2023
International Conference on Compound Semiconductor Manufacturing Technology

May 15th – 18th, 2023
www.csmantech.org

Hyatt Regency Grand Cypress
Orlando, Florida, USA

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CONFERENCE AT A GLANCE

MONDAY, May 15th

6:00 PM – 9:00 PM	**EXHIBITOR RECEPTION** *Regency Hall*

TUESDAY, May 16th

7:00 AM – 8:30 AM	**BREAKFAST** *Regency Hall*
8:00 AM – 8:45 AM	**OPENING CEREMONIES** *Grand Cypress Ballroom DEF*
8:00 AM – 5:00 PM	**EXHIBIT HOURS** *Regency Hall*
8:45 AM – 10:15 AM	**SESSION 1: PLENARY I** *Grand Cypress Ballroom DEF*
10:15 AM – 10:45 AM	**BREAK**
10:45 AM – 11:45 PM	**SESSION 1: PLENARY I** *Grand Cypress Ballroom DEF*
11:45 PM – 1:00 PM	**EXHIBITS LUNCH including EXHIBITOR FORUM** *Regency Hall*
1:00 PM – 2:50 PM	**SESSION 2: RF DEVICES** *Grand Cypress Ballroom DEF*

1:00 PM – 2:50 PM	**SESSION 3: MODERN MANUFACTURING I** *Grand Cypress Ballroom ABC*
2:50 – 3:20 PM	**BREAK**
3:20 PM – 5:00 PM	**SESSION 4: GAN RF DEVICES AND CIRCUITS** *Grand Cypress Ballroom DEF*
3:20 PM – 5:00 PM	**SESSION 5: DEVICE FABRICATION** *Grand Cypress Ballroom ABC*
5:10 PM – 6:10 PM	**STUDENT FORUM** *Regency Club*
5:10 PM – 6:30 PM	**EXHIBITOR FORUM** *Grand Cypress ABC, Grand Cypress DEF, Grand Cypress G, Grand Cypress H, Grand Cypress I*
6:30 PM	**BUSES DEPART FOR INTERNATIONAL RECEPTION**
7:00 AM – 10:00 PM	**INTERNATIONAL RECEPTION** *Sea World Orlando*

WEDNESDAY, May 17th

7:00 AM – 8:30 AM	**BREAKFAST** *Regency Hall*
8:00 AM – 11:00 AM	**EXHIBIT HOURS** *Regency Hall*
8:00 AM – 9:45 AM	**SESSION 6: PLENARY II** *Grand Cypress Ballroom DEF*
9:45 AM – 10:15 AM	**BREAK**
10:15 AM – 12:05 PM	**SESSION 7: POWER DEVICES** *Grand Cypress Ballroom DEF*
10:15 AM – 12:05 PM	**SESSION 8: PACKAGING & HETEROGENEOUS INTEGRATION OF CS DEVICES** *Grand Cypress Ballroom ABC*
12:05 PM – 1:20 PM	**CS MANTECH LUNCH** *Portico*

1:20 PM – 3:00 PM	**SESSION 9: VERTICAL GAN POWER** *Grand Cypress Ballroom DEF*
1:20 PM – 3:00 PM	**SESSION 10: MODERN MANUFACTURING II** *Grand Cypress Ballroom ABC*
3:00 PM – 3:40 PM	**BREAK**
3:40 PM – 5:50 PM	**SESSION 11: WIDE BANDGAP PROCESSING** *Grand Cypress Ballroom DEF*
3:40 PM – 5:30 PM	**SESSION 12: CHARACTERIZATION AND RELIABILITY** *Grand Cypress Ballroom ABC*

THURSDAY, May 18th

7:00 AM – 8:30 AM	**BREAKFAST** *Regency Hall*
8:00 AM – 9:35 AM	**SESSION 13: PLENARY III** *Grand Cypress Ballroom DEF*
9:35 AM – 10:00 AM	**BREAK**
10:00 AM – 11:50 AM	**SESSION 14: OPTOELECTRONICS** *Grand Cypress Ballroom DEF*
10:00 AM – 11:50 PM	**SESSION 15: WIDE BANDGAP MATERIALS & EPITAXY** *Grand Cypress Ballroom ABC*
11:50 PM – 1:00 PM	**CS MANTECH LUNCHEON** *Portico*
1:00 PM – 2:40 PM	**SESSION 16: LIGHT EMITTING DIODES** *Grand Cypress Ballroom DEF*
1:00 PM – 2:40 PM	**SESSION 17: III-V EPITAXY AND MATERIALS** *Grand Cypress Ballroom ABC*
2:40 PM – 4:00 PM	**POSTER SESSION** *Portico*
4:00 PM – 5:00 PM	**CLOSING SESSION WITH FEATURED SPEAKER** *Portico*

MESSAGE FROM THE CONFERENCE CHAIR

On behalf of the Executive and Technical Program Committees, it is my pleasure to welcome you to the 37th International Conference on Compound Semiconductor Manufacturing Technology (CS MANTECH) in beautiful Orlando, Florida.

Since 1986 CS MANTECH has promoted and supported the compound semiconductor industry by offering an annual conference filled with technical presentations, vendor exhibits, and plenty of opportunities to network with colleagues from across the CS ecosystem. By fostering interactions and information exchange among attendees hailing from industry, academia, and government organizations, we endeavor to advance the state-of-the-art in the compound semiconductor industry. You can expect to hear a number of excellent presentations covering CS MANTECH topics such as markets and applications, RF devices, power devices, photonics technology, process development and control, materials, manufacturing, test, and device reliability. This year's conference offers over 90 presentations and posters – sure to provide something interesting for all our attendees. We will also honor John Palmour, who died unexpectedly in late 2022, as one of the pioneers in semiconductor technology who transformed how we all do RF and power electronics in many fields.

Following our successful in-person conference in Monterey in 2022 after the hiatus driven by the COVID-19 pandemic, we are excited to have another in-person conference this year. Everyone involved in planning this year's conference is committed to providing a safe experience for all who attend; we will follow the current recommendations of the U.S. Centers for Disease Control (CDC) and local authorities at the time of our event. We are determined to offer our attendees, speakers, and exhibitors a both stimulating and safe experience.

We are excited to announce that from this year the *Reliability of Compound Semiconductors Workshop* (ROCS), previously associated with JEDEC, is fully part of the CS MANTECH offerings. We aim with this to continue to offer CS MANTECH attendees an even greater variety of presentations and industry-relevant knowledge. ROCS will run in parallel to the CS MANTECH workshop, which this year focuses on the *Art of CS Manufacturing: Foundational & Advanced Fabrication Techniques*.

This conference relies on the dedication and commitment of the many volunteers who make up the technical program and executive committees. I would like to extend my great appreciation and thanks to these individuals as well as to the companies, institutions, and organizations that support them. This conference would not be possible without their collective efforts.

Welcome to Orlando and to CS MANTECH 2023!

Martin Kuball
University of Bristol
Conference Chair

2023 CONFERENCE SPONSORS

CS MANTECH is an independent not-for-profit organization whose mission is to promote technical discussion and scientific education in the compound semiconductor manufacturing industry. The continued success of the conference is enabled by donations from corporate sponsors. The 2022 CS MANTECH Conference Committee gratefully acknowledges the support from our sponsors.

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2023 CONFERENCE HIGHLIGHTS

The 2023 CS MANTECH program begins on Monday, May 15th with our workshop. This year's workshop theme is "The Art of CS Manufacturing: Foundational & Advanced Fabrication Techniques". Please see the MANTECH WORKSHOP section for details. Also on Monday, CS MANTECH is pleased to be hosting the internationally-recognized Reliability of Compound Semiconductor (ROCS) workshop. This workshop is the premier forum for the presentation of the latest results and new developments related to compound semiconductor reliability.

The conference social functions begin Monday evening at 6:00 pm with the Exhibitor Reception. Attendees will have the opportunity to interact with dozens of material suppliers, tool manufacturers, and service providers. This is a great chance to touch base with current vendors, view new offerings, and network with colleagues all while enjoying a taste of the local cuisine.

