



ASME[®] 2019 InterPACK[®]

International Technical Conference on
Packaging and Integration of Electronic and
Photonic Microsystems Conference

CONFERENCE
October 7–9, 2019

Hilton Anaheim
Anaheim, California

Program

www.asme.org/events/interpack



SREEKANT NARUMANCHI
GENERAL CONFERENCE CHAIR



XIAOBING LUO
*GENERAL CONFERENCE
VICE-CHAIR*



SAMUEL GRAHAM
*GENERAL CONFERENCE
VICE-CHAIR*

WELCOME LETTER

On behalf of the ASME Electronic and Photonic Packaging Division (EPPD), welcome to the 2019 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK) being held at the Hilton Anaheim in Anaheim, CA, from October 7–9, 2019.

The InterPACK Conference is ASME EPPD's flagship conference and has a long history of providing a forum to disseminate and share information on cutting-edge research in the areas of packaging and reliability of electronic devices, components, and systems for researchers in Academia, Government, and Industry, and the 2019 meeting will continue with that tradition. The organizers have developed a comprehensive technical program, with nearly 230 technical papers and presentations, close to 100 posters, as well as tutorials, panels, workshops, and keynotes aligned with the areas of heterogeneous integration, servers of the future, edge and cloud computing, internet of things, flexible and wearable electronics, photonics and optics, power electronics, energy conversion and storage, and autonomous, hybrid and electric vehicles. The conference program is set up to promote networking between the attendees, offering opportunities to foster collaboration.

We are pleased to announce that we have six keynote presentations from distinguished experts in the areas of electronic and photonic packaging, including “High Speed, High Bandwidth Density, High Efficiency Optical Interconnects” by John Bowers from the University of California Santa Barbara, “Advanced Packaging for Heterogeneous Integration” by Ravi Mahajan from Intel, “Wired and Wireless Charging: Status, Challenges and Opportunities” by Burak Ozpineci from the Oak Ridge National Laboratory, “Soft Electronic and Microfluidic Systems for the Skin” by John Rogers from the Northwestern University, “Sustainability of Commercial Printers” by Masumi Sato from the Ricoh Company, and “Building Trust in AI Systems” by Mohak Shah from LG Electronics. This year, we also formed and promoted new Tracks on Photonics and Optics, as well as the Internet of Things. The area of photonics and optics packaging is developing fast and fully aligned with the mandate of the ASME EPPD and InterPACK. We are pleased to offer new workshops – the Robotics, Self-Driving Cars, and Artificial Intelligence Workshop (thanks to volunteers from Intel Corporation) and comprehensive Professional Development Workshops, comprising multiple sessions focusing on aspects such as career planning, intellectual property, entrepreneurship, and networking. We sincerely thank the ASME Design, Materials, and Manufacturing (DMM) Segment Leadership Team for supporting the workshops with the TEC Development Funds.

We hope that you will enjoy the exciting program that has been organized for you by numerous volunteers, including track chairs, session chairs, workshop and tutorial organizers, panel moderators, and technical paper reviewers. We thank them as well as the staff at ASME for the many hours put into making this a high-quality conference and look forward to enjoying the outcome of their hard work. We also thank all our sponsors across the globe for their generous support as well as participation.

We wish you the very best as you attend InterPACK 2019!

Sreekant Narumanchi
General Conference Chair

Ankur Jain
Conference Program Chair

Xiaobing Luo
General Conference Vice-Chair

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CONFERENCE PROGRAM CO-CHAIR

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Schedule-at-a-Glance

SUNDAY, OCTOBER 6

TIME	SESSION #	EVENT	ROOM
7:00PM–9:00PM		InterPACK Leadership Dinner (By Invitation)	

MONDAY, OCTOBER 7

TIME	SESSION #	EVENT	ROOM
7:00AM–7:45AM		Authors' Breakfast	Pacific Ballroom C
8:00AM–9:30AM		TECHNICAL SESSIONS	
	1-7	Design and Characterization II	Huntington A
	2-1	Data Center Cooling I	Huntington B
	5-1	DUV-LED I	Huntington C
	6-1	Wide Bandgap Materials, Devices, and Circuits	Palos Verdes A
	8-2	Electric/Hybrid Cars	Palos Verdes B
	11-1	Suhir Tutorial	El Capitan A
9:30AM–10:30AM	12-1	Keynote: Masumi Sato: Sustainability of Commercial Printers	Pacific Ballroom A
9:30AM–10:30AM	12-4	Keynote: John Rogers: Soft Electronic and Microfluidic Systems for the Skin	Pacific Ballroom B
10:30AM–10:45AM		Tea/Coffee Break	Pacific Ballroom Foyer
10:45AM–12:15PM		TECHNICAL SESSIONS	
	1-3	Microfabrication	Huntington A
	2-2	Two Phase Cooling I	Huntington B
	5-2	DUV-LED II	Huntington C
	6-2	Ultra-Wide Bandgap Gallium Oxide Electronics	Palos Verdes A
	7-9	Challenges and Opportunities in Thermal Management of Components and Systems	Palos Verdes B
	8-4	Material Modeling for Automotive Packaging I	Redondo
12:15PM–1:45PM	12-8	Lunch / InterPACK Achievement Award	Pacific Ballroom C
1:45PM–3:15PM		TECHNICAL SESSIONS	
	1-4	Fundamentals of Thermal Transport	Huntington A
	2-3	Two Phase Cooling II	Huntington B
	5-3	Integrated Photonics and Wide Bandgap Photonics	Huntington C
	6-3	Device Thermal Management and Reliability	Palos Verdes A
	8-6	Prognostics and Health Management of Automotive Electronics	Palos Verdes B
	13-5	Track 2 Panel	Malibu
3:15PM–3:30PM		Tea/Coffee Break	Pacific Ballroom Foyer
3:30PM–5:00PM		TECHNICAL SESSIONS	
	1-5	Design and Characterization I	Huntington A
	2-4	Fundamental Cooling Technologies	Huntington B
	5-4	Nanostructure/Flexible Materials & Devices	Huntington C
	6-7	Two-Phase Cooling	Palos Verdes B
	7-4	Solid-State Cooling	Palos Verdes A
3:30PM–6:30PM		WORKSHOPS	
3:30PM–6:30PM	10-7	Heterogeneous Integration Roadmap (HIR) Workshop	Malibu
5:00PM–6:30PM	10-2	Professional Development Workshop on Entrepreneurship	El Capitan A
5:00PM–6:30PM	10-3	Professional Development Workshops on IP	El Capitan B
6:30PM–8:30PM		Poster Session	Laguna
6:30PM–7:30PM	14-1	K-16 Committee Meeting	Malibu
7:30PM–8:30PM	14-2	Electronic and Photonic Packaging Division (EPPD) Executive Committee Meeting	Malibu

TUESDAY, OCTOBER 8

TIME	SESSION #	EVENT	ROOM
7:00AM–7:45AM		Authors' Breakfast	Pacific Ballroom C
8:00AM–9:30AM		TECHNICAL SESSIONS	
	2-5	Data Center Cooling II	Huntington A
	4-1	Design & Modeling for Flexible Electronics	Huntington B
	5-5	Visible LED and its Applications	Huntington C
	6-6	Power Electronics Packaging Reliability	Palos Verdes A
	7-2	Thermal Management Optimization Strategies	Palos Verdes B
	11-2	Jain and Mukherjee Tutorial	El Capitan A
9:30AM–10:30AM	12-2	Keynote: Burak Ozpineci: Wired and Wireless Charging: Status, Challenges and Opportunities	Pacific Ballroom A
9:30AM–10:30AM	12-6	Keynote: Mohak Shah: Building Trust in AI Systems	Pacific Ballroom B
10:30AM–10:45AM		Tea/Coffee Break	Pacific Ballroom Foyer
10:45AM–12:15PM		TECHNICAL SESSIONS	
	2-6	Immersion Cooling I	Huntington A
	4-6	FHE Design & Modeling Demonstrations	Huntington B
	5-6	LED, OLED and Photo Devices	Huntington C
	6-4	Metrology Techniques	Palos Verdes A
	7-3	Phase-Change Cooling	Palos Verdes B
	13-2	Track 7 Panel	Santa Monica
	11-4	Luo Tutorial	El Capitan A
12:15PM–1:45PM	12-7	Lunch / Allan Kraus Award	Pacific Ballroom C
1:45PM–3:15PM		TECHNICAL SESSIONS	
	1-6	Microsystems Packaging	Huntington A
	5-7	Organic Materials and Devices	Huntington B
	6-8	Microchannel Heat Sinks	Huntington C
	7-1	Batteries, Supercapacitors, and Solar Cells I	Palos Verdes A
	8-5	Material Modeling for Automotive Packaging II	Palos Verdes B
	13-3	Women in Engineering	Malibu
	13-7	Track 4 Panel	Santa Monica
3:15PM–3:30PM		Tea/Coffee Break	Pacific Ballroom Foyer
3:30PM–5:00PM		TECHNICAL SESSIONS	
	5-8	Packaging and Thermal Management I	Huntington A
	6-9	Phase Change Materials	Huntington B
	6-10	Thermal Interface Materials	Huntington C
	7-6	Batteries, Supercapacitors, and Solar Cells III	Palos Verdes A
	13-1	Track 1 Panel	Malibu
	13-4	Track 8 Panel	Santa Monica
5:00PM–6:30PM		WORKSHOPS	
	10-1	Introduction to Robotics, Self-Driving Cars, and AI Workshop	Avila A
	10-4	Professional Development Workshop on Communication	El Capitan B
	10-5	K-16 Professional Development Workshop on Mentoring	El Capitan A
6:30PM–7:30PM	14-3	InterPACK Meeting (Open)	Malibu
7:30PM–8:00PM	14-4	InterPACK Meeting (Advisory)	Santa Monica
8:00PM–8:30PM	14-5	Journal of Electronic Packaging (JEP)	Malibu

Schedule-at-a-Glance

WEDNESDAY, OCTOBER 9

TIME	SESSION #	EVENT	ROOM
7:00AM–7:45AM		Authors' Breakfast	Pacific Ballroom C
8:00AM–9:30AM		TECHNICAL SESSIONS	
	1-2	Thermal Management Applications I	Huntington A
	4-3	Flexible Electronics Packaging & Assembly	Huntington B
	5-9	Packaging and Thermal Management II	Huntington C
	6-5	High-Temperature Electronics Packaging	Palos Verdes B
	6-11	System-Level Thermal Design I	Palos Verdes A
	11-3	Boteler Tutorial	El Capitan A
9:30AM–10:30AM	12-5	Keynote: Ravi Mahajan: Advanced Packaging for Heterogeneous Integration + Ceremony in Honor of Nasser Grayeli	Pacific Ballroom B
9:30AM–10:30AM	12-3	Keynote: John Bowers: High Speed, High Bandwidth Density, High Efficiency Optical Interconnects	Pacific Ballroom A
10:30AM–10:45AM		Tea/Coffee Break	Pacific Ballroom Foyer
10:45AM–12:15PM		TECHNICAL SESSIONS	
	1-8	Thermal Management Applications II	Huntington A
	4-4	Interconnect Reliability in Flexible Systems	Huntington B
	6-12	System-Level Thermal Design II	Huntington C
	7-7	Thermal Characterization	Palos Verdes A
	8-1	ECU-Level Reliability	Palos Verdes B
	13-6	Track 6 Panel	Santa Monica
12:15PM–1:45PM	12-9	Lunch / InterPACK and Nasser Grayeli Poster, EPPD, and JEP Awards	Pacific Ballroom C
1:45PM–3:15PM		TECHNICAL SESSIONS	
	2-7	Immersion Cooling II	Palos Verdes B
	3-1	IoT Applications	Huntington A
	4-5	Process Development and Characterization of Flexible Systems	Huntington B
	6-13	System Integration	Huntington C
	7-8	Thermal Switches and Thermal Metamaterials	Palos Verdes A
3:15PM–3:30PM		Tea/Coffee Break	Pacific Ballroom Foyer
3:30PM–5:00PM		TECHNICAL SESSIONS	
	4-2	Microfluidics for Flexible Electronics	Huntington B
	6-14	Additive Manufacturing	Huntington C
	6-15	Emerging Technologies	Palos Verdes A
	7-10	Batteries, Supercapacitors, and Solar Cells II	Palos Verdes B
	8-7	Reliability of Electronic Components for Harsh Environment	Redondo

PANELS

Women in Engineering
Track 1: Progressing or Not Progressing During Two Years of HIR
Track 2: System / Data Center Liquid Cooling
Track 4: Application Challenges in Flexible and Wearable Electronics
Track 6: Transient Thermal Management – Considering Thermal Capacitance and Not Just Thermal Resistance
Track 7: Extreme Fast Charging of Lithium-Ion Batteries
Track 8: Reliability in the Age of AI: Opportunities and Challenges

TUTORIALS

Ephraim Suhir: Failure-Oriented-Accelerated-Testing (FOAT) vs. Highly-Accelerated-Life-Testing (HALT) in Making a Viable Electron Device/Package Into a Reliable Product
Ankur Jain and Ankit Verma: Thermo-Electrochemical Coupling and Interactions in Li-Ion Cells
Lauren Boteler: Army Research Laboratory ParaPower Tutorial
Fang Luo: A Review of Advanced Power Module Packaging and Thermal Management in WBG Era

TRACK 1: HETEROGENEOUS INTEGRATION

1-2: THERMAL MANAGEMENT APPLICATIONS I

1-3: MICROFABRICATION

1-4: FUNDAMENTALS OF THERMAL TRANSPORT

1-5: DESIGN AND CHARACTERIZATION I

1-6: MICROSYSTEMS PACKAGING

1-7: DESIGN AND CHARACTERIZATION II

1-8: THERMAL MANAGEMENT APPLICATIONS II

TRACK 2: SERVERS OF THE FUTURE, EDGE AND CLOUD COMPUTING

2-1: DATA CENTER COOLING I

2-2: TWO PHASE COOLING I

2-3: TWO PHASE COOLING II

2-4: FUNDAMENTAL COOLING TECHNOLOGIES

2-5: DATA CENTER COOLING II

2-6: IMMERSION COOLING I

2-7: IMMERSION COOLING II

TRACK 3: INTERNET OF THINGS

3-1: IOT APPLICATIONS

TRACK 4: FLEXIBLE AND WEARABLE ELECTRONICS

4-1: DESIGN & MODELING FOR FLEXIBLE ELECTRONICS

4-2: MICROFLUIDICS FOR FLEXIBLE ELECTRONICS

4-3: FLEXIBLE ELECTRONICS PACKAGING & ASSEMBLY

4-4: INTERCONNECT RELIABILITY IN FLEXIBLE SYSTEMS

4-5: PROCESS DEVELOPMENT AND CHARACTERIZATION OF FLEXIBLE SYSTEMS

4-6: FHE DESIGN & MODELING DEMONSTRATIONS

TRACK 5: PHOTONICS AND OPTICS

5-1: DUV-LED I

5-2: DUV-LED II

5-3: INTEGRATED PHOTONICS AND WIDE BANDGAP PHOTONICS

5-4: NANOSTRUCTURE/FLEXIBLE MATERIALS & DEVICES

5-5: VISIBLE LED AND ITS APPLICATION

5-6: LED & OLED & PHOTO DEVICE

5-7: ORGANIC MATERIALS AND DEVICES

5-8: PACKAGING AND THERMAL MANAGEMENT I

5-9: PACKAGING AND THERMAL MANAGEMENT II

TRACK 6: POWER ELECTRONICS

6-1: WIDE BANDGAP MATERIALS, DEVICES, AND CIRCUITS

6-2: ULTRA-WIDE BANDGAP GALLIUM OXIDE ELECTRONICS

6-3: DEVICE THERMAL MANAGEMENT AND RELIABILITY

6-4: METROLOGY TECHNIQUES

6-5: HIGH-TEMPERATURE ELECTRONICS PACKAGING

6-6: POWER ELECTRONICS PACKAGING RELIABILITY

6-7: TWO-PHASE COOLING

6-8: MICROCHANNEL HEAT SINKS

6-9: PHASE CHANGE MATERIALS

6-10: THERMAL INTERFACE MATERIALS

6-11: SYSTEM-LEVEL THERMAL DESIGN I

6-12: SYSTEM-LEVEL THERMAL DESIGN II

6-13: SYSTEM INTEGRATION

6-14: ADDITIVE MANUFACTURING

6-15: EMERGING TECHNOLOGIES

TRACK 7: ENERGY CONVERSION AND STORAGE

7-1: BATTERIES, SUPERCAPACITORS, AND SOLAR CELLS I

7-2: THERMAL MANAGEMENT OPTIMIZATION STRATEGIES

7-3: PHASE-CHANGE COOLING

7-4: SOLID-STATE COOLING

7-6: BATTERIES, SUPERCAPACITORS, AND SOLAR CELLS III

7-7: THERMAL CHARACTERIZATION

7-8: THERMAL SWITCHES AND THERMAL METAMATERIALS

7-9: CHALLENGES AND OPPORTUNITIES IN THERMAL MANAGEMENT OF COMPONENTS AND SYSTEMS

7-10: BATTERIES, SUPERCAPACITORS, AND SOLAR CELLS II

TRACK 8: AUTONOMOUS, HYBRID, AND ELECTRIC VEHICLES

8-1: ECU-LEVEL RELIABILITY

8-2: ELECTRIC/HYBRID CARS

8-4: MATERIAL MODELING FOR AUTOMOTIVE PACKAGING I

8-5: MATERIAL MODELING FOR AUTOMOTIVE PACKAGING II

8-6: PROGNOSTICS AND HEALTH MANAGEMENT OF AUTOMOTIVE ELECTRONICS

8-7: RELIABILITY OF ELECTRONIC COMPONENTS FOR HARSH ENVIRONMENT

General Information



REGISTRATION HOURS AND LOCATION

Registration will be located at the Pacific Registration desk, Ballroom Level, on the Second Floor of the hotel.

The hours are as follows:

Sunday	
October 6	4:00PM–6:00PM
Monday	
October 7	7:00AM–5:00PM
Tuesday	
October 8	7:00AM–5:00PM
Wednesday	
October 9	7:00AM–4:00PM

Exhibit Hours and Location

Pacific Ballroom Foyer, Ballroom Level, Second Floor

Monday–Wednesday	
October 7–9	7:00AM–5:00PM

AUDIOVISUAL EQUIPMENT IN SESSION ROOMS

All technical sessions rooms are equipped with an LCD projector and screen. Laptops will NOT be provided in the sessions. Presenters MUST arrange to have their presentations transferred to the Session Chairs' laptop/mobile computers.

BADGE REQUIRED FOR ADMISSION

All conference attendees must wear the official ASME 2019 InterPACK badge at all times in order to gain admission to technical sessions, exhibits, and other conference events. Without a badge, you will NOT be allowed to attend any conference activities. Your badge also provides a helpful introduction to other attendees.

CONFERENCE AUTHOR BREAKFASTS

Monday–Wednesday, October 7–9

7:00AM–7:45AM

Pacific Ballroom C, Ballroom Level, Second Floor

Meet your session chairs and fellow presenters each morning prior to your presentation! Look for your session number on the day you present. On the days you are not presenting, non-session specific tables will also be available.

InterPACK ACHIEVEMENT AWARDS LUNCHEON

Monday, October 7

12:15PM–1:45PM

Pacific Ballroom C, Ballroom Level, Second Floor

ALLAN KRAUS THERMAL MANAGEMENT MEDAL AWARD LUNCHEON

Tuesday, October 8

12:15PM–1:45PM

Pacific Ballroom C, Ballroom Level, Second Floor

InterPACK and Nasser Grayeli Poster Awards, Electronic and Photonic Packaging Division (EPPD) and Journal Electronic Packaging (JEP) AWARDS LUNCHEON

Wednesday, October 9

12:15PM–1:45PM

Pacific Ballroom C, Ballroom Level, Second Floor

CONFERENCE NETWORKING BREAKS

Morning and afternoon breaks will be provided in the Pacific Ballroom foyer, located on the Ballroom Level, Second Floor. Join your fellow attendees for a few minutes of networking and discussion. The schedule is as follows:

Monday–Wednesday, October 7–9

10:30AM–10:45AM and 3:15PM–3:30PM

CONFERENCE AWARDS LUNCHEON

The Awards Luncheon will take place on October 7, 8 and 9, from 12:15PM to 1:45PM in Pacific Ballroom C, Ballroom Level, Second Floor to recognize and celebrate a select group of individuals for their contributions and achievements in research and engineering. All meals are included for full conference registrants.

CONFERENCE PROCEEDINGS

Each attendee will be provided with an individual link to the online papers via email. In the event you do not receive the email, send a request to toolboxhelp@asme.org. Access to all of the papers accepted for presentation at the conference will be found online with this link. The official conference archival proceedings will be published after the conference and will not include accepted papers that were not presented at the conference. The official conference proceedings is registered with the Library of Congress and are submitted for abstracting and indexing. The proceedings is published on the ASME Digital Library.

REGISTRANTS WITH DISABILITIES

Whenever possible, we are pleased to make arrangements for registrants with disabilities. Advance notice may be required for certain requests. For on-site assistance, please visit the conference registration area and ask to speak with a conference representative.

ABOUT ANAHEIM, CALIFORNIA – 5 FUN FACTS

Fact 1

Anaheim is located in the far southwest side of the state of California. It is the oldest city in the Orange County, California.

Fact 2

The city was founded by wine makers and grape farmers. After grape crops failed, oranges became the largest crop of the city.

Fact 3

Anaheim literally translates to home by the river. It got its name “Ana” because of its proximity to the Santa Ana River, and “heim” is a German word for “home.”

Fact 4

Prior to the opening of Disneyland in 1955, the city was one large rural community.

Fact 5

Gwen Stefani, the lead singer, songwriter, and front woman of No Doubt, is from Anaheim.

HOTEL

Located across the street from the Anaheim Convention Center, and just one mile from the Disneyland® Resort, the hotel is the perfect choice when visiting sunny Orange County. Inside the hotel, visit the Disney® Desk, where cast members will offer expert advice, provide tickets, and organize a shuttle service to the world-class attractions. Comfortable rooms and suites, fantastic dining, and first-class facilities for business and recreation all combine to ensure you have an unforgettable stay in Anaheim, California.

Hilton Anaheim
777 W Convention Way
Anaheim, CA 92802
Phone Number: 714-750-4321

QUESTIONS ABOUT THE MEETING

If you have any questions or need assistance, an ASME representative will be located at the conference registration area.

Sponsors

It is with great appreciation that we acknowledge this year's sponsors! Their support, generosity, and collaboration allow this conference to maintain its high standards of excellence.

This year we would like to introduce a special sponsorship and would like to thank the family of Nasser Grayeli for their sponsorship and contribution to the newly created "Nasser Grayeli Best Student Poster Awards."

GOLD SPONSORS

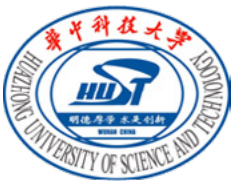


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Alongside a broad portfolio of established technologies, ASE is also delivering innovative advanced packaging and System-in-Package solutions to meet growth momentum across a broad range of end markets. For more about our advances in SiP, WLP, Fan Out, MEMS, Flip Chip, and, 2.5D, 3D & TSV technologies, all ultimately geared towards applications to improve lifestyle and efficiency, please visit: aseglobal.com. To follow ASE on Twitter: [@asegroup_global](https://twitter.com/asegroup_global)

For more information please visit our website:
www.aseglobal.com



HUST

Thermal Packaging Laboratory (TPL) is affiliated to the School of Energy and Power Engineering, Huazhong University of Science and Technology (HUST) in Wuhan city of China. HUST is a top ten university in China. TPL has rich experience in solving thermal and fluid issues in electronics packaging and works on industrial and academic projects which relate to thermal management, manufacturing materials and processes of electronic systems. This lab has designed and commercialized the hydrodynamically levitated micro-pump and liquid cooling garment.

For more information please visit our website:
<http://TPL.energy.hust.edu.cn>



INTEL

Intel invents at the boundaries of technology to make amazing experiences possible for business and society, and for every person on

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For more information please visit the website:

Intel.com/California or <https://www.intel.com/content/www/us/en/corporate-responsibility/intel-in-california.html>



The S3IP

The S3IP, comprising five constituent research centers and two laboratories (available for industry use), brings to bear faculty expertise, applied and fundamental academic research results and capability in electronics packaging. Its staff has decades of industrial experience to solve practical problems for electronics industry partners. An industrial member-driven research portfolio and project base in thermal management, manufacturing materials, failure analysis, reliability improvement, and energy efficiency for electronic systems underpins improvements in the manufacturing of microelectronic products, commercialization of flexible printed electronic technology, development of advanced batteries and energy harvesting devices, and improvements in the energy efficiency of data centers.

For more information please visit our website:
www.binghamton.edu/s3ip/



MICROSANJ

Microsanj is a leading provider of high-resolution transient thermal imaging solutions & services for commercial and research applications. The systems are based on optical thermoreflectance characterization, digital signal processing, and advanced software algorithms to support: electronic and optoelectronic components measurement, thermal design validation of ICs, defects, and failure analysis.

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www.google.com



CALCE

The Center for Advanced Life Cycle Engineering (CALCE), the largest electronic products and systems research center focused on electronics reliability, is dedicated to providing a knowledge and resource base to support the development of competitive electronic components, products and systems.

The Center for Advanced Life Cycle Engineering is recognized as a founder and driving force behind the development and implementation of physics-of-failure (PoF) approaches to reliability, as well as a world leader in accelerated testing, electronic parts selection and management, and supply-chain management. CALCE is at the forefront of international standards development for critical electronic systems, having chaired the development of several reliability and part selection standards. CALCE is staffed by more than 100 faculty, staff, and students and, in 1999, became the first academic research facility in the world to be ISO 9001 certified. Collectively, CALCE researchers have authored over 35 internationally acclaimed textbooks and well over 1000 research publications relevant to electronics reliability. Over the last 15 years, CALCE has invested over \$75 million in developing methodologies, models, and tools that address the design, manufacture, analysis, and management of electronic systems.

For more information please visit our website at:
www.calce.umd.edu



NOVARK

Novark Technologies, Inc. spans three factories and leverages over a decade of experience and expertise in thermal management solutions. Its product lines include various heat pipe, heat sink, and cold plate configurations used in a variety of industries ranging from automotive to LED to CPU cooling to industrial power systems and more. Routine support of academic research at various institutions combines with constant exploration of new thermal management solutions to push the company's capabilities forward every year.

For more information, please visit our website:
<https://www.novarktechnologies.com/>



National Renewable Energy Laboratory

NREL's Advanced Power Electronics & Electric Machines (APEEM) team is comprised of a staff of researchers with expertise in thermal, electrothermal, mechanical, and reliability aspects of power electronics and electric machines for electric-drive vehicles (EDVs) as well as other energy efficiency and renewable energy applications. In collaboration with research and industry partners, NREL's APEEM team is developing novel thermal management technologies to improve performance, cost, and reliability, and reduce the volume/size of power electronics and electric machines. APEEM researchers work in five labs/facilities that feature a wide range of equipment and investigate three primary areas: 1) Electric motor thermal management, 2) Power electronics thermal management, 3) Power electronics packaging reliability and prognostics.

For more information please visit our website:
<https://www.nrel.gov/transportation/peem.html>



INFINEUM

Infineum is one of the world leaders in the formulation, manufacturing and marketing of petroleum additives for lubricants and fuels. Drawing on nearly 80 years' experience and supported by a powerful research and development capability, Infineum is a truly global operation with production facilities worldwide.

Infineum transmission fluid technology is used in more than 70 % of electrified vehicles with proven cooling performance and compatibility with e-motors. Current research is focused on delivering lower viscosity transmission and dielectric cooling fluids with enhanced heat transfer capability for cooling e-motors, power electronics, and batteries.

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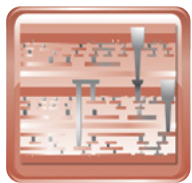
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We would like to acknowledge that Track 2, Servers of the Future, Edge and Cloud Computing: with Papers Honoring Michael Ellsworth for Contributions and Service to ASME InterPACK, the Electronic and Photonic Packaging Division, and Leadership in Liquid Cooling of Server Systems.

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The University of Texas at Arlington is a Carnegie Research Institution (High Research Activity) whose mission is the advancement of knowledge and the pursuit of excellence in research, teaching, and service to the community. The mission statement affirms UT Arlington's commitment to expanding academic research; to attracting and retaining high quality faculty scholars who actively engage students; to providing a well-rounded academic experience that promotes student involvement, service learning, and free discourse; to employing alternative access venues to meet students' needs; and to developing public and private partnerships.

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National Academy of Engineering, the Electronics, MEMS and Nanotechnology Systems Packaging Center is a first class research center that will meet the needs of industry, and in particular, the state of Texas and the North Texas region's "Electronic, MEMS and Nanoelectronics Packaging Industry". This includes research, education and training. EMNSPC will target the needs of the Microelectronics, MEMS and Nanoelectronics (with a special emphasis on thermo-mechanical issues) as a fundamental research area as these technologies have and will continue to overlap. The EMNSPC is a partner in the NSF I/UCRC Center for Energy-Smart Electronic Systems, working with government, industry and academia to develop systematic methodologies for efficiently operating electronic systems.

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The Woodruff School is proud to sponsor ASME InterPACK. We have strong research activities in electronics packaging, thermal management, and reliability. Our faculty are working on new technologies in printed electronics and flexible, Si-based electronics, neuromorphic computing, and wide bandgap power and rf-electronics. We encourage you to visit our website as well as our faculty and students during InterPACK to learn more about our activities

You may find more information on the Woodruff School at:

www.me.gatech.edu

12-1: SUSTAINABILITY OF COMMERCIAL PRINTERS

MONDAY, OCTOBER 7

9:30AM–10:30AM

ROOM: PACIFIC BALLROOM A, BALLROOM LEVEL, SECOND FLOOR

**Masumi Sato**

Corporate Associate Vice President
Deputy General Manager of Commercial Printing
Business Group
Ricoh

Abstract: Ricoh has consistently provided innovative products and services with the fundamental concept of “Ease of Use and Energy Saving.” We offer innovative energy-efficient technologies for business needs. For example, we have worked on developing QSU (Quick Start-Up) technology for office printer to provide customers with energy-saving mode stress-free operation. In this presentation, innovative technologies for commercial and industrial printers will be explained, and future printers that enable individuals to work smarter will be mentioned.

