm: **A novel technique to measure residual systematic segment piston errors of large aperture optical telescopes**, Sam Ragland, W. M. Keck Observatory (USA). . . . . [10700-45]

5:00 pm: **Chromatic effects in narrowband phasing of the Keck Telescope segments: theory and numerical simulations**, Gary Chanan, Univ. of California, Irvine (USA), et al. . . . . [10700-46]

5:20 pm: **Aligning and phasing segmented mirror telescope with the pyramid sensor**, Annu Jacob, Padmakar S. Parihar, Indian Institute of Astrophysics (India), et al.. . . . . [10700-47]

5:40 pm: **Planetary science capabilities of a UV-visible balloon-borne telescope as a function of wavefront error**, Eliot F. Young, Southwest Research Institute (USA), et al. . . . . [10700-48]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Thursday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Thursday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

TELESCOPE CONTROL II

Flight performance of the attitude control system of the balloon experimental twin telescope for infrared interferometry (BETTII), Jordi Vila Hernández de Lorenzo, NASA Goddard Space Flight Ctr. (USA) . . . . . [10700-213]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 15

LOCATION: CC LEVEL 1, BALLROOM A . . . . . THU 10:30 AM TO 12:00 PM

Project Reviews: Robotic Telescopes and Arrays

Session Chairs: **Heather K. Marshall,** National Solar Observatory (USA); **Jeffrey R. Kuhn,** Institute for Astronomy (USA)

10:30 am: **SPECULOOS: a robotic telescopes network to hunt for terrestrial planets around the nearest ultracool dwarf stars** *(Invited Paper)*, Artem Burdanov, Michaël Gillon, Emmanuël Jehin, Univ. de Liège (Belgium), et al.. . . . . [10700-49]

11:00 am: **The BlackGEM array**, Paul J. Groot, Radboud Univ Nijmegen (Netherlands), et al. . . . . [10700-50]

11:20 am: **SAMM: the solar activity MOF monitor**, Marco Stangalini, Roberto Piazzesi, Roberto Speziali, INAF - Osservatorio Astronomico di Roma (Italy), et al.. . . . . [10700-51]

11:40 am: **Introduction of Chinese Antarctic Optical Telescopes**, Zhengyang Li, Xiangyan Yuan, Xiangqun Cui, Nanjing Institute of Astronomical Optics & Technology (China) . . . . . [10700-52]

Lunch Break . . . . . Thu 12:00 pm to 1:20 pm

SESSION 16

LOCATION: CC LEVEL 1, BALLROOM A . . . . . THU 1:20 PM TO 3:30 PM

Project Reviews: Projects in Development

Session Chairs: **Frank W. Kan,** Simpson Gumpertz & Heger Inc. (USA); **Matthew M. Colless,** The Australian National Univ. (Australia)

1:20 pm: **CCAT-Prime: an ultra-widefield submillimeter observatory on Cerro Chajnantor** *(Invited Paper)*, Gordon J. Stacey, Cornell Univ. (USA), et al. [10700-53]

1:50 pm: **Maunakea spectroscopic explorer emerging from conceptual design** *(Invited Paper)*, Kei Szeto, Richard Murowinski, Alan McConnachie, Alexis Hill, Nicolas Flagey, Canada-France-Hawaii Telescope (USA), et al. . . . . [10700-54]

2:20 pm: **The Next-Generation Very Large array: a technical overview** *(Invited Paper)*, Robert Selina, Mark McKinnon, Eric Murphy, Chris Carilli, Anthony J. Beasley, National Radio Astronomy Observatory (USA). . . . . [10700-55]

2:50 pm: **Concept studies of the proposed Chinese Large Optical/infrared Telescope**, Xiangqun Cui, Yongtian Zhu, Ming Liang, Nanjing Institute of Astronomical Optics & Technology, Chinese Academy of Sciences (China), et al.. . . . . [10700-56]

3:10 pm: **A recommended conceptual optical system design for China's Large Optical-infrared Telescope (LOT)**, Donglin Ma, Huazhong Univ. of Science and Technology (China), et al. . . . . [10700-57]

Coffee Break . . . . . Thu 3:30 pm to 4:00 pm

SESSION 17

LOCATION: CC LEVEL 1, BALLROOM A . . . . . THU 4:00 PM TO 5:40 PM

Alignment and Wavefront Sensing

Session Chairs: **Victor L. Krabbendam,** LSST (USA); **Jürgen Wolf,** Deutsches SOFIA Institut (Germany)

4:00 pm: **Development of DKIST IT and C Shack-Hartmann wavefront measurement system**, Chen Liang, Predrag Sekulic, Kerry Gonzales, Pierre Aka, Simon Craig, National Solar Observatory (USA) . . . . . [10700-58]

4:20 pm: **Prototyping the GMT Telescope metrology system on LBT**, Andrew Rakich, Patricio Schurter, Matthieu Bec, Rodolphe Conan, GMTO Corp. (USA), et al.. . . . . [10700-59]

4:40 pm: **The acquisition, guiding, and wavefront sensing system for the Giant Magellan Telescope**, Brian A. McLeod, Daniel Catropa, Daniel Durusky, Jan Kansky, Derek Kopon, Kenneth McCracken, Stuart McMuldroch, William Podgorski, Harvard-Smithsonian Ctr. for Astrophysics (USA), et al. . . . . [10700-60]

5:00 pm: **Automatic mirror alignment for the medium-sized telescopes of the Cherenkov Telescope array using the Bokeh method**, Thomas Murach, Deutsches Elektronen-Synchrotron (Germany), et al.. . . . . [10700-61]

5:20 pm: **Introduction of measurement and control technology of FAST,** LiChun Zhu, National Astronomical Observatories (China) . . . . . [10700-62]

FRIDAY 15 JUNE

SESSION 18

LOCATION: CC LEVEL 1, BALLROOM A . . . . . FRI 9:10 AM TO 10:30 AM

Telescope Structures I

Session Chairs: **Emanuela Ciattaglia,** European Southern Observatory (Germany); **Heather K. Marshall,** National Solar Observatory (USA)

9:10 am: **The Maunakea Spectroscopic Explorer (MSE) telescope mount**, Gaizka Murga Llano, IDOM Ingenieria y Consultoria S.A. (Spain), et al.. . [10700-63]

9:30 am: **LSST telescope mount assembly: construction status,** Shawn P. Callahan, National Optical Astronomy Observatory (USA), et al. . . . . [10700-64]

9:50 am: **DAG 4m Telescope: assembly, integration and testing**, Olivier Pirnay, Grégory Lousberg, Eric Gabriel, Thibault Leseur, AMOS Ltd. (Belgium), et al.. . . . . [10700-65]

10:10 am: **Iranian National Observatory: mechanical design of the 3.4m optical telescope**, Zohreh Azizi, Habib G. Khosroshahi, Masoud Bidar, Hooshdad Jenab, Ali Karami, Mahdi Saeidifar, Iranian National Observatory (Iran, Islamic Republic of) [10700-66]

Coffee Break . . . . . Fri 10:30 am to 11:00 am

SESSION 19

LOCATION: CC LEVEL 1, BALLROOM A . . . . . FRI 11:00 AM TO 12:20 PM

Telescope Structures II

Session Chairs: **Frank W. Kan,** Simpson Gumpertz & Heger Inc. (USA); **Jason Spyromilio,** European Southern Observatory (Germany)

11:00 am: **Developing the ngDVA 15m composite reflector concept**, Gordon E. Lacy, NRC - Herzberg Astronomy & Astrophysics (Canada), et al. . . . . [10700-67]

11:20 am: **ELT design status: the most powerful ground telescope**, Gianpietro Marchiori, EIE Group s.r.l. (Italy), et al. . . . . [10700-68]

11:40 am: **Design and characterization of a balloon-borne diffraction-limited submillimeter telescope platform for BLAST-TNG**, Nathan P. Lourie, Univ. of Pennsylvania (USA), et al. . . . . [10700-69]

12:00 pm: **Medium size telescopes for the Cherenkov Telescope array**, Markus Garczarczyk, Deutsches Elektronen-Synchrotron (Germany). . . . . [10700-70]

CONFERENCE 10701

Monday–Friday 11–15 June 2018 • Proceedings of SPIE Vol. 10701

Optical and Infrared Interferometry and Imaging VI

Conference Chairs: **Michelle J. Creech-Eakman,** New Mexico Institute of Mining and Technology (USA); **Peter G. Tuthill,** The Univ. of Sydney (Australia); **Antoine Mérand,** European Southern Observatory (Chile)

Program Committee: **Ellyn K. Baines,** U.S. Naval Research Lab. (USA); **Fabien Baron,** Georgia State Univ. (USA); **Jean-Philippe Berger,** European Southern Observatory (Chile); **Elliott P. Horch,** Southern Connecticut State Univ. (USA); **Takayuki Kotani,** National Astronomical Observatory of Japan (Japan); **Lucas Labadie,** Univ. zu Köln (Germany); **Fabien Malbet,** Institut de Planétologie et d'Astrophysique de Grenoble (France); **Keiichi Ohnaka,** Univ. Católica del Norte (Chile); **Claudia Paladini,** Univ. Libre de Bruxelles (Belgium); **Stephanie Sallum,** Univ. of California, Santa Cruz (USA); **Isabelle Tallon-Bosc,** Ctr. de Recherche Astronomique de Lyon (France)

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . 10:30 AM TO 10:40 AM

Welcome and Announcements

Session Chairs: **Michelle J. Creech-Eakman,** New Mexico Institute of Mining and Technology (USA); **Peter G. Tuthill,** The Univ. of Sydney (Australia); **Antoine Mérand,** European Southern Observatory (Chile)

SESSION 1

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . MON 10:40 AM TO 12:10 PM

Current and Planned Facilities I

Session Chair: **Antoine Mérand,** European Southern Observatory (Chile)

10:40 am: **Recent technical and scientific highlights from the CHARA array** *(Invited Paper)*, Douglas R. Gies, Theo A. ten Brummelaar, CHARA, Georgia State Univ. (USA), et al. . . . . [10701-1]

11:10 am: **VLTI status update: two years into the 2nd generation** *(Invited Paper)*, Julien Woillez, Sébastien Egner, Frédéric Gonté, European Southern Observatory (Germany), et al. . . . . [10701-2]

11:40 am: **Refining the LBT interferometer** *(Invited Paper)*, Philip M. Hinz, The Univ. of Arizona (USA) . . . . . [10701-3]

Lunch Break . . . . . Mon 12:10 pm to 1:40 pm

SESSION 2

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . MON 1:40 PM TO 3:20 PM

Current and Planned Facilities II

Session Chair: **Peter G. Tuthill,** The Univ. of Sydney (Australia)

1:40 pm: **Many interesting things are afoot at the Navy precision optical interferometer** *(Invited Paper)*, Gerard T. van Belle, Lowell Observatory (USA), et al.. . . . . [10701-4]

2:10 pm: **The Magdalena Ridge Observatory interferometer: first light and deployment of the first telescope on the array** *(Invited Paper)*, Michelle Creech-Eakman, New Mexico Institute of Mining and Technology (USA), et al. . . . [10701-5]

2:40 pm: **Fringe tracking with the GRAVITY instrument**, Sylvestre Lacour, Roderick Dembet, Observatoire de Paris à Meudon (France), et al. . . . . [10701-6]

3:00 pm: **Ten micro-arcsecond astrometry with GRAVITY: first science results**, Feng Gao, Oliver Pfuhl, Frank Eisenhauer, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10701-7]

Coffee Break . . . . . Mon 3:20 pm to 4:00 pm

SESSION 3

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . MON 4:00 PM TO 5:00 PM

Current and Planned Facilities III

Session Chair: **Michelle J. Creech-Eakman,** New Mexico Institute of Mining and Technology (USA)

4:00 pm: **Commissioning MATISSE I: the performances of MATISSE on the VLTI in low spectral resolution**, Romain Petrov, Pierre Cruzalèbes, Stéphane Lagarde, Sylvie Robbe-Dubois, Bruno Lopez, Philippe Berio, Florentin Millour, Observatoire de la Côte d'Azur (France) . . . . . [10701-8]

4:20 pm: **FIRST, the pupil-remapping fiber interferometer at Subaru Telescope: towards photonic beam-combination with phase control and on-sky commissioning results**, Nick Cvetojevic, Elsa Huby, Observatoire de Paris (France), et al. . . . . [10701-9]

4:40 pm: **An infrared beam combiner for the NPOI**, J. Thomas Armstrong, Henrique R. Schmitt, Sergio R. Restaino, Ellyn K. Baines, U.S. Naval Research Lab. (USA), et al. . . . . [10701-10]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 5:30 PM TO 7:00 PM

Posters: Monday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Monday evening from 5:30 to 7:00 PM (followed by the Welcome Reception). Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

CRITICAL SUBSYSTEMS

The first generation near-infrared science beam combiner at the MROI, Daniel Mortimer, David Buscher, Univ. of Cambridge (United Kingdom) . . . . . [10701-60]

The MROI fringe tracking system: camera hardware modifications to integrate the SAPHIRA detector, Edgar R. Ligon III, Chris D. Salcido, Fernando G. Santoro, Magdalena Ridge Observatory, New Mexico Institute of Mining and Technology (USA), et al. . . . . [10701-61]

The GRAVITY metrology system, Stefan Gillessen, Max-Planck-Institut für extraterrestrische Physik (Germany) . . . . . [10701-62]

Fringe tracking systems : high performance piezoelectric OPD modulation, Jean-Pierre Folcher, Univ. de Nice Sophia Antipolis (France) . . . . . [10701-63]

Beam combiner multiplexing at MROI, David F. Buscher, Donald M. A. Wilson, Univ. of Cambridge (United Kingdom) . . . . . [10701-64]

CURRENT AND PLANNED FACILITIES AND INSTRUMENTS

NESSI and 'Alopeke: two new dual-channel speckle imaging instruments, Nicholas J. Scott, Steve B. Howell, NASA Ames Research Ctr. (USA), et al.. . . . . [10701-65]

MATISSE: performance in laboratory, results of AIV in Paranal, and first results on sky, Stéphane Lagarde, Sylvie Robbe-Dubois, Fatmé Allouche, Philippe Berio, Bruno Lopez, Romain Petrov, Florentin Millour, Alexis Matter, Pierre Cruzalèbes, Observatoire de la Côte d'Azur (France), et al. . . . . [10701-66]

A new method of atmospheric characterization over long baseline arrays, Jonathan Dooley, Magdalena Ridge Observatory, New Mexico Institute of Mining and Technology (USA). . . . . [10701-67]

Towards controlled Fizeau observations with the Large Binocular Telescope, Eckhart Spalding, Phil Hinz, Steve Ertel, Jordan Stone, The Univ. of Arizona (USA) . . . . . [10701-68]

Improving GRAVITY towards observations of fainter targets, Felix Widmann, Frank Eisenhauer, Stefan Gillessen, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10701-69]

Optomechanical infrastructure design for the 1-m telescopes at the Navy precision optical interferometer, Allison M. Lindgren, Lowell Observatory (USA), et al.. . . . . [10701-70]

Automated alignment system of the Magdalena Ridge Observatory interferometer, James Luis, Univ. of Cambridge (United Kingdom), et al.[10701-71]

NAOMI: the adaptive optics for the auxiliary telescopes of VLTI, Frédéric Gonté, Sébastien Egner, Julien Woillez, European Southern Observatory (Germany) . . . . . [10701-72]

Magdalena Ridge Observatory interferometer: UT#1 site installation, alignment and test, Christian Bastin, Olivier Pirnay, Vincent Moreau, Carlo Flebus, AMOS Ltd. (Belgium), et al. . . . . [10701-73]

Towards integration of the Unit telescope for the Magdalena Ridge Observatory interferometer, Andres Olivares, Fernando Santoro, Christopher Salcido, Robert Ligon, Chuck Dahl, Perry Johnston, Robert Blasi, Allen Farris, Michelle Creech-Eakman, Ifan Payne, New Mexico Institute of Mining and Technology (USA), et al. . . . . [10701-74]

FUTURE OF INTERFEROMETRY

The advantage of telescopes with a non-circular pupil, Guy Nir, Barak Zackay, Eran O. Ofek, Weizmann Institute of Science (Israel) . . . . . [10701-76]

High performance control of an hierarchical fringe tracker, Jean-Pierre Folcher, Univ. de Nice Sophia Antipolis (France) . . . . . [10701-77]

OBSERVING TECHNIQUES

Non-redundant aperture masking laboratory experiment of binary star, Yanqiang Wang, Nanjing Institute of Astronomical Optics & Technology (China) . . . . . [10701-78]

Correction of differential chromatic dispersion in GRAVITY, Xavier Haubois, European Southern Observatory (Chile), et al. . . . . [10701-79]

Simultaneous ground- and space-based observations in the JWST era, Albert R. Conrad, Christian Veillet, Large Binocular Telescope Observatory (USA) . . . . . [10701-80]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 4

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . TUE 10:30 AM TO 12:00 PM

Techniques I

Session Chair: **Stephanie Sallum,** Univ. of California, Santa Cruz (USA)

10:30 am: **Masking interferometry: 150 years young** *(Invited Paper)*, Peter G. Tuthill, The Univ. of Sydney (Australia) . . . . . [10701-11]

11:00 am: **Multiplexed holographic aperture masking with liquid-crystal geometric phase masks**, David S. Doelman, Leiden Observatory, Leiden Univ. (Netherlands), et al. . . . . [10701-12]

11:20 am: **Hi-5: a potential high-contrast thermal near-infrared imager for the VLTI**, Denis Defrère, Olivier Absil, Univ. de Liège (Belgium), et al. . . . . [10701-13]

11:40 am: **Nulling interferometry with photonic technologies for high contrast imaging of substellar companions**, Tiphaine Lagadec, Barnaby Norris, The Univ. of Sydney (Australia), et al. . . . . [10701-14]

Lunch Break . . . . . Tue 12:00 pm to 1:30 pm

SESSION 5

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . TUE 1:30 PM TO 3:00 PM

Techniques II

Session Chair: **Ellyn K. Baines,** U.S. Naval Research Lab. (USA)

1:30 pm: **The MATISSE instrument at the VLTI** *(Invited Paper)*, Bruno Lopez, Stéphane Lagarde, Romain Petrov, Sylvie Robbe-Dubois, Alexis Matter, Florentin Millour, Anthony Meilland, Pierre Cruzalèbes, Fatmé Allouche, Pierre Antonelli, Observatoire de la Côte d'Azur (France), et al. . . . . [10701-54]

2:00 pm: **Implementation of an intensity interferometry system on the StarBase observatory,** Nolan Matthews, Shaun Snow, Stephan LeBohec, David B. Kieda, The Univ. of Utah (USA) . . . . . [10701-16]

2:20 pm: **Stellar photon correlation detection with the Southern Connecticut stellar interferometer,** Samuel A. Weiss, Justin D. Rupert, Elliott P. Horch, Southern Connecticut State Univ. (USA). . . . . [10701-17]

2:40 pm: **Prospects for wireless optical intensity interferometry with the Southern Connecticut stellar interferometer**, Elliott P. Horch, Samuel A. Weiss, Justin D. Rupert, Ryan LaRue, Southern Connecticut State Univ. (USA), et al.. . . . . [10701-18]

Coffee Break . . . . . Tue 3:00 pm to 3:40 pm

SESSION 6

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . TUE 3:40 PM TO 4:50 PM

Techniques III

Session Chair: **Keiichi Ohnaka,** Univ. Católica del Norte (Chile)

3:40 pm: **The current state of speckle imaging** *(Invited Paper)*, Nicholas J. Scott, Steve B. Howell, NASA Ames Research Ctr. (USA), et al. . . . . [10701-19]

4:10 pm: **Wide-field speckle techniques for small, urban telescopes**, Nicole M. Granucci, Elliott P. Horch, Southern Connecticut State Univ. (USA) . . . . [10701-20]

4:30 pm: **Image-plane fringe tracker for adaptive-optics assisted long baseline interferometry**, Michael J. Ireland, The Australian National Univ. (Australia), et al.. . . . . [10701-21]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Tuesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Tuesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

DATA PROCESSING, ANALYSIS, ACCESS, AND DISCOVERY

Image enhancement for the observation of the solar corona, Mingyu Zhao, Yu Liu, Tengfei Song, Xuefei Zhang, Yunnan Observatories, Chinese Academy of Sciences (China) . . . . . [10701-81]

Two-color speckle imaging of M-dwarfs with the Discovery Channel Telescope, Frederick Hahne, Elliott P. Horch, Southern Connecticut State Univ. (USA), et al. . . . . [10701-82]

SHARK-NIR coronagraphic simulations: performance depending on the Strehl ratio, Elena Carolo, INAF - Osservatorio Astronomico di Padova (Italy), et al.. . . . . [10701-83]

Can the European ELT detect super-Earths? Spectral deconvolution on a GPU: parallelising the search for exoplanets in high contrast data, Robert M. Barnsley, Niranjan Thatte, Univ. of Oxford (United Kingdom). . . . . [10701-84]

The fundamentals: angular diameter measurements of zero-crossing stars from the NPOI, Ellyn K. Baines, J. Thomas Armstrong, Henrique R. Schmitt, U.S. Naval Research Lab. (USA), et al. . . . . [10701-85]

Speckle imaging of KOI binary stars with the WIYN Telescope, Nicole M. Hess, Patrick R. Thayer, Elliott P. Horch, Southern Connecticut State Univ. (USA), et al. . . . . [10701-86]

High fidelity imaging of geosynchronous satellites with MROI, John Young, Christopher Haniff, David Buscher, Tanish Satoor, Matthew Le Maitre, Univ. of Cambridge (United Kingdom), et al. . . . . [10701-87]

Common spatial pattern filtering for imaging of circumstellar discs, Jacob Shapiro, Dmitry Savransky, Cornell Univ. (USA), et al. . . . . [10701-88]

GRAVITY deep imaging reconstruction, Feng Gao, Frank Eisenhauer, Oliver Pfuhl, Stefan Gillessen, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10701-89]

Detecting exoplanets and characterizing their orbital properties with fringe nulling, Henrique R. Schmitt, Ellyn K. Baines, J. Thomas Armstrong, Sergio R. Restaino, U.S. Naval Research Lab. (USA) . . . . . [10701-90]

Optimal spectral extraction and detector characteristics for GRAVITY, Matthew Horrobin, Christian Straubmeier, Univ. zu Köln (Germany), et al. . . . . [10701-91]

TECHNOLOGIES

Imaging analysis tool for measuring and analyzing cameras and instruments, Seonghwan Choi, Jihun Kim, Jongyeob Park, Ji-Hye Baek, Heesu Yang, Young Sam Yu, Korea Astronomy and Space Science Institute (Korea, Republic of), et al.. . . . . [10701-93]

Fiber-based infrared heterodyne technology for the PFI: development of a prototype test system with three small telescopes, Felipe E. Besser, Nicolas Ramos, Alfredo Rates, Miguel Piña, Clemente Pollarolo, Pablo Martín, Taky Parvex, Ernest A. Michael, Univ. de Chile (Chile) . . . . . [10701-94]

Heterodyne versus direct detection: it's not over, Ernest A. Michael, Univ. de Chile (Chile) . . . . . [10701-95]

Image restoration of Y-type Fizeau optical synthetic aperture telescope, Congcong Zhang, Shanghai Astronomical Observatory (China) . . . . . [10701-96]

Photonics-based mid-infrared interferometry II: design, fabrication and monochromatic characterization of laser-written multi-telescope combiners, Stefano Minardi, Romina Diener, Friedrich-Schiller-Univ. Jena (Germany), et al.. . . . . [10701-97]

A large mosaic echelle grating for ESPRESSO spectrograph, Jean-Louis Lizon, Johannes Klaas Dekker, Antonio Ramon Manescau Hernandez, European Southern Observatory (Germany), et al. . . . . [10701-98]

Piezoelectric positioner real time control: from design to FPGA implementation, Jean-Pierre Folcher, Univ. de Nice Sophia Antipolis (France) . . . . . [10701-99]

Very accurate cryogenic mechanisms for CRIRES+, Jean-Louis Lizon, Barbara Klein, Ignacio Molina-Conde, Claudio Cumani, Anna Brucalassi, Reinhold Dorn, European Southern Observatory (Germany), et al. . . . . [10701-100]

Imaging with new classic and VISION at the NPOI, Anders M. Jorgensen, New Mexico Institute of Mining and Technology (USA), et al. . . . . [10701-101]

Time tagging individual photons with low-cost FPGA based time to digital converted, Genady Pilyavsky, Philip Mauskopf, Adrian Sinclair, Eric Weeks, Arizona State Univ. (USA) . . . . . [10701-102]

First results on an electro-optic visible multi-telescope beam combiner for next generation FIRST/SUBARU instruments, Guillermo Martin, Institut de Planétologie et d'Astrophysique de Grenoble (France) et al. . . . . [10701-104]

Speckle imaging through a coherent fiber bundle, James W. Davidson, University of Virginia (USA), et al. . . . . [10701-105]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 7

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . WED 10:30 AM TO 12:30 PM

Future of Interferometry I

Session Chair: **Fabien Malbet,** Institut de Planétologie et d'Astrophysique de Grenoble (France)

10:30 am: **High-angular resolution imaging of massive stars** *(Invited Paper)*, Hugues Sana, KU Leuven (Belgium) . . . . . [10701-22]

11:00 am: **the VLTI roadmap for the next decade** *(Invited Paper)*, Antoine Mérand, European Southern Observatory (Chile) . . . . . [10701-23]

11:30 am: **Prospects for exoplanet science with the Hi-5 interferometer**, Thibault Boulet, Denis Defrère, Olivier Absil, Univ. de Liège (Belgium), et al.. . . . . [10701-24]

11:50 am: **A six-apertures discrete beam combiners for J-band interferometry**, Ettore Pedretti, Leibniz-Institut für Astrophysik Potsdam (Germany), et al.[10701-25]

12:10 pm: **P-REx: the AO fed piston reconstruction experiment**, Jörg-Uwe Pott, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10701-26]

Lunch Break . . . . . Wed 12:30 pm to 2:00 pm

SESSION 8

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . WED 2:00 PM TO 3:30 PM

Future of Interferometry II

Session Chair: **Jean-Philippe Berger,** European Southern Observatory (Chile)

2:00 pm: **Planet formation imager: project update** *(Invited Paper)*, John D. Monnier, Univ. of Michigan (USA), et al. . . . . [10701-27]

2:30 pm: **A three-telescope active integrated optics spectro-interferometric combiner in the L-band for application to high precision interferometry**, Guillermo Martin, Samuel Heidmann, Institut de Planétologie et d'Astrophysique de Grenoble (France), et al. . . . . [10701-28]

2:50 pm: **The 4 apertures prototype of an hierarchical fringe tracker**, Abdelkarim Boskri, Univ. Cadi Ayyad (Morocco), et al. . . . . [10701-29]

3:10 pm: **Photonics-based mid-infrared interferometry III: the challenges of polychromatic operation and comparative performances**, Jan Tepper, Univ. zu Köln (Germany), et al. . . . . [10701-30]

Coffee Break . . . . . Wed 3:30 pm to 4:00 pm

SESSION 9

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . WED 4:00 PM TO 5:30 PM

Data Processing I

Session Chair: **Claudia Paladini,** Univ. Libre de Bruxelles (Chile)

4:00 pm: **Synergy between radio and optical interferometry: image reconstruction, calibration and data analysis** *(Invited Paper)*, Urvashi Rau, National Radio Astronomy Observatory (USA) . . . . . [10701-31]

4:30 pm: **Comparing non-redundant masking and kernel phase for exoplanet detection and characterization,** Stephanie Sallum, Andy Skemer, Univ. of California, Santa Cruz (USA) . . . . . [10701-32]

4:50 pm: **Photonic mid-infrared nulling for exoplanet detection on a planar chalcogenide platform**, Harry-Dean Kenchington Goldsmith, Michael Ireland, Pan Ma, The Australian National Univ. (Australia), et al.. . . . . [10701-33]

5:10 pm: **Data reduction of the VLTI/GRAVITY interferometric instrument**, Vincent Lapeyrère, Pierre Kervella, Observatoire de Paris (France) and Univ. de recherche Paris Sciences et Lettres (France) and UPMC Sorbonne Univ. (France), et al.. . . . . [10701-34]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 10

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . THU 10:30 AM TO 12:20 PM

Space Interferometry

Session Chair: **Elliott P. Horch,** Southern Connecticut State Univ. (USA)

10:30 am: **A dispersive backend design for the 'double-Fourier' interferometer BETTII** *(Invited Paper)*, Arnab Dhabal, Univ. of Maryland, College Park (USA) and NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10701-35]

11:00 am: **Characterizing the atmosphere of Proxima b with a space-based mid-infrared nulling interferometer**, Denis Defrère, Univ. de Liège (Belgium), et al.. . . . . [10701-36]

11:20 am: **Exoplanet science with a space-based mid-infrared interferometer**, Sascha P. Quanz, ETH Zurich (Switzerland), et al. . . . . [10701-37]

11:40 am: **The TOLIMAN space telescope**, Peter G. Tuthill, The Univ. of Sydney (Australia), et al.. . . . . [10701-38]

12:00 pm: **The wide-field spatio-spectral interferometer: system overview, data synthesis and analysis**, Roser Juanola-Parramon, Matthew Bolcar, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10701-39]

Lunch Break . . . . . Thu 12:20 pm to 1:40 pm

SESSION 11

Data Processing II

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . .1:40 PM TO 3:40 PM

Session Chair: **Fabien Baron,** Georgia State Univ. (USA)

1:40 pm: **Protoplanetary environments at the astronomical unit scale: the contribution of long baseline optical interferometry** *(Invited Paper),* Jean-Philippe Berger, Institut de Planétologie et d'Astrophysique de Grenoble (France), et al . . . . . [10701-40]

2:10 pm: **A two-band approach to nλ phase error corrections with LBTI's PHASECam,** Erin Maier, Philip Hinz, The Univ. of Arizona (USA), et al . . [10701-41]

2:30 pm: **Correction of differential chromatic dispersion in GRAVITY**, Xavier Haubois, European Southern Observatory (Chile); et al . . . . . [10701-79]

2:50 pm: **Coherent integration**, David Mozurkewich, Seabrook Engineering (USA); et al . . . . . [10701-43]

3:10 pm: **Panel discussion: next steps for OIFITS** *(Invited Paper),* John Young, Univ. of Cambridge (United Kingdom); et al . . . . . [10701-44]

Coffee Break . . . . . Thu 3:40 pm to 4:00 pm

SESSION 12

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . .THU 4:00 PM TO 5:30 PM

Technologies I

Session Chair: **Takayuki Kotani,** National Astronomical Observatory of Japan (Japan)

4:00 pm: **Astrophotonic interferometry: coherently moulding the flow of starlight** *(Invited Paper)*, Barnaby Norris, The Univ. of Sydney (Australia) [10701-45]

4:30 pm: **Photonics-based mid-infrared interferometry I: 4-year results of the ALSI project and future prospects**, Lucas Labadie, I. Physikalisches Institut, Univ. zu Köln (Germany), et al. . . . . [10701-46]

4:50 pm: **Visible and near-infrared multilayer arrayed waveguide gratings: a novel approach for spectro-interferometry**, Guillermo Martin, Institut de Planétologie et d'Astrophysique de Grenoble (France), et al. . . . . [10701-47]

5:10 pm: **Staring at stars makes you see spots: long-term imaging of red supergiants ("THESIS")**, Ryan Norris, Fabien Baron, Georgia State Univ. (USA) . . . . . [10701-48]

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . .5:30 PM TO 5:45 PM

Imaging Beauty Contest Winners

5:40 pm: **Interferometric imaging beauty contest 2018**, Antoine Mérand, European Southern Observatory (Chile) . . . . . [10701-103]

FRIDAY 15 JUNE

SESSION 13

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . .FRI 8:30 AM TO 10:10 AM

Technologies II

Session Chair: **Lucas Labadie,** Univ. zu Köln (Germany)

8:30 am: **The success of extragalactic infrared interferometry: from what we have learned to what to expect** *(Invited Paper)*, Konrad R. W. Tristram, European Southern Observatory (Chile), et al. . . . . [10701-49]

9:00 am: **Improving angular resolution of telescopes through probabilistic single-photon amplification?** *(Invited Paper)*, Aglae Kellerer, European Southern Observatory (Germany), et al. . . . . [10701-50]

9:30 am: **Fiber-based infrared heterodyne technology for the PFI: breaking the noise temperature quantum limit with correlation,** Ernest A. Michael, Felipe E. Besser, Univ. de Chile (Chile) . . . . . [10701-51]

9:50 am: **Learnings from the use of fiber optics in GRAVITY**, Magdalena Lippa, Stefan Gillessen, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10701-52]

Coffee Break . . . . . .Fri 10:10 am to 10:40 am

SESSION 14

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . FRI 10:40 AM TO 12:10 PM

Critical Subsystems

Session Chair: **Antoine Mérand,** European Southern Observatory (Chile)

10:40 am: **GRAVITY: a new era for optical interferometry** *(Invited Paper)*, Roberto Abuter, Matteo Accardo, European Southern Observatory (Germany), et al. . . . . [10701-53]

11:10 am: **Recent intensity interferometry experiments at Nice Observatory: temporal and spatial photon bunching with two 1m optical telescopes** *(Invited Paper)*, Farrokh Vakili-Christensen, Obserbatoire de la Cote d'Azur (France) . . . . . [10701-15]

11:40 am: **SPICA, a new 6T visible beam combiner for CHARA: science, design and interfaces** *(Invited Paper)*, Denis Mourard, Philippe Berio, Orlagh Creevey, Jean-Michel Clausse, Observatoire de la Côte d'Azur (France), et al. . . . [10701-55]

Lunch Break . . . . . Fri 12:10 pm to 1:40 pm

SESSION 15

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . FRI 1:40 PM TO 2:10 PM

Michelson, Fizeau and Thesis Prizes

Session Chairs: **Michelle J. Creech-Eakman,** New Mexico Institute of Mining and Technology (USA); **Peter G. Tuthill,** The Univ. of Sydney (Australia)

SESSION 16

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . FRI 2:10 PM TO 3:30 PM

Critical Subsystems II

2:10 pm: **MYSTIC: Michigan Young STar Imager at CHARA**, John D. Monnier, Univ. of Michigan (USA), et al. . . . . [10701-56]

2:30 pm: **The MIRC-X 6-telescope imager at CHARA: key science drivers, instrument specifications and operation**, Stefan Kraus, Univ. of Exeter (United Kingdom), et al. . . . . [10701-57]

2:50 pm: **CHARA/MIRC-X: sensitivity improvements with an ultra low noise detector,** Narsireddy Anugu, Univ. of Exeter (United Kingdom), et al. . . . [10701-58]

3:10 pm: **The new classic fringe tracker at NPOI**, Anders M. Jorgensen, New Mexico Institute of Mining and Technology (USA), et al. . . . . [10701-59]

Coffee Break . . . . . Fri 3:30 pm to 4:00 pm

LOCATION: CC LEVEL 3, ROOM 4A/C . . . . . 4:00 PM TO 4:30 PM

Wrap-Up and Community Discussion

Session Chairs: **Michelle J. Creech-Eakman,** New Mexico Institute of Mining and Technology (USA); **Peter G. Tuthill,** The Univ. of Sydney (Australia); **Antoine Mérand,** European Southern Observatory (Chile)

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

CONFERENCE 10702

Sunday–Thursday 10–14 June 2018 • Proceedings of SPIE Vol. 10702

Ground-based and Airborne Instrumentation for Astronomy VII

Conference Chairs: **Christopher J. Evans,** UK Astronomy Technology Ctr. (United Kingdom); **Luc Simard,** NRC - Herzberg Astronomy & Astrophysics (Canada), Thirty Meter Telescope (USA); **Hideki Takami,** National Astronomical Observatory of Japan (Japan)

Program Committee: **Rebecca A. Bernstein,** Carnegie Obervatories (USA), GMTO Corp. (USA); **Julia J. Bryant,** The Univ. of Sydney (Australia), Austrailian Astronomical Observatory (Australia); **Armando Gil de Paz,** Univ. Complutense de Madrid (Spain); **James E. Larkin,** Univ. of California, Los Angeles (USA); **Kentaro Motohara,** The Univ. of Tokyo (Japan); **Livia Origlia,** INAF - Osservatorio Astronomico di Bologna (Italy); **Rolf Schlichmaier,** Kiepenheuer-Institut für Sonnenphysik (Germany); **Erin C. Smith,** NASA Ames Research Ctr. (USA); **Joël R. D. Vernet,** European Southern Observatory (Germany)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 1, BALLROOM C . . . . . SUN 9:00 AM TO 12:10 PM

Observatory Overviews

Session Chair: **Christopher J. Evans,** UK Astronomy Technology Ctr. (United Kingdom)

9:00 am: **Breaking the limits: early science with the GRAVITY interferometer** *(Invited Paper)*, Frank Eisenhauer, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10702-1]

9:30 am: **The Keck cosmic web imager: first light** *(Invited Paper)*, D. Christopher Martin, Caltech (USA), et al. . . . . [10702-2]

10:00 am: **The ESO Paranal instrumentation programme,** Luca Pasquini, European Southern Observatory (Germany) . . . . . [10702-3]

Coffee Break . . . . . .Sun 10:20 am to 10:50 am

10:50 am: **Current status of the facility instruments at the Large Binocular Telescope Observatory**, Barry Rothberg, Large Binocular Telescope Observatory (USA) and George Mason Univ. (USA), et al. . . . . [10702-4]

11:10 am: **Instrumentation at Gemini Observatory**, Scot J. Kleinman, Gemini Observatory (USA). . . . . [10702-5]

11:30 am: **Innovations and advances in instrumentation at the W. M. Keck Observatory**, Marc Kassis, Hilton Lewis, Peter Wizinowich, Percy Gomez, Luca Rizzi, James E. Lyke, W. M. Keck Observatory (USA), et al. . . . . [10702-6]

11:50 am: **Australian technology innovation at the Advanced Instrumentation and Technology Centre, Mount Stromlo Observatory**, Anna M. Moore, The Australian National Univ. (Australia) . . . . . [10702-7]

Poster Interlude . . . . . 12:10 pm to 12:20 pm

Lunch Break . . . . . Sun 12:20 pm to 1:40 pm

SESSION 2

LOCATION: CC LEVEL 1, BALLROOM C . . . . . SUN 1:40 PM TO 3:20 PM

New and Upgraded Facility Instruments for Large Observatories I

Session Chair: **Hideki Takami,** National Astronomical Observatory of Japan (Japan)

1:40 pm: **ERIS: revitalising an adaptive optics instrument for the VLT**, Richard Davies, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. [10702-8]

2:00 pm: **An overview of the NIRSPEC upgrade for the Keck II Telescope**, Emily C. Martin, Michael P. Fitzgerald, Ian S. McLean, Univ. of California, Los Angeles (USA), et al. . . . . [10702-9]

2:20 pm: **Commissioning of the adaptive optics supported LUCI instruments at the Large Binocular Telescope: final results**, Jochen Heidt, Landessternwarte Heidelberg (Germany), et al. . . . . [10702-10]

2:40 pm: **ALES: overview and upgrades**, Andrew J. Skemer, Univ. of California, Santa Cruz (USA), et al.. . . . . [10702-11]

3:00 pm: **NEAR: new earths in the alpha Cen region (bringing VISIR as a "visiting instrument" to ESO-VLT-UT4)**, Hans-Ulrich Käufl, Markus Kasper, Robin Arsenault, Gerd Jakob, European Southern Observatory (Germany), et al.[10702-12]

Poster Interlude . . . . . 3:20 pm to 3:30 pm

Coffee Break . . . . . Sun 3:30 pm to 4:00 pm

SESSION 3

LOCATION: CC LEVEL 1, BALLROOM C . . . . . SUN 4:00 PM TO 5:20 PM

New and Upgraded Facility Instruments for Large Observatories II

Session Chair: **Livia Origlia,** INAF - Osservatorio Astronomico di Bologna (Italy)

4:00 pm: **CRIRES+ on its way to VLT**, Roman Follert, Thüringer Landessternwarte Tautenburg (Germany), et al.. . . . . [10702-13]

4:20 pm: **SOXS: a wide band spectrograph to follow up the transients,** Pietro Schipani, INAF - Osservatorio Astronomico di Capodimonte (Italy), et al. [10702-14]

4:40 pm: **The OCTOCAM instrument concept at Gemini and beyond,** Antonio de Ugarte Postigo, Instituto de Astrofísica de Andalucía - CSIC (Spain), Dark Cosmology Ctr., Niels Bohr Institute (Denmark), et al. . . . . [10702-15]

5:00 pm: **KRAKENS: a general purpose MKID integral field spectrograph for the Keck I Telescope**, Benjamin A. Mazin, Univ. of California, Santa Barbara (USA) . . . . . [10702-16]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters Sunday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Sunday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

NEW AND UPGRADED FACILITY INSTRUMENTS FOR LARGE OBSERVATORIES

First results using a new technology near-infrared narrow-band filter in the GTC 10.4m Telescope to detect galaxies at the dawn of the universe, Ulf Brauneck, SCHOTT Suisse SA (Switzerland) . . . . . [10702-75]

Optical design of imaging and spectrograph for 4m Telescope in China, Hangxin Ji, Yongtian Zhu, Zhongwen Hu, Yi Chen, Lei Wang, Mingming Xu, Songxin Dai, Huatao Zhang, Nanjing Institute of Astronomical Optics & Technology (China) . . . . . [10702-76]

A fiber injection unit for Keck: final design and first results, Jacques-Robert Delorme, Dimitri Mawet, Nemanja Jovanovic, Caltech (USA), et al. . . . . [10702-77]

Development status of the simultaneous two-color near-infrared multi-object spectrograph SWIMS for the TAO 6.5m Telescope, Masahiro Konishi, Kentaro Motohara, Hidenori Takahashi, Natsuko Kato, Yasunori Terao, Hirofumi Ohashi, Yukihiro Kono, Kosuke Kushibiki, Ken Tateuchi, Yutaro Kitagawa, Soya Todo, Tsutomu Aoki, Mamoru Doi, Bunyo Hatsukade, Takafumi Kamizuka, Kotaro Kohno, Takeo Minezaki, Takashi Miyata, Tomoki Morokuma, Shigeyuki Sako, Takao Soyano, Toshihiko Tanabe, Masuo Tanaka, Ken'ichi Tarusawa, The Univ. of Tokyo (Japan), et al.. . . . . [10702-78]

Optical design of the SOXS spectrograph for ESO NTT, Ricardo Zánmar Sánchez, Matteo Munari, INAF - Osservatorio Astrofisico di Catania (Italy), et al.. . . . . [10702-79]

The NIR spectrograph for the new SoXS instrument at the ESO-NTT, Fabrizio Vitali, INAF - Osservatorio Astronomico di Roma (Italy), et al. . . . . [10702-80]

The WIYN one degree imager in 2018: operating an extended 30-detector focal plane in an upgraded instrument, Daniel R. Harbeck, Las Cumbres Observatory Global Telescope Network (USA) and WIYN Observatory (USA), et al. . . [10702-81]

Characterising the stability of the SPRAT autonomous imaging spectrograph, Andrzej S. Piascik, Liverpool John Moores Univ. (United Kingdom). . . . . [10702-82]

Photometric error in mid-infrared observations at the TAO site caused by short-term variation of atmospheric water vapor, Masahito S. Uchiyama, Takashi Miyata, Ryou Ohsawa, Takafumi Kamizuka, Shigeyuki Sako, Tomohiro Mori, Jumpei Yamaguchi, Yutaka Yoshida, The Univ. of Tokyo (Japan) . [10702-83]

Acceptance testing for LSST camera raft tower modules, Margaux Lopez, Stuart Marshall, SLAC National Accelerator Lab. (USA). . . . . [10702-84]

Blue-MUSE: a blue-optimised large field integral-field spectrograph, Johan Richard, Roland Bacon, Patrick Caillier, Ctr. de Recherche Astrophysique de Lyon (France) . . . . . [10702-85]

Revisiting the science requirements for the VLT-CUBES concept, Christopher J. Evans, UK Astronomy Technology Ctr. (United Kingdom), et al. . . . . [10702-86]

New wavefront-sensing guiders for SOAR, Andrei Tokovinin, Nicole David, Jose Piraces, Rolando Cantarutti, Cerro Tololo Inter-American Observatory (Chile). . . . . [10702-87]

Conversion of a classical coudé room at the CFHT into a clean room, Tom Benedict, Gregory A. Barrick, Canada-France-Hawaii Telescope (USA) . [10702-89]

Laboratory performance evaluation of the mid-infrared camera and spectrograph MIMIZUKU for the TAO 6.5m Telescope, Takafumi Kamizuka, Masahito S. Uchiyama, Jumpei Yamaguchi, Tomohiro Mori, Ryou Ohsawa, Yutaka Yoshida, Shigeyuki Sako, Takashi Miyata, The Univ. of Tokyo (Japan), et al.. . . . . [10702-90]

Commissioning tests of an integral field unit (IFU) at GREGOR solar telescope, Carlos Dominguez-Tagle, Manuel Collados, Miguel A. Esteves, Nauzet Vega Reyes, Jacinto J. Vaz-Cedillo, Roberto L. Lopez, Esperanza Paez, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10702-91]

The VIS detector system of SOXS, Rosario Cosentino, Telescopio Nazionale Galileo (Spain), et al. . . . . [10702-92]

Design and results for the SAAO wide-field nasmyth camera, Pieter Swanevelder, David B. Carter, James O'Connor, Hannah Worters, South African Astronomical Observatory (South Africa), et al. . . . . [10702-93]

The next generation Palomar spectrograph design for 200-inch Hale Telescope, Haijiao Jiang, Mingming Xu, Songxin Dai, Huatao Zhang, Lei Wang, Yi Chen, Zhongwen Hu, Nanjing Institute of Astronomical Optics & Technology (China) . . . . . [10702-94]

The acquisition camera system for SOXS at NTT, Anna Brucalassi, European Southern Observatory (Germany), et al. . . . . [10702-95]

Performance of the reflective optics of MIMIZUKU at cryogenic temperature, Tomohiro Mori, Takashi Miyata, Takafumi Kamizuka, Ryou Ohsawa, Shigeyuki Sako, Masahito S. Uchiyama, Jumpei Yamaguchi, Yutaka Yoshida, The Univ. of Tokyo (Japan) . . . . . [10702-96]

A near infrared integral field spectrograph for the Southern African Large Telescope (SALT), Marsha J. Wolf, Douglas P. Adler, Matthew A. Bershady, Kurt P. Jaehnig, Univ. of Wisconsin-Madison (USA), et al.. . . . . [10702-97]

Variation of the sky background in near-infrared spectroscopy using X-Shooter and KMOS at the VLT, Hector Flores, Observatoire de Paris à Meudon (France) . . . . . [10702-98]

ALES: pipeline and calibration unit, Zackery Briesemeister, Andrew J. Skemer, Univ. of California, Santa Cruz (USA), et al. . . . . [10702-99]

Spectral and polarimetric facilities for ground support of the WSO-UV Space mission, Vladimir Panchuk, Special Astrophysical Observatory (Russian Federation) and ITMO Univ. (Russian Federation), et al. . . . . [10702-100]

FIES fiber injection upgrade, Julian Stürmer, Andreas Seifahrt, The Univ. of Chicago (USA), et al. . . . . [10702-101]

Hamamatsu CCD upgrade for the Gemini multi-object spectrographs GMOS-S and GMOS-N: results from the 2017 GMOS-N upgrade and project completion summary, Julia Scharwaechter, Kristin Chiboucas, Gemini Observatory (USA), et al.. . . . . [10702-102]

Detection performance of the upgraded OSIRIS imager, Pauline Arriaga, Michael P. Fitzgerald, Christopher Johnson, Jason L. Weiss, John Canfield, Theodore Aliado, Kenneth Magnone, Ji Man Sohn, Univ. of California, Los Angeles (USA), et al. . . . . [10702-103]

Adding a second spectral channel to the SOFIA FPI+ science instrument, Enrico Pfüller, Deutsches SOFIA Institut (USA), et al.. . . . . [10702-104]

Upgrade of the MMT/SPOL spectropolarimeter with a new blue-sensitive camera, Sung-Joon Park, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10702-105]

The LUCI@LBT twins: instrument flexure control, Alexander Pramskiy, Zentrum für Astronomie der Univ. Heidelberg (Germany), et al. . . . . [10702-106]

Thermal-infrared adaptive optics imaging- and spectro-polarimetry with the infrared camera and spectrograph of the Subaru Telescope, Hiroshi Terada, Thirty Meter Telescope (USA) and National Astronomical Observatory of Japan (Japan), et al.. . . . . [10702-107]

MITS: the multi-imaging transient spectrograph for SOXS, Adam Rubin, Weizmann Institute of Science (Israel), et al.. . . . . [10702-108]

Development of cryogenic mechanisms for the VLT/ERIS instrument, Adrian M. Glauser, Walter Bachmann, Stephen March, Polychronis Patapis, ETH Zurich (Switzerland), et al. . . . . [10702-109]

The mechanical design of SOXS for the NTT, Matteo Aliverti, INAF - Osservatorio Astronomico di Brera (Italy), et al.. . . . . [10702-110]

GeMS/GSAOI: towards regular astrometric distortion correction, Vincent Garrel, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10702-111]

Wide-field acousto-optical imaging spectral polarimeter: design and commissioning, Sergey P. Anikin, Alexander I. Chizhikov, National Univ. of Science and Technology "MISiS" (Russian Federation), et al. . . . . [10702-112]