The CS MANTECH Conference begins Tuesday morning with opening ceremonies that include the 2022 Best Paper awards, Sponsorship Recognition, and a conference overview. During the opening ceremonies, there will be a special memorial tribute to the "Legacy of John Palmour," presented by Laura Rea, a former technical program manager at the Air Force Research Laboratory and a longtime friend of John. Following the opening functions, the technical program will start with a Plenary Presentation from John Cowles of Analog Devices, speaking on "Digitization and Edge Processing Redefine the Roles of Semiconductor and Packaging Technologies for Future Defense Platforms." This is followed by a Plenary Presentation from Dr. Devanand Shenoy, Principal Director of Microelectronics, Office of the Under Secretary of Defense for Research and Engineering, discussing Department of Defense investments in compound semiconductor technologies related to the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act.

The Plenary Session continues with two invited talks. First, Khaled Ahmed from Intel Corporation will present "Merits and Challenges of GaN MicroLEDs" and discuss the potential impact of developing a monolithic RGB GaN MicroLED solution on 300 mm silicon wafers. Second, Kazuaki Matsuura from Sumitomo Electric Device Innovations will talk about progress in the "Production of High Reliability 150 mm GaN HEMT for 5G Base Stations" bringing low-cost GaN technology to the expanding 5G base station market. Following the Plenary Session, attendees are

welcome to attend a sponsored luncheon in the Exhibitor Hall.

After lunch, the technical program resumes with sessions on RF devices, modern manufacturing, GaN RF devices and circuits, and device fabrication. These parallel sessions are composed of both invited and regular contributed talks. Parallel sessions have been structured so that attendees can move between talks and sessions. The Tuesday technical program concludes with our Exhibitors ' Forum and Student Forum. The Exhibitors 'Forum provides an opportunity for exhibitors to present short marketing/technical presentations to the conference attendees. The Student Forum provides an opportunity for students to explore career options through networking with members of the CS community from industry, academia, and government. Tuesday evening, CS MANTECH will host the International Reception at SeaWorld Orlando.

Wednesday morning begins early with breakfast in the Exhibitor Hall where attendees can follow up on questions from the Exhibitors 'Forum or meet with one or two new vendors before the technical sessions begin at 8:00 am. The technical sessions start with a Plenary Session. Missy Stigall from Wolfspeed will present a talk entitled "From Research to Reality: The Path of Compound Semiconductor Manufacturing Innovation," overviewing her company's innovation in manufacturing and discussing its newest fabrication facilities. Next, Jan Sonsky from Innoscience Europe will present an invited talk exploring the question "How to get GaN power devices into mainstream, high volume power management applications?" This talk will highlight the massive opportunities for GaN power devices in low voltage segments of power supply and power management in data servers, and computing and mobile applications, including direct battery-connected functions. The session concludes with an invited presentation given by Avinash Kashyap from Renesas Electronics on "Power Semiconductor Considerations for Electrical Vehicle (xEV) applications." This is followed by morning and afternoon parallel sessions focused on power devices, packaging & heterogeneous integration of CS devices, vertical GaN power, modern manufacturing, and concluding with sessions on wide bandgap processing and characterization & reliability. Similar to the previous day, parallel sessions are structured so that attendees can move between talks and sessions. The morning break, held in the Exhibitor Hall, will be one last opportunity to talk with vendors before the exhibit closes at 11:00 am. Lunch will be provided to attendees at this convenient opportunity for networking and discussions.

Thursday morning starts with a Plenary Session. Rodney Pelzel from IQE in his presentation "Enabling the Next Generation of Optical Devices through Fundamental

Materials Engineering" will share an exciting view of the future of next gen optical devices, and this will be linked to engineering at the fundamental materials level. Next Michael Wrabak from the Army Research Laboratory will discuss fundamental issues affecting III-N based UV optoelectronics in an invited talk titled "From Deep UV to Far UV Optoelectronics: Fundamental Issues, Opportunities, and Applications." The morning Plenary session concludes with a contributed talk by Ali Jaffal from Yole Intelligence overviewing "The Dawn of The InP Market in Consumer Applications." After a short break, the technical program continues with parallel sessions on optoelectronics, wide bandgap materials & epitaxy, light emitting diodes, and III-V epitaxy & materials. CS MANTECH will be providing attendees lunch to allow them the most time to engage with speakers and colleagues.

The technical program continues with our interactive Poster Session. The poster session is a unique opportunity to talk one-on-one with the authors on topics including manufacturing, substrate developments, power and RF, and optical devices, and more. Attendees will vote for best poster for which the winning author will receive an award.

The technical program finishes with "Outlook for Quantum Computing with Superconducting Qubits and their Supporting Architecture" from Nicholas Bronn from IBM Quantum, discussing the physics of superconducting qubits, including the role of materials in their fabrication and effects on decoherence, followed by IBM's hardware and software roadmaps for scaling these processors and their applications.

The conference ends Thursday afternoon with a Closing Reception and the perennial picture contest. AI image generators are growing in popularity and so this year we are looking for the best AI-generated image related to compound semiconductors. Amazon gift cards will be given to the top two pictures, as determined by voting of attendees at the Poster Session. The closing reception also features the conference feedback prize drawing.

On behalf of the 2023 Technical Program Committee, Welcome to Orlando!

David Meyer

Technical Program Committee Chair

CS MANTECH WORKSHOP

The theme for this year's CS MANTECH Workshop is the "**Art of CS Manufacturing: Foundational & Advanced Fabrication Techniques**". With the resurgence in Microelectronics technology development and advance packaging and integration, we are excited to offer a series of talks focused on the key basics of foundational process methods used in Compound Semiconductor manufacturing as well as new and advanced methods that are enabling next generation manufacturing.

The Workshop will begin with talks on **Lithography Techniques**. Mr. Doug Shelton, Canon U.S.A., will provide an overview of optical lithography methods including i-line and Deep UV exposure. Mr. Gabe Cueva, MACOM, will review electron beam lithography (EBL).

Following the lithography workshop talks, we will move on to reviewing two **Deposition Techniques**. Mr. James Watkins, ClassOne, will cover metal plating and Dr. Matt Weimer, ForgeNano, will discuss Atomic Layer Deposition (ALD).

Following the deposition talks, we will break for lunch. The afternoon begins with talks on **Epitaxy Material Growth, Substrates, and Characterization Techniques**. Ms. Evyn Routh and Dr. Katie Sautter, both from IQE, will update us on Metal Organic Vapor Deposition (MOCVD) and Molecular Beam Epitaxy (MBE) growth techniques. Dr. Mark Goorsky, University of California Los Angeles (UCLA), will discuss engineered substrates and characterization.

We will end the Workshop with talks on **Advanced Integration Techniques**. Dr. Dan Green, Pseudolithic, will provide a review of heterogeneous integration. Dr. Dino Ferizovic, Northrop Grumman, will cover techniques to validate and check the integrity of Wafer-Level Packaged (WLP) MMICs.

This year's CS MANTECH Workshop, "Art of CS Manufacturing: Foundational & Advanced Fabrication Techniques", is an excellent opportunity for new and experienced process engineers, device technologists, and designers to

understand the capabilities and key considerations of CS semiconductor manufacturing. Our objective is to expand your breadth of knowledge to elevate your skill set and it is a great refresher opportunity for those who have been working in the industry for a while. Be a part of a great learning and sharing opportunity in a workshop environment!

2023 ROCS WORKSHOP

Monday, May 15, 2023
Hyatt Regency Grand Cypress, Orlando FL
Room: Grand Cypress ABC
8:30 a.m. – 5:00 p.m.

ROCS has joined CS MANTECH!

The 37th annual Reliability of Compound Semiconductors (ROCS) Workshop will be held as part of the CS MANTECH conference this year, one day before the start of the main conference. The objective is to bring together researchers, manufacturers, and users of compound devices with an emphasis on device reliability, test, failure mechanisms, thermal analysis, radiation effects, and environmental effects, to name just a few areas of interest. Papers and tutorials showing the latest results and new developments in all phases of Compound Semiconductor Reliability are presented and discussed. Original papers and work detailing work-in-progress and emerging device technologies encouraged. A full day of Compound Semiconductor Reliability Presentations is being offered, along with a luncheon and two breaks.