Biography: Masumi Sato received his MA in applied physics from the University of Nagoya and joined Ricoh Company Ltd. in 1989. Since then he has been working in the research and development section at Ricoh. From 2006, he has been engaging in Commercial Printing (CP) and now he is managing both development and business of CP.

12-4: SOFT ELECTRONIC AND MICROFLUIDIC SYSTEMS FOR THE SKIN

MONDAY, OCTOBER 7

9:30AM–10:30AM

ROOM: PACIFIC BALLROOM B, BALLROOM LEVEL, SECOND FLOOR

**John Rogers**

Louis Simpson and Kimberly Querrey
Professor of Materials Science and Engineering
Biomedical Engineering and Medicine at
Northwestern University

Abstract: Recent advances in materials, mechanics and manufacturing establish the foundations for high performance classes of electronics and other microsystems technologies that have physical properties precisely matched to those of the human epidermis. The resulting devices can integrate with the skin in a physically imperceptible fashion, to provide continuous, clinical-quality information on physiological status. This talk summarizes the key ideas and presents specific examples in wireless monitoring for neonatal intensive care, and in capture, storage and biomarker analysis of sweat.

Biography: Professor John A. Rogers is the Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering and Medicine at Northwestern University, with affiliate appointments in Mechanical Engineering, Electrical and Computer Engineering and Chemistry, where he is also Director of the newly endowed Center for Bio-Integrated Electronics. He has published more than 650 papers, is a co-inventor on more than 100 patents, and he has co-founded several successful technology companies. His research has been recognized by many awards, including a MacArthur Fellowship (2009), the Lemelson-MIT Prize (2011), and the Smithsonian Award for American Ingenuity in the Physical Sciences (2013) – and most recently the Benjamin Franklin Medal from the Franklin Institute (2019). He is a member of the National Academy of Engineering, the National Academy of Sciences, the National Academy of Inventors, and the American Academy of Arts and Sciences.

Track Keynotes

12-2: WIRED AND WIRELESS CHARGING: STATUS, CHALLENGES, AND OPPORTUNITIES

TUESDAY, OCTOBER 8

9:30AM–10:30AM

ROOM: PACIFIC BALLROOM A, BALLROOM LEVEL, SECOND FLOOR



Burak Ozpineci

Group Leader

Oak Ridge National Laboratory

Abstract: With the recent demand for faster charging electric vehicles to rival the refill time of conventional vehicles, the interest in high power wired and wireless charging is increasing. While recent industry demonstrations have shown 450 kW wired charging, Oak Ridge National Laboratory (ORNL) has recently demonstrated a 120 kW static wireless charging system using a single power conversion system and a single transmitter/receiver coil pair. Now the focus switches to more than 300 kW wireless charging and dynamic wireless charging. This presentation will talk about current status in wired and wireless charging, the associated challenges with a focus on packaging, and the opportunities in this area.

Biography: Burak Ozpineci received the M.S. and Ph.D. degrees in electrical engineering from the University of Tennessee, Knoxville, TN, in 1998 and 2002, respectively. He joined the Post-Master's Program with the Power Electronics and Electric Machinery Research Center, Oak Ridge National Laboratory (ORNL), Knoxville, TN, in 2001 and became a Full-Time Research and Development Staff Member in 2002 and Group Leader of the Power and Energy Systems Group in 2008. He is currently leading the Power Electronics and Electric Machinery Group and managing the Electric Drive Technologies Program at ORNL. He also serves as a Joint Faculty Associate Professor with The Bredesen Center at The University of Tennessee, Knoxville.

12-6: BUILDING TRUST IN AI SYSTEMS

TUESDAY, OCTOBER 8

9:30AM–10:30AM

ROOM: PACIFIC BALLROOM B, BALLROOM LEVEL, SECOND FLOOR



Mohak Shah

Vice President of AI and Machine Learning

LG Electronics

Abstract: Artificial Intelligence (AI) and data-driven decision-making capabilities are becoming ubiquitous. These algorithms become part of increasingly sophisticated systems that impact not just safety-critical products but also social interactions, discourse, and institutions. It is important that the practitioner community accept and adopt a broader role in ascertaining the behavior of these systems going beyond just algorithm-level evaluation. The implications of these systems need to be well understood - not just as isolated technical components but as part of overall systems, their interaction with the intended users and the environment. While global efforts have been initiated to develop guidelines for AI, ranging from ethics to procurement, they are not yet actionable. This talk will highlight how vulnerabilities can become systemic in AI systems and can have unintended, but serious, consequences. It will also cover how the practitioners can get more involved in understanding the system-level interactions and educate the adoption process to be cognizant of technology's limitations.

Biography: Mohak Shah is a technology leader and technologist with an established history of leading high-impact initiatives in AI, IoT, digital transformation, and building data-driven businesses and strategies. He is deeply passionate about responsible development, introduction, adoption, and integration of AI capabilities in industry and society at large. His experience in leading technology initiatives spans a broad range - including autonomous driving, automotive, aviation, energy, and healthcare. He is leading diverse teams from research, software, and businesses. As a machine learning and AI scientist, Mohak has developed novel technologies with high-impact business applications. He is the author of "Evaluating Learning Algorithms: A Classification Perspective" (Cambridge), and has published more than 45 research articles, in top conferences and journals in the analytics space, and patented technologies. Mohak regularly contributes to the community through participation in scientific panels, organizing committees, review committees, and social impact programs. He was the General Chair of ACM SIGKDD 2016 conference. He also holds an adjunct faculty position with the University of Illinois (Chicago).

12-3: HIGH SPEED, HIGH BANDWIDTH DENSITY, HIGH EFFICIENCY OPTICAL INTERCONNECTS

WEDNESDAY, OCTOBER 9

9:30AM–10:30AM

ROOM: PACIFIC BALLROOM A, BALLROOM LEVEL, SECOND FLOOR

**John Bowers**

Director, Institute of Energy Efficiency
University of California
Santa Barbara, CA

Abstract: Photonics can reduce energy consumption in information processing and communications while simultaneously increasing the interconnect bandwidth density. The energy consumption in data centers is shifting from logic operations to interconnect energies. Without the prospect of substantial reduction in energy per bit communicated, the exponential growth of our use of information is limited. The use of optical interconnects fundamentally addresses both interconnect energy and bandwidth density, and is the only scalable solution to this problem. With the use of photonic integration and fiber optics, and the elimination of electrical line charging dissipation, we can save power by transmitting data from 1 mm to 1 km with the same energy (20 fJ/bit) and simplicity as local electrical wires on chip. A focus of our research is on using quantum dot (QD) lasers and integration on silicon for lower threshold and higher efficiency sources, higher temperature operation, isolator free operation, and superior mode locking capability. A recent example includes a 4.1 Tbps, 60 wavelength, 32 Gbaud PAM-4 transmitter using a single mode locked quantum dot laser.

Biography: John Bowers is Director of the Institute for Energy Efficiency and a professor in the Departments of Electrical and Computer Engineering and Materials at the University of California, Santa Barbara. His research interests are primarily concerned with silicon photonics, optoelectronic devices, optical switching and transparent optical networks and quantum dot lasers. Bowers received the M.S. and Ph.D. degrees from Stanford University and then worked for AT&T Bell Laboratories before joining UCSB. Bowers is a fellow of the IEEE, OSA, and the American Physical Society, and a recipient of the IEEE Photonics Award, OSA/IEEE Tyndall Award, the IEEE LEOS William Streifer Award, and the South Coast Business and Technology Entrepreneur of the Year Award. He is a member of the National Academy of Engineering and the National Academy of Inventors.

12-5: ADVANCED PACKAGING FOR HETEROGENEOUS INTEGRATION + CEREMONY IN HONOR OF NASSER GRAYELI

WEDNESDAY, OCTOBER 9

9:30AM–10:30AM

ROOM: PACIFIC BALLROOM B, BALLROOM LEVEL, SECOND FLOOR

**Ravi Mahajan**

Intel Fellow and Co-director
Pathfinding and Assembly and Packaging
Technologies

Abstract: Heterogeneous Integration (HI) of disparate computing and communications functions is a key performance enabler in micro-electronic systems. HI is crucially enabled by advanced packaging since packages offer compact, power efficient platforms for HI. This talk will describe the role of advanced 2D and 3D packaging in enabling HI and will focus on the evolution of packaging to provide increased interconnect density. Key high-end technologies such as EMIB, the Silicon Interposer, and Foveros will be discussed in this context. The talk will also touch on the evolving future challenges in interconnect density scaling. In addition to interconnect scaling, challenges and opportunities in key areas such as power management, high speed IO, thermal management, and test will be briefly discussed.

Biography: Ravi Mahajan is an Intel Fellow and the Co-director of Pathfinding and Assembly and Packaging technologies for future silicon nodes. Ravi also represents Intel in academia through research advisory boards, conference leadership, and participation in various student initiatives. Ravi has led efforts to define directions for package architecture, technologies, and assembly processes at Intel since 2000, spanning 90 nm, 65 nm, 45 nm, 32 nm, 22 nm, and 7 nm silicon. Earlier in his Intel career, he spent five years as group manager for thermal mechanical tools and analysis. In that role, Ravi oversaw a Thermal-Mechanical Lab chartered with delivering detailed thermal and mechanical characterization of Intel's packaging solutions for current and future processors. A prolific inventor and recognized expert in microelectronics packaging technologies, Ravi holds more than 40 patents, including the original patent for a silicon bridge that became the foundation for Intel's EMIB technology. His early insights also led to high-performance, cost-effective cooling solutions for high-end microprocessors and the proliferation of photo-mechanics techniques used for thermo-mechanical stress model validation. Ravi has written several book chapters and more than 30 papers on topics related to his area of expertise. Ravi joined Intel in 1992 after earning a bachelor's degree from Bombay University, a master's degree from the University of Houston, and a Ph.D. from Lehigh University, all in mechanical engineering. His contributions during his Intel career have earned him numerous industry honors, including the SRC's 2015 Mahboob Khan Outstanding Industry Liaison Award, the 2016 THERMI Award from SEMITHERM, the 2016 Allan Kraus Thermal Management Medal from the ASME and the 2018 InterPACK Achievement award. He has been nominated as an IEEE EPS Distinguished Lecturer. He is one of the founding editors for the Intel Assembly and Test Technology Journal (IATTJ) and currently VP of Publications & Managing Editor-in-Chief of the IEEE Transactions of the CPMT. Additionally, he has been long associated with ASME's InterPACK conference and was Conference Co-Chair of the 2017 Conference. Ravi is a Fellow of two leading societies, ASME, and IEEE. He was named an Intel Fellow in 2017.

Award Luncheon Speakers

INTERPACK ACHIEVEMENT AWARD LUNCHEON SPEAKER 12-8: DEVELOPING RELIABLE MICROSYSTEMS IN THE ERA OF HETEROGENEOUS INTEGRATION

MONDAY, OCTOBER 7

12:15PM–1:45PM

ROOM: PACIFIC BALLROOM C, BALLROOM LEVEL, SECOND FLOOR

The prestigious InterPACK Achievement Award is presented to a single individual once every year at the ASME InterPACK Conference. Awardees have demonstrated excellence and international recognition in research and development related to electronic packaging, as well as service to the technical community at large.



Abhijit Dasgupta

Jeong H. Kim Professor
Center for Advanced Life Cycle Engineering (CALCE)
Mechanical Engineering Department
University of Maryland, College Park

Abstract: Heterogeneous integration (HI) was conceived as a work-around for the semiconductor industry to get beyond the end of the economic and technological scalability of Moore's Law. However, the resulting developments in system-in-package (SiP) multi-scale architectures have also unleashed a powerful collateral multi-physics revolution in the microsystems industry. System developers see HI as the next-generation platform for integrating many diverse functionalities, such as logic, memory, power, photonics, MEMS, energy storage, sensing, and actuation, all into a single package. HI offers the potential to catalyze this convergence of technology and demand and to create a powerful inflexion in multi-functional technologies that will enable the world of intelligent, autonomous systems and Internet of Things (IoT).

Successful development of complex and reliable HI systems requires transformative changes in the ecosystem, to enable truly concurrent integration of heterogeneous development functions, such as design, manufacture, testing, qualification, and life-cycle management. The newly compiled pan-industry Heterogeneous Integration Roadmap (HIR) identifies Reliability as one of the cornerstones of this new domain and cautions that methods and tools for assuring higher performance will have to dovetail concurrently with those for assuring reliability, manufacturability, testability, sustainability, availability, affordability, and resilience. Assurance of these attributes can no longer be sequential tasks if we have to bring such complex products to the marketplace in a timely manner. Methods and algorithms lack sufficient sophistication and will have to be based partly on the underlying fundamental multi-physics principles, and partly on machine-learning methods that exploit the massive availability of big-data.

This presentation will begin with a discussion of the current state of the art in multiscale, multiphysics approaches, and big-data approaches, for developing highly reliable microsystems. Technology gaps, for timely development of complex next-generation HI systems, will be identified and critical shortfalls in current approaches will be discussed. Finally, potential roadmaps for new break-through approaches will be presented.

Biography: Abhijit Dasgupta is Jeong H. Kim Professor of Mechanical Engineering at the University of Maryland (UMD), with research experience in the microscale and nanoscale mechanics and reliability physics of engineered materials used in conventional and additively manufactured 3D flexible electronic packaging and intelligent microsystems. He holds a Ph.D. in Theoretical and Applied Mechanics from the University of Illinois at Urbana-Champaign (UIUC) and has been a principal investigator at the Center for Advanced Life Cycle Engineering (CALCE) at UMD for the past 30 years, conducting research in reliability physics, design for reliability, accelerated stress testing, and real-time health management. He has published over 300 articles and conference papers, served on editorial boards of two international archival journals, presented over 40 workshops and short courses, helped form research and educational roadmaps for the electronics industry, and provided consulting services to numerous industry leaders. He has presented multiple keynote talks at international conferences, received six best-paper awards and received eight major awards in recognition of his research and educational contributions. He is an ASME Fellow, past Chair of the ASME Electronic and Photonic Packaging Division (EPPD), current member of the ASME Design, Manufacturing and Materials Segment Leadership Team (DMM-SLT) and Reliability Topic Lead in the multi-society Heterogeneous Integration Roadmap (HIR) Team.

ALLAN KRAUS THERMAL MANAGEMENT MEDAL LUNCHEON SPEAKER

12-7: WHAT ARE PULSATING HEAT PIPES (PHPs) AND ARE PHPs READY FOR COOLING OF ELECTRONICS?

TUESDAY, OCTOBER 8

12:15PM–1:45PM

ROOM: PACIFIC BALLROOM C, BALLROOM LEVEL, SECOND FLOOR



The Allan Kraus Thermal Management Medal recognizes an individual who has demonstrated outstanding achievements in thermal management of electronic systems and his or her commitment to the field of thermal science and engineering. The nominee for the award should have: Significant contributions in thermal management of electronic systems demonstrated by successful product development, seminal papers, filed patents and/or leadership of research and development programs. The Thermal Management Award was established in 1994 by the Electronic and Photonic Packaging Division and operated as a divisional award until 2009, when it was elevated to a Society Award and renamed the Allan Kraus Thermal Management Medal.



John R. Thome

Professor-Emeritus, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
Technical Director, JJ Cooling Innovation, Lausanne, Switzerland

Abstract: Pulsating heat pipes were first described in the literature about 30 years ago and in recent years have seen a huge interest by the research community. A pulsating heat pipe (PHP) is a long single channel formed into a serpentine path with its evaporator at its hot end (to cool electronics) and its condenser end cooled by air or water. In effect, the two-phase flow created by nucleation, bubble growth and the back-and-forth movement of the liquid slugs and elongated bubbles creates a “pulsating” motion. As such, a PHP operates without any wick, and fluid movement is only due to the pulsations self-created by the flow itself, which stems from the bubble nucleation process and bidirectional growth of confined bubbles in the small channels. Studies show that significant flow rates can be obtained, giving rise to good thermal performance up to potentially moderately high heat fluxes. Working fluids tested in laboratories are usually water, ethanol, dielectric fluids and refrigerants. A PHP can work vertically, inclined, horizontally and in some cases even against gravity. The physical phenomena are quite complex because of the unsteady reversing flow. In the talk today, I will describe some PHP configurations, their experimental thermal performance studies and some flow visualizations of the pulsating flow, then discuss the leading heat transfer mechanisms, and finally describe our 1-dimension PHP transient thermal/hydraulic simulation code (including simulation videos of the pulsating flow) to try to give a “flavor” of how PHPs actually work. The objective today is to stimulate discussion about the pros and cons of industrial application of PHPs.

Biography: John R. Thome is Professor-Emeritus of Heat and Mass Transfer at the Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, having set up and run the LTCM lab from 1998 to 2018 with more than a dozen of his PhDs and post-docs going on to professorships themselves. He is currently Technical Director of JJ Cooling Innovation in Lausanne, a two-phase electronics cooling consulting/software firm he co-founded in 2014, now with four employees. He obtained his Ph.D. at Oxford University in 1978. He is also an Honorary Professor at the University of Edinburgh and a Visiting Professor at Brunel University in London...keeping his “feet wet” in research while still supervising MS student theses at the EPFL. He has authored five books on two-phase flow/heat transfer and has over 245 journal papers on macroscale and microscale two-phase flow, developed numerous new flow visualization techniques, extensively studied boiling and condensation heat transfer in microchannels and macrochannels, created the first flow pattern-based models, micro-two-phase cooling systems for electronics cooling together with thermosyphon simulation codes, developed 3D-inverse heat transfer methods for reducing multi-microchannel evaporator data, developed a transient 1-d numerical simulation tool for simulating the thermal performance of pulsating heat pipes, published 3D numerical work on bubbly and slug flows in microchannels with inhouse, OpenFoam and modified commercial codes. He has completed numerous sponsored projects with IBM, ABB, Nokia Bell Labs, Carl Zeiss, CERN, and the European Space Agency. He received the 2017 Nusselt-Reynolds Prize, the IEEE Richard Chu ITherm Award in 2019, the ASME Heat Transfer Division's Journal of Heat Transfer Best Paper Award in 1998, the United Kingdom's Institute of Refrigeration J.E. Hall Gold Medal in 2008, the 2010 ASME Heat Transfer Memorial Award, the ICEPT-HDP 2012 Best Paper Award on a 3D-IC prototype with interlayer cooling (13,000 TVS's and 260 microchannels inside), the ASME Journal of Electronics Packaging Best Paper Award in 2014, and the Outstanding Paper Award at InterPACK2017. He is editor-in-chief of the 16-volume Encyclopedia of Two-Phase Heat

Transfer and Flow (2016–2018). He founded the *Virtual International Research Institute of Two-Phase Flow and Heat Transfer* in 2014, now with 30+ participating universities to promote research collaboration, share experimental and numerical data, and organize Ph.D. summer school courses. According to Google Scholar, he has an h-index of 70 with over 23,300 citations.

12-9: INTERPACK AND NASSER GRAYELI POSTER, EPPD, K-16 AND JEP AWARDS

WEDNESDAY, OCTOBER 9

12:15PM–1:45PM

ROOM: PACIFIC BALLROOM C, BALLROOM LEVEL, SECOND FLOOR

During the Luncheon ceremony on October 9, the InterPACK Awards including the Nasser Grayeli Poster Awards, the Electronic and Photonic Packaging and K-16 Awards, and the ASME Journal of Electronic Packaging Awards will be given out.

11-1: FAILURE-ORIENTED-ACCELERATED-TESTING (FOAT) VERSUS HIGHLY-ACCELERATED-LIFE-TESTING (HALT) IN MAKING A VIABLE ELECTRON DEVICE/PACKAGE INTO A RELIABLE PRODUCT

MONDAY, OCTOBER 7

8:00AM–9:30AM

ROOM: EL CAPITAN A, CONCOURSE LEVEL, FOURTH FLOOR



Ephraim Suhir

Portland State University, Portland, OR

Abstract: The almost 40 years old HALT is currently widely employed, in different modifications, with an intent to determine an electronic product's reliability weaknesses, assess the reliability limits, ruggedize the product by applying elevated stresses (not necessarily mechanical and not necessarily limited to the anticipated field stresses) that could cause field failures, and provide large (although, actually, unknown) safety margins over expected in-use conditions. HALT is as a "discovery" test that tries to "kill many unknown birds with one big stone." HALT has demonstrated over the years its ability to improve product robustness through a "test-fail-fix" process, in which the applied stresses ("stimuli") are somewhat above the specified operating limits. By doing that, HALT is able to precipitate and identify failures of different origins, ruggedize the product and to assess the reliability limits. Its end point is defined by the predetermined number or percent of failures and its follow up activity is failure (root cause) analysis. An ideal HALT is when no failures occur in a long time.

FOAT, on the other hand, is aimed at understanding the physics of failure, confirm the use of a particular predictive model and assess the probability of failure. Its end point is also defined by the predetermined number or percent (typically 50%) of failures. The follow-up activity is failure analysis and probabilistic analyses of the test data. An ideal FOAT is the one that is able to generate numerous failures in a short time. A highly focused and highly cost-effective FOAT is the "heart" of the probabilistic-design-for-reliability (PDfR) concept. FOAT should be geared to an established predictive model. The recently suggested multi-parametric Boltzmann-Arrhenius-Zhurkov (BAZ) model can be employed as such a model.

The FOAT/PDfR/BAZ approach could be viewed as a "quantified and reliability physics oriented" HALT. FOAT should be implemented, whenever feasible and appropriate, in addition to HALT. In some cases, FOAT could be conducted even instead of HALT, especially for new materials and products, whose operational reliability is unclear and for which no experience is accumulated and no best practices exist.

Biography: Ephraim Suhir is on the faculty of the Portland State University, Portland, OR, Technical University, Vienna, Austria and James Cook University, Queensland, Australia. He is also CEO of a Small Business Innovative Research (SBIR) ERS Co. in Los Altos, CA, is Foreign Full Member (Academician) of the National Academy of Engineering, Ukraine (he was born in that country); Life Fellow of the Institute of Electrical and Electronics Engineers (IEEE), the American Society of Mechanical Engineers (ASME), the Society of Optical Engineers (SPIE), and the International Microelectronics and Packaging Society (IMAPS); Fellow of the American Physical Society (APS), the Institute of Physics (IoP), UK, and

the Society of Plastics Engineers (SPE); and Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA). Ephraim has authored 400+ publications (patents, technical papers, book chapters, books), presented numerous keynote and invited talks worldwide, and received many professional awards, including 1996 Bell Laboratories Distinguished Member of Technical Staff (DMTS) Award (for developing effective methods for predicting the reliability of complex structures used in AT&T and Lucent Technologies products), and 2004 ASME Worcester Read Warner Medal (for outstanding contributions to the permanent literature of engineering and laying the foundation of a new discipline "Structural Analysis of Electronic Systems"). Ephraim is the third "Russian American," after S. Timoshenko and I. Sikorsky, who received this prestigious award. This year he received the 2019 IEEE Electronic Packaging Society (EPS) Field award for seminal contributions to mechanical reliability engineering and modeling of electronic and photonic packages and systems.

11-2: THERMO-ELECTROCHEMICAL COUPLING AND INTERACTIONS IN LI-ION CELLS

TUESDAY, OCTOBER 8

8:00AM–9:30AM

ROOM: EL CAPITAN A, CONCOURSE LEVEL FOURTH FLOOR



Ankur Jain

University of Texas, Arlington, TX



Ankit Verma

Purdue University, West Lafayette, IN

Abstract: Li-ion cells are used extensively for energy storage in a broad variety of engineering applications. A fundamental understanding of coupled thermal and electrochemical transport in Li-ion cells is very important for optimizing performance and ensuring safety. This tutorial will present the fundamentals of heat transfer and electrochemical mechanisms in a Li-ion cell. Heat generation and dissipation within the cell will be discussed. A variety of thermal management approaches investigated in the recent past will be presented. Safety of Li-ion cells in the context of thermal runaway will be presented. Fundamentals of electrochemical characterization of a Li-ion cell will be presented. The intricate coupling between thermal and electrochemical transport phenomena will be highlighted. Material presented in this tutorial may help attendees gain a fundamental understanding of Li-ion cells and various aspects related to performance and safety.

Biography: Ankur Jain is an Associate Professor in the Mechanical and Aerospace Engineering Department at the University of Texas, Arlington,

TX. He directs the Microscale Thermophysics Laboratory (www.uta.edu/mtl), which carries out experimental and theoretical research on heat transfer and energy conversion in Li-ion batteries, microscale thermal transport, bioheat transfer, microelectromechanical systems, etc. He received the Lockheed Martin Excellence in Teaching Award (2018), UTA College of Engineering Outstanding Early Career Award (2017), NSF CAREER Award (2016), and the ASME EPP Division Young Engineer of the Year Award (2013). Dr. Jain was among a small group of U.S.-based researchers invited by the U.S. National Academy of Sciences to participate in the 5th Arab-American Frontiers of Science, Engineering, and Medicine Symposium in 2017. He received his Ph.D. (2007) and M.S. (2003) in Mechanical Engineering from Stanford University, where he received the Stanford Graduate Fellowship (SGF) and his B.Tech. (2001) in Mechanical Engineering from the Indian Institute of Technology (IIT), Delhi with the highest GPA among the class of Mechanical Engineering. He has published 53 high quality journal articles on topics related to energy conversion and heat transfer in batteries, microelectronics and biological systems. His research has been supported by National Science Foundation, Department of Energy, Office of Naval Research, Indo-US Science & Technology Forum, etc.

Biography: Ankit Verma is a doctoral candidate at Purdue University under the tutelage of Prof. Partha Mukherjee. He is working on multi-modal degradation mechanisms and interactions in lithium intercalation and metal batteries. He has authored more than ten publications in battery energy storage.

11-3: ARL PARAPOWER TUTORIAL

WEDNESDAY, OCTOBER 9

8:00AM–9:30AM

ROOM: EL CAPITAN A, CONCOURSE LEVEL, FOURTH FLOOR



Lauren Boteler

U.S. Army Research Laboratory (ARL)
Washington, DC

Abstract: This tutorial will demonstrate the open-sourced ARL ParaPower tool, which has been designed to aid in design space analysis. After defining the problem, the typical process includes back-of-the-envelope calculations, which are limited in their accuracy, ability to understand large parametric spaces, and ability to address multiple domains. Therefore, the ARL ParaPower tool has been developed to address this critical capability gap. ARL ParaPower is capable of quickly, holistically, and parametrically exploring a large design space to aid in assessing the impact of layout, dimension, and material choices. This tutorial will introduce the governing equations of the tool, demonstrate how to use the MATLAB based GUI, and demonstrate its use in a few applications. It has been shown to be useful for the following applications: (1) quick “What if?” calculations, (2) parametric sweeps, (3) teaching tool, (4) proposal review, and (5) integration with other tools for system-of-systems analysis. ARL ParaPower can do steady-state, transient, and solid-liquid phase change analysis of a wide variety of rectilinear geometries

Biography: Lauren Boteler leads the thermal and packaging research programs as part of the Advanced Power Electronics group at the U.S. Army Research Laboratory (ARL). She received her Ph.D. degree in mechanical engineering from the University of Maryland. Her work at ARL, beginning in 2005, has included electronics packaging and thermal management solutions for a wide range of Army applications. Her research programs focus on design tool development and package integrated thermal solutions including 3D chip stacking, power electronics, laser diodes, double side cooling, and phase change materials. More recently, she has initiated a research program in Advanced Power Electronics Packaging and Thermal Management that defines the four main challenges of power electronics packaging: co-engineering/co-design, transient thermal mitigation, additive manufacturing, and high-voltage packaging. She is an adjunct professor at Johns Hopkins University and was awarded the 2018 ASME EPPD Woman Engineer of the Year award for her contributions to the electronics packaging community.

11-4: A REVIEW OF ADVANCED POWER MODULE PACKAGING AND THERMAL MANAGEMENT IN WBG ERA

WEDNESDAY, OCTOBER 9

1:45PM–3:15PM

ROOM: EL CAPITAN A, CONCOURSE LEVEL, FOURTH FLOOR



Fang Luo

University of Arkansas, Fayetteville, AR

Abstract: Wide bandwidth (WBG) devices with superior performance over traditional silicon power devices have become the prime candidates for future high-performance power electronics energy conversion. Traditional device packaging starts turning into a limiting factor in fully realizing the benefits offered by WBG power devices, and thus, improved and advanced packaging structures are required to bridge the gap between WBG devices and their applications. This talk provides a review of the state-of-art advanced module packaging technologies for SiC and GaN devices with the focuses on module layout, packaging material system, and module integration trend, and potential thermal management solutions in these WBG power electronics systems.

Biography: Fang Luo is Assistant Professor in the Electrical Engineering Department at the University of Arkansas. His research interests include high power-density converter design, high-density EMI filter design and integration, and power module packaging/integration for wide band-gap devices. His current projects include high-voltage SiC packaging, turbo-electric propulsion for aircraft systems, cryogenic power converters, and active EMI filters for power electronics systems.

Prior to joining Arkansas, Dr. Luo was a research assistant professor at The Ohio State University. Dr. Luo got his Bachelor's and Ph.D. degrees from Huazhong University of Science and Technology in 2003 and 2010, respectively, and jointly with Virginia Tech. He was a visiting Ph.D. student from 2007 to 2010 and then Postdoctoral researcher from 2010 to 2014, both at Virginia Tech.

Dr. Luo is a senior member of IEEE and member of AIAA and ASME. He holds two U.S. patents and has authored/co-authored more than 20 journal papers and more than 50 peer-reviewed conference papers. He is Associate Editor of *IEEE Transactions on Power Electronics* and *International Transactions on Electrical Energy Systems*. He is a recipient of the NSF CAREER Award.