A unique infrared spectropolarimetric unit for CRIRES+, Nikolai Piskunov, Eric Stempels, Alexis Lavail, Uppsala Univ. (Sweden), et al. . . . . [10702-113]

The Canarias infrared camera experiment (CIRCE): on-sky performance at the GTC 10.4-meter, Alan Garner, Stephen S. Eikenberry, Univ. of Florida (USA), et al. [10702-114]

Bringing high-spectral resolution to VLT/SPHERE with a fiber coupling to VLT/CRIRES+, Arthur Vigan, Jean-Luc Beuzit, Kjetil Dohlen, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10702-115]

The ASTRI camera for the Cherenkov Telescope array, Osvaldo Catalano, INAF - Istituto di Astrofisica e Planetologia Spaziali - IAPS (Italy) . . . . . [10702-116]

NectarCam, a Cherenkov camera for medium sized telescopes of CTA : status and results, Thomas Tavernier, CEA-IRFU (France) . . . . . [10702-117]

Preliminary acceptance Europe and early commissioning results for CRIRES+, Anna Brucalassi, Reinhold J. Dorn, European Southern Observatory (Germany), et al.. . . . . [10702-118]

Development of TCal: a mobile spectrophotometric calibration unit for astronomical imaging systems, Peter Ferguson, Darren L. DePoy, Jennifer L. Marshall, Travis Prochaska, Luke M. Schmidt, Daniel Freeman, Lawrence Gardner, Doyeon Kim, Marcus Sauseda, Isaac Gutierrez, Hugh Sharp, Michael Torregosa, Texas A&M Univ. (USA). . . . . [10702-119]

CIRCE near-infrared polarimetry design and on-sky performance, Yigit Dallilar, Stephen S. Eikenberry, Miguel Charcos, Univ. of Florida (USA), et al. . . [10702-120]

A near infrared integral field spectrograph for the Southern African Large Telescope (SALT): mechanical design, Michael P. Smith, Douglas P. Adler, Matthew A. Bershady, Kurt P. Jaehnig, Univ. of Wisconsin-Madison (USA), et al.. . . . . [10702-121]

The assembly integration and test activities for the new SOXS instrument at NTT, Federico Biondi, INAF - Osservatorio Astronomico di Padova (Italy), et al.. . . . . [10702-122]

NIHTS: the near-infrared high throughput spectrograph for the Discovery Channel Telescope, Edward W. Dunham, Thomas A Bida, Lowell Observatory (USA), et al. . . . . [10702-123]

On-sky operations with the ALES integral field spectrograph, Jordan Stone, Steward Observatory, The Univ. of Arizona (USA), et al. . . . . [10702-124]

Final design and construction of the ERIS calibration unit, Mauro Dolci, Gianluca Di Rico, Angelo Valentini, Amico Di Cianno, INAF - Osservatorio Astronomico d'Abruzzo (Italy), et al. . . . . [10702-125]

MegaCam FAST: reducing data acquisition overheads on Canada-France-Hawaii Telescope's wide-field optical imager, Kevin K. Y. Ho, Sidik Isani, Andreea Petric, Simon Prunet, Canada-France-Hawaii Telescope (USA)[10702-126]

RIMAS: near infrared cryogenic imager and spectrometer, Alexander S. Kutyrev, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10702-127]

WIRC+Pol: a low-resolution near-infrared spectropolarimeter, Samaporn Tinyanont, Caltech (USA), et al.. . . . . [10702-128]

The new NESSI: refurbishment of a NIR MOS for characterizing exoplanets using the Hale Telescope, Michelle J. Creech-Eakman, New Mexico Institute of Mining and Technology (USA), et al.. . . . . [10702-129]

Design of ALES: a broad wavelength integral field unit for LBTI/LMIRcam, Philip M. Hinz, The Univ. of Arizona (USA), et al. . . . . [10702-130]

LLAMAS: a wide-field seeing-limited IFU spectrometer for the Magellan Telescopes, Robert A. Simcoe, Gábor Furész, Michael McDonald, Massachusetts Institute of Technology (USA), et al. . . . . [10702-131]

Developing an infrared APD array camera for near-infrared wavefront sensing, Adam Butko, Suresh Sivanandam, Dunlap Institute for Astronomy & Astrophysics (Canada), et al. . . . . [10702-132]

Sky-limited photometry with InGaAs sensors: on-sky validation and wide-field imaging applications, Robert A. Simcoe, Gábor Furész, Andrew Malonis, Massachusetts Institute of Technology (USA), et al.. . . . . [10702-133]

Design implementation for the Magellan LLAMAS integral field spectrograph, Mark Egan, MIT Kavli Institute for Astrophysics and Space Research (USA), et al.. . . . . [10702-134]

Integral field unit for LLAMAS, the large lenslet array Magellan spectrograph, Gábor Furész, Mark Egan, Andrew Malonis, Robert A. Simcoe, MIT Kavli Institute for Astrophysics and Space Research (USA) . . . . . [10702-135]

Gemini instrument upgrade program, Ruben Diaz, Stephen Goodsell, Scot J. Kleinman, Paul Hirst, Gemini Observatory (USA) . . . . . [10702-136]

Model based approach for data calibrations of microlens fed hyperspectral imager (MiHI), Anantha Chanumolu, Michiel van Noort, Max-Planck-Institut für Sonnensystemforschung (Germany). . . . . [10702-137]

The common path of SOXS (Son of X-Shooter), Riccardo U. Claudi, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10702-138]

A Fabry-Pérot interferometer for FEROS, Sebastian Schäfer, Georg-August-Univ. Göttingen (Germany), et al. . . . . [10702-139]

Near-infrared adaptive optics imaging- and spectro-polarimetry with the infrared camera and spectrograph of the Subaru Telescope, Makoto Watanabe, Okayama Univ. of Science (Japan), et al. . . . . [10702-140]

Observing modes for the new OCTOCAM imager and spectrograph at Gemini South, Amanda Bayless, Jason Stange, Kristian Persson, Southwest Research Institute (USA), et al. . . . . [10702-141]

KCWI: a flexible integral field spectrograph at WM Keck Observatory, Mateusz Matuszewski, Christopher Martin, Caltech (USA), et al. . . . . [10702-142]

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . MON 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 4

LOCATION: CC LEVEL 1, BALLROOM C . . . . MON 10:30 AM TO 12:00 PM

Time-domain Astronomy

Session Chair: **Kentaro Motohara,** The Univ. of Tokyo (Japan)

10:30 am: **The Tomo-e Gozen wide field CMOS camera for the Kiso Schmidt Telescope** *(Invited Paper)*, Shigeyuki Sako, Ryou Ohsawa, Hidenori Takahashi, Yuto Kojima, Mamoru Doi, Naoto Kobayashi, Kentaro Motohara, Takashi Miyata, Tomoki Morokuma, Masahiro Konishi, Tsutomu Aoki, Takao Soyano, Ken'ichi Tarusawa, Yuki Mori, Yoshikazu Nakada, Kazuma Mitsuda, Makoto Ichiki, Noriaki Arima, Tomonori Totani, Noriyuki Matsunaga, Toshikazu Shigeyama, The Univ. of Tokyo (Japan), et al. . . . . [10702-18]

11:00 am: **The Evryscopes: observing the entire sky at high cadence**, Nicholas M. Law, Jeffrey Ratzloff, Hank Corbett, Octavi Fors, Ward Howard, Erin Conn, The Univ. of North Carolina at Chapel Hill (USA) . . . . . [10702-19]

11:20 am: **First light with HiPERCAM on the WHT and GTC**, Vik Dhillon, The Univ. of Sheffield (United Kingdom), et al. . . . . [10702-20]

11:40 am: **Initial performance of the Zwicky transient facility: a wide-fast time-domain survey**, Richard G. Dekany, Roger Smith, Reed L. Riddle, Michael Feeney, Stephen Kaye, Michael Porter, David Hale, Jeffry Zolkower, Peter Mao, Daniel J. Reiley, Patrick Murphy, Hector Rodriguez, Justin Belicki, John Henning, John Cromer, Caltech (USA) . . . . . [10702-21]

Lunch Break . . . . . Mon 12:00 pm to 1:40 pm

SESSION 5

LOCATION: CC LEVEL 1, BALLROOM C . . . . . MON 1:40 PM TO 3:20 PM

Novel Approaches

Session Chair: **Armando Gil de Paz,** Univ. Complutense de Madrid (Spain)

1:40 pm: **Window to the universe for less money: 10 years of PAIX in Antarctica,** Merieme Chadid, Observatoire de la Côte d'Azur (France), et al.. . . . . [10702-23]

2:00 pm: **Optical system design of the AST3-NIR camera**, Jessica R. Zheng, Jonathan S Lawrence, Robert Content, Vladimir Churilov, Australian Astronomical Observatory (Australia), et al. . . . . [10702-24]

2:20 pm: **PRAXIS: an OH suppression optimised near infrared spectrograph,** Simon C. Ellis, Australian Astronomical Observatory (Australia), et al.. . . [10702-25]

2:40 pm: **IGRINS at the Discovery Channel Telescope and Gemini South**, Gregory N. Mace, The Univ. of Texas at Austin (USA) and The Univ. of Texas McDonald Observatory (USA), et al. . . . . [10702-26]

3:00 pm: **Overview, design, and flight results from SuperBIT: a high-resolution, wide-field, visible-to-near-UV balloon-borne astronomical telescope**, Javier L. Romualdez, Univ. of Toronto (Canada), et al. . . . . [10702-27]

Poster Interlude . . . . . 3:20 pm to 3:30 pm

Coffee Break . . . . . Mon 3:30 pm to 4:00 pm

SESSION 6

LOCATION: CC LEVEL 1, BALLROOM C . . . . . MON 4:00 PM TO 5:20 PM

High-contrast Imaging

4:00 pm: **Diffraction-limited polarimetric imaging of protoplanetary disks and mass-loss shells with VAMPIRES,** Barnaby Norris, Peter Tuthill, The Univ. of Sydney (Australia), et al. . . . . [10702-28]

4:20 pm: **Around the world: status and prospects with the infrared vortex coronagraph**, Olivier Absil, Univ. de Liège (Belgium), et al.. . . . . [10702-29]

4:40 pm: **Installation and commissioning of the LINC-NIRVANA near-infrared MCAO imager on LBT**, Thomas M. Herbst, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10702-30]

5:00 pm: **MEC: the MKID exoplanet camera for high contrast astronomy at Subaru**, Alex Walter, Benjamin A. Mazin, Clint Bockstiegel, Neelay Fruitwala, Univ. of California, Santa Barbara (USA), et al. . . . . [10702-31]

Poster Interlude . . . . . 5:20 pm to 5:30 pm

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . .5:30 PM TO 7:30 PM

Posters: Monday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Monday evening from 5:30 to 7:00 PM (followed by the Welcome Reception). Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

HIGH-CONTRAST IMAGING

Cryogenic characterization of the grating vector APP coronagraph for the upcoming ERIS instrument at the VLT, Anna Boehle, Adrian M. Glauser, ETH Zurich (Switzerland), et al. . . . . [10702-143]

A polarization aberrations model to understand and improve the performance of VLT/SPHERE-ZIMPOL, Rob van Holstein, Frans Snik, Christoph U. Keller, Leiden Observatory (Netherlands), et al.. . . . . [10702-144]

Moving the Gemini planet imager to Gemini North: expectations and challenges, Fredrik T. Rantakyrö, Gemini Observatory (Chile), et al.. . . [10702-145]

Study of a vortex coronagraph for SPHERE, Elsa Huby, Lab. d'Etudes Spatiales et d'Instrumentation en Astrophysique (France) and Observatoire de Paris à Meudon (France), et al. . . . . [10702-146]

High-contrast imaging of tight resolved binaries with two vector vortex coronagraphs in cascade using the Palomar SDC instrument, Jonas G. Kuhn, Sebastian Daemgen, ETH Zurich (Switzerland), et al.. . . . . [10702-147]

Design, specification and manufacturing of a PIAACMC for the SPEED testbed, Patrice Martinez, Mathilde Beaulieu, Lab. J.L. Lagrange (France), et al.. . . . . [10702-148]

Upgrading the Gemini planet imager: GPI 2.0, Jeffrey K. Chilcote, Stanford Univ. (USA), et al. . . . . [10702-149]

TIME-DOMAIN AND NOVEL APPROACHES

The exoplanet climate infrared telescope (EXCITE), Gregory S. Tucker, Brown Univ. (USA), et al. . . . . [10702-199]

Panoramic optical and near-infrared SETI instrument: prototype design and testing, Maren Cosens, Jérôme Maire, Shelley A. Wright, Ctr. for Astrophysics and Space Sciences, Univ. of California, San Diego (USA), et al. . . . . [10702-200]

Panoramic optical and near-infrared SETI instrument: overall specifications and science program, Shelley A. Wright, Univ. of California, San Diego (USA) and Ctr. for Astrophysics & Space Sciences (USA), et al. . . . . [10702-201]

Development of the single mode fibre integral field unit for the RHEA spectrograph, Adam D. Rains, Michael Ireland, The Australian National Univ. (Australia), et al. . . . . [10702-202]

Evryscopes North and South: hardware to science, Jeffrey Ratzloff, The Univ. of North Carolina at Chapel Hill (USA). . . . . [10702-203]

Panoramic optical and near-infrared SETI instrument: optical and structural design concepts, Jérôme Maire, Shelley A. Wright, Maren Cosens, Ctr. for Astrophysics and Space Sciences, Univ. of California, San Diego (USA), et al. . . . . [10702-204]

Optical design for an 8 channel imager/polarimeter, Brian W. Taylor, TI-Research (USA) and The Univ. of Arizona (USA). . . . . [10702-205]

Polarization analysis for a 8 channel imager/polarimeter optical design, Brian W. Taylor, TI-Research (USA) . . . . . [10702-206]

GravityCam: a novel high-speed and wide-field instrument for a large ground based telescope, conducting high-cadence imaging surveys, Jesper Skottfelt, The Open Univ. (United Kingdom), et al. . . . . [10702-207]

BATMAN @ TNG: instrument integration and performance, Frédéric Zamkotsian, Patrick Lanzoni, Nicolas Tchoubaklian, Harald Ramarijaona, Lab. d'Astrophysique de Marseille (France), et al. . . . . [10702-208]

SIFAP2: a new versatile configuration at the TNG of the MPPC based photometer, Adriano Ghedina, Fundación Galileo Galilei - INAF (Spain), et al. . . . . [10702-209]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . TUE 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . .Tue 10:00 am to 10:30 am

SESSION 8

LOCATION: CC LEVEL 1, BALLROOM C . . . . . TUE 10:30 AM TO 12:30 PM

High-Resolution Spectrographs I

Session Chair: **Livia Origlia,** INAF - Osservatorio Astronomico di Bologna (Italy)

10:30 am: **CARMENES: high-resolution spectra and precise radial velocities in the red and infrared** *(Invited Paper)*, Andreas Quirrenbach, CARMENES Consortium, Landessternwarte Heidelberg (Germany) . . . . . [10702-32]

11:00 am: **ESPRESSO@VLT: an instrument for advanced exoplanet research** *(Invited Paper)*, Francesco Pepe, Observatoire de Genève (Switzerland), et al. . . . . [10702-33]

11:30 am: **Veloce Rosso: Australia's new precision radial velocity spectrograph**, James Gilbert, Michael Ireland, Gaston Gausachs, Gabe Bloxham, Annino Vaccarella, Michael Ellis, Ian Price, Nicholas Herrald, Ellie O'Brien, Matthew Robertson, Colin Vest, Robert Boz, Tom Carkic, The Australian National Univ. (Australia), et al. . . . . [10702-34]

11:50 am: **GIARPS: commissioning and first scientific results**, Riccardo U. Claudi, Serena Benatti, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10702-35]

12:10 pm: **The near-infrared planet searcher (NIRPS)**, Rene Doyon, Univ. de Montréal, Observatoire du Mont-Mégantic (Canada) and Institut de recherche sur les exoplanètes (Canada), et al. . . . . [10702-36]

Lunch/Exhibition Break . . . . . .Tue 12:30 pm to 1:40 pm

SESSION 7

LOCATION: CC LEVEL 1, BALLROOM C . . . . . .TUE 1:40 PM TO 3:30 PM

High-Resolution Spectrographs II

1:40 pm: **The infrared Doppler (IRD) instrument for the Subaru Telescope: instrument description and commissioning results** *(Invited Paper)*, Takayuki Kotani, National Institutes of Natural Sciences (Japan) and National Astronomical Observatory of Japan (Japan), et al. . . . . [10702-37]

2:10 pm: **Want a PEPSI? Performance status of the recently commissioned high-resolution spectrograph and polarimeter for the 2x8.4m Large Binocular Telescope**, Klaus G. Strassmeier, Ilya Ilyin, Michael Weber, Arto Järvinen, Manfred Woche, Silva Järvinen, Daniel Sablowski, Matthias Mallonn, Engin Keles, Thorsten Carroll, Leibniz-Institut für Astrophysik Potsdam (Germany), et al. . . . . [10702-38]

2:30 pm: **The NEID precision radial velocity spectrometer: project overview and status update**, Chad F. Bender, The Univ. of Arizona (USA), et al. . [10702-39]

2:50 pm: **The habitable-zone planet finder: engineering and commissioning on the Hobby Eberly Telescope**, Suvrath Mahadevan, Tyler B. Anderson, The Pennsylvania State Univ. (USA), et al. . . . . [10702-40]

3:10 pm: **SPIRou @CFHT: full in-lab and on-sky performances**, Andres Carmona, Institut de Recherche en Astrophysique et Planétologie (France) and Univ. de Toulouse (France), et al. . . . . [10702-41]

Poster Interlude . . . . . 3:20 pm to 3:30 pm

Coffee Break . . . . . .Tue 3:40 pm to 4:10 pm

SESSION 9

LOCATION: CC LEVEL 1, BALLROOM C . . . . . TUE 4:10 PM TO 5:40 PM

MOS/IFS I

Session Chair: **Julia J. Bryant,** The Univ. of Sydney (Australia)

4:10 pm: **MEGARA, the R=6000-20000 IFU and MOS GTC** *(Invited Paper)*, Esperanza E. Carrasco Licea, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al. . . . . [10702-42]

4:40 pm: **First scientific observations with MEGARA at GTC**, Armando Gil de Paz, Univ. Complutense de Madrid (Spain), et al. . . . . [10702-43]

5:00 pm: **The wide integral field infrared spectrograph: commissioning results and on-sky performance**, Suresh Sivanandam, Dae-Sik Moon, R. Elliot Meyer, Jason Grunhut, Univ. of Toronto (Canada), et al. . . . . [10702-44]

5:20 pm: **EMIR@GTC: performances and results after 18 months of operation**, Francisco Garzón López, Lee Patrick, José Antonio Acosta, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10702-45]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A .WED 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 10

LOCATION: CC LEVEL 1, BALLROOM C . . . . WED 10:30 AM TO 12:20 PM

MOS/IFS II

Session Chair: **Armando Gil de Paz,** Univ. Complutense de Madrid (Spain)

10:30 am: **TAIPAN: construction, commissioning, and the start of the surveys** *(Invited Paper)*, Nuria P. F. Lorente, Kyler Kuehn, Jonathan S. Lawrence, Carlos Bacigalupo, David Brown, Rebecca Brown, Scott Case, Steve Chapman, Vladimir Churilov, Robert Content, Tony Farrell, Michael Goodwin, Urs Klauser, Slavko Mali, Rolf Muller, Vijay Nichani, Naveen Pai, Scott Smedley, Minh Vuong, Lewis Waller, Ross Zhelem, Australian Astronomical Observatory (Australia) . . . . . [10702-46]

11:00 am: **Construction progress of WEAVE: the next generation wide-field spectroscopy facility for the William Herschel Telescope**, Gavin B. Dalton, STFC Rutherford Appleton Lab. (United Kingdom) and Univ. of Oxford (United Kingdom), et al. . . . . [10702-47]

11:20 am: **Prime focus spectrograph for the Subaru Telescope: ongoing integration and future plans**, Naoyuki Tamura, Kavli Institute for the Physics and Mathematics of the Universe (Japan), et al. . . . . [10702-48]

11:40 am: **4MOST: the 4-metre multi-object spectroscopic telescope project at final design review,** Roelof S. de Jong, Samuel C. Barden, Olga Bellido-Tirado, Joar G. Brynnel, Steffen Frey, Domenico Giannone, Roger Haynes, Diana Johl, Olivier Schnurr, Jakob C. Walcher, Roland Winkler, Leibniz-Institut für Astrophysik Potsdam (Germany), et al. . . . . [10702-49]

12:00 pm: **MIRADAS: the facility multi-object medium-resolution NIR spectrograph for the GTC**, Stephen S. Eikenberry, Steven Nicholas Raines, Univ. of Florida (USA), et al. . . . . [10702-50]

Poster Interlude . . . . . 12:20 pm to 12:30 pm

Lunch/Exhibition Break . . . . . Wed 12:30 pm to 1:50 pm

SESSION 11

LOCATION: CC LEVEL 1, BALLROOM C . . . . . WED 1:50 PM TO 3:30 PM

MOS/IFS III

Session Chair: **Kentaro Motohara,** The Univ. of Tokyo (Japan)

1:50 pm: **Overview of the dark energy spectroscopic instrument**, Paul Martini, The Ohio State Univ. (USA), et al. . . . . [10702-51]

2:10 pm: **Rising MOONS: an update on the VLT's next multi-object spectrograph as its construction begins**, William D. Taylor, UK Astronomy Technology Ctr. (United Kingdom), et al. . . . . [10702-52]

2:30 pm: **Hector: a modular integral field spectrograph instrument for the Anglo-Australian Telescope**, Julia J. Bryant, The Univ. of Sydney (Australia) and Australian Astronomical Observatory (Australia), et al. . . . . [10702-53]

2:50 pm: **The LAMOST middle resolution spectrograph**, Yonghui Hou, Nanjing Institute of Astronomical Optics & Technology (China). . . . . [10702-54]

3:10 pm: **Gemini infrared multi-object spectrograph: instrument overview**, Suresh Sivanandam, Univ. of Toronto (Canada), et al. . . . . [10702-55]

Coffee Break . . . . . Wed 3:30 pm to 4:00 pm

SESSION 12

LOCATION: CC LEVEL 1, BALLROOM C . . . . . WED 4:00 PM TO 5:40 PM

MOS/IFS IV

Session Chair: **Julia J. Bryant,** The Univ. of Sydney (Australia)

4:00 pm: **VIRUS: status and performance of the massively replicated fiber integral field spectrograph for the upgraded Hobby-Eberly Telescope**, Gary J. Hill, The Univ. of Texas at Austin (USA), et al.. . . . . [10702-56]

4:20 pm: **Manuakea spectroscopic explorer instrumentation suite,** Kei Szeto, Alexis Hill, Nicolas Flagey III, Alan W. McConnachie, Richard Murowinski, Canada-France-Hawaii Telescope (USA) . . . . . [10702-57]

4:40 pm: **Sphinx: a massively multiplexed fiber positioner for MSE**, Scott Smedley, Gabriella Baker, Rebecca Brown, Australian Astronomical Observatory (Australia), et al.. . . . . [10702-58]

5:00 pm: **On-sky performance evaluation of RITMOS, a micromirror-based multi-object spectrometer**, Anton Travinsky, Dmitry Vorobiev, Kathleen Oram, Gregory M. Nero, Zoran Ninkov, Rochester Institute of Technology (USA)[10702-59]

5:20 pm: **The opto-mechanical design of SAMOS: a DMD-based spectrograph for the SOAR Telescope**, Stephen A. Smee, Robert Barkhouser, Stephen Hope, Johns Hopkins Univ. (USA), et al. . . . . [10702-60]

Poster Interlude . . . . . 5:40 pm to 5:50 pm

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Wednesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Wednesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

HIGH-RESOLUTION SPECTROGRAPHS

SPIRou at CFHT: fiber links and pupil slicer, Yoan Micheau, Zalpha Challita, Gérard Gallou, Nicolas Striebig, Driss Kouach, Jean-François Donati, Marielle Lacombe, Laurent Parès, Observatoire Midi-Pyrénées (France) . . . . . [10702-210]

Commissioning the high stability mode of SALT's high resolution spectrograph, Lisa Ann Crause, South African Astronomical Observatory (South Africa), et al.. . . . . [10702-211]

Designing and building an ultra-stable single mode fiber spectrograph for adaptive optics assisted observation in the infrared, Blaise C. Kuo Tiong, Christian Schwab, Nathan Lentini, Tobias Feger, David W. Coutts, Macquarie Univ. (Australia). . . . . [10702-212]

Very high-sensitive NIR high-resolution spectrograph WINERED: on-going observations at NTT, Yuji Ikeda, Photocoding (Japan), et al. . . . . [10702-213]

Design and manufacturing of a precision cryogenic actuator, Michael Carty, Jean Christophe Barrière, Olivier Corpace, Axel Arhancet, Damien Bachet, Didier Leboeuf, Michel Berthé, Bruno Duboué, Luc Dumaye, Jean Fontignie, Jérôme Martignac, Marin Prieur, Commissariat à l'Énergie Atomique (France), et al.. . . . . [10702-214]

A simple Fabry Perot calibration source for IR spectrometers, Andrea Tozzi, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10702-215]

Keck Planet Finder: Preliminary Design, Steven R. Gibson, Space Sciences Lab. (USA), et al. . . . . [10702-216]

Experimental test of a 30cm-long R=100 000 spectrometer for exoplanet characterisation, Guillaume Bourdarot, Univ. Grenoble Alpes (France), et al.. . . . . [10702-217]

Final design of the iLocater cryostat: achieving cryogenic thermal stability for precision radial velocity measurements, Jonathan Crass, Scott Mullin, Randall Hamper, Andrew Bechter, James Smous, Univ. of Notre Dame (USA), et al.. . . . . [10702-218]

Performance tests of Subaru/IRd for very precise and stable infrared radial velocity observations, Masayuki Kuzuhara, National Institutes of Natural Sciences (Japan) and National Astronomical Observatory of Japan (Japan), et al. [10702-219]

On-sky performances of GIANO-B: the infrared high resolution spectrometer of TNG with its new telescope interface, Avet Harutyunyan, Adriano Ghedina, Fundación Galileo Galilei - INAF (Spain), et al. . . . . [10702-220]

SPIRou @CFHT: integration and performance of the cryogenic near infra-red spectrograph unit, Zalpha Challita, Institut de Recherche en Astrophysique et Planétologie (France), et al. . . . . [10702-221]

Stability of the FOCES spectrograph based on frequency comb time series, Hanna Kellermann, Vanessa Fahrenschon, Liang Wang, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10702-222]

A 4-fiber assembly for simultaneous wavelength calibration of the high-resolution spectrograph FOCES, Hanna Kellermann, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10702-223]

Test results and operating configuration of the calibration unit for the near-infrared spectropolarimeter SPIRou, Sandrine Perruchot, Observatoire de Haute-Provence (France), et al. . . . . [10702-224]

Introducing GOFIO: a DRS for the GIANO-B near-infrared spectrograph, Monica Rainer, INAF - Osservatorio Astronomico di Brera (Italy), et al. . [10702-225]

The NEID precision radial velocity spectrometer: port adapter overview, requirements, and test plan, Sarah E. Logsdon, Michael W. McElwain, Qian Gong, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10702-226]

On-sky results with the fast guiding system on the SPIRou spectropolarimeter at the CFHT, Gregory A. Barrick, Canada-France-Hawaii Telescope (USA), et al.. . . . . [10702-227]

GHOST optical fibre system, Vladimir Churilov, Ross Zhelem, Scott Case, Yuriy Kondrat, Lewis Waller, Jonathan S. Lawrence, Michael Edgar, Gabriella Baker, Kristin Fiegert, Australian Astronomical Observatory (Australia). . . . . [10702-228]

Development of a stabilized Fabry-Perot based wavelength calibrator for precision Doppler spectroscopy, Tanya Das, Ravinder K. Banyal, S. Kathiravan, Sivarani Thirupathi, Ravindra B., Indian Institute of Astrophysics (India) [10702-229]

Analysis of the polarimetric performance of the HARPS3 Cassegrain adaptor unit, Patrick Dorval, Frans Snik, Leiden Univ. (Netherlands), et al. . . . . [10702-230]

NRES: the network of robotic echelle spectrographs, Robert J. Siverd, Tim Brown, Todd Henderson, Las Cumbres Observatory Global Telescope Network (USA), et al. . . . . [10702-231]

MAROON-X: a radial velocity spectrograph for the Gemini Observatory, Andreas Seifahrt, Julian Stürmer, Jacob L. Bean, The Univ. of Chicago (USA), et al.. . . . . [10702-232]

Design and commissioning of the Veloce fibre system, Scott Case, Vladimir Churilov, Ross Zhelem, Anthony Horton, Australian Astronomical Observatory (Australia), et al.. . . . . [10702-233]

A double scrambler and agitator system for the Keck planet finder fiber-fed high resolution spectrograph, Martin M. Sirk, Edward H. Wishnow, Marie Weisfeiler, Elisha Jhoti, James Curtis, Yuzo Ishikawa, Steven R Gibson, Jerry Edelstein, Univ. of California, Berkeley (USA), et al. . . . . [10702-234]

PARAS-2 precision radial velocimeter: optical and mechanical design of a fiber-fed high resolution spectrograph under vacuum and temperature control, Abhijit G. Chakraborty, Kapil Kumar, Prasad J.S.S. V. Neelam, Physical Research Lab. (India), et al. . . . . [10702-235]

Final design and assembly of the GHOST Cassegrain unit, Ross Zhelem, Vladimir Churilov, Lewis Waller, Australian Astronomical Observatory (Australia), et al.. . . . . [10702-236]

CONFERENCE 10702

MOS/IFS

Calibration system for the 4MOST multi object fiber-fed spectrographs, Ronald Roelfsema, Johan Pragt, Rik ter Horst, NOVA Optical Infrared Instrumentation Group (Netherlands), et al. . . . . [10702-287]

Mauna Kea spectrographic explorer (MSE): preliminary design of multi-object high resolution spectrograph, Kai Zhang, Yifei Zhou, Zhen Tang, Nanjing Institute of Astronomical Optics & Technology (China), et al.. . . . . [10702-289]

Final assembly and first lab results of the WEAVE fibre positioner system, Ellen Schallig, Ian J. Lewis, Univ. of Oxford (United Kingdom), et al. . . . . [10702-290]

As-built new Mayall Telescope top end for the DESI project, Gaston Gutierrez, Giuseppe Gallo, Donald Friend, Andrew Stefanik, Fermi National Accelerator Lab. (USA) . . . . . [10702-291]

Performance of the first production-ready actuators for the 4MOST-AESOP fiber positioner, Scott Smedley, Gabriella Baker, Rebecca Brown, Jurek Brzeski, Tony Farrell, Peter Gillingham, Sudharshan Venkatesan, Lewis Waller, Australian Astronomical Observatory (Australia) . . . . . [10702-292]

The commissioning instrument for the dark energy spectroscopic instrument, Ashley J. Ross, Mark A. Derwent, Paul Martini, Thomas P. O'Brien, Daniel P. Pappalardo, Suk Sien Tie, Klaus Honscheid, Rebecca Coles, Richard W. Pogge, The Ohio State Univ. (USA), et al. . . . . [10702-293]

VIRUS: comparison of lab characterization with on-sky performance for multiple spectrograph units, Briana L. Indahl, Gary J. Hill, Greg Zeimann, Cynthia S. Froning, Karl Gebhardt, The Univ. of Texas at Austin (USA), et al.. . . [10702-294]

Structural error simulation analysis of LAMOST fiber units, Xinyu Feng, Yonggang Gu, Yuran Shen, Hongzhuan Hu, Chao Zhai, Univ. of Science and Technology of China (China) . . . . . [10702-295]

Wavelength calibration for LAMOST medium resolution spectrographs, Jian-Jun Chen, Zhongrui Bai, National Astronomical Observatories, Chinese Academy of Sciences (China), et al. . . . . [10702-296]

Guidelines and design rules for fiber positioning systems for massive spectroscopic surveys, Philipp Hörler, Luzius Kronig, Jean-Paul Kneib, Mohamed Bouri, Laleh Makarem, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [10702-297]

The assembly and alignment of the DESI prime focus corrector, David Brooks, Peter Doel, Univ. College London (United Kingdom), et al. . . . . [10702-298]

4MOST metrology system error analysis, Roland Winkler, Samuel C. Barden, Allar Saviauk, Nicolas Azais, Steffen Frey, Leibniz-Institut für Astrophysik Potsdam (Germany), et al. . . . . [10702-299]

4MOST low resolution spectrograph final design, Patrick Caillier, Univ. Claude Bernard Lyon 1 (France) and Ctr. de Recherche Astrophysique de Lyon, Univ. de Lyon (France) and Ecole Normale Supérieure de Lyon (France), et al. . . [10702-300]

SUBARU prime focus spectrograph integration and performance at LAM, Fabrice Madec, Kjetil Dohlen, Arnaud Le Fur, Mohamed Belhadi, Sandrine Pascal, David Le Mignant, Rudy Barette, Patrick Vors, Marc Jaquet, Patrick Blanchard, Jean-Antoine Benedetti, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10702-301]

4MOST fibre feed: performance and final design, Dionne M. Haynes, Allar Saviauk, Andreas Kelz, Dennis Plüschke, Roger Haynes, Thomas Jahn, Johannes Piotrowski, Leibniz-Institut für Astrophysik Potsdam (Germany), et al. . [10702-302]

Deployment and handling of the VIRUS fiber integral field units, Brian L. Vattiat, Gary J. Hill, The Univ. of Texas at Austin (USA), et al. . . . . [10702-303]

Maunakea spectroscopic explorer low moderate resolution spectrograph conceptual design, Patrick Caillier, Univ. de Lyon (France) and Ctr. de Recherche Astrophysique de Lyon, Ctr. National de la Recherche Scientifique (France) and Ecole Normale Supérieure de Lyon (France), et al.. . . . . [10702-304]

Optical design of DMD-based multi-object spectrograph and preliminary study, Shaojie Chen, Suresh Sivanandam, Fazal Mahmood Syed, Univ. of Toronto (Canada), et al. . . . . [10702-305]

DESI focal plane thermal management, Andrew Lambert, Robert W. Besuner, Todd M. Claybaugh, Joseph H. Silber, Lawrence Berkeley National Lab. (USA) . . . . . [10702-306]

VIRUS-2 for the Harlan J. Smith Telescope of the McDonald Observatory, Hanshin Lee, Gary J. Hill, Niv Drory, Brian L. Vattiat, Jason Ramsey, The Univ. of Texas at Austin (USA) . . . . . [10702-307]

Opto-mechanical design of the top end assembly (TEA) for the Maunakea spectroscopic explorer (MSE): a multi-function compact prime focus environment, Shan B. Mignot, Galaxies Etoiles Physique Instrumentation (France) and Observatoire de Paris à Meudon (France) and Ctr. National de la Recherche Scientifique (France), et al. . . . . [10702-309]

The planetary systems imager: 0.5-1.8 micron channel, Dimitri Mawet, Caltech (USA), et al. . . . . [10702-310]

Dark energy spectroscopic instrument (DESI) focal plane system, Joseph H. Silber, Lawrence Berkeley National Lab. (USA) . . . . . [10702-311]

Optical design of the highly cost optimized Hector spectrograph, Robert Content, Will Saunders, Jonathan S Lawrence, Julia J. Bryant, Ross Zhelem, Australian Astronomical Observatory (Australia) . . . . . [10702-312]

Research on the key technology of the fiber positioning closed-loop control system based on four-quadrant detector, Hua Zou, Hohai Univ. (China) . . . . . [10702-313]

Priority coordination of fiber positioners in multi-objects spectrographs, Laleh Makarem, Dominique Tao, Jean-Paul Kneib, Mohamed Bouri, Denis Gillet, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [10702-314]

The optical design of SAMOS: a DMD-based spectrograph for the SOAR Telescope, Robert H. Barkhouser, Stephen A Smee, Johns Hopkins University (USA), et al. . . . . [10702-380]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . THU 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 13

LOCATION: CC LEVEL 1, BALLROOM C . . . . . THU 10:30 AM TO 12:10 PM

Instrumentation for the ELTs I

Session Chair: **Rebecca A. Bernstein,** GMTO Corp. (USA)

10:30 am: **Instrumentation for ESO's Extremely Large Telescope**, Suzanne K. Ramsay, Mark Casali, European Southern Observatory (Germany) . . . . . [10702-61]

10:50 am: **HARMONI @ ELT: status of the AO assisted, first light, visible and near-IR integral field spectrograph at the end of the preliminary design phase**, Fraser Clarke, Niranjan A. Thatte, Univ. of Oxford (United Kingdom), et al.. . . . . [10702-62]

11:10 am: **The GMT-consortium large earth finder (G-CLEF): an optical echelle spectrograph for the Giant Magellan Telescope (GMT)**, Andrew Szentgyorgyi, Daniel Baldwin, Stuart Barnes, Harvard-Smithsonian Ctr. for Astrophysics (USA), et al.. . . . . [10702-63]

11:30 am: **The MICADO first light imager for ELT: overview and operation**, Richard Davies, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10702-64]

11:50 am: **The infrared imaging spectrograph (IRIS) for TMT: instrument overview**, James E. Larkin, Univ. of California, Los Angeles (USA), et al. [10702-65]

Poster Interlude . . . . . 12:10 pm to 12:20 pm

Lunch/Exhibition Break . . . . . Thu 12:20 pm to 1:40 pm

SESSION 14

LOCATION: CC LEVEL 1, BALLROOM C . . . . . THU 1:40 PM TO 3:20 PM

Instrumentation for the ELTs II

Session Chair: **James E. Larkin,** Univ. of California, Los Angeles (USA)

1:40 pm: **Status of the mid-infrared ELT imager and spectrograph METIS**, Bernhard R. Brandl, Leiden Univ. (Netherlands), et al. . . . . [10702-66]

2:00 pm: **Design evolution of the Giant Magellan Telescope integral field spectrograph, GMTIFS**, Robert G. Sharp, Gabe Bloxham, Robert Boz, Dave Bundy, Brady Espeland, Bart Fordham, Gaston Gausachs, John Hart, Nicholas Herrald, Jon Nielsen, Ellie O'Brien, Chris Onken, Ian Price, Annino Vaccarella, Colin Vest, Peter Young, The Australian National Univ. (Australia) . . . . . [10702-67]

2:20 pm: **The ELT-MOS: towards the construction phase**, François Hammer, Observatoire de Paris à Meudon (France), et al.. . . . . [10702-68]

2:40 pm: **The Giant Magellan Telescope multi-object astronomical and cosmological spectrograph (GMACS)**, Darren L. DePoy, Jennifer L. Marshall, Erika Cook, Texas A&M Univ. (USA), et al. . . . . [10702-69]

3:00 pm: **ELT-HIRES, the high resolution spectrograph for the ELT: results from the Phase A study**, Alessandro Marconi, Univ. degli Studi di Firenze (Italy), et al.. . . . . [10702-70]

Poster Interlude . . . . . 3:20 pm to 3:30 pm

Coffee Break . . . . . Thu 3:30 pm to 4:00 pm

CONFERENCE 10702

SESSION 15

LOCATION: CC LEVEL 1, BALLROOM C . . . . . THU 4:00 PM TO 5:20 PM

Instrumentation for the ELTs III

Session Chair: **Christopher J. Evans,** UK Astronomy Technology Ctr. (United Kingdom)

4:00 pm: **Arrayed wide-angle camera system for the extremely large telescopes**, Hanshin Lee, John M. Good, Brian L. Vattiat, Gary J. Hill, The Univ. of Texas at Austin (USA) . . . . . [10702-71]

4:20 pm: **WFOS instrument trade study: slicer vs. fiber instrument concept designs and results**, Kevin Bundy, Maureen Savage, Renate Kupke, Nicholas MacDonald, Kyle Westfall, Matthew Radovan, Zheng Cai, Brian Digiorgio, Univ. of California, Santa Cruz (USA), et al. . . . . [10702-72]

4:40 pm: **The wide field optical spectrograph (WFOS) for TMT: fiber-WFOS optical design**, Renate Kupke, Univ. of California, Santa Cruz (USA), et al.. . . . . [10702-73]

5:00 pm: **The planetary systems imager: a high-contrast instrumentation platform for the Thirty Meter Telescope**, Michael P. Fitzgerald, Univ. of California, Los Angeles (USA), et al.. . . . . [10702-74]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Thursday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Thursday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

INSTRUMENTATION FOR ELTS

Image slicer module for wide field optical spectrograph (WFOS), Shinobu Ozaki, Satoshi Miyazaki, Toshihiro Tsuzuki, National Astronomical Observatory of Japan (Japan), et al. . . . . [10702-315]

Opto-mechanical design of a high contrast module (HCM) for HARMONI, François B. Hénault, Alexis Carlotti, Institut de Planétologie et d'Astrophysique de Grenoble (France) . . . . . [10702-316]

ELT-HIRES the high resolution spectrograph for the ELT: optical design and overall instrument architecture, Ernesto Oliva, Andrea Tozzi, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al.. . . . . [10702-317]

The warm calibration unit of METIS: optical design and principle of operation, Christian Straubmeier, Lucas Labadie, Nicola Baccichet, Michael Wiest, Andreas Eckart, Univ. zu Köln (Germany), et al. . . . . [10702-318]

ELT-HIRES, the high resolution spectrograph for the ELT: the IFU module, Andrea Tozzi, Ernesto Oliva, Marco Xompero, Guido Agapito, Marco Bonaglia, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al.. . . . . [10702-319]

Simulating surveys for ELT/MOSAIC, Mathieu Puech, Observatoire de Paris à Meudon (France), et al. . . . . [10702-320]

ELT-HIRES the high resolution spectrograph for the ELT: fiber link, Ana Belen Fragoso Lopez, José Luis Rasilla, Instituto de Astrofísica de Canarias (Spain), et al.. . . . . [10702-321]

The MICADO first light imager for ELT: derotator design status and prototype results, Santiago Barboza, Jörg-Uwe Pott, Ralf-Rainer Rohloff, Friedrich Müller, Ralph Hofferbert, Norbert Münch, Lars Mohr, José Ramos, Monica Ebert, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10702-322]

The MICADO first light imager for ELT: preliminary design of the calibration assembly, Gabriele Rodeghiero, Jörg-Uwe Pott, Norbert Münch, Ralf-Rainer Rohloff, Ulrich Groezinger, Enrico Biancalani, Javier Moreno-Ventas, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10702-323]

Studying the intergalactic medium with the E-ELT multi-object spectrograph MOSAIC, Simon L. Morris, Durham Univ. (United Kingdom), et al. . . . . [10702-324]

The MICADO first light imager for ELT: cold optics instrument, Josef Schubert, Richard Davis, Michael Hartl, Veronika Hörmann, Vincent Garrel, Bastian Eder, Markus Manhart, Max-Planck-Institut für extraterrestrische Physik (Germany), et al.. . . . . [10702-325]

Detailed design of the G-CLEF flexure control camera subsystem, Jae Sok Oh, Chan Park, Kang-Min Kim, Moo-Young Chun, Young-Sam Yu, Sungho Lee, Jihun Kim, Ueejeong Jeong, Chang-Hee Kim, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10702-326]

The MICADO main selection mechanism (MSM): an operational mode selector for the MICADO instrument, Florian Lang-Bardl, Anna Monna, Univ.-Sternwarte München (Germany), et al. . . . . [10702-327]

MICADO instrument control approach in context of ESO ELT standards, Marco H. Häuser, Hans-Joachim Hess, Jörg Schlichter, Helmut Kravcar, Josef Richter, Michael Wegner, Univ.-Sternwarte München (Germany) . . . . . [10702-328]

The MICADO first light imager for ELT: its astrometric performance, Jörg-Uwe Pott, Gabriele Rodeghiero, Hannes Riechert, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10702-329]

The calibration unit of the mid-infrared E-ELT instrument METIS, Nicola Baccichet, Lucas Labadie, Steffen Rost, Christian Straubmeier, Michael Wiest, Univ. zu Köln (Germany), et al. . . . . [10702-330]

The MICADO first light imager for ELT: from a hexapod to an octopod instrument support structure, Harald Nicklas, Heiko Anwand-Heerwart, Karen Disseau, Petra Rhode, Georg-August-Univ. Göttingen (Germany). . . . . [10702-331]

Assembly, integration, test and verification scenarios for the ELT MOSAIC instrument, Kacem El Hadi, Kjetil Dohlen, David Le Mignant, Fabrice Madec, Pascal Vola, Benoit Neichel, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10702-332]

The MICADO first light imager for ELT: control concept for the derotator, Martin Glück, Univ. Stuttgart (Germany), et al. . . . . [10702-333]

USM test cryostat for the MICADO project: irst steps in stabilizing and testing the cryostat, Anna Monna, Florian Lang-Bardl, Univ.-Sternwarte München (Germany), et al. . . . . [10702-334]

ELT HARMONI: image slicer preliminary design, Florence Laurent, Didier Boudon, Magali Loupias, Alban Remillieux, Edgard Renault, Ctr. de Recherche Astrophysique de Lyon (France) . . . . . [10702-335]

Design and test results of APol: a polarimeter for the Atacama sub-millimeter telescope experiment, Yapeng Zhang, Hua-bai Li, The Chinese Univ. of Hong Kong (Hong Kong, China) . . . . . [10702-336]

The estimation of the instrumental polarization and crosstalk at the focus of the mid-infrared adaptive optics system for Thirty-Meter Telescope, Ramya M. Anche, Indian Institute of Astrophysics (India), et al. . . . . [10702-337]

MOSAIC/E-ELT: science specifications and operational concept, Myriam Rodrigues, Galaxies Etoiles Physique Instrumentation (France), et al.. . [10702-338]

The infrared imaging spectrograph (IRIS) for TMT: design of image slicer, Kai Zhang, Yifei Zhou, Nanjing Institute of Astronomical Optics & Technology (China), et al.. . . . . [10702-339]

The optical design for the Giant Magellan Telescope multi-object astronomical and cosmological spectrograph (GMACS), Rafael A. S. Ribeiro, Univ. de São Paulo (Brazil), et al. . . . . [10702-340]

Direct imaging spectroscopic characterization of the RV planet population with GSMTs, Jared Males, The Univ. of Arizona (USA), et al. . . . . [10702-341]

An N-band test bench for the METIS coronagraphic masks, Samuel Ronayette, Salima Mouzali, Eric Pantin, Philippe Galdemard, Commissariat à l'Énergie Atomique (France), et al. . . . . [10702-342]

Test and control of new-generation optical fiber positioning units of LAMOST based on ZigBee network, Yuran Shen, Mingshan Yang, Xiang Lu, Xinyu Feng, Yonggang Gu, Chao Zhai, Univ. of Science and Technology of China (China) . . . . . [10702-343]

Challenges of designing a visible spectrograph for the ELT: trade-offs in the visible spectrograph of MOSAIC, Annemieke Janssen, NOVA Optical Infrared Instrumentation Group (Netherlands), et al. . . . . [10702-344]

The MICADO first light imager for ELT: integral design approach for the filter wheel, ADC and pupil wheel assembly, Niels Tromp, Ramón Navarro, Netherlands Research School for Astronomy (Netherlands), et al.. . . . . [10702-345]

HARMONI pre-optics design at PDR, Miguel Angel Cagigas Garcia, Elvio Hernández, José Luis Rasilla, Evencio Mediavilla, Begoña García-Lorenzo, José Miguel Herreros, José Vicente Gigante, Luis Fernando Rodriguez, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10702-346]

ELT-HIRES the high resolution spectrograph for the ELT: application of E2E + ETC for instrument characterisation, from efficiency to accuracy in radial velocity measurements, Matteo Genoni, Marco Landoni, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . . . [10702-347]

Design of the ELT-METIS cryostat, Adrian M. Glauser, Stephen March, Walter Bachmann, Marcel Baer, Roland Eichhorn, ETH Zürich (Switzerland), et al.. . . . . [10702-348]

New features in the optical design of the GMT-consortium large Earth finder, Sagi Ben-Ami, Andrew Szentgyorgyi, William Podgorski, Mark A. Mueller, Ian Evans, Harvard-Smithsonian Ctr. for Astrophysics (USA), et al.. . . . . [10702-349]

ELT-HIRES the high resolution spectrograph for the ELT: comparison of astrophysical Fabry-Perots with respect to the requirements of HIRES, Philipp Huke, Sebastian Schäfer, Ansgar Reiners, Georg-August-Univ. Göttingen (Germany), et al. . . . . [10702-350]

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

CONFERENCE 10703

Sunday–Friday 10–15 June 2018 • Proceedings of SPIE Vol. 10703

Adaptive Optics Systems VI

Conference Chairs: **Laird M. Close,** The Univ. of Arizona (USA); **Laura Schreiber,** INAF - Osservatorio Astronomico di Bologna (Italy); **Dirk Schmidt,** National Solar Observatory (USA)