2023 CoInnovateCS

Thursday, May 18 2023, 5:00 pm – Friday, May 19 2023, 1:00 pm

Co-located with CS MANTECH in Orlando, CoInnovateCS is an interactive event that fosters collaboration & innovation across the compound semiconductor supply chain. Led by industry experts, CoInnovateCS provides a unique platform where leaders throughout the Compound Semiconductor supply chain collaborate to identify and solve industry-wide challenges that will underpin and enable next-generation technologies and products. The conference promises an agenda with engaging activities, including inspirational talks, panel sessions, and workshops where we will explore challenges and opportunities in a more innovative and collaborative way. More details can be found online: https://coinnovatecs.com/

INDUSTRY EXHIBITS

The CS MANTECH Exhibition is the premiere annual venue for key CS suppliers and vendors to showcase their products and services. Building on the conference technical focus of CS manufacturing and technology, the Exhibition is an excellent opportunity for participating companies and organizations to meet and interact with both existing and future clients and collaborators involved in today's leading manufacturing and tomorrow's innovations. This unique opportunity brings researchers, engineers, managers, and the key decision makers who shape and guide the industry all together for face-to-face interaction. Attendees will gain excellent visibility to a wide range of CS-focused participants from around the globe who are critical to ensuring your success in the CS community. You are sure to see most of your major suppliers and collaborators for the unique chance to efficiently meet with many of your contacts all in one place.

The 2023 CS MANTECH Exhibition will be located in the Hyatt Regency Grand Cypress Regency Hall, a short walk from the technical sessions. Exhibitors can begin setting up their booths at 8:00 am on Monday, May 15th, before the Exhibits kick-off opening at 6:00 pm that evening with the Exhibits Reception. The Exhibits Reception will include food and drink and is an excellent opportunity to catch up with friends, colleagues, suppliers, and competitors. This first full evening of the conference is a great networking opportunity to meet and greet the assembling conference attendees who contribute to the continued success of the CS Industry.

The Exhibits hall will open again Tuesday morning with breakfast at 7:00 am. Following the Plenary Session, the Exhibit Hall will be a focal point for attendees as the location for the morning and afternoon breaks, along with our buffet-style Exhibits Lunch. After Tuesday's technical sessions, the Grand Cypress Ballroom meeting areas will be used for five parallel Exhibitor Forum sessions. The Exhibitor Forum is only open to registered Exhibitors and offers an opportunity for participating companies to introduce new products, highlight company strengths, or even just introduce themselves in a short seven-minute presentation. Space in the forum schedule will be very limited this year, and will be assigned on a first-come, first-serve basis, so make sure to sign up early!

The Exhibits will open again on Wednesday morning at 7:00 am with breakfast, and run until 11:00 am when the Exhibition closes and Exhibitors begin disassembling and packing up their booths. This last morning of Exhibits provides an ideal opportunity for both conference attendees and participating Exhibitors to follow up on interest generated by the forums, exchange business cards, and finalize those last-minute deals!

We are very thankful for all of our CS MANTECH Exhibitors, who not only make our conferences possible, but also make them exceptional! We know you will not only find this a very valuable return-on-investment, but a lot of fun, too! Visit https://csmantech.org/exhibitor/ for more details, and please contact the 2023 Exhibits chair, Shawn Burnham at exhibitor@csmantech.org with any questions.

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Vital Materials
Wolfspeed, Inc.
Yield Engineering Systems (YES) Inc.

2022 BEST PAPERS AWARDS

On Tuesday morning, CS MANTECH will formally recognize the authors of the best paper and best student paper from the 2022 conference. Both awards are based on conference attendee on-line feedback. The Best Paper Award is named in honor of Dr. He Bong Kim, the founder of the International Conference on Compound Semiconductor MANufacturing TECHnology.

The He Bong Kim Award winner for the 2022 Conference is:

The New Normal: The Semiconductor Access Singularity and What It Means to You
Juan Cordovez
Global Foundries, Austin, TX, USA

The Best Student Paper for the 2022 Conference, for which the principal student author will receive a special cash award of $1000, is:

Hybrid Etching Process in Submicron Type-II GaAsSb/InP DHBT for 5G and millimeter-wave Power Amplification
Yulin He, Yu-Ting Peng, Xin Yu, and Milton Feng.
University of Illinois at Urbana-Champaign, Department of Electrical and Computer Engineering, IL USA

Congratulations to these award-winning teams for their excellent presentation and technical contribution to our field.

INTERNATIONAL RECEPTION

We are very excited to host the 2023 CS MANTECH International Reception (IR) on Tuesday, May 16 from 7-10 pm, at Sea World in Orlando, Florida! Transportation will be provided to and from the conference hotel (buses leave at 6:30 PM). Dinner will be a buffet-style service set throughout the Wild Arctic Plaza. Guests are welcome to enjoy the Glacier Bar, Beer Garden, and Gift Shop throughout the evening, as well as the Ice Breaker roller coaster and the Beluga Whale, Leopard Seal and Walrus exhibits. Please join us for what is sure to be a very memorable evening of entertainment and networking amidst the unique backdrop of Sea World Orlando!

One IR ticket is included in your registration. Additional tickets will be available for purchase (please see registration site for details).

CONFERENCE CONTEST

Details coming soon!

CONFERENCE CLOSING RECEPTION

The Conference Closing Reception brings the 2023 CS MANTECH to an end. Immediately following the technical program, the closing reception affords attendees one last opportunity to exchange business cards, ideas, and experiences as they reflect on the week. During the reception voting for Best Poster Presentation and Picture Contest will be tallied and winners announced.

Dr. Nicholas Bronn, IBM Quantum

This year we will have a featured speaker from IBM Quantum, Dr. Nicholas Bronn, who will present a special talk entitled “Outlook for Quantum Computing with Superconducting Qubits and their Supporting Architecture”. This will provide attendees a glimpse into emerging quantum computer analog electronics and the microwave hardware that is utilized within.

As in previous years, our conference will hold a Feedback Form Raffle. Conference feedback on technical content and venue is valuable to the CS MANTECH committees in structuring in the conference and technical program from year to year. In addition, conference feedback is used to help select the Best Paper and Best Student Paper. Each Feedback Form submitted will be entered into a raffle for a prize. It's as simple as that! The drawing will be held during the closing reception, though the winner need not be present to win.

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TECHNICAL PROGRAM

Monday, May 15th

6:00 PM **EXHIBITOR RECEPTION**

Tuesday, May 16th

CONFERENCE OPENING

8:00 AM **Opening Ceremonies**
Martin Kuball, *University of Bristol*
Conference Chair

8:10 AM **2022 Conference Best Paper Awards**
Martin Kuball, University of Bristol
Conference Chair

8:20 AM **Legacy of John Palmour**
Laura Rea

8:35 AM **Technical Program Highlights**
David Meyer, Naval Research Laboratory
Technical Program Chair

SESSION 1: PLENARY
Chairs: Martin Kuball, *University of Bristol*
David Meyer, *Naval Research Laboratory*

8:45 AM *Plenary Presentation*
1.1 Digitization and Edge Processing Redefine the Roles of Semiconductor and Packaging Technologies for Future Defense Platforms
John Cowles
Analog Devices

9:30 AM *Plenary Presentation*
1.2 T DoD Microelectronics for the Near, Medium, and Long Term
Devanand Shenoy[1], Darren Crum[2], Brian Olson[2], Joshua Hawke[2]
[1]Office of the Under Secretary of Defense for Research and Engineering, Washington, DC
[2]*Naval Surface Warfare Center Crane, Crane, IN*

10:15 AM **BREAK**

10:45 AM *Invited Presentation*

1.3 Merits and Challenges of GaN Micro-LEDs
Khaled Ahmed
Intel Corporation, Santa Clara, CA, USA

11:15 AM *Invited Presentation*
1.4 Production of High Reliability 150mm GaN HEMT for 5G Base Station
Kazuaki Matsuura[1], T. Watanabe[2], T. Kosaka[2], S. Kitajima[2], P. Mushini[3], J. Bellotti[3], and B Gedzberg[3]
[1]*Sumitomo Electric Device Innovations USA, San Jose CA, USA*
[2]*Sumitomo Electric Device Innovations, Inc., Yamanashi, Japan*
[3]*Coherent Corp., Warren, NJ*