10-2: PROFESSIONAL DEVELOPMENT WORKSHOP: ENTREPRENEURSHIP

MONDAY, OCTOBER 7

5:00PM–6:30PM

ROOM: EL CAPITAN A, CONCOURSE LEVEL, FOURTH FLOOR



Jimil Shah
3M Company

InterPACK 2019 is organizing a panel for science and engineering students and recent graduates who are interested in developing entrepreneurial skills. Participants will be introduced to the process of innovation, generation and protection of intellectual property, technology transfer and the commercialization of ideas and inventions. They will benefit also from the international perspectives and insights of leading experts in the field. The panelists will be from both academia and industry who will help and encourage students to start a successful technology-based venture. This panel will also address how academia and industry can go hand in hand to support post graduate students to be a “technopreneur.”

Biography: Jimil M. Shah is an Application Development Engineer for the Server Immersion Cooling of Data Centers in the EMSD Fluids Lab at 3M Company. Jimil received his Ph.D. in Mechanical Engineering from UT at Arlington in August of 2018 under the guidance of Professor Agonafer. He then worked as a Post-Doctoral Research Associate again in Professor Agonafer’s group prior to joining 3M. His research is in the area of data center cooling with a focus on immersion cooling as well as mitigation of contamination related to airside economization. He also has interest in the general area of electronic packaging and the internet of things.

Dr. Shah is a professional member of ASME and ASHRAE. In InterPACK 2018, he received the ASME Electronics and Photonic Packaging Division (EPPD) Student Engineer of The Year Award. He is the recipient of the 2018 UTA College of Engineering Summer Dean’s Dissertation Fellowship and spring 2018 UTA I-Engage Mentoring Program Scholarship. He has also received the Best Student Abstract Award at IMAPS 2015, Los Gatos, CA. Dr. Shah has published 18 journal and conference papers with five additional journal papers under review.

10-3: PROFESSIONAL DEVELOPMENT WORKSHOP: INTELLECTUAL PROPERTY AND PATENTING FOR ENGINEERS

MONDAY, OCTOBER 7

5:00PM–6:30PM

ROOM: EL CAPITAN B, CONCOURSE LEVEL, FOURTH FLOOR



David Risley
Thomas Horstemeyer Intellectual Property Attorneys

Development and protection of intellectual property (IP) is a critical aspect of the engineering profession. Even in academia, IP plays a key role in addition to fundamental research. In this session, Dave Risley, an attorney with Thomas Horstemeyer, will provide an introduction to IP and patenting for engineers. He will discuss what intellectual property means, when it makes sense to file a patent, as well as the logistical details of the patenting process. He will specifically focus on the synergy between patenting and fundamental research.

Biography: David Risley is an attorney in the Los Angeles offices of Thomas Horstemeyer. He received his J.D. from Columbus School of Law, The Catholic University of America in 1995. He began his intellectual property career at the U.S. Patent and Trademark Office and has been with Thomas Horstemeyer since 1997.

10-7: HETEROGENEOUS INTEGRATION ROADMAP (HIR) WORKSHOP

MONDAY, OCTOBER 7

3:30PM–6:30PM

ROOM: MALIBU, CONCOURSE LEVEL, FOURTH FLOOR



Bill Bottoms

Co-chair of HIR (3 MTs)



Ravi Mahajan

Intel Corporation



Bahgat Sammakia

Binghamton University



Amr Helmy

University of Toronto

Heterogeneous Integration (HI) of disparate computing and communications functions is a key performance enabler in micro-electronic systems. HI is crucially enabled by advanced packaging since packages offer compact, power efficient platforms for HI. This talk will describe the role of advanced 2D and 3D packaging in enabling HI and will focus on the evolution of packaging to provide increased interconnect density. This workshop shares an update of HIR and progresses of HIR in recent years to a wide audience.

Biography: Bill Bottoms received a B.S. degree in Physics from Huntington College in Montgomery, Alabama in 1965, and a Ph.D. in Solid State from Tulane University in New Orleans in 1969, and is currently Chairman of Third Millennium Test Solutions. He has worked as a faculty member in the department of electrical engineering at Princeton University, manager of Research and Development at Varian Associates, founding President of the Semiconductor Equipment Group of Varian Associates, and general Partner of Patricof & Co. Ventures. Dr. Bottoms has served as Chairman and CEO of many companies, both public and private.

Biography: Ravi Mahajan is an Intel Fellow and the Co-director of Pathfinding and Assembly and Packaging technologies for future silicon nodes. Ravi also represents Intel in academia through research advisory boards, conference leadership, and participation in various student initiatives. Ravi has led efforts to define directions for package architecture, technologies, and assembly processes at Intel since 2000, spanning 90 nm, 65 nm, 45 nm, 32 nm, 22 nm, and 7 nm silicon. Earlier in

his Intel career, he spent five years as group manager for thermal mechanical tools and analysis. In that role, Ravi oversaw a Thermal-Mechanical Lab chartered with delivering detailed thermal and mechanical characterization of Intel's packaging solutions for current and future processors. A prolific inventor and recognized expert in microelectronics packaging technologies, Ravi holds more than 40 patents, including the original patent for a silicon bridge that became the foundation for Intel's EMIB technology. His early insights also led to high-performance, cost-effective cooling solutions for high-end microprocessors and the proliferation of photo-mechanics techniques used for thermo-mechanical stress model validation. Ravi has written several book chapters and more than 30 papers on topics related to his area of expertise. Ravi joined Intel in 1992 after earning a bachelor's degree from Bombay University, a master's degree from the University of Houston, and a Ph.D. from Lehigh University, all in mechanical engineering. His contributions during his Intel career have earned him numerous industry honors, including the SRC's 2015 Mahboob Khan Outstanding Industry Liaison Award, the 2016 THERMI Award from SEMITHERM, the 2016 Allan Kraus Thermal Management Medal from the ASME, and the 2018 InterPACK Achievement award. He has been nominated as an IEEE EPS Distinguished Lecturer. He is one of the founding editors for the Intel Assembly and Test Technology Journal (IATTJ) and currently VP of Publications & Managing Editor-in-Chief of the IEEE Transactions of the CPMT. Additionally, he has been long associated with ASME's InterPACK conference and was Conference Co-Chair of the 2017 Conference. Ravi is a Fellow of two leading societies, ASME and IEEE. He was named an Intel Fellow in 2017.

Biography: Bahgat Sammakia, a SUNY distinguished professor of mechanical engineering, is the Vice President for Research at Binghamton University. He is the founding director of the Small Scale Systems Integration and Packaging Center, a New York State Center of Excellence, and is the director of the Energy Efficient Electronic Systems Center, an NSF IUCRC founded in 2011 with a focus on reducing the energy consumed by data centers around the world. Sammakia served as the interim president of SUNY Polytechnic Institute from December 2016 to June 2018. He is a fellow of the American Society of Mechanical Engineers, the National Academy of Inventors, and the IEEE. Sammakia holds 21 U.S. patents and has published more than 250 peer-reviewed technical papers. Sammakia, who received the SUNY Chancellor's Award for Excellence in Scholarship and Creative Activities in 2010, was honored with the 2010 ITerm Achievement Award for his contributions to the field of semiconductor thermal management. Sammakia earned his bachelor's degree from the University of Alexandria in Egypt and his master's and doctoral degrees from the University at Buffalo. A former IBM senior technical staff member, Sammakia joined Binghamton's faculty in 1998.

Biography: Amr Helmy is a Professor in the department of electrical and computer engineering at the University of Toronto. Prior to his academic career, he held a position at Agilent Technologies, R&D division, in the UK between 2000 and 2004. At Agilent, his responsibilities included developing InP-based photonic semiconductor integrated circuits and high-powered submarine-class 980 nm pump lasers. He received his Ph.D. and M.Sc. from the University of Glasgow with a focus on photonic devices and fabrication technologies, in 1999 and 1995, respectively. He received his B.Sc. from Cairo University in 1993, in electronics and telecommunications engineering science. His research interests include photonic device physics and characterization techniques, with emphasis on nonlinear optics in III-V semiconductors; applied optical spectroscopy in III-V optoelectronic devices and materials; III-V fabrication and

monolithic integration techniques. Amr has served the community in numerous roles. He has served as Vice President Membership for the IEEE Photonics Society (2008–2010). He is currently the CLEO Program Chair (2018–2020), where he previously served as the chair for the Semiconductor Lasers committee. He also serves as the Technical Program Chair for IPC 2016–2018, where he previously served as the chair for the committees on Semiconductor Lasers, Optical Materials, and Metamaterials as well as the committees on Photonic Integration and Packaging. He has served as an associate editor for the *Photonics Journal* and is currently an associate editor for *Optics Express*.

10-1: INTRODUCTION TO ROBOTICS, SELF-DRIVING CARS, AND AI WORKSHOP

TUESDAY, OCTOBER 8

5:00PM–6:30PM

ROOM: AVILA A, CONCOURSE LEVEL, FOURTH FLOOR



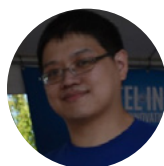
Anna Prakash

Co-chair of HIR (3 MTs)



Oliver Chen

Co-chair of HIR (3 MTs)



Shih-to Fei

Co-chair of HIR (3 MTs)



Priyanka Dobriyal

Intel Corporation, Chandler, AZ



Elaina Ashton

Arizona College Prep
Chandler, AZ

experience in programming robots and understanding AI and help you set up after-school STEM-Robotics clubs for your local community children. The hands-on lessons are taught by award winning teams from Education Empowers Inc. (501(c) non-profit) as well as Intel Industry professionals (Intel).

Biography: Anna Prakash received her Ph.D from Arizona State University in Chemistry under the guidance of Prof. Dr. Karl Booksh. She began her engineering career at Three-Five Systems Inc., an electronic display manufacturer, working on Liquid Crystal Displays, HDTVs, and handheld communication devices. She joined Intel Corporation in 2004 as a Packaging Research & Development Engineer and is currently a Senior Materials Engineer. In addition to being a key contributor for over 20+ technical publications, Anna is also a prolific inventor with over 20+ patents (granted/filed) covering sensors, displays, optoelectronics, and semiconductor packaging materials and process. Outside of work, Anna is passionate about promoting STEM, robotics, and sustainability education for local children. Along with her daughter Elaina, she co-founded Education Empowers Inc. (www.educationempowers.org), a non-profit promoting STEM education for children. She mentors junior engineers, girls, underserved and underrepresented children in STEM through her non-profit organization. Anna is the recipient of the Society of Women Engineers “Prism Award” and the IEEE STEM outreach award for her contribution to technology and the community.

Biography: Elaina Ashton is a Senior at Arizona College Prep-Erie High School in Chandler, Arizona. She is the President of her High School VEX robotics club and also the President of the SiSePeude FRC all-girls robotics club. She spends her weekends promoting robotics for girls and underserved children living in the Phoenix, Arizona community. For her dedication to STEM outreach, she received the Cox connect2STEM award and the Chandler Mayor’s Youth of the Year award.

Biography: Oliver Chen is a Technical Marketing Engineer supporting AI in the Sales and Marketing Group at Intel Corporation. He is passionate about the intersection of leading-edge technology and new business opportunities. He thrives in expanding the STEAM pipeline by making AI and Maker content easier to consume.

Biography: Priyanka Dobriyal is a Product Engineer in Datacenter group at Intel Corporation. She has a Ph.D. in Chemistry from University of Massachusetts, Amherst and M.S. from Indian Institute of Technology, Roorkee, India. She is passionate about leading STEM outreach related activities.

Biography: Alex (Shih-to) Fei is a Project Manager and Engineer perfecting cutting-edge 14 nm and 10 nm technology at Intel LTD. He also functions as Community Lead and Project Manager at Intel Makers Oregon, organizing events in collaboration with IOTG and Outreach Programs. Alex joined Intel after receiving Ph.D. degree at Penn State in 2010.

Have fun as you learn about robotics and program self-driving cars with this introductory course. From understanding sensors to programming EV3 robots for missions, this course will equip you with hands-on

Workshops

10-4: PROFESSIONAL DEVELOPMENT WORKSHOP: TECHNICAL COMMUNICATION

TUESDAY, OCTOBER 8

5:00PM–6:30PM

ROOM: EL CAPITAN B, CONOURSE LEVEL, FOURTH FLOOR



Ankur Jain

University of Texas at Arlington



Milena Vujosevic

TDK-Sensor Systems Business Company

Effective technical communication through oral and written means is extremely important for engineers and researchers. This workshop will focus on the oral communication. Two presenters – one from academia and one from industry – will discuss key do's and don'ts of oral technical communication. They will share their experiences and offer advice about designing effective oral communication tools.

Biography: Ankur Jain is an Associate Professor in the Mechanical and Aerospace Engineering Department at the University of Texas, Arlington. His research interests include heat transfer and energy conversion in Li-ion batteries, additive manufacturing, and microscale thermal transport. He received the Lockheed Martin Excellence in Teaching Award (2018), UTA College of Engineering Outstanding Early Career Award (2017), NSF CAREER Award (2016), and the ASME EPP Division Young Engineer of the Year Award (2013).

Biography: Milena Vujosevic is a Senior Director of Advanced Packaging in TDK where she is responsible for MEMS sensors package technology development and new product introduction. She has been in semiconductor industry for more than 20 years and prior to TDK she worked at Intel and Motorola. She has a Ph.D. in Mechanical Engineering. Milena is the current Chair of ASME Electronic and Photonic Packaging Division.

10-5: PROFESSIONAL DEVELOPMENT WORKSHOP: MENTORING

TUESDAY, OCTOBER 8

5:00PM–6:30PM

ROOM: EL CAPITAN A, CONOURSE LEVEL, FOURTH FLOOR



Ron Warzoha

United States Naval Academy

This workshop, sponsored by the ASME Heat Transfer Division K16 Committee on Heat Transfer in Electronic Equipment is intended to connect junior and senior members of industry, academia, and government laboratories in a formal mentorship program through the ASME K-16 committee. The workshop itself will detail best practices for mentors and establish accountability standards for mentees that are designed to be at critical inflection points in one's career. The program lifecycle is planned such that early-career members of industry, academia and government laboratories serve as mentors to Ph.D. students in their last two years of study, master's students in their final year of study or undergraduates in their final year of study, while senior members in these fields will serve as mentors to early-career scientists. Emphasis will be placed on diversity in mentorship pairings and pairs will be identified in advance of the program.

Biography: Ron Warzoha is an Assistant Professor in the Mechanical Engineering Department at the United States Naval Academy. He received his Ph.D. (2014) from Villanova University. His research interests include thermal energy storage, micro-/nanoscale energy conversion and transport, and thermal management of electronics.

13-5: TRACK 2 PANEL: SYSTEM/DATA CENTER LIQUID COOLING

MONDAY, OCTOBER 7

1:45PM–3:15PM

ROOM: MALIBU, CONCOURSE LEVEL, FOURTH FLOOR

Panel Focus: The development of liquid cooling of computer systems and data centers has provided a path to improve both cooling energy efficiency and thermal performance compared to conventional air cooling technology. Liquid cooling technology has been deployed in commercial systems including water cooled supercomputers and data centers. The development of liquid cooling has included a range of scale from macroscopic rack level heat exchangers to microscale fluidic structures in chip embedded cooling. The panel will discuss the different coolants deployed including water to dielectric fluids and the many technology approaches used to implement liquid cooling for thermal management of computer systems.

Moderator: **Saket Karajgikar**, Facebook

Panelists: **Veerendra Mulay**, Facebook, **Timothy Chainer**, IBM, **Jin Yang**, Intel, **Jimil Shah**, 3M, **Chris Malone**, Google

13-2: TRACK 7 PANEL: EXTREME FAST CHARGING OF LITHIUM-ION BATTERIES

TUESDAY, OCTOBER 8

10:45AM–12:15PM

ROOM: SANTA MONICA, CONCOURSE LEVEL, FOURTH FLOOR

Panel Focus: Extreme fast charging capability of lithium-ion batteries is desired for various applications ranging from smart electronics to electric vehicles. However, major challenges still exist, such as lithium plating and rapid heat generation within batteries, power and thermal management design of vehicles/devices and charging infrastructure. Both lithium plating and heat generation could significantly reduce battery life and increase safety failure risks. This panel will explore the challenges and opportunities in extreme fast charging of lithium-ion batteries from the perspectives of lithium plating, thermal management, materials, and vehicles/devices.

Moderators: **Guangsheng Zhang**, University of Alabama Huntsville, **Partha Mukherjee**, Purdue University

Panelists: **Corey T. Love**, Naval Research Laboratory, **Tanvir R. Tanim**, Idaho National Laboratory, **Xiao-Guang Yang**, Pennsylvania State University, **Aron Saxon**, National Renewable Energy Laboratory

13-3: PANEL: WOMEN IN ENGINEERING PANEL

TUESDAY, OCTOBER 8

1:45PM–3:15PM

ROOM: MALIBU, CONCOURSE LEVEL, FOURTH FLOOR

Panel Focus: Discussion on women's role and contribution in engineering disciplines. Panelists will share their own experiences in engineering exercise, including teaching, research, and progression exercise.

Moderator: **Leila Choobineh**, SUNY Polytechnic Institute

Panelists: **Borca Tasciuc**, **Diana Andra**, Rensselaer Polytechnic Institute, **Tannaz Harirchian**, Intel, **Yoonjin Won**, University of California, Irvine, **Amy Spencer Fleischer**, California Polytechnic State University, **Amanie**

Abdelmessih, California Baptist University, **Ghazal Mohsenian**,

Binghamton University, **Rahima Mohammed**, Intel Corporation, **Valerie**

Marty, Connected Micro Inc.

13-7: TRACK 4 PANEL: APPLICATION CHALLENGES IN FLEXIBLE AND WEARABLE ELECTRONICS

TUESDAY, OCTOBER 8

1:45PM–3:15PM

ROOM: SANTA MONICA, CONCOURSE LEVEL, FOURTH FLOOR

Panel Focus: Applications across multiple markets are driving development of flexible and wearable electronics use cases. The panelists will share their insights regarding these opportunities as well as the corresponding technical challenges given their industry and government research experience. There will be plenty of time for an interactive conversation with the audience after the panel introductions.

Moderator: **Valerie Marty**, Connected Micro LLC

Panelists: **Stephanie Harvey**, SEMI, **James Chew**, Cadence, **Benjamin Leever**, NextFlex, **Janos Veres**, PARC Research

13-1: TRACK 1 PANEL: PROGRESSING OR NOT PROGRESSING DURING TWO YEARS OF HIR

TUESDAY, OCTOBER 8

3:30PM–5:00PM

ROOM: MALIBU, CONCOURSE LEVEL, FOURTH FLOOR

Panel Focus: Heterogeneous Integration (HI) of disparate computing and communications functions is a key performance enabler in micro-electronic systems. HI is crucially enabled by advanced packaging since packages offer compact, power efficient platforms for HI. This talk will describe the role of advanced 2D and 3D packaging in enabling HI and will focus on the evolution of packaging to provide increased interconnect density. Heterogeneous integration roadmap (HIR) panel to review progresses made during last years and future work in later years.

Moderators: **Gamal Refai-Ahmad**, Xilinx, **Leila Choobineh**, SUNY Polytechnic Institute

Panelists: **Bill Bottoms**, 3MTS, **Ravi Mahajan**, Intel, **Bahgat Sammakia**, Binghamton University, **Amr Helmy**, University of Toronto

13-8: TRACK 8 PANEL: RELIABILITY IN THE AGE OF AI: OPPORTUNITIES AND CHALLENGES

TUESDAY, OCTOBER 8

3:30PM–5:00PM

ROOM: SANTA MONICA, CONCOURSE LEVEL, FOURTH FLOOR

Panel Focus: Increased functionality of everyday use machines – ranging from washers to highly automated vehicles – has been made possible through employment of more sensing, more actuation, and more processing capabilities. At the same time, the increased complexity introduces more ways in which a machine can breakdown. The incredible advancement in our sensing capabilities, coupled with connectivity, offers unprecedented insights into a wide variety of processes and operations. The operating conditions of machines can be mapped with greater

Panel Sessions

accuracy while carrying out performance monitoring and predicting failures. The envelope of reliability can essentially be stretched and redefined. While the opportunities abound, tremendous challenges exist towards properly housing the data, cataloging it, cleaning it, labeling it, and creating the right models to extract actionable insights through use of Artificial Intelligence and Machine Learning. This panel will explore the challenges and opportunities posed by our ability to collect data from machines and components during their manufacturing and operation, and identify roadblocks that must be overcome to extract value from it to help machines last longer, and fail gracefully towards the end of life.

Moderator: **Azeem Sarwar**, General Motors

Panelist: **Mohak Shah**, LG Electronics, **Ercan Dede**, Toyota, **Przemyslaw Gromala**, Bosch, **Anna Prakash**, Intel, **Pradeep Lall**, Auburn University

13-6: TRACK 6 PANEL: TRANSIENT THERMAL MANAGEMENT: CONSIDERING THERMAL CAPACITANCE AND NOT JUST THERMAL RESISTANCE

WEDNESDAY, OCTOBER 9

10:45AM–12:15PM

ROOM: SANTA MONICA, CONCOURSE LEVEL, FOURTH FLOOR

Panel Focus: There are many applications throughout the military and commercial industries whose thermal profiles are dominated by intermittent and/or periodic pulsed thermal loads. Typical thermal solutions are steady-state heat sinks that provide enough continuous cooling capacity to address the peak thermal load as if it were a steady-state condition. Such a conservative approach guarantees satisfying the thermal challenge, but it can result in significant cooling overdesign. This panel will investigate improving system size and weight without sacrificing platform performance by considering transient thermal mitigation methods.

Moderator: **Sukwon Choi**, Pennsylvania State University

Panelists: **Lauren Boteler**, US Army Research Laboratory, **Peter DeBock**, General Electric, **Patrick Shamberger**, Texas A&M University, **Nicholas Niedbalski**, US Air Force Research Laboratory, **David Huitink**, University of Arkansas

14-1 - K-16 COMMITTEE MEETING (OPEN)

MONDAY, OCTOBER 7

6:30PM–7:30PM

MALIBU, CONCOURSE LEVEL, FOURTH FLOOR

14-2 - ELECTRONIC AND PHOTONIC PACKAGING DIVISION (EPPD)

EXECUTIVE COMMITTEE MEETING (BY INVITATION ONLY)

MONDAY, OCTOBER 7

7:30PM–8:30PM

EXECUTIVE BOARDROOM, CONCOURSE LEVEL, FOURTH FLOOR

14-3 - INTERPACK 2020 MEETING (OPEN)

TUESDAY, OCTOBER 8

6:30PM–7:30PM

MALIBU, CONCOURSE LEVEL, FOURTH FLOOR

14-4 - INTERPACK ADVISORY MEETING (BY INVITATION ONLY)

TUESDAY, OCTOBER 8

7:30PM–8:00PM

SANTA MONICA, CONCOURSE LEVEL, FOURTH FLOOR

14-5 - JOURNAL OF ELECTRONIC PACKAGING (JEP) MEETING (OPEN)

TUESDAY, OCTOBER 8

8:00PM–8:30PM

MALIBU, CONCOURSE LEVEL, FOURTH FLOOR

Poster Session

POSTER SESSIONS/STUDENT COMPETITION

MONDAY, OCTOBER 7

6:30 PM –8:30 PM

ROOM: LAGUNA, CONCOURSE LEVEL, FOURTH FLOOR

On behalf of the 2019 InterPACK organizing committee, we are pleased to announce that a student poster competition will be held during the 2019 InterPACK (October 7–9, Hilton Anaheim, Anaheim, CA).

The Industry, Academia and National Lab Poster Session during InterPACK is open to all students. It will provide a great opportunity for student attendees to showcase their research and collect feedback from professionals and experts in the area of electronics and photonics packaging in an interactive way. This is also a networking opportunity for the students who have an interest in distributing their resumes and connecting with professionals from industry, academia, and national labs. Students are encouraged to submit their resume to ipakres@asme.org. These resumes will be provided by ASME to all institutions that are interested in potentially hiring these students.

Each student poster in this competition will be judged by experts in the area of electronics and photonics packaging on the following aspects: originality, technical quality, completeness, clarity, and communications and interactions during the poster session. The top three student poster presenters will be awarded the **Nasser Grayeli Best Student Poster Awards** – first, second, and third place. The first, second, and third-place students will receive cash awards of \$500, \$300, and \$200, respectively, and will also have their registration fees reimbursed. The awards will be presented at the 2019 InterPACK Awards Luncheon. In addition, based on the review process, the lead student author for another top-17 posters will have their registration fees reimbursed after the conference.

Monday, October 7, 6:30PM–8:30PM

Room: Laguna, Concourse Level, Fourth Floor

TRACK 9: INDUSTRY, ACADEMIA, AND NATIONAL LAB POSTERS

Track Organizer: **Kyle Gluesenkamp**, Oak Ridge National Laboratory, Knoxville, TN, United States

Track Co-Organizer: **Yoonjin Won**, University of California, Irvine, Irvine, CA, United States

9-1: INDUSTRY, ACADEMIA, AND NATIONAL LAB POSTERS

Concourse Level, Fourth Floor, Laguna

Session Organizer: **Kyle Gluesenkamp**, Oak Ridge National Laboratory, Knoxville, TN, United States

Session Co-Organizer: **Yoonjin Won**, University of California, Irvine, Irvine, CA, United States

High-Speed Visible Laser Light Communication (VLLC) Enabled Using RGB Laser Module for Gbps Li-Fi Links

6739

Chao Shen, SaNoor Technologies, Thuwal, Saudi Arabia, **Hala H. Al-Hashim**, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia, **Jie Hu**, SaNoor Technologies, Thuwal, Saudi Arabia, **Boon S. Ooi**, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

Thermomechanical Stress and Warpage Augmentation Using Auxetic Features in Electronic Design

6742

Mahsa Montazeri, **John Harris**, **David Huitink**, **Adithya Venkatanarayanan**, **Simon Ang**, University of Arkansas, Fayetteville, AR, United States

Continuously Tunable Thermal Switch Based on Compressible Graphene Foams

6743

Luis Delgado, Purdue University, West Lafayette, IN, United States, **Tingting Du**, Shandong University, Purdue University, Jinan, China, **Amy Marconnet**, **Xiulin Ruan**, Purdue University, West Lafayette, IN, United States

Folding Reliability Assessment of Flexible Electronics in Wearable

6744

Hyesoo Jang, **Pradeep Lall**, **Yunli Zhang**, Auburn University, Auburn, AL, United States

Thermal Management of Beta-Ga₂O₃ Transistors

6749

Samuel Kim, **Chao Yuan**, **Samuel Graham**, Georgia Institute of Technology, Atlanta, GA, United States

NREL Energy Storage Thermal Management

6368

Aron Saxon, **Matt Keyser**, National Renewable Energy Laboratory, Golden, CO, United States

Vandal Glass Heat Distribution and the Effect of Glass Gap Adjustments in Outdoor Digital Display Components

6758

Jeho Kim, Georgia Institute of Technology, Atlanta, GA, United States, **J. Michael Brown**, Manufacturing Resources International, Alpharetta, GA, United States, **Yogendra Joshi**, Georgia Institute of Technology, Atlanta, GA, United States, **Kevin O'Connor**, **Marcos Diaz**, Manufacturing Resources International, Alpharetta, GA, United States, **Zhuomin Zhang**, **Peiyan Yang**, Georgia Institute of Technology, Atlanta, GA, United States

Analysis of the Relation Between Grain Size of Tin and Wettability in View Point of Strength of Material

6404

Takuya Takeda, Tokyo Denki University, Higashihirayama, Hino, Japan, **Hirofumi Saito**, Tokyo Denki University, Asahicho, Japan

Design of Nanostructured Copper Surfaces for Thin Film Evaporation

6467 **Jessica Lee, Kimia Montazeri, Yoonjin Won**, University of California, Irvine, Irvine, CA, United States, **Michael Barako**, Northrop Grumman Aerospace Systems, Irvine, CA, United States

Thermal-Switch-Enabled Power Electronics Isothermalization

6761 **Tianyu Yang**, University of Illinois at Urbana-Champaign, Urbana, IL, United States, **Fei Diao, Alan Mantoath, Yue Zhao**, University of Arkansas, Fayetteville, AR, United States, **William P. King, Nenad Miljkovic**, University of Illinois at Urbana-Champaign, Urbana, IL, United States

Moving Boundary Model for Dynamic Control of Two Microchannel Evaporator Cooling System

6763 **Qi Jin, John T. Wen, Shankar Narayanan**, Rensselaer Polytechnic Institute, Troy, NY, United States

Review of US Patents on Mechanical Failures in Foldable Smartphones

6350 **Ali Nematollahisarvestani**, University of Colorado Boulder, Boulder, CO, United States, **Ryan Lewis**, Kelvin Thermal Technologies, Lafayette, CO, United States, **Yung-Cheng Lee**, University of Colorado Boulder, Boulder, CO, United States

Integrated Optical Probing of the Thermal Dynamics of Wide Bandgap Power Electronics

6527 **James Spencer Lundh**, Pennsylvania State University, University Park, PA, United States, **Bikramjit Chatterjee**, Pennsylvania State University, State College, PA, United States, **Albert G. Baca, Robert J. Kaplar, Andrew M. Armstrong, Andrew A. Allerman**, Sandia National Laboratories, Albuquerque, NM, United States, **Hyungtak Kim**, Hongik University, Seoul, Korea (Republic), **Sukwon Choi**, Pennsylvania State University, University Park, PA, United States

Correlated Effects of Self-Heating, Light Output, and Efficiency of GaN Light-Emitting Diodes on Junction Temperature

6529 **Daniel Shoemaker**, Pennsylvania State University, University Park, PA, United States, **Bikramjit Chatterjee**, Pennsylvania State University, State College, PA, United States, **James Spencer Lundh**, Pennsylvania State University, University Park, PA, United States, **Joon Seop Kwak**, Suncheon National University, Suncheon, Jeonnam, Korea (Republic), **Jaehee Cho**, Chonbuk National University, Jeonju, Chonbuk, Korea (Republic), **Sukwon Choi**, Pennsylvania State University, University Park, PA, United States

Radiation effects on the self-heating of AlGaIn/GaN HEMTs

6537 **Bikramjit Chatterjee, Yiwen Song**, Pennsylvania State University, State College, PA, United States, **Brian Foley, Azaree Lintereur**, Pennsylvania State University, University Park, PA, United States, **Hyungtak Kim**, Hongik University, Seoul, Korea (Republic), **Sukwon Choi**, Pennsylvania State University, University Park, PA, United States