Program Committee: **Christoph Baranec,** Univ. of Hawai'i (USA); **Thomas Berkefeld,** Kiepenheuer-Institut für Sonnenphysik (Germany); **Antonin H. Bouchez,** GMTO Corp. (USA); **Brendan P. Bowler,** The Univ. of Texas at Austin (USA); **Simone Esposito,** INAF - Osservatorio Astrofisico di Arcetri (Italy); **Thierry Fusco,** Laboratoire d'Astrophysique de Marseille, ONERA (France); **Yutaka Hayano,** TMT-J Project Office, National Astronomical Observatory of Japan (Japan); **Caroline Kulcsar,** Institut d'Optique (France); **Anne-Marie Lagrange,** Laboratoire d'Astrophysique de l'Observatoire de Grenoble (France); **Miska Le Louarn,** European Southern Observatory (Germany); **Jessica R. Lu,** Univ. of California, Berkeley (USA); **Pierre-Yves Madec,** European Southern Observatory (Germany); **Elena Masciadri,** INAF - Osservatorio Astrofisico di Arcetri (Italy); **Dimitri Mawet,** California Institute of Technology (USA); **Benoit Neichel,** Lab. d'Astrophysique de Marseille (France); **Mamadou N'Diaye,** Observatoire de la Côte d'Azur (France); **Tim J. Morris,** Durham Univ. (United Kingdom); **Elise Vernet,** European Southern Observatory (Germany); **Peter L. Wizinowich,** W. M. Keck Observatory (USA)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . .SUN 9:20 AM TO 10:20 AM

AO Systems and Status I

Session Chair: **Laird M. Close,** The Univ. of Arizona (USA)

9:20 am: **Adaptive Optics Facility: from an amazing present to a brilliant future**, Pierre-Yves Madec, Robin Arsenault, Harald Kuntschner, Johann Kolb, Jean-François Pirard, Jérôme Paufique, Paolo La Penna, Wolfgang Hackenberg, Elise Vernet, Marcos Suárez Valles, Norbert Hubin, European Southern Observatory (Germany) . . . . . [10703-3]

9:40 am: **The ERIS adaptive optics system: from design to hardware**, Armando Riccardi, Simone Esposito, Guido Agapito, Valdemaro Biliotti, Runa Briguglio, Luca Carbonaro, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10703-2]

10:00 am: **The CHARA array adaptive optics program**, Theo A. ten Brummelaar, Judit Sturmann, Laszlo Sturmann, Matthew D. Anderson, Nils H. Turner, CHARA (USA), et al. . . . . [10703-4]

Coffee Break . . . . . .Sun 10:20 am to 10:50 am

SESSION 2

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . SUN 10:50 AM TO 12:20 PM

Astronomy with AO

Session Chair: **Laird M. Close,** The Univ. of Arizona (USA)

10:50 am: **Two decades of exoplanetary science with adaptive optics** *(Invited Paper)*, Gaël Chauvin, Institut de Planétologie et d'Astrophysique de Grenoble (France) . . . . . [10703-5]

11:20 am: **Keck Planet imager and characterizer (KPIC): recent results and status update**, Dimitri Mawet, Nemanja Jovanovic, Jacques-Robert Delorme, Caltech (USA), et al. . . . . [10703-6]

11:40 am: **A search for massive exoplanet and brown dwarf companions using the new SAPHIRA infrared detector on Robo-AO**, Maissa Salama, Christoph Baranec, Michael C. Liu, Institute for Astronomy (USA), et al. . . . . [10703-7]

12:00 pm: **First light for the vAPP on SCExAO/CHARIS**, David S. Doelman, Emiel H. Por, Steven P. Bos, Leiden Observatory (Netherlands), et al. . . . . [10703-8]

Lunch Break . . . . . Sun 12:20 pm to 1:40 pm

SESSION 3

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . SUN 1:40 PM TO 5:00 PM

AO Systems and Status II

Session Chairs: **Pierre-Yves Madec,** European Southern Observatory (Germany); **Dirk Schmidt,** National Solar Observatory (USA)

1:40 pm: **MagAO-X: project status and first laboratory results**, Jared R. Males, Laird M. Close, Kelsey L. Miller, Lauren Schatz, Jennifer Lumbres, The Univ. of Arizona (USA), et al.. . . . . [10703-9]

2:00 pm: **AO systems at the Large Binocular Telescope: status, upgrades and improvements**, Julian C. Christou, Guido Brusa Zappellini, Gregory E. Taylor, Douglas L. Miller, Xianyu Zhang, Large Binocular Telescope Observatory (USA), et al.. . . . . [10703-10]

2:20 pm: **Commissioning multi-conjugate adaptive optics with LINC-NIRVANA on LBT,** Thomas M. Herbst, Max-Planck-Institut für Astronomie (Germany), et al.. . . . . [10703-11]

2:40 pm: **GTC adaptive optics performance tests in laboratory**, Marcos Reyes García-Talavera, Jesús Patrón Recio, Miguel Núñez Cagigal, Roberto Luis Simoes, Roberto López López, José Marco de la Rosa, Iciar Montilla Garcia, Marta Puga Antolín, Luis Fernando Rodríguez-Ramos, Josefina Rosich Minguell, Victor Javier Sánchez Béjar, Óscar Tubío Araújo, Instituto de Astrofísica de Canarias (Spain) . . . . . [10703-12]

3:00 pm: **THEMIS solar adaptive optics system: on bench system performance validations and integration at the telescope**, Maud Langlois, Gil Moretto, Éric M. Thiébaut, Ctr. de Recherche Astronomique de Lyon (France), et al. . . . . [10703-13]

Coffee Break . . . . . Sun 3:20 pm to 3:50 pm

3:50 pm: **SHARK-NIR: the AIV phase at INAF-Padova of the NIR coronagraphic camera for LBT**, Jacopo Farinato, INAF - Osservatorio Astronomico di Padova (Italy) and ADONI - ADaptive Optics National Lab. (Italy), et al. . . . . [10703-14]

4:10 pm: **Laboratory integration of the DKIST wavefront correction system** *(Invited Paper)*, Luke C. Johnson, Keith Cummings, Mark Drobilek, Erik M. Johansson, José Marino, Rachel Rampy, Kit Richards, Thomas R. Rimmele, Predrag Sekulic, Friedrich Wöger, National Solar Observatory (USA) . . . [10703-15]

4:40 pm: **Progress on solar multi-conjugate adaptive optics at the New Vacuum Solar Telescope**, Changhui Rao, Lanqiang Zhang, Lin Kong, Xuejun Rao, Youming Guo, Hua Bao, Libo Zhong, Lei Zhu, Institute of Optics and Electronics, Chinese Academy of Sciences (China) . . . . . [10703-16]

SESSION 4

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . .SUN 5:00 PM TO 5:40 PM

Post-processing AO Data

Session Chair: **Dirk Schmidt,** National Solar Observatory (USA)

5:00 pm: **Mining the GPIES database**, Dmitry Savransky, Jacob Shapiro, Cornell Univ. (USA), et al. . . . . [10703-17]

5:20 pm: **AO point spread function reconstruction for integral field spectroscopy**, Tuan Do, Anna Ciurlo, Gunther Witzel, Michael P. Fitzgerald, Andrea M. Ghez, Univ. of California, Los Angeles (USA), et al.. . . . . [10703-18]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Sunday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Sunday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

ASTRONOMY WITH AO

PSF reconstruction for NIRC2/Keck: application of AIROPA to Galactic Center observations, Gunther Witzel, Univ. of California, Los Angeles (USA), et al.. . . . . [10703-92]

Exploring the performance of a GMCAO-equipped ELT within the deep field surveys strategy, Elisa Portaluri, Valentina Viotto, Roberto Ragazzoni, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10703-93]

Upgrading the MMT AO system with a near-infrared Pyramid wavefront sensor, Siqi Liu, Suresh Sivanandam, Univ. of Toronto (Canada) and Dunlap Institute for Astronomy & Astrophysics (Canada), et al. . . . . [10703-94]

In-lab testing of six-layer phase mask coronagraphs onto the high-contrast imaging THD2 testbed, Fabien Patru, INAF - Osservatorio Astrofisico di Arcetri (France), et al. . . . . [10703-95]

Surveying the Epsilon Eridani system Using MagAO, Rachel Morgan, Massachusetts Institute of Technology (USA) . . . . . [10703-96]

Real-time estimation and correction of quasi-static aberrations in ground-based high contrast imaging systems with high frame-rates, Alexander T. Rodack, Jared R. Males, The Univ. of Arizona (USA), et al. . . . . [10703-97]

Active CFRP mirror using MFC piezoeletric actuator for thermal deformation and atmospheric aberration correction, Hadi Baghsiahi, Univ. College London (United Kingdom), et al.. . . . . [10703-98]

Development of elements for an adaptive optics system for solar telescope, Vladimir P. Lukin, Nina Botygina, Oleg Emaleev, Petr Konyaev, Eugenii Kopylov, V.E. Zuev Institute of Atmospheric Optics (Russian Federation) . . . . . [10703-99]

Environmental stress testing of mirror mounts in the MagAO-X astronomical coronagraph, Maggie Y. Kautz, Laird M. Close, Jared R. Males, The Univ. of Arizona (USA) . . . . . [10703-100]

POST-PROCESSING AO DATA

Exoplanet detection in angular and spectral differential imaging: local learning of background correlations for improved detections, Olivier Flasseur, Univ. Jean Monnet Saint-Etienne (France), et al. . . . . [10703-101]

Imaging exoplanets using phase sorting interferometry and coherent differential imaging, Emiel H. Por, Matthew A. Kenworthy, Leiden Observatory (Netherlands) . . . . . [10703-102]

The hunt for "Sirius Ab": comparison of algorithmic sky and PSF estimation performance in deep coronagraphic thermal-IR high contrast imaging, Joseph D. Long, Jared R. Males, Katie M. Morzinski, Laird M. Close, Asher Haug-Baltzell, The Univ. of Arizona (USA), et al. . . . . [10703-103]

SFADI: a speckle-free method for high-contrast imaging of point-like and extended sources, Gianluca Li Causi, INAF - Istituto di Astrofisica e Planetologia Spaziali (Italy), et al.. . . . . [10703-104]

Recurrence quantification analysis as a post-processing technique in adaptive optics high contrast imaging, Marco Stangalini, Fernando Pedichini, INAF - Osservatorio Astronomico di Roma (Italy), et al.. . . . . [10703-105]

PSF reconstruction and deconvolution for extremely large telescopes, Roland Wagner, Johann Radon Institute for Computational and Applied Mathematics (Austria), et al. . . . . [10703-106]

The application of PeX to real data, Nicholas Devaney, National Univ. of Ireland, Galway (Ireland), et al.. . . . . [10703-107]

Multi-channel phase diversity speckle image processing technology for AO corrected solar images, Hua Bao, Changhui Rao, Institute of Optics and Electronics, Chinese Academy of Sciences (China) . . . . . [10703-108]

Slope-based wavefront sensor optimisation with multi-resolution analysis, Saloni Pal, Richard Clare, Univ. of Canterbury (New Zealand), et al. . . . [10703-109]

Processing multispectral high-contrast images for exoplanet detection: MEDUSAE: an inverse problem approach, Faustine Cantalloube, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10703-110]

Approximate nonnegative matrix factorization algorithm for the analysis of angular differential imaging data, Carmelo Arcidiacono, INAF - Osservatorio Astronomico di Bologna (Italy), et al.. . . . . [10703-111]

Phase-diverse restoration of solar images partially compensated by GLAO using a PC cluster, Takahiro Suzuki, Noriaki Miura, Susumu Kuwamura, Kitami Institute of Technology (Japan), et al. . . . . [10703-112]

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 5

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . MON 10:30 AM TO 12:10 PM

AO Systems and Status III

Session Chair: **Christoph Baranec,** Institute for Astronomy (USA)

10:30 am: **On-sky results from the wide-field ground-layer adaptive optics demonstrator 'imaka**, Mark R. Chun, Univ. of Hawai'i (USA), et al. . . . . [10703-19]

10:50 am: **The Gemini planet imager: looking back over five years and forward to the future**, Bruce A. Macintosh, Connor Beierle, Stanford Univ. (USA), et al.. . . . . [10703-20]

11:10 am: **MagAO status and visible light science**, Laird M. Close, Jared R. Males, Katie M. Morzinski, The Univ. of Arizona (USA), et al.. . . . . [10703-21]

11:30 am: **Ongoing and future AO activities on Subaru Telescope**, Yoshito H. Ono, Yosuke Minowa, Christophe S. Clergeon, Etsuko Mieda, Olivier Guyon, Julien Lozi, Subaru Telescope, NAOJ (USA), et al. . . . . [10703-22]

11:50 am: **Science metrics and image quality for ground layer adaptive optics systems**, Jessica R. Lu, Univ. of California, Berkeley (USA), et al. . . . . [10703-23]

Lunch Break . . . . . Mon 12:10 pm to 1:40 pm

SESSION 6

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . MON 1:40 PM TO 2:20 PM

AO Systems and Status IV

Session Chair: **Dirk Schmidt,** National Solar Observatory (USA)

1:40 pm: **Satellite tracking with adaptive optics tracking and pushing system for space debris manoeuvre,** Marcus Lingham, Doris Grosse, Francis Bennet, Michael Copeland, Céline d'Orgeville, The Australian National Univ. (Australia) and Space Environment Research Ctr. (Australia), et al. . . . . [10703-24]

2:00 pm: **An infusion of new blood using the Toptica laser with GeMS: results of the commissioning and science performance**, Gaetano Sivo, Eduardo Marin, Gemini Observatory (Chile), et al. . . . . [10703-25]

SESSION 7

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . MON 2:20 PM TO 4:50 PM

LGS

Session Chairs: **Dirk Schmidt,** National Solar Observatory (USA); **Peter L. Wizinowich,** W. M. Keck Observatory (USA)

2:20 pm: **Projected pupil plane pattern (PPPP): new LGS alternative wave-front sensing**, Huizhe Yang, Nazim Ali Bharmal, Richard M. Myers, Durham Univ. (United Kingdom) . . . . . [10703-26]

2:40 pm: **Studies towards a directional polychromatic sodium laser guide star**, Felipe Pedreros Bustos, Johannes Gutenberg Univ. Mainz (Germany), et al.. . . . . [10703-28]

Coffee Break . . . . . Mon 3:00 pm to 3:30 pm

3:30 pm: **A 100-W 1178-nm continuous-wave single-frequency linearly-polarized Raman fiber amplifier**, Daoping Wei, Vladimir Karpov, Ning Guo, Wallace R. L. Clements, MPB Communications Inc. (Canada). . . . . [10703-29]

3:50 pm: **Semiconductor guidestar laser for astronomy, Space, and laser communications**, Céline d'Orgeville, The Australian National Univ. (Australia), et al.. . . . . [10703-30]

4:10 pm: **Modeling the return flux for a sodium beacon created by combining two laser beams**, Robert L. Johnson, Air Force Research Lab. (USA) . . [10703-31]

4:30 pm: **Dealing with the cigar: preliminary performance estimation of an INGOT WFS**, Valentina Viotto, Elisa Portaluri, Roberto Ragazzoni, Maria Bergomi, Federico Biondi, Elena Carolo, Simonetta Chinellato, Marco Dima, Jacopo Farinato, Davide Greggio, Demetrio Magrin, Luca Marafatto, INAF - Osservatorio Astronomico di Padova (Italy) and ADONI - ADaptive Optics National Lab. (Italy), et al.. . . . . [10703-32]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 5:30 PM TO 7:00 PM

Posters: Monday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Monday evening from 5:30 to 7:00 PM (followed by the Welcome Reception). Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

AO SYSTEMS AND STATUS

Adaptive optics corrected imaging for satellite and debris characterisation, Michael Copeland, Francis Bennet, François Rigaut, Visa A. Korkiakoski, Céline d'Orgeville, The Australian National Univ. (Australia), et al. . . . . [10703-113]

Status and upgrade of ALTAIR, Gemini North Adaptive Optics, Laure Catala, South African Astronomical Observatory (South Africa), et al. . . . . [10703-114]

Keck II adaptive optics upgrade: simulations of the near-infrared pyramid sensor, Cédric Plantet, Guido Agapito, Christophe Giordano, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10703-115]

Experiments of GLAO using the domeless solar telescope of the Hida Observatory, Noriaki Miura, Takahiro Suzuki, Shinya Takahashi, Susumu Kuwamura, Kitami Institute of Technology (Japan), et al. . . . . [10703-116]

Subaru AO188 upgrade phase 1: integration of the new real-time system, Christophe S. Clergeon, Yosuke Minowa, Olivier Guyon, Yoshito H. Ono, Etsuko Mieda, Nour Skaf, Hiroshige Yoshida, Subaru Telescope, NAOJ (USA), et al. . . . . [10703-117]

Preliminary design of SALTO: the Belgian adaptive optics demonstrator, Gilles Orban de Xivry, Olivier Absil, Univ. de Liège (Belgium), et al. . . . . [10703-118]

A near-infrared pyramid wavefront sensor for Keck adaptive optics: real-time controller, Sylvain Cetre, W. M. Keck Observatory (USA), et al. . . . . [10703-119]

Upgrades to the AO system of the 1.5m Gregor solar telescope, Thomas Berkefeld, Kiepenheuer-Institut für Sonnenphysik (Germany), et al. . . . [10703-120]

A fiber injection unit for Keck: final design and first results, Jacques-Robert Delorme, Dimitri Mawet, Nemanja Jovanovic, Caltech (USA), et al. . . . . [10703-121]

SAMplus: adaptive optics in optical wavelengths at SOAR, Daniel Faes, Univ. de São Paulo (Brazil), et al. . . . . [10703-122]

The Gran Telescopio Canarias laser guide star AO system: error budget and expected performance, Iciar Montilla Garcia, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10703-123]

High-contrast observations with GTC/FRIDA: design and study of the coronagraphic devices, Mamadou N'Diaye, Observatoire de la Côte d'Azur (France), et al. . . . . [10703-125]

Servo control simulations and preliminary laboratory results for GTC adaptive optics with NGS, Miguel Núñez Cagigal, José Marco de la Rosa, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10703-126]

A near-infrared pyramid wavefront sensor for Keck adaptive optics: opto-mechanical design, Scott J. Lilley, Peter L. Wizinowich, Adam Vandenberg, W. M. Keck Observatory (USA), et al. . . . . [10703-127]

Hardware implementation of tilt correction system for the solar imaging, Hemanth Pruthvi, Sridharan Rengaswamy, B. Ravindra, Indian Institute of Astrophysics (India) . . . . . [10703-128]

Control electronics of the ERIS AO and CU subsystems, Gianluca Di Rico, INAF - Osservatorio Astronomico d'Abruzzo (Italy), et al. . . . . [10703-129]

Electronics design of the NGS WFS subsystem of MAORY, Gianluca Di Rico, Marco Bonaglia, Lorenzo Busoni, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10703-130]

LASER GUIDE START SYSTEMS

Feasibility of daytime LGS-adaptive optics: LGS photometric measurements from the Swedish Solar Telescope, Domenico Bonaccini Calia, European Southern Observatory (Germany), et al. . . . . [10703-131]

Design of a laser guide star wavefront sensor system for NFIRAOS, Jeffrey Crane, Jenny Atwood, David R. Andersen, Peter Byrnes, Glen Herriot, Jean-Pierre Véran, NRC - Herzberg Astronomy & Astrophysics (Canada). . . . . [10703-132]

TOPTICA sodium guide star laser: new flexibilities for telescope integration, Martin Enderlein, Bernhard Ernstberger, TOPTICA Photonics AG (Germany), et al. . . . . [10703-133]

Dueling lasers! A comparative analysis of two different sodium laser technologies on sky, Eduardo Marin, Gaetano Sivo, Gemini Observatory (Chile), et al. . . . . [10703-134]

Performance prediction for a new 100-watt quasi-static solid state sodium laser for laser guide star, Lu Feng, National Astronomical Observatories, Chinese Academy of Sciences (China), et al. . . . . [10703-135]

Current status of the laser guide star upgrade at Subaru Telescope, Etsuko Mieda, Yosuke Minowa, Christophe S. Clergeon, Yoshito H. Ono, Takashi Hattori, Subaru Telescope, NAOJ (USA), et al. . . . . [10703-136]

High-resolution sodium layer profiles from the Canary project, James Osborn, Matthew J. Townson III, Durham Univ. (United Kingdom), et al. . . . . [10703-137]

Simulations of CW sodium laser guide stars with polarization modulation at Larmor frequency, Felipe Pedreros Bustos, Johannes Gutenberg Univ. Mainz (Germany), et al. . . . . [10703-138]

Confirmation of laser-induced Raman scattering at Cerro Pachon, Eduardo Marin, Gaetano Sivo, Morten Andersen, Eleazar Rodrigo Carrasco Damele, Cristian Moreno, Emmanuel Chirre, Gemini Observatory (Chile), et al. . . . . [10703-139]

Switching between two Laser Guide Star Facilities: an overview of the opto-mechanical design for the new laser beam injector at the Gemini South Observatory, Emmanuel Chirre, Cristian Moreno, Gabriel R. Pérez, Pablo Diaz, Gaetano Sivo, Eduardo Marin, Gemini Observatory (Chile), et al. . . . . [10703-141]

An experimental investigation of angular anisoplanatism of turbulent atmosphere for sodium laser guide star, Xi Luo, Institute of Optics and Electronics, Chinese Academy of Sciences (China) . . . . . [10703-142]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 8

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . TUE 10:30 AM TO 12:10 PM

AO for ELTs I

Session Chair: **Timothy J. Morris,** Durham Univ. (United Kingdom)

10:30 am: **An overview and status of GMT active and adaptive optics** *(Invited Paper)*, Antonin H. Bouchez, George Z. Angeli, GMTO Corp. (USA), et al. [10703-33]

11:00 am: **On-sky results of the next generation GMT phasing sensor prototype**, Derek A. Kopon, Brian A. McLeod, Harvard-Smithsonian Ctr. for Astrophysics (USA), et al. . . . . [10703-34]

11:20 am: **Adaptive optics program at TMT** *(Invited Paper)*, Corinne Boyer, Thirty Meter Telescope (USA) . . . . . [10703-35]

11:50 am: **Wavefront control architecture and expected performance for the TMT planetary systems imager**, Olivier Guyon, The Univ. of Arizona (USA), et al. . . . . [10703-36]

Lunch/Exhibition Break . . . . . Tue 12:10 pm to 1:40 pm

SESSION 9

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . TUE 1:40 PM TO 6:00 PM

AO for ELTs II

Session Chair: **Laura Schreiber,** INAF - Osservatorio Astronomico di Bologna (Italy)

1:40 pm: **Adaptive optics at ESO's ELT** *(Invited Paper)*, Henri M. Bonnet, Elise Vernet, Fabio Biancat-Marchet, Pierre-Yves Madec, Michael Esselborn, Enrico Marchetti, Jérôme Paufique, Miska Le Louarn, Sylvain Oberti, Stefan Stroebele, European Southern Observatory (Germany) . . . . . [10703-37]

2:10 pm: **MAORY for ELT: preliminary design overview**, Emiliano Diolaiti, Paolo Ciliegi, Renata Abicca, INAF - Osservatorio Astronomico di Bologna (Italy), et al. . . . . [10703-38]

2:30 pm: **HARMONI at the diffraction limit: from single conjugate to laser tomography adaptive optics**, Benoit Neichel, Lab. d'Astrophysique de Marseille (France), et al. . . . . [10703-39]

2:50 pm: **MICADO-MAORY SCAO: towards the preliminary design review**, Yann Clénet, Jean-Tristan M. Buey, Éric Gendron, Zoltán Hubert, Fabrice Vidal, Mathieu Cohen, Arnaud Sevin, Florian Ferreira, Pierre Baudoz, Frédéric Chapron, Napoléon Nguyen-Tuong, Vincent Deo, Pierre Fedou, Sébastien Durand, Gaele Barbary, Simone Thijs, Elsa Huby, Clément Perrot, Olivier Dupuis, Bertrand Le Ruyet, Jean-Michel Huet, Youssef Younès, Damien Gratadour, Gérard Rousset, Observatoire de Paris à Meudon (France), et al. . . . . [10703-40]

3:10 pm: **Adaptive optics for METIS**, Thomas Bertram, Peter Bizenberger, Florian Briegel, Faustine Cantalloube, María Concepción Cárdenas Vázquez, Markus Feldt, Thomas Henning, Stefan Hippler, Armin Huber, Martin Kulas, Lars Mohr, Vianak Naranjo, Johana Panduro, Ralf-Rainer Rohloff, Silvia Scheithauer, Roy van Boekel, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10703-41]

Coffee Break . . . . . Tue 3:30 pm to 4:00 pm

4:00 pm: **Status of the EST AO preparatory work**, Thomas Berkefeld, Kiepenheuer-Institut für Sonnenphysik (Germany) . . . . . [10703-42]

4:20 pm: **Phase A AO system design and performance for MOSAIC at the ELT**, Timothy J. Morris, Alastair G. Basden, Ariadna Calcines-Rosario, Durham Univ. (United Kingdom), et al. . . . . [10703-43]

4:40 pm: **Final design of the real-time controller (RTC) for the narrow field infrared adaptive optics system (NFIRAOS) for TMT**, Jennifer S. Dunn, Dan Kerley, Malcolm Smith, Edward Chapin, Glen Herriot, Jean-Pierre Veran, NRC - Herzberg Astronomy & Astrophysics (Canada), et al. . . . . [10703-44]

5:00 pm: **Prototyping AO RTC using emerging high performance computing technologies with the Green Flash project**, Damien Gratadour, Lab. d'Etudes Spatiales et d'Instrumentation en Astrophysique (France), et al. . . . . [10703-45]

5:20 pm: **An ELT scale MCAO real-time control prototype using Xeon Phi technologies**, David R. Jenkins, Alastair G. Basden, Richard M. Myers, James Osborn, Matthew J. Townson III, Andrew P. Reeves, Lazar Staykov, Edward J. Younger, Deli Geng, Nigel A. Dipper, Durham Univ. (United Kingdom), et al.. . . . . [10703-46]

5:40 pm: **A calibration source for ELT AO systems daytime functional and performance verification**, Simone Esposito, Lorenzo Busoni, Marco Bonaglia, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10703-47]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

AO FOR ELTS

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Tuesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

NFIRAOS adaptive optics for the Thirty Meter Telescope, Jeffrey Crane, David R. Andersen, Jenny Atwood, Peter Byrnes, Krzysztof Caputa, Adam Densmore, Jennifer S. Dunn, Joeleff Fitzsimmons, Tim Hardy, Glen Herriot, Brian Hoff, Kathryn Jackson, Dan Kerley, Olivier Lardière, Malcolm Smith, Jonathan Stocks, Jean-Pierre Véran, NRC - Herzberg Astronomy & Astrophysics (Canada) . . . [10703-144]

Closing the loop: creating better atmosphere models and phase screens by analyzing Gemini planetary imager telemetry, Srikar Srinath, Univ. of California, Santa Cruz (USA), et al.. . . . . [10703-145]

Opto-mechanical designs for the HARMONI adaptive optics systems, Kjetil Dohlen, Kacem El Hadi, Sandrine Pascal, Pascal Vola, Marc Llored, Lab. d'Astrophysique de Marseille (France), et al. . . . . [10703-146]

Extending the pyramid WFS to LGSs: the INGOT WFS, Roberto Ragazzoni, INAF - Osservatorio Astronomico di Padova (Italy) . . . . . [10703-147]

Experimental demonstration of enhanced broadband starlight suppression through a single-mode fiber injection unit, Nikita Klimovich, Yeyuan Xin, Jacques-Robert Delorme, Daniel Echeverri, Nemanja Jovanovic, Garreth Ruane, Dimitri Mawet, Caltech (USA) . . . . . [10703-148]

Line of sight mesospheric sodium profiles obtained from the LGS signal, for optimal ELT LGS-AO, Joschua Hellemeier, Paul Hickson, The Univ. of British Columbia (Canada), et al. . . . . [10703-150]

ELT-HIRES the high resolution spectrograph for the ELT: implementing exoplanet atmosphere reflection detection with a SCAO module, Marco Xompero, Christophe Giordano, Marco Bonaglia, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al.. . . . . [10703-151]

High contrast imaging for Python (HCIPy): an open-source adaptive optics and coronagraph simulator, Emiel H. Por, Sebastiaan Y. Haffert, Vikram Mark Radhakrishnan, David S. Doelman, Maaike van Kooten, Leiden Observatory (Netherlands) . . . . . [10703-152]

MAORY real time computer preliminary design, Italo Foppiani, Laura Schreiber, Carmelo Arcidiacono, INAF - Osservatorio Astronomico di Bologna (Italy), et al. . . . [10703-153]

Wavefront reconstruction for ELT-sized telescopes with pyramid wavefront sensors, Iuliia Shatokhina, Victoria Hutterer, Johannes Kepler Univ. Linz (Austria), et al.. . . . . [10703-154]

Fitting error analysis and performance evaluation of M4 deformable mirror, Marco Xompero, Runa Briguglio, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al.. . . . . [10703-155]

Performance analysis of the NGS WFS of MAORY, Cédric Plantet, Guido Agapito, Christophe Giordano, Lorenzo Busoni, Marco Bonaglia, Simone Esposito, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10703-156]

Real-time end-to-end AO simulations at ELT scale on multiple GPUs with the COMPASS platform, Florian Ferreira, Damien Gratadour, Arnaud Sevin, Nicolas Doucet, Eric Gendron, Fabrice Vidal, Vincent Deo, Sébastien Durand, Observatoire de Paris (France) . . . . . [10703-157]

The real time MCAO Solar prototype for the EST, Luz Maria Montoya Martínez, Sergio Velasco Muñoz, Jorge Sánchez Capuchino, Manuel Collados Vera, Luis Fernando Rodríguez-Ramos, Andres Asensio Ramos, Instituto de Astrofísica de Canarias (Spain), et al.. . . . . [10703-158]

Point spread function reconstruction simulations for laser guide star multi conjugate adaptive optics on Extremely Large Telescopes, Luc Gilles, Lianqi Wang, Corinne Boyer, Thirty Meter Telescope (USA) . . . . . [10703-159]

Modelization and identification of PSF corrected by adaptive optics systems, Florian Ferreira, Eric Gendron, Gérard Rousset, Damien Gratadour, Observatoire de Paris à Meudon (France) . . . . . [10703-160]

Performance of a scalable GPU based SCAO RTC prototype, Julien Bernard, Arnaud Sevin, Denis Perret, Maxime Lainé, Jean-Tristan M. Buey, Damien Gratadour, Observatoire de Paris (France) . . . . . [10703-161]

A new temporal control approach for SCAO systems, Markus Pöttinger, Johannes Kepler Univ. Linz (Austria). . . . . [10703-162]

Status of the preliminary design of the NGS WFS subsystem of MAORY, Marco Bonaglia, Lorenzo Busoni, Cédric Plantet, Guido Agapito, Christophe Giordano, Simone Esposito, Gianluca Di Rico, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al.. . . . . [10703-164]

MAORY LGS WFS trade-off study by numerical simulations: constraining the baseline, Christophe Verinaud, Sylvain Oberti, Miska Le Louarn, European Southern Observatory (Germany), et al. . . . . [10703-165]

The vibration environment of the Large Binocular Telescope adaptive optics system, Pedro Escárate, Julian C. Christou, John M. Hill, Gustavo Rahmer, Douglas L. Miller, Gregory E. Taylor, Large Binocular Telescope Observatory (USA) . . . . . [10703-166]

Next generation adaptive optics: a low-voltage ASIC driver for MEMS deformable mirrors, Colin Ross, Scott Chapman, Dalhousie Univ. (Canada), et al.. . . . . [10703-167]

MAORY for ELT: preliminary mechanical design of the support structure, Vincenzo De Caprio, INAF - Osservatorio Astronomico di Capodimonte (Italy), et al.. . . . . [10703-168]

Numerical simulations of MAORY MCAO module for the ELT, Carmelo Arcidiacono, Laura Schreiber, Giovanni Bregoli, Italo Foppiani, INAF - Osservatorio Astronomico di Bologna (Italy), et al.. . . . . [10703-169]

MAORY requirements flow down and technical budgets, Fausto Cortecchia, INAF - Osservatorio Astronomico di Bologna (Italy), et al. . . . . [10703-265]

Estimation of polarization aberrations from the telescope optics and it's effect on the point spread function of the Thirty Meter Telescope, Ramya M. Anche, G.C. Anupama, Sriram S, K. Sankarasubramanian, Indian Institute of Astrophysics (India). . . . . [10703-266]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 10

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . WED 10:30 AM TO 12:20 PM

Advances in AO Control I

Session Chair: **Miska Le Louarn,** European Southern Observatory (Germany)

10:30 am: **Overview of multi-conjugate adaptive optics reconstructors** *(Invited Paper)*, Clementine Bechet, Pontificia Univ. Católica de Chile (Chile) . . . [10703-48]

11:00 am: **Combined calibration of the Island effect and low-order aberrations with closed-loop focal plane wavefront control on Subaru/SCExAO,** Mamadou N'Diaye, Frantz Martinache, Observatoire de la Côte d'Azur (France), et al.. . . . . [10703-49]

11:20 am: **Dealing with Spiders on ELTs: using a Pyramid WFS to overcome residual piston effects**, Andreas Obereder, Stefan Raffetseder, Johann Radon Institute for Computational and Applied Mathematics (Austria), et al. . . . [10703-50]

11:40 am: **The compute and control for adaptive optics (CACAO) real-time control software package**, Olivier Guyon, The Univ. of Arizona (USA), et al.. . . . . [10703-51]

12:00 pm: **Wavefront reconstruction and prediction with convolutional neural networks**, Robin Swanson, Univ. of Toronto (Canada), et al. . . . . [10703-52]

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

SESSION 11

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . .WED 1:50 PM TO 5:00 PM

Advances in AO Control II

Session Chairs: **Yutaka Hayano,** Advanced Technology Ctr., NAOJ (Japan); **Antonin H. Bouchez,** GMTO Corp. (USA)

1:50 pm: **The AO in AOF** *(Invited Paper)*, Sylvain Oberti, Johann Kolb, Pierre-Yves Madec, Miska Le Louarn, Lorenzo Pettazzi, European Southern Observatory (Germany), et al. . . . . [10703-53]

2:20 pm: **Adaptive gain in closed-loop tilt control and adaptive optics**, Dennis A. Montera, Air Force Research Lab. (USA) . . . . . [10703-54]

2:40 pm: **Innovative real-time processing for solar adaptive optics**, Éric M. Thiébaut, Ctr. de Recherche Astronomique de Lyon (France), et al. . . . . [10703-55]

3:00 pm: **Status of point spread function determination for Keck adaptive optics**, Sam Ragland, Peter L. Wizinowich, W. M. Keck Observatory (USA), et al. . . . . [10703-59]

Coffee Break . . . . . Wed 3:20 pm to 3:50 pm

3:50 pm: **The multi-object adaptive optics system for the GIRMOS spectrograph on Gemini-South**, Scott Chapman, Dalhousie Univ. (Canada), et al.. . . . . [10703-56]

4:10 pm: **Active speckle control with microwave kinetic inductance detectors**, Neelay Fruitwala, Univ. of California, Santa Barbara (USA), et al. . . . . [10703-57]

4:30 pm: **Advanced control laws for the new generation of AO systems** *(Invited Paper)*, Carlos M. Correia, Lab. d'Astrophysique de Marseille (France) . . . . . [10703-58]

SESSION 12

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . WED 5:00 PM TO 5:40 PM

Point Spread Function Reconstruction

5:00 pm: **LLAMAS: extremely low latency adaptive optics at LLNL**, S. Mark Ammons, Lisa A. Poyneer, Doug Homoelle, Brian J. Bauman, Robert Panas, Greg Burton, Paul Pax, Brian Hackel, Jay Dawson, Lawrence Livermore National Lab. (USA) . . . . . [10703-60]

5:20 pm: **PSF reconstruction applied to the integral field spectrograph Keck/OSIRIS**, Anna Ciurlo, Tuan Do, Gunther Witzel, Univ. of California, Los Angeles (USA), et al. . . . . [10703-61]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Wednesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Wednesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

ADVANCES IN AO CONTROL

Scalable soft real-time supervisor module for tomographic AO, Nicolas Doucet, Damien Gratadour, Observatoire de Paris (France), et al. . . . . [10703-170]

Fourier wavefront reconstruction with a Pyramid wavefront sensor, Charlotte Z. Bond, Institute for Astronomy (USA), et al.. . . . . [10703-171]

Optimization of contrast in adaptive optics for exoplanet imaging, Vikram Mark Radhakrishnan, TNO Science and Industry (Netherlands) and Leiden Univ. (Netherlands), et al.. . . . . [10703-172]

Rolling shutter detector data flow strategies to push the limits of AO performance, Markus Dirnberger, François Rigaut, The Australian National Univ. (Australia), et al.. . . . . [10703-173]

Analysis of AO modeling for pseudo-synthetic interaction matrix at the LBT, Cedric Heritier, Simone Esposito, Enrico Pinna, Guido Agapito, Alfio T. Puglisi, Runa Briguglio, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . [10703-174]

Ultra-low latency real-time control system for adaptive optics, Tuan N. Truong, Jet Propulsion Lab. (USA) . . . . . [10703-175]

The calibration procedure of the LINC-NIRVANA ground and high layer WFS, Carmelo Arcidiacono, INAF - Osservatorio Astronomico di Bologna (Italy), et al.. . . . . [10703-176]

Optical distortion calibration for 'imaka, Maxwell Service, Mark R. Chun, Institute for Astronomy (USA), et al. . . . . [10703-177]

High level adaptive optics supervision software for fast transition to optimal performance, Visa A. Korkiakoski, The Australian National Univ. (Australia) and SERC Ltd. (Australia), et al.. . . . . [10703-178]

An integrated identification and predictive control strategy for high wind velocity adaptive optics applications, Jesse Cranney, The Univ. of Newcastle (Australia) and Space Environment Research Ctr. (Australia), et al. . . . . [10703-179]

Adaptive optics for high precision polarimetry, Marco Stangalini, Fernando Pedichini, Roberto Piazzesi, Ilaria Ermolli, Fabrizio Giorgi, INAF - Osservatorio Astronomico di Roma (Italy), et al. . . . . [10703-180]

EMCCD in-situ periodic characterization while integrated in Shack Hartmann wave front sensor for GTC AO, Óscar Tubío Araújo, Miguel Núñez Cagigal, Roberto Manuel Luis Simoes, José Marco de la Rosa, Marta Puga Antolín, Marcos Reyes García-Talavera, Luis Fernando Rodríguez-Ramos, Josefina Rosich Minguell, Roberto López López, Jesús Patrón Recio, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10703-182]

dOTF for ALTAIR non-common path aberrations calibration, Laure Catala, South African Astronomical Observatory (South Africa), et al. . . . . [10703-183]

EXTREME AO

The optical mechanical design of the extreme AO System MagAO-X, Laird M. Close, Jared R. Males, Kelsey L. Miller, The Univ. of Arizona (USA), et al.. . . . . [10703-184]

Modeling coronagraphic extreme wavefront control systems for high contrast imaging in ground and space telescope missions, Jennifer Lumbres, College of Optical Sciences, The Univ. of Arizona (USA), et al.. . . . . [10703-185]

Subaru coronagraphic extreme-AO (SCExAO) wavefront control: current status and ongoing developments, Ananya Sahoo, Olivier Guyon, Christophe S. Clergeon, Nour Skaf, Yosuke Minowa, Julien Lozi, Subaru Telescope, NAOJ (USA), et al.. . . . . [10703-187]

Fast focal plane wavefront sensing on ground-based telescopes, Benjamin L. Gerard, Univ. of Victoria (Canada), et al.. . . . . [10703-188]

The Exo-Life Finder (ELF) Telescope: new strategies for extreme adaptive optics and cophasing for an extremely large telescope dedicated to high contrast imaging, Maud Langlois, Gil Moretto, Ctr. de Recherche Astronomique de Lyon (France), et al.. . . . . [10703-189]

New strategies to optimize the Mach-Zehnder wavefront sensor for extreme adaptive optics with the ELTs, Maud Langlois, Ctr. de Recherche Astronomique de Lyon (France), et al. . . . . [10703-190]

Nonlinear control with an unmodulated pyramid wavefront sensor, Richard A. Frazin, Univ. of Michigan (USA), et al.. . . . . [10703-191]

Optical field/pupil rotator with a novel compact K-mirror for MagAO-X, Alexander D. Hedglen, College of Optical Sciences, The Univ. of Arizona (USA), et al.. . . . . [10703-192]

Air, telescope, and instrument temperature effects on the Gemini Planet Imager's image quality, Melisa Tallis, Stanford University (USA), et al. [10703-267]

The segmented pupil experiment for exoplanet detection: 3. laboratory results with segments cophasing control and monitoring, Patrice Martinez, Marina Yu. Postnikova, Carole Gouvret, Lab. J.L. Lagrange (France), et al.. . . . . [10703-268]

Optimizing optics and opto-mechanical mounting to minimize static aberrations in high-contrast instruments, Daniel Echeverri, Nemanja Jovanovic, Jacques-Robert Delorme, Jason Fucik, Caltech (USA), et al.. . . . . [10703-269]

SCExAO, an instrument with a dual purpose: perform cutting-edge science and develop new technologies, Julien Lozi, Subaru Telescope, NAOJ (USA), et al.. . . . . [10703-270]

Characterization of deformable mirrors for the MagAO-X project, Kyle Van Gorkom, Kelsey L Miller, Alexander T Rodack, Jennifer Lumbres, Justin Knight, College of Optical Sciences, The Univ. of Arizona (USA) and Steward Observatory, The Univ. of Arizona (USA), et al. . . . . [10703-272]

Characterizing CCD and CMOS detectors for MagAO-X, Christopher Bohlman, Jared R Males, Kevin Perez, Anna L Sanchez, Kelsey Miller, Univ of Arizona (USA) . . . . . [10703-273]

Stirling cycle cryocooler exported vibration analysis, Annino Vaccarella, Robert Sharp, Robert Boz, The Australian National Univ. (Australia) . . . . . [10703-274]

Effect of multiple deformable mirrors in broadband high-contrast coronagraphs, Chris de Jonge, SRON Netherlands Institute for Space Research (Netherlands), et al.. . . . . [10703-275]

Discretized aperture mapping for wavefront sensing, Fabien Patru, Observatoire de Paris (France), et al. . . . . [10703-276]

WAVEFRONT SENSING

The DKIST low order wavefront sensor, Erik M. Johansson, Keith Cummings, Mark Drobilek, Luke C. Johnson, Rachel Rampy, Friedrich Woeger, National Solar Observatory (USA). . . . . [10703-194]

Laboratory and on-sky results of the MCAO partial illumination issue and wind predictive wavefront control, Kalyan Kumar Radhakrishnan Santhakumari, Thomas M. Herbst, Thomas Bertram, Max-Planck-Institut für Astronomie (Germany), et al. . . . . [10703-195]

First on-sky results, performance and future of the HiCIBaS - LOWFS, Guillaume Allain, Denis Brousseau, Simon Thibault, Cédric Vallée, Mireille Ouellet, Univ. Laval (Canada), et al. . . . . [10703-196]

Freeform lenslet array solution for LGS spot elongation in ELTs, Robert G. Sharp, François Rigaut, Ian Price, The Australian National Univ. (Australia). . . . . [10703-197]

Effects of the telescope spider on extreme adaptive optics systems with pyramid wavefront sensors, Byron Engler, Stephen J. Weddell, Univ. of Canterbury (New Zealand), et al.. . . . . [10703-198]

A new technique to retrieve non-linear phase, Mala Mateen, Air Force Research Lab. (USA), et al. . . . . [10703-199]

Using an imaging Shack-Hartmann wavefront sensor to tomographically measure turbulence across an extended scene, Phillip Scott, Madison A. Jean, Zachary Waters, Michael Hart, Lauren Schatz, The Univ. of Arizona (USA) . . . . . [10703-200]

On-sky adaptive optics with a geometric wavefront sensor, Carlos Colodro-Conde, Sergio Velasco Muñoz, Roberto López López, Alejandro Oscoz, Rafael Rebolo López, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10703-201]

Demonstration of a photonic lantern low order wavefront sensor using an adaptive optics testbed, Mark Corrigan, Timothy J. Morris, Durham Univ. (United Kingdom), et al. . . . . [10703-202]

Spatial filtering applied to the pyramid WFS: simulations and preliminary results, Daniele Vassallo, INAF - Osservatorio Astronomico di Padova (Italy) and Univ. degli Studi di Padova (Italy) and ADONI - ADaptive Optics National laboratory in Italy (Italy), et al.. . . . . [10703-203]

Applications of the phase diversity technique to estimate the non-common path aberrations in the Gemini planet imager, Masen P. Lamb, Dunlap Institute for Astronomy & Astrophysics (Canada), et al. . . . . [10703-204]

Solar MCAO with a single sensor: simulating tomographic reconstruction with the plenoptic camera, Noelia Martínez Rey, Luis Fernando Rodríguez-Ramos, Instituto de Astrofísica de Canarias (Spain) . . . . . [10703-205]

On-sky compensation of non-common path aberrations with the ZELDA wavefront sensor in VLT/SPHERE, Arthur Vigan, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10703-206]

EMCCD for Pyramid wavefront sensor: laboratory characterization, Tommaso Mazzoni, Guido Agapito, Enrico Pinna, Alfio Puglisi, Fabio Rossi, INAF - Osservatorio Astrofisico di Arcetri (Italy) . . . . . [10703-207]

A fast wavefront reconstructor for the nonlinear curvature wavefront sensor, Johanan L. Codona, The Univ. of Arizona (USA), et al.. . . . . [10703-208]

The latency measurement of wavefront sensor camera and its impact on the performance of an adaptive optical system, Jessica R. Zheng, Michael Goodwin, Australian Astronomical Observatory (Australia), et al. . . . . [10703-209]

Low light level quadriwave lateral shearing interferometer for in-situ wavefront sensing in flight, Brian Catanzaro, CFE Services (USA), et al. . . . . [10703-210]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 13

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . THU 10:30 AM TO 12:10 PM

Extreme AO

Session Chair: **Mamadou N'Diaye,** Observatoire de la Côte d'Azur (France)

10:30 am: **A possible VLT-SPHERE XAO upgrade: going faster, going fainter, going deeper**, Jean-Luc Beuzit, David Mouillet, Institut de Planétologie et d'Astrophysique de Grenoble (France), et al. . . . . [10703-62]

10:50 am: **Statistical analysis and lessons learned of SPHERE adaptive optics performance**, David Mouillet, Institut de Planétologie et d'Astrophysique de Grenoble (France), et al. . . . . [10703-63]

11:10 am: **Simulating high dispersion coronagraphy (HDC) observations for large ground-based telescopes**, Ji Wang, Dimitri Mawet, Caltech (USA)[10703-64]

11:30 am: **A laser communication adaptive optics system as a testbed for extreme adaptive optics**, Lewis C. Roberts Jr., Jennifer E. Roberts, Santos F. Fregoso, Tuan N. Truong, Harrison Herzog, Gary L. Block, Joshua D. Rodriguez, Seth R. Meeker, Jonathan A. Tesch, Jet Propulsion Lab. (USA) . . . . . [10703-65]

11:50 am: **Wavefront sensing and control strategies for high-contrast imaging on the MagAO-X instrument**, Kelsey L. Miller, Steward Observatory, The Univ. of Arizona (USA) and College of Optical Sciences, The Univ. of Arizona (USA), et al.. . . . . [10703-66]

Lunch/Exhibition Break . . . . . Thu 12:10 pm to 1:40 pm

SESSION 14

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . THU 1:40 PM TO 5:30 PM

Wavefront Sensing

Session Chairs: **Thomas Berkefeld,** Kiepenheuer-Institut für Sonnenphysik (Germany); **Simone Esposito,** INAF - Osservatorio Astrofisico di Arcetri (Italy)

1:40 pm: **Review of high-contrast imaging systems for current and future ground-based and space-based telescopes II: common path wavefront sensing/control and coherent differential imaging** *(Invited Paper)*, Nemanja Jovanovic, Caltech (USA), et al. . . . . [10703-67]

2:10 pm: **C-RED 2 InGaAs 640x512 600-fps infrared camera for low order wavefront sensing**, Philippe Feautrier, Jean-Luc Gach, First Light Imaging S.A.S. (France) . . . . . [10703-68]

2:30 pm: **Update on development of WFS cameras at ESO for the ELT**, Mark Downing, Mark Casali, Enrico Marchetti, Leander Mehrgan, Javier Reyes, European Southern Observatory (Germany) . . . . . [10703-69]

2:50 pm: **Error breakdown of ELT-elongated LGS wavefront-sensing using CANARY on-sky measurements**, Lisa Bardou, Éric Gendron, Gérard Rousset, Damien Gratadour, Observatoire de Paris (France), et al. . . . . [10703-70]

3:10 pm: **The MAORY laser guide star wavefront sensor: design status**, Laura Schreiber, INAF - Osservatorio Astronomico di Bologna (Italy), et al. . . . [10703-71]

Coffee Break . . . . . Thu 3:30 pm to 4:00 pm

4:00 pm: **Adaptive optics with an infrared pyramid wavefront sensor** *(Invited Paper)*, Charlotte Z. Bond, Institute for Astronomy (USA), et al.. . . . . [10703-72]

4:30 pm: **A modal approach to optical gain compensation for the pyramid wavefront sensor**, Vincent Deo, Fabrice Vidal, Éric Gendron, Jean-Tristan M. Buey, Zoltán Hubert, Damien Gratadour, Lab. d'Etudes Spatiales et d'Instrumentation en Astrophysique (France), et al. . . . . [10703-73]

4:50 pm: **Assessing the fundamental sensitivities of different pyramid wavefront sensor architectures**, Lauren Schatz, College of Optical Sciences, The Univ. of Arizona (USA), et al. . . . . [10703-74]

5:10 pm: **Analysis and mitigation of the influence of pupil discontinuities on adaptive optics performance**, Noah Schwartz, UK Astronomy Technology Ctr. (United Kingdom), et al.. . . . . [10703-75]

CONFERENCE 10703

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Thursday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Thursday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