11:45 AM **EXHIBITS LUNCH**

SESSION 2: RF Devices
Chairs: Dave Via, *Air Force Research Laboratory*
Jansen Uyeda, *Northrop Grumman*

1:00 PM *Invited Presentation*
2.1 RF Gallium Nitride on Silicon Carbide: US-Based Access to Millimeter-Wave Spectrum
Joshua Hawke[1], Vince Williamson[1], Eric Kamp[2], John Blevins[3], Andrew Green[3], Nicholas Miller[3]
[1]*Naval Surface Warfare Center Crane*
[2]*Booze Allen Hamilton*
[3]*Air Force Research Lab*

1:30 PM **2.2 Accelerated adoption of GaN RF in Telecom infrastructure as opportunities for GaN-on-Si**
V. Aymen Ghorbel, P Chiu, E. Dogmus, C. Malaquin, C. Burey, and C. Troadec
Yole Développement, Villeurbanne, France

1:50 PM **2.3 Optical and electrical methods for yield improvement of T-shaped gates for AlGaN/GaN HEMT**
P. Denis, H. Sahin, M. Madel, T. Böhm, L. Trinh-Xuan, T. Berndorfer, A. Hugger, M. Amann, H. Stieglauer, and H. Blanck
United Monolithic Semiconductors GmbH, Ulm, Germany

2:10 PM **2.4 High-k Nanolaminate Gate Dielectric for SLCFET Amplifiers with Improved Frequency Performance and Breakdown Voltage**
S. Afroz[1], T. Vasen[1], B. Novak[1], B. Grisafe[1], V. Wheeler[2], A. Koehler[2], K. Hobart[2], P.

Shea[1], S. Van Campen[1], J. Chang[1], R. Howell[1]
[1]Northrop Grumman Mission Systems, Linthicum, MD
[2]US Naval Research Laboratory, Washington, DC

2:30 PM **2.5 Lg = 25 nm InP-based high-electron mobility transistors with both fT and fmax in excess of 700 GHz**
In-Geun Lee[1], Hyeon-Bhin Jo[1], Wan-Soo Park[1], Ji-Hoon Yoo[1], Jacob Yun[2], Ted Kim[2], Takuya Tsutsumi[2], Hiroki Sugiyama[3], Jae-Hak Lee[1] and Dae-Hyun Kim[1]
[1]Kyungpook National University, Daegu, South Korea
[2]QSI, Kyunggi-do, South Korea
[3]NTT Corporation, Kanagawa, Japan

SESSION 3: Modern Manufacturing I
Chairs: Corey Nevers, *Qorvo*
Celicia Della-Morrow, *Qorvo*

1:00 PM *Invited Presentation*
3.1 Plasma Dicing of thin-film LEDs
Heribert Zull, Mahsa Norouzi Kalkani, Stelio Correia, Mathias Kaempf, Martin Strassburg
ams OSRAM Group, Regensburg, Germany

1:30 PM **3.2 New and Innovative die singulation technology for Compound Semiconductors with extremely small kerf-loss and completely no damage on the side wall**
Keitaro Okamoto
Mitsuboshi Diamond Industrial Co.,Ltd, Osaka, Japan

1:50 PM **3.3 Manufacturing Process Development of High Temperature Silicon Carbide Junction Field-Effect Transistors**
A. Masurkar, I. Wildeson, D. Brown, P. Srivastava, L. Lanzerotti, L. Mt. Pleasant, B. Zivasatienraj
BAE Systems, Inc., Nashua, NH

2:10 PM **3.4 Advanced Carbon film for high-voltage power, high-performance SiC devices**
Ludovico Megalini[1], Yi Zheng[1], Ricky Fang[1], Pratim Palit[1], Jinghe Yang[1], Xiao Chen[1], Jiao Yang[1], Jang Seok Oh[1], Bryan Turner[1], Michel Khoury[1], Joseph Lee[1], Gopal Prabhu[1], Aswin Prathap Pitchiya[1], Raghav Sreenivasan[1], David Britz[1], Stephen Krause[1], Michael Chudzik[1], Tamara Fidler[2], Patrick Schmid[2], Bas Derksema[2]
[1]*Applied Materials, Santa Clara, CA*

[2]*Centrotherm international AG, Blaubeuren, Germany*

2:30 PM **3.5 Transfer and Implementation of the AFRL 140nm GaN/SiC Technology on 6-inch GaN on SiC**
Wen Zhu, David Brown, Puneet Srivastava, Kanin Chu
BAE Systems Inc., Nashua, NH

2:50 PM **BREAK**

SESSION 4: GaN RF Devices and Circuits
Chairs: Fabian Radulescu, *Cree*
Jeff LaRoche, *Raytheon Technologies*

3:20 PM *Invited Presentation*
4.1 GaN as a Catalyst for Ultra-High-Power Directed Energy
Andy Lowery
Epirus, Torrance, CA

3:50 PM *Invited Presentation*
4.2 Designs and Fabrication of Millimeter-Wave GaN HEMTs
Keisuke Shinohara, Dean Regan, Casey King, Eric Regan, Andy Carter, Andrea Arias-Purdue, Josh Bergman, Miguel Urteaga, Berinder Brar
Teledyne Scientific & Imaging, Thousand Oaks, CA

4:20 PM **4.3 GaN based 2-stage Wide Band Doherty PA for 3.4-3.8 GHz Using Hybrid Integration with IPDs on HPSI SiC Substrate**
Sangmin Lee[1], Jinman Jin[1], Inseop Kim[1], Hyeyoung Jung[1], Seo Koo[2] and Dal Ahn[2]
[1]*Wavice Inc., Hwasung-si, Korea*
[2]*Soonchunhyang University, Korea*

4:40 PM **4.4 Origin of Transconductance roll-off in mmWave AlGaN/GaN HEMTs**
Terirama Thingujam[1], Michael J Uren[1], Niklas Rorsman[2], Matthew Smith[1] and Martin Kuball[1]
[1]*University of Bristol, Bristol, UK*
[2]*Chalmers University of Technology, Gothenburg, Sweden*

SESSION 5: Device Fabrication
Chairs: Eric Stewart, *Northrop Grumman*

3:20 PM **5.1 Isolation in Compound Semiconductors and the Risk of Neutron Generation with Implantation of Light Ions**

J.A. Turcaud, C. Heckman, V. Heckman, A. Hassan, R. Pong and J. Schuur
COHERENT - INNOViON, San Jose, CA

3:40 PM **5.2 Effects of Circuit Layout on Electrostatic Discharge Damage in Semiconductor Wafer Fabrication**
Kezia Cheng, Shiban K. Tiku
Skyworks Solutions Inc., Woburn, MA

4:00 PM **5.3 Integration of Nichrome Process as a Competitive Alternative to Tantalum Nitride for Thin Film Resistors in Compound Semiconductors**
Stephanie Y. Chang, Shiban Tiku, Tom Brown, Lam Luu, Manohar Krishnappa, Randy Bryie, Nercy Ebrahimi
Skyworks Solutions Inc., Newbury Park, CA

4:20 PM **5.4 Gold Assisted Deposition of a Material with Low Spitting by a New Carbon Removal Process**
Taichi Ito, Kiyofumi Kodera, Yuichiro Shindo
Matsuda Sangyo Co., Ltd., Tokyo, Japan

4:40 PM **5.5 Production Ready in Integration of 0.15um E/D mode GaAs p-HEMT by DUV 248nm Stepper**
Zong-Zheng Yan, Pei-Ying Wu, Rong-Hao Syu, Shi-Tsung Lin, Shu-Hsiao Tsai, Chang-Hwang Hua, Cheng-Kuo Lin, Yu-Chi Wang
WIN Semiconductors Corp., Taoyuan, Taiwan

5:10 PM **EXHIBITOR FORUM**
Grand Cypress ABC, Grand Cypress DEF, Grand Cypress G, Grand Cypress H, Grand Cypress I

5:10 PM **STUDENT FORUM**
Regency Club

7:00 PM **INTERNATIONAL RECEPTION**
Sea World Orlando
Buses leave hotel at 6:30 PM