The Doping Dependence of the Thermal Conductivity of Bulk Gallium Nitride Synthesized via Diverse Growth Techniques

6538 **Yiwen Song, Bikramjit Chatterjee**, Pennsylvania State University, State College, PA, United States, **Weijie Wang**, University of Houston, Houston, TX, United States, **Jacob Leach**, Kyma Technologies, Inc., Raleigh, NC, United States, **Srabanti Chowdhury**, Stanford University, Stanford, CA, United States, **Brian Foley**, Pennsylvania State University, University Park, PA, United States, **Jae-Hyun Ryou**, University of Houston, Houston, TX, United States, **Sukwon Choi**, Pennsylvania State University, University Park, PA, United States

Thermal Behavior of Phase Change Materials (PCMs) Embedded in Gradient Porous Metal Foams

6593 **Ali Ghahremannezhad**, University of California, Riverside, Riverside, CA, United States

Realizing Enhanced CPU and GPU Performance With Directed Cooling on Scalable Coatings

6766 **Thomas Foulkes, Douglas Petrik, Peter Sokalski, Kevin Uvodich, Xinhe Chen, Patrick Deroche, Nenad Miljkovic**, University of Illinois at Urbana-Champaign, Urbana, IL, United States

Nucleate Boiling Heat Transfer Using Well-Ordered Microporous Patterns for Controlled Bubble Dynamics

6618 **Quang Pham, Youngjoon Suh, Yoonjin Won**, University of California, Irvine, Irvine, CA, United States

The Critical Role of Dynamic Surface Wettability on Bubble Dynamics and Boiling Performance

6622 **Taylor Allred, Justin Weibel**, Purdue University, West Lafayette, IN, United States, **Suresh Garimella**, University of Vermont, Burlington, VT, United States

Fatigue Life of Sn3.0Ag0.5Cu Solder Alloys Under Combined Shear and Compressive Loads

6613 **Travis Dale, Yuvraj Singh, Ian Bernander, Ganesh Subbarayan, Carol Handwerker**, Purdue University, West Lafayette, IN, United States, **Peng Su, Bernard Glasauer**, Juniper Networks, Sunnyvale, CA, United States

Designing an Ultra-Lightweight, Compact Thermal Management System for a 6.6 kW Electric Charger with Extreme Power Density

6765 **Thomas Foulkes, Yashraj Gurumukhi, Geroge Popovic, Stephen Bosch, Ahmet Gunay**, University of Illinois at Urbana-Champaign, Urbana, IL, United States, **Zitao Liao, Derek Chou, Kelly Fernandez, Robert Pilawa-Podgurski**, University of California, Berkeley, Berkeley, CA, United States, **Nenad Miljkovic**, University of Illinois at Urbana-Champaign, Urbana, IL, United States

Mechanical Behavior of SAC Solder Joints Under Thermal Cycling Loading

6641 **Abdullah Fahim, S.M. Kamrul Hasan, Jeffrey Suhling, Pradeep Lall**, Auburn University, Auburn, AL, United States

Poster Session

6644	<p>Evolution of Cyclic Stress-Strain Behavior of Lead Free Solders Subjected to Different Test Temperature and Prior Aging</p> <p><i>Mohammad Ashraful Haq, Mohd Aminul Hoque, Jeffrey Suhling, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>	6649	<p>Effects of Aging on the Damage Accumulation in Lead Free Solders Subjected to Cyclic Loading</p> <p><i>Md. Mahmudur Chowdhury, Mohd Aminul Hoque, Jeffrey Suhling, Sa'd Hamasha, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>
6645	<p>Evolution of the Mechanical Properties of SAC and SAC+X Lead Free Solders Subjected to Shear Cycling</p> <p><i>Mohd Aminul Hoque, Md. Mahmudur Chowdhury, Jeffrey Suhling, Sa'd Hamasha, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>	6650	<p>Characterization of a Topside Cooled Epoxy-Resin Composite Dielectric (ERCD) Package for Bi-Directional Power Switch</p> <p><i>Tzu-Hsuan Cheng, Bo Gao, North Carolina State University, Raleigh, NC, United States, Kenji Nishiguchi, Risho Kogyo Co., Ltd., Tokyo, Japan, Douglas Hopkins, North Carolina State University, Raleigh, NC, United States</i></p>
6647	<p>The Poisson's Ratio of Lead Free Solder: The Often Forgotten but Important Material Property</p> <p><i>K.M. Rafidh Hassan, Mohammad S. Alam, Jeffrey Suhling, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>	6651	<p>Computational Analysis for Thermal Optimization of Server for Single-Phase Immersion Cooling</p> <p><i>Dhruvkumar Gandhi, Uschas Chowdhury, Tushar Chauhan, Pratik Bansode, Pardeep Shahi, Jimil M. Shah, Dereje Agonafer, University of Texas at Arlington, Arlington, TX, United States</i></p>
6635	<p>Stress-Induced Electric Resistance Change of Flexible Displays With Multiple-Laminations Architecture Enabled by Experimental Measurement and Simulation</p> <p><i>Chi-Wei Wang, Pei-Chen Huang, Chang-Chun Lee, National Tsing Hua University, Hsinchu City, Taiwan</i></p>	6652	<p>Foldable Thermal Ground Plane for Cooling of Foldable Smartphones</p> <p><i>Ali Nematollahisarvestani, University of Colorado Boulder, Boulder, CO, United States, Ryan Lewis, Kelvin Thermal Technologies, Lafayette, CO, United States, Yung-Cheng Lee, University of Colorado Boulder, Boulder, CO, United States</i></p>
6636	<p>Evolution of the Mechanical Properties of SAC and SAC+X Lead Free Solder Joints Subjected to Shear Cycling</p> <p><i>Mohd Aminul Hoque, Md. Mahmudur Chowdhury, Jeffrey Suhling, Sa'd Hamasha, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>	6653	<p>Artificial Neural Network Based Prediction of Control Strategies for Multiple Air Cooling Units in a Raised Floor Data Center</p> <p><i>Vibin Shalom Simon, Ashwin Siddarth, Dereje Agonafer, University of Texas at Arlington, Arlington, TX, United States</i></p>
6639	<p>Characterization and FEA Modeling of Underfilled Flip Chip Package Assemblies Using Both Viscoelastic and Elastic Material Properties</p> <p><i>Promod Chowdhury, Jeffrey Suhling, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>	6654	<p>Water Immersion Cooling of High Power Density Electronics</p> <p><i>Tarek Gebrael, University of Illinois at Urbana-Champaign, Champaign, IL, United States</i></p>
6640	<p>Evolution of the Mechanical Behavior of Lead Free Solders Exposed to Thermal Cyclic Loading</p> <p><i>S.M. Kamrul Hasan, Abdullah Fahim, Jeffrey Suhling, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>	6655	<p>Evaporation Rate Measurement at the Sub-Micron Level Using Temperature-Sensitive Fluorescence Thermometry</p> <p><i>Youngjoon Suh, Cheng-Hui Lin, Hamsa N. Gowda, Yoonjin Won, University of California, Irvine, Irvine, CA, United States</i></p>
6642	<p>Microstructural Evolution in SAC+X Solders Subjected to Aging</p> <p><i>Jing Wu, Mohammad S. Alam, Jeffrey Suhling, Pradeep Lall, Auburn University, Auburn, AL, United States</i></p>	6657	<p>Characterizing Dynamic Response of Phase Change Materials</p> <p><i>Alison Hoe, Texas A&M University, College Station, TX, United States, Michael Barako, Northrop Grumman, Manhattan Beach, CA, United States, Patrick Shamberger, Texas A&M University, College Station, TX, United States</i></p>
6643	<p>A Study on the Impact of Four-Degree Off-Axis Wafers on 4H-SiC Stress Sensors</p> <p><i>Jun Chen, Richard Jaeger, Jeffrey Suhling, Auburn University, Auburn, AL, United States</i></p>	6662	<p>Light-Weight Hybrid Cold Plates for Isothermalization of Electronics</p> <p><i>Muhammad Jahidul Hoque, Nithin Vinod Upot, Nenad Miljkovic, University of Illinois at Urbana-Champaign, Urbana, IL, United States</i></p>
6646	<p>On Temperature Discontinuity at an Evaporating Liquid-Vapor Interface</p> <p><i>Hadi Ghasemi, Parham Jafari, University of Houston, Houston, TX, United States</i></p>		
6648	<p>Local Airflow Delivery in Data Centers Using Air Dampers</p> <p><i>Ghazal Mohsenian, Sadegh Khalili, Bahgat Sammakia, Binghamton University, Binghamton, NY, United States</i></p>		

Modular Heat Sinks for Localized Thermal Management of High Gravimetric Power Density Electronics

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Muhammad Jahidul Hoque, Andrew Stillwell, Yashraj Gurumukhi, University of Illinois at Urbana-Champaign, Urbana, IL, United States, **Robert Pilawa-Podgurski**, University of California, Berkeley, Berkeley, CA, United States, **Nenad Miljkovic**, University of Illinois at Urbana-Champaign, Urbana, IL, United States

Thermal Management Approaches for Next-Generation Fast Charging of Electric Vehicles

6661

Yashraj Gurumukhi, Muhammad Jahidul Hoque, University of Illinois at Urbana-Champaign, Urbana, IL, United States, **Hansen Qiao**, Stanford University, Stanford, CA, United States, **Myung Ki Sung, Xi Lu, Ted Fillipi**, Ford Motor Company, Dearborn, MI, United States, **Andrew Alleyne**, University of Illinois, Urbana, IL, United States, **Kenneth Goodson, Mehdi Asheghi**, Stanford University, Stanford, CA, United States, **Nenad Miljkovic**, University of Illinois at Urbana-Champaign, Urbana, IL, United States

Demonstration of a Compliant Micro-Spring Array as a Thermal Interface Material for Pluggable Optoelectronic Transceiver Modules

6666

Justin Weibel, Liang Pan, Jin Cui, Purdue University, West Lafayette, IN, United States

Experimental Analysis for Optimization of Thermal Performance of a Server in Single Phase Immersion Cooling

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Pravin Shinde, Pratik Bansode, Pardeep Shahi, Rajesh Kasukurthy, Tushar Chauhan, Jimil M. Shah, Dereje Agonafer, University of Texas at Arlington, Arlington, TX, United States

Thermal Destratification of Air Streams to Improve the Cooling Provisioning of Air-Cooled Data Centers

6684

Anto Joseph Barigala Charles Paulraj, University of Texas At Arlington, Arlington, TX, United States

Development and Optimization of Control Strategy for Dynamic Cooling Technology to Save Pumping Power

6670

Amrutha Valli Rachakonda, Rajesh Kasukurthy, University of Texas at Arlington, Arlington, TX, United States

Effect of Squeezing on Thermal Conductivity of Thermal Interface Materials

6689

Rajath Kantharaj, Jackson Santana, Carl Wassgren, Aaron Morris, Amy Marconnet, Purdue University, West Lafayette, IN, United States

Generating Ultra-Packed Thermal Greases With Ellipsoidal Fillers and Evaluation of Their Effective Properties

6697

Huanyu Liao, Sukshitha Achar Puttur Lakshminarayana, Ganesh Subbarayan, Purdue University, West Lafayette, IN, United States

Numerical/Experimental Hybrid Approach to Predict Warpage of Thin Substrates

6682

Sukrut Prashant Phansalkar, Bongtae Han, University of Maryland, College Park, College Park, MD, United States

Experimental Investigation of Single-Phase Cooling in Embedded Microchannels: 3D Manifold Heat Exchanger With R245fa

6399

Ki Wook Jung, Stanford University, Stanford, CA, United States, **Feng Zhou, Ercan Dede**, Toyota Research Institute of North America, Ann Arbor, MI, United States, **Mehdi Asheghi, Kenneth Goodson**, Stanford University, Stanford, CA, United States

Effect of Nonlinear Response of Printed Circuit Boards (PCBs) Under Multiaxial Vibration Excitation

6667

Xiao Lin, Abhijit Dasgupta, University of Maryland, College Park, College Park, MD, United States, **Washington De Lima**, Honeywell, Kansas City, MO, United States

Novel Post-Process Cleaning Technique for Perfect Laser Debris Removal

6672

Sougata Hazra, Ki Wook Jung, Mehdi Asheghi, Kenneth Goodson, Stanford University, Stanford, CA, United States, **Madhusudan Iyengar**, Google LLC, Mountain View, CA, United States

Pressure-Dependent Thermal Characterization of Inverse Opal Copper Structures

6762

Cheng-Hui Lin, University of California, Irvine, Irvine, CA, United States

Condensation Heat Transfer on Superhydrophobic Hierarchical Copper Inverse Opals

6674

Jonggyu Lee, Baiheng Li, Yoonjin Won, University of California, Irvine, Irvine, CA, United States

Replication of Hairy Surface Nanostructures on Elastomer Films for Flexible Pressure Sensors

6675

Kwanoh Kim, Eunju Yeo, Yeong-Eun Yoo, Jeong Hwan Kim, Doo-Sun Choi, Jae Sung Yoon, Korea Institute of Machinery Materials, Daejeon, Korea (Republic)

Study of Hybrid Cooled Servers Using Warm Water Cooling and Comparing Distributed Pumping System With and Without Controlling Pumps

6677

Pardeep Shahi, Rajesh Kasukurthy, Dereje Agonafer, University of Texas at Arlington, Arlington, TX, United States

Reliability Evaluation of Bonded Interfaces for High-Temperature Power Electronics Packages

6678

Paul Paret, National Renewable Energy Laboratory, Golden, CO, United States, **Joshua Major**, National Renewable Energy Laboratory, Denver, CO, United States, **Douglas DeVoto, Sreekant Narumanchi**, National Renewable Energy Laboratory, Golden, CO, United States

In-Situ Service Load Monitoring of Automotive Electronic Systems Using Silicon-Based Piezoresistive Stress Sensor

6681

Yu-Hsiang Yang, Bongtae Han, University of Maryland, College Park, MD, United States

Poster Session

6686	<p>Medium to High Strain-Rate Characterization of Lead Free Solder Alloys Through Metal Cutting Experiments</p> <p><i>Yuvraj Singh, Anirudh Udupa, Srinivasan Chandrasekar, Ganesh Subbarayan, Purdue University, West Lafayette, IN, United States</i></p>	6705	<p>Flow Boiling Heat Transfer in Embedded Micro Pin Fin Arrays</p> <p><i>Daewoong Jung, Daeyoung Kong, Eunho Cho, Chung-Ang University, Seoul, Korea (Republic), Ki Wook Jung, Stanford University, Stanford, CA, United States, Madhusudan Iyengar, Chris Malone, Google LLC, Mountain View, CA, United States, Mehdi Asheghi, Kenneth Goodson, Stanford University, Stanford, CA, United States, Hyoungsoon Lee, Chung-Ang University, Seoul, Korea (Republic)</i></p>
6688	<p>Flexible High Thermal Conductivity Ultra-High Molecular Weight Polyethylene Fabrics: Fabrication and Metrology</p> <p><i>Aaditya Candadai, Emily Nadler, Jack Burke, Justin Weibel, Amy Marconnet, Purdue University, West Lafayette, IN, United States</i></p>	6706	<p>A Study on Fabrication of Molds for Microlens Array Using Arrangement of Microparticles in a Liquid Droplet</p> <p><i>Jae Sung Yoon, Eunju Yeo, Kwanoh Kim, Yeong-Eun Yoo, Doo-Sun Choi, Korea Institute of Machinery and Materials, Daejeon, Korea (Republic)</i></p>
6692	<p>Experimental Investigation of Capillary Rising in Micro Pin Fin Structures</p> <p><i>Sougata Hazra, Farid Soroush, Mehdi Asheghi, Kenneth Goodson, Stanford University, Stanford, CA, United States</i></p>	6708	<p>Full-Field Thermal Imaging of Electromigration In Aluminum Interconnects at Different Ambient Temperatures</p> <p><i>Sami Alajlouni, Purdue University, West Lafayette, IN, United States</i></p>
6695	<p>Demonstration of Two-Layer Wicks for High-Heat-Flux Dissipation in Vapor Chambers</p> <p><i>Srivathsan Sudhakar, Justin Weibel, Purdue University, West Lafayette, IN, United States, Feng Zhou, Ercan Dede, Toyota Research Institute of North America, Ann Arbor, MI, United States, Suresh Garimella, University of Vermont, Burlington, VT, United States</i></p>	6712	<p>Parametric Study of Silicon-Based Embedded Microchannels With 3D Manifold Coolers (EMMC) for High Heat FloorUX (> 1 kW/cm²) Power Electronics Cooling</p> <p><i>Ki Wook Jung, Sougata Hazra, Heungdong Kwon, Stanford University, Stanford, CA, United States, Alisha Piazza, Stanford Nanoheat Lab, Stanford, CA, United States, Edward Jih, Man Prakash Gupta, Ford Motors, Dearborn, MI, United States, Mehdi Asheghi, Stanford University, Stanford, CA, United States, Michael Degner, Ford Motors, Dearborn, MI, United States, Kenneth Goodson, Stanford University, Stanford, CA, United States</i></p>
6696	<p>Comparative Evaluation of Algorithms for Achieving Ultrapacked Thermal Greases: Microstructural Models and Effective Behavior</p> <p><i>Sukshitha Achar Puttur Lakshminarayana, Huanyu Liao, Ganesh Subbarayan, Purdue University, West Lafayette, IN, United States</i></p>	6714	<p>Estimation of Acceleration Factor for Flexible Electronic Substrates From Human Motion Measurements</p> <p><i>Tony Thomas, Pradeep Lall, Vikas Yadav, Jinesh Narangaparambil, Wei Liu, Auburn University, Auburn, AL, United States</i></p>
6698	<p>Time-Dependent Behavior of Epoxy Molding Compound Subjected to Hydrostatic Loading: Characterization and Its Effect on Reliability Assessment</p> <p><i>Hyun Seop Lee, Sukrut Prashant Phansalkar, Bongtae Han, University of Maryland, College Park, MD, United States</i></p>	6715	<p>High Strain Rate Mechanical Properties of SAC-Q With Constant High Temperature Storage at 100°C</p> <p><i>Vishal Mehta, Pradeep Lall, Jeffrey Suhling, Auburn University, Auburn, AL, United States, David Locker, U.S. Army RDECOM, Redstone Arsenal, AL, United States</i></p>
6700	<p>Effects of Cooling Architecture and PCB Layout Co-design on the Concurrent Thermal and Electrical Performance of an On-Board Electric Vehicle Charger</p> <p><i>Omri Tayyara, Kshitij Gupta, Carlos Da Silva, Miad Nasr, Amir Assadi, Olivier Trescases, Cristina H. Amon, University of Toronto, Toronto, ON, Canada</i></p>	6716	<p>Effect of Process Parameters on Aerosol Jet Printing of Multi-Layer Circuitry</p> <p><i>Kartik Goyal, Pradeep Lall, Nakul Kothari, Auburn University, Auburn, AL, United States, Benjamin Leever, Air Force Research Laboratory, Wright Patterson AFB, OH, United States, Scott Miller, NextFlex, San Jose, CA, United States</i></p>
6701	<p>Exploring the Limits of Cooling for Extreme Heat Flux Applications</p> <p><i>Qianying Wu, Stanford University, Palo Alto, CA, United States, Chi Zhang, Sougata Hazra, Mehdi Asheghi, Kenneth Goodson, Stanford University, Stanford, CA, United States</i></p>	6717	<p>Flexure and Twist Test Reliability Study of Flexible Electronics</p> <p><i>Jinesh Narangaparambil, Pradeep Lall, Auburn University, Auburn, AL, United States, Benjamin Leever, Air Force Research Laboratory, Wright Patterson AFB, OH, United States, Scott Miller, NextFlex, San Jose, CA, United States</i></p>
6704	<p>Enhanced Evaporative Cooling Using Electro-Spray of DI Water</p> <p><i>Sangwoo Jung, Yunseo Kim, Soyeon Kim, Minsung Kim, Hyoungsoon Lee, Chung-Ang University, Seoul, Korea (Republic)</i></p>		

6718 **Low Cycle Flexure Fatigue Life Prediction of Epoxy Potted PCB Interfaces Under Three Point Bending**

Kalyan Dornala, Pradeep Lall, Auburn University, Auburn, AL, United States

Evolution of Anand Parameters for Thermally Aged SAC Leadfree Solder Alloys

6719 **Vikas Yadav, Pradeep Lall, Jeffrey Suhling**, Auburn University, Auburn, AL, United States, **David Locker**, U.S. Army RDECOM, Redstone Arsenal, AL, United States

Thermo-Mechanical Degradation of Thermal Interface Materials: Accelerated Test Development and Reliability Analysis

6720 **Hayden Carlton, Dustin Pense, David Huitink**, University of Arkansas, Fayetteville, AR, United States

Packaging Environmental Sensors for an Internet-of-Things Solution for Urban-Microclimate Studies

6721 **Shuv Dey, Yogendra Joshi**, Georgia Institute of Technology, Atlanta, GA, United States, **J. Michael Brown**, Manufacturing Resources International, Alpharetta, GA, United States

A Numerical Investigation of Additive Manufactured Foam Structures for Single Phase Hotspot Thermal Management

6722 **Justin Broughton, Yogendra Joshi**, Georgia Institute of Technology, Atlanta, GA, United States

Comparative CFD Analysis of the Effect of Air and Liquid Cooling on the Form Factor of Gpu Server

6723 **Ankit Sutaria, Uschas Chowdhury, Rajesh Kasukurthy, Dereje Agonafer**, University of Texas at Arlington, Arlington, TX, United States

Comparative Rack Level CFD Analysis of Air to Hybrid Cooling

6724 **Jay Parekh, Uschas Chowdhury, Dereje Agonafer**, University of Texas at Arlington, Arlington, TX, United States

Simplified Fabrication and Integration of Optical Fiber Sensor for Bio-Reactor Monitoring

6726 **Shubhodeep Goswami, Baokai Cheng, W.A. Challener**, General Electric Company, Niskayuna, NY, United States

Effect of Inclination of Drop on Surface Mount Electronics Under High G Shock Conditions

6727 **Aathi Raja Ram Pandurangan, Venkata Kalyan Reddy Dornala, Pradeep Lall, Jeffrey Suhling**, Auburn University, Auburn, AL, United States, **John Deep**, Air Force Research Laboratory, Eglin AFB, AL, United States, **Ryan Lowe**, ARA Associates, Littleton, CO, United States

Evaluation of Thermal and Electrical Properties of Nano-Enhanced PCM for Usage in High-Voltage Systems

6732 **Ange-Christian Iradukunda, Josh Kasitz, Fernando Moreno, David Huitink**, University of Arkansas, Fayetteville, AR, United States

Pressure and Temperature in Simulations of Large-Footprint Manifold-Microchannel Cooling Devices

6729 **Alisha Piazza**, Stanford Nanoheat Lab, Stanford, CA, United States, **Sougata Hazra, Ki Wook Jung, Mehdi Asheghi, Ken-neth Goodson**, Stanford University, Stanford, CA, United States

System-level Thermal Management and Reliability of Automotive Electronics: Goals and Opportunities in the Next Generation of Electric and Hybrid Electric Vehicles

6730 **Bakhtiyar Mohammad Nafis, Ange-Christian Iradukunda, Imam Al Razi, David Huitink, Yarui Peng**, University of Arkansas, Fayetteville, AR, United States

Capillary Evaporation in Graphene Coated Nanochannels

6734 **Masoumeh Nazari**, University of Houston, Houston, TX, United States

Performance Analysis and Shape Optimization of Manifold in Liquid-Cooled Parallel Micro-Channel Heat Sinks

6741 **Yaser Hadad, Bahgat Sammakia, Bharath Ramakrishnan**, Binghamton University, Binghamton, NY, United States, **Paul R. Chiarot**, State University of New York at Binghamton, Binghamton, NY, United States

Advanced Packaging and Thermal Management of High-Power DC-DC Converters

6753 **Sevket Umut Yuruker, Raphael Mandel, Patrick McCluskey, Michael Ohadi, Shiladri Chakraborty, Yongwan Park, He Yun, Alireza Khaligh**, University of Maryland, College Park, College Park, MD, United States, **Lauren M. Boteler**, U.S. Army Research Laboratory, Highland, MD, United States, **Miguel Hinojosa**, U.S. Army Research Laboratory, Adelphi, MD, United States

Power Delivery and Thermal Management for the Silicon Interconnect Fabric

6754 **Ujash Shah, Timothy Fisher, Umesha Mogera, Boris Vaisband, Pranav Ambhore, Subramanian Iyer**, University of California, Los Angeles, Los Angeles, CA, United States

Effect of Shallow Charging on Flexible Lithium Ion Battery Capacity Subjected to Differing C-Rates and Various Temperatures

6736 **Ved Soni, Pradeep Lall**, Auburn University, Auburn, AL, United States, **Benjamin Leever**, Air Force Research Laboratory, Wright Patterson AFB, OH, United States, **Scott Miller**, Next-Flex, San Jose, CA, United States

High Brightness White Laser Module Enabling Gbps Li-Fi Link for High-Speed Visible Light Communications

6737 **Chao Shen**, SaNoor Technologies, Thuwal, Saudi Arabia, **Hala H. Al-Hashim**, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia, **Jie Hu**, SaNoor Technologies, Thuwal, Saudi Arabia, **Boon S. Ooi**, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

Technical Sessions

MONDAY, OCTOBER 7

	8:00AM	8:20AM	8:40AM	9:00AM
1-7: Design and Characterization II Fourth Floor, Huntington A Session Organizers: Shankar Narayanan , <i>Rensselaer Polytechnic Institute</i> , Shima Hajimirza , <i>Texas A&M University</i>	Fatigue Life of Sn3.0Ag0.5Cu Solder Alloys Under Combined Shear and Compressive Loads (6507) Paper Publication Travis Dale , <i>Yuvraj Singh</i> , <i>Ian Bernander</i> , <i>Ganesh Subbarayan</i> , <i>Carol Handwerker</i> , <i>Purdue University</i> , Peng Su , <i>Bernard Glasauer</i> , <i>Juniper Networks</i>	Strain Distribution in a Small Solder Specimen With Few Crystal Grains (6546) Presentation Only Toru Ikeda , <i>Takumi Sasaki</i> , <i>Atushi Yanase</i> , <i>Kagoshima University</i> , Dai Okumura , <i>Nagoya University</i> , Yoshiharu Kariya , <i>Shibaura Institute of Technology</i> , Masaaki Koganemaru , <i>Kagoshima University</i>	Medium to High Strain-Rate Characterization of Lead-Free Solder Alloys Through Metal Cutting Experiments (6510) Paper Publication Yuvraj Singh , <i>Anirudh Udupa</i> , <i>Srinivasan Chandrasekar</i> , <i>Ganesh Subbarayan</i> , <i>Purdue University</i>	
2-1: Data Center Cooling I Fourth Floor, Huntington B Session Organizers: Cheng Chen , <i>Prakriti Choudhary</i> , <i>Facebook</i> , Brent Goren , <i>Eaton</i>	Dynamic Control of Airflow Balance in Data Centers (6304) Paper Publication Stephen Linder , <i>Jim VanGilder</i> , <i>Yan Zhang</i> , <i>Schneider-Electric</i> , Enda Barrett , <i>National University of Ireland Galway</i>	Thermal Profiling of a Small Operational Data Center (6309) Paper Publication Ismail Turkmen , <i>Cem Ahmet Mercan</i> , <i>Hamza Salih Erden</i> , <i>Istanbul Technical University</i>	Feedback Control System for Airflow Management in Data Centers Using Active Air Dampers (6430) Presentation Only Ghazal Mohsenian , <i>Sadegh Khalili</i> , <i>Bahgat Sammakia</i> , <i>Binghamton University</i>	Thermal Challenges in Servers (6532) Presentation Only Timothy Chainer , <i>Mark Schultz</i> , <i>Pritish Parida</i> , <i>IBM</i>
5-1: DUV-LED I Fourth Floor, Huntington C Session Organizers: Yuji Zhao , <i>Arizona State University</i> , Jonathan Klamkin , <i>University of California, Santa Barbara</i>	AlGaIn Nanowire Light Emitting Diodes on Metal Substrates (6322) Presentation Only Haiding Sun , <i>University of Science and Technology of China</i>	Large Roll Hexagonal BN Monolayer: Synthesis, Modulation Doping, and 2D Emitter (6326) Presentation Only Duanjun Cai , <i>Guozhen Liu</i> , <i>Yuejin Wang</i> , <i>Xiamen University</i>	Polarization Engineering of III-Nitride Photonic Devices (6370) Presentation Only Cheng Liu , <i>Jing Zhang</i> , <i>Rochester Institute of Technology</i>	Recent Progress on the Development of III-Nitride Based DUV Light-Emitting Diodes and Micro-/Nano-Structured Light Emitting Diodes (6310) Presentation Only Zi-Hui Zhang , <i>Yonghui Zhang</i> , <i>Kangkai Tian</i> , <i>Chunshuang Chu</i> , <i>Jiamang Che</i> , <i>Hua Shao</i> , <i>Jianquan Kou</i> , <i>Xu Hou</i> , <i>Hebei University of Technology</i>
6-1: Wide Bandgap Materials, Devices, and Circuits Fourth Floor, Palos Verdes A Session Organizers: Jae-Hyun Ryou , <i>University of Houston</i> , Richard Thomas , <i>U.S. Army Research Laboratory</i> , Anil Yuksel , <i>IBM</i>	Radiation Effects on the Self-Heating of AlGaIn/GaN HEMTs (6438) Presentation Only Bikramjit Chatterjee , <i>Yiwen Song</i> , <i>Brian Foley</i> , <i>Pennsylvania State University</i> , Hyungtak Kim , <i>Hongik University</i> , Sukwon Choi , <i>Pennsylvania State University</i>	Piezoresistive Theory for 4H Silicon Carbide Stress Sensors on Four-Degree Off-Axis Wafers (6461) Paper Publication Jun Chen , <i>Richard Jaeger</i> , <i>Jeffrey Suhling</i> , <i>Auburn University</i>	The Doping Dependence of the Thermal Conductivity of Bulk Gallium Nitride Synthesized via Diverse Growth Techniques (6528) Presentation Only Yiwen Song , <i>Bikramjit Chatterjee</i> , <i>Pennsylvania State University</i> , Brian Foley , <i>Pennsylvania State University</i> , WeiJie Wang , <i>Jae-Hyun Ryou</i> , <i>University of Houston</i> , Sukwon Choi , <i>Pennsylvania State University</i> , Jacob Leach , <i>Kyma Technologies</i> , Srabanti Chowdhury , <i>Stanford University</i>	Design, Analysis, and Comparison of Insulated Metal Substrates for High Power Wide-Bandgap Power Modules (6436) Paper Publication Emre Gurpınar , <i>Burak Ozpineci</i> , Shajjad Chodhury , <i>Oak Ridge National Laboratory</i>
8-2: Electric/Hybrid Cars Fourth Floor, Palos Verdes B Session Organizers: Azeem Sarwar , <i>General Motors</i> , Przemyslaw Jakub Gromala , <i>Bosch</i>	System-level Thermal Management and Reliability of Automotive Electronics: Goals and Opportunities in the Next Generation of Electric and Hybrid Electric Vehicles (6429) Paper Publication Bakhtiyar Mohammad Nafis , <i>David Huitink</i> , <i>Ange-Christian Iradukunda</i> , <i>Yarui Peng</i> , <i>Imam Al Razi</i> , <i>University of Arkansas</i>	Experimentation and Simulation of Jet Impingement Cooling of Electric Machines With Automatic Transmission Fluid (6445) Presentation Only Xuhui Feng , <i>Kevin Bennion</i> , <i>J. Emily Cousineau</i> , <i>Gilberto Moreno</i> , <i>Bidzina Kekelia</i> , <i>Sreekant Narumanchi</i> , <i>Jeff Tomerlin</i> , <i>National Renewable Energy Laboratory</i>	Thermal Management of Fast Charging Systems for Electrified Vehicles (6660) Presentation Only Yashraj Gurumukhi , <i>Muhammad Jahidul Hoque</i> , <i>University of Illinois at Urbana-Champaign</i> , Hansen Qiao , <i>Stanford University</i> , Myung Ki Sung , <i>Xi Lu</i> , <i>Ted Fillipi</i> , <i>Ford Motor Company</i> , Andrew Alleyne , <i>University of Illinois</i> , Kenneth Goodson , <i>Mehdi Asheghi</i> , <i>Stanford University</i> , Nenad Miljkovic , <i>University of Illinois at Urbana-Champaign</i>	Surface Temperature Effect on Convective Heat Transfer Coefficients for Jet Impingement Cooling of Electric Machines With Automatic Transmission Fluid (6457) Paper Publication Bidzina Kekelia , <i>Kevin Bennion</i> , <i>Xuhui Feng</i> , <i>Gilberto Moreno</i> , <i>J. Emily Cousineau</i> , <i>Sreekant Narumanchi</i> , Jeff Tomerlin , <i>National Renewable Energy Laboratory</i>