PATHFINDERS FOR AO

Wavefront sensing and adaptive optics for solar prominences, Dirk Schmidt, Thomas R. Rimmele, National Solar Observatory (USA), et al. . . . . [10703-211]

Lab demonstration and characterization of CAWS: a field-modulated point-diffraction interferometer in a polychromatic high-order closed-loop adaptive optics system, Nicolás S. Dubost, Cornelis M. Dubbeldam, Nazim Ali Bharmal, Alastair G. Basden, Daniel A. Hölck-Santibanez, Richard M. Myers, Durham Univ. (United Kingdom). . . . . [10703-212]

A Segmented MCAO concept: toward visible observations for the VLT-AOF, Yoann Brûlé, Benoit Neichel, Thierry Fusco, Carlos M. Correia, Lab. d'Astrophysique de Marseille (France), et al. . . . . [10703-213]

CACAO: a generic low-cost adaptive optics system for small aperture telescopes, Jamie Soon, François Rigaut, The Australian National Univ. (Australia). . . . . [10703-214]

CHOUGH: current status and future plans, Nazim Ali Bharmal, Richard M. Myers, Daniel A. Hölck-Santibanez, Cornelis M. Dubbeldam, Alastair G. Basden, Nicolás S. Dubost, Durham Univ. (United Kingdom), et al. . . . . [10703-215]

The adaptive optics lucky imager (AOLI): presentation, commissioning and AIV innovations, Sergio Velasco Muñoz, Carlos Colodro-Conde, Roberto López López, Alejandro Oscoz, Rafael Rebolo-López, Instituto de Astrofísica de Canarias (Spain), et al.. . . . . [10703-216]

PPPP: an on-sky experiment for a zero-cone effect LGS alternative, Nazim Ali Bharmal, Richard M. Myers, Huizhe Yang, Durham Univ. (United Kingdom), et al.. . . . . [10703-217]

Simulation of cascaded AO systems for high contrast imaging, Miska Le Louarn, Nelly Cerpa, Markus Kasper, European Southern Observatory (Germany) . . . . . [10703-218]

Concept of a MCAO module for a visible imager and spectrograph for the VLT, Lorenzo Busoni, Marco Bonaglia, Guido Agapito, Christophe Giordano, Simone Esposito, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al. . . . . [10703-219]

Uplink correction demonstrator: test bench and experimental results, Noelia Martínez Rey, Luis Fernando Rodríguez-Ramos, Instituto de Astrofísica de Canarias (Spain) . . . . . [10703-220]

A flexible adaptive optics concept for general purpose high angular resolution science, Laurent Jolissaint, Audrey Tiphaine Bouxin, HEIG-VD (Switzerland), et al. . . . . [10703-221]

DKIST solar multi-conjugate adaptive optics system: simulation results, José Marino, Dirk Schmidt, National Solar Observatory (USA) . . . . . [10703-222]

Design and development of IR camera for RoboAO, Jyotirmay Paul, Anamparambu N. Ramaprakash, H. K. Das, Mahesh P. Burse, Pravin A. Chordia, Pravin Khodade, Abhay Kohok, Deepa Modi, Sujit P. Punnadi, Chaitanya V. Rajarshi, Inter-Univ. Ctr. for Astronomy and Astrophysics (India). . . . . [10703-224]

Developing new adaptive secondary electronics for the MAPS project, Philip M. Hinz, Elwood C. Downey, Oscar Montoya, Keith Powell, Eckhart Spalding, The Univ. of Arizona (USA) . . . . . [10703-226]

ALIOLI: The aligerated version of AOLI, Sergio Velasco Muñoz, Roberto López López, Alejandro Oscoz, Carlos Colodro-Conde, Instituto de Astrofísica de Canarias (Spain) . . . . . [10703-227]

Feasibility and motivations for a visible MCAO system on the VLT, François Rigaut, The Australian National Univ. (Australia), et al. . . . . [10703-271]

CHARACTERIZATION, MEASUREMENT AND MODELING OF THE DISTURBANCES FACED BY AO

Turbulence profiling with non-Kolmogorov statistics for Extremely Large telescopes, Carlos M. Correia, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10703-228]

Deconstructing turbulence and optimising GLAO using imaka telemetry, Olivier Lai, Observatoire de la Côte d'Azur (France), et al.. . . . . [10703-229]

Characterization of lemniscate atmospheric aberrations in Gemini Planet Imager (GPI) data, Alexander Madurowicz, Bruce A. Macintosh, Jean-Baptiste Ruffio, Jeffery Chilcote, Stanford Univ. (USA), et al. . . . . [10703-230]

Introducing a temporal technique for measuring the outer scale profile, Douglas J. Laidlaw, James Osborn, Timothy J. Morris, Timothy Butterley, Matthew J. Townson III, Richard W. Wilson, Durham Univ. (United Kingdom) . . . [10703-231]

Improvements to MASS turbulence profile estimation at Paranal, Timothy Butterley, Durham Univ. (United Kingdom), et al. . . . . [10703-232]

Investigation on impact of filtering techniques on performances of forecasts of atmospheric parameters applied to the queue-scheduling of ground-based telescopes, Alessio Turchi, Gianluca Martelloni, Elena Masciadri, INAF - Osservatorio Astrofisico di Arcetri (Italy) . . . . . [10703-233]

LIDAR Site profiling, or sub-100m vertical resolution, in any direction, at any time, Nazim Ali Bharmal, Durham Univ. (United Kingdom). . . . . [10703-234]

Determination of the residual and static aberrations of an adaptive-optics integral field spectrograph, Beatriz S. Sánchez, Alan M. Watson, Salvador Cuevas Cardona, Univ. Nacional Autónoma de México (Mexico) . . . . . [10703-235]

Toward a complete atmospheric turbulence profiles characterization using PML instrument, Malak Ben Rahhal, Aziz Ziad, Éric Aristidi, Julien Chabé, Julien Borgnino, Yan Fantéï-Caujolle, Lab. J.L. Lagrange (France), et al.. . . . . [10703-236]

CATS: an autonomous station for atmospheric turbulence characterization, Aziz Ziad, Julien Chabé, Yan Fantéï-Caujolle, Éric Aristidi, Catherine Renaud, Malak Ben Rahhal, Lab. J.L. Lagrange (France) . . . . . [10703-237]

Towards the forecast of atmospheric parameters and optical turbulence above an astronomical site on 24h time scale, Gianluca Martelloni, Elena Masciadri, Alessio Turchi, INAF - Osservatorio Astrofisico di Arcetri (Italy) . . . . . [10703-238]

Automated wind speed and direction profiling using AO telemetry, Douglas J. Laidlaw, James Osborn, Timothy J. Morris, Nazim Ali Bharmal, Urban Bitenc, Timothy Butterley, Durham Univ. (United Kingdom), et al. . . . . [10703-239]

The site of the VLT according to Stereo-SCIDAR, James Osborn, Timothy Butterley, Durham Univ. (United Kingdom), et al. . . . . [10703-240]

Monitoring the low wind effect on the Starfire Optical Range 3.5-m Telescope, Mala Mateen, Robert L. Johnson, Lee Kann, Miles Buckman, Air Force Research Lab. (USA) . . . . . [10703-241]

The characterization of the Zernike modes at the focal plane for Extremely Large telescopes projects, Marcelo Leigui de Oliveira, João P. S. Gabriel, Univ. Federal do ABC (Brazil) . . . . . [10703-242]

Vibration model identification using the maximum likelihood method, Karen Gonzalez, Univ. Técnica Federico Santa María (Chile), et al. . . . . [10703-243]

Evaluating atmospheric coherence time from LBT AO correction telemetry, Amali Vaz, Philip M. Hinz, Eckhart Spalding, Katie M. Morzinski, Jordan Stone, Steve Ertel, The Univ. of Arizona (USA). . . . . [10703-244]

DAG-TGI: turbulence generator instrument for DAG (Eastern Anatolia Observatory), Cahit Yeşilyaprak, Atatürk Üniv. (Turkey), et al. . . . . [10703-246]

Turbulence monitoring at the Plateau de Calern with the GDIMM instrument, Éric Aristidi, Yan Fantéï-Caujolle, Julien Chabé, Lab. J.L. Lagrange (France), et al.. . . . . [10703-247]

First seasonal study of solar seeing and wind speed vertical distribution at Baikal Astrophysical Observatory, Vladimir P. Lukin, Lidia Bolbasova, Eugenii Kopylov, V.E. Zuev Institute of Atmospheric Optics (Russian Federation), et al.. . . . . [10703-248]

Design of micro displacement measurement system for large aperture adaptive mirror, Heng Zuo, Zhimin Liu, Nanjing Institute of Astronomical Optics & Technology (China) . . . . . [10703-249]

Measuring atmospheric turbulence with LuSci, Hualin Chen, Nanjing Institute of Astronomical Optics & Technology (China). . . . . [10703-250]

Tropospheric seeing effects on site selection and adaptive optics for solar telescopes, Jacques M. Beckers, The Univ. of Arizona (USA) . . . . . [10703-251]

WAVEFRONT CORRECTORS

Demonstration of a speckle nulling algorithm and Kalman filter estimator with a fiber injection unit for observing exoplanets with high-dispersion coronagraphy, Yeyuan Xin, Nikita Klimovich, Dimitri Mawet, Garreth Ruane, Jacques-Robert Delorme, Nemanja Jovanovic, Jorge D. Llop Sayson, Caltech (USA) . . . . . [10703-252]

Cryo micro-deformable mirrors for next generation AO systems, Frédéric Zamkotsian, Patrick Lanzoni, Rudy Barette, Lab. d'Astrophysique de Marseille (France), et al. . . . . [10703-253]

Characterization of deformable mirrors for the NAOMI VLTI auxiliary telescopes adaptive optics systems, Jean-Baptiste Le Bouquin, Institut de Planétologie et d'Astrophysique de Grenoble (France) and Univ. of Michigan (USA), et al.. . . . . [10703-254]

Wavefront control for minimization of speckle coupling into a fiber injection unit based on the electric field conjugation algorithm, Jorge D. Llop Sayson, Caltech (USA), et al. . . . . [10703-255]

The crystal ball, the spider and other stories: going around the test tower of the M4 adaptive mirror, Runa Briguglio, Marco Xompero, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al.. . . . . [10703-256]

Multi-actuator adaptive lens in astronomy: in lab test results, Demetrio Magrin, INAF - Osservatorio Astronomico di Padova (Italy), et al.. . . . . [10703-257]

Testing and characterization of deformable mirrors, Lewis C. Roberts Jr., Camilo Mejia Prada, Jean Chris Shelton, Jet Propulsion Lab. (USA), et al.. . . . . [10703-258]

GTCAO real time AO closed loop software implementation and computer performance analysis, José Marco de la Rosa, Miguel Núñez Cagigal, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10703-259]

A CVD SiC deformable mirror with monolithic waterline for adaptive optics, Kyohoon Ahn, Univ. of Science and Technology (Korea, Republic of) and Korea Research Institute of Standards and Science (Korea, Republic of), et al.[10703-260]

Calibration and test procedures for the NFIRAOS deformable mirror prototypes, Kathryn Jackson, Olivier Lardière, Jeffrey Crane, Jean-Pierre Véran, David R. Andersen, Glen Herriot, NRC - Herzberg Astronomy & Astrophysics (Canada) . . . . . [10703-261]

A possible concept for the day-time calibration and co-phasing of the adaptive M4 mirror at the E-ELT Telescope, Runa Briguglio, INAF - Osservatorio Astrofisico di Arcetri (Italy), et al.. . . . . [10703-262]

Active metal mirror for future large UVOIR space telescopes, Matthias Goy, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany), et al.. . . . . [10703-263]

Non-contact displacement measure method based on eddy current sensors in the large aperture adaptive mirror system, Heng Zuo, Guoping Li, Nanjing Institute of Astronomical Optics & Technology (China), et al.. . . . . [10703-264]

FRIDAY 15 JUNE

SESSION 15

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . FRI 9:10 AM TO 12:00 PM

Pathfinders for AO

Session Chair: **Dimitri Mawet,** Caltech (USA)

9:10 am: **On-sky results of high-dispersion integral-field spectroscopy and high-contrast imaging with the Leiden EXoplanet Instrument(LEXI)**, Sebastiaan Y. Haffert, Michael J. Wilby, Christoph U. Keller, Ignas A. G. Snellen, David S. Doelman, Emiel H. Por, Joost Wardenier, Fedde Fagginger Auer, Leiden Univ. (Netherlands) . . . . . [10703-76]

9:30 am: **A conceptual design study for Subaru Ultimate GLAO**, François Rigaut, The Australian National Univ. (Australia), et al. . . . . [10703-77]

9:50 am: **Closed loop operation with extremely elongated LGS spots in CANARY Phase D,** Alastair G. Basden, Durham Univ. (United Kingdom), et al.. . . . . [10703-78]

Coffee Break . . . . . Fri 10:10 am to 10:40 am

10:40 am: **From Clear to DKIST: advancing solar MCAO from 1.6 meters to 4 meters**, Dirk Schmidt, José Marino, National Solar Observatory (USA), et al.. . . . . [10703-79]

11:00 am: **The Robo-AO-2 facility for rapid visible/near-infrared imaging and the demonstration of hybrid techniques**, Christoph Baranec, Institute for Astronomy (USA) . . . . . [10703-80]

11:20 am: **The Copernico Telescope testing facility for AO on-sky demonstrations,** Simonetta Chinellato, Roberto Ragazzoni, Jacopo Farinato, Federico Biondi, Davide Greggio, Marco Dima, Maria Bergomi, Elena Carolo, Demetrio Magrin, Luca Marafatto, Elisa Portaluri, Gabriele Umbriaco, Daniele Vassallo, Valentina Viotto, Stefano Benetti, Enrico Cappellaro, Venerio Chiomento, Aldo Frigo, Giorgio Martorana, Mauro Rebeschini, Lina Tomasella, Luciano Traverso, Massimo Turatto, INAF - Osservatorio Astronomico di Padova (Italy) . . . . . [10703-81]

11:40 am: **Experimental validation of the non-linear dark hole on the THD bench**, Olivier Herscovici-Schiller, ONERA (France), et al.. . . . . [10703-82]

Lunch Break . . . . . Fri 12:00 pm to 1:30 pm

SESSION 16

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . FRI 1:30 PM TO 4:30 PM

Characterization, Measurement and Modeling of the Disturbances Faced by AO

Session Chairs: **Elena Masciadri,** INAF - Osservatorio Astrofisico di Arcetri (Italy); **Laura Schreiber,** INAF - Osservatorio Astronomico di Bologna (Italy)

1:30 pm: **Low wind effect on VLT/SPHERE : impact, mitigation strategy with a low-emissivity coating applied to the spiders of UT3, and results** *(Invited Paper)*, Julien Milli, European Southern Observatory (Chile), et al.. . . . . [10703-83]

2:00 pm: **Optimizing multi-LGS WFS AO performance in the context of sodium profile evolution and non-common path aberration**, Lianqi Wang, Thirty Meter Telescope (USA), et al. . . . . [10703-84]

2:20 pm: **Implications for contrast as a result of the wind vector and non-stationary turbulence**, Maaike van Kooten, Leiden Observatory (Netherlands), et al.. . . . . [10703-85]

2:40 pm: **On-sky results of the AOF online profiler**, Andrés Guesalaga, Pontificia Univ. Católica de Chile (Chile), et al. . . . . [10703-86]

3:00 pm: **Representative atmospheric turbulence profiles for ESO Paranal**, Ollie Farley, James Osborn, Richard W. Wilson, Timothy Butterley, Douglas J. Laidlaw, Matthew J. Townson III, Timothy J. Morris, Saavidra Perera, Durham Univ. (United Kingdom), et al. . . . . [10703-87]

Coffee Break . . . . . Fri 3:20 pm to 3:50 pm

3:50 pm: **Automated wind speed and direction profiling using AO telemetry**, Douglas J. Laidlaw, James Osborn, Matthew J. Townson III, Durham Univ. (United Kingdom), et al. . . . . [10703-88]

4:10 pm: **Point spread function reconstruction coupling AO telemetry and focal plane images**, Olivier A. Martin, Carlos M. Correia, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10703-89]

SESSION 17

LOCATION: CC LEVEL 3, ROOM 9B/C . . . . . FRI 4:30 PM TO 5:10 PM

Wavefront Correctors

Session Chair: **Laura Schreiber,** INAF - Osservatorio Astronomico di Bologna (Italy)

4:30 pm: **Recent progress in compact electro-magnetic deformable mirrors,** Marie Laslandes, Pierre Mahiou, Julien Charton, ALPAO S.A.S. (France) [10703-90]

4:50 pm: **Prototyping of large deformable mirrors for TMT: test results**, Hubert Pagès, Tarik Aribi, Arnaud Bastard, Emmanuel Beaufort, Gabrielle Dutey, Catherine Grèzes-Besset, Denis Groeninck, Jean-Michel Guinet, Hélène Krol, Aurélien Moreau, Pierre Morin, Richard Palomo, Jean-Christophe Sinquin, Stéphane Vaillant, Ronan Wehrlé, CILAS (France) . . . . . [10703-91]

CONFERENCE 10704

Monday–Friday 11–15 June 2018 • Proceedings of SPIE Vol. 10704

Observatory Operations: Strategies, Processes, and Systems VII

Conference Chairs: **Alison B. Peck,** Gemini Observatory (USA); **Robert L. Seaman,** Lunar and Planetary Lab., The Univ. of Arizona (USA); **Chris R. Benn,** Isaac Newton Group of Telescopes (Spain)

Program Committee: **Raffaele D'Abrusco,** Smithsonian Astrophysical Observatory/Chandra X-ray Ctr. (USA); **David S. Adler,** Space Telescope Science Institute (USA); **Todd Boroson,** Las Cumbres Observatory Global Telescope Network (USA); **Dennis R. Crabtree,** National Research Council Canada (Canada); **Antonio Chrysostomou,** SKA Organisation (United Kingdom); **Daisuke Iono,** National Astronomical Observatory of Japan (Japan); **Andreas Kaufer,** European Southern Observatory (Chile); **Lisa J. Storrie-Lombardi,** Jet Propulsion Lab. (USA); **Christian Veillet,** Large Binocular Telescope Observatory (USA); **Beth Willman,** LSST/Univ. of Arizona (USA)

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 1

LOCATION: CC LEVEL 3, ROOM 9A . . . . . MON 10:30 AM TO 12:10 PM

Operations and Data Quality Control I

Session Chair: **Alison B. Peck,** Gemini Observatory (USA)

10:30 am: **Long-term monitoring of throughput in Las Cumbres Observatory's Fleet of telescopes**, Daniel R. Harbeck, Curtis McCully, Andrew Pickles, Nikolaus Volgenau, Las Cumbres Observatory Global Telescope Network (USA) . . [10704-1]

10:50 am: **Finding fault: 19 years of fault-tracking during night operations at the Subaru Telescope**, Thomas Winegar, Subaru Telescope, NAOJ (USA) . . . . . [10704-2]

11:10 am: **VLT Unit Telescopes performance monitoring**, Vittorio Nurzia, European Southern Observatory (Chile) . . . . . [10704-3]

11:30 am: **A daytime and nighttime task manager for Paranal science operations**, Leonel Rivas, Steffen Mieske, Stéphane Brillant, Cristian Romero, Andres Pino Pavez, European Southern Observatory (Chile) . . . . . [10704-4]

11:50 am: **Alignment of wide field corrector against the primary mirror optical axis by spot images on auto guide cameras for Prime Focus Spectrograph of Subaru Telescope**, Yoko Tanaka, Naruhisa Takato, Subaru Telescope, NAOJ (USA), et al. . . . . [10704-5]

Lunch Break . . . . . Mon 12:10 pm to 2:00 pm

SESSION 2

LOCATION: CC LEVEL 3, ROOM 9A . . . . . MON 2:00 PM TO 2:40 PM

Operations and Data Quality Control II

Session Chair: **David S. Adler,** Space Telescope Science Institute (USA)

2:00 pm: **Stray-light calibration and correction algorithm for the METOP-3MI mission**, Lionel Clermont, Céline Michel, Pascal Blain, Emmanuel Mazy, Yvan Stockman, Ctr. Spatial de Liège (Belgium) . . . . . [10704-7]

2:20 pm: **The dirt in astronomy's genie lamp: ThO contamination of Th-Ar calibration lamps**, Gillian Nave, National Institute of Standards and Technology (USA), et al. . . . . [10704-8]

SESSION 3

LOCATION: CC LEVEL 3, ROOM 9A . . . . . MON 2:40 PM TO 5:10 PM

Time Domain and Transient Surveys

Session Chairs: **David S. Adler,** Space Telescope Science Institute (USA); **Raffaele D'Abrusco,** Smithsonian Astrophysical Observatory (USA)

2:40 pm: **Timekeeping infrastructure for the Catalina Sky Survey**, Robert L. Seaman, Alex Gibbs, The Univ. of Arizona (USA) . . . . . [10704-10]

3:00 pm: **The Zwicky transient facility robotic observing system**, Reed Riddle, John Cromer, David Hale, John Henning, John Baker, Jennifer Milburn, Stephen Kaye, Caltech (USA), et al. . . . . [10704-11]

Coffee Break . . . . . Mon 3:20 to 3:50 pm

3:50 pm: **SALT and SAAO strategy, focusing on the time-domain: process, plans, and challenges**, Petri Väisänen, Lisa Crause, South African Astronomical Observatory (South Africa) and Southern African Large Telescope (South Africa), et al. . . . . [10704-12]

4:10 pm: **The SOAR Telescope as a node in a time domain followup network: concepts and plans**, Jonathan H. Elias, Cerro Tololo Inter-American Observatory (Chile), et al. . . . . [10704-13]

4:30 pm: **A telescope control and scheduling system for the gravitational-wave optical transient observer (GOTO)**, Martin J. Dyer, Vik S. Dhillon, Stuart Littlefair, The Univ. of Sheffield (United Kingdom), et al. . . . . [10704-14]

4:50 pm: **Dark Energy Survey operations: years 4 and 5**, H. Thomas Diehl, Fermi National Accelerator Lab. (USA) . . . . . [10704-15]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 4

LOCATION: CC LEVEL 3, ROOM 9A . . . . . TUE 10:30 AM TO 11:50 AM

Data Flow and Management

Session Chair: **Robert L. Seaman,** The Univ. of Arizona (USA)

10:30 am: **LOFAR operations: lessons learned and challenges**, Roberto Pizzo, Astron Corp. (Netherlands) . . . . . [10704-16]

10:50 am: **ESPRESSO data flow in operations: results of commissioning activities**, Paolo Di Marcantonio, Guido Cupani, INAF - Osservatorio Astronomico di Trieste (Italy), et al. . . . . [10704-17]

11:10 am: **Concordance: In-flight calibration of x-ray telescopes without absolute references**, Herman L. Marshall, MIT Kavli Institute for Astrophysics and Space Research (USA), et al. . . . . [10704-18]

11:30 am: **Achieving a rolled-up view of SKA TM health status and state: definition and analysis of aggregation methods**, Mauro Dolci, INAF - Osservatorio Astronomico di Teramo (Italy), et al. . . . . [10704-19]

SESSION 5

LOCATION: CC LEVEL 3, ROOM 9A . . . . . TUE 11:50 AM TO 12:10 PM

Operations Benchmarking and Metrics I

Session Chair: **Robert L. Seaman,** The Univ. of Arizona (USA)

11:50 am: **Investigating global instrumental response for the JVLA low band ionosphere and transient experiment (VLITE)**, Tracy E. Clarke, Henrique R. Schmitt, Simona Giacintucci, Wendy L. Peters, Namir Kassim, U.S. Naval Research Lab. (USA) . . . . . [10704-20]

Lunch/Exhibition Break . . . . . Tue 12:10 pm to 1:40 pm

SESSION 6

LOCATION: CC LEVEL 3, ROOM 9A . . . . . TUE 1:40 PM TO 5:30 PM

Operations Benchmarking and Metrics II

Session Chairs: **Antonio Chrysostomou,** SKA Organisation (United Kingdom); **Lisa J. Storrie-Lombardi,** Jet Propulsion Lab. (USA)

1:40 pm: **Diversity and inclusion in observatory operations: how to implement programs for success**, Alysha Shugart, Gemini Observatory (Chile), et al.. . . . . [10704-21]

2:00 pm: **Diversity at ESO: Paranal Observatory**, Pascale Hibon, European Southern Observatory (Chile) . . . . . [10704-22]

2:20 pm: **Gender systematics in Canadian time allocation committee telescope proposal reviews**, Kristine Spekkens, Royal Military College of Canada (Canada), et al.. . . . . [10704-23]

2:40 pm: **Every second of science is sacred: automating science operations tracking at JCMT**, Jessica T. Dempsey, Sarah Graves, Harriet A. L. Parsons, Paul Ho, Craig Walther, Graham Bell, East Asian Observatory (USA) . . . . . [10704-24]

3:00 pm: **Keck Observatory Telescope control system upgrade status report**, Shui Hung Kwok, Kevin Tsubota, Tomas Krasuski, Jim Lyke, Ben McCarney, Jeff Mader, Kevin McCann, W. M. Keck Observatory (USA) . . . . . [10704-25]

Coffee Break . . . . . .Tue 3:20 pm to 3:50 pm

3:50 pm: **Astronomy operations with the Southern African Large Telescope (SALT): SALT is doing great!**, Encarnacion Romero Colmenero, South African Astronomical Observatory (South Africa) and Southern African Large Telescope (South Africa), et al.. . . . . [10704-26]

4:10 pm: **SALT achieving synergy through integrated operations**, Johannes C. Coetzee, South African Astronomical Observatory (South Africa), et al. . [10704-27]

4:30 pm: **Preparing the NIRSpec/JWST science data calibration: from ground testing to sky**, Catarina Alves de Oliveira, Stephan M. Birkmann, Torsten Böker, European Space Agency (USA), et al.. . . . . [10704-28]

4:50 pm: **ESO telbib: learning from experience, preparing for the future**, Uta Grothkopf, Silvia Meakins, Dominic Bordelon, European Southern Observatory (Germany) . . . . . [10704-29]

5:10 pm: **A bibliometric analysis of observatory publications for the period 2012-2016,** Dennis R. Crabtree, NRC - Herzberg Astronomy & Astrophysics (Canada) . . . . . [10704-30]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . .9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 7

LOCATION: CC LEVEL 3, ROOM 9A . . . . . .WED 10:30 AM TO 12:10 PM

Program and Observation Scheduling I

Session Chair: **Alison B. Peck,** Gemini Observatory (USA)

10:30 am: **Science operations rehearsals: planning and scheduling of the James Webb Space Telescope**, David S. Adler, Brigette E. Hesman, Kristen B. Wymer, Space Telescope Science Institute (USA) . . . . . [10704-31]

10:50 am: **Implementation and Results of the SNR-QSO mode at the Canada-France-Hawaii Telescope**, Daniel Devost, Billy Mahoney, Canada-France-Hawaii Telescope (USA), et al. . . . . [10704-32]

11:10 am: **Optimal scheduling and science delivery of millions of targets in thousands of fields: the operational concept of the Maunakea spectroscopic explorer (MSE)**, Nicolas Flagey, Canada-France-Hawaii Telescope (USA), et al.. . . . . [10704-33]

11:30 am: **The observation queue scheduler for WEAVE on the WHT**, Cecilia Fariña, Lilian Domínguez-Palmero, Isaac Newton Group of Telescopes (Spain) and Instituto de Astrofísica de Canarias (Spain), et al.. . . . . [10704-34]

11:50 am: **Design of observational and control system of imaging system of a 1.2-meter Telescope**, Ming-hao Jia, Ya-qi Chen, Jin-ting Chen, Guang-yu Zhang, Yi-ling Xu, Yi Feng, Hong-fei Zhang, Zhen-feng Sheng, Chen-wei Yang, Univ. of Science and Technology of China (China), et al. . . . . [10704-35]

Lunch/Exhibition Break . . . . . .Wed 12:10 pm to 1:40 pm

SESSION 8

LOCATION: CC LEVEL 3, ROOM 9A . . . . . WED 1:40 PM TO 3:00 PM

Program and Observation Scheduling II

Session Chair: **Robert L. Seaman,** The Univ. of Arizona (USA)

1:40 pm: **STARS: framework for scheduling telescopes and space missions like CARMENES, TJO and ARIEL-ESA**, Álvaro García-Piquer, Josep Colomé, Juan Carlos Morales, Ignasi Ribas, Josep Guàrdia, Jaume Castroviejo, Emma de Ona Wilhelmi, Diego F. Torres, Francesc Vilardell, Institut de Ciències de l'Espai (Spain) . . . . . [10704-36]

2:00 pm: **The abstract observatory: an interface for networking telescopes**, Eric S. Saunders, Mark K. Bowman, Todd A. Boroson, Rachel A. Street, Las Cumbres Observatory Global Telescope Network (USA) . . . . . [10704-37]

2:20 pm: **Autonomous observation scheduling in astronomy**, Ruby Van Rooyen, SKA South Africa (South Africa), et al. . . . . [10704-38]

2:40 pm: **Observation scheduling with a free bug tracking software: redmine 4 obs**, Claus A. Gössl, Univ.-Sternwarte München (Germany), et al. . . . . [10704-39]

SESSION 9

LOCATION: CC LEVEL 3, ROOM 9A . . . . . WED 3:00 PM TO 5:50 PM

Archive Operations, Surveys and Datasets

Session Chairs: **Robert L. Seaman,** The Univ. of Arizona (USA); **Lisa J. Storrie-Lombardi,** Jet Propulsion Lab. (USA)

3:00 pm: **Astronomical data archives as Instruments: accelerating and sustaining scientific discovery**, Raffaele D'Abrusco, Glenn E. Becker, Michael L. McCollough, Arnold H. Rots, Sinh A. Thong, David W. Van Stone, Sherry L. Winkelman, Smithsonian Astrophysical Observatory (USA) . . . . . [10704-40]

Coffee Break . . . . . .Wed 3:20 pm to 3:50 pm

3:50 pm: **Overview of the Mikulski Archive for Space Telescopes for the James Webb Space Telescope data archiving**, Anthony Marston, Richard A. Shaw, Peter Forshay, Karen Levay, Susan Mullally, Jonathan Hargis, Space Telescope Science Institute (USA) . . . . . [10704-41]

4:10 pm: **Enabling new science with MAST community contributed data collections**, Richard A. Shaw, Scott Fleming, Karen Levay, Randy Thompson, Shui-Ay Tseng, Anton Koekemoer, Peter Forshay, Jonathan Hargis, Brian McLean, Space Telescope Science Institute (USA), et al.. . . . . [10704-42]

4:30 pm: **The TESS science data archive**, Daryl A. Swade, Space Telescope Science Institute (USA), et al. . . . . [10704-43]

4:50 pm: **The ESO science archive: supporting and enhancing science from the La Silla Paranal Observatory**, Martino Romaniello, Nausicaa Delmotte, Vincenzo Forchi, Nathalie Fourniol, Olivier Hainaut, Uwe Lange, Alberto Micol, Jörg Retzlaff, European Southern Observatory (Germany), et al.. . . . . [10704-44]

5:10 pm: **14 years of Spitzer publications: data use and reuse**, Elena Scire, Caltech (USA) . . . . . [10704-45]

5:30 pm: **Indicators of the science impact of an observatory**, Sherry L. Winkelman, Raffaele D'Abrusco, Arnold H. Rots, Smithsonian Astrophysical Observatory (USA). . . . . [10704-46]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters-Wednesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Wednesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

Challenges in sky subtraction process for multi-fiber spectroscopy, Alireza Molaeinezhad, Institute for Research in Fundamental Sciences (Iran, Islamic Republic of), et al.. . . . . [10704-9]

SALT observing in higher humidity, Eben Wiid, Keith R. J. Browne, Jonathan Love, Thabelo Makananise, Paul Rabe, Etienne L. Simon, Johannes C. Coetzee, Johan Hendricks, SALT Foundation (South Africa). . . . . [10704-82]

The WEAVE observatory control system, Sergio Picó, Don Carlos Abrams, Chris Benn, Isaac Newton Group of Telescopes (Spain), et al. . . . . [10704-83]

Weather trends at the Magdalena Ridge Observatory, Daniel Klinglesmith, Colleen Gino, Erica Garcia, Dylan Etscorn, Magdalena Ridge Observatory (USA), et al.. . . . . [10704-84]

Photometry of transients and variable sources at the Osservatorio Polifunzionale del Chianti, Emanuele Pace, Ruggero Stanga, Mauro Focardi, Luca Naponiello, Lorenzo Betti, Maila Agostini, Univ. degli Studi di Firenze (Italy) and Osservatorio Polifunzionale del Chianti (Italy), et al. . . . . [10704-85]

Preparing SALT's software for the future, Christian Hettlage, Encarnacion Romero Colmenero, Steven M. Crawford, Nhlavutelo E. Macebele, Anelisiwe S. Mayekiso, Rosalind E. Skelton, Rudolf B Kuhn, Petri Väisänen, Janus Brink, Anthony Koeslag, Stephen Hulme, South African Astronomical Observatory (South Africa) and Southern African Large Telescope (South Africa). . . . . [10704-86]

Detection and mitigation of condensation signatures in imaging data, Ralf Kotulla, Univ. of Wisconsin-Madison (USA), et al. . . . . [10704-87]

Calibration trending in the Spitzer Beyond era, Patrick J. Lowrance, Jessica E. Krick, Jim G. Ingalls, Seppo Laine, Sean J. Carey, Caltech (USA) and IPAC (USA), et al.. . . . . [10704-88]

Implementation of a building automation system for the W.M. Keck Observatory summit facilities, John Baldwin, Grant M. Hill, W. M. Keck Observatory (USA). . . . . [10704-89]

Base facility operations (BFO) at Gemini Observatory after two and half years implementation, Ariel Lopez, Gemini Observatory (Chile), et al. . . . . [10704-90]

Development of the Arizona Robotic Telescope network, Benjamin Weiner, Dennis Zaritsky, The Univ. of Arizona (USA), et al. . . . . [10704-91]

Fast photometry of stars, Fernando Ángeles, Valeri Orlov, Univ. Nacional Autónoma de México (Mexico) . . . . . [10704-92]

A framework to use modern Big Data Software Tools to improve operations in the Paranal Observatory., Eduardo Peña, Juan Osorio, Claudio Reinero, Christian Stephan, European Southern Observatory (Chile) . . . . . [10704-93]

ALMA engineering fault detection framework, José L. Ortiz, ALMA (Chile), et al.. [10704-94]

New approach to the space mission program optimisation: WSO-UV, Mikhail Sachkov, nstitute of Astronomy of the Russian Academy of Sciences (Russian Federation), et al.. . . . . [10704-95]

The role of the US National Office in the Gemini Partnership, Kenneth Hinkle, Letizia Stanghellini, Verne Smith, Dara Norman, National Optical Astronomy Observatory (USA). . . . . [10704-96]

The calibration scheme for ELT/METIS, Leonard Burtscher, Leiden Univ. (Netherlands), et al. . . . . [10704-97]

Molding the public face of Chandra: long-lasting and useful interfaces to the mission products, Glenn E. Becker, Sherry L. Winkelman, Raffaele D'Abrusco, Smithsonian Astrophysical Observatory (USA) . . . . . [10704-98]

Airplanes and satellites: keeping LGS operations efficient and safe at the Large Binocular Telescope Observatory, Gustavo Rahmer, Julian C. Christou, Michael J. Lefebvre, Large Binocular Telescope Observatory (USA) . . . . [10704-99]

Conducting Spitzer Space Telescope microlensing parallax observations, Sean J. Carey, Spitzer Science Ctr. (USA), et al. . . . . [10704-100]

Expected observing efficiency of the Maunakea spectroscopic explorer, Daniel Devost, Canada-France-Hawaii Telescope (USA), et al.. . . . . [10704-101]

RFI mitigation through prediction and avoidance, Balthasar T. Indermuehle, Malte Marquarding, John Reynolds, Lisa Harvey-Smith, CSIRO Astronomy and Space Science (Australia) . . . . . [10704-102]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 10

LOCATION: CC LEVEL 3, ROOM 9A . . . . . THU 10:30 AM TO 12:10 PM

Science Operations Processes and Workflows I

Session Chair: **Christian Veillet,** Large Binocular Telescope Observatory (USA)

10:30 am: **The Square Kilometre array: challenges of distributed operations and big data rates**, Antonio Chrysostomou, Rosie C. Bolton, Gary R. Davis, SKA Organisation (United Kingdom) . . . . . [10704-47]

10:50 am: **20 years of scientific and technical results with the INAF-TNG Telescope**, Adriano Ghedina, Fundación Galileo Galilei - INAF (Spain), et al.. . . . . [10704-48]

11:10 am: **Las Cumbres Observatory operations: balancing new developments with long-term sustainability**, Nikolaus Volgenau, Todd A. Boroson, Eric S. Saunders, Daniel R. Harbeck, Curtis McCully, Andrew Pickles, Las Cumbres Observatory Global Telescope Network (USA) . . . . . [10704-49]

11:30 am: **HXMT science operations**, Shumei Jia, Xiang Ma, Yue Huang, Liming Song, Jinlu Qu, Shu Zhang, Chinese Academy of Sciences (China) . . . . [10704-50]

11:50 am: **Lessons learned in extended-extended Spitzer Space Telescope operations**, Lisa J. Storrie-Lombardi, Bolinda Kahr, Joseph Hunt, Jet Propulsion Lab. (USA), et al. . . . . [10704-51]

Lunch/Exhibition Break . . . . . Thu 12:10 pm to 1:40 pm

SESSION 11

LOCATION: CC LEVEL 3, ROOM 9A . . . . . THU 1:40 PM TO 5:30 PM

Science Operations Processes and Workflows II

Session Chairs: **Todd A. Boroson,** Las Cumbres Observatory Global Telescope Network (USA); **Alison B. Peck,** Gemini Observatory (USA)

1:40 pm: **Eight years of solar observations with PICARD**, Mustapha Meftah, LATMOS (France), et al. . . . . [10704-52]

2:00 pm: **The Gemini Observatory large and long programs**, Steven J. Margheim, Gemini Observatory (Chile) . . . . . [10704-53]

2:20 pm: **Reshaping the user experience at the Large Binocular Telescope Observatory (LBTO)**, Michelle L. Edwards, Doug Summers, Joseph Astier, Igor Suarez Sola, Christian Veillet, Andrew Cardwell, Jennifer Power, Shane Walsh, Large Binocular Telescope Observatory (USA). . . . . [10704-54]

2:40 pm: **Observing recommendations for JWST/MIRI users**, Sarah Kendrew, Space Telescope Science Institute (USA), et al. . . . . [10704-55]

3:00 pm: **Target acquisition for multi-object spectroscopy with JWST NIRSpec,** Charles D. Keyes, Tracy L. Beck, Maria Peña-Guerrero, Space Telescope Science Institute (USA), et al. . . . . [10704-56]

Coffee Break . . . . . Thu 3:20 pm to 3:50 pm

3:50 pm: **Flexible and dynamic observing at the ESO Very Large Telescope**, Thomas Bierwirth, European Southern Observatory (Germany), et al. . . . [10704-57]

4:10 pm: **The Paranal Observatory eavesdropping mode (POEM), and remote observing at ESO**, George Hau, Steffen Mieske, Stéphane Brillant, Marcus Pavez, Ivo Saviane, Stéphane Marteau, European Southern Observatory (Chile) [10704-58]

4:30 pm: **Connecting ELT to the current VLT operations scheme: how the telescope and instrument operators, as well as other groups at Paranal Observatory, are preparing the staff for the ELT era**, Andres Pino Pavez, Susana Cerda Hernandez, Stéphane Brillant, Claudia Cid, Xavier Haubois, Steffen Mieske, Julien Milli, Julio Navarrete, Diego Parraguez, Leonel Rivas, Juan Carlos Muñoz-Mateos, Cristian Romero, Alain Smette, European Southern Observatory (Chile). . . . . [10704-59]

4:50 pm: **A new sky subtraction optimised flat field calibration system for the 3.9m Anglo-Australian Telescope**, Anthony J. Horton, Chris Lidman, Doug Gray, Pascal Xavier, Australian Astronomical Observatory (Australia) . . . . . [10704-61]

5:10 pm: **The science calibration challenges of next generation highly multiplexed optical spectroscopy: the case of the Maunakea spectroscopic explorer**, Alan W. McConnachie, NRC - Herzberg Astronomy & Astrophysics (Canada), et al. . . . . [10704-62]

FRIDAY 15 JUNE

SESSION 12

LOCATION: CC LEVEL 3, ROOM 9A . . . . . FRI 8:30 AM TO 12:00 PM

Site and Facilities Operations I

Session Chairs: **David S. Adler,** Space Telescope Science Institute (USA); **Todd A. Boroson,** Las Cumbres Observatory Global Telescope Network (USA)

8:30 am: **Past and future evolution of Gemini operations**, Andrew J. Adamson, Gemini Observatory (USA), et al.. . . . . [10704-63]

8:50 am: **Visiting instruments as part of a strategic plan**, Alison B. Peck, Andrew J. Adamson, Scot J. Kleinman, Laura Ferrarese, Stephen J. Goodsell, Gemini Observatory (USA), et al.. . . . . [10704-64]

9:10 am: **Sharing and optimizing operations and resources between Maunakea Observatories**, Jessica T. Dempsey, East Asian Observatory (USA), et al.. . . . . [10704-65]

9:30 am: **Transforming the Canada France Hawaii Telescope (CFHT) into the Maunakea spectroscopic explorer (MSE): a conceptual observatory building and facilities design**, Steven E. Bauman, Canada-France-Hawaii Telescope (USA), et al.. . . . . [10704-66]

9:50 am: **Las Campanas Observatory operations,** Francesco Di Mille, Povilas Palunas, Konstantina Boutsia, Leopoldo Infante, David J. Osip, Mark M. Phillips, Las Campanas Observatory (Chile). . . . . [10704-67]

Coffee Break . . . . . Fri 10:10 am to 10:40 am

10:40 am: **LBTO's long march to full operation: step 3**, Christian Veillet, Large Binocular Telescope Observatory (USA). . . . . [10704-68]

11:00 am: **MeerKAT operations in the era of large astronomical telescopes**, Rosly Renil, Ruby van Rooyen, SKA South Africa (South Africa) . . . . . [10704-69]

11:20 am: **APEX beyond 2016: the evolution of an experiment into an efficient and productive Submillimeter Wavelength Observatory**, Thomas Klein, Francisco Montenegro, Miroslaw Ciechanowicz, Claudio Agurto, Juan Pablo Araneda, Oriel Arriagada, Francisco Azagra, Michael Cantzler, Mauricio Cardenas, Edouard Gonzalez, Christian Herrera, Felipe Mac Auliffe, Rodrigo Parra, Juan Pablo Perez-Beaupuits, Jorge Ramirez, Jorge Santana, Karl Torstensson, Paulina Venegas, European Southern Observatory (Chile) . . . . . [10704-70]

11:40 am: **Merging operations on the surveys telescopes at PAO**, Susana Cerda Hernandez, Steffen Mieske, Stéphane Brillant, Cristian Romero, Andres Pino Pavez, Carlos La Fuente, European Southern Observatory (Chile) . . . . . [10704-71]

Lunch Break . . . . . Fri 12:00 pm to 1:30 pm

SESSION 13

LOCATION: CC LEVEL 3, ROOM 9A . . . . . FRI 1:30 PM TO 5:20 PM

Site and Facilities Operations II

Session Chairs: **Antonio Chrysostomou,** SKA Organisation (United Kingdom); **Raffaele D'Abrusco,** Smithsonian Astrophysical Observatory (USA)

1:30 pm: **Technical operations and maintenance activities at Paranal Observatory**, Maxime Boccas, Eva Diaz, Michel Frantz, Sergio Gonzalez, Gerd Hüdepohl, Ismo Kastinen, Vittorio Nurzia, Matteo Pozzobon, Christian Ramirez, Claudio Reinero, Fernando Salgado, Christian Stephan, Javier Valenzuela, European Southern Observatory (Chile) . . . . . [10704-72]

1:50 pm: **Study on application of quality management system to Subaru Telescope**, Junichi Noumaru, Subaru Telescope, NAOJ (USA). . . . . [10704-73]

2:10 pm: **Testing of the LSST's photometric calibration strategy at the CTIO 0.9 meter Telescope**, Michael Coughlin, Harvard Univ. (USA), et al. . . . . [10704-74]

2:30 pm: **The Observatorio Astrofísico de Javalambre: engineering for empowering observatory operations**, Axel Yanes Díaz, Sergio Rueda-Teruel, Ctr. de Estudios de Física del Cosmos de Aragón (Spain) . . . . . [10704-75]

2:50 pm: **Operation of the astronomical monitoring station at Mt. Wumingshan**, Yu Liu, Yunnan Observatories (China). . . . . [10704-76]

Coffee Break . . . . . Fri 3:10 pm to 3:40 pm

3:40 pm: **More effective fault management at SALT**, Keith R. J. Browne, Johannes C. Coetzee, Christian Hettlage, South African Astronomical Observatory (South Africa). . . . . [10704-77]

4:00 pm: **SALT integrated safety management system**, Etienne L. Simon, Johannes C. Coetzee, Keith R. J. Browne, Eben Wiid, Theodore Williams, South African Astronomical Observatory (South Africa), et al. . . . . [10704-78]

4:20 pm: **Deskilling SALT primary mirror recoating process**, Jonathan Love, Johannes C. Coetzee, Hitesh Gajjar, Martin Wilkinson, South African Astronomical Observatory (South Africa) . . . . . [10704-79]

4:40 pm: **Using near real-time satellite data for severe weather protection of remote telescope facilities**, Balthasar T. Indermuehle, Malte Marquarding, John Reynolds, Lisa Harvey-Smith, CSIRO Astronomy and Space Science (Australia). . . . . [10704-80]

5:00 pm: **A bottom-up and top-down approach to cloud detection**, Robert J. Smith, Jonathan M. Marchant, Iain A. Steele, Liverpool John Moores Univ. (United Kingdom) . . . . . [10704-81]

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

CONFERENCE 10705

Sunday–Tuesday 10–12 June 2018 • Proceedings of SPIE Vol. 10705

Modeling, Systems Engineering, and Project Management for Astronomy VIII

Conference Chairs: **George Z. Angeli,** GMTO Corp. (USA); **Philippe Dierickx,** European Southern Observatory (Germany)

Program Committee: **Roberto Biasi,** Microgate S.r.l. (Italy); **Sebastian G. Els,** Gulf Solutions (United Arab Emirates); **James L. Fanson,** GMTO Corp. (USA); **Robert Karban,** Jet Propulsion Lab. (USA); **Gary E. Mosier,** NASA Goddard Space Flight Ctr. (USA); **Richard M. Prestage,** National Radio Astronomy Observatory (USA); **Scott Roberts,** Thirty Meter Telescope Observatory Corp. (Canada); **Masao Saito,** National Astronomical Observatory of Japan (Japan); **Hermine Schnetler,** UK Astronomy Technology Ctr. (United Kingdom); **Masahiro Sugimoto,** National Astronomical Observatory of Japan (Japan); **Albert Tomàs,** NTE-SENER S.A. (Spain); **Mitchell Troy,** Jet Propulsion Lab. (USA)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 3, ROOM 10C . . . . . SUN 9:00 AM TO 10:20 AM

System Performance Modeling I

Session Chairs: **Philippe Dierickx,** European Southern Observatory (Germany); **Sebastian G. Els,** Gulf Solutions (United Arab Emirates)

9:00 am: **Giant Magellan Telescope site and enclosure CFD modeling and analysis**, Abdollah Khodadoust, John A. Ladd, Mathew Oser, The Boeing Co. (USA), et al. . . . . [10705-1]

9:20 am: **GMT aerothermal modeling validation through site measurements**, Kaushik Das, Konstantinos Vogiatzis, George Z. Angeli, Wylie Rosenthal, Antonin H. Bouchez, Robert W. Goodrich, GMTO Corp. (USA) . . . . . [10705-2]

9:40 am: **Dome seeing sensitivity analysis for LSST**, Konstantinos Vogiatzis, Consultant (USA), et al. . . . . [10705-3]

10:00 am: **On the precision of aero-thermal simulations for TMT: revisited**, Konstantinos Vogiatzis, Hugh Thompson, Scott Roberts, Thirty Meter Telescope (USA) . . . . . [10705-4]

Coffee Break . . . . . .Sun 10:20 am to 10:50 am

SESSION 2

LOCATION: CC LEVEL 3, ROOM 10C . . . . . SUN 10:50 AM TO 12:10 PM

Project Management I

Session Chairs: **Richard M. Prestage,** National Radio Astronomy Observatory (USA); **Scott C. Roberts,** Thirty Meter Telescope (USA)

10:50 am: **How to talk so your engineer will listen, how to listen so your scientist will talk: Tthe human side of astronomical instrument development**, John A. Booth, Large Telescope Consulting Engineering (USA), et al.. . . . [10705-5]

11:10 am: **A novel approach to the development of the HARMONI integral field spectrograph (IFS) using structured systems thinking**, Hermine Schnetler, Andy J. Born, Dave J. Melotte, UK Astronomy Technology Ctr. (United Kingdom), et al.. . . . . [10705-6]

11:30 am: **Understanding the risk of unattended nighttime operations at WMKO**, Sarah Gajadhar, SG Consulting, Inc. (Canada), et al. . . . . [10705-7]

11:50 am: **Risk management system at Gemini Observatory**, Isabelle Tait, Gemini Observatory (USA) . . . . . [10705-8]