Wednesday, May 17th

SESSION 6: PLENARY II

Chairs: Dilip Risbud, *Renesas Electronics*
Martin Kuball, *University of Bristol*

8:00 AM *Plenary Presentation*
6.1 From Research to Reality: The Path of Compound Semiconductor Manufacturing Innovation
Missy Stigall and Winston Parker
Wolfspeed, Durham NC

8:45 AM *Invited Presentation*
6.2 How to get GaN power devices into mainstream, high volume power management applications?
Jan Sonsky, Thomas Zhao, Gary Kong, David Zhou, and Felix Wang
Innoscience Europe, Philipssite 5/b1, 3001 Leuven Belgium

9:15 AM *Invited Presentation*
6.3 Power Semiconductor Considerations for xEV applications
Avinash Kashyap, Tanui Saxena, Dilip Risbud
Renesas Electronics

9:45 AM **BREAK**

SESSION 7: Power Devices

Chairs: John Blevins, *Air Force Research Laboratory*
Andrew Green, *Air Force Research Laboratory*

10:15 AM *Invited Presentation*
7.1 β-Ga_2O_3 Crystal Growth and Device Processing
K. Sasaki and A. Kuramata
Novel Crystal Technology, Inc., Saitama, Japan

10:45 AM **7.2 Characterization of (001) β-Ga_2O_3 Schottky Diodes with Drift Layer Grown by MOCVD**

Prakash P. Sundaram[1], Fengdeng Liu[1], Fikadu Alema[2], Andrei Osinsky[2], Bharat Jalan[1], and Steven J. Koester[1]
[1]*University of Minnesota, Minneapolis, MN*
[2]*Agnitron Technology Incorporated, Chanhassen, MN*

11:05 AM **7.3 Scaled β-Ga_2O_3 MOSFETs with Pulsed Laser Deposition-Regrown Ohmics**
Daniel M. Dryden[1], Hyung Min Jeon[1], Kyle J. Liddy[2], Ahmad E. Islam[2], Dennis E. Walker, Jr.[2], Jeremiah C. Williams[2], Nicholas P. Sepelak[2], Nolan S. Hendricks[2], Kevin D. Leedy[2], Kelson D. Chabak[2], Andrew J. Green[2]
[1]*KBR, Inc., Beavercreek, OH*
[2]*Air Force Research Laboratory, Wright-Patterson AFB, OH*

11:25 AM *Student Presentation*
7.4 Development of GaN-on-Ga_2O_3 Heterostructures for Vertical Power Devices
Frank P. Kelly[1], Matthew M. Landi[1], Riley E. Vesto[1], Marko J. Tadjer[2], Karl D. Hobart[2], Kyekyoon Kim[1]
[1]*University of Illinois at Urbana-Champaign, Urbana, IL*
[2]*Naval Research Laboratory, Washington, DC*

11:45 AM **7.5 Improving the yield for GaN-on-Si HEMT devices for power applications**
D. Fahle[1], C. Mauder[1], I. Booker[1], H. Hahn[1], Z. Gao[1], M. Marx[1], Niels Posthuma[2] and Stefaan Decoutere[2]
[1]*AIXTRON SE, Herzgenrath, Germany*
[2]*Imec, Leuven, Belgium*

SESSION 8: Packaging and Heterogeneous Integration of CS Devices
Chairs: Shiva Rai, *Applied Materials*
Mario Faria, *Tignis, Inc.*

10:15 AM *Invited Presentation*
8.1 Perspective of power module packaging technology
Olaf Hohlfeld
Infineon Technologies AG, Warstein, Germany

10:45 AM **8.2 Diamond-Metal Composite Package for High Power RF Device**
Quinn D. Martin
MACOM Technology Solutions, Morrisville, NC

11:05 AM **8.3 Heterogeneous Integration of Gallium Nitride HEMTs with Single Crystal Diamond Substrates via Micro-transfer Printing for Thermal Management**
James Spencer Lundh[1], Andy Xie[2], Shawn Mack[3], D. Scott Katzer[3], Marko J. Tadjer[3], Karl D. Hobart[3], Travis J. Anderson[3], Brian P. Downey[3], David J. Meyer[3]
[1]*National Research Council Postdoctoral Fellow, Residing at NRL, Washington, DC*
[2]*Qorvo, Richardson, TX*
[3]*U.S. Naval Research Laboratory, Washington, DC*

11:25 AM **8.4 Micro-Transfer Printing for Manufacturing mmWave 3DHI Microsystems**
Bill Batchelor, David Gomez and Bob Conner
X-Celeprint, Inc., Durham, NC

11:45 AM **8.5 Atomic Diffusion Bonding Using AlN and Al_2O_3 Fims**
T. Saito[1], H. Makita[1], Y. Suzuki[1], Y. Kozuka[1], A. Muraoka[1], H. Fukunaga[2], M. Uomoto[2], and T. Shimatsu[2]
[1]*Canon ANELVA Corporation, Kawasaki, Japan*
[2]*Tohoku University, Sendai, Japan*

12:05 PM **CSM Lunch**

SESSION 9: Vertical GaN Power
Chairs: Yohei Otoki, *SCIOCS*
Andrew Green, *Air Force Research Laboratory*

1:20 PM *Invited Presentation*
9.1 Expectations and Challenges of GaN Power Devices from Application Viewpoints
Mariko Takayanagi
Toshiba Electronic Devices & Storage Corporation, Japan

1:50 PM *Invited Presentation*
9.2 Challenges in Manufacturing Vertical GaN "Technology of Future" – Now a Reality at NexGen Power Systems
Dinesh Ramanathan
NexGen Power Systems, Santa Clara, CA

2:20 PM **9.3 Drift Region Epitaxy Development and Characterization for High Blocking Strength and Low Specific On-State Resistance in Vertical GaN-Based Devices**

Eldad Bahat Treidel, Frank Brunner, Enrico Brusaterra, Mihaela Wolf, Andreas Thies, Joachim Würfl and Oliver Hilt
Ferdinand-Braun-Institut gGmbH, Berlin, Germany

2:40 PM **9.4 Scalable Manufacturing of Planar, Large-Area 1.2kV and 3.3kV Vertical GaN PiN Diodes**
Travis J. Anderson[1], Alan G. Jacobs[1], Mona A. Ebrish[2], James C. Gallagher[1], Andrew D. Koehler[1], Marko J. Tadjer[1], James Spencer Lundh[3], Jennifer K. Hite[1], Nadeemullah A. Mahadik[1], Ozgur Aktas[4], Karl D. Hobart[1], Robert J. Kaplar[4]
[1]*U.S. Naval Research Laboratory, Washington, DC*
[2]*Vanderbilt University, Nashville, TN*
[3]*National Research Council, Washington, DC (postdoc residing at NRL)*
[4]*Sandia National Labs, Albuquerque, NM*

SESSION 10: Modern Manufacturing II
Chairs: Marty Brophy
Steve Mahon

1:20 PM **10.1 Mechanisms and Control of Photolithography Hotspots in Compound Semiconductor Manufacturing**
Mark J. Miller, Marietta L. Balandan, Aida J. Castro, Lorain Ross, Arif Zeeshan
Skyworks Solutions, Inc., Woburn, MA

1:40 PM **10.2 Reduction in Scattered Particles Contamination in Inductively Coupled Plasma Etching Systems for High Volume High Yield Production**
Mohammadsadegh Beheshti, Samuel Mony, Nercy Ebrahimi, Tom Brown
Skyworks Solutions, Inc., Newbury Park, CA

2:00 PM **10.3 Optimization of Iridium RF-Sputter Process for AlGaN/GaN based HEMT Gate Technology**
I. Ostermay, S. Seifert and O. Krueger
Ferdinand-Braun-Institut (FBH), Berlin, Germany

2:20 PM **10.4 Learnings from Multiple Implementations of Closed-Loop AI/ML Controllers for Semiconductor Manufacturing**
Jon Herlocker, Eric Holzer, Mario Faria
Tignis Inc., Seattle, WA