	10:45AM	11:05AM	11:25AM	11:45AM
1-3: Microfabrication Fourth Floor, Huntington A Session Organizers: Tuhin Sinha , IBM, Shima Hajimirza , Texas A&M University	CFD Analysis of Molten Solder Flow Behavior and Bridging Mechanism During Solder Bump Formation (6395) Paper Publication Risa Miyazawa , Keishi Okamoto, Hiroyuki Mori, IBM	Numerical/Experimental Hybrid Approach to Predict Warpage of Thin Substrates (6420) Presentation Only Sukrut Prashant Phansalkar , Bongtae Han , University of Maryland, Jongkeun Moon , Samsung Electronics	Addressing the Challenges in Laser Micro-Machining and Bonding of Silicon Microchannel Cold-Plate and 3D-Manifold for Embedded Cooling Applications: Perfect Debris Removal (6539) Paper Publication Sougata Hazra , Ki Wook Jung, Stanford University, Madhusudan Iyengar , Chris Malone , Google, LLC, Mehdi Asheghi , Kenneth Goodson , Stanford University	
2-2: Two Phase Cooling I Fourth Floor, Huntington B Session Organizers: Emad A. Posh-tan , Bosch, Mark Schultz , IBM	An Experimental Investigation on the Fluid Distribution in a Two-Phase Cooled Rack Under Steady and Transient IT Load (6463) Paper Publication Sadegh Khalili , State University of New York at Binghamton, Srikanth Rangarajan , Bahgat Sammakia , Binghamton University, Vadim Gektin , Futurewei Technologies		Design of Passive Two-Phase Thermosyphons for Server Cooling (6386) Paper Publication Raffaele L. Amalfi , Nokia Bell Labs, Jackson B. Marcinichen , JJ Cooling Innovation, John R. Thome , Ecole Polytechnique Federale de Lausanne, Filippo F. Cataldo , Provides Metalmeccanica S.r.l.	
5-2: DUV-LED II Fourth Floor, Huntington C Session Organizers: Zi-Hui Zhang , Hebei University of Technology, Haiding Sun , University of Science and Technology of China	III-Nitride UV-Visible Integrated Photonics for Quantum and Biomedical Applications (6323) Presentation Only Yuji Zhao , Arizona State University	Improvement of DUV LEDs Light Extraction Efficiency by Novel Microstructures (6340) Presentation Only Changqing Chen , Shuang Zhang , Shuai Wang , Jun Zhang , Hanling Long , Qian Chen , Jiangnan Dai , Huazhong University of Science and Technology	Strain Effect on AlGaN Anisotropic Ultraviolet Light Emitting Characteristic (6341) Presentation Only Hanling Long , Linlin Xu , Jiangnan Dai , Changqing Chen , Huazhong University of Science and Technology	Photonic Engineering in AlGaN-Based Deep Ultraviolet Devices: Symmetry, Strain and Polarization (6357) Presentation Only Shiqiang Lu , Wei Lin , Shuping Li , Junyong Kang , Duanjun Cai , Xiamen University
6-2: Ultra-Wide Bandgap Gallium Oxide Electronics Fourth Floor, Palos Verdes A Session Organizers: Jungwan Cho , Kyunghee University, Mandar Kulkarni , Amazon	Electrothermal Modeling and Analysis of Gallium Oxide Power Switching Devices (6453) Paper Publication Ramchandra Kotecha , Andriy Zakutayev , Wyatt Metzger , Paul Paret , Gilbert Moreno , Bidzina Kekelia , Kevin Bennion , Barry Mather , Sreekant Narumanchi , National Renewable Energy Laboratory, Samuel Kim , Samuel Graham , Georgia Tech	Thermal Management of Beta-Ga₂O₃ Transistors (6728) Presentation Only Samuel Kim , Chao Yuan , Jingjing Shi , Samuel Graham , Georgia Tech	Thermal Management of Gallium Oxide Electronics via Hetero-Integration on High Thermal Conductivity Substrates (6439) Presentation Only Bikramjit Chatterjee , Pennsylvania State University, Craig McGray , Modern Microsystems, Inc., Jacob Leach , Kyma Technologies, Inc., Yiwen Song , Zahabul Islam , Aman Haque , Brian Foley , Sukwon Choi , Pennsylvania State University	Surface-Pretreatment-Dependent High Thermal Boundary Conductance Across Heterogeneous Atomic-Layer-Deposited Ga₂O₃-Diamond Interfaces (6608) Presentation Only Zhe Cheng , Georgia Institute of Technology, Virginia Wheeler , Marko Tadjer , Karl Hobart , U.S. Naval Research Laboratory, Jingjing Shi , Georgia Institute of Technology, Tingyu Bai , University of California, Los Angeles, Luke Yates , Georgia Institute of Technology, Mark Goorsky , University of California, Los Angeles, Samuel Graham , Georgia Institute of Technology
7-9: Challenges and Opportunities in Thermal Management of Components and Systems Fourth Floor, Palos Verdes B Session Organizers: Aritra Sur , United Technologies Research Center, Ayyoub Momem , Oak Ridge National Laboratory	Challenges and Opportunities in Thermal Management of Direct-ed Energy Systems (6625) Technical Presentation Only Avram Bar-Cohen , DARPA, Terry G. DuBois , U.S. Army Futures Command		Measuring Junction Temperature of LEDs: Challenges and Opportunities (6776) Technical Presentation Only Mehmet Arik , Ozyegin University	
8-4: Material Modeling for Automotive Packaging I Fourth Floor, Redondo Session Organizers: Xuhui Feng , National Renewable Energy Laboratory, Klas Brinkfeldt , RISE IVF	Study of Thermal Aging Behavior of Epoxy Molding Compound for Applications in Harsh Environments (6506) Presentation Only Przemysław Jakub Gromala , Adwait Inamdar , Alexandru Prisacaru , Bosch , Bongtae Han , University of Maryland	Fatigue Delamination Crack Growth of Potting Compounds in PCB/Epoxy Interfaces Under Flexure Loading (6572) Paper Publication Pradeep Lall , Kalyan Dornala , Jeffrey Suhling , Auburn University, John Deep , U.S. Air Force Research Laboratory, Ryan Lowe , ARA Associates	Moisture Transport Through Housing Materials Enclosing Critical Automotive Electronics (6621) Presentation Only Artur Roman , Bongtae Han , University of Maryland	Evolution of the Microstructure of Lead Free Solders Subjected to Both Aging and Cyclic Loading (6560) Paper Publication Md. Mahmudur Chowdhury , Mohd Aminul Hoque , Jeffrey Suhling , Sa'd Hamasha , Pradeep Lall , Auburn University

Technical Sessions

MONDAY, OCTOBER 7

	1:45PM	2:05PM	2:25PM	2:45PM
1-4: Fundamentals of Thermal Transport Fourth Floor, Huntington A Session Organizers: Nirup Nagabandi , <i>Incendium Technologies</i> , Yuling Niu , <i>Binghamton University</i>	Boiling Heat Transfer Using Spatially-Variant and Uniform Microporous Coatings (6307) Paper Publication Quang Pham , <i>Youngjoon Suh</i> , Bowen Shao , <i>Yoonjin Won</i> , <i>University of California, Irvine</i>	Effect of Inclined Angle of Heat Sink on Natural Convective Heat Dissipation Performance (6313) Paper Publication Tengfei Ma , <i>Wen Wang</i> , <i>Shanghai Jiao Tong University</i>	Ultrahigh Thermal Boundary Conductance Across GaN-SiC Heterogeneous Interfaces by Surface Activated Bonding (6607) Presentation Only Zhe Cheng , <i>Georgia Institute of Technology</i> , Fengwen Mu , <i>Tadatomo Suga</i> , <i>University of Tokyo</i> , Samuel Graham , <i>Georgia Institute of Technology</i>	Demonstration of 150-micron Ultrathin Vapor Chambers for 5G Smartphones (6683) Presentation Only Ryan Lewis , <i>Kelvin Thermal Technologies</i> , Yung Cheng Lee , <i>University of Colorado, Boulder</i>
2-3: Two Phase Cooling II Fourth Floor, Huntington B Session Organizers: Emad Poshtan , <i>Bosch</i> , Mark Schultz , <i>IBM</i>	The Critical Role of Dynamic Surface Wettability on Bubble Dynamics and Boiling Performance (6308) Presentation Only Taylor Allred , <i>Justin Weibel</i> , <i>Purdue University</i> , Suresh Garimella , <i>University of Vermont</i>	On Temperature Discontinuity at an Evaporating Liquid-Vapor Interface (6346) Presentation Only Parham Jafari , <i>Hadi Ghasemi</i> , <i>University of Houston</i>	Capillary Evaporation in Graphene-Coated Nanochannels (6428) Presentation Only Hadi Ghasemi , <i>Masoumeh Nazari</i> , <i>University of Houston</i>	Enabling Thermal Management of High-Powered Server Processors Using Passive Thermosiphon Heat Sink (6530) Paper Publication Devdatta Kulkarni , <i>Priyanka Tunuguntla</i> , <i>Guixiang Tan</i> , <i>Casey Carte</i> , <i>Intel</i>
5-3: Integrated Photonics and Wide Bandgap Photonics Fourth Floor, Huntington C Session Organizers: Jing Zhang , <i>Rochester Institute of Technology</i> , Bin Liu , <i>Nanjing University</i>	On-Chip Detection From Directly Modulated Quantum Dot Microring Lasers on Si (6352) Presentation Only Yating Wan , <i>University of California, Santa Barbara</i>	High-Gain Solid-State Photomultiplier Based on Periodic GaN/AlN Hetero-Structures (6371) Presentation Only Lai Wang , <i>Xingzhao Wu</i> , <i>Tsinghua University</i> , Julien Brault , <i>Mohamed Al Khalfioui</i> , <i>Maud Nemoz</i> , <i>CNRS</i> , Zhibiao Hao , <i>Yi Luo</i> , <i>Changzheng Sun</i> , <i>Bing Xiong</i> , <i>YanJun Han</i> , <i>Jian Wang</i> , <i>Hongtao Li</i> , <i>Tsinghua University</i>	Laser Integration Technologies for Silicon Photonics (6610) Presentation Only Jonathan Klamkin , <i>University of California, Santa Barbara</i>	Improving Performance and Reliability of GaN-Based Flip-Chip Light Emitting Diodes by Reflective Bonding Pads (6337) Presentation Only Linlin Xu , <i>Hanling Long</i> , <i>Jiangnan Dai</i> , <i>Changqing Chen</i> , <i>Huazhong University of Science and Technology</i>
6-3: Device Thermal Management and Reliability Fourth Floor, Palos Verdes A Session Organizers: Shubhodeep Goswami , <i>General Electric</i> , Lauren Kegley , <i>Cree Wolfspeed</i>	Degradation Modeling and Reliability Assessment of Capacitors (6456) Paper Publication Anunay Gupta , <i>Om Prakash Yadav</i> , <i>Arighna Roy</i> , <i>North Dakota State University</i> , Douglas DeVoto , <i>Joshua Major</i> , <i>National Renewable Energy Laboratory</i>	Thermal Assessment and In-Situ Monitoring of Insulated Gate Bipolar Transistors in Power Electronic Modules (6470) Paper Publication Erick Gutierrez , <i>Kevin Lin</i> , <i>University of Maryland</i> , Douglas DeVoto , <i>National Renewable Energy Laboratory</i> , Patrick McCluskey , <i>University of Maryland</i>	The Effect of Anisotropy on Thermal Boundary Conductance at Metal-Semiconductor Interface (6748) Presentation Only Jingjing Shi , <i>Zhe Cheng</i> , <i>Chao Yuan</i> , <i>Samuel Graham</i> , <i>Georgia Tech</i>	Integrated Optical Probing of the Thermal Dynamics of Wide Bandgap Power Electronics (6440) Paper Publication James Spencer Lundh , <i>Yiwen Song</i> , <i>Bikramjit Chatterjee</i> , <i>Pennsylvania State University</i> , Albert G. Baca , <i>Robert J. Kaplar</i> , <i>Andrew M. Armstrong</i> , <i>Andrew A. Allerman</i> , <i>Sandia National Laboratories</i> , Hyungtak Kim , <i>Hongik University</i> , Sukwon Choi , <i>Pennsylvania State University</i>
8-6: Prognostics and Health Management of Automotive Electronics Fourth Floor, Palos Verdes B Session Organizers: Przemyslaw Jakub Gromala , <i>Bosch</i> , Bongtae Han , <i>University of Maryland</i>	Silicon-Based Piezoresistive Stress Sensor as a Load Counter for Automotive Electronic Systems (6419) Presentation Only Yu-Hsiang Yang , <i>Bongtae Han</i> , <i>University of Maryland</i>	Data-Driven Approaches for Fault Prognosis of SiC MOSFETs (6524) Presentation Only WeiQiang Chen , <i>Lingyi Zhang</i> , <i>Ali Bazzi</i> , <i>Krishna Pattipati</i> , <i>University of Connecticut</i> , Shalesh Joshi , <i>Ercan Dede</i> , <i>Toyota</i>	Prognostication of Failure in Packaged Power Devices for Automotive Applications (6487) Presentation Only Andreas Löwberg , <i>Klas Brinkfeldt</i> , <i>Jerry Börjesson</i> , <i>Dag Andersson</i> , <i>RISE IVF</i>	Stator Diagnosis in Permanent Magnet Synchronous Motor (6423) Paper Publication Madi Zholbaryssov , <i>University of Illinois at Urbana-Champaign</i> , Azeem Sarwar , <i>General Motors</i>

	3:30PM	3:50PM	4:10PM	4:30PM
1-5: Design and Characterization I Fourth Floor, Huntington A Session Organizers: Sandeep Mallampati , <i>Global Foundries</i> , Fabian Welschinger , <i>Bosch</i>	The Assembly Solutions for Heterogeneous Integration Packaging Technology for High Performance Computing (6450) Presentation Only Bo-Hao Ma , Chich Sheng Lin , Nicholas Kao , Daniel Ng , Yu Po Wang , <i>Siliconware Precision Industries</i>	Effect of Nonlinear Response of Printed Circuit Boards (PCBs) Under Multiaxial Vibration Excitation (6369) Presentation Only Abhijit Dasgupta , <i>University of Maryland</i>	Time-Dependent Behavior of Epoxy Molding Compound Subjected to Hydrostatic Loading: Characterization and Its Effect on Reliability Assessment (6441) Presentation Only Hyun Seop Lee , Sukrut Prashant Phansalkar , Bongtae Han , <i>University of Maryland</i>	Design-for-Reliability of Solder Joint Interconnections in Aerospace Electronics (6318) Presentation Only Ephraim Suhir , <i>Portland State University</i>
2-4: Fundamental Cooling Technologies Fourth Floor, Huntington B Session Organizers: Jimil M. Shah , <i>University of Texas at Arlington</i> , Pavan Rajmane , <i>Qualcomm</i> , Sterve Moon , <i>3M</i>	Demonstration of a Compliant Micro-Spring Array as a Thermal Interface Material for Pluggable Optoelectronic Transceiver Modules (6389) Paper Publication Jin Cui , Liang Pan , Justin Weibel , <i>Purdue University</i>	Investigation Regarding Transient Compact Thermal Model for Microprocessor Packages (6390) Paper Publication Koji Nishi , <i>Japan/Ashikaga University</i>	Thermal and Mechanical Design of the Fastest Supercomputer of the World in Cognitive Systems: IBM POWER AC 922 (6444) Paper Publication Anil Yuksel , Vic Mahaney , Chris Marroquin , Shurong Tian , Mark Hoffmeyer , Mark Schultz , Todd Takken , <i>IBM Corporation</i>	Comparative Evaluation of Algorithms for Achieving Ultrapacked Thermal Greases: Microstructural Models and Effective Behavior (6501) Paper Publication Sukshitha Achar , Puttur Lakshminarayana , Huan Yu Liao , Ganesh Subbarayan , <i>Purdue University</i>
5-4: Nanostructures/ Flexible Materials and Devices Fourth Floor, Huntington C Session Organizers: Junyou Pan , <i>Guangzhou ChinaRay Optoelectronic Materials</i> , Klaus Müllen , <i>Max-Planck Institute for Polymer Research</i>	Barcode-Like Security Labels Based on Flexible and Ultra-Lightweight Polymer Membrane Lasers (6431) Presentation Only Malte Gather , <i>University of St. Andrews</i>	Near-Field Infrared Imaging of Hot Electrons in Nano-Devices (6330) Presentation Only Zhenghua An , <i>Fudan University</i>	Design of Diffractive Beam Splitters by Indirect Construction of Diffraction Pattern Based on Sampling Theory (6338) Presentation Only Hui Xiong , <i>Hubei University</i>	Direct Ink Printing of Cavities in DPC Ceramic Substrates With Kaolin Pastes for Hermetic Packaging (6616) Paper Publication Qinglei Sun , Yang Peng , Hwo Cheng , Yun Mou , Mingxiang Chen , <i>Huazhong University of Science and Technology</i>
6-7: Two-Phase Cooling Fourth Floor, Palos Verdes B Session Organizers: Ruander Cardenas , <i>Intel</i> , Franklin Robinson , <i>NASA Goddard Space Flight Center</i>	Two-Phase Immersion Cooling of a SiC on-Vehicle Inverter by Self-Cooling Effect Using Lotus Porous Coppers (6494) Presentation Only Tsuji Rikako , Kazuhisa Yuki , Kio Takai , Risako Kibushi , Noriyuki Unno , <i>Sanyo-Onoda City University</i> , Takuya Ide , Tetsuro Ogushi , Masaaki Murakami , Tomiyuki Numata , <i>Lotus Thermal Solution</i> , Hikaru Nomura , <i>Osaka University</i>	Gravity Effects in Two-Phase Microgap Flow (6745) Presentation Only Franklin Robinson , <i>NASA Goddard Space Flight Center</i> , Avram Bar-Cohen , <i>University of Maryland</i>	Moving Boundary Model for Dynamic Control of Two Micro-channel Evaporator Cooling System (6760) Presentation Only Qi Jin , John T. Wen , Shankar Narayanan , <i>Rensselaer Polytechnic Institute</i>	Assessing the Performance of Advanced Cooling Techniques on Thermal Management of Next-Generation Power Electronics (6311) Paper Publication Palash Acharya , Vaibhav Bahadur , Robert Hebner , Abdelhamid Ouroua , Shannon Strank , <i>University of Texas at Austin</i>
7-4: Solid-State Cooling Fourth Floor, Palos Verdes A Session Organizers: Michael Benedict , <i>Palo Alto Research Center</i> , Aritra Sur , <i>United Technologies Research Center</i>	Performance of an Electrocaloric Heat Pump Device (6558) Presentation Only Subramanyaravi Annapragada , Aritra Sur , Joseph Mantese , William Rioux , <i>United Technologies Research Center</i>	Magnetocaloric Refrigeration (6623) Presentation Only Ayyoub Momem , <i>Oak Ridge National Laboratory</i>		

Technical Sessions

TUESDAY, OCTOBER 8

	8:00AM	8:20AM	8:40AM	9:00AM
2-5: Data Center Cooling II Fourth Floor, Huntington A Session Organizers: Prakriti Choudhary, Cheng Chen, Facebook, Brent Goren, Eaton	Optimal Design and Modeling of Server Cabinets With In-Row Coolers and Air Conditioning Units in a Modular Data Center (6522) Paper Publication Uschas Chowdhury, University of Texas at Arlington, Mark Hendrix, Thomas Craft, Willis James, CommScope Inc., Ankit Sutaria, Dereje Agonafer, University of Texas at Arlington	Comparison of Data Driven Modeling Approaches for Temperature Prediction in Data Centers (6565) Presentation Only Jayati Athavale, Facebook, Yogendra Joshi, Minami Yoda, Georgia Tech	Data Center Thermal Efficiency Improvement by Cooling Flow Vectoring Using Synthetic Jets (6585) Paper Publication Eduardo Sepúlveda Jiménez, Jean Paul D'alencón, Luis Silva-Lianca, Universidad de La Serena	Development of a Technique to Measure Deliquescent Relative Humidity of Particulate Contaminants and Determination of the Operating Relative Humidity of a Data Center (6601) Paper Publication Jimil M. Shah, Roshan Anand, Satyam Saini, Rawhan Cyriac, Dereje Agonafer, University of Texas at Arlington, Prabjit Singh, IBM, Mike Kaler, Mestek
4-1: Design & Modeling for Flexible Electronics Fourth Floor, Huntington B Session Organizers: Philip Buskohl, U.S. Air Force Research Laboratory, Tsung-Ching Jim Huang, Hewlett Packard Labs	Mechanical and Electrical Modeling and Characterization of Flexible Printed Electronic Elements (6498) Presentation Only Rui Chen, Yi Zhou, Sridhar Sivapurapu, Nahid A. Amoli, Mohamed Bellaredj, Justin Chow, Georgia Institute of Technology, Tsung-Ching Jim Huang, Hewlett Packard Labs, Madhavan Swaminathan, Suresh Sitaraman, Georgia Institute of Technology	Design Tools and FHE Materials for Physically Reconfigurable RF Platforms (6750) Presentation Only Philip Buskohl, Air Force Research Laboratory	Bounding the Problem (6764) Presentation Only James Chew, Cadence Design Systems	Applying Multi-Physics Analysis and Data Analytics for IIoT Applications With FHE (6755) Invited Presentation Norman Chang, ANSYS
5-5: Visible LED and its Applications Fourth Floor, Huntington C Session Organizers: Changqing Chen, Huazhong University of Science and Technology, Lai Wang, Tsinghua University	Red InGaN LEDs Grown by Micro-Flow Channel MOVPE (6362) Presentation Only Kazuhiro Ohkawa, Daisuke Iida, King Abdullah University of Science and Technology	Hybrid Nitride-Based Micro/Nano-LEDs With Quantum Dots for High Performance RGB/White Emissions (6406) Presentation Only Bin Liu, Nanjing University	GaN White Lasers and III-Nitride Integrated Photonics for Visible Light Communications (6488) Presentation Only Chao Shen, SaNaor Technologies	Making a Viable Electronic or a Photonic Device Into a Reliable Product: Application of the Probabilistic Design for Reliability Concept (6301) Presentation Only Ephraim Suhir, Portland State University
6-6: Power Electronics Packaging Reliability Fourth Floor, Palos Verdes A Session Organizers: Fang Luo, University of Arkansas, Pedro Quintero, University of Puerto Rico at Mayaguez	Numerical Investigation on Electromigration Oriented Failure of Lead-Free Solder Joints With Aging Effects (6521) Paper Publication Tusher Ahmed, Mohammad Motalab, Bangladesh University of Engineering and Technology, Jeffrey Suhling, Auburn University	Analysis of Thermal Stress in High Temperature Transient Liquid Phase Bonding of Power Electronics (6525) Presentation Only Yanghe Liu, Toyota Research Institute of North America, Shailesh N. Joshi, Toyota Motor North America, Ercan Dede, Toyota Research Institute of North America	A Reliability Study of Silicon Carbide Power Modules Using POL-kW Packaging Technology (6531) Presentation Only Liang Yin, Christopher Kapusta, Arun Gowda, David Esler, Kaustubh Nagarkar, GE Global Research Center, Risto Tuominen, GE Ventures, Richard Eddins, Liqiang Yang, Robert George, GE Aviation	Thermomechanical Stress and Warpage Augmentation Using Auxetic Features in Electronic Design (6424) Paper Publication Mahsa Montazeri, John Harris, David Huitink, Adithya Venkatanarayanan, Simon Ang, University of Arkansas
7-2: Thermal Management Optimization Strategies Fourth Floor, Palos Verdes B Session Organizers: Menglong Hao, University of California, Berkeley, Sean Lubner, Lawrence Berkeley National Laboratory	A Statistical Study to Evaluate the Performance of Liquid Cooling Garments Considering Thermal Comfort (6325) Paper Publication Weicheng Shu, Jiawen Wang, Xinfeng Zhang, Xiaobing Luo, Huazhong University of Science and Technology	Analysis of Channel Layout of a Pulsating Heat Pipe using Topology Optimization (6360) Presentation Only Jonghyun Lim, Sung Jin Kim, Korea Advanced Institute of Science and Technology	Development and Optimization of Control Strategy for a Dynamic Cold Plate to Save Pumping Power and Increase the Reliability (6536) Presentation Only Rajesh Kasukurthy, Amrutha Valli Rachakonda, Dereje Agonafer, University of Texas at Arlington	Thermal Management of a Highly Optimized Power Dense Non-Rare Earth Permanent Magnet Based Electric Traction Motor (6566) Presentation Only Aritra Sur, Zhentao Du, Robert H. Dold, Jagadeesh K. Tangudu, United Technologies Research Center

	10:45AM	11:05AM	11:25AM	11:45AM
2-6: Immersion Cooling I Fourth Floor, Huntington A Session Organizers: Nikhil Lakhkar , Emerson Climate Technologies, Steve Moon , 3M	Experimental Analysis for Optimization of Thermal Performance of a Server in Single Phase Immersion Cooling (6590) Paper Publication Pravin Shinde, Pratik Bansode, Satyam Saini, Rajesh Kasukurthy, Tushar Chauhan, Jimil M. Shah, Dereje Agonafer , University of Texas at Arlington	CFD Analysis of Thermal Shadowing and Optimization of Heatsinks in Third-Generation Open Compute Server for Single-Phase Immersion Cooling (6600) Paper Publication Jimil M. Shah, Ravya Dandamudi, Chinmay Bhatt, Pranavi Rachamreddy, Pratik Bansode, Dereje Agonafer , University of Texas at Arlington	Viability of Two Phase Immersion Cooling by Performing Thermal Testing Vehicle Experiments Using Enhanced Boilers (6604) Presentation Only Jimil M. Shah , University of Texas at Arlington	
4-6: FHE Design & Modeling Demonstrations Fourth Floor, Huntington B Session Organizers: Tsung-Ching Jim Huang , Hewlett Packard Labs, Philip Buskohl , Air Force Research Laboratory	Flexible Hybrid Electronics Process Design Kit (FHE-PDK) (6756) Invited Presentation Tsung-Ching Jim Huang , Hewlett Packard Labs	Manufacturing Process Driven Design (MPDD) for Improved Flexible Hybrid Electronic Design (6768) Invited Presentation Kris Hill , International TechneGroup	EDA Design and Analysis Methodology for Flexible Circuits (6759) Presentation Only John Carney, James Chew, John Park , Cadence Design Systems	Digital Qualification of Flexible and Wearable Electronics (6767) Invited Presentation Ian Campbell , OnScale
5-6: LED, OLED and Photo Devices Fourth Floor, Huntington C Session Organizers: Zhenghua An , Fudan University, Chao Shen , SaNoor Technologies	Printed OLED Display and Soluble Materials (6374) Presentation Only Junyou Pan, Jiahui Tan, Xi Yang, Yusheng Chen , Guangzhou ChinaRay Optoelectronic Materials	On the Development of Beta-Ga₂O₃-Based High-Performance Solar-Blind Photodetectors (6414) Presentation Only Yunbin He, Qile Wang, Mingkai Li , Hubei University	Correlated Effects of Self-Heating, Light Output, and Efficiency of GaN Light-Emitting Diodes on Junction Temperature (6426) Paper Publication Bikramjit Chatterjee, James Spencer Lundh, Daniel Shoemaker , Pennsylvania State University, Tae Kyoung Kim, Joon Seop Kwak , Sunchon National University, Jaehee Cho , Chonbuk National University, Sukwon Choi , Pennsylvania State University	High Performance Nonplanar M-Plane InGaN Multiple-Quantum-Well Solar Cells With Improved Carrier Collection and High Temperature Spectral Response (6335) Presentation Only Xuanqi Huang, Houqiang Fu, Yuji Zhao , Arizona State University
6-4: Metrology Techniques Fourth Floor, Palos Verdes A Session Organizers: Ronald Warzoha , U.S. Naval Academy, Brian Foley , Pennsylvania State University	Evaporation Rate Measurement at Multiple Scales Using Temperature-Sensitive Fluorescence Dyes (6372) Paper Publication Youngjoon Suh, Cheng-Hui Lin, Hamsa Gowda, Yoonjin Won , University of California, Irvine	Advances in Nanoscale Thermorefectance Thermal Imaging Calibration (6425) Presentation Only Kazuaki Yazawa, Dustin Kendig, Microsanj, Ali Shakouri , Purdue University	Application of X-Ray CT Images and Phase-Shifted Sampling Moiré Method to Residual Strain Measurement in Electronic Packages (6486) Presentation Only Masaaki Koganemaru, Sho Nagato , Kagoshima University, Masakazu Uchino , Fukuoka Industrial Technology Center, Toru Ikeda , Kagoshima University	Thermorefectance Imaging of Electromigration in Aluminum Interconnects at Different Ambient Temperatures (6413) Paper Publication Sami Alajlouni, Kerry Maize, Peter Bermel, Ali Shakouri , Purdue University
7-3: Phase-Change Cooling Fourth Floor, Palos Verdes B Session Organizers: Marc Dunham , 3M, Kyle Gluesenkamp , Oak Ridge National Laboratory	Mechanical Properties of Polyethylene Based Heat Storage Composite Containing Phase Change Material and Copper Sheet (6464) Presentation Only Kohei Fukuchi, Kenichi Ohguchi, Kengo Kurosawa, Yuuki Sugimoto , Akita University, Katsuhiko Sasaki , Hokkaido University	Characterizing Dynamic Response of Phase Change Materials (6656) Presentation Only Alison Hoe , Texas A&M University, Michael Barako , Northrop Grumman, Patrick Shamberger , Texas A&M University	Evaporation of Microdroplet Suspended on Porous Micropillar Structure: The Effect of Micropillar Height on Transport Performance (6465) Presentation Only Junhui Li, Li Shan, Binjian Ma, Runzhi Zhang, Damena Agonafer , Washington University in St. Louis, Baris Dogruoz , Cisco Systems	Molecular Dynamics Simulation of Thin-Film Evaporation From Nanocoated Surfaces: The Asymptotic Relationship Between Evaporation Rate and Nanocoating Thickness (6466) Presentation Only Binjian Ma, Rui Zhou, Li Shan, Junhui Li , Washington University in St. Louis, Baris Dogruoz , Cisco Systems Inc., Damena Agonafer , Washington University in St. Louis