Lunch Break . . . . . Sun 12:10 pm to 1:30 pm

SESSION 3

LOCATION: CC LEVEL 3, ROOM 10C . . . . . SUN 1:30 PM TO 3:30 PM

Assembly, Integration, and Test

Session Chairs: **Gary E. Mosier,** NASA Goddard Space Flight Ctr. (USA); **Masao Saito,** National Astronomical Observatory of Japan (Japan)

1:30 pm: **An overview of the LSST system integration and commission plan**, Charles F. Claver, LSST (USA), et al. . . . . [10705-9]

1:50 pm: **Integration and verification testing of the LSST camera**, Aaron J. Roodman, Tim Bond, Kevin Reil, James Chiang, Seth Digel, Kirk Gilmore, Travis Lange, Stuart Marshall, Andrew Rasmussen, Scott Newbry, Vincent Lee, Margaux Lopez, Martin Nordby, Pat Hascall, Richard Dubois, Anthony Johnson, Adam Snyder, Tom Glanzman, Anders Borgland, Diane Hascall, Max Turri, Owen Saxton, Stephen Tether, Jeff Tice, SLAC National Accelerator Lab. (USA), et al. . [10705-10]

2:10 pm: **LSST camera: integration and test subsystem planning and status**, Tim Bond, SLAC National Accelerator Lab. (USA) . . . . . [10705-11]

2:30 pm: **ESO ELT system requirements verification**, Juan-Carlos Gonzáles, Fabio Biancat-Marchet, Sébastien E. Egner, European Southern Observatory (Germany) . . . . . [10705-12]

2:50 pm: **Delivery and integration of MEGARA at GTC: the risky process of going from laboratory to the telescope**, Ana Pérez-Calpena, Marísa Luisa García Vargas, FRACTAL S.L.N.E (Spain), et al.. . . . . [10705-13]

3:10 pm: **Precise alignment method for MAORY**, Mauro Patti, Matteo Lombini, Emiliano Diolaiti, Paolo Ciliegi, Fausto Cortecchia, INAF - Osservatorio Astronomico di Bologna (Italy), et al. . . . . [10705-14]

Coffee Break . . . . . Sun 3:30 pm to 4:00 pm

SESSION 4

LOCATION: CC LEVEL 3, ROOM 10C . . . . . SUN 4:00 PM TO 6:00 PM

Systems Engineering

Session Chairs: **Robert Karban,** Jet Propulsion Lab. (USA); **Hermine Schnetler,** UK Astronomy Technology Ctr. (United Kingdom)

4:00 pm: **Cherenkov Telescope array (CTA): challenges in systems engineering and project management** *(Invited Paper)*, Wolfgang Wild, Cherenkov Telescope Array Observatory GmbH (Germany) . . . . . [10705-15]

4:30 pm: **A comparison of systems engineering challenges and practices between space and ground based astronomical projects** *(Invited Paper)*, Gerald Hechenblaikner, Sébastien E. Egner, European Southern Observatory (Germany), et al.. . . . . [10705-16]

5:00 pm: **Systems engineering for the Giant Magellan Telescope**, George Z. Angeli, Rebecca Bernstein, Brian Walls, Antonin H. Bouchez, Rodolphe Conan, Benjamin A. Irarrazaval, GMTO Corp. (USA). . . . . [10705-17]

5:20 pm: **Evolving an instrument system architecture in HARMONI**, Fraser Clarke, Univ. of Oxford (United Kingdom), et al. . . . . [10705-18]

5:40 pm: **Maunakea spectroscopic explorer (MSE): implementing the system engineering methodology for the development of a new facility**, Alexis Hill, Canada-France-Hawaii Telescope (USA), et al. . . . . [10705-19]

SESSION PSSUN

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . .SUN 6:00 PM TO 8:00 PM

Posters-Sunday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Sunday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. P*oster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.*

FAST cable-net structural collapse analysis based on finite particle method, Qing Zhao, National Astronomical Observatories (China). . . . . [10705-45]

Systems engineering applied to ELT instrumentation: the GMACS case, Daniel Faes, Univ. de São Paulo (Brazil) and Instituto de Astronomia, Geofísica e Ciências Atmosféricas (Brazil), et al. . . . . [10705-46]

Integrating project management and systems engineering to transition to remote operations, Sarah Gajadhar, SG Consulting, Inc. (Canada), et al.[10705-47]

Integrated modeling targeted to proposal preparation and feasibility phases of complex optomechanical systems, Lorenzo Zago, HEIG-VD (Switzerland) . . . . . [10705-48]

Non-blind deconvolution of the residual tip-tilt error of the Sunrise solar observatory, Stefan Tabel, Max-Planck-Institut Halbleiterlabor (Germany), et al.. . . . . [10705-49]

Radial velocity accuracy prediction of the GREGOR at night spectrograph based on simulated spectra, Michael Weber, Klaus G. Strassmeier, Manfred Woche, Ilya Ilyin, Arto Järvinen, Leibniz-Institut für Astrophysik Potsdam (Germany) . . . . . [10705-50]

The integration and verification of the power and mechanism control unit of the VIS instrument for the Euclid space mission, Diana Renaud, Christophe Cara, Jean Fontignie, Thierry Tourrette, Michel Berthé, Michel Lortholary, Thierry Orduna, CEA-Ctr. de SACLAY (France), et al. . . . . [10705-52]

Flexure compensation simulation tool for TMT-WFOS spectrograph, Arun Surya, Sivarani Thirupathi, Indian Institute of Astrophysics (India), et al. . [10705-53]

Simulating the effects of imperfect charge transfer efficiency on high precision spectroscopic measurements in extreme precision Doppler velocimeters, Samuel Halverson, Univ. of Pennsylvania (USA), et al.. . . . . [10705-54]

The decision making process for forming machine learning competency at SKA-SA, Khutso Ngoasheng, SKA South Africa (South Africa) . . . . . [10705-55]

Initial on-site measurements at potential observatory sites within the UAE, Sebastian G. Els, Johan Maree, Abdulla H. Bushahab, Mohammed Bin Rashid Space Ctr. (United Arab Emirates) . . . . . [10705-56]

Analysis of mode excitation on different geometries of optical fibres for astronomical spectroscopy, Eloy Hernandez, Martin M. Roth, Andreas Kelz, Leibniz-Institut für Astrophysik Potsdam (Germany). . . . . [10705-57]

Systems engineering and software for the SKA Telescope manager: applying a multi-perspective approach to increase depth of understanding, Gerhard M. Le Roux, SKA South Africa (South Africa) . . . . . [10705-58]

Giant Magellan Telescope enclosure thermal modeling and simulation, Abdollah Khodadoust, The Boeing Co. (USA), et al.. . . . . [10705-60]

Ground Layer studies for the alternate TMT site, Konstantinos Vogiatzis, Hugh Thompson, Scott Roberts, Christophe Dumas, Thirty Meter Telescope (USA) . . . . . [10705-61]

Modeling and budgeting fiber injection efficiency for the Maunakea spectroscopic explorer (MSE), Nicolas Flagey III, Canada-France-Hawaii Telescope (USA), et al. . . . . [10705-62]

Verification process for instrumentation projects using DOORS, Sébastien E. Egner, European Southern Observatory (Germany), et al. . . . . [10705-63]

Parametric cost estimation of a ground-based astronomical instrument, Sébastien E. Egner, European Southern Observatory (Germany), et al.. . [10705-64]

COLIBRI end-to-end simulations, ground follow-up telescope for the SVOM mission, David Corre, Stéphane Basa, Lab. d'Astrophysique de Marseille (France) and Aix-Marseille Univ. (France) and Ctr. National de la Recherche Scientifique (France), et al. . . . . [10705-65]

Organisation, management and risk analysis of the MAORY project, Paolo Ciliegi, Emiliano Diolaiti, Fausto Cortecchia, INAF - Osservatorio Astronomico di Bologna (Italy), et al. . . . . [10705-66]

Possible implementation of MBSE in ground based astronomical instrumentation: phase-A of ELT-HIRES as an example, Marco Riva, Matteo Genoni, INAF - Osservatorio Astronomico di Brera (Italy), et al.. . . . . [10705-67]

Investigating the effects of the wavelength solution in the radial velocity precision for CARMENES, Marcelo Said Tala Pinto, Andreas Quirrenbach, Sabine Reffert, Zentrum für Astronomie der Univ. Heidelberg (Germany), et al. . [10705-68]

Product assurance for instrumental projects in research laboratory: galaxies, etoiles, physique, instrumentation (GEPI), Fatima De Frondat Laadim, Galaxies Etoiles Physique Instrumentation (France) and Observatoire de Paris à Meudon (France) and Ctr. National de la Recherche Scientifique (France), et al.. . [10705-69]

Adaptive optics modelling for the Extremely Large Telescope and the European Solar Telescope, Alastair G. Basden, Durham Univ. (United Kingdom) . . . . . [10705-70]

The open-source path to model-based enterprise: proof of concept, Jacinto Javier Vaz-Cedillo, Nauzet Vega Reyes, Instituto de Astrofísica de Canarias (Spain), et al.. . . . . [10705-71]

Management of astronomical and space-based instrumentation projects at CfAI, Madeline Close, Durham Univ. (United Kingdom) . . . . . [10705-72]

Image simulation in the Fourier domain, Breann N. Sitarski, Ronald M. Bloom, Matthew C. Britton, Jason M. Fields, The Aerospace Corp. (USA) . . . . . [10705-73]

Project management and status update for DAG (Eastern Anatolia Observatory) the 4 meter VIS/IR optical telescope, Onur Keskin, Isik Üniv. (Turkey), et al. . . . . [10705-74]

4MOST optical system model for final design analysis, Steffen Frey, Olga Bellido-Tirado, Nicolas Azais, Roland Winkler, Andreas Kelz, Benito Moralejo, Dionne M. Haynes, Leibniz-Institut für Astrophysik Potsdam (Germany), et al.. . . . . [10705-75]

Maximising the sensitivity of next generation multi-object spectroscopy: system budget development and design optimizations for the Maunakea spectroscopic explorer, Alan W. McConnachie, NRC - Herzberg Astronomy & Astrophysics (Canada), et al.. . . . . [10705-76]

Modeling of cables, Torben Andersen, Mette Owner-Petersen, Lund Observatory (Sweden) . . . . . [10705-77]

The 4MOST numerical instrument model: TOAD, Roland Winkler, Ole Streicher, Steffen Frey, Dionne M. Haynes, Olga Bellido-Tirado, Olivier Schnurr, Leibniz-Institut für Astrophysik Potsdam (Germany) . . . . . [10705-78]

Factory acceptance testing and model validation for the Daniel K. Inouye Solar Telescope air knife assembly, Isaac McQuillen, LeEllen Phelps, National Solar Observatory (USA). . . . . [10705-79]

WFIRST coronagraph technology requirements: status update, systems engineering approach, and lessons learned, Ewan S. Douglas, Kerri L. Cahoy, Massachusetts Institute of Technology (USA), et al.. . . . . [10705-81]

Modeling stray light artifacts on the OSIRIS-REx spacecraft using GPU-enabled software, Richard N. Pfisterer, Photon Engineering LLC (USA), et al.. . . . . [10705-82]

Recent advances in stray light modeling for large telescope/observatory systems, Stephen M. Pompea, National Optical Astronomy Observatory (USA), et al.. . . . . [10705-83]

Maunakea spectroscopic explorer (MSE): the prime focus subsystems: requirements and interfaces, Alexis Hill, Kei Szeto, Canada-France-Hawaii Telescope (USA), et al. . . . . [10705-84]

Key aspects in designing for electromagnetic compatibility for astronomical instrumentation, José Leonardo Garcés Medina, David Y. Silva, Univ. Nacional Autónoma de México (Mexico) . . . . . [10705-85]

Simulation of SCALES: a thermal infrared integral field spectrograph for the TMT, Gang Zhao, Nanjing Institute of Astronomical Optics & Technology (China), et al.. . . . . [10705-86]

Coordination in building an observatory: a case study of Eastern Anatolian Observatory (DAG), Ali Erkan Sahmali, GÜNARDA (Turkey), et al. . . . . [10705-88]

Realistic performance prediction with combined opto-mechanical analyses, Jeroen Heijmans, Michael Müller, Ronald Holzlöhner, European Southern Observatory (Germany) . . . . . [10705-89]

ELT Telescope: control system dynamic simulations, Gianpietro Marchiori, EIE Group s.r.l. (Italy), et al. . . . . [10705-90]

At the dawn of a systems engineering process, B. Bülent Güçsav, Atatürk Üniv. (Turkey), et al. . . . . [10705-91]

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 5

LOCATION: CC LEVEL 3, ROOM 10C . . . . . MON 10:30 AM TO 12:00 PM

Project Management II

Session Chairs: **James L. Fanson,** GMTO Corp. (USA); **Albert Tomàs,** SENER Ingeniería y Sistemas S.A. (Spain)

10:30 am: **The interplay between the PI and engineering in the design, construction and commissioning of prototypes** *(Invited Paper)*, Jason Spyromilio, European Southern Observatory (Germany) . . . . . [10705-21]

11:00 am: **Technology development programme at ESO: challenges for industry**, Mark M. Casali, Adrian Russell, European Southern Observatory (Germany) . . . . . [10705-22]

11:20 am: **Operational concepts and behaviors at the Giant Magellan Telescope**, Robert W. Goodrich, Aline Souza, GMTO Corp. (USA). . . . . [10705-87]

11:40 am: **Deriving generic telescope use cases for the Cherenkov Telescope array**, Igor Oya, Matthias Füßling, Deutsches Elektronen-Synchrotron (Germany), et al.. . . . . [10705-59]

Lunch Break . . . . . Mon 12:10 pm to 1:20 pm

SESSION 6

LOCATION: CC LEVEL 1, BALLROOM A ..... MON 1:20 PM TO 3:20 PM

Modeling as a Driver of Observatory Design I

JOINT SESSION WITH CONFERENCES 10700 AND 10705

Session Chairs: **Jeffrey R. Kuhn,** Institute for Astronomy (USA); **Amir Sadjadpour,** Thirty Meter Telescope (USA); **Jean-Gabriel Cuby,** Lab. d'Astrophysique de Marseille (France); **Mitchell Troy,** Jet Propulsion Lab. (USA); **George Z. Angeli,** GMTO Corp. (USA)

1:20 pm: **Stray light and thermal self-emission minimization at the ELT**, Ronald Holzlöhner, Johan Kosmalski, European Southern Observatory (Germany) . . . . . [10700-13]

1:40 pm: **Integrated modeling under uncertainty for the James Webb Space Telescope**, Giuseppe Cataldo, Gary E. Mosier, NASA Goddard Space Flight Ctr. (USA) . . . . . [10705-24]

2:00 pm: **Direct measurements of wind disturbances forces on the CTIO Blanco 4m Telescope Mount and its effect in tracking jitter**, Michael Warner, Norman Diaz, Cerro Tololo Inter-American Observatory (Chile) . . . . . [10700-14]

2:20 pm: **A new finite element model of the SOFIA primary mirror cell to investigate dynamical behavior**, Benjamin Greiner, Bernhard Malicek, Michael Lachenmann, Alfred Krabbe, Jörg Wagner, Deutsches SOFIA Institut, Univ. Stuttgart (Germany) . . . . . [10700-15]

2:40 pm: **Vibration measurements in the Daniel K. Inouye Solar Telescope**, William R. McBride II, Mackenzie Stratton, National Solar Observatory (USA) . . . . . [10700-16]

3:00 pm: **Monitoring the LSST system performance during construction**, Bo Xin, Charles F. Claver, Brian M. Selvy, LSST (USA), et al. . . . . [10705-25]

Coffee Break . . . . . Mon 3:20 pm to 3:50 pm

SESSION 7

LOCATION: CC LEVEL 1, BALLROOM A ..... MON 3:50 PM TO 5:30 PM

Modeling as a Driver of Observatory Design II

JOINT SESSION WITH CONFERENCES 10700 AND 10705

Session Chairs: **Yongtian Zhu,** Nanjing Institute of Astronomical Optics & Technology (China); **Victor L. Krabbendam,** LSST (USA); **Roberto Biasi,** Microgate S.r.l. (Italy); **Sebastian G. Els,** Gulf Solutions (United Arab Emirates)

3:50 pm: **JWST structural-thermal-optical stability model validation**, Joseph M. Howard, Kong Q. Ha, Garrett J. West, Jeffrey S. Smith, Timothy M. Carnahan, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10705-26]

4:10 pm: **Interferometric characterization of Keck segment edge errors,** Mitchell Troy, Jet Propulsion Lab. (USA), et al. . . . . [10700-17]

4:30 pm: **The Giant Magellan Telescope phasing strategy and performance**, Fernando Quirós-Pacheco, Antonin H. Bouchez, Rodolphe Conan, GMTO Corp. (USA), et al. . . . . [10700-18]

4:50 pm: **Optical performance prediction of the Thirty Meter Telescope after initial alignment using optical modeling**, Byoung-Joon Seo, Carl Nissly, Mitchell Troy, Jet Propulsion Lab. (USA), et al. . . . . [10705-27]

5:10 pm: **Computational fluid dynamics modeling of GMT,** Konstantinos Vogiatzis, Kaushik Das, George Z. Angeli, Bruce C. Bigelow, William Burgett, GMTO Corp. (USA) . . . . . [10705-28]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A ..... 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 8

LOCATION: CC LEVEL 3, ROOM 10C .....TUE 10:30 AM TO 12:10 PM

Model Based Systems Engineering

Session Chairs: **Hermine Schnetler,** UK Astronomy Technology Ctr. (United Kingdom); **Philippe Dierickx,** European Southern Observatory (Germany)

10:30 am: **Generating interface control documents for the alignment and phasing subsystem of the Thirty Meter Telescope from a system model in SysML**, Sebastian Herzig, Jet Propulsion Lab. (USA) and Caltech (USA), et al. . . . . [10705-29]

10:50 am: **V&V planning and execution in an integrated model-based engineering environment using MagicDraw, Syndeia, and JIRA**, Brian M. Selvy, Charles F. Claver, Michael Reuter, LSST (USA), et al. . . . . [10705-30]

11:10 am: **The OpenSE Cookbook: a practical recipe based collection of patterns, procedures, and best practices for executable systems engineering for the Thirty Meter Telescope**, Robert Karban, Amanda Crawford, Jet Propulsion Lab. (USA), et al. . . . . [10705-31]

11:30 am: **A system architecture approach for the Cherenkov Telescope array**, Matthias Füßling, Deutsches Elektronen-Synchrotron (Germany), et al. . [10705-32]

11:50 am: **The multi-object spectroscopy (MOS) observations automatized production line**, Jacinto Javier Vaz Cedillo, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10705-33]

Lunch/Exhibition Break . . . . . Tue 12:10 pm to 1:40 pm

SESSION 9

LOCATION: CC LEVEL 3, ROOM 10C .....TUE 1:40 PM TO 3:20 PM

System Performance Modeling II

Session Chairs: **Gary E. Mosier,** NASA Goddard Space Flight Ctr. (USA); **Mitchell Troy,** Jet Propulsion Lab. (USA)

1:40 pm: **The Giant Magellan Telescope integrated modeling and performance**, Benjamin A. Irarrazaval, David Schwartz, Rodolphe Conan, George Z. Angeli, Antonin H. Bouchez, Kaushik Das, Fernando Quirós-Pacheco, GMTO Corp. (USA) . . . . . [10705-34]

2:00 pm: **Performance analysis tools and results for Giant Magellan Telescope primary mirror segments active support system**, Trupti M. Ranka, David Ashby, Rodolphe Conan, GMTO Corp. (USA), et al. . . . . [10705-35]

2:20 pm: **Multivariable frequency response analysis methods for GMT motion control systems**, Peter M. Thompson, Systems Technology, Inc. (USA), et al. . . . . [10705-36]

2:40 pm: **Tip/tilt and pressure control modeling of the fast steering secondary mirror for GMT**, Christoph Dribusch, The Univ. of Arizona (USA), et al. . [10705-37]

3:00 pm: **ELT dome and telescope: performance analysis overview**, Gianpietro Marchiori, EIE Group s.r.l. (Italy), et al. . . . . [10705-38]

Coffee Break . . . . . Tue 3:20 pm to 3:50 pm

SESSION 10

LOCATION: CC LEVEL 3, ROOM 10C ..... TUE 3:50 PM TO 5:30 PM

System Performance Modeling III

Session Chairs: **George Z. Angeli,** GMTO Corp. (USA); **Scott C. Roberts,** Thirty Meter Telescope (USA)

3:50 pm: **End-to-end imaging simulations for the Large Synoptic Survey Telescope (LSST) utilizing massively parallel computer hardware**, Scott Ellis, Photon Engineering LLC (USA) . . . . . [10705-39]

4:10 pm: **Validating the phase diversity approach for sensing NCPA in SHARK-NIR, the second-generation high-contrast imager for the Large Binocular Telescope**, Daniele Vassallo, INAF - Osservatorio Astronomico di Padova (Italy) and Univ. degli Studi di Padova (Italy) and ADONI (Italy), et al. . . . . [10705-40]

4:30 pm: **INO340 Telescope performance and behavioral analysis with end-to-end simulation**, Asghar Jafarzadeh, Iranian National Observatory (Iran, Islamic Republic of) . . . . . [10705-41]

4:50 pm: **STOP modeling in support of 1-meter aperture balloon based telescope**, Brian Catanzaro, CFE Services (USA), et al. . . . . [10705-42]

5:10 pm: **ELT-HIRES, the high resolution spectrograph for the ELT, et al.** . . . . . [10705-43]

Sunday–Friday 10–15 June 2018 • Proceedings of SPIE Vol. 10706

Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation III

Conference Chairs: **Ramón Navarro,** NOVA Optical & Infrared Instrumentation Group at ASTRON (Netherlands); **Roland Geyl,** Safran Reosc (France)

Program Committee: **Magomed A. Abdulkadyrov,** JSC Lytkarino Optical Glass Factory (Russian Federation); **Daniel R. Blanco,** MMT Observatory (USA); **Myung Kyu Cho,** National Optical Astronomy Observatory (USA); **Yutaka Ezaki,** Mitsubishi Electric Corp. (Japan); **V. Alfonso Feria,** Jet Propulsion Lab. (USA); **Virginia G. Ford,** Thirty Meter Telescope Observatory Corp. (USA); **Roger Haynes,** Leibniz-Institut für Astrophysik Potsdam (Germany); **Emmanuel Hugot,** Lab. d'Astrophysique de Marseille (France); **Huub Janssen,** Janssen Precision Engineering B.V. (Netherlands); **Ralf Jedamzik,** SCHOTT AG (Germany); **Matthew A. Kenworthy,** Leiden Observatory (Netherlands); **Dae Wook Kim,** College of Optical Sciences, The Univ. of Arizona (USA); **Hélène T. Krol,** CILAS (France); **David M. Montgomery,** UK Astronomy Technology Ctr. (United Kingdom); **Mikhail Sachkov,** Institute of Astronomy (Russian Federation); **Andrew T. Sarawit,** Simpson Gumpertz & Heger Inc. (USA); **Yoshinori Suematsu,** National Astronomical Observatory of Japan (Japan); **Robert R. Thomson,** Heriot-Watt Univ. (United Kingdom); **Jinxue Wang,** Raytheon Space & Airborne Systems (USA); **Yongtian Zhu,** Nanjing Institute of Astronomical Optics & Technology (China)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 1, BALLROOM B ..... SUN 10:50 AM TO 12:10 PM

Atmospheric Compensation

Session Chair: **Yongtian Zhu,** Nanjing Institute of Astronomical Optics & Technology (China)

10:50 am: **Advanced technologies and instrumentation and the National Science Foundation**, Peter L. Kurczynski, The National Science Foundation (USA) and Rutgers, the State Univ. of New Jersey (USA) . . . . . [10706-1]

11:10 am: **Innovative aspects to shrink the volume of the future laser guide star (LGS) facility for the Gran Telescopio Canarias Adaptive Optics (GTCAO) system**, Jorge Sánchez Capuchino, Marcos Reyes, Elvio Hernández, Iciar Montilla, Roberto Simoes, Óscar Tubío, Instituto de Astrofísica de Canarias (Spain) [10706-2]

11:30 am: **FBG development for OH suppression at innoFSPEC Potsdam**, Martin M. Roth, Ziyang Zhang, Kalaga V. Madhav, Julia Fiebrandt, Leibniz-Institut für Astrophysik Potsdam (Germany) . . . . . [10706-3]

11:50 am: **The WEAVE prime focus Correction: from design to integration**, Francesc Dalmases, Albert Tomàs, Óscar Maroto, Manuel Canchado, Carlos Martín-Nuño, Joan Manel Casalta, Antonio Romero, SENER Ingeniería y Sistemas S.A. (Spain), et al. . . . . [10706-4]

Lunch Break . . . . . Sun 12:10 pm to 1:30 pm

SESSION 2

LOCATION: CC LEVEL 1, BALLROOM B ..... SUN 1:30 PM TO 3:30 PM

Mirror Technology

Session Chair: **Myung Kyu Cho,** National Optical Astronomy Observatory (USA)

1:30 pm: **Design of the fast steering secondary mirror assembly for the Giant Magellan Telescope**, Myung K. Cho, National Optical Astronomy Observatory (USA), et al. . . . . [10706-5]

1:50 pm: **Advanced mirror construction: ULE replication**, James T. Mooney, Steven Desmitt, James Bolton, Stephen Oliver, Harris Corp. (USA). . . . . [10706-6]

2:10 pm: **ZERODUR mirror segment performance analytical predictions for large spaceborne telescopes based on thermally induced distortions,** Tony B. Hull, The Univ. of New Mexico (USA), et al. . . . . [10706-7]

2:30 pm: **A summary and analysis of NASA's strategic astrophysics technology (SAT) program in the past decade**, Azita Valinia, NASA Goddard Space Flight Ctr. (USA) . . . . . [10706-8]

2:50 pm: **Alignment-free gapless segmented mirror for large telescope**, Yasuhiro Nakahori, KYOCERA Corp. (Japan), et al. . . . . [10706-9]

3:10 pm: **Application of topography optimization techniques to the design of a lightweight primary mirror for the GCT, a dual-mirror telescope for the Cherenkov Telescope array**, Jean-Laurent R. Dournaux, Oriane Le Blanc, Observatoire de Paris à Meudon (France). . . . . [10706-10]

Coffee Break . . . . . Sun 3:30 pm to 4:00 pm

SESSION 3

LOCATION: CC LEVEL 1, BALLROOM B ..... SUN 4:00 PM TO 6:00 PM

Optical Fabrication I

Session Chair: **Roland Geyl,** Safran Reosc (France)

4:00 pm: **Process optimization for efficient convergence in large optics fabrication**, Chang Jin Oh, Andrew E. Lowman, Greg A. Smith, College of Optical Sciences, The Univ. of Arizona (USA) . . . . . [10706-11]

4:20 pm: **A new mirror manufacturing technology for free space optical communication**, Robert Banham, Fabio Marioni, Giuseppe Valsecchi, Giovanni Bianucci, Fabio E. Zocchi, Media Lario S.r.l. (Italy). . . . . [10706-12]

4:40 pm: **A novel hyper-crossing tool path generation algorithm for sub-aperture polishing**, Christina Reynolds, David D. Walker, Guoyu Yu, Hongyu Li, Univ. of Huddersfield (United Kingdom) . . . . . [10706-13]

5:00 pm: **From today's optical programs to tomorrows dreams through optics manufacturing**, Kate Medicus, Brian Myer, Michael Hyman, Optimax Systems, Inc. (USA) . . . . . [10706-14]

5:20 pm: **Topological design of lightweight additive manufactured mirrors for space**, Carolyn Atkins, UK Astronomy Technology Ctr. (United Kingdom), et al.. . . . . [10706-15]

5:40 pm: **A novel approach for the realization of thin glass substrates for optical mirrors,** Gabriele Vecchi, Stefano Basso, Marta M. Civitani, Mauro Ghigo, Joanna Holyszko, Giovanni Pareschi, Bianca Salmaso, INAF - Osservatorio Astronomico di Brera (Italy). . . . . [10706-16]

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A .....8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 4

LOCATION: CC LEVEL 1, BALLROOM B .....MON 10:30 AM TO 12:10 PM

Optical Fabrication II

Session Chair: **Christopher A. Hall,** QED Technologies, Inc. (USA)

10:30 am: **The polishing of WEAVE spectrograph collimator mirror**, Rafael Izazaga, Esperanza Carrasco Licea, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al. . . . . [10706-18]

10:50 am: **Applying MRF to large aperture optical components, assemblies, and systems,** Christopher A. Hall, Michael A. DeMarco, QED Optics (USA), et al.. . . . . [10706-19]

11:10 am: **NAIR: novel astronomical instrumentation through photonic reformatting**, Robert J. Harris, Landessternwarte Heidelberg (Germany), et al.. . . . . [10706-20]

11:30 am: **Primary and secondary mirror manufacturing for COLIBRI ground follow-up telescope of the SVOM mission**, Johan Floriot, Michel Marcos, Lab. d'Astrophysique de Marseille, Aix Marseille Univ. (France) and Ctr. National de la Recherche Scientifique (France), et al. . . . . [10706-21]

11:50 am: **Precision fabrication of high-slope convex aspheric optics**, Haojin Gu, Chaoyang Wei, Chen Hu, Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China) . . . . . [10706-22]

Lunch Break . . . . . Mon 12:10 pm to 1:40 pm

SESSION 5

LOCATION: CC LEVEL 1, BALLROOM B . . . . . MON 1:40 PM TO 3:20 PM

Materials

Session Chair: **Ralf Jedamzik,** SCHOTT AG (Germany)

1:40 pm: **Development of ultra lightweight and thermally stable Cordierite ceramic mirrors**, Tomohiro Kamiya, Japan Aerospace Exploration Agency (Japan) [10706-23]

2:00 pm: **Fused silica for IR telescope applications**, Frank Nuernberg, Klaus Rollmann, Heraeus Quarzglas GmbH & Co. KG (Germany) . . . . . [10706-24]

2:20 pm: **Advances in ZERODUR manufacturing for space and ground based telescopes**, Thomas Westerhoff, Thomas Werner, SCHOTT AG (Germany) . . . . . [10706-25]

2:40 pm: **Negative thermal expansion Allvar alloys**, James Monroe, Jeremy S. McAllister, Jay Zgarba, David S. Content, ALLVAR (USA), et al. . . . . [10706-26]

3:00 pm: **3D-printed optical instrumentation: practical starter designs and initial experiences**, Helen E. Jermak, Iain A. Steele, Stuart Bates, Liverpool John Moores Univ. (United Kingdom), et al. . . . . [10706-27]

Coffee Break . . . . . Mon 3:20 pm to 3:50 pm

SESSION 6

LOCATION: CC LEVEL 1, BALLROOM B . . . . . MON 3:50 PM TO 5:30 PM

Large Optics Manufacturing

Session Chair: **Dae Wook Kim,** College of Optical Sciences, The Univ. of Arizona (USA)

3:50 pm: **Enabling technologies for future large optical missions: current perspectives for astronomy and Earth observation at ESA**, Pascal Hallibert, European Space Research and Technology Ctr. (Netherlands) . . . . . [10706-28]

4:10 pm: **Fabrication, integration and testing of 6.5m primary mirror and telescope cell assembly for the University of Tokyo Atacama Observatory**, Chang Jin Oh, Andrew E. Lowman, Matthew B. Dubin, Greg A. Smith, William Verts, College of Optical Sciences, The Univ. of Arizona (USA), et al. . . . . [10706-29]

4:30 pm: **Manufacture of primary mirror segments for the Giant Magellan Telescope**, Hubert M. Martin, Rich Allen, Victor Gasho, Buell Jannuzi, Dae Wook Kim, Jeffrey Kingsley, Kevin Law, Adrian Loeff, Randy Lutz, Michael Tuell, Stuart Weinberger, Steven C. West, The Univ. of Arizona (USA). . . . . [10706-30]

4:50 pm: **ELT optics polishing: year 1 report,** Roland Geyl, Dominique Bardon, Rémi Bourgois, Nicolas Ferachoglou, Emmanuelle Harel, Safran Reosc (France) . . . . . [10706-31]

5:10 pm: **Fabrication of the DESI corrector lenses**, Timothy N. Miller, Robert W. Besuner, Michael E. Levi, Michael Lampton, Patrick Jelinsky, Henry Heetderks, David J. Schlegel, Jerry Edelstein, Lawrence Berkeley National Lab. (USA), et al.. . . . . [10706-32]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 7

LOCATION: CC LEVEL 1, BALLROOM B . . . . . 10:30 AM TO 12:10 PM

Telescope Structures and Domes

Session Chair: **Andrew T. Sarawit,** Simpson Gumpertz & Heger Inc. (USA)

10:30 am: **ELT Dome and Telescope: a unique prototype in a highly seismic context**, Gianpietro Marchiori, EIE Group s.r.l. (Italy), et al. . . . . [10706-33]

10:50 am: **Performance of a deployable tertiary mirror for the Keck I Telescope**, Christopher T. Ratliff, Gerald Cabak, Xavier Prochaska, William Deich, Dale Sandford, David Cowley, Alex Tripsas, Andrew C. Phillips, Michael J. Bolte, Univ. of California Observatories (USA), et al.. . . . . [10706-34]

11:10 am: **Research on algorithm of optical path difference-stability index of space gravitational wave telescope of China**, Mingming Xu, Zhongwen Hu, Teng Xu, Hangxin Ji, Chenzhong Wang, Lei Wang, Yi Chen, Nanjing Institute of Astronomical Optics & Technology (China). . . . . [10706-141]

11:30 am: **Mechanical design and configuration of visible emission line coronagraph on-board Aditya L1**, Nagabhushana S., Kamath P.U., Natarajan Venkatasubramanian, Pawan Kumar S., Kathiravan S, Raghavendra Prasad B., Indian Institute of Astrophysics (India) . . . . . [10706-36]

11:50 am: **Aerodynamic modeling in dome seeing study of the 2.16-m Telescope**, Taoran Li, Jianfeng Tian, Zhigang Hou, Hongbin Li, National Astronomical Observatories, Chinese Academy of Sciences (China). . . . [10706-37]

Lunch/Exhibition Break . . . . . Thu 12:10 pm to 1:40 pm

SESSION 8

LOCATION: CC LEVEL 1, BALLROOM B . . . . . TUE 1:40 PM TO 3:20 PM

Active Instruments (Active Structures, Active Optics)

Session Chair: **Emmanuel Hugot,** Lab. d'Astrophysique de Marseille (France)

1:40 pm: **Active mirrors for future space telescopes**, John Steeves, James K. Wallace, David Redding, Charles Lawrence, Randall Bartman, Jet Propulsion Lab. (USA) . . . . . [10706-38]

2:00 pm: **Development challenges of a Focus Mechanism for EXOMARS mission submitted to the harsh Martian environment.**, Lionel Kiener, Gérald Perruchoud, Philippe Schwab, Antoine Verhaeghe, Ctr. Suisse d'Electronique et de Microtechnique SA (Switzerland) . . . . . [10706-39]

2:20 pm: **Full characterization of an F/2 Freeform active mirror**, Szigfrid Farkas, MTA Research Ctr. for Astronomy and Earth Sciences (Hungary), et al. . [10706-40]

2:40 pm: **The ELT M2 and M3 Cells: key design aspects**, Albert Tomas, Francesc Dalmases, Manuel Canchado, Óscar Maroto, Joan Manel Casalta, SENER Ingeniería y Sistemas S.A. (Spain), et al.. . . . . [10706-41]

3:00 pm: **Advances of TNO's electromagnetic deformable mirror development**, Stefan Kuiper, Rudolf Saathof, Niek Doelman, Jet Human, Matthew Maniscalco, Max J. J. Baeten, TNO Technical Sciences (Netherlands) . . . . . [10706-42]

Coffee Break . . . . . Tue 3:20 pm to 3:50 pm

SESSION 9

LOCATION: CC LEVEL 1, BALLROOM B . . . . . TUE 3:50 PM TO 5:10 PM

Technologies for Cryogenic Instruments

Session Chair: **Ramón Navarro,** NOVA Optical IR Instrumentation Group (Netherlands)

3:50 pm: **The MATISSE photometric slider: achieving sub-micrometer reproducibility under cryogenic conditions,** Felix C. M. Bettonvil, Leiden Observatory (Netherlands), et al.. . . . . [10706-43]

4:10 pm: **Qualification and performances of a highly repeatable cryogenic actuator**, Jean Christophe Barrière, Olivier Corpace, Axel Arhancet, Damien Bachet, Michel Berthé, Michael Carty, Bruno Duboué, Luc Dumaye, Gilles-Alphonse Durand, Jean Fontignie, Philippe Galdemard, Mickael Lacroix, Yannick Le Noa, Jérôme Martignac, Marin Prieur, Commissariat à l'Énergie Atomique (France) . . . . . [10706-44]

4:30 pm: **A novel design for a cryogenic, angle-scanned, Fabry-Pérot interferometer**, Ian T. Veenendaal, David Naylor, Brad G. Gom, Trevor Fulton, Univ. of Lethbridge (Canada), et al.. . . . . [10706-46]

4:50 pm: **Cryogenic cooling systems for the ELT instruments**, Gerd H. Jakob, Matteo Accardo, Marcus Haug, Volker Heinz, European Southern Observatory (Germany) . . . . . [10706-47]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A .....9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 10

LOCATION: CC LEVEL 1, BALLROOM B .....WED 10:30 AM TO 11:50 AM

Test and Metrology I

Session Chair: **Ralf Jedamzik,** SCHOTT AG (Germany)

10:30 am: **Measurement of large on-axis and off-axis mirrors using software configurable optical test system**, Andrew E. Lowman, College of Optical Sciences, The Univ. of Arizona (USA), et al. . . . . [10706-48]

10:50 am: **Meter-class mirror figure metrology using a 24-channel fiber interferometer**, Ronald Holzlöhner, Samuel Lévêque, Nicola Di Lieto, Juan Antonio Marrero Hernández, European Southern Observatory (Germany), et al. . [10706-49]

11:10 am: **High efficiency programmable CGH using DMD generated masks**, Romain Alata, Frédéric Zamkotsian, Patrick Lanzoni, Lab. d'Astrophysique de Marseille (France), et al.. . . . . [10706-51]

11:30 am: **PHAST: plano holographic aspheric stitching technique**, Rebecca Borrelli, Cormic Merle, Eugene Olczak, Harris Corp. (USA) . . . . . [10706-52]

Lunch/Exhibition Break . . . . . Wed 11:50 am to 1:40 pm

SESSION 11

LOCATION: CC LEVEL 1, BALLROOM B .....WED 1:40 PM TO 3:20 PM

Test and Metrology II

Session Chair: **Yoshinori Suematsu,** National Astronomical Observatory of Japan (Japan)

1:40 pm: **Practical co-phasing metrology sensor for E-ELT Telescope**, Rob Snel, TNO (Netherlands) . . . . . [10706-53]

2:00 pm: **Comparison of angle resolved scatter and power spectral density of super polished mirrors,** Venkata Suresh N., Raghavendra Prasad B., Natarajan V., Kamath U. P., Kathiravan S., Indian Institute of Astrophysics (India) . . . . [10706-54]

2:20 pm: **Efficient high-precision CCD-field lens alignment and integration process of mass-produced fast astronomical spectrograph cameras with VIRUS as an example**, Hanshin Lee, Brian L. Vattiat, Gary J. Hill, The Univ. of Texas at Austin (USA) . . . . . [10706-55]

2:40 pm: **DESI commissioning instrument metrology,** Rebecca A. Coles, Mark A. Derwent, Paul Martini, Ashley J. Ross, Thomas P. O'Brien, Suk Sien Tie, The Ohio State Univ. (USA). . . . . [10706-56]

3:00 pm: **VUV test of a new polarimeter for simultaneous ultra-violet and visible spectropolarimetric measurements onboard space missions**, Maëlle Le Gal, Lab. d'Etudes Spatiales et d'Instrumentation en Astrophysique, Observatoire de Paris (France), et al. . . . . [10706-57]

Coffee Break . . . . . Wed 3:20 pm to 3:50 pm

SESSION 12

LOCATION: CC LEVEL 1, BALLROOM B .....WED 3:50 PM TO 5:10 PM

Test and Metrology III

Session Chair: **Roland Geyl,** Safran Reosc (France)

3:50 pm: **Can the European ELT detect super-Earths? Measuring the contrast limit for slicer and lenslet IFS technologies in a laboratory experiment: an update on progress**, Robert M. Barnsley, Oxford of Univ. (United Kingdom), et al.. . . . . [10706-58]

4:10 pm: **Data analysis methods for measuring a laser frequency comb with a Fourier transform spectrograph**, Michael Debus, Philipp Huke, Ansgar Reiners, Georg-August-Univ. Göttingen (Germany) . . . . . [10706-59]

4:30 pm: **3D metrology with a laser tracker inside a vacuum chamber for NISP test campaign**, Anne Costille, Florent Beaumont, Éric Prieto, Lab. d'Astrophysique de Marseille (France), et al. . . . . [10706-60]

4:50 pm: **Optical assessment of the James Webb Space Telescope primary and secondary mirror cryogenic alignment with a Hartmann test**, Laura E. Coyle, Taylor S. Chonis, Koby Z. Smith, J. S. Knight, Ball Aerospace (USA), et al.. . . . . [10706-247]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 .....5:10 PM TO 6:00 PM

Poster Pop Presentations

Session Chairs: **Ramón Navarro,** NOVA Optical IR Instrumentation Group (Netherlands); **Roland Geyl,** Safran Reosc (France)

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 ..... 6:00 PM TO 8:00 PM

Posters: Wednesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Wednesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

ACTIVE INSTRUMENTS (ACTIVE STRUCTURES, ACTIVE OPTICS)

Design and analysis of active vibration damper for telescope by linear motor, Fujia Du, Zhiyong Zhang, Hao Li, Penghui Li, Nanjing Institute of Astronomical Optics & Technology (China). . . . . [10706-99]

Parametric analysis of optomechanical mountings based on hexapodal kinematics, Edoardo Maria Alberto Redaelli, Marco Riva, Matteo Aliverti, Giorgio Pariani, Istituto Nazionale di Astrofisica - INAF (Italy) . . . . . [10706-100]

Design and additive manufacturing of topologically optimized compliant structures for high precision mechanisms, Herve Saudan, Lionel Kiener, Gérald Perruchoud, Johan Kruis, Mohammad Mehdi Dadras, Kaushik Vaideeswaran, Ctr. Suisse d'Electronique et de Microtechnique SA (Switzerland), et al. . . . [10706-101]

Comparison of pose error compensation for focal plane pose test platform using GRNN and CART, Qiang Lu, Jianping Wang, Zhigang Liu, Chao Zhai, Zengxiang Zhou, Univ. of Science and Technology of China (China). . . [10706-102]

Centralized or distributed control configuration, Leszek Lisowski, electronics-lis (Switzerland) . . . . . [10706-103]

An open-loop deformation control of active reflector and its initiative application in FAST telescope, Hui Li, National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10706-104]

Highly integrated versatile motion control units, Leszek Lisowski, electronics-lis (Switzerland), et al. . . . . [10706-105]

Design and Improvements of the control system for LAMOST spectrographs, Guanru Lv, National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10706-106]

Development and test of a novel hexapod with partial decoupling in DOFs for secondary mirrors, Dehua Yang, Changcheng Wu, Fei Fei, Nanjing Univ. of Aeronautics and Astronautics (China), et al. . . . . [10706-107]

LARGE OPTICS MANUFACTURING

Production of mirrors M1, M2 and M3 for DAG project (Belgium, Russia): current status, Magomed A. Abdulkadyrov, Aleksandr P. Semenov, Sergey P. Belousov, Nikita M. Vladimirov, Alexandr N. Ignatov, Vladimir E. Patrikeev, Vitaliy V. Pridnya, Andrey V. Polyanchikov, "Lytkarino Optical Glass Factory", JSC (Russian Federation), et al.. . . . . [10706-108]

Fabricating and testing of the trim plate for the Zwicky Transient Facility, Chen Xu, Yi Zheng, Bo Li, XinNan Li, Zhe Chen, Kunxing Chen, Bin Liang, Nanjing Institute of Astronomical Optics & Technology (China). . . . . [10706-109]

A prototype for the primary mirror of the ESA ARIEL mission: design and development of an off-axis 1-m diameter aluminium mirror for infrared space applications, Vania Da Deppo, CNR-IFN Padova (Italy) and INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10706-110]

MATERIALS

The relation of surface treatment and sub-surface damage on ZERODUR, Ralf Jedamzik, SCHOTT AG (Germany) . . . . . [10706-112]

Radioactive emission from high-index optical glasses, Michael Edgar, Australian Astronomical Observatory (Australia), et al. . . . . [10706-114]

Advices for the use of ZERODUR at higher temperatures, Ralf Jedamzik, Thomas Westerhoff, SCHOTT AG (Germany) . . . . . [10706-115]

Photochromic focal plane mask for MOS spectroscopy, Luca Oggioni, Andrea Bianco, Marco Landoni, INAF - Osservatorio Astronomico di Brera (Italy), et al.. . . . . [10706-116]

A coating method on CFRP mirror surfaces, Young-Soo Kim, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10706-248]

CONFERENCE 10706

MIRROR TECHNOLOGY

Delivery of 20-micron surface segments for the 50-meter LMT primary reflector, David M. Gale, Guillermo B. Hernández, Alejandra O. Rincon, Martín T. Sosa, Lizeth C. Cuevas, Maribel L. Alvarez, Esteban T. Sosa, David C. Santos, Carlos T. Torres, Emilio H. Rios, Andrea L Huerta, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) . . . . . [10706-117]

OPTICAL FABRICATION

Modeling of a stepped Luneberg lens for all-sky surveys, Matthew A. Kenworthy, Mason Carney, Leiden Observatory (Netherlands) . . . . . [10706-118]

Designing and testing a highly stable ceramic sensor platform for challenging thermoelastic requirements, Mathias Krödel, ECM Engineered Ceramic Materials GmbH (Germany), et al.. . . . . [10706-119]

Final correction of thin shells for x-ray telescopes by ion beam figuring, Mauro Ghigo, Stefano Basso, Marta M. Civitani, Bianca Salmaso, Giovanni Pareschi, INAF - Osservatorio Astronomico di Brera (Italy) . . . . . [10706-120]

Commercial availability of astronomical machined gratings by Canon, Takashi Sukegawa, Tomonao Nakayasu, Yukinobu Okura, Canon Inc. (Japan) . [10706-121]

High resolution wideband infrared stationary-wave spectrometer fabricated by ultrafast laser inscription in integrated optic, Irene Heras, Univ. Grenoble Alpes (France) and Institut de Planétologie et d'Astrophysique de Grenoble, Ctr. National de la Recherche Scientifique (France), et al.. . . . . [10706-122]

The first polarimeter in astronomy to use stress-engineered optics, Tristan Wolfe, Robert E. Stencel, Univ. of Denver (USA) . . . . . [10706-123]

Manufacturing of aluminum mirrors for cryogenic applications, Jan Kinast, Ralph Schlegel, Knut Kleinbauer, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany), et al.. . . . . [10706-124]

Spectral multiplexed VPHG based on photopolymers: the first application on a spectrograph, Alessio Zanutta, INAF - Osservatorio Astronomico di Brera (Italy), et al.. . . . . [10706-125]

High-performance integrated photonic spectrometers based on arrayed waveguide gratings in silica, Ziyang Zhang, Andreas Stoll, Kalaga V. Madhav, Julia Fiebrandt, Vadim Makan, Kirill Makan, Kai Sun, Dele Zhu, Martin M. Roth, Leibniz-Institut für Astrophysik Potsdam (Germany). . . . . [10706-126]

WEAVE spectrograph cameras: the polishing of the spherical lenses, Rafael Izazaga, Esperanza Carrasco Licea, Andrea Alejandra Hidalgo Valadez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al.. . . . . [10706-127]

Probing 3M Trizact diamond tiled abrasive pads in polishing phase of fused silica, Marta M. Civitani, Joanna Holyszko, Gabriele Vecchi, INAF - Osservatorio Astronomico di Brera (Italy) . . . . . [10706-128]

Design of an integral field unit for SWIMS and its milling process fabrication with an ultra-high precision machine tool, Yukihiro Kono, The Univ. of Tokyo (Japan), et al.. . . . . [10706-129]

Test plate optics manufacturing and design for the camera lenses of the WEAVE spectrograph, Andrea Alejandra Hidalgo Valadez, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico) and Univ. of Oxford (United Kingdom), et al.. . . . . [10706-130]

TECHNOLOGIES FOR CRYOGENIC INSTRUMENTS

Cryogenic reliability of stock and re-windowed digital micromirror devices (DMDs), Gavin Hope, Aberdeen High School (USA), et al.. . . . . [10706-131]

Performance definition and design description of the power and mechanism control Unit of the VIS instrument on-board the EUCLID space mission, Christophe Cara, Eric Doumayrou, Alain Goetschy, Francois Nico, Jean Fontignie, Luc Dumaye, Thierry Tourrette, Duc Dat Huynh, Michel Berthe, Commissariat à l'Énergie Atomique (France), et al. . . . . [10706-132]

Compact sub-mm FTS for CMB instrumentation, Ritoban Basu Thakur, Mira Liu, Stephan Meyer, Zhaodi Pan, Hazal Goksu, Bradford Benson, The Univ. of Chicago (USA) . . . . . [10706-133]

Testing a prototype rotary mechanism for GMTIFS, Ian Price, John Hart, Ellie O'Brien, Rob Sharp, Gaston Gausachs, Gabe Bloxham, Colin Vest, James Gilbert, Brady Espeland, The Australian National Univ. (Australia) . . . . . [10706-134]