2:40 PM **10.5 Accuracy of Machine Learning Models on Predicting the Properties of Vertical GaN Diodes**
James C. Gallagher[1], Michael A. Mastro[1], Mona A. Ebrish[2], Alan G. Jacobs[1], Brendan. P. Gunning[3], Robert. J. Kaplar[3], Karl D. Hobart[1], Travis J. Anderson[1]
[1]*U.S. Naval Research Laboratory, Washington, DC*
[2]*NRC Postdoc Fellow Residing at the U.S. Naval Research Laboratory*
[3]*Sandia National Laboratories, Albuquerque, NM*

3:00 PM **BREAK**

SESSION 11: Wide Bandgap Processing
Chairs: Guoliang Zhou, *Skyworks*
Andy Carter, *Teledyne Scientific and Imaging*

3:40 PM *Invited Presentation*
11.1 HVPE-Based Gallium Oxide Epiwafer Development
J.H. Leach, K. Udwary, G. Dodson, and H. Splawn
Kyma Technologies, Inc., Raleigh, NC

4:10 PM **11.2 High selectivity GaN to AlGaN etching for HEMT devices**
Matthew Day[1], Will Worster[1], Richard Barnett[1], Jih-Wen Chou[2], Robin Chistine Hwang[2], Yen-Ling Chuang[3], Jia-Wei Hsu[3]
[1]*KLA Corporation (SPTS Division), Newport, UK*
[2]*PSMC (8" Tech Dev Center), Hsinchu, Taiwan*
[3]*PSMC (Fab 8B), Miaoli, Taiwan*

4:30 PM **11.3 Structural and Electrical Characterization of Schottky Barrier Diodes on 100 mm HVPE β-Ga_2O_3 Epiwafer Technology**
Marko J. Tadjer[1], Nadeemullah A. Mahadik[1], James C. Gallagher[1], Hannah N. Masten[2], James Spencer Lundh[2], Karl D. Hobart[1], Travis J. Anderson[1], Akito Kuramata[3]
[1]*U.S. Naval Research Laboratory, Washington, DC*
[2]*National Research Council Postdoctoral Fellow, Residing at NRL, Washington, DC*
[3]*Novel Crystal Technology, Inc., Saitama, Japan*

4:50 PM **11.4 Nanocrystalline Diamond-Capped β-$(Al_xGa_{1-x})_2O_3/Ga_2O_3$ Heterostructure Field-Effect Transistor**

Hannah N. Masten[1], James Spencer Lundh[1], Joseph A. Spencer[2,3] Tatyana Feygelson[2], Jennifer Hite[2], Daniel Pennachio[2], Alan G. Jacobs[2], Boris Feygelson[2], Kohei Sasaki[4], Akito Kuramata[4], Pai-Ying Liao[5], Peide Ye[5], Bradford Pate[2], Karl D. Hobart[2], Travis J. Anderson[2], Marko J. Tadjer[2]
[1]*National Research Council Postdoctoral Fellow at U.S. Naval Research Laboratory, Washington, DC*
[2]*U.S. Naval Research Laboratory, Washington, DC*
[3]*Virginia Tech, Blacksburg, VA*
[4]*Novel Crystal Technology, Inc., Saitama, Japan*
[5]*Purdue University, West Lafayette, IN*

5:10 PM **11.5 GaN substrate cut-out process and GaN on GaN device thinning process with laser slicing**
A. Tanaka[1], T. Yu[2], T. Aratani[2], K. Hara[2], D. Kawaguchi[2], H. Watanabe[1], T. Kanemura[3], Y. Nagasato[3], M. Nagaya[3], Y. Honda[1], A. Wakejima[4], Y, Ando[1], S. Onda[1], J. Suda[1], H. Amano[1]
[1]*Nagoya University, Nagoya, Japan*
[2]*Hamamatsu Photonics K.K., Hamamatsu, Japan*
[3]*MIRISE Technologies Corporation, Nisshin, Japan*
[4]*Nagoya Institute of Technology, Nagoya, Japan*

5:30 PM **11.6 Sonic Lift-off (SLO) to Enable Substrate Reuse and Lower Manufacturing Cost**
P. Guimera Coll, T. Black, A.P. Merkle, L. Bathurst, M. Bertoni
Crystal Sonic, Inc., Phoenix, AZ

SESSION 12: INTEGRATION & PACKAGING
Chairs: Peter Ersland, *MACOM*
Raitnait Long, *MACOM*

3:40 PM *Invited Presentation*
12.1 GaN-devices with Thermal management for increased power density
Mohamadali Malakoutian[1], Rohith Soman[1], Jeongkyu Kim[1], Bhawani Shankar[1], Xiang Zheng[2], Martin Kuball[2] and Srabanti Chowdhury[1]
[1]*Stanford University, Stanford, CA*
[2]*University of Bristol, Bristol, UK*

4:10 PM **12.2 High Temperature Studies of 140 nm T-gate AlGaN/GaN HEMT Devices**
Ahmad E. Islam[1], Adam Miesle[2], Nicholas P. Sepelak[2], Hanwool Lee[3], Dennis E. Walker Jr.[1], Nicholas C. Miller[1], Kyle J. Liddy[1], Antonio Crespo[1], Gary Hughes[1], Wenjuan Zhu[3], Kelson D. Chabak[1], and Andrew J. Green[1]
[1]*Air Force Research Laboratory, Wright-Patterson AFB, Dayton, OH*
[2]*KBR, Inc., Beavercreek, OH*
[3]*University of Illinois, Urbana, IL*

4:30 PM **12.3 Characterization of a Novel Thermal Interface Material based on Nanoparticles for High Power Device Package Assembly**
Zeina Abdallah[1], James W. Pomeroy[1,2], Nicolas Blasakis[3], Athanasios Baltopoulos[3], Antonios Vavouliotis[3], and Martin Kuball[1,2]
[1]*University of Bristol, Bristol, UK*
[2]*TherMap Solutions, Bristol, UK*
[3]*Adamant Composite Ltd., Platani-Patras, Greece*

4:50 PM *Student Presentation*
12.4 Analysis of the effects of Gamma-ray irradiation on 1.2 kV SiC MOSFETs
Chaeyun Kim[1], Hyowon Yoon[1], Yeongeun Park[1], Gwangjae Kim[1], Gyuhyeok Kang[1], Dong-Seok Kim[2] and Ogyun Seok[1]
[1]*Kumoh National Institute of Technology, Gyeongsangbuk-do, South Korea*
[2]*Korea Atomic Energy Research Institute, Daejeon, South Korea*

5:10 PM *Student Presentation*
12.5 Short-circuit failure mechanisms of 1.2 kV 4H-SiC MOSFETs under different drain
Dongyoung Kim and Woongje Sung
State University of New York Polytechnic Institute, Albany, NY

Thursday, May 18th

SESSION 13: PLENARY III

Chairs: Michael Krames, *Arkesso*
David Meyer, *AFRL*

8:00 AM *Plenary Presentation*
13.1 Enabling the Next Generation of Optical Devices through Fundamental Materials Engineering
Rodney Pelzel
IQE, Cardiff, Wales, UK

8:45 AM *Invited Presentation*
13.2 From Deep UV to Far UV Optoelectronics: Fundamental Issues, Opportunities, and Applications
M. Wraback, G.S. Rupper, C.R. Haughn, J. Smith, S. Kelley, J. Schuster, F. Nouketcha, G.A. Garrett, and A.V. Sampath
Army Research Laboratory, Adelphi, MD

9:15 AM **13.3 The Dawn of The InP Market in Consumer Applications**
A. Jaffal, P. Chiu, M. Vallo, E. Dogmus, C. Troadec
Yole Intelligence, Villeurbanne, France

9:35 AM **BREAK**

SESSION 14: Optoelectronics
Chairs: Paul Pinsukanjana, *Intelliepi*
Travis Abshere, *nLight*

10:00 AM *Invited Presentation*
14.1 Colloidal Quantum Dot Image Sensor Technology
J. S. Steckel[1], J. Arnaud[1], A. G. Pattantyus-Abraham[2], E. Josse[1], M. Bidaud[1], M. Sarmiento[2], A. Arnaud[1], H. Wehbe-Alause[1], K. Rochereau[1]
[1]*STMicroelectronics, France,* [2]*STMicroelectronics, CA, USA*