Technical Sessions

TUESDAY, OCTOBER 8

	1:45PM	2:05PM	2:25PM	2:45PM
1-6: Microsystems Packaging Fourth Floor, Huntington A Session Organizers: Subhasis Mukherjee , <i>Apple</i> , Subramanyaravi Annapragada , <i>United Technologies Research Center</i>	Double Side System in Package Development Challenge for Heterogeneous Integration (6354) Paper Publication Feng Kao , <i>Yu Po Wang</i> , <i>Davidlion Wang</i> , <i>Jensen Tsai</i> , <i>Mike Tsai</i> , <i>Ryan Chiu</i> , <i>Eric He</i> , <i>Siliconware Precision Industries</i>	Performance Analysis and Shape Optimization of Manifold in Liquid-Cooled Parallel Micro-Channel Heat Sinks (6455) Presentation Only Yaser Hadad , <i>Cong Hoang</i> , <i>Srikanth Rangarajan</i> , <i>Binghamton University</i> , Paul R. Chiarot , <i>State University of New York at Binghamton</i> , Bahgat Sammakia , <i>Binghamton University</i>	Minimizing the Effects of On-Chip Hot-Spots Using Multi-Objective Optimization of Flow Distribution in Water-Cooled Parallel Micro-Channel Heat Sinks (6459) Presentation Only Yaser Hadad , <i>Vahideh Radmard</i> , Mahdi Farahikia , <i>Binghamton University</i> , Paul R. Chiarot , <i>State University of New York at Binghamton</i> , Bahgat Sammakia , <i>Binghamton University</i>	High Strain Rate Mechanical Properties of SAC-Q With Sustained Elevated Temperature Storage at 100°C (6576) Paper Publication Pradeep Lall , <i>Vishal Mehta</i> , <i>Jeffrey Suhling</i> , <i>Auburn University</i> , David Locker , <i>U.S. Army RDECOM</i>
5-7: Organic Materials and Devices Fourth Floor, Huntington B Session Organizers: Malte Gather , <i>University of St. Andrews</i> , Yunbin He , <i>Hubei University</i>	Mechanical Instability in Organic Optoelectronics: Surface Wrinkling and Its Prediction (6355) Presentation Only Yu-Lin Shen , <i>University of New Mexico</i>	Organic Electronics for Neuro-morphic Computing (6375) Presentation Only Yoei van de Burgt , <i>Eindhoven University of Technology</i>	Double Perovskites as p-Type Conducting Transparent Semiconductors: A High-Throughput Search (6378) Presentation Only Haichen Wang , <i>Miguel A.L. Marques</i> , <i>Martin-Luther-Universität Halle-Wittenberg</i>	Designed Silver Nanowires Transparent Conductive Electrodes for Efficient Optoelectronic Devices (6380) Presentation Only Bin Hu , <i>Huazhong University of Science and Technology</i>
6-8: Microchannel Heat Sinks Fourth Floor, Huntington C Session Organizers: Hyoungsoon Lee , <i>Chung-Ang University</i> , Bladimir Ramos Alvarado , <i>Pennsylvania State University</i>	Experimental Investigation of Single-Phase Cooling in Embedded Microchannels: 3D Manifold Heat Exchanger With R-245fa (6400) Paper Publication Ki Wook Jung , <i>Stanford University</i> , Hyoungsoon Lee , <i>Chung-Ang University</i> , Chirag R. Kharangate , <i>Case Western Reserve University</i> , Feng Zhou , <i>Toyota Research Institute North America</i> , Mehdi Asheghi , <i>Stanford University</i> , Ercan Dede , <i>Toyota Research Institute of North America</i> , Kenneth Goodson , <i>Stanford University</i>	Single-Phase Thermal and Hydraulic Performance of Embedded Micro-Pin Fin Using R245fa (6382) Presentation Only Daeyoung Kong , <i>Chung-Ang University</i> , Ki Wook Jung , <i>Stanford University</i> , Sangwoo Jung , <i>Dae-woong Jung</i> , <i>Chung-Ang University</i> , Joseph Schaad , <i>Villanova University</i> , Madhusudan Iyengar , <i>Chris Malone</i> , <i>Google LLC</i> , Chirag R. Kharangate , <i>Case Western Reserve University</i> , Mehdi Asheghi , <i>Kenneth Goodson</i> , <i>Stanford University</i> , Hyoungsoon Lee , <i>Chung-Ang University</i>	Parametric Study of Silicon-Based Embedded Microchannels With 3D Manifold Coolers (EMMC) for High Heat Flux ($^{\circ}1 \text{ kW/cm}^2$) Power Electronics Cooling (6472) Paper Publication Ki Wook Jung , <i>Sougata Hazra</i> , <i>Heungdong Kwon</i> , <i>Stanford University</i> , <i>Stanford, CA, United States</i> , Alisha Piazza , <i>Stanford Nano-heat Lab</i> , <i>Stanford, CA, United States</i> , Edward Jih , <i>Ford Motor Co.</i> , <i>Dearborn, MI, United States</i> , Mehdi Asheghi , <i>Stanford University</i> , <i>Stanford, CA, United States</i> , Man Prakash Gupta , <i>Michael Degner</i> , <i>Ford Motors</i> , <i>Dearborn, MI, United States</i> , Kenneth Goodson , <i>Stanford University</i> , <i>Stanford, CA, United States</i>	
7-1: Batteries, Supercapacitors, and Solar Cells I Fourth Floor, Palos Verdes A Session Organizers: Amy Marconnet , <i>Purdue University</i> , June Stanley , <i>Sandia National Laboratories</i>	Operando Measurements of the Dominant Thermal Resistance in Lithium-Ion Batteries (6658) Presentation Only Sean Lubner , <i>Sumanjeet Kaur</i> , <i>Yanbao Fu</i> , <i>Vince Battaglia</i> , <i>Ravi Prasher</i> , <i>Lawrence Berkeley National Laboratory</i>	Lithium Plating and Dendrites in Li-Ion Batteries Under Thermal Gradient (6432) Presentation Only Conner Fear , <i>Aashutosh Mistry</i> , <i>Purdue University</i> , Rachel Carter , <i>Corey T. Love</i> , <i>U.S. Naval Research Laboratory</i> , Partha Mukherjee , <i>Purdue University</i>	Effects of Non-Uniform Temperature Distributions on Lithium-Ion Battery Degradation (6477) Presentation Only Gabriel M. Cavalheiro , <i>Takuto Iriyama</i> , <i>Shan Huang</i> , <i>George Nelson</i> , <i>Guangsheng Zhang</i> , <i>University of Alabama in Huntsville</i>	Effect of Transition Metal Prussian Blue Analogues as Mediators on the Performance of Mediator Supercapacitor (6478) Presentation Only Xiangyang Zhou , <i>University of Miami</i>
8-5: Material Modeling for Automotive Packaging II Fourth Floor, Palos Verdes B Session Organizers: Adam Boros , <i>Bosch</i> , Anna Prakash , <i>Intel</i>	Nanoindentation Testing of SAC305 Solder Joints Subjected to Thermal Cycling Loading (6471) Paper Publication Abdullah Fahim , <i>S.M. Kamrul Hasan</i> , <i>Jeffrey Suhling</i> , <i>Pradeep Lall</i> , <i>Auburn University</i>	Constitutive Modeling and Experimental Characterization of Volumetric and Isochoric Nonlinear Viscoelasticity for Epoxy-Based Molding Compounds (6409) Presentation Only Fabian Welschinger , <i>Przemyslaw Jakub Gromala</i> , <i>Bosch</i> , Hüsnü Dal , <i>Middle East Technical University in Ankara</i> , Hyun Seop Lee , <i>Bongtae Han</i> , <i>University of Maryland</i>	Effects of Thermal Cycling on the Mechanical and Microstructural Evolution of SAC305 Lead-Free Solder (6563) Paper Publication S.M. Kamrul Hasan , <i>Abdullah Fahim</i> , <i>Jeffrey Suhling</i> , <i>Sa'd Hamasha</i> , <i>Pradeep Lall</i> , <i>Auburn University</i>	Investigation of the Effects of High Temperature Aging on Mechanical Behavior and Microstructural Changes in Lead Free Solders (6571) Paper Publication Jing Wu , <i>Mohammad S. Alam</i> , <i>Jeffrey Suhling</i> , <i>Pradeep Lall</i> , <i>Auburn University</i>

	3:30PM	3:50PM	4:10PM	4:30PM
5-8: Packaging and Thermal Management I Fourth Floor, Huntington A Session Organizers: Firooz Faili , <i>Element Six</i> , Duanjun Cai , <i>Xiamen University</i>	Numerical Analysis of Pulse Laser Assisted Curing Region of Photocurable Resins (6356) Paper Publication Yuta Nakamura, Kazuyoshi Fushinobu, Asato Tamura , <i>Tokyo Institute of Technology</i>	Vandal Glass Heat Distribution and the Effect of Glass Gap Adjustments in Outdoor Digital Display Components (6391) Paper Publication Jeho Kim , <i>Georgia Institute of Technology</i> , J. Michael Brown , <i>Manufacturing Resources International</i> , Yogendra Joshi , <i>Georgia Institute of Technology</i> , Kevin O'Connor, Marcos Diaz , <i>Manufacturing Resources International</i> , Zhuomin Zhang, Peiyan Yang , <i>Georgia Institute of Technology</i>	Topology Optimization of Time-Transient Heat Conduction for Thermo-Optic Devices (6526) Presentation Only Ercan Dede , <i>Toyota Research Institute of North America</i> , Gil Ho Yoon , <i>Hanyang University</i> , Paul Schmalenberg, Tsuyoshi Nomura , <i>Toyota Research Institute of North America</i>	Modeling of Light Emitting Device Populations in the Electrical, Thermal, and Optical Domain for Luminaire Design (6547) Paper Publication Gabor Farkas, Marta Rencz, Andras Vass Varnai, Lajos Gaal , <i>Mentor Graphics</i>
6-9: Phase Change Materials Fourth Floor, Huntington B Session Organizers: Michael Fish , <i>U.S. Army Research Laboratory</i> , Jorge Padilla , <i>Google</i>	Evaluation of Thermal and Electrical Properties of Nano-Enhanced PCM for Usage in High-Voltage Systems (6422) Paper Publication Ange-Christian Iradukunda, Joshua Kasitz, Fernando Moreno, David Huitink , <i>University of Arkansas</i>	Metallic PCMs Microstructural Stability Under Repetitive Melting/Solidification Cycles (6385) Paper Publication Rafael Baez, Luis Gonzalez , <i>University of Puerto Rico-Mayaguez</i> , Lauren M. Boteler , <i>U.S. Army Research Laboratory</i> , Pedro Quintero , <i>University of Puerto Rico-Mayaguez</i>	Lamellar Phase Change Material Composites for Power Electronics Thermal Management (6751) Presentation Only Patrick Shamberger, Alison Hoe, Michael Deckard, Achutha Tamraparni, Alaa Elwany, Jonathan Felts , <i>Texas A&M University</i>	Multi-Scale Multi-Fidelity Approaches to Power and Thermal System Engineering Challenges (6772) Invited Presentation Nicholas Niedbalski , <i>U.S. Air Force</i>
6-10: Thermal Interface Materials Fourth Floor, Huntington C Session Organizers: Xuhui Feng , <i>National Renewable Energy Laboratory</i> , Dinesh P R Thanu , <i>Intel</i>	Evaluation of Contact Thermal Resistance of Metal Material in Low Contact Pressure Region (6543) Presentation Only Yoshiki Hyodo, Tomoyuki Hatakeyama , <i>Toyama Prefectural University</i> , Risako Kibushi , <i>Sanyo-Onoda City University</i> , Masaru Ishizuka , <i>Toyama Prefectural University</i>	Thermal Contact Resistance at DBC Interfaces (6609) Presentation Only Lauren Boteler , <i>U.S. Army Research Laboratory</i> , Ronald Warzoha , <i>U.S. Naval Academy</i>	Thermo-Mechanical Degradation of Thermal Interface Materials: Accelerated Test Development and Reliability Analysis (6416) Paper Publication Dustin Pense, Hayden Carlton, David Huitink , <i>University of Arkansas</i>	
7-6: Batteries, Supercapacitors, and Solar Cells III Fourth Floor, Palos Verdes A Session Organizers: Laura Spinella , <i>National Renewable Energy Laboratory</i> , Kazuaki Yazawa , <i>Purdue University</i>	Three-Dimensional Modeling of Mediator-Enhanced Solid-State Supercapacitors (6481) Presentation Only Xiangyang Zhou , <i>University of Miami</i>	Application of Electronics Packaging Fundamentals to Photovoltaic Interconnects and Packaging (6520) Paper Publication Laura Spinella, Nick Bosco , <i>National Renewable Energy Laboratory</i>	Development of Structural Supercapacitors With Epoxy Based Adhesive Polymer Electrolyte (6480) Presentation Only Xiangyang Zhou , <i>University of Miami</i>	

Technical Sessions

WEDNESDAY, OCTOBER 9

	8:00AM	8:20AM	8:40AM	9:00AM
1-2: Thermal Management Applications I Fourth Floor, Huntington A Session Organizers: Srikanth Rangarajan , <i>Binghamton University</i> , Leila Chooibneh , <i>SUNY Polytechnic Institute</i>	Thermal Cycle Reliability of Package on Package (PoP) Assemblies (6317) Presentation Only Reza Ghaffarian , <i>NASA Jet Propulsion Laboratory</i>	Optimal Arrangement of Multiple Heat Sources in Vertically Stacked Two-Layer 3D IC Using Genetic Algorithm (6334) Paper Publication Srikanth Rangarajan , <i>Yaser Hadad</i> , <i>Binghamton University</i> , Leila Chooibneh , <i>SUNY Polytechnic Institute</i> , Bahgat Sammakia , <i>Binghamton University</i>	Thermal-Switch-Enabled Power Electronics Isothermalization (6738) Presentation Only Tianyu Yang , <i>University of Illinois at Urbana-Champaign</i> , Fei Diao , Alan Mantooth , Yue Zhao , <i>University of Arkansas</i> , William P. King , Nenad Miljkovic , <i>University of Illinois at Urbana-Champaign</i>	
4-3: Flexible Electronics Packaging & Assembly Fourth Floor, Huntington B Session Organizers: Pradeep Lall , <i>Auburn University</i> , Baris Dogruoz , <i>Cisco Systems</i>	Applying Ultrasonic Dehumidification Technology for Water Rejection in Wearable Electronics (6387) Paper Publication Priyanka Deo , Samuel Graham , <i>Georgia Tech</i> , Ayyoub Momen , <i>Oak Ridge National Laboratory</i>	Foldable Thermal Ground Plane for Cooling of Foldable Smartphones (6351) Presentation Only Ali Nematollahisarvestani , <i>University of Colorado Boulder</i> , Ryan Lewis , <i>Kelvin Thermal Technologies</i> , Yung-Cheng Lee , <i>University of Colorado Boulder</i>	Stretchable and Wearable Emitters Based on Corrugated Nickel for Personal Thermal Management (6628) Presentation Only Anirudh Krishna , Martí Sala-Casanas , Ziqi Yu , Jaeho Lee , <i>University of California, Irvine</i>	How Ultrathin Die Enable Flexible Hybrid Electronics (6769) Invited Presentation Wilfred Bair , <i>NextFlex</i>
5-9: Packaging and Thermal Management II Fourth Floor, Huntington C Session Organizers: Niamh Richardson , <i>University of Limerick</i> , Ercan Dede , <i>Toyota</i>	Study on the Precise Measurement of LED Thermal Resistance Based on LEDs With an Internal Sensor Unit (6321) Presentation Only Yugang Zhou , Renbao Tian , Zili Xie , Bin Liu , Rong Zhang , Youdou Zheng , <i>Nanjing University</i>	Prediction and Control Technique of the Paper Media Temperature After Fusing in Electrophotographic Process (6396) Paper Publication Shunsuke Kawasaki , Shinichi Kuramoto , Kazuyoshi Fushinobu , Koichi Kato , <i>Tokyo Institute of Technology</i> , Kimiharu Yamazaki , Kaori Hemmi , <i>Ricoh</i>	Reducing CTE Mismatch and Maximizing Heat Transport on Single Emitter Laser Diodes Using Diamond Heat Spreaders (6599) Presentation Only Firooz Faili , Alex Muhr , Thomas Obeloer , Daniel Twitchen , <i>Element Six Technologies</i>	
6-5: High-Temperature Electronics Packaging Fourth Floor, Palos Verdes B Session Organizers: Douglas DeVoto , <i>National Renewable Energy Laboratory</i> , Christina DiMarino , <i>Virginia Tech</i>	Aging Dependent Anand Parameters of SAC305 Lead Free Solder at Extreme High Temperatures (6564) Presentation Only K.M. Rafidh Hassan , Mohammad S. Alam , Jeffrey Suhling , Pradeep Lall , <i>Auburn University</i>	Evaluation of a Lead Glass for Encapsulating High-Temperature Power Modules for Aerospace Application (6393) Paper Publication Lanbing Liu , David Nam , <i>Virginia Tech</i> , Ben Guo , <i>United Technologies</i> , Rolando Burgos , Guo-Quan Lu , <i>Virginia Tech</i>	Health Monitoring of PCBs Under Mechanical Shock Loads (6578) Paper Publication Pradeep Lall , Tony Thomas , Jeffrey Suhling , <i>Auburn University</i> , Ken Blecker , <i>U.S. Army CCDC-AC</i>	Advances in Organic Substrate Approaches for High Voltage Power Electronics Packaging (6770) Invited Presentation Douglas Hopkins , <i>North Carolina State University</i>
6-11: System-Level Thermal Design I Fourth Floor, Palos Verdes A Session Organizers: Todd Bandhauer , <i>Colorado State University</i> , David Huitink , <i>University of Arkansas</i>	Modular Heat Sinks for Enhanced Thermal Management of Electronics (6665) Presentation Only Muhammad Jahidul Hoque , Ahmet Gunay , Andrew Stillwell , Yashraj Gurumukhi , <i>University of Illinois at Urbana-Champaign</i> , Robert Pila-wa-Podgurski , <i>University of California, Berkeley</i> , Nenad Miljkovic , <i>University of Illinois at Urbana-Champaign</i>	Thermal Analysis of High Efficiency High Speed Drives (6534) Paper Publication Yasmin Khakpour , Weilun Warren Chen , Parikshith Channegowda , Matthew R. Pearson , Yongduk Lee , Luis Ardeco , <i>United Technologies Research Center</i>	Evaluation of Low Order Stress Models for Use in Co-Design Analysis of Electronics Packaging (6381) Paper Publication Lauren Boteler , <i>U.S. Army Research Laboratory</i> , Steven Miner , <i>U.S. Naval Academy</i>	Multi-Scale Thermal Analysis for Design of SiC-Based Medium Voltage Motor Drive (6631) Paper Publication J. Emily Cousineau , Kevin Bennion , <i>National Renewable Energy Laboratory</i> , Karun Potty , He Li , Risha Na , Longya Xu , Jin Wang , <i>Ohio State University</i>

	10:45AM	11:05AM	11:25AM	11:45AM
1-8: Thermal Management Applications II Fourth Floor, Huntington A Session Organizers: Yuling Niu , <i>Binghamton University</i> , Leila Choobineh , <i>SUNY Polytechnic Institute</i>	Thermal Analysis of 3D ICs With TSVs Placement Optimization (6417) Paper Publication Zongqing Ren, Ayed Alqahtani, Nader Bagherzadeh, Jaeho Lee , <i>University of California, Irvine</i>	Fabrication Steps and Thermal Modeling of Three-Dimensional Asynchronous Field Programmable Gate Array (3D-AFPGA) (6514) Paper Publication Robert Carroll , <i>SUNY Polytechnic Institute</i> , Carlos Gutierrez, Leila Choobineh , <i>SUNY Polytechnic Institute</i> , Robert Geer , <i>SUNY Polytechnic Institute</i>	Power Delivery and Thermal Management for the Silicon Interconnect Fabric (6550) Presentation Only Ujash Shah, Pranav Ambhore, Umesha Mogera, Subramanian Iyer, Timothy Fisher, Boris Vaisband , <i>University of California, Los Angeles</i>	Generating Ultra-Packed Thermal Greases With Ellipsoidal Fillers and Evaluation of Their Effective Properties (6669) Presentation Only Huanyu Liao, Sukshitha Achar, Puttur Lakshminarayana, Ganesh Subbarayan , <i>Purdue University</i>
4-4: Interconnect Reliability in Flexible Systems Fourth Floor, Huntington B Session Organizers: Vaibhav Agrawal , <i>Intel</i> , Benjamin Leever , <i>Air Force Research Laboratory</i>	Damage of Flexible Electronic Line Printed With Ag Nanoparticle Ink due to High-Current Density (6408) Paper Publication Daiki Saito, Kazuhiko Sasagawa, Takeshi Moriwaki, Kazuhiro Fujisaki , <i>Hirotsuki University</i>	Stress Evaluation of Flexible Displays With Multiple-Laminations Architecture Enabled by Experimental Measurement and Simulation Based Factorial Design (6541) Paper Publication Chang-Chun Lee, Pei-Chen Huang, Chi-Wei Wang, Oscar Chuang , <i>National Tsing Hua University</i>	Folding-Reliability of Flexible Electronics in Wearable Applications (6584) Paper Publication Pradeep Lall, Hyesoo Jang , <i>Auburn University</i> , Benjamin Leever , <i>Air Force Research Laboratory</i> , Scott Miller , <i>NextFlex</i>	Flexure and Twist Test Reliability Assurance of Flexible Electronics (6579) Paper Publication Pradeep Lall, Jinesh Narangaparambil, Auburn University, Benjamin Leever , <i>Air Force Research Laboratory</i> , Scott Miller , <i>NextFlex</i>
6-12: System-Level Thermal Design II Fourth Floor, Huntington C Session Organizers: Nicholas Niedbalski , <i>U.S. Air Force</i> , Kristen Hines , <i>Johns Hopkins</i>	System Electrothermal Transient Analysis of a High Current (40A) Synchronous Step-Down Converter (6384) Paper Publication Rajen Murugan, Jie Chen, Todd Harrison , <i>Texas Instruments</i> , C.T. Kao, Nathan Ai , <i>Cadence Design Systems</i>	Direct Bonding of Aluminum Foam With AISiC for Rapid Fabrication of Power Electronic Packages (6733) Presentation Only Darshan Pahinkar, Chidinma Imedegwu , <i>Georgia Institute of Technology</i> , Jordon Hoyer , <i>Mississippi State University</i> , Brian Kelly, Samuel Graham , <i>Georgia Institute of Technology</i>	Effects of Cooling Architecture and PCB Layout Co-Design on the Concurrent Thermal and Electrical Performance of an On-Board Electric Vehicle Charger (6434) Paper Publication Omri Tayyara, Kshitij Gupta, Carlos Da Silva, Miad Nasr, Amir Assadi, Olivier Trescases, Cristina H. Amon , <i>University of Toronto</i>	
7-7: Thermal Characterization Fourth Floor, Palos Verdes A Session Organizers: Ayyoub Momen , <i>Oak Ridge National Laboratory</i> , Aritra Sur , <i>United Technologies Research Center</i>	Pressure-Dependent Thermal Characterization of Inverse Opal Copper Structures (6606) Presentation Only Cheng-Hui Lin, Youngjoon Suh, Yoonjin Won , <i>University of California, Irvine</i>	Combined Experimental-Numerical Investigation of Microstructure and Thermal Conduction in Dispensed and Squeezed Thermal Interface Materials (6462) Presentation Only Rajath Kantharaj, Jackson Santana, Carl Wassgren, Aaron Morris, Amy Marconnet , <i>Purdue University</i>	Surface Temperature Measurements using Infrared Thermometry Considering Background Radiation From High-Temperature Environment (6505) Presentation Only Mingeon Kim , <i>Korea Advanced Institute of Science and Technology</i> , Dong Hwan Shin, Jinsub Kim, Jung-ho Lee , <i>Korea Institute of Machinery and Materials</i> , Bong Jae Lee , <i>Korea Advanced Institute of Science and Technology</i>	Experimental Investigation of Asymmetrical Microdroplet Evaporation on Heated Porous Pillar Array Structures (6449) Presentation Only Li Shan, Runzhi Zhang, Xinyu Jiang, Binjian Ma , <i>Washington University in St. Louis</i> , Jorge Padilla , <i>Google LLC</i> , Damena Agonafer , <i>Washington University in St. Louis</i>
8-1: ECU-Level Reliability Fourth Floor, Palos Verdes B Session Organizers: Ercan Dede , <i>Toyota</i> , Hyun Seop Lee , <i>University of Maryland</i>	Effects of Test Temperature and Prior Aging on the Cyclic Stress-Strain Behavior of Lead-Free Solders (6562) Paper Publication Mohammad Ashraful Haq, Mohd Aminul Hoque, Jeffrey Suhling, Pradeep Lall , <i>Auburn University</i>	A Study on Relationship Between Low Cycle Fatigue Strength and Load Conditions for Lead Free Solder Material (6446) Presentation Only Takashi Kawakami, Takahiro Kinoshita, Yuki Murai , <i>Toyama Prefectural University</i>	The Effect of Low Temperature Conditions on Vibration Durability of SAC105 Interconnects (6509) Presentation Only David Leslie , <i>University of Maryland, College Park</i> , Karsten Meier, Maximilian Ochmann , <i>Technische Universität Dresden</i> , Tamara Storz , <i>Hochschule Mannheim - University of Applied Sciences</i> , Abhijit Dasgupta , <i>University of Maryland, College Park</i>	Automated Method Using Finite Element Analysis to Identify Plated Through Holes and Microvia Stacks at Failure Risk in Complex PCB Designs (6347) Paper Publication Kourosh Kalayeh , <i>DfR Solutions</i> , Natalie Hernandez , <i>ANSYS Inc.</i> , Nathan Blattu , <i>Craig Hillman, DfR Solutions</i>