Design and analysis of a compact Fourier transform spectrometer, Mira Liu, Ritoban Basu Thakur, Stephan Meyer, Zhaodi Pan, Hazal Goksu, Bradford Benson, The Univ. of Chicago (USA). . . . . [10706-135]

Applications of CMOS visible image sensor to survey of potentially hazardous asteroids using optimized ground based telescopes, Stephen M. Larson, The Univ. of Arizona (USA), et al.. . . . . [10706-136]

The pre-optics mechanism prototypes for HARMONI, Elvio Hernández Suárez, José Vicente Gigante Ripoll, Instituto de Astrofísica de Canarias (Spain), et al.. . . . . [10706-137]

Composite material evaluation at cryogenic temperatures for applications in space-based far-infrared astronomical instrumentation, Locke D. Spencer, Ian T. Veenendaal, David A. Naylor, Univ. of Lethbridge (Canada), et al.. . . [10706-138]

Reflective optical system made entirely of ultra low thermal expansion ceramics: a possibility of genuine athermal cryogenic IR instrument, Yuki Sarugaku, Kyoto Sangyo Univ. (Japan), et al.. . . . . [10706-139]

TELESCOPE STRUCTURES AND DOMES

The key technology of large telescope tracking system based on integrated super-low speed bearingless motor, Changzhi Ren, Nanjing Institute of Astronomical Optics & Technology (China). . . . . [10706-35]

Research on active heat dissipation experimental system for focal plate, Lixuan Cheng, Jianping Wang, Jiaru Chu, Zengxiang Zhou, Ping Zhang, Univ. of Science and Technology of China (China) . . . . . [10706-140]

Design and optimization for a 1m telescope tube, Yile Xie, Zhiyong Zhang, Guomin Wang, Nanjing Institute of Astronomical Optics & Technology (China) . . . . . [10706-142]

Correlation analysis of angular deviation and sunshine temperature on Miyun 50m Radio Telescope, Deqing Kong, Zhengyang Jiang, National Astronomical Observatories, Chinese Academy of Sciences (China). . . . . [10706-143]

Beam pointing deviation calculation method for large antennas at any position based on track roughness, Haihua Li, Congsi Wang, Kang Ying, Hao Wang, Xidian Univ. (China), et al. . . . . [10706-144]

Real-time measuring of supporting legs deformations of radio telescope sub-reflector under the environmental loading, Yong Zhao, Hong Bao, Xidian Univ. (China), et al. . . . . [10706-145]

Mechanical-electrical integration design of 110m radio telescope structure, Wei Wang, Shuo Zhang, Xidian Univ. (China), et al. . . . . [10706-146]

GIANO-B online data reduction software (DRS) at the TNG, Avet Harutyunyan, Fundación Galileo Galilei - INAF (Spain), et al. . . . . [10706-147]

TEST AND METROLOGY

Photogrammetry mapping and alignment of the LMT 50-meter primary reflector, David M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al. . . . . [10706-148]

SIPA: stitching interferometry with probabilistic algorithms, Daniel Aguirre-Aguirre, Univ. Nacional Autónoma de México (Mexico), et al. . . . . [10706-149]

Wavefront sensing for active alignment control of a telescope with dynamically varying pupil geometry: theory, implementation, on-sky performance, Hanshin Lee, Gary J. Hill, Niv Drory, Jason Ramsey, Randy Bryant, Matthew Shetrone, The Univ. of Texas at Austin (USA) . . . . . [10706-150]

A Fabry-Perot etalon calibrator for the Habitable Zone Planet Finder, Ryan C. Terrien, Carleton College (USA), et al.. . . . . [10706-151]

Near infrared throughput and stray light measurements of diffraction gratings for ELT-HARMONI, John I. Capone, Fraser Clarke, Univ. of Oxford (United Kingdom), et al. . . . . [10706-152]

Mechanical alignment of optical systems: practical limits and accuracy estimation, Matteo Aliverti, Giorgio Pariani, Marco Riva, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . . . [10706-153]

Post-fabrication metrology and analysis of the LMT segmented secondary reflector, David M. Gale, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al. . . . . [10706-154]

Absolute Shack-Hartmann type wavefront metrology, Jean-Michel Asfour, Niklas Andermahr, Dioptic GmbH (Germany) . . . . . [10706-155]

Development of a broadband and stable astrocomb for calibration of the Habitable Zone Planet Finder (HPF) spectrograph, Connor Fredrick, Andrew J. Metcalf, Univ. of Colorado Boulder (USA) and National Institute of Standards and Technology (USA), et al. . . . . [10706-156]

Knife-edge and ZWFS fusion: demonstrating ultra-high dynamic range sensing for segmented apertures, Shannon Kian Zareh, Dustin Moore, James K. Wallace, David Redding, Jet Propulsion Lab. (USA) . . . . . [10706-157]

Test of a laser-frequency-comb-based wavelength calibration on the GIANO-B near-infrared spectrograph, Ewelina Obrzud, Univ. de Genève (Switzerland) and Ctr. Suisse d'Electronique et de Microtechnique SA (Switzerland), et al.[10706-158]

High precision metrology for large bandpass filters, Benoît Sassolas, IN2P3-Lab. des Matériaux Avancés, Ctr. National de la Recherche Scientifique (France), et al.. . . . . [10706-159]

Factory and site characterization testing of a large precision hexapod for the LMT/GTM, David R. Smith, MERLAB, P.C. (USA), et al. . . . . [10706-160]

Dark Energy Spectroscopic Instrument (DESI) Fiber Positioner Thermal and Wind Disturbance Test, Kai Zhang, Joseph H. Silber, Lawrence Berkeley National Lab. (USA), et al. . . . . [10706-161]

Mechanical alignment of optical system: CMMs forces and damages on optical elements, Matteo Aliverti, Giorgio Pariani, Marco Riva, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . . . [10706-162]

Experimental study of breakaway system for the fast-steering secondary mirror of GMT, Yunjong Kim, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10706-163]

DESI focal plate alignment, Yutong Duan, Boston Univ. (USA), et al. . [10706-164]

Lens mounting techniques for precise radial location of fragile lenses in the NGS2 and Veloce instruments, Nicholas Herrald, Francis Bennet, John Hart, Céline d'Orgeville, François Rigaut, Ian Price, The Australian National Univ. (Australia) . . . . . [10706-165]

MADLaSR: multi-angle detector of Lambertian and specular reflectivity, Lawrence Gardner, Rutgers Univ. (USA), et al. . . . . [10706-166]

Polarimetric testing and calibration strategies for the DKIST optical components and optical system, Stacey R. Sueoka, David M. Harrington, National Solar Observatory (USA) . . . . . [10706-167]

Mechanical based alignment of large optical instruments: ESPRESSO as an example, Giorgio Pariani, Matteo Aliverti, Matteo Genoni, Luca Oggioni, Marco Riva, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . . . [10706-168]

Simulation analysis of the photographic noncoincidence between fiber ends and light spots under integrating sphere light source, Juan Luo, Yonggang Gu, Ye Zhu, Chao Zhai, Univ. of Science and Technology of China (China) . [10706-169]

Optimal baffle design for flat illumination with an integrating sphere, Justine Haupt, Ivan Kotov, Andrei Nomerotski, Brookhaven National Lab. (USA)[10706-170]

Photogrammetry-based metrology of the fiber positioner in LAMOST, Lianpo Wang, Yonggang Gu, Ye Zhu, Chao Zhai, Hongzhuan Hu, Zhigang Liu, Univ. of Science and Technology of China (China) . . . . . [10706-171]

A multi-purpose cryogenic test facility for astronomical instrumentation, Adrian M. Glauser, Stephen March, Marcel Baer, ETH Zürich (Switzerland) . . . . . [10706-172]

A reconstruction method of large shaped reflective surface antenna based on Zernike polynomials and least squares method, Hao Wang, Congsi Wang, Kang Ying, Haihua Li, Xidian Univ. (China) . . . . . [10706-173]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 13

LOCATION: CC LEVEL 1, BALLROOM B . . . . . THU 10:30 AM TO 12:10 PM

Coatings, Filters and Gratings I

Session Chair: **Hélène T. Krol,** CILAS (France)

10:30 am: **high uniformity IBS coatings for the world's largest Fabry-Perot etalon of the VTF instrument**, Laurent Pinard, Christophe Michel, Benoît Sassolas, Julien Teillon, Lab. des Matériaux Avancés, Ctr. National de la Recherche Scientifique (France) and Institut National de Physique Nucléaire et de Physique des Particules (France), et al. . . . . [10706-61]

10:50 am: **BBAR coating for the meter class DESI lenses**, Charles M. Kennemore III, Debi Archer, Russ Barbaria, Joe Bertolina, Viavi Solutions Inc. (USA), et al. . . . . [10706-62]

11:10 am: **Protected silver coatings for reflectors**, Stefan Schwinde, Mark Schürmann, Ralph Schlegel, Jan Kinast, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany), et al. . . . . [10706-63]

11:30 am: **In-Situ Measurement of the Subaru Telescope Primary Mirror Reflectivity**, Hirofumi Okita, Naruhisa Takato, Subaru Telescope, NAOJ (USA), et al. . . . . [10706-64]

11:50 am: **Elimination of Mirror Recoating and Realignment: Optical Contamination Control Using First Contact Polymers on GTC, Keck, LIGO and Starshade Telescopes**, James P. Hamilton, Univ. of Wisconsin-Platteville (USA) and Photonic Cleaning Technologies (USA), et al. . . . . [10706-65]

Lunch/Exhibition Break . . . . . Thu 12:10 pm to 1:40 pm

SESSION 14

LOCATION: CC LEVEL 1, BALLROOM B . . . . . THU 1:40 PM TO 3:20 PM

Coatings, Filters and Gratings II

Session Chair: **Hélène T. Krol,** CILAS (France)

1:40 pm: **Update on UCO development of improved astronomical coatings**, Andrew C. Phillips, Univ. of California Observatories (USA), et al. . . . . [10706-66]

2:00 pm: **ELT-HIRES the High Resolution Spectrograph for the ELT: phase-A design of its polarimetric unit,** Igor Di Varano, Manfred Woche, Klaus G. Strassmeier, Ilya Ilyin, Michael Weber, Leibniz-Institut für Astrophysik Potsdam (Germany), et al. . . . . [10706-67]

2:20 pm: **Carbon nanotube based optical black coatings for optical and infrared applications**, David Carnahan, Colin Preston, Nanolab, Inc. (USA), et al. . . . . [10706-68]

2:40 pm: **Dense black absorbing coatings for parasitic light reduction**, Hélène T. Krol, Catherine Grèzes-Besset, Grégory Chauveau, Colin Bondet de la Bernardie, Baptiste Grasmuck, Dragan Stojcevski, CILAS (France) . . . . . [10706-69]

3:00 pm: **Surface relief gratings manufactured by lithographic means being a candidate for VLT MOONS instrument's main dispersers**, Thomas Flügel-Paul, Torsten Harzendorf, Dirk Michaelis, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany), et al. . . . . [10706-70]

Coffee Break . . . . . Thu 3:20 pm to 3:50 pm

SESSION 15

LOCATION: CC LEVEL 1, BALLROOM B . . . . . THU 3:50 PM TO 5:50 PM

Coatings, Filters and Gratings III

Session Chair: **Ramón Navarro,** NOVA Optical IR Instrumentation Group (Netherlands)

3:50 pm: **Dispersing elements for astronomy: new trends and possibilities**, Andrea Bianco, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . [10706-71]

4:10 pm: **Innovative diffraction gratings for astronomy application**, Christophe Gombaud, HORIBA FRANCE SAS (France) . . . . . [10706-72]

4:30 pm: **Manufacturing silicon immersion gratings for GMTNIRS on 150-mm material**, Benjamin T. Kidder, Cynthia B. Brooks, Michelle M. Grigas, Daniel T. Jaffe, The Univ. of Texas at Austin (USA) . . . . . [10706-73]

4:50 pm: **High efficiency transmission grating for the ESO CUBES UV spectrograph**, Frank Burmeister, Thomas Flügel-Paul, Uwe Zeitner, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany), et al. . . . . [10706-74]

5:10 pm: **New opportunities of freeform gratings using diamond machining,** Cyril Bourgenot, Ray M. Sharples, Ariadna Calcines, Durham Univ. (United Kingdom) . . . . . [10706-75]

5:30 pm: **Convex blazed gratings for high throughput spectrographs**, Frédéric Zamkotsian, Lab. d'Astrophysique de Marseille (France), et al. . . . . [10706-76]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Thursday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Thursday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

ATMOSPHERIC COMPENSATION

The origin of core-to-core variations in multicore fibre Bragg gratings, Simon C. Ellis, Australian Astronomical Observatory (Australia), et al. . . . . [10706-174]

On the modal throughput of photonic lanterns in the presence of partial AO correction, Momen Diab, Stefano Minardi, Ettore Pedretti, Leibniz-Institut für Astrophysik Potsdam (Germany). . . . . [10706-175]

Lateral displacement biplate for DIMM, Félix Gracia Témich, José Luis Rasilla Piñeiro, José Miguel Delgado Hernández, Instituto de Astrofísica de Canarias (Spain) . . . . . [10706-176]

COATINGS, FILTERS AND GRATINGS

New type of echelle gratings with integrated cross-disperser functionality, Thomas Flügel-Paul, Torsten Harzendorf, Dirk Michaelis, Frank Burmeister, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany), et al. . . . . [10706-177]

CONFERENCE 10706

Protecting silver-based mirrors with the Big ALD: introduction of a novel large-scale optic coating tool, David M. Fryauf, Univ. of California, Santa Cruz (USA), et al. . . . . [10706-178]

Dichroic and anti-reflective coatings for astronomical instrumentation, Eléonore Barthélémy-Mazot, Christophe Michel, Julien Teillon, Laurent Pinard, Benoît Sassolas, David Hofman, Lab. des Matériaux Avancés, Ctr. National de la Recherche Scientifique (France) and Institut National de Physique Nucléaire et de Physique des Particules (France), et al. . . . . [10706-179]

The instrumental polarization of off-axis main optics of the 1.6m Goode Solar Telescope, Shu Yuan, Yunnan Astronomical Observatories, Chinese Academy of Sciences (China), et al. . . . . [10706-180]

Design, fabrication, and test of a patterned optical filter array for the Europa imaging system, Kyle J. Ryan, Steven N. Osterman, Johns Hopkins Univ. Applied Physics Lab., LLC (USA), et al. . . . . [10706-181]

Optimizing the efficiency of Fabry-Perot interferometers with silicon-substrate mirrors, Nicholas F. Cothard, Mahiro Abe, German Cortes, Patricio Gallardo, Brian Koopman, Michael Niemack, Thomas Nikola, Stephen Parshley, Gordon Stacey, Kenny Vetter, Cornell Univ. (USA) . . . . . [10706-182]

Photopolymer-based VPHGs for astronomy: update and new possibilities, Paola Galli, Politecnico di Milano (Italy), et al.. . . . . [10706-183]

New over-octave VPHG architecture for DOLORES spectrograph at TNG, Alessio Zanutta, INAF - Osservatorio Astronomico di Brera (Italy), et al. [10706-184]

Towards a multi-input astrophotonic AWG spectrograph, Pradip R. Gatkine, Univ. of Maryland, College Park (USA), et al. . . . . [10706-185]

Hemispherical total reflectance from 2 to 20 micron wavelength for vacuum compatible IR black coatings, Paul J. Kuzmenko, Lawrence Livermore National Lab. (USA), et al. . . . . [10706-186]

Higher dispersion and efficiency Bragg gratings for optical spectroscopy, Will Saunders, Australian Astronomical Observatory (Australia), et al. . . . . [10706-187]

Design of free-form diffraction gratings: performance, limitations and potential applications, Ariadna Calcines, Cyril Bourgenot, Ray M. Sharples, Durham Univ. (United Kingdom). . . . . [10706-188]

Optical testing and performance of large ZnSe grisms for the rapid infrared/ imager spectrometer (RIMAS), Paul J. Kuzmenko, Steve L. Little, Lawrence Livermore National Lab. (USA), et al. . . . . [10706-189]

VPHGs for WEAVE: design, manufacturing and characterization, Andrea Bianco, Giorgio Pariani, Matteo Aliverti, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . . . [10706-190]

Process and metrology developments in the production of immersion gratings, Cynthia B. Brooks, Benjamin T. Kidder, Michelle M. Grigas, Daniel T. Jaffe, The Univ. of Texas at Austin (USA) . . . . . [10706-191]

Micro-ring resonator-based suppression of atmospheric OH emission for infrared spectroscopy, Kyler Kuehn, Simon C. Ellis, Australian Astronomical Observatory (Australia), et al. . . . . [10706-192]

ELT-HIRES the high resolution spectrograph for the ELT: optical design studies for the polarimetric unit, Manfred Woche, Igor Di Varano, Klaus G. Strassmeier, Michael Weber, Leibniz-Institut für Astrophysik Potsdam (Germany), et al.. . . . . [10706-193]

Testing of a germanium immersion grating, Matthew J. Richter, Univ. of California, Davis (USA), et al.. . . . . [10706-194]

Characterization of the reflectivity of various black materials II, Luke M. Schmidt, Doyeon Kim, Michael Torregosa, Darren L. DePoy, Lawrence Gardner, Walter Grant, Jennifer L. Marshall, Travis Prochaska, Marcus Sauseda, Madelynn Gomez, Texas A&M Univ. (USA) . . . . . [10706-195]

Characterization of the reflectivity of various white materials, Luke M. Schmidt, Doyeon Kim, Michael Torregosa, Darren L. DePoy, Daniel Freeman, Lawrence Gardner, Walter Grant, Jennifer L. Marshall, Travis Prochaska, Marcus Sauseda, Madelynn Gomez, Texas A&M Univ. (USA). . . . . [10706-196]

Antireflective coatings in astronomical instruments, WEAVE: a case of study, Rafael Ortiz, Esperanza E. Carrasco Licea, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al. . . . . [10706-197]

MEGARA anti-reflective coatings: theoretical and observed throughput estimations, Rafael Ortiz, Esperanza E. Carrasco Licea, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico), et al.. . . . . [10706-198]

CORONOGRAPHY AND HIGH CONTRAST IMAGING

Fully broadband vAPP coronagraphs enabling polarimetric high contrast imaging, Steven P. Bos, David S. Doelman, Jos de Boer, Emiel H. Por, Leiden Observatory (Netherlands), et al.. . . . . [10706-199]

Phase-induced amplitude apodization complex-mask coronagraph tolerancing and analysis, Justin Knight, Olivier Guyon, Alexander T. Rodack, Jared Males, The Univ. of Arizona (USA), et al. . . . . [10706-200]

A simple amplitude pupil mask to attempt to directly image Proxima b with SPHERE/ZIMPOL at VLT, Polychronis Patapis, Hans Martin Schmid, Jonas G. Kuhn, ETH Zürich (Switzerland), et al.. . . . . [10706-201]

Performance and characterization of direct write techniques on multi-core fibers for the SCAR coronagraph, Sebastiaan Y. Haffert, Leiden Univ. (Netherlands), et al. . . . . [10706-202]

Development of an integral field spectrograph on a high contrast imaging test bench for exoplanet characterization, Christian Delacroix, He Sun, Princeton Univ. (USA), et al. . . . . [10706-204]

Development of low-scatter optical edges for starshades, John Steeves, Hyeong J Lee, Evan Hilgemann, David Webb, Stuart Shaklan, Stefan Martin, Douglas Lisman, Dylan McKeithen, Christine Bradley, Jet Propulsion Lab. (USA) . . . . . [10706-205]

Focal-plane phase-apodized vortex coronagraphy for centrally obscured telescopes, Emiel H. Por, Leiden Observatory (Netherlands) . . . . . [10706-206]

SCExAO: new high-performance coronagraphs ready for science, Julien Lozi, Subaru Telescope, NAOJ (USA), et al. . . . . [10706-207]

PIAA coronagraph for Origins Space Telescope (OST) mid-infrared imager, spectrometer, coronagraph (MISC) instrument, Naofumi Fujishiro, Teikyo Univ. (Japan), et al.. . . . . [10706-208]

Hhigh-constrast apodization baffle for instruments of the solar system exploration missions, Keigo Enya, Institute of Space and Astronautical Science (Japan), et al.. . . . . [10706-209]

MULTI OBJECT SPECTROSCOPY

Multiple rooks of chess: a generic integral field unit deployment technique, Sabyasachi Chattopadhyay, Anamparambu Ramaprakash, Inter-Univ. Ctr. for Astronomy and Astrophysics (India), et al. . . . . [10706-210]

Scattered light testing of digital micromirror devices (DMDs), Aidan Gray, Univ. of Maryland, Baltimore (USA), et al. . . . . [10706-212]

A microoptical fiber positioner, Hongzhuan Hu, Jianping Wang, Zhigang Liu, Zengqiang Zhou, Chao Zhai, Jiaru Chu, Univ. of Science and Technology of China (China) . . . . . [10706-213]

OPTICAL FIBERS AND POSITIONERS

Modal noise suppression in the NIR region using multicore fibre and photonic lanterns, Dionne M. Haynes, Leibniz-Institut für Astrophysik Potsdam (Germany), et al.. . . . . [10706-214]

Final characteristics and performances of the fibres of MOONS, Isabelle Guinouard, Jean-Philippe Amans, Observatoire de Paris (France), et al. [10706-215]

TAIPAN: a massively multiplexed spectroscopic instrument with rapid reconfiguration capabilities, Kyler Kuehn, Jon Lawrence, Nuria Lorente, David Brown, Rebecca A. Brown, Slavko Mali, Lewis Waller, Rolf Muller, Scott Case, Vlad Churilov, Ross Zhelem, Michael Goodwin, Naveen Pai, Urs Klauser, Tony Farrell, Pascal Xavier, Minh Vuong, Carlos Bacigalupo, Robert Brookfield, Carl Holmesby, Steve Chapman, Australian Astronomical Observatory (Australia) . . . . . [10706-216]

Dark energy spectroscopic instrument (DESI) focal plate assembly, Todd M. Claybaugh, Jessica Aguilar, Lawrence Berkeley National Lab. (USA), et al.. . . . . [10706-217]

Dynamic position accuracy analysis of fiber positioner, Feng Cheng, Yonggang Gu, Chao Zhai, Univ. of Science and Technology of China (China) . . . . [10706-218]

Evaluation and optimization of optical hollow fiber and rectangular hollow waveguide coupler as applications of future mid-infrared heterodyne spectrometer, Kosuke Takami, Hiromu Nakagawa, Takashi Katagiri, Tohoku Univ. (Japan), et al.. . . . . [10706-219]

New-generation hexabundles: development and initial results, Rebecca A. Brown, Julia J. Bryant, Australian Astronomical Observatory (Australia) and The Univ. of Sydney (Australia), et al.. . . . . [10706-220]

Influence of optical fiber positioning accuracy on IFU performance, Weimin Sun, Tao Geng, Qi Yan, Xiren Jin, Xudong Chen, Hang Jiang, Qiong Zhang, Rong Zhao, Harbin Engineering Univ. (China) . . . . . [10706-221]

The effect of fibre fusion on focal ratio degradation and transmission, Jian Li, National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10706-222]

Sensorless position control of brushless DC motor in optical fiber positioning, Guanxi Chen, Yi Kan, Yuran Shen, Zhigang Liu, Chao Zhai, Yonggang Gu, Hongzhuan Hu, Univ. of Science and Technology of China (China). . . . [10706-223]

The impact of fiber fusion on the focal ratio degradation and transmission, Jian Li, National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10706-224]

Final mechanical design and routing of optical fibre system for 4MOST, Allar Saviauk, Dionne Haynes, Roger Haynes, Thomas Jahn, Andreas Kelz, Johannes Piotrowski, Dennis Plüschke, Leibniz-Institut für Astrophysik Potsdam (Germany), et al. . . . . [10706-225]

A new fiber link for the HERMES spectrograph: throughput, scrambling and modal noise issues, Gert Raskin, KU Leuven (Belgium), et al. . . . . [10706-226]

Acquisition and guiding for TAIPAN using Starbugs, Carlos Bacigalupo, Michael Goodwin, Kyler Kuehn, Scott Case, David M. Brown, Nuria Lorente, Rebecca Brown, Tony Farrell, Australian Astronomical Observatory (Australia) . . [10706-227]

Dark energy spectroscopic instrument (DESI) fiber positioner production, Daniela Leitner, Jessica N. Aguilar, Joseph H. Silber, Lawrence Berkeley National Lab. (USA), et al. . . . . [10706-228]

Performance of the updated Southern African Large Telescope prime-focus guidance system, Janus D. Brink, Ockert J. Strydom, Stephen N. Hulme, Anthony R. Koeslag, Deneys S. Maartens, Keith Browne, Eben P. Wiid, South African Astronomical Observatory (South Africa) and Southern African Large Telescope (South Africa). . . . . [10706-229]

A diagnostic tool for microbends in fibre termination as a source of FRD, David Coutts, Macquarie Univ. (Australia). . . . . [10706-230]

Position control of brushless DC motor in optical fiber positioning, Guanxi Chen, Yi Kan, Yuran Shen, Yonggang Gu, Zhigang Liu, Hongzhuan Hu, Chao Zhai, Univ. of Science and Technology of China (China). . . . . [10706-231]

Design and performances of an optical metrology system to test position and tilt accuracy of fiber positioners, Luzius Kronig, Philipp Hörler, Jean-Paul Kneib, Mohamed Bouri, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . . . . [10706-232]

9:30 am: **A new tilting-spine, grid-based fibre positioner concept that stays pupil centric and in focus**, Roelof S. de Jong, Leibniz-Institut für Astrophysik Potsdam (Germany), et al.. . . . . [10706-80]

SLIT SPECTROSCOPY AND IMAGE SLICERS

Laboratory and system performance of the VLT/CRIRES+ infra-red Fabry-Perot Etalon calibrator, Ulf Seemann, Heiko Anwand-Heerwart, Georg-August-Univ. Göttingen (Germany), et al. . . . . [10706-233]

Development of a field-of-view scanning system (FoV-SS): test results and lessons learned, Miguel Ángel Esteves Pérez, Kiepenheuer-Institut für Sonnenphysik (Germany), et al.. . . . . [10706-234]

The TNG/GIARPS gas-absorption cell for near-infrared precision radial velocities, Ulf Seemann, Georg-August-Univ. Göttingen (Germany), et al.. . . . . [10706-235]

The advanced image slicers of OCTOCAM, Robert Content, Australian Astronomical Observatory (Australia), et al. . . . . [10706-236]

Fiber Fabry Perot: high precision spectral calibration for medium and low resolution optical spectrographs, Maximilian H. Fabricius, Ralf Bender, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10706-237]

A high-efficiency low-resolution spectrograph design for SALT, Janus D. Brink, Ockert J. Strydom, South African Astronomical Observatory (South Africa) and Southern African Large Telescope (South Africa), et al. . . . . [10706-238]

A study of white pupil configurations for high-resolution échelle spectrographs, Daniel P. Sablowski, Manfred Woche, Michael Weber, Arto Järvinen, Klaus G. Strassmeier, Leibniz-Institut für Astrophysik Potsdam (Germany) . . . . . [10706-240]

ASSORTED TOPICS

Geometry for off-axis parabolic mirrors, Jeong-Yeol Han, Korea Astronomy and Space Science Institute (Korea, Republic of), et al. . . . . [10706-241]

Ultrashort pulse point-by-point written aperiodic fiber Bragg gratings for suppression of OH-emission lines, Thorsten A. Goebel, Friedrich-Schiller-Univ. Jena (Germany), et al. . . . . [10706-242]

A Light-Weighted F/1.3 Elliptical Secondary Mirror for the GREGOR Solar Telescope, Oskar F. von der Lühe, Kiepenheuer-Institut für Sonnenphysik (Germany) . . . . . [10706-243]

High precision metrology of a large aperture Fabry-Pérot etalon, Wilbur J. Reichman II, Zygo Corporation (USA), et al. . . . . [10706-244]

Field testing and performance characterization of the production LMT/GTM active surface actuators, David R. Smith, MERLAB, P.C. (USA), et al. [10706-245]

VIRUS: the instrument infrastructure to support the deployment and upkeep of 156 spectrographs at the Hobby-Eberly Telescope, Renny Spencer, Edmundo Balderrama, George Damm, Jim Fowler, John Good, Gary J. Hill, The Univ. of Texas at Austin (USA), et al. . . . . [10706-246]

FRIDAY 15 JUNE

SESSION 16

LOCATION: CC LEVEL 1, BALLROOM B . . . . . FRI 8:50 AM TO 10:10 AM

Optical Fibers and Positioners

Session Chair: **Roger Haynes,** Leibniz-Institut für Astrophysik Potsdam (Germany)

8:50 am: **3D-printed microlens arrays as tip-tilt sensor for single mode fiber coupling**, Philipp Hottinger, Zentrum für Astronomie der Univ. Heidelberg (Germany) and Landessternwarte Königstuhl (Germany), et al. . . . . [10706-77]

9:10 am: **Merging light beams from the 4 VLT telescopes**, Félix Gracia Témich, José Luis Rasilla, Instituto de Astrofísica de Canarias (Spain), et al. . . . . [10706-78]

9:30 am: **DESI fiber positioner testing and performance**, Michael S. Schubnell, Univ. of Michigan (USA), et al.. . . . . [10706-79]

9:30 am: **Hoverboards: focal plane positioner for large-sized payloads**, Michael Goodwin, David M. Brown, Prerak Chapagain, Jon S. Lawrence, Australian Astronomical Observatory (Australia) . . . . . [10706-81]

Coffee Break . . . . . Fri 10:10 am to 10:40 am

SESSION 17

LOCATION: CC LEVEL 1, BALLROOM B . . . . . FRI 10:40 AM TO 12:00 PM

Multi Object Spectroscopy

Session Chair: **Roger Haynes,** Leibniz-Institut für Astrophysik Potsdam (Germany)

10:40 am: **MEGARA MOS: where are my positioners and fibers pointing to?**, Ana Pérez-Calpena, Ernesto Sánchez, Pedro Gomez-Cambronero, Ismael Martinez, FRACTAL S.L.N.E (Spain), et al. . . . . [10706-82]

11:00 am: **Development of digital micromirror devices for use in the far-ultraviolet regime**, Dmitry Vorobiev, Anton Travinsky, Zoran Ninkov, Rochester Institute of Technology (USA), et al. . . . . [10706-211]

11:20 am: **A new photolithography based technique to mass produce microlens+fibre based integralfield units (IFUs) for 2D spectroscopy**, Sabyasachi Chattopadhyay, Inter-Univ. Ctr. for Astronomy and Astrophysics (India), et al.. . . . . [10706-84]

11:40 am: **Digital micromirror control electronics for visible and near IR spectroscopy**, Stephen C. Hope, Johns Hopkins Univ. (USA), et al. . . . [10706-85]

Lunch Break . . . . . Fri 12:00 pm to 1:30 pm

SESSION 18

LOCATION: CC LEVEL 1, BALLROOM B . . . . . FRI 1:30 PM TO 2:50 PM

Slit Spectroscopy and Image Slicers

Session Chair: **Matthias Tecza,** Univ. of Oxford (United Kingdom)

1:30 pm: **The reformatting advantage: Photonics vs conventional optics!**, Ariadna Calcines, Durham Univ. (United Kingdom), et al.. . . . . [10706-86]

1:50 pm: **Optimising astrophotonic spatial reformatters using simulated on sky performance**, Theodoros Anagnos, Robert J. Harris, Landessternwarte Heidelberg (Germany) and Zentrum für Astronomie der Univ. Heidelberg (Germany), et al.. . . . . [10706-87]

2:10 pm: **Design and proto-typing of integral field units for the ELT-PCS test bench spectrograph**, Matthias Tecza, Robert M. Barnsley, Univ. of Oxford (United Kingdom), et al. . . . . [10706-88]

2:30 pm: **Astrophotonics devices for agriculture sensors: photonic lantern enabled low-cost 3D-printed Raman spectrometer and probe**, Christopher H. Betters, Sergio G. Leon-Saval, Joss Bland-Hawthorn, Robyn McConchie, Salah Sukkarieh, Rosalind Deaker, The Univ. of Sydney (Australia). . . . . [10706-89]

SESSION 19

LOCATION: CC LEVEL 1, BALLROOM B . . . . . FRI 2:50 PM TO 5:40 PM

Coronography and High Contrast Imaging

Session Chair: **Matthew A. Kenworthy,** Leiden Observatory (Netherlands)

2:50 pm: **Progress on an astronomical on-chip nulling interferometer in the mid-infrared**, Thomas Gretzinger, Simon Gross, Alexander Arriola, Macquarie Univ. (Australia) and CUDOS, An ARC Ctr. of Excellence (Australia), et al. . . . . [10706-90]

Coffee Break . . . . . Fri 3:10 pm to 3:40 pm

3:40 pm: **Review of high-contrast imaging systems for current and future ground-based and space-based telescopes III: technology opportunities and pathways,** Frans Snik, Leiden Observatory (Netherlands), et al. . . . . [10706-91]

4:00 pm: **Experimental test of a micro-mirror array as an adaptive apodizer for high-contrast imaging,** Alexis Carlotti, David Mouillet, Laurent Jocou, Etienne Le Coarer, Guillaume Bourdarot, Institut de Planétologie et d'Astrophysique de Grenoble (France) . . . . . [10706-92]

4:20 pm: **SLM-based digital adaptive coronagraphy: current status and key capabilities, from NCPA self-calibration to a re-configurable aperture-optimized coronagraph**, Jonas G. Kuhn, Polychronis Patapis, Xin Lu, ETH Zürich (Switzerland) . . . . . [10706-93]

4:40 pm: **Optimization and performance of multi-DM correction on the THD2 bench**, Pierre Baudoz, Lab. d'Etudes Spatiales et d'Instrumentation en Astrophysique, Observatoire de Paris (France) and Univ. PSL (France), et al.. . . . . [10706-94]

5:00 pm: **The evanescent wave coronagraph project: setup results and demonstrator preliminary design**, Christophe Buisset, National Astronomical Research Institute of Thailand (Thailand), et al. . . . . [10706-95]

5:20 pm: **Phase-induced amplitude apodization complex-mask coronagraphy for the Magellan extreme adaptive optics instrument and the giant Magellan Telescope: design and fabrication**, Justin Knight, Olivier Guyon, Jared Males, The Univ. of Arizona (USA) . . . . . [10706-96]

CONFERENCE 10707

Sunday–Wednesday 10–13 June 2018 • Proceedings of SPIE Vol. 10707

Software and Cyberinfrastructure for Astronomy V

Conference Chairs: **Juan C. Guzman,** Commonwealth Scientific and Industrial Research Organisation (Australia); **Jorge Ibsen,** European Southern Observatory appointed to Atacama Large MIllimiter/Submillimiter Array (Chile)

Program Committee: **Alan Bridger,** UK Astronomy Technology Ctr. (United Kingdom); **Gianluca Chiozzi,** European Southern Observatory (Germany); **Tom Donaldson,** Space Telescope Science Institute (USA); **Frossie Economou,** LSST (USA); **Kim K. Gillies,** Thirty Meter Telescope Observatory Corp. (USA); **José M. Filgueira,** GMTO Corp. (USA); **Shui Hung Kwok,** W. M. Keck Observatory (USA); **David L. Terrett,** RAL Space (United Kingdom)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 1, ROOM 3 . . . . . SUN 9:00 AM TO 11:30 AM

Project Overviews and Progress Reports

Session Chairs: **Juan Carlos Guzman,** Commonwealth Scientific and Industrial Research Organisation (Australia); **Gianluca Chiozzi,** European Southern Observatory (Germany)

9:00 am: **Project PANOPTES: the good, the bad, and the ugly challenges of running a successful Pro-Am astronomy project**, Wilfred T. Gee, Macquarie Univ. (Australia), et al. . . . . [10707-1]

9:20 am: **The SKA Telescope manager software: a status update**, Alan Bridger, UK Astronomy Technology Ctr. (United Kingdom), et al. . . . . [10707-2]

9:40 am: **Completing Gemini's first major upgrade of telescope control systems using operating system independent interfaces**, Mathew J. Rippa, Arturo Nunez, Gemini Observatory (USA), et al. . . . . [10707-3]

Coffee Break . . . . . .Sun 10:00 am to 10:30 am

10:30 am: **Status of the observatory control system for the GMT**, Josema Filgueira, Marti Pi, Matthieu Bec, Chien Peng, Jose Soto, Marianne Cox, Yohan Kim, Alfonso Roman, GMTO Corp. (USA). . . . . [10707-4]

10:50 am: **GHOST instrument control software: a progress report**, Jon G. Nielsen, Peter J. Young, Michael J. Ireland, The Australian National Univ. (Australia). . . . . [10707-5]

11:10 am: **Sustaining the Montage Image mosaic engine since 2002**, Graham B. Berriman, John C. Good, Caltech (USA). . . . . [10707-7]

Lunch Break . . . . . Sun 11:30 am to 1:50 pm

SESSION 2

LOCATION: CC LEVEL 1, ROOM 3 . . . . . SUN 1:50 PM TO 2:30 PM

Software Engineering

Session Chairs: **Alan Bridger,** UK Astronomy Technology Ctr. (United Kingdom); **Kim Gillies,** Thirty Meter Telescope (USA)

1:50 pm: **Pushing Agile (and people) to the extreme: case study on developing (scripts) under pressure**, Jorge Ibsen, Joint ALMA Observatory (Chile) and European Southern Observatory (Chile), et al. . . . . [10707-9]

2:10 pm: **LSST data management software development practices and tools**, Timothy Jenness, Frossie Economou, William O'Mullane, LSST (USA), et al.. . . . . [10707-10]

SESSION 3

LOCATION: CC LEVEL 1, ROOM 3 . . . . . SUN 2:30 PM TO 4:40 PM

Middleware/Simulation Infrastructure

Session Chairs: **Frossie Economou,** Large Synoptic Survey Telescope (USA); **Jorge Ibsen,** Joint ALMA Observatory (Chile)

2:30 pm: **Implementing the Magdalena Ridge Observatory interferometer supervisory system**, Allen Farris, Robert Blasi, Robert Kelly, Louis Jencka, New Mexico Institute of Mining and Technology (USA), et al. . . . . [10707-11]

2:50 pm: **LSST Telescope and site software: from simulation to integration**, Dave Mills, Francisco Delgado, Michael Reuter, Andres Anania, National Optical Astronomy Observatory (USA) . . . . . [10707-12]

Coffee Break . . . . . Sun 3:10 pm to 3:40 pm

3:40 pm: **introducing hardware in the loop and model based simulation concepts in the ALMA observatory for software testing**, Tzu-Chiang Shen, ALMA (Chile) . . . . . [10707-13]

4:00 pm: **Software testing for the CTA observation execution system**, Thomas Murach, Igor Oya, Matthias Füßling, Deutsches Elektronen-Synchrotron (Germany), et al.. . . . . [10707-14]

4:20 pm: **Selecting a simple natively implemented middleware solution for the SALT control system**, Deneys S. Maartens, Janus D. Brink, South African Astronomical Observatory (South Africa) and SALT Foundation (South Africa) . . . . . [10707-15]

LOCATION: CC LEVEL 1, ROOM 3 . . . . . 4:40 PM TO 5:00 PM

Lightning Talks

Session Chairs: **Alan Bridger,** UK Astronomy Technology Ctr. (United Kingdom); **Kim Gillies,** Thirty Meter Telescope (USA)

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 4

LOCATION: CC LEVEL 1, ROOM 3 . . . . . MON 10:30 AM TO 12:00 PM

Cyberinfrastructure

Session Chairs: **Shui Hung Kwok,** W. M. Keck Observatory (USA); **José M. Filgueira,** GMTO Corp. (USA)

10:30 am: **We're all programmers now: the JupyterLab notebook environment of the LSST science platform** *(Invited Paper)*, Frossie Economou, Adam Thornton, Simon Krughoff, Joshua C. Hoblitt, Angelo Fausti, LSST (USA), et al.. . . [10707-16]

11:00 am: **Application of cloud computing in astrophysics: the case of Amazon Web Services**, Marco Landoni, Matteo Genoni, Marco Riva, Andrea Bianco, INAF - Osservatorio Astronomico di Brera (Italy), et al. . . . . [10707-17]

11:20 am: **MeerKAT data distribution network**, Martin J. Slabber, Jason Manley, SKA South Africa (South Africa) . . . . . [10707-19]

11:40 am: **Very large scale high performance computing and instrument management for high availability systems through the use of virtualization at the Square Kilometre Array (SKA) Telescope**, J. Bruno Morgado, Observatório Astronómico " Prof. Manuel de Barros" (Portugal), et al. . . . . [10707-20]

Lunch Break . . . . . Mon 12:00 pm to 1:30 pm

SESSION 5

LOCATION: CC LEVEL 1, ROOM 3 . . . . . MON 1:30 PM TO 5:20 PM

Data Processing and Pipelines

Session Chairs: **Tom Donaldson,** Space Telescope Science Institute (USA); **David L. Terrett,** STFC Rutherford Appleton Lab. (United Kingdom)

1:30 pm: **Challenges of real-time processing in HPC environments: the ASKAP experience**, Eric Bastholm, Commonwealth Scientific and Industrial Research Organization (Australia), et al. . . . . [10707-21]

1:50 pm: **Real-time processing of the imaging data from the network of Las Cumbres Observatory Telescopes using BANZAI**, Curtis McCully, Nikolaus Volgenau, Daniel R. Harbeck, Tim Lister, Eric Saunders, Las Cumbres Observatory Global Telescope Network (USA) . . . . . [10707-22]

2:10 pm: **The quick RTE inversion on FPGA for DKIST**, Juan Pedro Cobos Carrascosa, José Luis Ramos Mas, Beatriz Aparicio del Moral, David Hernández Expósito, Antonio Sánchez Gómez, María Balaguer Jiménez, Antonio Carlos López Jiménez, David Orozco Suárez, José Carlos del Toro Iniesta, Instituto de Astrofísica de Andalucía - CSIC (Spain) . . . . . [10707-23]

2:30 pm: **Tensor representation, constrain(storage) and processing of multidimensional astronomical data over intense computing support,** Humberto Farias Sr., Mauricio Solar Sr., Camilo Núñez Sr., Univ. Técnica Federico Santa María (Chile) . . . . . [10707-24]

2:50 pm: **Using clustering for disperse star fields segmentation in MIRADAS instrument**, Josep Sabater, Univ. de Barcelona (Spain) and Institut d'Estudis Espacials de Catalunya (Spain), et al. . . . . [10707-25]

Coffee Break . . . . . Mon 3:10 pm to 3:40 pm

3:40 pm: **Autonomous on-board data processing and instrument calibration software for the SO/PHI**, Kinga Albert, Johann Hirzberger, Dennis Busse, Max-Planck-Institut für Sonnensystemforschung (Germany), et al. . . . . [10707-26]

4:00 pm: **Matrix: the Green Bank Observatory dataflow application framework**, Mark Whitehead, Joseph J. Brandt, Ramon Creager, Green Bank Observatory (USA) . . . . . [10707-27]

4:20 pm: **The CTA Data processing and preservation system**, Karl Kosack, CEA-Ctr. de SACLAY (France). . . . . [10707-28]

4:40 pm: **ASTRI data reduction software in the framework of the Cherenkov Telescope array**, Saverio Lombardi, Lucio Angelo Antonelli, Ciro Bigongiari, ASI Science Data Ctr. (Italy) and INAF - Osservatorio Astronomico di Roma (Italy), et al.. . . . . [10707-29]

5:00 pm: **Data processor prototype of the SKA China Regional Center**, Tao An, Quan Guo, Baoqiang Lao, Shaoguang Guo, Shanghai Astronomical Observatory (China), et al. . . . . [10707-30]

LOCATION: CC LEVEL 1, ROOM 3 . . . . . 5:20 PM TO 5:40 PM

Lightning Talks

Session Chairs: **Jorge Ibsen,** Joint ALMA Observatory (Chile); **Gianluca Chiozzi,** European Southern Observatory (Germany)

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . MON 6:00 PM TO 8:00 PM

Posters-Monday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Monday evening from 5:30 to 7:00 PM (followed by the Welcome Reception). Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. *Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.*

TM Services: an architecture for monitoring and controlling the Square Kilometre Array (SKA) Telescope manager, Matteo Di Carlo, Mauro Dolci, Matteo Canzari, INAF - Osservatorio Astronomico di Teramo (Italy), et al.. . . . . [10707-59]

Challenges and solutions for the SKA architectural team, Matteo Di Carlo, INAF - Osservatorio Astronomico di Teramo (Italy), et al. . . . . [10707-60]

Motor control for 0.1-meter diameter crystal retarders on the Daniel K. Inouye Solar Telescope, Austin Kootz, National Solar Observatory (USA). . . . . [10707-61]

Telescope motion control based on PC-based EtherCAT master motion controller, Zhendong Chen, Shanghai Astronomical Observatory (China)[10707-62]

Prototyping the central control system for the Cherenkov Telescope array, David Melkumyan, Igor Oya, Deutsches Elektronen-Synchrotron (Germany), et al.. . . . . [10707-63]

Monitor and control for the SKA1 CSP Mid.CBF utilizing the Stratix-10 FPGA equipped with HPS, David A. Del Rizzo, Mark A. B. Garstin, National Research Council Canada (Canada) . . . . . [10707-64]

ELT high resolution spectrograph: phase-A software architecture study, Paolo Di Marcantonio, INAF - Osservatorio Astronomico di Trieste (Italy), et al. [10707-65]

Machine learning based DB white dwarfs mining with unknown spectra in LAMOST data release 4, Xiao Kong, Ali Luo, National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10707-66]

Application of a component template for designing and implementing LSST Telescope and site software components, Paul J. Lotz, LSST (USA), et al.. . . . . [10707-67]

A guiding system of astronomical imaging system for a 1.2-meter Telescope, Ya-qi Chen, Hong-fei Zhang, Ming-hao Jia, Jin-ting Chen, Guang-yu Zhang, Yi-ling Xu, Yi Feng, Zhen-feng Sheng, Chen-wei Yang, Liang Chang, Jian Wang, Univ. of Science and Technology of China (China) . . . . . [10707-68]

Low level control software for the Weave spectrograph, Bernardo Salasnich, INAF - Osservatorio Astronomico di Padova (Italy), et al.. . . . . [10707-69]

Application isolation using TANGO and Dockers within SKA synchronization and timing local monitor and control system, Rajesh Warange, Tata Institute of Fundamental Research (India), et al.. . . . . [10707-70]

A comparison of SOFA and NOVAS astrometric software libraries, Andrzej S. Piascik, Liverpool John Moores Univ. (United Kingdom) . . . . . [10707-71]

Middleware abstraction layer in E-ELT core integration infrastructure, Matej Šekoranja, Damjan Kumar, Gregor Cuk, Cosylab d.d. (Slovenia), et al. . . [10707-72]

Please enter a title. If you would like to withdraw this submission, please contact Annie Gerstl at AnnieG@spie.org., Marco Lam, Iain A. Steele, Robert J. Smith, Christopher M. Copperwheat, Andrzej S. Piascik, Astrophysics Research Institute (United Kingdom), et al.. . . . . [10707-73]

Italian center for Astronomical Archives publishing solution: modular and distributed, Marco Molinaro, Nicola Fulvio Calabria, Robert Butora, Sonia Zorba, Riccardo Smareglia, INAF - Osservatorio Astronomico di Trieste (Italy). . [10707-74]

Astrocook: a thousand recipes to analyze a spectrum, Guido Cupani, Giorgio Calderone, Stefano Cristiani, Paolo Di Marcantonio, Giuliano Taffoni, Valentina D'Odorico, INAF - Osservatorio Astronomico di Trieste (Italy) . . . . . [10707-76]

The DAQ system support to the AIV activities of the ASTRI camera proposed for the Cherenkov Telescope array, Vito Conforti, Massimo Trifoglio, Fulvio Gianotti, Andrea Bulgarelli, Valentina Fioretti, INAF - IASF Bologna (Italy), et al.. . . . . [10707-77]

Designing and managing software interfaces for the ELT, Gianluca Chiozzi, Luigi Andolfato, Mario J. Kiekebusch, Nick Kornweibel, Marcus Schilling, Michele Zamparelli, European Southern Observatory (Germany) . . . . . [10707-78]

An electronic traveler system for LSST camera assembly and testing, Joanne Bogart, Richard Dubois, Tony Johnson, James Chiang, Heather Kelly, Warren Focke, Tom Glanzman, SLAC National Accelerator Lab. (USA) . . . . . [10707-79]

Upgrading the processing pipeline for the National Park Service Night Skies Program, Li-Wei Hung, Sharolyn Anderson, Davyd Betchkal, Damon Joyce, U.S. National Park Service (USA) . . . . . [10707-80]

Software development of fiber positioning sequencer for prime focus spectrograph of Subaru Telescope, Chi-Hung Yan, Shiang-Yu Wang, Chih-Yi Wen, Jennifer Karr, Institute of Astronomy and Astrophysics - Academia Sinica (Taiwan), et al. . . . . [10707-81]

A controller designed for the motion system of a space solar filter, Ming Yan, Jianing Wang, Nanjing Institute of Astronomical Optics & Technology (China) and National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10707-82]

An application of deep neural networks in the analysis of stellar spectra, Spencer Bialek, Univ. of Victoria (Canada) . . . . . [10707-83]

LAMOST staller parameters pipeline for medium resolution spectra, Ali Luo, National Astronomical Observatories, Chinese Academy of Sciences (China) . . . . . [10707-84]