10:30 AM **14.2 Assessment of 1.3-µm InAs QD Edge-Emitting Lasers Grown on Large Area GaAs Substrates**
S. Gillgrass[1], C.P. Allford[1], M. Debnath[2], A. Clark[2], P.M. Smowton[1]
[1]*Cardiff University, Cardiff, UK*
[2]*IQE plc, Greensboro, NC*

10:50 AM **14.3 Silicon Anti-Phase Optical Coatings for High-Power, Single-Mode Operation in Vertical-Cavity Surface-Emitting Lasers**
Kevin Pikul, Leah Espenhahn, Patrick Su, Mark Kraman, John M. Dallesasse
University of Illinois at Urbana-Champaign, Urbana, IL

11:10 AM *Student Presentation*
14.4 Develop Single-Mode VCSEL for extending High Speed PAM4 Transmission in SMF-28 Fiber Distance up to 1 km and 70 °C
Haonan Wu[1], Dufei Wu[1], Xin Yu[2] and Milton Feng[1]
[1]*University of Illinois at Urbana-Champaign, Urbana, IL*
[2]*Foxconn-Interconnect-Technology (FIT) U.S. Research and Development Center at Urbana-Champaign, IL*

11:30 AM *Student Presentation*
14.4 Reliability assessment of HTOL stressed VCSELs with camera-based beam profilers
Hao-Tien Cheng, Taixian Zhang, Yun-Cheng Yang, Te-Hua Liu, Chao-Hsin Wu
National Taiwan University, Taipei, Taiwan

SESSION 15: Wide Bandage Materials and Epitaxy
Chairs: Yohei Otoki, *SCIOCS*

Winston Parker, *Wolfspeed*

10:00 AM *Invited Presentation*
15.1 A review of current development trends in the semiconductor industry and measures of Japanese manufacturers
Riyako Namiki
Orbray Co., Ltd., Tokyo, Japan

10:30 AM *Student Presentation*
15.2 Selective Area Growth of β-Ga_2O_3
Arpit Nandi, Indraneel Sanyal, and Martin Kuball
University of Bristol, Bristol, UK

10:50 AM *Student Presentation*
15.3 Characterization of Nitridated Ga_2O_3 for GaN-on-Ga_2O_3 Power Device Applications
Matthew M. Landi[1], Frank P. Kelly[1], Riley E. Vesto[1], Marko J. Tadjer[2], Karl D. Hobart[2], Kyekyoon Kim[1]
[1]*University of Illinois at Urbana Champaign, Urbana, IL*
[2]*U.S. Naval Research Laboratory, Washington, DC*

11:10 AM **15.4 Noncontact Measurement of Doping with Enhanced Throughput and High Precision for Wide Bandgap Wafer Manufacturing**
M. Wilson[1], C. Almeida[1], I. Shekerov[1], B. Schrayer[1], A. Savtchouk[1], B. Wilson[2] and J. Lagowski[1]
[1]*Semilab SDI, Tampa, FL*
[2]*University of South Florida, Tampa, FL*

11:30 AM **15.5 Scalable Selective Area Doping for Manufacturing of Planar Vertical Power GaN Devices**
Alan G. Jacobs[1], Boris N. Feigelson[1], Jennifer K. Hite[1], Joseph A. Spencer[1,2], Prakash Pandey[3], Daniel G. Georgiev[3], Raghav Khanna[3], Marko J. Tadjer[1], Karl D. Hobart[1], Travis J. Anderson[1]
[1]*U.S. Naval Research Laboratory, Washington, DC*
[2]*Virginia Tech, Blacksburg, VA,* [3]*University of Toledo, Toledo, OH*

11:50 AM **CS MANTECH LUNCHEON**

SESSION 16: Light Emitting Diodes
Chairs: Sarang Kulkarni, *Skyworks*
Michael Krames, *Arkesso*

1:00 PM *Invited Presentation*
16.1 Technical and Manufacturing Challenges in MicroLED Processes
Hee Jin Kim
Lumileds LLC, San Jose, CA

1:30 PM *Invited Presentation*
16.2 Manufacturing MicroLED Display by PixeLED Solution
Yun-Li Li and Ying-Tsang Liu
PlayNitride Inc., Hsinchu, Taiwan

2:00 PM *Student Presentation*
16.3 Design and Performance of P-side down Green Tunnel-Junction LEDs
Sheikh Ifatur Rahman[1], Robert Armitage[2] and Siddharth Rajan[1]
[1]*The Ohio State University, Columbus, OH,*
[2]*Lumileds LLC, San Jose, CA*

2:20 PM *Student Presentation*
16.4 1.55 µm DFB Laser with ns-level pulses for LiDAR
Te-Hua Liu,Hong-Ye Lin, Hao-Tien Cheng, and Chao-Hsin Wu
National Taiwan University, Taipei, Taiwan

SESSION 17: III-V Epitaxy and Materials
Chairs: Andy Souzis. *Coherent*
Kevin Stevens, *IQE*

1:00 PM **17.1 Large diameter epi-ready InP on Si (InPOSi) substrates**
Bruno Ghyselen[1], François-Xavier Darras[1], Odile Mourey[1], Christelle Navone[2], Loic Sanchez[2], Christine Di Nardo[2], Carla Crobu[2], Laura Toselli[2], Baptiste Rousset[2], Jérôme Dechamp[2], Frédéric Milesi[2], Laurence Gabette[2], Frank Fournel[2], Jean Decobert[3], Claire Besançon[3], Mickael Martin[2], Jeremy Moeyaert[2], Thierry Baron[2]
[1]*SOITEC, Bernin, France*
[2]*Univ. Grenoble Alpes, Grenoble, France*
[3]*III-V Lab, Palaiseau Cedex, France*

1:20 PM **17.2 Development of Laser Diode Grade Si-doped 8-inch GaAs Substrates**
K. Shibata[1], F. Adachi[1], K. Aoyama1, K. Hashio[1], S. Fujita[1,2], Y. Hagi[1,2] and T. Morishita[1,2]

[1]*Sumiden Semiconductor Materials Co., Ltd., Hyogo, Japan*
[2]*Sumitomo Electric Industries, Ltd., Hyogo, Japan*

1:40 PM **17.3 MOCVD 8-inch GaAs HBT Manufacture Evaluation**
Tzu-Wei Tseng, Chin-Che Hung, Po-Lun Tseng, Ming-Zheng Hsu
Win Semiconductors Corp., Taoyuan City, Taiwan

2:00 PM **17.4 Dynamic Hydride Vapor Phase Epitaxy as a route to high-throughput manufacturing of III-V materials and devices**
A.J. Ptak[1], J.T. Boyer[1], A.K. Braun[2], A. Perna[2], K.L. Schulte[1], and J. Simon[1]
[1]*National Renewable Energy Laboratory, Golden, CO*
[2]*Colorado School of Mines, Golden, CO*

2:20 PM **17.5 Morphology Control of Growth by Hydride Vapor Phase Epitaxy on Faceted GaAs Substrates Produced by Controlled Spalling for Low Cost III-V Devices**
Anna K. Braun[1], Jacob T. Boyer[2], William E. McMahon[2], Kevin L. Schulte[2], John Simon[2], Corinne E. Packard[1,2], and Aaron J. Ptak[2]
[1]*Colorado School of Mines, Golden, CO*
[2]*National Renewable Energy Laboratory, Golden, CO*

SESSION 18: POSTER SESSION

Chairs: Steve Mahon
Patrick Holly, *Northrop Grumman*
Sarang Kulkarni, *Skyworks*
Shawn Burnham, *DCS Corp*
Marty Brophy

2:40 PM **18.1 Photonic Debonding for Wafer-Level Packaging**
Vikram Turkani, Vahid Akhavan, Ian Rawson, Kurt Schroder, Luke Prenger, Xavier Martinez
PulseForge, Inc. and Brewer Science, Inc., Austin, TX

18.2 Ge substrates for photonics applications – GaAs replacement advantages and new device possibilities.

Ivan Zyulkov, Charlotte Vets, Guillaume Courtois, Johannes Vanpaemel, Bendix De Meulemeester, Kristof Dessein
Umicore Electro-Optic Materials, Olen, Belgium

18.3 Photoresist Softbake Oven Qualification
Nitin Kalra, James Mortellaro, James Martel, Xiaoping Yang
BAE Systems Inc., Nashua, NH