Technical Sessions

WEDNESDAY, OCTOBER 9

	1:45PM	2:05PM	2:25PM	2:45PM
2-7: Immersion Cooling II Fourth Floor, Palos Verdes B Session Organizers: Nikhil Lakhkar , Emerson Climate Technologies, Steve Moon , 3M	Impact of Immersion Cooling on Thermo-Mechanical Properties of PCBs and Reliability of Electronic Packages (6568) Paper Publication Shrinath Ramdas , Pavan Rajmane, Tushar Chauhan, Abel Misrak, Dereje Agonafer , University of Texas at Arlington	Computational Analysis for Thermal Optimization of Server for Single Phase Immersion Cooling (6587) Paper Publication Dhruvkumar Gandhi , Dereje Agonafer, Tushar Chauhan, Uschas Chowdhury, Satyam Saini, Pratik Bansode, Jimil M. Shah , University of Texas at Arlington	Computational Form Factor Study of a Third-Generation Open Compute Server for Single-Phase Immersion Cooling (6602) Paper Publication Jimil M. Shah , Chinmay Bhatt, Pranavi Rachamreddy, Ravya Dandamudi, Satyam Saini, Dereje Agonafer , University of Texas at Arlington	
3-1: IoT Applications Fourth Floor, Huntington A Session Organizers: Baris Dogruoz , Cisco Systems, Damena Agonafer , Washington University in St. Louis	Thermal Characterization of Composite Ultra-High Molecular Weight Polyethylene Fabrics (6412) Presentation Only Aaditya Candadai , Justin Weibel, Amy Marconnet , Purdue University	Packaging Environmental Sensors for an Internet-of-Things Solution for Urban-Microclimate Studies (6515) Paper Publication Shuv Dey , Yogendra Joshi , Georgia Tech, J. Michael Brown , Manufacturing Resources International	Ultra-Low SWaP CO₂ Sensing for Demand Control Ventilation (6747) Presentation Only Elif Karatay , Eric Cocker , Kyle Arakaki , David Schwartz , Palo Alto Research Center	An RF-Powered Self-Locating Flexible Building Environment Sensor System (6306) Presentation Only David Schwartz , Shabnam Ladan , Vijay Venkatasubramanian , Clinton Smith , Joseph Lee , Ping Mei , Brent Krusor , Shakthi Gowri , Palo Alto Research Center
4-5: Process Development and Characterization of Flexible Systems Fourth Floor, Huntington B Session Organizers: David Schwartz , Janos Veres , Palo Alto Research Center, Vaibhav Agrawal , Intel	Process Capability of Aerosol-Jet Additive Processes for Long-Runs up to 10 Hours (6569) Paper Publication Pradeep Lall , Amrit Abrol , Nakul Kothari , Auburn University, Benjamin Leever , Air Force Research Laboratory, Scott Miller , NextFlex	Effect of Charge-Discharge Depth and Environment Use Conditions on Flexible Power Sources (6570) Paper Publication Pradeep Lall , Amrit Abrol , Ved Soni , Auburn University, Benjamin Leever , Air Force Research Laboratory, Scott Miller , NextFlex	Effect of Process Parameters on Aerosol Jet Printing of Multi-Layer Circuitry (6574) Paper Publication Pradeep Lall , Kartik Goyal , Nakul Kothari , Auburn University, Benjamin Leever , Air Force Research Laboratory, Scott Miller , NextFlex	Acceleration Factors for Flexible Electronics in Wearable Applications From Actual Human Body Measurements (6580) Paper Publication Pradeep Lall , Tony Thomas , Vikas Yadav , Jinesh Narangaparambil , Wei Liu , Auburn University
6-13: System Integration Fourth Floor, Huntington C Session Organizers: Ramchandra Kotecha , National Renewable Energy Laboratory, Sangbeom Cho , Qualcomm	Comparative Study on Power Module Architectures for Modularity and Scalability (6443) Paper Publication Mei-Chien Lu , Monte Rosa Technology	Integration Challenges of SiC Power Module for High Temperature and High Frequency Operation (6548) Presentation Only Shohei Suenaga , Shailesh N. Joshi , Toyota	Parametric and Sensitivity Analysis of Power Module Design (6592) Paper Publication Lauren Boteler , Michael Fish , Morris Berman , U.S. Army Research Laboratory	Packaging and Integration of an Additively Manufactured Photovoltaic Inverter (6411) Presentation Only Akanksha Singh , National Renewable Energy Laboratory
7-8: Thermal Switches and Thermal Metamaterials Fourth Floor, Palos Verdes A Session Organizers: Menglong Hao , University of California, Berkeley, Sean Lubner , Lawrence Berkeley National Laboratory	3D Architected Packaging Structures for Thermal Management (6415) Presentation Only Shiva Farzinazar , Jaeho Lee , University of California, Irvine	Modeling and Analysis of a Shape Memory Alloy-Based Adaptive Regulator for Thermal Management (6402) Paper Publication Gary Liang , Ashkan Sadeghifard , Anirudh Krishna , Jaeho Lee , Edwin Peraza Hernandez , University of California, Irvine	Continuously Tunable Thermal Switch Based on Compressible Graphene Foams (6554) Presentation Only Luis Delgado , Purdue University, Tingting Du , Shandong University, Purdue University, Amy Marconnet , Xiulin Ruan , Purdue University	Environmental Testing of a Temperature Regulator Based on Compressible Graphene Foams (6557) Presentation Only Tingting Du , Shandong University, Weizhi Liao , Luis Delgado , Joseph Peoples , Amy Marconnet , Xiulin Ruan , Purdue University

	3:30PM	3:50PM	4:10PM	4:30PM
4-2: Microfluidics for Flexible Electronics Fourth Floor, Huntington B Session Organizers: Azar Alizadeh , General Electric, E. Yegan Erdem , Bilkent University	Textured Superoleophobic Surfaces: Fabrication and Characterization (6713) Presentation Only Ecem Yelekli, E. Yegan Erdem , Bilkent University	Experimental Study of Flexible Electrohydrodynamic Conduction Pumping for Electronics Cooling (6746) Presentation Only Alexander J. Castaneda, Nathaniel O'Connor, Jamal Yagoobi , Worcester Polytechnic Institute	Bio-Applications of Wearable Sensors (6775) Invited Presentation Andrew Burns , General Electric	Microfluidic Devices for Health Monitoring (6774) Invited Presentation Leanna Levine , Aline
6-14: Additive Manufacturing Fourth Floor, Huntington C Session Organizers: Douglas Hopkins , North Carolina State University, Stephen Lynch , Pennsylvania State University	Additive Manufactured, Low EMI, Non-Metallic Convective Heat Spreader Design and Optimization (6442) Paper Publication Reece Whitt, David Huitink, Skyler Hudson, Bakhtiyar Mohammad Nafis, Zhao Yuan, Balaji Narayanasamy, Amol Deshpande, Fang Luo, Asif Imran , University of Arkansas, Zion Clarke, Sonya Smith , Howard University	A Numerical Investigation of Additive Manufactured Foam Structures for Single Phase Hotspot Thermal Management (6519) Paper Publication Justin Broughton, Yogendra Joshi , Georgia Tech	Advanced Packaging and Thermal Management of High-Power DC-DC Converters (6559) Paper Publication Sevket Umut Yuruker, Raphael Mandel, Patrick McCluskey, Michael Ohadi, Shiladri Chakraborty, Yongwan Park, He Yun, Alireza Khaligh , University of Maryland, Lauren Boteler, Miguel Hinojosa , U.S. Army Research Laboratory	Additive Manufactured Hybrid Cold Plates for Efficient Thermal Management of High-Power Density Electronics (6664) Presentation Only Muhammad Jahidul Hoque, Nithin Vinod Upot, Nenad Miljkovic , University of Illinois at Urbana-Champaign
6-15: Emerging Technologies Fourth Floor, Palos Verdes A Session Organizers: Paul Paret , National Renewable Energy Laboratory, Patrick McCluskey , University of Maryland	Evolution of Anand Parameters With Elevated Temperature Aging for SAC Leadfree Alloys (6577) Paper Publication Pradeep Lall, Vikas Yadav, Jeffrey Suhling , Auburn University, David Locker , U.S. Army RDECOM	Simulating the Effect of Elastic Particle Inclusion on the Mechanical Properties of Transient Liquid Phase Sintered (TLPS) Alloys (6435) Presentation Only Gilad Nave, Erick Gutierrez, Patrick McCluskey , University of Maryland	Quantitative Characterization of Sapphire and Silicon Nitride for Space Applications Circuit Subassemblies Using Cryogenic Cycling (6499) Paper Publication Kirsten Lovelace, Sonya Smith , Howard University	Effect of Low Melting Point Bridge With High Melting Point Fine Filler on the Conductivity of Conductive Adhesive (6403) Presentation Only Michiya Matsushima, Shogo Minami, Naoki Ito, Shinji Fukumoto, Kozo Fujimoto , Osaka University
7-10: Batteries, Supercapacitors, and Solar Cells II Fourth Floor, Palos Verdes B Session Organizers: Xiangyang Zhou , University of Miami, Chuanbo Yang , National Renewable Energy Laboratory	Li-Ion Battery Impact Testing (6710) Presentation Only June Stanley , Sandia National Laboratories	The Role of Interfacial Thermal Resistance in Li-Ion Battery Thermal Management (6594) Paper Publication Chuanbo Yang, Lei Cao , National Renewable Energy Laboratory	In-situ Diagnosis of Li-Ion Battery Internal Short Circuit (6757) Presentation Only Shan Huang, Guangsheng Zhang , University of Alabama in Huntsville	A High-Performance Polymer Electrolyte Membrane Based on Poly (Vinylidene Fluoride) and Graphene Oxide Doped With Redox Species (6479) Paper Publication Xiangyang Zhou , University of Miami
8-7: Reliability of Electronic Components for Harsh Environment Fourth Floor, Redondo Session Organizers: Fabian Welschinger , Bosch, David Huitink , University of Arkansas	Effects of Shear Cycling on the Mechanical Properties of SAC and SAC+X Lead Free Solder Joints (6567) Paper Publication Mohd Aminul Hoque, Md. Mahmudur Chowdhury, Jeffrey Suhling, Sa'd Hamasha, Pradeep Lall , Auburn University	Demonstration of Two-Layer Wicks for High-Heat-Flux Dissipation in Vapor Chambers (6367) Presentation Only Srivathsan Sudhakar, Justin Weibel , Purdue University, Feng Zhou , Toyota Research Institute North America, Ercan Dede , Toyota Research Institute of North America, Suresh Garimella , University of Vermont	Effect of Drop Angle Variation and Restraint Mechanisms on Surface Mount Electronics Under High G Shock (6575) Paper Publication Pradeep Lall, Aathi Raja Ram Pandurangan, Jeffrey Suhling , Auburn University, John Deep , Air Force Research Laboratory, Ryan Lowe , ARA Associates, Venkata Kalyan Reddy Dornala , Auburn University	Modeling of Underfilled PBGA Assemblies Using Both Viscoelastic and Elastic Material Properties (6561) Paper Publication Promod Chowdhury, Jeffrey Suhling, Pradeep Lall , Auburn University

Technical Sessions

MONDAY, OCTOBER 7

Monday, October 7, 8:00AM–9:30AM

TRACK 1: HETEROGENEOUS INTEGRATION

Track Organizer: **Gamal Refai-Ahmad**, *Xilinx, Santa Clara, CA, United States*

Track Co-Organizers: **Leila Choobineh**, *SUNY Polytechnic Institute, Utica, NY, United States*, **Fabian Welschinger**, *Robert Bosch GmbH, Renningen, Germany*, **Winston Zhang**, *Novark Technologies, Inc., Shenzhen, Guangdong, Guangdong, China*

1-7: DESIGN AND CHARACTERIZATION II

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Shankar Narayanan**, *RPI, Troy, NY, United States*

Session Co-Organizer: **Shima Hajimirza**, *Texas A&M University, College Station, TX, United States*

8:00AM	Fatigue Life of Sn3.0Ag0.5Cu Solder Alloys Under Combined Shear and Compressive Loads Technical Paper Publication. InterPACK2019-6507 Travis Dale, Yuvraj Singh, Ian Bernander, Ganesh Subbarayan, Carol Handwerker , <i>Purdue University, West Lafayette, IN, United States</i> , Peng Su, Bernard Glasauer , <i>Juniper Networks, Sunnyvale, CA, United States</i>
8:20AM	Strain Distribution in a Small Solder Specimen With Few Crystal Grains Technical Presentation. InterPACK2019-6546 Toru Ikeda, Takumi Sasaki, Atushi Yanase , <i>Kagoshima University, Kagoshima, Japan</i> , Dai Okumura , <i>Nagoya University, Nagoya, Aichi, Japan</i> , Yoshiharu Kariya , <i>Shibaura Institute of Technology, Tokyo, Japan</i> , Masaaki Koganemaru , <i>Kagoshima University, Kagoshima, Japan</i>
8:40AM	Medium to High Strain-Rate Characterization of Lead Free Solder Alloys Through Metal Cutting Experiments Technical Paper Publication. InterPACK2019-6510 Yuvraj Singh, Anirudh Udupa, Srinivasan Chandrasekar, Ganesh Subbarayan , <i>Purdue University, West Lafayette, IN, United States</i>

TRACK 2: SERVERS OF THE FUTURE, EDGE, AND CLOUD COMPUTING: WITH PAPERS HONORING MICHAEL ELLSWORTH FOR CONTRIBUTIONS AND SERVICE TO ASME INTERPACK, THE ELECTRONIC AND PHOTONIC PACKAGING DIVISION, AND LEADERSHIP IN LIQUID COOLING OF SERVER SYSTEMS

Track Organizer: **Saket Karajgikar**, *Facebook Inc., Menlo Park, CA, United States*

Track Co-Organizers: **Timothy Chainer**, *IBM, Yorktown Heights, NY, United States*, **Joshua Gess**, *Oregon State University, Corvallis, OR, United States*, **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States*

2-1: DATA CENTER COOLING I

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Cheng Chen**, *Facebook Inc., Menlo Park, CA, United States*

Session Co-Organizer: **Prakriti Choudhary**, *Facebook Inc., Menlo Park, CA, United States*, **Brent Goren**, *Eaton Corporation, San Marcos, CA, United States*

8:00AM	Dynamic Control of Airflow Balance in Data Centers Technical Paper Publication. InterPACK2019-6304 Stephen Linder , <i>Schneider-Electric, Medford, MA, United States</i> , Jim VanGilder, Yan Zhang , <i>Schneider-Electric, Andover, MA, United States</i> , Enda Barrett , <i>National University of Ireland Galway, Galway, Ireland</i>
8:20AM	Thermal Profiling of a Small Operational Data Center Technical Paper Publication. InterPACK2019-6309 Ismail Turkmen, Cem Ahmet Mercan, Hamza Salih Erden , <i>Istanbul Technical University, Istanbul, Turkey</i>
8:40AM	Feedback Control System for Airflow Management in Data Centers Using Active Air Dampers Technical Presentation. InterPACK2019-6430 Ghazal Mohsenian , <i>Binghamton State University, Binghamton, NY, United States</i> , Sadegh Khalili , <i>State University of New York at Binghamton, Binghamton, NY, United States</i> , Bahgat Sammakia , <i>Binghamton University, Binghamton, NY, United States</i>
9:00AM	Thermal Challenges in Servers Technical Presentation. InterPACK2019-6532 Timothy Chainer, Mark Schultz, Pritish Parida , <i>IBM, Yorktown Heights, NY, United States</i>

Monday, October 7, 8:00AM–9:30AM

TRACK 5: PHOTONICS AND OPTICS

Track Organizer: **Changqing Chen**, *Huazhong University of Science and Technology, Wuhan, China*

Track Co-Organizer: **Ping Zhou**, *LDX Optronics, Maryville, TN, United States*, **Haiding Sun**, *University of Science and Technology of China, Anhui, China*

5-1: DUV-LED I

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Yuji Zhao**, *Arizona State University, Tempe, AZ, United States*

Session Co-Organizer: **Jonathan Klamkin**, *University of California, Santa Barbara, Santa Barbara, CA, United States*

8:00AM	AlGaIn Nanowire Light Emitting Diodes on Metal Substrates Technical Presentation. InterPACK2019-6322 Haiding Sun , <i>University of Science and Technology of China, Anhui, China</i>
8:20AM	Large Roll Hexagonal BN Monolayer: Synthesis, Modulation Doping and 2D Emitter Technical Presentation. InterPACK2019-6326 Duanjun Cai , Guozhen Liu , Yuejin Wang , <i>Xiamen University, Xiamen, Fujian, China</i>
8:40AM	Polarization Engineering of III-Nitride Photonic Devices Technical Presentation. InterPACK2019-6370 Cheng Liu , Jing Zhang , <i>Rochester Institute of Technology, Rochester, NY, United States</i>
9:00AM	Recent Progress on the Development of III-Nitride Based DUV Light-Emitting Diodes and Micro-/Nano-Structured Light Emitting Diodes Technical Presentation. InterPACK2019-6310 Zi-Hui Zhang , Yonghui Zhang , Kangkai Tian , Chunshuang Chu , Jiamang Che , Hua Shao , Jianquan Kou , Xu Hou , <i>Hebei University of Technology, Tianjin, China</i>

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*

Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States*

6-1: WIDE BANDGAP MATERIALS, DEVICES, AND CIRCUITS

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Jae-Hyun Ryou**, *University of Houston, Houston, TX, United States*

Session Co-Organizer: **Richard Thomas**, *U.S. Army Research Laboratory, Adelphi, MD, United States*, **Anil Yuksel**, *IBM Corporation, Austin, TX, United States*

8:00AM	Radiation Effects on the Self-Heating of AlGaIn/GaN HEMTs Technical Presentation. InterPACK2019-6438 Bikramjit Chatterjee , Yiwen Song , Brian Foley , <i>Pennsylvania State University, State College, PA, United States</i> , Hyungtak Kim , <i>Hongik University, Seoul, Korea (Republic)</i> , Sukwon Choi , <i>Pennsylvania State University, University Park, PA, United States</i>
8:20AM	Piezoresistive Theory for 4H Silicon Carbide Stress Sensors on Four-Degree Off-Axis Wafers Technical Paper Publication. InterPACK2019-6461 Jun Chen , Richard Jaeger , Jeffrey Suhling , <i>Auburn University, Auburn, AL, United States</i>
8:40AM	The Doping Dependence of the Thermal Conductivity of Bulk Gallium Nitride Synthesized via Diverse Growth Techniques Technical Presentation. InterPACK2019-6528 Yiwen Song , Bikramjit Chatterjee , Brian Foley , <i>Pennsylvania State University, University Park, PA, United States</i> , Jae-Hyun Ryou , <i>University of Houston, Houston, TX, United States</i> , Sukwon Choi , <i>Pennsylvania State University, University Park, PA, United States</i> , Jacob Leach , <i>Kyma Technologies, Inc., Raleigh, NC, United States</i> , Srabanti Chowdhury , <i>Stanford University, Stanford, CA, United States</i>
9:00AM	Design, Analysis and Comparison of Insulated Metal Substrates for High Power Wide-Bandgap Power Modules Technical Paper Publication. InterPACK2019-6436 Emre Gulpinar , Burak Ozpineci , Shajjad Chowdhury , <i>Oak Ridge National Laboratory, Knoxville, TN, United States</i>

Technical Sessions

MONDAY, OCTOBER 7

Monday, October 7, 8:00AM–9:30AM

TRACK 8: AUTONOMOUS, HYBRID, AND ELECTRIC VEHICLES

Track Organizer: **Przemyslaw Jakub Gromala**, *Robert Bosch GmbH, Reutlingen, Germany*

Track Co-Organizer: **Gopi Krishnan**, *Tesla, Palo Alto, CA, United States*, **Ercan Dede**, *Toyota Research Institute of North America, Ann Arbor, MI, United States*, **Sven Rzepka**, *Fraunhofer ENAS, Chemnitz, Germany*

8-2: ELECTRIC/HYBRID CARS

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Azeem Sarwar**, *General Motors, Warren, MI, United States*

Session Co-Organizer: **Przemyslaw Jakub Gromala**, *Robert Bosch GmbH, Reutlingen, Germany*

8:00AM	System-Level Thermal Management and Reliability of Automotive Electronics: Goals and Opportunities in the Next Generation of Electric and Hybrid Electric Vehicles Technical Paper Publication. InterPACK2019-6429 Bakhtiyar Mohammad Nafis, David Huitink, Ange-Christian Iradukunda, Yarui Peng, Imam Al Razi , <i>University of Arkansas, Fayetteville, AR, United States</i>
8:20AM	Experimentation and Simulation of Jet Impingement Cooling of Electric Machines With Automatic Transmission Fluid Technical Presentation. InterPACK2019-6445 Xuhui Feng, Kevin Bennion, J. Emily Cousineau, Gilberto Moreno, Bidzina Kekelia, Sreekant Narumanchi, Jeff Tomerlin , <i>National Renewable Energy Laboratory, Golden, CO, United States</i>
8:40AM	Thermal Management of Fast Charging Systems for Electrified Vehicles Technical Presentation. InterPACK2019-6660 Yashraj Gurumukhi, Muhammad Jahidul Hoque , <i>University of Illinois at Urbana-Champaign, Urbana, IL, United States</i> , Hansen Qiao , <i>Stanford University, Stanford, CA, United States</i> , Myung Ki Sung, Xi Lu, Ted Fillipi , <i>Ford Motor Company, Dearborn, MI, United States</i> , Andrew Alleyne , <i>University of Illinois, Urbana, IL, United States</i> , Kenneth Goodson, Mehdi Asheghi , <i>Stanford University, Stanford, CA, United States</i> , Nenad Miljkovic , <i>University of Illinois at Urbana-Champaign, Urbana, IL, United States</i>
9:00AM	Surface Temperature Effect on Convective Heat Transfer Coefficients for Jet Impingement Cooling of Electric Machines With Automatic Transmission Fluid Technical Paper Publication. InterPACK2019-6457 Bidzina Kekelia, Kevin Bennion, Xuhui Feng, Gilberto Moreno, J. Emily Cousineau, Sreekant Narumanchi, Jeff Tomerlin , <i>National Renewable Energy Laboratory, Golden, CO, United States</i>

Monday, October 7, 10:45AM–12:15PM

TRACK 1: HETEROGENEOUS INTEGRATION

Track Organizer: **Gamal Refai-Ahmad**, *Xilinx, Santa Clara, CA, United States*

Track Co-Organizer: **Leila Choobineh**, *SUNY Polytechnic Institute, Utica, NY, United States*, **Fabian Welschinger**, *Robert Bosch GmbH, Renningen, Germany*, **Winston Zhang**, *Novark Technologies, Inc., Shenzhen, Guangdong, Guangdong, China*

1-3: MICROFABRICATION

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Tuhin Sinha**, *IBM, Hopewell Junction, NY, United States*

Session Co-Organizer: **Shima Hajimirza**, *Texas A&M University, College Station, TX, United States*

10:45AM

CFD Analysis of Molten Solder Flow Behavior and Bridging Mechanism During Solder Bump Formation
Technical Paper Publication. InterPACK2019-6395

Risa Miyazawa, *IBM Japan, Ltd., Kawasaki, Japan*, **Keishi Okamoto**, *IBM Research - Tokyo, Kawasaki, Japan*, **Hiroyuki Mori**, *IBM Japan Ltd., Kawasaki, Kanagawa, Japan*

11:05AM

Numerical/Experimental Hybrid Approach to Predict Warpage of Thin Substrates
Technical Presentation. InterPACK2019-6420

Sukrut Prashant Phansalkar, *Bongtae Han*, *University of Maryland, College Park, MD, United States*, **Jongkeun Moon**, *Samsung Electronics, Asansi, Korea (Republic)*

11:25AM

Addressing the Challenges in Laser Micro-Machining and Bonding of Silicon Microchannel Cold-Plate and 3D-Manifold for Embedded Cooling Applications: Perfect Debris Removal
Technical Paper Publication. InterPACK2019-6539

Sougata Hazra, **Ki Wook Jung**, *Stanford University, Stanford, CA, United States*, **Madhusudan Iyengar**, **Chris Malone**, *Google, LLC, Mountain View, CA, United States*, **Mehdi Asheghi**, **Kenneth Goodson**, *Stanford University, Stanford, CA, United States*

TRACK 2: SERVERS OF THE FUTURE, EDGE AND CLOUD COMPUTING: WITH PAPERS HONORING MICHAEL ELLSWORTH FOR CONTRIBUTIONS AND SERVICE TO ASME INTERPACK, THE ELECTRONIC AND PHOTONIC PACKAGING DIVISION, AND LEADERSHIP IN LIQUID COOLING OF SERVER SYSTEMS

Track Organizer: **Saket Karajgikar**, *Facebook Inc., Menlo Park, CA, United States*

Track Co-Organizer: **Timothy Chainer**, *IBM, Yorktown Heights, NY, United States*, **Joshua Gess**, *Oregon State University, Corvallis, OR, United States*, **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States*

2-2: TWO PHASE COOLING I

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Emad A. Poshtan**, *Bosch, Reutlingen, Germany*

Session Co-Organizer: **Mark Schultz**, *IBM Corporation, Yorktown Heights, NY, United States*

10:45AM

An Experimental Investigation on the Fluid Distribution in a Two-Phase Cooled Rack Under Steady and Transient IT Load
Technical Paper Publication. InterPACK2019-6463

Sadegh Khalili, *State University of New York at Binghamton, Binghamton, NY, United States*, **Srikanth Rangarajan**, *Binghamton University, Vestal, NY, United States*, **Bahgat Sammakia**, *Binghamton University, Binghamton, NY, United States*, **Vadim Gektin**, *Futurewei Technologies, Santa Clara, CA, United States*

11:25AM

Design of Passive Two-Phase Thermosyphons for Server Cooling
Technical Paper Publication. InterPACK2019-6386

Raffaele Luca Amalfi, *Nokia Bell Labs, Murray Hill, NJ, United States*, **Jackson Braz Marcinichen**, *JJ Cooling Innovation Sarl, Lausanne, Switzerland*, **John Richard Thome**, *Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland*, **Filippo, F. Cataldo**, *Provides Metalmeccanica S.r.l., Latina, Italy*

Technical Sessions

MONDAY, OCTOBER 7

Monday, October 7, 10:45AM–12:15PM

TRACK 5: PHOTONICS AND OPTICS

Track Organizer: **Changqing Chen**, *Huazhong University of Science and Technology, Wuhan, China*

Track Co-Organizer: **Ping Zhou**, *LDX Optronics, Maryville, TN, United States*, **Haiding Sun**, *University of Science and Technology of China, Anhui, China*

5-2: DUV-LED II

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Zi-Hui Zhang**, *Hebei University of Technology, Tianjin, China*

Session Co-Organizer: **Haiding Sun**, *University of Science and Technology of China, Anhui, China*

10:45AM

III-Nitride UV-Visible Integrated Photonics for Quantum and Biomedical Applications

Technical Presentation. InterPACK2019-6323

Yuji Zhao, *Arizona State University, Tempe, AZ, United States*

11:05AM

Improvement of DUV LEDs Light Extraction Efficiency by Novel Microstructures

Technical Presentation. InterPACK2019-6340

Changqing Chen, Shuang Zhang, Shuai Wang, Jun Zhang, Hanling Long, Qian Chen, Jiangnan Dai, *Huazhong University of Science and Technology, Wuhan, China*

11:25AM

Strain Effect on AlGaIn Anisotropic Ultraviolet Light Emitting Characteristic

Technical Presentation. InterPACK2019-6341

Hanling Long, Linlin Xu, Jiangnan Dai, Changqing Chen, *Huazhong University of Science and Technology, Wuhan, Hubei, China*

11:45AM

Photonic Engineering in AlGaIn-Based Deep Ultraviolet Devices: Symmetry, Strain, and Polarization

Technical Presentation. InterPACK2019-6357

Shiqiang Lu, Wei Lin, Shuping Li, Junyong Kang, Duanjun Cai, *Xiamen University, Xiamen, Fujian, China*

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*

Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States*

6-2: ULTRA-WIDE BANDGAP GALLIUM OXIDE ELECTRONICS

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Jungwan Cho**, *Kyunghee University, Gyeonggi-do, Korea (Republic)*

Session Co-Organizer: **Mandar Kulkarni**, *Amazon, Fremont, CA, United States*

10:45AM

Electrothermal Modeling and Analysis of Gallium Oxide Power Switching Devices

Technical Paper Publication. InterPACK2019-6453

Ramchandra Kotecha, Andriy Zakutayev, Wyatt Metzger, Paul Paret, Gilberto Moreno, Bidzina Kekelia, Kevin Bennion, Barry Mather, Sreekant Narumanchi, *National Renewable Energy Laboratory, Golden, CO, United States*, **Samuel Kim, Samuel Graham**, *Georgia Institute of Technology, Atlanta, GA, United States*

11:05AM

Thermal Management of Beta-Ga₂O₃ Transistors

Technical Presentation. InterPACK2019-6728

Samuel Kim, Chao Yuan, Jingjing Shi, Samuel Graham, *Georgia Institute of Technology, Atlanta, GA, United States*

11:25AM

Thermal Management of Gallium Oxide Electronics via Hetero-Integration on High Thermal Conductivity Substrates

Technical Presentation. InterPACK2019-6439

Bikramjit Chatterjee, *Pennsylvania State University, State College, PA, United States*, **Craig McGray**, *Modern Microsystems, Inc., Gaithersburg, MD, United States*, **Jacob Leach**, *Kyma Technologies, Inc., Raleigh, NC, United States*, **Yiwen Song, Zahabul Islam, Aman Haque, Brian Foley, Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States*

11:45AM

Surface-Pretreatment-Dependent High Thermal Boundary Conductance Across Heterogeneous Atomic-Layer-Deposited Ga₂O₃-Diamond Interfaces

Technical Presentation. InterPACK2019-6608

Zhe Cheng, *Georgia Institute of Technology, Atlanta, GA, United States*, **Virginia Wheeler, Marko Tadjer, Karl Hobart**, *U.S. Naval Research Laboratory, Washington, DC, United States*, **Jingjing Shi**, *Georgia Institute of Technology, Atlanta, GA, United States*, **Tingyu Bai**, *University of California, Los Angeles, Los Angeles, United States*, **Luke Yates**, *Georgia Institute of Technology, Atlanta, GA, United States*, **Mark Goorsky**, *University of California, Los Angeles, Los Angeles, CA, United States*, **Samuel Graham**, *Georgia Institute of Technology, Atlanta, GA, United States*

Monday, October 7, 10:45AM–12:15PM

TRACK 7: ENERGY CONVERSION AND STORAGE

Track Organizer: **Guangsheng Zhang**, *University of Alabama in Huntsville, Huntsville, AL, United States*

Track Co-Organizer: **Aritra Sur**, *United Technologies Research Center, East Hartford, CT, United States*, **Xuemin Li**, *A123 Systems, Waltham, MA, United States*, **Ayyoub Momen**, *Oak Ridge National Library, Oak Ridge, TN, United States*, **Partha Mukherjee**, *Purdue University, West Lafayette, IN, United States*

7-9: CHALLENGES AND OPPORTUNITIES IN THERMAL MANAGEMENT OF COMPONENTS AND SYSTEMS

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Aritra Sur**, *United Technologies Research Center, East Hartford, CT, United States*

Session Co-Organizer: **Ayyoub Momen**, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*

10:45AM

Challenges and Opportunities in Thermal Management of Directed Energy Systems

Technical Presentation. InterPACK2019-6625

Avram Bar-Cohen, *DARPA, Arlington, VA, United States*, **Terry G. DuBois**, *U.S. Army Futures Command, Aberdeen Proving Ground, MD, United States*