A complete automatization of an educational observatory at INAF-OATs, Veronica Baldini, Giorgio Calderone, Francesco Cepparo, Roberto Cirami, Igor Coretti, Paolo Di Marcantonio, Giulia Iafrate, INAF - Osservatorio Astronomico di Trieste (Italy) . . . . . [10707-85]

HDB@ELK: another noSql customization for the HDB++, Matteo Di Carlo, Mauro Dolci, Matteo Canzari, INAF - Osservatorio Astronomico d'Abruzzo (Italy), et al.. . . . . [10707-86]

METIS AO RTC concept, Martin Kulas, Thomas Bertram, Florian Briegel, Max-Planck-Institut für Astronomie (Germany) . . . . . [10707-87]

Image compression on reconfigurable FPGA for the SO/PHI space instrument, David Hernández Expósito, Juan Pedro Cobos Carrascosa, José Luis Ramos Mas, Instituto de Astrofísica de Andalucía - CSIC (Spain), et al.. . . . . [10707-88]

ESPRESSO instrument control software and electronics: commissioning in Paranal, Giorgio Calderone, Veronica Baldini, Roberto Cirami, Igor Coretti, Stefano Cristiani, Paolo Di Marcantonio, INAF - Osservatorio Astronomico di Trieste (Italy), et al.. . . . . [10707-89]

SOXS control electronics design, Giulio Capasso, Mirko Colapietro, Sergio D'Orsi, Pietro Schipani, INAF - Osservatorio Astronomico di Capodimonte (Italy), et al.. . . . . [10707-90]

FRIDA Instrument Library: the software architecture to execute and coordinate observing sequences, Cesar Augusto Guzman Alvarez, Marta Aguiar Gonzalez, José Marco de la Rosa, Heidy Moreno, José Antonio Acosta-Pulido, Jesús Patrón Recio, Almudena Prieto, Instituto de Astrofísica de Canarias (Spain) . . . . . [10707-91]

Design and integration of the HARPS3 software system, John Young, Univ. of Cambridge (United Kingdom), et al. . . . . [10707-92]

Path-finding algorithms for the TAIPAN fibre positioner, Carlos Bacigalupo, Tony Farrell, Nuria Lorente, Michael Goodwin, Australian Astronomical Observatory (Australia). . . . . [10707-93]

A proposed software standard on controlling and operating systems for real unattended robotic observatory, Yi Hu, National Astronomical Observatories, Chinese Academy of Sciences (China), et al. . . . . [10707-95]

Image processing for a Pyramid wavefront sensor equipped guide probe on SALT, Anthony R. Koeslag, Janus D. Brink, Deneys S. Maartens, Stephen N. Hulme, Ockert J. Strydom, South African Astronomical Observatory (South Africa) . . . . . [10707-97]

Development of a centralised change logging system for the Southern African Large Telescope, Stephen N. Hulme, Deneys S. Maartens, Janus D. Brink, Anthony R. Koeslag, South African Astronomical Observatory (South Africa) and Southern African Large Telescope (South Africa) . . . . . [10707-98]

The GreenFlash real-time control and simulation solution for AO using many integrated cores, Alastair G. Basden, Urban Bitenc, Nigel A. Dipper, Deli Geng, Durham Univ. (United Kingdom), et al. . . . . [10707-99]

TM services GUI prototype: compliance with the user-centered design approach for the Square Kilometer array, Matteo Canzari, INAF - Osservatorio Astronomico di Teramo (Italy) and INAF - Osservatorio Astronomico d'Abruzzo (Italy), et al. . . . . [10707-100]

A picture is worth a thousand words: on visual aspects of user interfaces of radio-telescopes, Valentina Alberti, INAF - Osservatorio Astronomico di Trieste (Italy), et al. . . . . [10707-101]

ChiVOLabs: cloud service that offer interactive environment for reprocessing astronomical data, Humberto Farias Sr., Mauricio Solar Sr., Daniel Ortiz Sr., Margarita Bugueno, Camilo Núñez Sr., Univ. Técnica Federico Santa María (Chile). . . . . [10707-102]

Control software for the AO modules of the AOF project, Mario J. Kiekebusch, Javier Argomedo, European Southern Observatory (Germany), et al. . . [10707-103]

Facility control software for 4MOST, Ingo Stilz, Florian Rothmaier, Alexander Pramskiy, Roland Winkler, Holger Mandel, Zentrum für Astronomie der Univ. Heidelberg (Germany) . . . . . [10707-104]

KLT for astronomy signals modeling, Claudio Maccone, Istituto Nazionale de Astrofisica (Italy) and International Academy of Astronautics (Italy), et al.[10707-105]

FPGA based wave front processing unit made with QuickPlay for the Green Flash collaboration, Lazar Staykov, Alastair G. Basden, Urban Bitenc, Nigel A. Dipper, Deli Geng, David Jenkins, Tim J. Morris, James Osborn, Andrew P. Reeves, Matthew J. Townson, Edward J. Younger, Durham Univ. (United Kingdom), et al.. . . . . [10707-106]

StarNet: an application of deep neural networks in the analysis of stellar spectra, Kim Venn, Spencer Bialek, Univ. of Victoria (Canada), et al. . . [10707-107]

Toward sustainable deployment of distributed services on the cloud: dockerized ODI-PPA on Jetstream, Arvind Gopu, Raymond Perigo, Indiana Univ. (USA), et al. . . . . [10707-108]

Telescope control system of the 1.8m Telescope in BOAO, Hyun-Il Sung, Korea Astronomy and Space Science Institute (Korea, Republic of) . . . . . [10707-109]

The SKA dish local monitoring and control system user interface, Alessandro Marassi, INAF - Osservatorio Astronomico di Trieste (Italy), et al. . . . . [10707-110]

The ACS-OPC UA based ICT monitoring system of the ASTRI SST-2M prototype proposed for the Cherenkov Telescope array, Fulvio Gianotti, INAF - IASF Bologna (Italy), et al. . . . . [10707-111]

The Infrared imaging spectrograph (IRIS) for TMT: advancing the data reduction system, Gregory Walth, Shelley A. Wright, Univ. of California, San Diego (USA), et al. . . . . [10707-112]

Managing NFIRAOS optical enclosure environmental conditions from a high level software system, Jonathan Stocks, David Andersen, Adam Densmore, Glen Herriot, Malcolm Smith, National Research Council Canada (Canada) . [10707-113]

Subaru Telescope computing system: 2018, Kiaina Schubert, Subaru Telescope, NAOJ (USA). . . . . [10707-114]

Overcoming the Bayer array: detecting exoplanets using consumer digital cameras, Wilfred T. Gee, Macquarie Univ. (Australia), et al. . . . . [10707-115]

Data reduction software for the Gemini high resolution optical spectrograph, Michael J. Ireland, Joao Bento, The Australian National Univ. (Australia), et al.. . . . . [10707-116]

Simulation strategies employed in the development and maintenance of the Hobby-Eberly Telescope control system, Jason Ramsey, Randy Bryant, Niv Drory, Linda Elliott, James Fowler, John Good, Gary J. Hill, The Univ. of Texas at Austin (USA), et al.. . . . . [10707-117]

Half-decade of MATISSE instrument software development, Eszter Pozna, European Southern Observatory (Germany), et al. . . . . [10707-118]

DAG observatory control system: updates, B. Bülent Güçsav, Deniz Çoker, Atatürk Üniv. (Turkey) . . . . . [10707-119]

Ethernet to multi-CAN gateway for VLT MOONS instrument control, Pablo Gutierrez, Nicola Di Lieto, European Southern Observatory (Germany) . [10707-120]

Communication to remote observatories is a science enabler, Giorgio Filippi, European Southern Observatory (Chile), et al. . . . . [10707-121]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 6

LOCATION: CC LEVEL 1, ROOM 3 . . . . . TUE 10:30 AM TO 12:20 PM

Telescope Control

Session Chairs: **Shui Hung Kwok,** W. M. Keck Observatory (USA); **Jorge Ibsen,** Joint ALMA Observatory (Chile)

10:30 am: **The ELT control system** *(Invited Paper)*, Gianluca Chiozzi, Mario J. Kiekebusch, Nick Kornweibel, Ulrich Lampater, Marcus Schilling, Babak Sedghi, Heiko Sommer, European Southern Observatory (Germany) . . . . . [10707-31]

11:00 am: **ESO ELT M1 local control system software design and development status**, Javier Argomedo, Luigi Andolfato, Carlos Diaz Cano, Robert Frahm, Thomas Grudzien, Nick Kornweibel, Diogo Ribeiro Gomes dos Santos, European Southern Observatory (Germany) . . . . . [10707-32]

11:20 am: **Dish LMC: a prototype control system for SKA1-mid array**, Simone Riggi, Corrado Trigilio, Francesco Schillirò, INAF - Osservatorio Astrofisico di Catania (Italy), et al.. . . . . [10707-33]

11:40 am: **Robotic operation of the Observatorio Astrofísico de Javalambre**, Axel Yanes Díaz, Sergio Rueda-Teruel, Juan Luís Antón, Rafael Bello, César Iñiguez, Javier Cenarro Lagunas, Antonio Marín-Franch, David Cristóbal-Hornillos, Ctr. de Estudios de Física del Cosmos de Aragón (Spain) . . . . . [10707-34]

12:00 pm: **Robotic acquisition of spectrograph targets across the Las Cumbres Observatory global network of telescopes**, Stephen Foale, Las Cumbres Observatory Global Telescope Network (United Kingdom), et al.. . . . . [10707-35]

Lunch/Exhibition Break . . . . . Tue 12:20 pm to 1:40 pm

SESSION 7

LOCATION: CC LEVEL 1, ROOM 3 . . . . . TUE 1:40 PM TO 3:20 PM

Observatory Software

Session Chairs: **Alan Bridger,** UK Astronomy Technology Ctr. (United Kingdom); **Tom Donaldson,** Space Telescope Science Institute (USA)

1:40 pm: **Queue scheduling software at the MMTO**, J. Duane Gibson, Dallan Porter, MMT Observatory (USA) . . . . . [10707-36]

2:00 pm: **General-purpose software for managing astronomical observing programs in the LSST era**, Rachel Street, Mark K. Bowman, Eric Saunders, Todd Boroson, Las Cumbres Observatory Global Telescope Network (USA) . . [10707-37]

2:20 pm: **The Euclid survey planning system,** Pedro Gómez-Álvarez, FRACTAL S.L.N.E (Spain), et al.. . . . . [10707-38]

2:40 pm: **Dynamically scheduling observations of moving objects: the Catalina Sky Survey queue manager**, Alex R. Gibbs, The Univ. of Arizona (USA) [10707-39]

3:00 pm: **Current status of software log analysis at ALMA Observatory**, Juan Pablo Gil, Nicolas Miranda, ALMA (Chile) . . . . . [10707-40]

Coffee Break . . . . . Tue 3:20 pm to 3:50 pm

SESSION 8

LOCATION: CC LEVEL 1, ROOM 3 . . . . . TUE 3:50 PM TO 5:10 PM

Real-time Control/AO

Session Chairs: **Kim Gillies,** Thirty Meter Telescope (USA); **José M. Filgueira,** GMTO Corp. (USA)

3:50 pm: **Multi-node homogeneous Xeon Phi architecture for ELT scale Adaptive Optics RTC**, David Jenkins, Alastair G. Basden, Richard M. Myers, James Osborn, Matthew J. Townson, Andrew P. Reeves, Lazar Staykov, Edward J. Younger, Deli Geng, Nigel A. Dipper, Durham Univ. (United Kingdom), et al.. . . . . [10707-42]

4:10 pm: **A modular design for the MOSAIC AO real-time control system Proposed Mosaic RTC**, Alastair G. Basden, Tim J. Morris, Matthew J. Townson, Durham Univ. (United Kingdom) . . . . . [10707-41]

4:30 pm: **The MAORY ICS software architecture,** Andrea Baruffolo, Bernardo Salasnich, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10707-43]

4:50 pm: **Middleware evaluation and selection for ELT-scale Adaptive Optics RTCS,** Edward J. Younger, Matthew J. Townson, Tim J. Morris, James Osborn, Durham Univ. (United Kingdom), et al. . . . . [10707-44]

LOCATION: CC LEVEL 1, ROOM 3 . . . . . 5:10 PM TO 5:30 PM

Lightning Talks

Session Chairs: **Frossie Economou,** Large Synoptic Survey Telescope (USA); **David L. Terrett,** STFC Rutherford Appleton Lab. (United Kingdom)

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 9

LOCATION: CC LEVEL 1, ROOM 3 . . . . . WED 10:30 AM TO 12:00 PM

UI/Web Techologies

Session Chairs: **Jorge Ibsen,** Joint ALMA Observatory (Chile); **Frossie Economou,** Large Synoptic Survey Telescope (USA)

10:30 am: **Connecting the dots: reducing fragmentation in radio-telescopes user interfaces** *(Invited Paper)*, Valentina Alberti, INAF - Osservatorio Astronomico di Trieste (Italy), et al.. . . . . [10707-45]

11:00 am: **ImageX: a full stack imaging archive solution**, Michael D. Young, Arvind Gopu, Raymond Perigo, Indiana Univ. (USA) . . . . . [10707-46]

11:20 am: **Increasing the usability of the MICADO observation preparation tool through a hybrid user interface**, Michael Wegner, Joerg Schlichter, Univ.-Sternwarte München (Germany) . . . . . [10707-47]

11:40 am: **Web application security: CAS and beyond,** A. Maurizio Chavan, European Southern Observatory (Germany) . . . . . [10707-48]

Lunch/Exhibition Break . . . . . Wed 12:00 pm to 1:40 pm

SESSION 10

LOCATION: CC LEVEL 1, ROOM 3 . . . . . WED 1:40 PM TO 5:30 PM

Instrumentation Control

Session Chairs: **Kim Gillies,** Thirty Meter Telescope (USA); **Shui Hung Kwok,** W. M. Keck Observatory (USA)

1:40 pm: **The infrared imaging spectrograph (IRIS) for TMT: closed-loop adaptive optics while dithering**, Edward L. Chapin, Jennifer Dunn, David Andersen, Glen Herriot, Dan Kerley, NRC - Herzberg Astronomy & Astrophysics (Canada), et al. . . . . [10707-49]

2:00 pm: **The preliminary design of the G-CLEF spectrograph instrument device control system**, Ian N. Evans, David A. Plummer, Cem Onyuksel, Daniel Durusky, Janet D. Evans, Thomas Gauron, Harvard-Smithsonian Ctr. for Astrophysics (USA) . . . . . [10707-50]

2:20 pm: **Architecture of the SOXS instrument control software**, Davide Ricci, Andrea Baruffolo, Bernardo Salasnich, Daniela Fantinel, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10707-51]

2:40 pm: **Design of the ERIS instrument control software**, Andrea Baruffolo, Bernardo Salasnich, INAF - Osservatorio Astronomico di Padova (Italy), et al.. . . . . [10707-52]

3:00 pm: **Control Software for the MUlti-CHannel LEd Starlight Simulator**, Bernardo Salasnich, Riccardo Claudi, Eleonora Alei, Andrea Baruffolo, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10707-53]

Coffee Break . . . . . Wed 3:20 pm to 3:50 pm

3:50 pm: **Software architecture of the high-level control of FRIDA**, Cesar Augusto Guzman Alvarez, Marta Aguiar Gonzalez, José Marco de la Rosa, Heidy Moreno, José Antonio Acosta-Pulido, Jesús Patrón Recio, Almudena Prieto, Instituto de Astrofísica de Canarias (Spain) . . . . . [10707-54]

4:10 pm: **Building a telescope engineering data system with Redis, Influxdb and Grafana**, Behzad Abareshi, Doug Williams, Robert Marshall, National Optical Astronomy Observatory (USA) . . . . . [10707-55]

4:30 pm: **MEGARA observation preparation and Quick Look software**, Pedro Gómez-Álvarez, FRACTAL S.L.N.E (Spain), et al.. . . . . [10707-56]

4:50 pm: **Design of SHINS: the SHArk-NIR instrument control software**, Marco De Pascale, Andrea Baruffolo, Bernardo Salasnich, INAF - Osservatorio Astronomico di Padova (Italy), et al. . . . . [10707-57]

5:10 pm: **Status and early testing of the DESI readout and instrument control system**, Klaus Honscheid, Ann Elliott, The Ohio State Univ. (USA), et al. . [10707-6]

LOCATION: CC LEVEL 1, ROOM 3 . . . . . 5:30 PM TO 5:40 PM

Closing Remarks

Session Chairs: **Juan Carlos Guzman,** Commonwealth Scientific and Industrial Research Organisation (Australia); **Jorge Ibsen,** Joint ALMA Observatory (Chile)

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

CONFERENCE 10708

Tuesday–Friday 12–15 June 2018 • Proceedings of SPIE Vol. 10708

Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX

Conference Chairs: **Jonas Zmuidzinas,** California Institute of Technology (USA); **Jian-Rong Gao,** SRON Netherlands Institute for Space Research (Netherlands), Delft Univ. of Technology (Netherlands)

Program Committee: **Masashi Hazumi,** High Energy Accelerator Research Organization, KEK (Japan); **Kent D. Irwin,** Stanford Univ. (USA); **Karl Schuster,** IRAM-Domaine Univ. de Grenoble (France); **Gordon J. Stacey,** Cornell Univ. (USA); **Neil A. Trappe,** National Univ. of Ireland, Maynooth (Ireland); **Carole E. Tucker,** Cardiff Univ. (United Kingdom); **Christopher K. Walker,** The Univ. of Arizona (USA)

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A .....9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 1

LOCATION: CC LEVEL 3, ROOM 8A/C ..... TUE 10:30 AM TO 12:30 PM

CMB Instruments I

Session Chair: **Sunil R. Golwala,** Caltech (USA)

10:30 am: **POLARBEAR-2: a new CMB polarization receiver system for the Simons array**, Masaya Hasegawa, High Energy Accelerator Research Organization, KEK (Japan), et al.. . . . . [10708-1]

10:50 am: **Year 2 instrument status from the SPT-3G cosmic microwave background receiver**, Amy N. Bender, Argonne National Lab. (USA) and Kavli Institute for Cosmological Physics, The Univ. of Chicago (USA), et al. . . . [10708-2]

11:10 am: **The Simons Observatory cryogenic cameras**, Nicholas Galitzki, Univ. of California, San Diego (USA), et al.. . . . . [10708-3]

11:30 am: **BFORE: a CMB balloon payload to measure reionization, neutrino mass, and cosmic Inflation**, Sean A. Bryan, Arizona State Univ. (USA), et al.. . . . . [10708-4]

11:50 am: **The primordial inflation polarization explorer (PIPER): current status and performance of the first flight**, Samuel Pawlyk, Univ. of Maryland (USA), et al.. . . . . [10708-5]

12:10 pm: **BICEP array receiver design and performance**, Howard Hui, Caltech (USA) . . . . . [10708-49]

Lunch/Exhibition Break . . . . . Tue 12:30 pm to 1:40 pm

SESSION 2

LOCATION: CC LEVEL 3, ROOM 8A/C .....TUE 1:40 PM TO 3:20 PM

CMB Detectors I

Session Chair: **Masashi Hazumi,** High Energy Accelerator Research Organization, KEK (Japan)

1:40 pm: **Electrical characterization and tuning of the integrated POLARBEAR-2a focal plane and readout**, Darcy Barron, Univ. of California, Berkeley (USA), et al.. . . . . [10708-6]

2:00 pm: **Thermal kinetic inductance detectors for CMB and sub millimeter observations**, Roger C. O'Brient, Jet Propulsion Lab. (USA), et al.. . . . . [10708-7]

2:20 pm: **Performance of advanced ACTPol low frequency array**, Yaqiong Li, Princeton Univ. (USA), et al. . . . . [10708-8]

2:40 pm: **Design and measured performance of dual-polarization LEKIDs for CMB polarimetry**, Heather McCarrick, Maximilian H. Abitbol, Columbia Univ. (USA), et al. . . . . [10708-9]

3:00 pm: **Characterization of prototype highly-multiplexed, multi-chroic pixels for balloon-borne platforms**, Karl Young, François Aubin, Univ. of Minnesota, Twin Cities (USA), et al.. . . . . [10708-10]

Coffee Break . . . . . Tue 3:20 pm to 3:50 pm

SESSION 3

LOCATION: CC LEVEL 3, ROOM 8A/C ..... TUE 3:50 PM TO 5:30 PM

Optics I

Session Chair: **Neal A. Trappe**, National Univ. of Ireland, Maynooth (Ireland)

3:50 pm: **Development of large-diameter flat mesh-lenses for millimetre wave instrumentation**, Giampaolo Pisano, Paul Moseley, Carole Tucker, Cardiff Univ. (United Kingdom), et al.. . . . . [10708-11]

4:10 pm: **Design and development of a polarization modulator unit based on a continuous rotating half-wave plate for LiteBIRD**, Yuki Sakurai, Tomotake Matsumura, Nobuhiko Katayama, Kavli Institute for the Physics and Mathematics of the Universe, The Univ. of Tokyo (Japan), et al. . . . . [10708-12]

4:30 pm: **Aerogel scattering filters for cosmic microwave background observations**, Thomas M. Essinger-Hileman, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10708-13]

4:50 pm: **Metamaterial-based Toraldo pupils for super-resolution at millimetre wavelengths**, Giampaolo Pisano, Carole Tucker, Cardiff Univ. (United Kingdom), et al.. . . . . [10708-14]

5:10 pm: **Scalable arrays of planar metamaterial lenslets for use in millimeter and submillimeter focal planes**, Christopher M. McKenney, National Institute of Standards and Technology (USA), et al.. . . . . [10708-15]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 ..... 6:00 PM TO 8:00 PM

Posters: Tuesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Tuesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

CMB DETECTORS I

Design and characterization of cosmology large angular scale surveyor (CLASS) 93GHz focal plane, Sumit Dahal, Johns Hopkins Univ. (USA), et al.. . . . . [10708-68]

Characterization and performance of the second-year SPT-3G focal plane, Daniel Dutcher, Kavli Institute for Cosmological Physics, The Univ. of Chicago (USA), et al. . . . . [10708-69]

Development of antenna-coupled KID array for CMB detection, Qing Yang Tang, Peter S. Barry, Ritoban Basu Thakur, Erik Shirokoff, The Univ. of Chicago (USA) . . . . . [10708-70]

Low loss crystalline silicon and hydrogenated amorphous silicon dielectrics for superconducting detectors, Fabien Defrance, Caltech (USA), et al. [10708-71]

Design, fabrication and performance of the transition-edge sensor array for SPT-3G experiment, Junjia Ding, Argonne National Lab. (USA) . . . . . [10708-72]

Research and develop progress of the transition-edge sensor for future CMB experiment, Junjia Ding, Amy N. Bender, Argonne National Lab. (USA), et al.. . . . . [10708-73]

Characterization of lumped-element titanium nitride KIDs on crystalline silicon substrate, Fabien Defrance, Caltech (USA), et al. . . . . [10708-74]

Characterization of doped silicon thermometers for new high sensitivity cryogenic bolometers, Obaïd-Allah Adami, Louis R. Rodriguez, Jean-Luc Sauvageot, CEA-Ctr. de SACLAY (France) and CEA-IRFU (France) and Univ. Paris-Saclay (France), et al. . . . . [10708-75]

Fabrication of >40,000 transition edge sensor bolometers for the Simons Observatory, Shannon M. Duff, James Beall, National Institute of Standards and Technology (USA), et al. . . . . [10708-76]

CMB INSTRUMENTS I

Cooldown strategies and simulations for the Simons Observatory, Gabriele Coppi, The Univ. of Manchester (United Kingdom), et al.. . . . . [10708-77]

The cosmology large angular scale surveyor high frequency receiver, Jeffrey Iuliano, Johns Hopkins Univ. (USA), et al.. . . . . [10708-78]

Simons Observatory large aperture receiver design overview, Ningfeng Zhu, John L. Orlowski-Scherer, Univ. of Pennsylvania (USA), et al. . . . . [10708-79]

Design and characterization of a ground-based absolute polarization calibrator for use with polarization sensitive CMB experiments., Martin F. Navaroli, Grant P. Teply, Kevin D. Crowley, Nicholas Galitzki, Jonathan p. Kaufman, Brian Keating, Univ. of California, San Diego (USA) . . . . . [10708-80]

QUBIC: the Q and U bolometric interferometer for cosmology, Créidhe O'Sullivan, National Univ. of Ireland, Maynooth (Ireland), et al. . . . . [10708-81]

The short wavelength instrument for the polarization explorer: a balloon-borne measurement of CMB polarization, Luca Lamagna, Sapienza Univ. di Roma (Italy) . . . . . [10708-82]

BICEP array cryostat and mount design, Michael Crumrine, Univ. of Minnesota, Twin Cities (USA). . . . . [10708-83]

High-precision scanning water vapor radiometers for CMB site characterization and comparison, Denis Barkats, Rachel Bowens-Rubin, Harvard-Smithsonian Ctr. for Astrophysics (USA), et al. . . . . [10708-84]

The scanning strategy for the LSPE-STRIP instrument, Federico Incardona, Univ. degli Studi di Milano (Italy). . . . . [10708-85]

OPTICS I

Design and performance of single/wide band corrugated walls for the BICEP array detector modules at 30/40 GHz, Ahmed Soliman, Roger C. O'Brient, Jakob van Zyl, James J. Bock, Caltech (USA). . . . . [10708-86]

Next generation sub-millimetre wave focal plane array coupling concepts: an ESA TRP project to develop multichroic focal plane pixels for future CMB polarisation experiments, Neal A. Trappe, National Univ. of Ireland, Maynooth (Ireland), et al. . . . . [10708-87]

Simulations and performance of the QUBIC optical beam combiner, Créidhe O'Sullivan, David Burke, Donnacha Gayer, J.D. Murphy, Stephen Scully, National Univ. of Ireland, Maynooth (Ireland), et al.. . . . . [10708-88]

Development of antenna-coupled hemispherical lens arrays for the Simons Observatory, Shawn M. Beckman, Adrian T. Lee, Aritoki Suzuki, Ari Cukierman, Leo Steinmetz, Benjamin Westbrook, Univ. of California, Berkeley (USA), et al.. . . . . [10708-89]

Design and optimization of vacuum windows for the BICEP/Keck array CMB experiment, Marion Dierickx, Denis Barkats, Harvard-Smithsonian Ctr. for Astrophysics (USA) . . . . . [10708-90]

Far sidelobes from baffles and telescope support structures in the Atacama Cosmology Telescope, Patricio A. Gallardo, Nicholas Cothard, Cornell Univ. (USA), et al. . . . . [10708-91]

Variable-delay polarization modulators for the cosmology large angular scale surveyor, Kathleen Harrington, Johns Hopkins Univ. (USA), et al. . . . . [10708-92]

2017 upgrade and performance of BICEP3: a 95GHz refracting telescope for degree-scale CMB polarization, Jae Hwan Kang, Kavli Institute for Particle Astrophysics & Cosmology, Stanford Univ. (USA) . . . . . [10708-93]

A cryogenic continuously rotating achromatic half-wave plate for CMB polarization modulation on Simons array, Charles A. Hill, Univ. of California, Berkeley (USA), et al.. . . . . [10708-94]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 4

LOCATION: CC LEVEL 3, ROOM 8A/C . . . . . WED 10:30 AM TO 12:10 PM

Submm/FIR Cameras

Session Chair: **Akira Endo,** Technische Univ. Delft (Netherlands)

10:30 am: **The TolTEC project: a millimeter wavelength imaging polarimeter**, Grant W. Wilson, Univ. of Massachusetts Amherst (USA), et al. . . . . [10708-16]

10:50 am: **Optical design of the TolTEC millimeter-wave camera**, Sean A. Bryan, Arizona State Univ. (USA), et al. . . . . [10708-17]

11:10 am: **The SAFARI detector system**, Michael D. Audley, Gert de Lange, Brian D. Jackson, Peter R. Roelfsema, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10708-18]

11:30 am: **Preflight characterization of the BLAST-TNG receiver and detector arrays**, Nathan P. Lourie, Univ. of Pennsylvania (USA), et al.. . . . . [10708-19]

11:50 am: **MUSCAT: the Mexico-UK sub-millimetre camera for astronomy**, Tom Brien, Peter A. R. Ade, Cardiff Univ. (United Kingdom), et al.. . . . . [10708-20]

Lunch/Exhibition Break . . . . . Wed 12:10 pm to 1:40 pm

SESSION 5

LOCATION: CC LEVEL 3, ROOM 8A/C . . . . . WED 1:40 PM TO 3:20 PM

Submm/FIR Spectrometers I

Session Chair: **Gordon J. Stacey,** Cornell Univ. (USA)

1:40 pm: **First light of DESHIMA on ASTE: on-chip filterbank spectrometer for submillimeter wave astronomy**, Akira Endo, Technische Univ. Delft (Netherlands), et al.. . . . . [10708-21]

2:00 pm: **HIRMES: the third generation instrument for SOFIA**, Thomas Nikola, Cornell Univ. (USA), et al. . . . . [10708-22]

2:20 pm: **SuperSpec: the on-chip spectrometer: characterization of a full 300 channel filterbank**, Jordan D. Wheeler, Univ. of Colorado Boulder (USA), et al.. . . . . [10708-23]

2:40 pm: **Enabling technologies for photon-counting spectroscopy with the Origins Space Telescope (OST) in the mid/far-infrared region**, Omid Noroozian, National Radio Astronomy Observatory (USA) and NASA Goddard Space Flight Ctr. (USA) and Univ. of Virginia (USA), et al. . . . . [10708-24]

3:00 pm: **TES detectors and instrument design for TIME, a mm-wavelength spectrometer array**, Jonathon Hunacek, Caltech (USA), et al.. . . . . [10708-25]

Coffee Break . . . . . Wed 3:20 pm to 3:50 pm

SESSION 6

LOCATION: CC LEVEL 3, ROOM 8A/C . . . . . WED 3:50 PM TO 5:50 PM

Submm/FIR Detectors I

Session Chair: **Omid Noroozian,** NASA Goddard Space Flight Ctr. (USA)

3:50 pm: **A dual polarization background limited kinetic inductance detector operating between 1.4 and 2.8 THz**, Juan Bueno, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10708-26]

4:10 pm: **Systematic study of cosmic ray effect on microwave kinetic inductance detectors**, Kenichi Karatsu, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10708-27]

4:30 pm: **Large format arrays of kinetic inductance detectors for the TolTEC millimeter-wave imaging polarimeter**, Jason E. Austermann, James Beall, National Institute of Standards and Technology (USA), et al.. . . . . [10708-28]

4:50 pm: **Development of aluminum LEKIDs for ballooon-borne far-infrared spectroscopy**, Alyssa Barlis, Univ. of Pennsylvania (USA), et al. . . . . [10708-29]

5:10 pm: **BRAHMS: polarimetric bolometer arrays for the SPICA observatory camera**, Louis R. Rodriguez, CEA-IRFU (France) and Univ. Paris-Saclay (France), et al.. . . . . [10708-30]

5:30 pm: **Characterization of polarization-sensitive MKID arrays to be deployed in BLAST-TNG,** Michael Vissers, Jason E. Austermann, Bradley Dober, Gene C. Hilton, Johannes Hubmayr, National Institute of Standards and Technology (USA), et al.. . . . . [10708-31]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Wednesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Wednesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

COHERENT DETECTION

Radio astronomical receiver, Giuseppe Valente, Agenzia Spaziale Italiana (Italy), et al.. . . . . [10708-95]

Analysis techniques for complex field radiation pattern measurements, Kristina Davis, Arizona State Univ. (USA), et al.. . . . . [10708-96]

A VLBI receiving system for the South Pole Telescope, Junhan Kim, Daniel P. Marrone, The Univ. of Arizona (USA), et al.. . . . . [10708-97]

The design of a 15-Gsps analog-to-digital converter board for radio telescopes, Homin Jiang, Institute of Astronomy and Astrophysics (Taiwan) . . . . . [10708-98]

Low-power CMOS digital electronics for radio, mm-wave and sub-mm astrophysics, Jonathan Hoh, Jeremy Whitton, Christoper E. Groppi, Arizona State Univ. (USA), et al. . . . . [10708-99]

The new heterodyne receiver system for the ASTE radio telescope: three-cartridge cryostat with two cartridge-type superconducting receivers, Tetsuya Ito, Takeshi Kamazaki, Yasunori Fujii, Natsuko Izumi, Motoko Inata, Kazunori Uemizu, Naohisa Satou, Daisuke Iono, Shin'ichiro Asayama, National Astronomical Observatory of Japan (Japan) . . . . . [10708-100]

IF system design for the Galactic/Extragalactic ULDB Spectroscopic Terahertz Observatory (GUSTO), Marko Neric, Christopher E. Groppi, Hamdi Mani, Justin Mathewson, Kristina Davis, Matthew Underhill, Arizona State Univ. (USA), et al.. . . . . [10708-101]

Development of a low power cryogenic MMIC HEMT amplifier for heterodyne array receiver application, Jie Liu, Purple Mountain Observatory (China), et al.. . . . . [10708-102]

The new IF distribution system for the Sardinia Radio Telescope, Adelaide Ladu, Francesco Gaudiomonte, Pierluigi Ortu, Andrea Saba, Pasqualino Marongiu, Tonino Pisanu, INAF - Osservatorio Astronomico di Cagliari (Italy) . . . . [10708-103]

Microwave radiometers based on optical up-conversion, Gabriel Santamaria Botello, Kerlos Atia Abdalmalak, Univ. Carlos III de Madrid (Spain), et al.[10708-104]

The RRI efficient linear-array Imager prototype, Ramesh Balasubramanyam, Raman Research Institute (India) . . . . . [10708-105]

Building a dedicated radio supernova search engine, Lekshmi M. Nair, Ramesh Balasubramanyam, Raman Research Institute (India) . . . . . [10708-106]

Q-band single pixel receiver development for the ngVLA and NRC, Lisa S. Locke, Lewis B. G. Knee, Nianhua Jiang, Vladimir Reshetov, NRC - Herzberg Astronomy & Astrophysics (Canada). . . . . [10708-36]

Performance of pre-production band 1 receiver for ALMA, Yau-De Huang, Institute of Astronomy and Astrophysics (Taiwan) . . . . . [10708-46]

A digital beamformer for the advanced focal array demonstrator (AFAD), Stephen Harrison, Gary J. Hovey, Zoran Ljusic, Bruce Veidt, Tom Burgess, Dominion Radio Astrophysical Observatory, National Research Council Canada (Canada) . . . . . [10708-58]

Overview of the East Asia ALMA development program, Shin'ichiro Asayama, Álvaro González, Hitoshi Kiuchi, Takafumi Kojima, Matthias Kroug, Wenlei Shan, George Kosugi, Daisuke Iono, Satoru Iguchi, National Astronomical Observatory of Japan (Japan) . . . . . [10708-244]

FIR CAMERAS

Latest results and prospects of the ArTeMiS camera on APEX, Michel Talvard, Vincent Revéret, Yannick Le Pennec, Philippe André, Agnès Arnaud, Laurent Clerc, Commissariat à l'Énergie Atomique (France), et al. . . . . [10708-107]

Upgrading SCUBA-2 with a newly designed thermal filter stack, Jamie L. Cookson, Daniel Bintley, East Asian Observatory (USA), et al.. . . . . [10708-108]

FIR DETECTORS

Progress towards ultra sensitive KIDs for future far-infrared missions, Adalyn Fyhrie, Jason Glenn, Univ. of Colorado Boulder (USA), et al.. . . . . [10708-109]

Ultra low-loss sputtered NbN films for microwave applications, Faustin W. Carter, Trupti S. Khaire, Thomas W. Cecil, Gensheng Wang, Valentine Novosad, Volodymyr G. Yefremenko, Stephen Padin, Junjia Ding, Chrystian M. Posada, Amy N. Bender, Clarence L. Chang, Argonne National Lab. (USA) . . . . . [10708-110]

Revisiting the optimization of the SCUBA-2 TES arrays for POL-2 and FTS-2 operations, Shaoliang Li, Purple Mountain Observatory (China) and East Asian Observatory (USA), et al.. . . . . [10708-111]

An array scalable far-IR detector with NEP < 1E-20 W/sqrt(Hz), Boris Karasik, Jet Propulsion Lab. (USA) . . . . . [10708-112]

FIR SPECTROSCOPY

The kinetic inductance detector spectrograph (KIDSpec) prototype, Sumedh Mahashabde, Univ. of Oxford (United Kingdom), et al. . . . . [10708-113]

TIME millimeter wave grating spectrometer, Chao-Te Li, Institute of Astronomy and Astrophysics (Taiwan), et al.. . . . . [10708-114]

Optical design of a far Infrared spectrometer for SPICA: grating modules evaluation, David Arrazola, Marianela Fernández, INTA Instituto Nacional de Técnica Aeroespacial (Spain), et al. . . . . [10708-115]

OPTICS II

Use of evolutionary computing algorithms in the design of millimetre-wave metamaterial devices, Jonathan Thompson, Giampaolo Pisano, Cardiff Univ. (United Kingdom). . . . . [10708-116]

Fabrication and characterization of a NIR-FIR dichroic for the infrared interferometer BETTII, Arnab Dhabal, Univ. of Maryland, College Park (USA) and NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10708-117]

A broadband antenna for on-chip integrated spectrometers at 240-950 GHz, Sebastian Haehnle, SRON Netherlands Institute for Space Research (Netherlands) and Technische Univ. Delft (Netherlands), et al. . . . . [10708-118]

Development of infrared filters using a low loss polymer material, Kevin L. Denis, Berhanu T. Bulcha, Alexander S. Kutyrev, Kevin H. Miller, Samuel H. Moseley, Peter C. Nagler, Edward J. Wollack, NASA Goddard Space Flight Ctr. (USA) . . . . . [10708-119]

Dielectrically embedded lens design for cubesat water detection, Jeremy Whitton, Philip Mauskopf, Arizona State Univ. (USA), et al. . . . . [10708-120]

Characterizing and reducing the POL-2 instrumental polarization, Per Friberg, David Berry, Daniel Bintley, Jessica Dempsey, Sarah Graves, Harriet Parsons, East Asian Observatory (USA) . . . . . [10708-121]

THURSDAY 14 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:30 AM TO 10:00 AM

Thursday Plenary Session

Coffee Break . . . . . Thu 10:00 am to 10:30 am

SESSION 7

LOCATION: CC LEVEL 3, ROOM 8A/C . . . . . THU 10:30 AM TO 12:10 PM

Coherent Detection I

Session Chair: **Christopher K. Walker,** The Univ. of Arizona (USA)

10:30 am: **Evaluation of controllers for tuning digitizers in the ALMA interferometer**, Daniel E. Herrera, Alejandro F. Saez, Joint ALMA Observatory (Chile). . . . . [10708-32]

10:50 am: **4×2 HEB receiver at 4.7 THz for GUSTO**, Jose R. Silva, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10708-33]

11:10 am: **Prospects of MgB2 based sensors for future far-IR heterodyne receivers**, Boris Karasik, Daniel Cunnane, Jet Propulsion Lab. (USA), et al.. . . . . [10708-34]

11:30 am: **MgB2 hot-electron bolometer THz mixers in compact cryo-coolers**, Sergey Cherednichenko, Evgenii Novoselov, Chalmers Univ. of Technology (Sweden) . . . . . [10708-35]

11:50 am: **Technical achievements of the ALMA future receiver development program at the National Astronomical Observatory of Japan**, Álvaro González, Takafumi Kojima, Matthias Kroug, Wenlei Shan, Shin'ichiro Asayama, Daisuke Iono, Takashi Noguchi, Satoru Iguchi, National Astronomical Observatory of Japan (Japan). . . . . [10708-36]

Lunch/Exhibition Break . . . . . Thu 12:10 pm to 1:40 pm

SESSION 8

LOCATION: CC LEVEL 3, ROOM 8A/C . . . . . THU 1:40 PM TO 3:20 PM

Coherent Detection II

Session Chair: **Jian-Rong Gao,** Technische Univ. Delft (Netherlands)

1:40 pm: **A proposal of a photonic Local system for the extended Atacama large millimeter/submillimeter array and advanced radio interferometers**, Hitoshi Kiuchi, National Astronomical Observatory of Japan (Japan). . . . [10708-37]

2:00 pm: **Planar superconductor-insulator-superconductor mixer array receivers for wide field of view astronomical observation**, Wenlei Shan, Shohei Ezaki, National Astronomical Observatory of Japan (Japan), et al. . . . . [10708-38]

2:20 pm: **GLT receiver commissioning at JCMT and future JCMT instrumentation**, Daniel Bintley, Per Friberg, Ryan Berthold, Tim Chuter, Kuan-Yu Liu, Craig Walther, Jessica Dempsey, Paul T. P. Ho, East Asian Observatory (USA), et al.. . . . . [10708-39]

2:40 pm: **Electronics instrumentation for the Greenland Telescope**, Derek Y. Kubo, Institute of Astronomy and Astrophysics (USA), et al. . . . . [10708-40]

3:00 pm: **New developments for integrated Schottky receivers in the terahertz regime**, Jonathan Hoh, Christopher E. Groppi, Arizona State Univ. (USA), et al.. . . . . [10708-41]

Coffee Break . . . . . Thu 3:20 pm to 3:50 pm

SESSION 9

LOCATION: CC LEVEL 3, ROOM 8A/C . . . . . THU 3:50 PM TO 5:50 PM

Multiplexed Readout

Session Chair: **Thomas Nikola,** Cornell Univ. (USA)

3:50 pm: **Readout demonstration of 512 TES bolometers using a single microwave SQUID multiplexer**, Bradley Dober, National Institute of Standards and Technology (USA), et al. . . . . [10708-42]

4:10 pm: **Highly-multiplexed microwave SQUID readout using the SLAC microresonator radio frequency (SMuRF) electronics for future CMB and sub-millimeter surveys**, Shawn W. Henderson, Zeeshan Ahmed, David Brown, SLAC National Accelerator Lab. (USA), et al. . . . . [10708-43]

4:30 pm: **Optical measurements of SAFARI TES bolometer arrays with a 176-pixel FDM readout system**, R. A. Hijmering, Damian Audley, Marcel Ridder, Ton van der Linde, Gert de Lange, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10708-44]

4:50 pm: **Wideband superconducting parametric amplifiers based on kinetic inductance,** Peter Day, ByeongHo Eom, Henry G. Leduc, Jet Propulsion Lab. (USA) . . . . . [10708-45]

5:10 pm: **Towards the next generation of frequency-multipexed TES bolometer readout,** Tijmen de Haan, Lawrence Berkeley National Lab. (USA), et al. [10708-46]

5:30 pm: **Digital frequency multiplexing with sub-Kelvin SQUIDs**, Amy E. Lowitz, The Univ. of Chicago (USA), et al. . . . . [10708-47]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters: Thursday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Thursday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

CMB DETECTORS II

Optimizing performance of commercially micro-fabricated antenna-coupled transition edge sensor bolometer detectors for next generation cosmic microwave background polarimetry experiment, Aritoki Suzuki, Lawrence Berkeley National Lab. (USA), et al. . . . . [10708-122]

Fabrication and characterization of cooled silicon bolometers for mm wave detection, Valérie Goudon, Abdelkader Aliane, Claire Vialle, Wilfried Rabaud, Stéphane Pocas, Hacile Kaya, Laurent Dussopt, Sébastien Becker, MINATEC, CEA-LETI (France) and Univ. Grenoble Alpes (France), et al. . . . . [10708-123]

Operation and performance of a cryogenic thermal source for detector array characterization, Kyle Helson, NASA Goddard Space Flight Ctr. (USA), et al. . . . . [10708-124]

Pre-Flight cCharacterization of the 280GHz focal plane units for the SPIDER-2 suborbital polarimeter, A. Stevie Bergman, Princeton Univ. (USA), et al. . . . . [10708-125]

The universal focal plane module for the Simons Observatory, Shuay-Pwu Ho, Princeton Univ. (USA), et al. . . . . [10708-126]

Fabrication process and techniques to realize high yield detector arrays for the POLARBEAR-2/Simons array CMB experiment, Christopher R. Raum, Benjamin Westbrook, Ari Cukierman, John C. Groh, Adrian T. Lee, Univ. of California, Berkeley (USA), et al. . . . . [10708-127]

Tuning the superconducting critical temperature of a four-layer Ti-Au-Ti-Au thin film stack for transition edge sensor detector applications, Faustin W. Carter, Stephen Padin, Chrystian M. Posada, Junjia Ding, Trupti S. Khaire, Thomas W. Cecil, Gensheng Wang, Volodymyr G. Yefremenko, Valentine Novosad, Amy N. Bender, Angelina H. Harke-Hosemann, Renae N. Gannon, Clarence L. Chang, Argonne National Lab. (USA). . . . . [10708-128]

CMB INSTRUMENTS II

Systematic error cancellation for the PIXIE four-port interferometric polarimeter, Alan J. Kogut, Dale J. Fixsen, NASA Goddard Space Flight Ctr. (USA) . . . . . [10708-129]

Thermal architecture for the QUBIC cryogenic receiver, Andrew May, The Univ. of Manchester (United Kingdom), et al. . . . . [10708-130]

Design and characterization of the POLARBEAR-2b and POLARBEAR-2c cosmic microwave background cryogenic receiver backends, Logan Howe, Calvin Tsai, Lindsay N. Lowry, Univ. of California, San Diego (USA), et al. . . . . [10708-131]

Simons Observatory large aperture receiver simulation overview, John L. Orlowski-Scherer, Ningfeng Zhu, Univ. of Pennsylvania (USA), et al. . . . [10708-132]

Systematic uncertainties in the Simons Observatory: optical effects and sensitivity considerations, Patricio A. Gallardo, Cornell Univ. (USA), et al. . . . . [10708-133]

Systematic uncertainties in the Simons Observatory: detector array effects, Sara M. Simon, Univ. of Michigan (USA), et al. . . . . [10708-134]

Development of calibration strategies for the Simons Observatory, Sean A. Bryan, Arizona State Univ. (USA), et al. . . . . [10708-135]

Designs for next generation CMB survey strategies from Chile, Jason R. Stevens, Cornell Univ. (USA) . . . . . [10708-136]

Sensitivity forecasting for the Simons Observatory, Charles A. Hill, Univ. of California, Berkeley (USA) and Lawrence Berkeley National Lab. (USA) and Simons Observatory Collaboration (USA), et al. . . . . [10708-137]

Broadband anti-reflective coatings for cosmic microwave background experiments, Andrew Nadolski, Univ. of Illinois (USA). . . . . [10708-138]

MULTIPLEXING

The FDM readout for the LSPE/SWIPE TES bolometers, Davide Vaccaro, Istituto Nazionale di Fisica Nucleare (Italy) and Univ. degli Studi di Siena (Italy), et al. . . . . [10708-139]

Performance of NbSi transition-edge sensors readout with a 128 MUX factor for the QUBIC experiment, Maria Salatino, AstroParticule et Cosmologie, CNRS (France) and Ctr. National de la Recherche Scientifique (France) and Institut National de Physique Nucléaire et de Physique des Particules (France), et al. . . . . [10708-140]

Magnetic shielding for multiplexed readout, Angelina H. Harke-Hosemann, Argonne National Lab. (USA). . . . . [10708-141]

OPTICS III

Prototype design and evaluation of the nine-layer achromatic half-wave plate for the LiteBIRD low frequency telescope, Kunimoto Komatsu, Okayama Univ. (Japan), et al. . . . . [10708-142]

Systematic uncertainties in the Simons Observatory: polarization modulator related effects, Joy Didier, The Univ. of Southern California (USA), et al. . . . . [10708-143]

Cross-polarization systematics due to Mizuguchi-Dragone condition breaking by a continuously rotating half-wave plate at prime focus in the Huan Tran Telescope, Frederick T. Matsuda, Kavli Institute for the Physics and Mathematics of the Universe, The Univ. of Tokyo (Japan), et al. . . . . [10708-144]

Multi-octave anti-reflection coating for polypropylene-based quasi-optical devices, Giampaolo Pisano, Carole Tucker, Peter A. R. Ade, Cardiff Univ. (United Kingdom) . . . . . [10708-145]

SiAl alloy feedhorn arrays: material properties, feedhorn design, and astrophysical applications, Aamir Ali, Univ. of California, Berkeley (USA), et al. . . . . [10708-146]

Feedhorn development and scalability for Simons Observatory and beyond, Sara M. Simon, Univ. of Michigan (USA). . . . . [10708-147]

FRIDAY 15 JUNE

SESSION 10

LOCATION: CC LEVEL 3, ROOM 8A/C . . . . . FRI 8:30 AM TO 10:10 AM

CMB Instruments II

Session Chair: **Johannes G. Staguhn,** NASA Goddard Space Flight Ctr. (USA)

8:30 am: **Advanced ACTPol: telescope systems and project sStatus**, Brian J. Koopman, Cornell Univ. (USA) . . . . . [10708-48]

8:50 am: **Multilayer antireflection coating for silicon optics at millimeter and submillimeter wavelengths**, Fabien Defrance, Caltech (USA), et al. . . [10708-148]

9:10 am: **The STRIP instrument of the large scale polarization explorer: microwave eyes to map the galactic polarized foregrounds**, Cristian Franceschet, Univ. degli Studi di Milano (Italy) . . . . . [10708-50]

9:30 am: **Design and characterization of the SPT-3G receiver**, Joshua A. Sobrin, Kavli Institute for Cosmological Physics, The Univ. of Chicago (USA) . . . [10708-51]

9:50 am: **Performance evaluation of MKDs on a high-speed rotating system for CMB Telescope: GroundBIRD,** Satoru Mima, RIKEN (Japan), et al. . . . [10708-52]