18.4 Temperature Independence of Dynamic Switching in 2.5 A /2.7 kV NiO/β-Ga_2O_3 High Power Rectifiers
Jian-Sian Li[1], Chao-Ching Chiang[1], Xinyi Xia[1], Cheng-Tse Tsai[2], Fan Ren[1], Yu-Te Liao[2] and S.J. Pearton[1]
[1]*University of Florida, Gainesville, FL*
[2]*National Yang Ming Chiao Tung University, Hsinchu, Taiwan*

18.5 Student Presentation
Characterisation Techniques for On-Wafer Testing of VCSELs in Volume Manufacture
J. Baker[1], C. Hentschel[1], C. P. Allford[1], S. Gillgrass[1], J. Iwan Davies[2], S. Shutts[1], P. M. Smowton[1]
[1]*Cardiff University, Cardiff, UK*
[2]*IQE plc, Cardiff, UK*

18.6 Lateral Range and Diffusion Simulation Capabilities for Ion Implantation in Compound Semiconductors
J.A. Turcaud
COHERENT - INNOViON, San Jose, CA

18.7 The Application of High-Volume Manufacturing Heterogeneous Packaging Technology to Simplify Highly Complex Systems
Dylan Robertson, Bong Rosario, Md Hasnine, George Kent, Neftali Salazar and Scott Morris
Qorvo Inc., Richardson, TX

18.8 Manufacturable processes and performance characteristics for few-layer hexagonal boron nitride based templates on sapphire
Tim Vogt, Vitali Soukhoveev, Fikadu Alema, and Andrei Osinsky
Agnitron Technology, Inc., Chanhassen, MN

18.9 Student Presentation
Determining the impact of facet roughness

on etched facet InP laser devices operating at telecom wavelengths, making comparisons to theoretical models
Tristan T. Burman[1], Jash Patel[2], Huma Ashraf[2], Tarran Grange[2], Samuel Shutts[1], Peter M. Smowton[1]
[1]*Cardiff University, Cardiff, UK,* [2]*KLA (SPTS Division), Newport, UK*

18.10 3-D Derived Structure Electromagnetic Simulation for Enhancement Mode Low Noise pHEMT Technology
Kuan-Hua Chen,Shih-Wei Chen, Chi-Ming Lin, Jia-Shyan Wu, Fan-Hsiu Huang, Chi-Hsiang Kuo, Cheng-Kuo Lin
WIN Semiconductors Corp., Taoyuan City, Taiwan

18.11 RF and Power Characteristics of AlGaN/AlN/GaN HEMTs on Mn-Doped Free-standing GaN substrate
Chien-Hsian Chao, Hsien-Chin Chiu, Hsiang-Chun Wang, Chong Rong Haung
Chang Gung University, Taoyuan City, Taiwan

18.12 Threshold Ion Energies and Cleaning of Etch Residues During Inductively Coupled Etching of NiO/Ga_2O_3 in BCl_3
Chao-Ching Chiang, Xinyi Xia, Jian-Sian Li, Fan Ren, and S.J. Pearton
University of Florida, Gainesville, FL

18.13 Student Presentation
Analytical model for the source resistance in advanced $In_xGa_{1-x}As/In_{0.52}Al_{0.48}As$ quantum-well high-electron-mobility transistors
Ji-Hoon Yoo[1], In-Geun Lee[1], Jae-Hak Lee[1], Yong-Hyun Kim[2], Sang-Kuk Kim[2], Jacob Yun[2], Ted Kim[2] and Dae-Hyun Kim[1]
[1]*Kyungpook National University, Daegu, South Korea*
[2]*QSI, Cheon-An, South Korea*

18.14 Student Presentation
Design and optimization of 1.2 kV SiC trench MOSFET using tilted ion implantation process for high breakdown voltage
Yeongeun Park, Hyowon Yoon, Chaeyun Kim, Gwangjae Kim, Gyuhyeok Kang, Ogyun Seok
Kumoh National Institute of Technology, Gyeongsangbuk-do, South Korea

18.15 Student Presentation
A new methodology to extract saturation velocity of $In_xGa_{1-x}As$ QW HEMTs
Hyo-Jin Kim[1], Ji-Hoon Yoo[1], Wan-Soo Park[1], Hyeon-Bhin Jo[1], In-Geun Lee[1], Tae-Woo Kim[2], Sang-Kuk Kim[3], Yong-Hyun Kim[3], Jacob Yun[3], Ted Kim[3], Takuya Tsutsumi[4], Hiroki Sugiyama[4], Hideaki Matsuzaki[4], Jae-Hak Lee[1] and Dae-Hyun Kim[1]
[1]*Kyungpook National University, Daegu, South Korea*
[2]*University of Ulsan, Nam-gu, Ulsan, South Korea*
[3]*QSI, Cheon-An, South Korea*
[4]*NTT Corporation, Japan*

18.16 Characterization of Optically Modulated Semi-Insulating GaN Photoconductive Semiconductor Switches
Geoffrey M. Foster[1], Andrew Koehler[2], Karl Hobart[2], Sadab Mahmud[3], Samuel Atwimah[3], Raghav Khanna[3], and Travis Anderson[2]
[1]*Jacobs Inc., Washington, DC*
[2]*U.S. Naval Research Laboratory, Washington, DC*
[3]*University of Toledo, Toledo, OH*

18.17 Electrical and Thermal Performance Analysis of AlGaN/GaN HEMT without Voltage Blocking Buffer Layer Design
Chong Rong Huang[1], Hsien-Chin Chiu[1], Chia-Hao Liu[1], Hsiang-Chun Wang[1], Chao-Wei Chiu[1], Hsuan-Ling Kao[1], Chih-Tien Chen[2] and Kuo-Jen Chang[2]
[1]*Chang Gung University, Taoyuan, Taiwan*
[2]*National Chung-Shan Institute of Science and Technology, Taoyuan, Taiwan*

CONFERENCE CLOSING

4:00 PM **Outlook for Quantum Computing with Superconducting Qubits and their Supporting Architecture**
Nicholas Brown, *IBM Quantum, Yorktown Heights, NY*

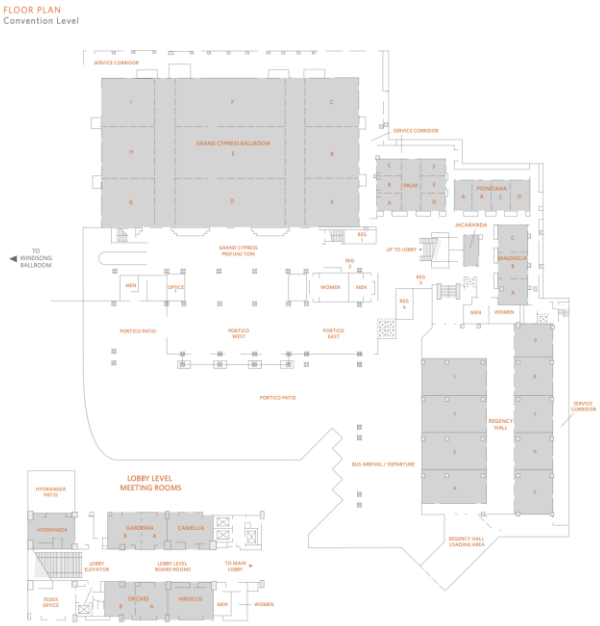
4:50 PM **Closing Reception**
Martin Kuball, *University of Bristol Conference Chair*

HOTEL INFORMATION

The 2023 conference will be located at the Hyatt Regency Grand Cypress, next to Disney Springs in Orlando, Florida Monday, May 15th to Thursday, May 18th, 2023. The hotel is easily accessible from Orlando International Airport (18 miles) or from Tampa Airport (77 miles).

Hyatt Regency Grand Cypress Resort offers self parking for guests and visitors in Lot #5. Handicap parking is available at the front entrance of the hotel. Additionally, Universal Electric Vehicle Charging Stations are available at the front entrance of the hotel. Oversized vehicles, including RVs and vans, may be self-parked in remote lot #7.

Uber and Lyft pickup and drop off are located right outside the hotel front door.



Hotel Floor Plan:

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