Coffee Break . . . . . Fri 10:10 am to 10:40 am

SESSION 11

LOCATION: CC LEVEL 3, ROOM 8A/C .....FRI 10:40 AM TO 12:00 PM

CMB Detectors II

Session Chair: J**ochem J. A. Baselmans,** SRON Netherlands Institute for Space Research (Netherlands)

10:40 am: **On-chip narrow-band filters for antenna-coupled LEKIDs**, Amber L. Hornsby, Cardiff Univ. (United Kingdom), et al. . . . . [10708-53]

11:00 am: **Multiscale multichroic focal-plane architecture for measurements of the cosmic microwave background**, Ari Cukierman, Adrian T. Lee, Christopher R. Raum, Univ. of California, Berkeley (USA), et al.. . . . . [10708-54]

11:20 am: **Electrothermal characterization of AlMn transition-edge sensor bolometers for advanced ACTPol**, Kevin T. Crowley, Princeton Univ. (USA), et al.. . . . . [10708-55]

11:40 am: **Antenna-coupled lumped-element ALD titanium nitride KIDs for CMB instruments**, Erik Shirokoff, Peter S. Barry, Qing Yang Tang, Rong Nie, The Univ. of Chicago (USA) . . . . . [10708-56]

Lunch Break . . . . . Fri 12:00 pm to 1:30 pm

SESSION 12

LOCATION: CC LEVEL 3, ROOM 8A/C .....FRI 1:30 PM TO 3:10 PM

Submm/FIR Spectrometers II

Session Chair: **Erik Shirokoff,** The Univ. of Chicago (USA)

1:30 pm: **The SAFARI grating spectrometer for the SPICA space observatory**, Gert de Lange, Peter R. Roelfsema, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10708-57]

1:50 pm: **Design and characterization of an optimized full-band millimeter filterbank for science with SuperSpec**, Joseph G. Redford, Caltech (USA), et al. . . . . [10708-58]

2:10 pm: **Development of the Fabry-Perot interferometers for the HIRMES spectrometer on SOFIA**, James G. Douthit, Chuck Henderson, Gordon J. Stacey, Thomas Nikola, Cornell Univ. (USA), et al. . . . . [10708-59]

2:30 pm: **Spectroscopy on chip: a new design for semiconductor bolometers to include spectroscopy within the pixels**, Sophie Bounissou, Louis R. Rodriguez, Vincent Revéret, Albrecht Poglitsch, CEA-Ctr. de SACLAY (France) . . . . . [10708-60]

2:50 pm: **On-sky demonstration of the SuperSpec millimeter-wave spectrometer**, Kirit S. Karkare, Peter S. Barry, The Univ. of Chicago (USA), et al.. . . . . [10708-61]

Coffee Break . . . . . Fri 3:10 pm to 3:40 pm

SESSION 13

LOCATION: CC LEVEL 3, ROOM 8A/C .....FRI 3:40 PM TO 5:40 PM

New Developments

Session Chair: **Gert de Lange,** SRON Netherlands Institute for Space Research (Netherlands)

3:40 pm: **High temperature operation of kinetic inductance bolometers (KIBs) for outer solar system missions**, Ayan Chakrabarty, Mark Lindeman, Alan W. Kleinsasser, Francesco Marsili, Emily C. Brageot, Warren A. Holmes, Bruce Bumble, Jet Propulsion Lab. (USA) and Caltech (USA) . . . . . [10708-62]

4:00 pm: **Development of cosmic ray mitigation techniques for the LiteBIRD space mission**, Shawn M. Beckman, Adrian T. Lee, Univ. of California, Berkeley (USA), et al. . . . . [10708-63]

4:20 pm: **Prime-Cam: a first light instrument for the CCAT-prime Telescope**, Eve Vavagiakis, Cornell Univ. (USA) . . . . . [10708-64]

4:40 pm: **Development of a robust efficient process to produce scalable superconducting kilopixel far-IR detector arrays**, Johannes G. Staguhn, NASA Goddard Space Flight Ctr. (USA) and Johns Hopkins Univ. (USA), et al.. [10708-65]

5:00 pm: **Ultra-low-noise transition edge sensors for far infrared wavelengths: optical design, measurement and stray light control**, Emily A. Williams, Stafford Withington, David J. Goldie, Christopher N. Thomas, Jiajun Chen, Univ. of Cambridge (United Kingdom), et al. . . . . [10708-66]

5:20 pm: **Eliminating stray radiation inside large area imaging arrays**, Jochem J. A. Baselmans, Stephen J. C. Yates, SRON Netherlands Institute for Space Research (Netherlands), et al. . . . . [10708-67]

CONFERENCE 10709

Sunday - Wednesday 10–13 June 2018 • Proceedings of SPIE Vol. 10709

High Energy, Optical, and Infrared Detectors for Astronomy VIII

Conference Chairs: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging at The Open Univ. (United Kingdom); **James Beletic,** Teledyne Imaging Sensors (USA)

Program Committee: **Megan E. Eckart,** NASA Goddard Space Flight Ctr. (USA); **Gert Finger,** European Southern Observatory (Germany); **Michael E. Hoenk,** Jet Propulsion Lab. (USA); **Paul Jorden,** e2v technologies plc (United Kingdom); **Satoshi Miyazaki,** National Astronomical Observatory of Japan (Japan); **Peter C. Moore,** National Optical Astronomy Observatory (USA); **S. Harvey Moseley,** NASA Goddard Space Flight Ctr. (USA); **Robert H. Philbrick,** Ball Aerospace & Technologies Corp. (USA); **Brian Shortt,** European Space Research and Technology Ctr. (Netherlands); **Roger M. Smith,** California Institute of Technology (USA); **Barry M. Starr,** Raytheon Vision Systems (USA); **Tadayuki Takahashi,** Japan Aerospace Exploration Agency (Japan); **Hiroshi Tsunemi,** Osaka Univ. (Japan)

SUNDAY 10 JUNE

SESSION 1

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . SUN 8:30 AM TO 10:15 AM

Sensor Reviews

Session Chair: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging (United Kingdom)

8:30 am: **Update on Teledyne imaging sensors technologies and products**, James W. Beletic, Teledyne Imaging Sensors (USA) . . . . . [10709-1]

9:05 am: **Teledyne e2v sensors optimised for ground-based and space applications**, Paul R. Jorden, Denis Bourke, Ryan Cassidy, Paul Jerram, Jérôme Pratlong, Ian Swindells, Teledyne e2v UK Ltd. (United Kingdom) . . . . . [10709-2]

9:40 am: **The status of the detector developments supported by the European Space Agency**, Pierre-Elie Crouzet, Brian Shortt, Thibaut Prod'homme, Nick Nelms, European Space Research and Technology Ctr. (Netherlands) . . . [10709-3]

Coffee Break . . . . . .Sun 10:15 am to 10:50 am

SESSION 2

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . SUN 10:50 AM TO 12:10 PM

IR Detector Development

Session Chair: **James Beletic,** Teledyne Imaging Sensors (USA)

10:50 am: **The status of the WFIRST near-IR detector development program**, Robert J. Hill, NASA Goddard Space Flight Ctr. (USA). . . . . [10709-4]

11:10 am: **Development of astronomy large focal plane array "ALFA" at Sofradir and CEA**, Bruno Fièque, Adrien Lamoure, SOFRADIR (France), et al.. . . . . [10709-5]

11:30 am: **Update on the status of H4RG-15 SCA production and testing at Teledyne imaging sensors**, Mark Farris, Majid Zandian, Lisa Fischer, Sam Hoffman, Luis Gordillo, Wyatt Strong, Dennis Edwall, Erdem Arkun, Annie C. Chen, Eric J. Holland, Michael Carmody, John Auyeung, James W. Beletic, Teledyne Scientific & Imaging, LLC (USA) . . . . . [10709-6]

11:50 am: **A monolithic 2k x 2k LWIR HgCdTe detector array for passively cooled space missions**, Meghan Dorn, Craig W. McMurtry, Judith L. Pipher, William J. Forrest, Mario Cabrera, Univ. of Rochester (USA), et al. . . . . [10709-7]

Lunch Break . . . . . Sun 12:10 pm to 1:30 pm

SESSION 3

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . SUN 1:30 PM TO 3:30 PM

CCD

Session Chair: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging (United Kingdom)

1:30 pm: **Development of germanium charge-coupled devices**, Christopher Leitz, Steven Rabe, Mike Zhu, Ilya Prigozhin, Daniel O'Mara, Barry Burke, Kevin Ryu, Michael Cooper, Robert Reich, Kay Johnson, WeiLin Hu, Bradley Felton, Matthew Cook, Corey Stull, Vyshnavi Suntharalingam, MIT Lincoln Lab. (USA) . . . . . [10709-8]

1:50 pm: **Sub-electron readout noise with fully depleted skipper CCD**, Miguel Sofo Haro, Ctr. Atómico Bariloche (Argentina) . . . . . [10709-9]

2:10 pm: **Characterization results of a large format 4k x 4k EMCCD**, Olivier Daigle, Jérémy Turcotte, Nüvü Caméras Inc. (Canada), et al. . . . . [10709-10]

2:30 pm: **Photon counting EMCCD developments for the WFIRST coronagraph**, Patrick Morrissey, Leon K. Harding, Michael Bottom, Richard T. Demers, Robert Effinger, Don Nieraeth, Larry Hovland, Yuki Maruyama, Jet Propulsion Lab. (USA), et al.. . . . . [10709-11]

2:50 pm: **Ultraviolet detectors for astrophysics missions: a case study with SPARCS**, April D. Jewell, John Hennessy, Todd Jones, Samuel Cheng, Alexander Carver, David Ardila, Jet Propulsion Lab. (USA), et al. . . . . [10709-12]

3:10 pm: **Ultraviolet sensitivity of an e2v EMCCD**, Neil Rowlands, Ken Smith, Honeywell Aerospace (Canada), et al. . . . . [10709-13]

Coffee Break . . . . . Sun 3:30 pm to 4:00 pm

SESSION 4

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . SUN 4:00 PM TO 5:40 PM

X-ray Detector Development I

Session Chair: **Kiyoshi Hayashida,** Osaka Univ. (Japan)

4:00 pm: **Small pixel hybrid CMOS detectors**, Samuel V. Hull, Abraham D. Falcone, David N. Burrows, Mitchell Wages, Maria McQuaide, The Pennsylvania State Univ. (USA). . . . . [10709-14]

4:20 pm: **Recent results on high-speed DEPFET detectors for x-ray astronomy**, Johannes Müller-Seidlitz, Wolfgang Treberspurg, Max-Planck-Institut für extraterrestrische Physik (Germany), et al. . . . . [10709-15]

4:40 pm: **First results on large format DEPFET active pixel sensors fabricated in an industrial CMOS foundry**, Stefan Aschauer, Peter Holl, PNSensor GmbH (Germany), et al. . . . . [10709-16]

5:00 pm: **Kyoto's event-driven x-ray astronomical SOI pixel sensor for the FORCE mission**, Takeshi Go Tsuru, Hideki Hayashi, Katsuhiro Tachibana, Soudai Harada, Hideaki Matsumura, Hiroyuki Uchida, Takaaki Tanaka, Kyoto Univ. (Japan), et al.. . . . . [10709-18]

5:20 pm: **Soft x-ray imaging with a newly designed large-area CCD**, Matthew R. Soman, David J. Hall, Thomas Buggey, Ross Burgon, Jonathan Keelan, Andrew D. Holland, The Open Univ. (United Kingdom), et al. . . . . [10709-19]

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

MONDAY 11 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 8:50 AM TO 10:00 AM

Monday Plenary Session

Coffee Break . . . . . Mon 10:00 am to 10:30 am

SESSION 5

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . MON 10:30 AM TO 12:10 PM

Radiation Damage Testing

Session Chair: **James Beletic,** Teledyne Imaging Sensors (USA)

10:30 am: **Radiation tests of Euclid IR H2RGs detectors**, Cyrille Rosset, Tanguy Decourcelle, AstroParticule et Cosmologie (France), et al.. . . . . [10709-20]

10:50 am: **Investigating end-of-life performance of the PLATO CCD: cryogenic versus room temperature proton irradiation comparison'**, Thibaut Prod'homme, Peter Verhoeve, Frederic Lemmel, Hans Smit, Sander Blommaert, Cornelis van der Luijt, Ivo Visser, Thierry Beaufort, Brian Shortt, Yves Levillain, European Space Research and Technology Ctr. (Netherlands) . . . . . [10709-21]

11:10 am: **Proton radiation damage experiment on a hybrid CMOS detector**, Evan Bray, David N. Burrows, Abraham D. Falcone, The Pennsylvania State Univ. (USA) . . . . . [10709-22]

11:30 am: **A comparison of proton damage effects on P- and N-Channel CCDs I: performance following cryogenic irradiation**, Nathan L. Bush, Ben Dryer, Anton Lindley De-Caire, Ross Burgon, Andrew D. Holland, The Open Univ. (United Kingdom) . . . . . [10709-23]

11:50 am: **TID and high energy protons tests on HgCdTe CMOS detectors for jovian environment**, Pierre Guiot, Mathieu Vincendon, John Carter, Institut d'Astrophysique Spatiale (France), et al.. . . . . [10709-24]

Lunch Break . . . . . Mon 12:10 pm to 2:00 pm

SESSION 6

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . MON 2:00 PM TO 3:20 PM

IR Characterization

Session Chair: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging (United Kingdom)

2:00 pm: **Euclid H2RG detectors: Impact of crosshatch patterns on photometric and centroid errors and persistence mitigation tests**, Pierre-Elie Crouzet, Paolo Strada, European Space Research and Technology Ctr. (Netherlands), et al. . . . . [10709-26]

2:20 pm: **Commissioning of cryogenic preamplifiers for SAPHIRA detectors**, Sean B. Goebel, Donald N. B. Hall, Shane M. Jacobson, Institute for Astronomy, Univ. of Hawai"i (USA), et al.. . . . . [10709-27]

2:40 pm: **Detector chain calibration strategy for the Euclid flight IR H2RGs**, Rémi Barbier, Sylvain Ferriol, Institut de Physique Nucléaire de Lyon (France), et al.. . . . . [10709-28]

3:00 pm: **The ACADIA ASIC: detector control and digitization for the wide-field infrared survey telescope (WFIRST)**, Markus Loose, Markury Scientific, Inc. (USA), et al. . . . . [10709-29]

Coffee Break . . . . . Mon 3:20 pm to 3:50 pm

SESSION 7

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . MON 3:50 PM TO 5:30 PM

CMOS Development and Testing

Session Chair: **James Beletic,** Teledyne Imaging Sensors (USA)

3:50 pm: **Curved detectors developments and characterization: application to astronomical instruments**, Simona Lombardo, Wilfried Jahn, Thibault Behaghel, Emmanuel Hugot, Eduard Muslimov, Melanie Roulet, Marc Ferrari, Lab. d'Astrophysique de Marseille, CNRS, Aix Marseille Univ. (France), et al.. [10709-30]

4:10 pm: **A novel large area CMOS visible image sensor with non-destructive readout capability for ground-based astronomy,** Gary R. Sims, Spectral Instruments, Inc. (USA) . . . . . [10709-31]

4:30 pm: **The CIS115: a CMOS sensor qualified for optical imaging in the Jovian environment**, Matthew R. Soman, Edgar A. H. Allanwood, Daniel-Dee Lofthouse-Smith, Andrew D. Holland, Konstantin D. Stefanov, Mark Leese, The Open Univ. (United Kingdom), et al. . . . . [10709-32]

4:50 pm: **Polarisation effects in sCMOS cameras**, Helen E. Jermak, Iain A. Steele, Robert J. Smith, Liverpool John Moores Univ. (United Kingdom) . . . . . [10709-33]

5:10 pm: **High-speed and low-noise detectors for GravityCam,** Jesper Skottfelt, Colin Snodgrass, Konstantin Stefanov, Harry Fox, Open University (United Kingdom), et al. . . . . [10709-123]

TUESDAY 12 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Tuesday Plenary Session

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 8

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . TUE 10:30 AM TO 12:10 PM

Testing/Characterization I

Session Chair: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging (United Kingdom)

10:30 am: **CCD linearity measurement by incremental binning**, Stephen Kaye, Roger M. Smith, Peter H. Mao, Timothée Greffe, Caltech (USA) . . . . . [10709-35]

10:50 am: **CCD speed-noise optimization at 1 MHz**, Roger M. Smith, Stephen Kaye, Timothée Greffe, Pavaman Bilgi, Peter H. Mao, Caltech (USA) . . . [10709-36]

11:10 am: **HgCdTe SAPHIRA arrays: individual pixel measurement of charge gain and node capacitance utilizing a stable IR LED**, Donald N. B. Hall, Institute for Astronomy, Univ. of Hawai"i (USA), et al. . . . . [10709-37]

11:30 am: **Superlattice-doped detectors with high stable quantum efficiency in high radiation environments**, Michael E. Hoenk, April D. Jewell, Shouleh Nikzad, Jet Propulsion Lab. (USA), et al. . . . . [10709-38]

11:50 am: **Improving charge transfer performance within irradiated EMCCDs**, Nathan L. Bush, David Hall, Ross Burgon, Andrew D. Holland, The Open Univ. (United Kingdom), et al.. . . . . [10709-39]

Lunch/Exhibition Break . . . . . Tue 12:10 pm to 2:00 pm

SESSION 9

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . TUE 2:00 PM TO 3:00 PM

Infrared Sensors I

Session Chair: **James Beletic,** Teledyne Imaging Sensors (USA)

2:00 pm: **Astronomical interferometry with near-IR e-APD at CHARA: characterization, optimization and on-sky operation,** Cyprien Lanthermann, Jean-Baptiste Le Bouquin, Institut de Planétologie et d'Astrophysique de Grenoble (France), et al. . . . . [10709-41]

2:20 pm: **Manufacturability and performance of 2.3-µm HgCdTe H2RG sensor chip assemblies for Euclid**, Yibin Bai, Ellen Boehmer, Mark Farris, Lisa Fischer, Jessica A. Maiten, Robert Kopp, Eric Piquette, Jon Ellsworth, Aristo Yulius, Teledyne Imaging Sensors (USA), et al. . . . . [10709-42]

2:40 pm: **Photon counting in the infrared with e-APD devices**, Jean-Luc Gach, Philippe Feautrier, First Light Imaging S.A.S. (France) . . . . . [10709-43]

Coffee Break . . . . . Tue 3:00 pm to 3:30 pm

SESSION 10

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . TUE 3:30 PM TO 5:30 PM

Simulation

Session Chair: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging (United Kingdom)

3:30 pm: **WFIRST coronagraph detector trap modeling results and improvements**, Robert Effinger, Jet Propulsion Lab. (USA), et al.. . . . . [10709-44]

3:50 pm: **C3TM: charge transfer model for radiation damaged CCDs**, Jesper Skottfelt, David J. Hall, Ben Dryer, Julia Campa, Ross Burgon, Andrew D. Holland, The Open Univ. (United Kingdom). . . . . [10709-45]

4:10 pm: **Validation of a CCD cosmic ray event simulator against Gaia in-orbit data**, Lionel Garcia, Thibaut Prod'homme, Alex Short, Giovanni Santin, Marco Vuolo, European Space Research and Technology Ctr. (Netherlands), et al.. . . . . [10709-46]

4:30 pm: **Pyxel!: a novel and multi-purpose Python-based framework for imaging detector simulation**, David Lucsanyi, Thibaut Prod'homme, Hans Smit, Frederic Lemmel, Pierre-Elie Crouzet, Peter Verhoeve, Brian Shortt, European Space Research and Technology Ctr. (Netherlands) . . . . . [10709-47]

4:50 pm: **Correcting persistence in JWST using a model of trap capture and decay**, Michael W. Regan, Louis Bergeron, Space Telescope Science Institute (USA) . . . . . [10709-48]

5:10 pm: **Proximity effect model for x-ray transition edge sensors**, Rebecca C. Harwin, David J. Goldie, Stafford Withington, Univ. of Cambridge (United Kingdom), et al.. . . . . [10709-49]

LOCATION: CC LEVEL 1, EXHIBIT HALL 2 . . . . . 6:00 PM TO 8:00 PM

Posters-Tuesday

Posters in this session may be displayed beginning at 10:00 am on the designated day and will be available for extended viewing. The interactive poster session with authors in attendance will be Tuesday evening from 6:00 to 8:00 pm. Authors should remove their posters at the end of the poster session. Posters left displayed will be considered unwanted and will be discarded. Poster presentation guidelines are available online at http://spie.org/AstronomyPosterGuidelines.

Scientific CCD camera for CSTAR Telescope in Antarctica, Hong-fei Zhang, Jian-min Wang, Yi Zhang, Yi Feng, Cheng Chen, Qi-jie Tang, Dong-xu Yang, Guang-yu Zhang, Jian Wang, Univ. of Science and Technology of China (China) . . . . . [10709-66]

Preparation and radiation effect of 4H-SiC SBD gamma-ray detector, Yuanyuan Du, Institute of High Energy Physics (China). . . . . [10709-68]

Detailed study of subpixel response in x-ray SOI pixel sensor for the future x-ray astronomical satellite, Kenji Oono, Takayoshi Kohmura, Kouichi Hagino, Koki Tamasawa, Taku Kogiso, Kousuke Negishi, Keigo Yarita, Tokyo Univ. of Science (Japan), et al. . . . . [10709-69]

Evaluation of large pixel CMOS image sensors for the Tomo-e Gozen wide field camera, Yuto Kojima, Shigeyuki Sako, Ryou Ohsawa, Hidenori Takahashi, Mamoru Doi, Naoto Kobayashi, Kentaro Motohara, Takashi Miyata, Tomoki Morokuma, Masahiro Konishi, Tsutomu Aoki, Takao Soyano, Ken'ichi Tarusawa, Yuki Mori, Yoshikazu Nakada, Kazuma Mitsuda, Makoto Ichiki, Noriaki Arima, Tomonori Totani, Noriyuki Matsunaga, Toshikazu Shigeyama, The Univ. of Tokyo (Japan), et al. . . . . [10709-70]

Design of two ASIC chips for scientific CCD detectors, Jie Gao, Dong-xu Yang, Yi Feng, Wen-qing Qu, Jian-min Wang, Hong-fei Zhang, Jian Wang, Univ. of Science and Technology of China (China) . . . . . [10709-71]

Commissioning of a common-user test facility to evaluate the effects of high-energy particles on next-generation cryogenic detectors, Reinier Janssen, Samantha Stever, Gerard Rouille, Mehdi Bouzit, Bruno Maffei, Univ. Paris-Sud 11 (France) . . . . . [10709-72]

SWIR photometry for point source targets using InGaAs photodiodes, George Gasparian, GPD Optoelectronics Corp (USA). . . . . [10709-73]

Development of a compact readout system for optical CCD in Higashi-Hiroshima Observatory, Wei Liu, Hiroshima Univ. (Japan) and Univ. of Chinese Academy of Sciences (China) and Purple Mountain Observatory (China), et al.. . . . . [10709-74]

Evaluation of the LCIS64M 8k×8k CMOS detector for the vector magnetic field measurement over the entire solar disk, Qian Song, Wei Duan, Yangbin Liu, National Astronomical Observatories (China) . . . . . [10709-75]

Thermal and mechanical design and test of the CCD mount for the WEAVE spectrograph cryostats, Stuart Bates, Iain A. Steele, Liverpool John Moores Univ. (United Kingdom), et al.. . . . . [10709-76]

Digital correlated double sampling CCD readout characterization, Carlos Cruz de la Torre, Juan de Vicente Albendea, Ctr. de Investigaciones Energéticas, Medioambientales y Tecnológicas (Spain) . . . . . [10709-77]

Flight H2RG IR detectors: on-ground characterization for the Euclid NISP instrument, Aurélia Secroun, Ctr. de Physique des Particules de Marseille (France) and Aix-Marseille Univ. (France) and Institut National de Physique Nucléaire et de Physique des Particules (France), et al. . . . . [10709-78]

Millisecond to microseconds: improving our understanding of the NuSTAR clock, Brian W. Grefenstette, Caltech (USA), et al. . . . . [10709-79]

Cryogenic detector preamplifer developments at the ANU, Annino Vaccarella, Robert Sharp, The Australian National Univ. (Australia), et al. . . . . [10709-80]

Configuration of readout electronics and data acquisition for HiPERCAM instrument, Naidu N. Bezawada, Xiaofeng Gao, David Henry, Martin Black, Chris Miller, David Lunney, UK Astronomy Technology Ctr. (United Kingdom), et al.. . . . . [10709-81]

Simulations of the large size telescope drive system proposed for the Cherenkov Telescope array, Quentin Piel, Lab. d'Annecy-le-Vieux de Physique des Particules (France) . . . . . [10709-82]

Progress in development of SWIR HgCdTe detectors grown on silicon substrates, Donald Figer, Joong Y. Lee, Rochester Institute of Technology (USA), et al.. . . . . [10709-83]

The operational characteristics and potential applications of a low voltage EMCCD in a CMOS process, Alice Dunford, Konstantin D. Stefanov, Andrew D. Holland, The Open Univ. (United Kingdom) . . . . . [10709-84]

Measuring PSF in CIS113: a 5T CMOS sensor, James M. Ivory, Konstantin D. Stefanov, Andrew D. Holland, The Open Univ. (United Kingdom) . . . . . [10709-85]

Operation of a H4RG-10 in the NASA Goddard Astrophyiscs Divison IR detector lab testbed, Gregory Mosby Jr., NASA Goddard Space Flight Ctr. (USA) . . . . . [10709-86]

Large format x-ray microcalorimeter arrays based on thermal MKIDs (TKIDs), Miguel Daal, Univ. of California, Santa Barbara (USA), et al. . . . . [10709-87]

Optimization of CCD operating voltages for the LSST camera, Aaron J. Roodman, Adam Snyder, Kirk Gilmore, SLAC National Accelerator Lab. (USA), et al.. . . . . [10709-88]

Laboratory characterization of SLS-based infrared detectors for precision photometry, Aaron Peterson-Greenberg, Michael D. Pavel, MIT Lincoln Lab. (USA) . . . . . [10709-89]

Electroplated bismuth absorbers for planar NTD Ge sensor arrays applied to hard x-ray detection in astrophysics, Salvatore Ferruggia Bonura, INAF - Osservatorio Astronomico di Palermo Giuseppe S. Vaiana (Italy), et al.. . [10709-90]

Microchannel plate detectors for future NASA UV observatories, Camden Ertley, Univ. of California, Berkeley (USA). . . . . [10709-91]

Characterization of the point spread function of the PLATO CCD, Peter Verhoeve, Thibaut Prod'homme, Thierry Beaufort, Frederic Lemmel, Hans Smit, Sander Blommaert, Cornelis van der Luijt, Ivo Visser, Bart Butler, Brian Shortt, European Space Research and Technology Ctr. (Netherlands) . . . . . [10709-92]

New TEC cooling CCD system of LAMOST, Lei Jia, Sicheng Zou, Yu Luo, National Astronomical Observatories (China) . . . . . [10709-94]

Development of two ASIC devices for astronomical CCD controller, Yuheng Zhang, National Astronomical Observatories (China), et al. . . . . [10709-96]

Design of a multiband near-infrared sky brightness monitor using an InSb detector, Jian Wang, Shu-cheng Dong, Qi-jie Tang, Feng-xin Jiang, Jin-ting Chen, Yi-hao Zhang, Zhi-yue Wang, Jie Chen, Hong-fei Zhang, Univ. of Science and Technology of China (China), et al. . . . . [10709-97]

Trap pumping results from Euclid irradiation campaign, Jesper Skottfelt, Ben Dryer, Julia Campa, David J. Hall, Nathan L. Bush, Andrew D. Holland, The Open Univ. (United Kingdom) . . . . . [10709-98]

Thermodynamics simulation for vaccum chamber of a 1K*1K CCD, Zhi-gang Huang, ECRI Microelectronics (China), et al. . . . . [10709-99]

The readout design of Si-PIN detector in HXMT, Tao Luo, Bin Meng, Institute of High Energy Physics (China) . . . . . [10709-100]

Development of a high-speed CMOS readout for an MCP based photon counting detector, Ambily Suresh, Mayuresh Sarpotdar, Jayant Murthy, Indian Institute of Astrophysics (India). . . . . [10709-101]

Status of the INTRAPIX and QUANTIX test benches, dedicated to the measurement of intrapixel response, quantum efficiency and persistence in astronomical detectors, Kévin Theophile, Commissariat à l'Énergie Atomique (France), et al. . . . . [10709-102]

Energy resolution of photon-counting MKID detectors for visible and near-infrared wavelengths, Pieter J. de Visser, Max van Strien, Vignesh Murugesan, Jochem J. A. Baselmans, SRON Netherlands Institute for Space Research (Netherlands) . . . . . [10709-103]

Reconfigurable focal plane electronics for advanced all-digital focal plane sensors in space applications, Robert H. Philbrick, Sandor Demosthenes, John A. Frye, David T. Ellis, Ball Aerospace (USA). . . . . [10709-104]

On-flight performance of an H4RG for the BETTII mission, Todd J. Veach, Southwest Research Institute (USA), et al. . . . . [10709-105]

Focal plane array alignment and cryogenic surface topography measurements for the Prime Focus spectrograph, Murdock Hart, Robert H. Barkhouser, Stephen A. Smee, Johns Hopkins Univ. (USA), et al. . . . . [10709-106]

Smartphone scene generator for efficient characterization of visible imaging detectors, Michael Bottom, Jet Propulsion Lab. (USA), et al. . . . . [10709-107]

Adapting thermal-infrared technology and astronomical techniques for use in conservation biology, Maisie Rashman, Liverpool John Moores Univ. (United Kingdom), et al. . . . . [10709-108]

A pair of custom ASICs for bias generation and clock buffering in space-based CCD camera systems, Quentin Morrissey, Stephen Bell, Mark Prydderch, Lawrence Jones, Martin Torbet, Nick Waltham, Matthew Clapp, STFC Rutherford Appleton Lab. (United Kingdom) . . . . . [10709-109]

The Habitable-Zone Planet Finder: improved flux image generation algorithms for H2RG up-the-ramp data, Joe P. Ninan, The Pennsylvania State Univ. (USA), et al. . . . . [10709-110]

Pushing the limits of NuSTAR detectors, Brian W. Grefenstette, Fiona A. Harrison, Caltech (USA), et al. . . . . [10709-111]

Characterization of the per-pixel dark current and activation energy of a large format CMOS image sensor, Swaraj Bandhu Mahato, KU Leuven (Belgium), et al. . . . . [10709-112]

Two-dimensional MTF characterization of a large format CMOS detector, Swaraj Bandhu Mahato, Joris De Ridder, KU Leuven (Belgium), et al. . . [10709-113]

Automated soft x-ray event detection on a high gain EMCCD for the OGRE sounding rocket mission, Matthew Lewis, Matthew R. Soman, Andrew D. Holland, Jonathan Keelan, The Open Univ. (United Kingdom), et al. . . . . [10709-114]

Point-like events in fully-depleted CCDs, Guillermo Fernandez-Moroni, Fermi National Accelerator Lab. (USA), et al. . . . . [10709-115]

Noise performance of the JWST/NIRSpec detector system, Stephan M. Birkmann, Marco Sirianni, European Space Agency (USA), et al. . . . . [10709-116]

Development of transition edge sensors optimized for single-photon spectroscopy in the optical and near-infrared, Peter C. Nagler, John E. Sadleir, Samuel H. Moseley, Bernard J. Rauscher, NASA Goddard Space Flight Ctr. (USA) . . . . . [10709-117]

Signal dependent interpixel capacitance in hybridized arrays: simulation, characterization, and correction, Kevan Donlon, Zoran Ninkov, Rochester Institute of Technology (USA), et al. . . . . [10709-118]

Sink pixels in the Hubble Space Telescope wide-field channel 3 CCDs, Sylvia M. Baggett, Jay Anderson, Matthew Bourque, Space Telescope Science Institute (USA) . . . . . [10709-119]

A machine learning-based package to enhance MKID device performance through optimized digital readout tuning, Rupert Dodkins, Univ. of Oxford (United Kingdom), et al. . . . . [10709-120]

VERITAS 2.2: a low noise source follower and drain current readout integrated circuit for the wide field imager on the Athena x-ray satellite, Sven Herrmann, SLAC National Accelerator Lab. (USA), et al. . . . . [10709-121]

Intra-pixel response characterization of a HgCdTe near infrared detector with a pronounced crosshatch pattern, Charles A. Shapiro, Eric Huff, Jet Propulsion Lab. (USA), et al. . . . . [10709-122]

Space radiation environment effects on the Athena WFI: understanding and mitigating the instrument background, David J. Hall, The Open Univ. (United Kingdom), et al. . . . . [10709-124]

WEDNESDAY 13 JUNE

LOCATION: CC LEVEL 1, BALLROOM A . . . . . 9:00 AM TO 10:00 AM

Wednesday Plenary Session

Coffee Break . . . . . Wed 10:00 am to 10:30 am

SESSION 11

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . WED 10:30 AM TO 11:30 AM

X-ray Detector Development II

Session Chair: **James Beletic,** Teledyne Imaging Sensors (USA)

10:30 am: **Characterization of Redlen CZT detectors for x-ray astronomy**, Sean M. Pike, Jill Burnham, Walter R. Cook, Brian W. Grefenstette, Fiona A. Harrison, Kristin Madsen, Hiromasa Miyasaka, Caltech (USA) . . . . . [10709-50]

10:50 am: **Pair creation energy and Fano factor of silicon measured using Fe55 x-rays**, Ivan V. Kotov, Paul O'Connor, Brookhaven National Lab. (USA), et al. . . . . [10709-51]

11:10 am: **The spectral response of X-ray CCDs in the energy band around Si-K edge: a solution to the Si-K edge problem for the XIS onboard Suzaku**, Koki Okazaki, Kiyoshi Hayashida, Hiroshi Nakajima, Riku Shomura, Tomokage Yoneyama, Hiroshi Tsunemi, Osaka Univ. (Japan), et al. . . . . [10709-52]

SESSION 12

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . WED 11:30 AM TO 12:10 PM

Testing/Characterization II

Session Chair: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging (United Kingdom)

11:30 am: **Random telegraph signal (RTS) in the Euclid IR H2RGs**, Ralf Kohley, European Space Astronomy Ctr. (Spain), et al. . . . . [10709-53]

11:50 am: **The SAPHIRA detector's NIR performance**, Dani E. Atkinson, Donald N. B. Hall, Shane M. Jacobson, Univ. of Hawai'i at Hilo (USA), et al. . . . . [10709-54]

Lunch/Exhibition Break . . . . . Wed 12:10 pm to 2:00 pm

SESSION 13

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . WED 2:00 PM TO 3:20 PM

Testing/Characterization III

Session Chair: **James Beletic,** Teledyne Imaging Sensors (USA)

2:00 pm: **Calibrating gain, uniformity, linearity and noise of CCDs in the presence of the brighter-fatter effect**, Daniel P. Weatherill, Univ. of Oxford (United Kingdom). . . . . [10709-55]

2:20 pm: **Image lag optimisation in a 4T CMOS image sensor for the JANUS camera on ESA's JUICE mission to Jupiter,** Daniel-Dee Lofthouse-Smith, Matthew R. Soman, Edgar A. H. Allanwood, Konstantin D. Stefanov, Andrew D. Holland, Mark Leese, The Open Univ. (United Kingdom), et al. . . . . [10709-56]

2:40 pm: **The impact of the brighter-fatter effect on the performance of the JWST fine guidance sensor,** Neil Rowlands, Calvin Midwinter, Gerry Warner, Honeywell Aerospace (Canada) . . . . . [10709-57]

3:00 pm: **Characterization of LSST CCDs before first light using realistic images**, Andrew Bradshaw, Craig S. Lage, Anthony J. Tyson, Univ. of California, Davis (USA) . . . . . [10709-59]

Coffee Break . . . . . Wed 3:20 pm to 3:50 pm

SESSION 14

LOCATION: CC LEVEL 3, ROOM 10A/B . . . . . WED 3:50 PM TO 5:10 PM

Infrared Sensors II

Session Chair: **Andrew D. Holland,** e2v Ctr. for Electronic Imaging (United Kingdom)

3:50 pm: **Microwave kinetic inductance detectors for visible to near infrared astronomy**, Grégoire Coiffard, Benjamin A. Mazin, Miguel Daal, Nicholas Zobrist, Univ. of California, Santa Barbara (USA), et al. . . . . [10709-61]

4:10 pm: **A megapixel class HgCdTe linear mode avalanche photo-diode array for low background astronomy**, Donald N. B. Hall, Institute for Astronomy, Univ. of Hawai"i (USA), et al. . . . . [10709-62]

4:30 pm: **Addressing environmental and atmospheric challenges for capturing high-precision thermal infrared data in the field of astro-ecology**, Claire Burke, Maisie Rashman, Stephen N. Longmore, Liverpool John Moores Univ. (United Kingdom) . . . . . [10709-63]

4:50 pm: **H4RG characterization for high-resolution infrared spectroscopy**, Étienne Artigau, McGill Univ. (Canada), et al. . . . . [10709-65]

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GENERAL INFORMATION

Registration

Onsite Registration and Badge Pick-up Hours

Austin Convention Center, Level 1, Palazzo

Saturday 9 June . . . . . 4:00 pm to 7:00 pm

Sunday 10 June . . . . . 7:00 am to 4:00 pm

Monday 11 June . . . . . 8:00 am to 5:00 pm

Tuesday 12 June . . . . . 8:00 am to 5:00 pm

Wednesday 13 June . . . . . 8:00 am to 4:00 pm

Thursday 14 June . . . . . 8:00 am to 4:00 pm

Friday 15 June . . . . . 8:00 am to 11:00 am

CONFERENCE REGISTRATION

Includes admission to all conference sessions, plenaries, panels, and poster sessions, admission to the Exhibition, Welcome Reception, coffee breaks, and a choice of online proceedings.

COURSE AND WORKSHOP REGISTRATION

Courses and workshops are priced separately. Course-only registration includes your selected course(s), course notes, coffee breaks, and admittance to the exhibition. Course prices include applicable taxes. Onsite, please go to the Registration Desk after you pick up your badge.

Multiple facilities may be used for courses; allow yourself enough time to register, pick up your materials, and possibly walk to a nearby facility before your course begins.

EXHIBITION REGISTRATION

Exhibition-Only visitor registration is complimentary.

SPIE MEMBER, SPIE STUDENT MEMBER, AND STUDENT PRICING

- SPIE Members receive conference and course registration discounts. Discounts are applied at the time of registration.
- SPIE Student Members receive a 50% discount on all courses.
- Student registration rates are available only to undergraduate and graduate students who are enrolled full time and have not yet received their Ph.D. Post-docs may not register as students. A student ID number or proof of student status is required with your registration.

PRESS REGISTRATION

For credentialed press and media representatives only. Please email contact information, title, and organization to media@spie.org.

SPIE Cashier

Registration Area, Open during registration hours.

REGISTRATION PAYMENTS

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, visit the SPIE Cashier.

RECEIPT AND CERTIFICATE OF ATTENDANCE

Preregistered attendees who did not receive a receipt or attendees who need a Certificate of Attendance may obtain those from the SPIE Cashier |at Badge Corrections and Receipts.

BADGE CORRECTIONS

Badge corrections can be made by the SPIE Cashier | at the Badge Corrections station. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

REFUND INFORMATION

There is a US$50 service charge for processing refunds. Requests for refunds must be received by 31 May 2018; all registration fees will be forfeited after this date. Membership dues, SPIE Digital Library subscriptions, or Special Events purchased are not refundable.

U.S. GOVERNMENT CREDIT CARDS

U.S. Government credit card users: have your purchasing officer contact the credit card company and get prior authorization before attempting to register. Advise your purchasing agent that SPIE is considered a 5968 company for authorization purposes.

PROGRAM FORMAT

In an effort to make the printed conference programs easier to use, each paper record lists only the primary author/affiliation group. The complete author list is available in the index, on the SPIE website, and in the SPIE conference app.

New data laws are in effect

Unless you **opt in** to receive **email** from us, you will not receive any further SPIE info about SPIE Astronomical Telescopes + Instrumentation.

www.spie.org/signup

Author / Presenter Information

Speaker Check-In and Preview Station

Austin Convention Center, Level 3, Austin Suite

Saturday . . . . . .4:00 pm to 7:00 pm

Sunday through Thursday . . . . . 7:30 am to 5:00 pm

Friday . . . . . 7:30 am to 3:30 pm

All presenters must stop by Speaker Check-In to upload their file(s) at least two hours before their scheduled talk. Authors are not able to present using their own devices. All conference rooms have a laptop, projector, screen, lapel microphone, and laser pointer.

Poster Setup Instructions

Austin Convention Center, Level 1, Hall 2

Sunday, 10 June through Thursday 14 June 2018

Conference attendees are invited to attend the five poster sessions. See conference program for a list of the posters in each session.

Each poster session will include a different set of conference poster presentations. Come view the posters, ask questions, and enjoy light refreshments. Authors of poster papers will be present during the poster sessions to answer questions concerning their papers.

As part of the technical program, poster sessions are for paid registrants only. Attendees are required to wear their conference registration badges to the poster sessions.

DAILY SCHEDULE

Poster Set Up – Beginning at 10:00 am

Extended Poster Viewing from 10:00 am to 5:00 pm Daily

POSTER SESSIONS

Each poster session includes a unique set of posters. Please view individual conference programs for poster session schedules.

Sunday . . . . . 6:00 pm to 8:00 pm

Monday . . . . . 5:30 pm to 7:00 pm, (followed by the Welcome Reception)

Tuesday . . . . . 6:00 pm to 8:00 pm (includes exhbition)

Wednesday . . . . . 6:00 pm to 8:00 pm

Thursday . . . . . 6:00 pm to 8:00 pm

POSTER AUTHOR SET-UP INSTRUCTIONS

- Paper numbers will be included on the poster boards in numerical order; please find your paper number and display your poster in the designated space.
- Authors are encouraged to display their posters early in the day for extended viewing.
- A poster author or coauthor is required to stand by the poster during the scheduled poster session to answer questions from attendees.
- Presenters who have not displayed their posters on their assigned board at least 30 minutes before the poster session begins will be considered a "no show" and their manuscript will not be published.
- Posters not removed at the end of the session will be considered unwanted and will be discarded.
- SPIE assumes no responsibility for posters left up after the end of each poster session.

Onsite Services

Internet Access

Austin Convention Center – all levels

Complimentary wireless access is available; instructions will be posted onsite.

SPIE Conference and Exhibition App

Search and browse the program, special events, participants, exhibitors, courses, and more. Free Conference App available for iPhone and Android phones.

SPIE Bookstore

Austin Convention Center, Level 3

Stop by the SPIE Bookstore to browse the latest SPIE Press Books, proceedings, and educational materials. While there, get a t-shirt or educational toy to bring home to the family.

SPIE Education Services

Austin Convention Center, Level 3

Browse course offerings or learn more about SPIE courses available in portable formats such as Online and customized, In-company courses.

SPIE Press Room

Austin Convention Center, Level 2, Room 2

Open during Registration hours

For Registered Press only. The Press Room provides meeting space, refreshments, access to exhibitor press releases, and Internet connections. Press are urged to register before the meeting by emailing name, contact information, and name of publication to media@spie.org. Preregistration closes approximately 10 days before the start of the event.

Business Center

Outside of Exhibit Hall 3, Level 1

8:00 am to 5:00 pm Sunday–Friday

Services include Print, copy, fax, email, information, scooter rental, small store with medicine, stationary supplies, beverages, etc.

Information Desk

Outside of Exhibit Hall 4, Level 1

Open during Registration hours

Services include Restaurant & City Information.

Child Care Services

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http://fairygodsitters.com/; info@fairygodsitters.com; 512-803-7377

Note: SPIE does not imply an endorsement nor recommendation of these services. They are provided on an "information only" basis for your further analysis and decision. Other services may be available.

GENERAL INFORMATION

Urgent Message Line

An urgent message line is available during registration hours: 1-512-404-4600

Lost and Found

Austin Convention Center

Open during registration hours

Found items will be kept at the SPIE Cashier and at the end of the meeting will be turned over to the Austin Convention Center Security, 512-404-4111.

Food and Beverage Services

Coffee Breaks

Austin Convention Center, Level 1 near Ballroom A, and Level 3 Terrace

Sunday, Monday, Tuesday am, Friday

Austin Convention Center, Level 1 Exhibition Hall 1

Tuesday pm, Wednesday, Thursday

Complimentary coffee will be served twice daily, at 10:00 am and 3:00 pm. Check individual conference listings for exact times and locations.

Food and Refreshments for Purchase

Austin Convention Center, Level 1

Hot and cold snacks, hot entrees, deli sandwiches, salads, and pastries are available for purchase. Cash and credit cards accepted.

Travel Information

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Hertz

Hertz Car Rental is the official car rental agency for this event. To reserve a car, identify yourself as a SPIE Astronomical Telescopes + Instrumentation Conference attendee using the Hertz Meeting Code CV# 029B0023. Note: When booking from International Hertz locations, the CV # must be entered with the letters CV before the number, i.e. CV029B0023.

- In the United States call 1-800-654-2240
- In Canada call 1-800-263-0600, or 1-416-620-9620 in Toronto
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Payment Policy

Registrations must be fully paid before access to the conference is allowed. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks and wire transfers. Onsite registrations can also be paid with cash.

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Reporting of Unethical or Inappropriate Behavior

Onsite at an SPIE meeting, contact any SPIE Staff with concerns or questions for thorough follow-up. If you feel in immediate danger, please dial the local emergency number for police intervention.

SPIE has established a confidential reporting system for staff and all meetings participants to raise concerns about possible unethical or inappropriate behavior within our community. Complaints may be filed by phoning toll-free to +1-888-818-6898 from within the United States and Canada, or online at www.SPIE.ethicspoint.com and may be made anonymously.

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To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued photo identification at registration to collect registration materials.

Individuals are not allowed to pick up badges for other attendees. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

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All conference technical and networking events require a badge for admission. Registered attendees may bring children with them as long as they have been issued a badge. Registration badges for children under 18 are free and available at the SPIE registration desk onsite. Children under 14 years of age must be accompanied by an adult at all times, and guardians are asked to help maintain a professional, disturbance-free conference environment.

Unauthorized Solicitation Policy

Unauthorized solicitation in the Exhibition Hall is prohibited. Any nonexhibiting manufacturer or supplier observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

Recording Policy

Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter or instructor. Attendees may not capture or use materials presented in any meeting/course room or in course notes on display without written permission. Consent forms are available at Speaker Check-In or SPIE Registration. Individuals not complying with this policy will be asked to leave a given session and/or asked to surrender their recording media. Refusal to comply with such requests is grounds for expulsion from the event.

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SPIE Event Policies

Laser Pointer Safety Information/Policy

SPIE supplies tested and safety-approved laser pointers for all conference meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers.

Use of a personal laser pointer represents the user's acceptance of liability for use of a non-SPIE-supplied laser pointer. If you choose to use your own laser pointer, it must be tested to ensure <5 mW power output. Laser pointers in Class II and IIIa (<5 mW) are eye safe if power output is correct, but output must be verified because manufacturer labeling may not match actual output. You are required to sign a waiver releasing SPIE of any liability for use of potentially non-safe, personal laser pointers. Waivers are available at Speaker Check-In.

Unsecured Items Policy

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

Wireless Internet Service Policy

At most events, SPIE provides wireless access for attendees. Properly secure your computer before accessing the public wireless network. SPIE is not responsible for computer viruses or other computer damage.

No-Smoking Policy

Smoking, including e-cigarettes, is not permitted at any SPIE event.

Agreement to Hold Harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

Event Cancellation Policy

If for some unforeseen reason SPIE should have to cancel an event, processed registration fees will be refunded to registrants. Registrants will be responsible for cancellation of travel arrangements or housing reservations and the applicable fees.

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Paid conference registration includes online Proceedings of SPIE. In the tables below you will find product order numbers to use on the registration form.

Available as part of registration:

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Online Proceedings Collection—access to multiple related proceedings volumes via the SPIE Digital Library. Available as papers are published.

Conference Attendees: You may purchase additional online collections for $175 each or additional online proceedings volumes for $60 each. Print conference proceedings volumes are also available; see pricing below.

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Conference Attendees The price for additional online proceedings volumes is $60 each.

Product Order Number		Volume Title/Volume Editors	Price for separate Print purchase
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10699	**DL 10699**	**Space Telescopes and Instrumentation 2018: Ultraviolet to Gamma Ray** *Jan-Willem A. den Herder, Shouleh Nikzad, Kazuhiro Nakazawa*	**$217.50**
10700	**DL 10700**	**Ground-based and Airborne Telescopes VII** *Heather K. Marshall, Jason Spyromilio, Roberto Gilmozzi*	**$210.00**
10701	**DL 10701**	**Optical and Infrared Interferometry and Imaging VI** *Michelle J. Creech-Eakman, Peter G. Tuthill, Antoine Mérand*	**$127.50**
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		Meeting Attendees
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DLC705	**SPIE Astronomical Telescopes and Instrumentation 2018: Instrumentation and Detectors** *Volumes #: 10701, 10702, 10703, 10708, 10709*	**$175.00**

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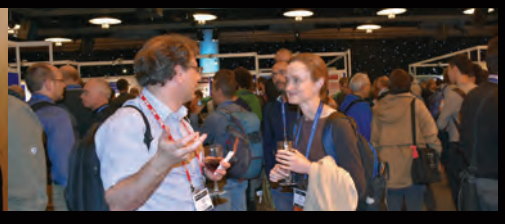


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