11:05AM

Measuring Junction Temperature of LEDs: Challenges and Opportunities

Technical Presentation. InterPACK2019-6776

Mehmet Arik, *Ozyegin University, Istanbul, Turkey*

TRACK 8: AUTONOMOUS, HYBRID, AND ELECTRIC VEHICLES

Track Organizer: **Przemyslaw Jakub Gromala**, *Robert Bosch GmbH, Reutlingen, Germany*

Track Co-Organizer: **Gopi Krishnan**, *Tesla, Palo Alto, CA, United States*, **Ercan Dede**, *Toyota Research Institute of North America, Ann Arbor, MI, United States*, **Sven Rzepka**, *Fraunhofer ENAS, Chemnitz, Germany*

8-4: MATERIAL MODELING FOR AUTOMOTIVE PACKAGING I

Concourse Level, Fourth Floor, Redondo

Session Organizer: **Xuhui Feng**, *National Renewable Energy Laboratory, Golden, CO, United States*

Session Co-Organizer: **Klas Brinkfeldt**, *RISE IVF AB, Molndal, Sweden*

10:45AM

Study of Thermal Aging Behavior of Epoxy Molding Compound for Applications in Harsh Environments

Technical Presentation. InterPACK2019-6506

Przemyslaw Jakub Gromala, **Adwait Inamdar**, **Alexandru Prisacaru**, *Robert Bosch GmbH, Reutlingen, Germany*, **Bongtae Han**, *University of Maryland, College Park, MD, United States*

11:05AM

Fatigue Delamination Crack Growth of Potting Compounds in PCB/Epoxy Interfaces Under Flexure Loading

Technical Paper Publication. InterPACK2019-6572

Pradeep Lall, **Kalyan Dornala**, **Jeffrey Suhling**, *Auburn University, Auburn, AL, United States*, **John Deep**, *U.S. Air Force Research Laboratory, Eglin AFB, AL, United States*, **Ryan Lowe**, *ARA Associates, Littleton, CO, United States*

11:25AM

Moisture Transport Through Housing Materials Enclosing Critical Automotive Electronics

Technical Presentation. InterPACK2019-6621

Artur Roman, **Bongtae Han**, *University of Maryland, College Park, MD, United States*

11:45AM

Evolution of the Microstructure of Lead Free Solders Subjected to Both Aging and Cyclic Loading

Technical Paper Publication. InterPACK2019-6560

Md. Mahmudur Chowdhury, **Mohd Aminul Hoque**, **Jeffrey Suhling**, **Sa'd Hamasha**, **Pradeep Lall**, *Auburn University, Auburn, AL, United States*

Technical Sessions

MONDAY, OCTOBER 7

Monday, October 7, 1:45PM–3:15PM

TRACK 1: HETEROGENEOUS INTEGRATION

Track Organizer: **Gamal Refai-Ahmad**, *Xilinx, Santa Clara, CA, United States*

Track Co-Organizer: **Leila Choobineh**, *SUNY Polytechnic Institute, Utica, NY, United States*, **Fabian Welschinger**, *Robert Bosch GmbH, Renningen, Germany*, **Winston Zhang**, *Novark Technologies, Inc., Shenzhen, Guangdong, Guangdong, China*

1-4: FUNDAMENTAL OF THERMAL TRANSPORT

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Nirup Nagabandi**, *Incendium Technologies, College Station, TX, United States*

Session Co-Organizer: **Yuling Niu**, *State University of New York at Binghamton, Vestal, NY, United States*

1:45PM	Boiling Heat Transfer Using Spatially-Variant and Uniform Microporous Coatings Technical Paper Publication. InterPACK2019-6307 Quang Pham, Youngjoon Suh, Bowen Shao, Yoonjin Won , <i>University of California, Irvine, Irvine, CA, United States</i>
2:05PM	Effect of Inclined Angle of Radiator on Natural Convective Heat Dissipation Performance Technical Paper Publication. InterPACK2019-6313 Tengfei Ma, Wen Wang , <i>Shanghai Jiao Tong University, Shanghai, China</i>
2:25PM	Ultrahigh Thermal Boundary Conductance Across GaN-SiC Heterogeneous Interfaces by Surface Activated Bonding Technical Presentation. InterPACK2019-6607 Zhe Cheng , <i>Georgia Institute of Technology, Atlanta, GA, United States</i> , Fengwen Mu, Tadatomo Suga , <i>University of Tokyo, Tokyo, Japan</i> , Samuel Graham , <i>Georgia Institute of Technology, Atlanta, GA, United States</i>
2:45PM	Demonstration of 150-micron Ultrathin Vapor Chambers for 5G Smartphones Technical Presentation. InterPACK2019-6683 Ryan Lewis , <i>Kelvin Thermal Technologies, Lafayette, CO, United States</i> , Yung Cheng Lee , <i>University of Colorado, Boulder, CO, United States</i>

TRACK 2: SERVERS OF THE FUTURE, EDGE AND CLOUD COMPUTING: WITH PAPERS HONORING MICHAEL ELLSWORTH FOR CONTRIBUTIONS AND SERVICE TO ASME INTERPACK, THE ELECTRONIC AND PHOTONIC PACKAGING DIVISION, AND LEADERSHIP IN LIQUID COOLING OF SERVER SYSTEMS

Track Organizer: **Saket Karajgikar**, *Facebook Inc., Menlo Park, CA, United States*

Track Co-Organizer: **Timothy Chainer**, *IBM, Yorktown Heights, NY, United States*, **Joshua Gess**, *Oregon State University, Corvallis, OR, United States*, **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States*

2-3: TWO PHASE COOLING II

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Emad A. Poshtan**, *Robert Bosch GmbH, Reutlingen, Germany*

Session Co-Organizer: **Mark Schultz**, *IBM Corporation, Yorktown Heights, NY, United States*

1:45PM	The Critical Role of Dynamic Surface Wettability on Bubble Dynamics and Boiling Performance Technical Presentation. InterPACK2019-6308 Taylor Allred, Justin Weibel , <i>Purdue University, West Lafayette, IN, United States</i> , Suresh Garimella , <i>University of Vermont, Burlington, VT, United States</i>
2:05PM	On Temperature Discontinuity at an Evaporating Liquid-Vapor Interface Technical Presentation. InterPACK2019-6346 Parham Jafari, Hadi Ghasemi , <i>University of Houston, Houston, TX, United States</i>
2:25PM	Capillary Evaporation in Graphene Coated Nanochannels Technical Presentation. InterPACK2019-6428 Hadi Ghasemi, Masoumeh Nazari , <i>University of Houston, Houston, TX, United States</i>
2:45PM	Enabling Thermal Management of High-Powered Server Processors Using Passive Thermosiphon Heat Sink Technical Paper Publication. InterPACK2019-6530 Devdatta Kulkarni, Priyanka Tunuguntla, Guixiang Tan, Casey Carte , <i>Intel, Hillsboro, OR, United States</i>

Monday, October 7, 1:45PM–3:15PM

TRACK 5: PHOTONICS AND OPTICS

Track Organizer: **Changqing Chen**, Huazhong University of Science and Technology, Wuhan, China

Track Co-Organizer: **Ping Zhou**, LDX Optronics, Maryville, TN, United States, **Haiding Sun**, University of Science and Technology of China, Anhui, China

5-3: INTEGRATED PHOTONICS AND WIDE BANDGAP PHOTONICS

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Jing Zhang**, Rochester Institute of Technology, Rochester, NY, United States

Session Co-Organizer: **Bin Liu**, Nanjing University, Nanjing, Jiangsu Province, China

1:45PM	On-Chip Detection From Directly Modulated Quantum Dot Microring Lasers on Si Technical Presentation. InterPACK2019-6352 Yating Wan , UCSB, Goleta, CA, United States
2:05PM	High-Gain Solid-State Photomultiplier Based on Periodic GaN/AlN Hetero-Structures Technical Presentation. InterPACK2019-6371 Lai Wang, Xingzhao Wu , Tsinghua University, Beijing, China, Julien Brault, Mohamed Al Khalfioui, Maud Nemoz , CNRS, Valbonne, France, Zhibiao Hao, Yi Luo, Changzheng Sun, Bing Xiong, Yanjun Han, Jian Wang, Hongtao Li , Tsinghua University, Beijing, China
2:25PM	Laser Integration Technologies for Silicon Photonics Technical Presentation. InterPACK2019-6610 Jonathan Klamkin , University of California, Santa Barbara, Santa Barbara, CA, United States
2:45PM	Improving Performance and Reliability of GaN-Based Flip-Chip Light Emitting Diodes by Reflective Bonding Pads Technical Presentation. InterPACK2019-6337 Linlin Xu, Hanling Long, Jiangnan Dai, Changqing Chen , Huazhong University of Science and Technology, Wuhan

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, U.S. Army Research Laboratory, Highland, MD, United States

Track Co-Organizer: **Damena Agonafer**, Washington University in St. Louis, Saint Louis, MO, United States, **Ram Ranjan**, United Technologies Research Center, East Hartford, CT, United States, **Sukwon Choi**, Pennsylvania State University, University Park, PA, United States

6-3: DEVICE THERMAL MANAGEMENT AND RELIABILITY

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Shubhodeep Goswami**, General Electric Company, Niskayuna, NY, United States

Session Co-Organizer: **Lauren Kegley**, Cree WolfSpeed, Fayetteville, AR, United States

1:45PM	Degradation Modeling and Reliability Assessment of Capacitors Technical Paper Publication. InterPACK2019-6456 Anunay Gupta, Om Prakash Yadav, Arighna Roy , North Dakota State University, Fargo, ND, United States, Douglas DeVoto , National Renewable Energy Laboratory, Golden, CO, United States, Joshua Major , National Renewable Energy Laboratory, Denver, CO, United States
2:05PM	Thermal Assessment and In-Situ Monitoring of Insulated Gate Bipolar Transistors in Power Electronic Modules Technical Paper Publication. InterPACK2019-6470 Erick Gutierrez, Kevin Lin , University of Maryland, College Park, MD, United States, Douglas DeVoto , National Renewable Energy Laboratory, Golden, CO, United States, Patrick McCluskey , University of Maryland, College Park, MD, United States
2:25PM	The Effect of Anisotropy on Thermal Boundary Conductance at Metal-Semiconductor Interface Technical Presentation. InterPACK2019-6748 Jingjing Shi, Zhe Cheng, Chao Yuan, Samuel Graham , Georgia Institute of Technology, Atlanta, GA, United States
2:45PM	Integrated Optical Probing of the Thermal Dynamics of Wide Bandgap Power Electronics Technical Paper Publication. InterPACK2019-6440 James Spencer Lundh , Pennsylvania State University, University Park, PA, United States, Yiwen Song, Bikramjit Chatterjee , Pennsylvania State University, State College, PA, United States, Albert G. Baca, Robert J. Kaplar, Andrew M. Armstrong, Andrew A. Allerman , Sandia National Laboratories, Albuquerque, NM, United States, Hyungtak Kim , Hongik University, Seoul, Korea (Republic), Sukwon Choi , Pennsylvania State University, University Park, PA, United States

Technical Sessions

MONDAY, OCTOBER 7

Monday, October 7, 1:45PM–3:15PM

TRACK 8: AUTONOMOUS, HYBRID, AND ELECTRIC VEHICLES

Track Organizer: **Przemyslaw Jakub Gromala**, Robert Bosch GmbH, Reutlingen, Germany

Track Co-Organizer: **Gopi Krishnan**, Tesla, Palo Alto, CA, United States, **Ercan Dede**, Toyota Research Institute of North America, Ann Arbor, MI, United States, **Sven Rzepka**, Fraunhofer ENAS, Chemnitz, Germany

8-6: PROGNOSTICS AND HEALTH MANAGEMENT OF AUTOMOTIVE ELECTRONICS

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Przemyslaw Jakub Gromala**, Robert Bosch GmbH, Reutlingen, Germany

Session Co-Organizer: **Bongtae Han**, University of Maryland, College Park, MD, United States

1:45PM	Silicon-Based Piezoresistive Stress Sensor as a Load Counter for Automotive Electronic Systems Technical Presentation. InterPACK2019-6419 Yu-Hsiang Yang, Bongtae Han , University of Maryland, College Park, MD, United States
2:05PM	Data-Driven Approaches for Fault Prognosis of SiC MOSFETs Technical Presentation. InterPACK2019-6524 Weiqiang Chen, Lingyi Zhang, Ali Bazzi, Krishna Pattipati , University of Connecticut, Storrs, CT, United States, Shailesh N Joshi , Toyota Motor North America, Ann Arbor, MI, United States, Ercan Dede , Toyota Research Institute of North America, Ann Arbor, MI, United States
2:25PM	Prognostication of Failure in Packaged Power Devices for Automotive Applications Technical Presentation. InterPACK2019-6487 Andreas Löwberg, Klas Brinkfeldt, Jerry Börjesson, Dag Andersson , RISE IVF AB, Mölndal, Sweden
2:45PM	Stator Diagnosis in Permanent Magnet Synchronous Motor (PMSM) Technical Paper Publication. InterPACK2019-6423 Madi Zholbaryssov , University of Illinois at Urbana-Champaign, Urbana, IL, United States, Azeem Sarwar , General Motors, Warren, MI, United States

Monday, October 7, 3:30PM–5:00PM

TRACK 1: HETEROGENEOUS INTEGRATION

Track Organizer: **Gamal Refai-Ahmad**, Xilinx, Santa Clara, CA, United States

Track Co-Organizer: **Leila Choobineh**, SUNY Polytechnic Institute, Utica, NY, United States, **Fabian Welschinger**, Robert Bosch GmbH, Renningen, Germany, **Winston Zhang**, Novark Technologies, Inc., Shenzhen, Guangdong, Guangdong, China

1-5: DESIGN AND CHARACTERIZATION

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Sandeep Mallampati**, globalfoundries, Albany, NY, United States

Session Co-Organizer: **Fabian Welschinger**, Robert Bosch GmbH, Renningen, Germany

3:30PM	The Assembly Solutions for Heterogeneous Integration Packaging Technology for High Performance Computing Technical Presentation. InterPACK2019-6450 Bo-Hao Ma, Chich Sheng Lin, Nicholas Kao, Daniel Ng, Yu Po Wang , Siliconware Precision Industries Co., Ltd., Taichung, Taiwan
3:50PM	Effect of Nonlinear Response of Printed Circuit Boards (PCBs) Under Multiaxial Vibration Excitation Technical Presentation. InterPACK2019-6369 Abhijit Dasgupta , University of Maryland College Park, College Park, MD, United States
4:10PM	Time-Dependent Behavior of Epoxy Molding Compound Subjected to Hydrostatic Loading: Characterization and Its Effect on Reliability Assessment Technical Presentation. InterPACK2019-6441 Hyun Seop Lee, Sukrut Prashant Phansalkar, Bongtae Han , University of Maryland, College Park, MD, United States
4:30PM	Design-for-Reliability of Solder Joint Interconnections in Aerospace Electronics Technical Presentation. InterPACK2019-6318 Ephraim Suhir , Portland State University, Portland, OR

Monday, October 7, 3:30PM–5:00PM

TRACK 2: SERVERS OF THE FUTURE, EDGE AND CLOUD COMPUTING: WITH PAPERS HONORING MICHAEL ELLSWORTH FOR CONTRIBUTIONS AND SERVICE TO ASME INTERPACK, THE ELECTRONIC AND PHOTONIC PACKAGING DIVISION, AND LEADERSHIP IN LIQUID COOLING OF SERVER SYSTEMS

Track Organizer: **Saket Karajgikar**, Facebook Inc., Menlo Park, CA, United States

Track Co-Organizer: **Timothy Chainer**, IBM, Yorktown Heights, NY, United States, **Joshua Gess**, Oregon State University, Corvallis, OR, United States, **Baris Dogruoz**, Cisco Systems Inc., Santa Clara, CA, United States

2-4: FUNDAMENTAL COOLING TECHNOLOGIES

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Jimil M. Shah**, University of Texas at Arlington, Arlington, TX, United States

Session Co-Organizer: **Pavan Rajmane**, Qualcomm, San Diego, CA, United States, **Steve Moon**, 3M Company, St. Paul, MN, United States

3:30PM	Demonstration of a Compliant Micro-Spring Array as a Thermal Interface Material for Pluggable Optoelectronic Transceiver Modules Technical Paper Publication. InterPACK2019-6389 Jin Cui, Liang Pan, Justin Weibel , Purdue University, West Lafayette, IN, United States
3:50PM	Investigation Regarding Transient Compact Thermal Model for Microprocessor Packages Technical Paper Publication. InterPACK2019-6390 Koji Nishi , Japan/Ashikaga University, Ashikaga, Japan
4:10PM	Thermal and Mechanical Design of the Fastest Supercomputer of the World in Cognitive Systems: IBM POWER AC 922 Technical Paper Publication. InterPACK2019-6444 Anil Yuksel, Vic Mahaney , IBM Corporation, Austin, TX, United States, Chris Marroquin , IBM Corporation, Rochester, MN, United States, Shurong Tian , IBM Corporation, Yorktown Heights, NY, United States, Mark Hoffmeyer , IBM Corporation, Rochester, MN, United States, Mark Schultz, Todd Takken , IBM Corporation, Yorktown Heights, NY, United States
4:30PM	Comparative Evaluation of Algorithms for Achieving Ultrapacked Thermal Greases: Microstructural Models and Effective Behavior Technical Paper Publication. InterPACK2019-6501 Sukshitha Achar Puttur Lakshminarayana, Huanyu Liao, Ganesh Subbarayan , Purdue University, West Lafayette, IN, United States

TRACK 5: PHOTONICS AND OPTICS

Track Organizer: **Changqing Chen**, Huazhong University of Science and Technology, Wuhan, China

Track Co-Organizer: **Ping Zhou**, LDX Optonics, Maryville, TN, United States, **Haiding Sun**, University of Science and Technology of China, Anhui, China

5-4: NANOSTRUCTURES/FLEXIBLE MATERIALS & DEVICES

Concourse Level, Fourth Floor, Huntington C

Session Co-Organizer: **Junyou Pan**, Guangzhou ChinaRay Optoelectronic Materials Co., Ltd, Guangzhou, China, **Klaus Müllen**, Max-Planck Institute for Polymer Research, Mainz, Germany

3:30PM	Barcode-Like Security Labels Based on Flexible and Ultra-Lightweight Polymer Membrane Lasers Technical Presentation. InterPACK2019-6431 Malte Gather , University of St. Andrews, St. Andrews, Fife, United Kingdom
3:50PM	Near-Field Infrared Imaging of Hot Electrons in Nano-Devices Technical Presentation. InterPACK2019-6330 Zhenghua An , Fudan University, Shanghai, Shanghai, China
4:10PM	Design of Diffractive Beam Splitters by Indirect Construction of Diffraction Pattern Based on Sampling Theory Technical Presentation. InterPACK2019-6338 Hui Xiong , Hubei University, Wuhan, China
4:30PM	Direct Ink Printing of Cavities in DPC Ceramic Substrates With Kaolin Pastes for Hermetic Packaging Technical Paper Publication. InterPACK2019-6616 Qinglei Sun, Yang Peng, Hao Cheng, Yun Mou, Mingxiang Chen , Huazhong University of Science and Technology, Wuhan, China

Technical Sessions

MONDAY, OCTOBER 7

Monday, October 7, 3:30PM–5:00PM

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*

Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States*

6-7: TWO PHASE COOLING

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Ruander Cardenas**, *Intel Corporation, Hillsboro, OR, United States*

Session Co-Organizer: **Franklin Robinson**, *NASA Goddard Space Flight Center, Greenbelt, MD, United States*

3:30PM	Two-Phase Immersion Cooling of a SiC On-Vehicle Inverter by Self-Cooling Effect Using Lotus Porous Coppers Technical Presentation. InterPACK2019-6494 Tsuji Rikako, Kazuhisa Yuki, Kio Takai, Risako Kibushi, Noriyuki Unno , <i>Sanyo-Onoda City University, Sanyo-Onoda, Japan</i> , Takuya Ide, Tetsuro Ogushi, Masaaki Murakami, Tomiyuki Numata , <i>Lotus Thermal Solution Inc., Kitaku, Japan</i> , Hikaru Nomura , <i>Osaka University, Toyonakashi, Japan</i>
3:50PM	Gravity Effects in Two-Phase Microgap Flow Technical Presentation. InterPACK2019-6745 Franklin Robinson , <i>NASA Goddard Space Flight Center, Greenbelt, MD, United States</i> , Avram Bar-Cohen , <i>University of Maryland at College Park, College Park, MD, United States</i>
4:10PM	Moving Boundary Model for Dynamic Control of Two Microchannel Evaporator Cooling System Technical Presentation. InterPACK2019-6760 Qi Jin, John T. Wen, Shankar Narayanan , <i>Rensselaer Polytechnic Institute, Troy, NY, United States</i>
4:30PM	Assessing the Performance of Advanced Cooling Techniques on Thermal Management of Next-Generation Power Electronics Technical Paper Publication. InterPACK2019-6311 Palash Acharya, Vaibhav Bahadur, Robert Hebner, Abdelhamid Ouroua, Shannon Strank , <i>University of Texas at Austin, Austin, TX, United States</i>

Monday, October 7, 3:30PM–5:00PM

TRACK 7: ENERGY CONVERSION AND STORAGE

Track Organizer: **Guangsheng Zhang**, University of Alabama in Huntsville, Huntsville, AL, United States

Track Co-Organizer: **Aritra Sur**, United Technologies Research Center, East Hartford, CT, United States, **Xuemin Li**, A123 Systems, Waltham, MA, United States, **Ayyoub Momen**, Oak Ridge National Laboratory, Oak Ridge, TN, United States, **Partha Mukherjee**, Purdue University, West Lafayette, IN, United States

7-4: SOLID-STATE COOLING

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Michael Benedict**, PARC, Palo Alto, CA, United States

Session Co-Organizer: **Aritra Sur**, United Technologies Research Center, East Hartford, CT, United States

3:30PM	Performance of an Electrocaloric Heat Pump Device Technical Presentation. InterPACK2019-6558 Subramanyaravi Annapragada , United Technologies Research, East Hartford, CT, United States, Aritra Sur , Joseph Mantese , United Technologies Research Center, East Hartford, CT, United States, William Rioux , Master Technician, East Hartford, CT, United States
3:50PM	Magnetocaloric Refrigeration Technical Presentation. InterPACK2019-6623 Ayyoub Momen , Oak Ridge National Laboratory, Oak Ridge, TN, United States

Tuesday, October 8, 8:00AM–9:30AM

TRACK 2: SERVERS OF THE FUTURE, EDGE AND CLOUD COMPUTING: WITH PAPERS HONORING MICHAEL ELLSWORTH FOR CONTRIBUTIONS AND SERVICE TO ASME INTERPACK, THE ELECTRONIC AND PHOTONIC PACKAGING DIVISION, AND LEADERSHIP IN LIQUID COOLING OF SERVER SYSTEMS

Track Organizer: **Saket Karajgikar**, Facebook Inc., Menlo Park, CA, United States

Track Co-Organizer: **Timothy Chainer**, IBM, Yorktown Heights, NY, United States, **Joshua Gess**, Oregon State University, Corvallis, OR, United States, **Baris Dogruoz**, Cisco Systems Inc., Santa Clara, CA, United States

2-5: DATA CENTER COOLING II

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Prakriti Choudhary**, Facebook Inc., Menlo Park, CA, United States

Session Co-Organizer: **Cheng Chen**, Facebook Inc., Menlo Park, CA, United States, **Brent Goren**, Eaton Corporation, San Marcos, CA, United States

8:00AM	Optimal Design and Modeling of Server Cabinets With In-Row Coolers and Air Conditioning Units in a Modular Data Center Technical Paper Publication. InterPACK2019-6522 Uschas Chowdhury , University of Texas at Arlington, Arlington, TX, United States, Mark Hendrix , Thomas Craft , Willis James , ComScope Inc., Richardson, TX, United States, Ankit Sutaria , Dereje Agonafer , University of Texas at Arlington, Arlington, TX, United States
8:20AM	Comparison of Data Driven Modeling Approaches for Temperature Prediction in Data Centers Technical Presentation. InterPACK2019-6565 Jayati Athavale , Facebook, Atlanta, GA, United States, Yogendra Joshi , Minami Yoda , Georgia Institute of Technology, Atlanta, GA, United States
8:40AM	Data Center Thermal Efficiency Improvement by Cooling Flow Vectoring Using Synthetic Jets Technical Paper Publication. InterPACK2019-6585 Eduardo Sepúlveda Jiménez , Jean Paul D'alençon , Luis Silva-Llanca , Universidad de La Serena, La Serena, Chile
9:00AM	Development of a Technique to Measure Deliquescent Relative Humidity of Particulate Contaminants and Determination of the Operating Relative Humidity of a Data Center Technical Paper Publication. InterPACK2019-6601 Jimil M. Shah , Roshan Anand , Satyam Saini , Rawhan Cyriac , Dereje Agonafer , University of Texas at Arlington, Arlington, TX, United States, Prabjit Singh , IBM Corporation, Poughkeepsie, NY, United States, Mike Kaler , Mestex, a Division of Mestek, Inc., Dallas, TX, United States

Technical Sessions

TUESDAY, OCTOBER 8

Tuesday, October 8, 8:00AM–9:30AM

TRACK 4: FLEXIBLE AND WEARABLE ELECTRONICS

Track Organizer: **Valerie Marty**, *Connected Micro, Corvallis, OR, United States*

Track Co-Organizer: **E. Yegan Erdem**, *Bilkent University, Ankara, Turkey*, **Benjamin Leeever**, *Air Force Research Laboratory, Wright Patterson AFB, OH, United States*, **Janos Veres**, *PARC, Palo Alto, CA, United States*, **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States*

4-1: DESIGN & MODELING FOR FLEXIBLE ELECTRONICS

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Philip Buskohl**, *U.S. Air Force Research Laboratory, OH, United States*

Session Co-Organizer: **Tsung-Ching Jim Huang**, *Hewlett Packard Labs, Palo Alto, CA, United States*

8:00AM	Mechanical and Electrical Modeling and Characterization of Flexible Printed Electronic Elements Technical Presentation. InterPACK2019-6498 Rui Chen, Yi Zhou, Sridhar Sivapurapu, Nahid A. Amoli, Mohamed Bellaredj, Justin Chow , <i>Georgia Institute of Technology, Atlanta, GA, United States</i> , Tsung-Ching, Jim Huang , <i>Hewlett Packard Labs, Palo Alto, CA, United States</i> , Madhavan Swaminathan, Suresh Sitaraman , <i>Georgia Institute of Technology, Atlanta, GA, United States</i>
8:20AM	Design Tools and FHE Materials for Physically Reconfigurable RF Platforms Technical Presentation. InterPACK2019-6750 Philip Buskohl , <i>AFRL, WPAFB, OH, United States</i>
8:40AM	Bounding The Problem Technical Presentation. InterPACK2019-6764 James Chew , <i>Cadence Design Systems, San Jose, CA, United States</i>
9:00AM	Applying Multi-Physics Analysis and Data Analytics for IIoT Applications With FHE Invited Presentation. InterPACK2019-6755 Norman Chang , <i>ANSYS Inc., San Jose, CA, United States</i>

TRACK 5: PHOTONICS AND OPTICS

Track Organizer: **Changqing Chen**, *Huazhong University of Science and Technology, Wuhan, China*

Track Co-Organizer: **Ping Zhou**, *LIX Optronics, Maryville, TN, United States*, **Haiding Sun**, *University of Science and Technology of China, Anhui, China*

5-5: VISIBLE LED AND ITS APPLICATION

Concourse Level, Fourth Floor, Huntington C

Session Co-Organizer: **Changqing Chen**, *Huazhong University of Science and Technology, Wuhan, China*, **Lai Wang**, *Tsinghua University, Beijing, Beijing, China*

8:00AM	Red InGaN LEDs Grown by Micro-Flow Channel MOVPE Technical Presentation. InterPACK2019-6362 Kazuhiro Ohkawa, Daisuke Iida , <i>King Abdullah University of Science and Technology, Thuwal, Saudi Arabia</i>
8:20AM	Hybrid Nitride-Based Micro/Nano-LEDs With Quantum Dots for High Performance RGB/White Emissions Technical Presentation. InterPACK2019-6406 Bin Liu , <i>Nanjing University, Nanjing, Jiangsu Province, China</i>
8:40AM	GaN White Lasers and III-Nitride Integrated Photonics for Visible Light Communications Technical Presentation. InterPACK2019-6488 Chao Shen , <i>SaNoor Technologies, Thuwal, Saudi Arabia</i>
9:00AM	Making a Viable Electronic or a Photonic Device Into a Reliable Product: Application of the Probabilistic Design for Reliability Concept Technical Presentation. InterPACK2019-6301 Ephraim Suhir , <i>Portland State University, Portland, OR</i>

Tuesday, October 8, 8:00AM–9:30AM

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, U.S. Army Research Laboratory, Highland, MD, United States

Track Co-Organizer: **Damena Agonafer**, Washington University in St. Louis, Saint Louis, MO, United States, **Ram Ranjan**, United Technologies Research Center, East Hartford, CT, United States, **Sukwon Choi**, Pennsylvania State University, University Park, PA, United States

6-6: POWER ELECTRONICS PACKAGING RELIABILITY

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Fang Luo**, University of Arkansas, Fayetteville, AR, United States

Session Co-Organizer: **Pedro Quintero**, University of Puerto Rico Mayaguez, Mayaguez, PR, United States

8:00AM	Numerical Investigation on Electromigration Oriented Failure of Lead Free Solder Joints With Aging Effects Technical Paper Publication. InterPACK2019-6521 Tusher Ahmed, Mohammad Motalab , Bangladesh University of Engineering and Technology, Dhaka, Bangladesh, Jeffrey Suhling , Auburn University, Auburn, AL, United States
8:20AM	Analysis of Thermal Stress in High Temperature Transient Liquid Phase Bonding of Power Electronics Technical Presentation. InterPACK2019-6525 Yanghe Liu , Toyota Research Institute of North America, Ann Arbor, MI, United States, Shailesh N. Joshi , Toyota Motor North America, Ann Arbor, MI, United States, Ercan Dede , Toyota Research Institute of North America, Ann Arbor, MI, United States
8:40AM	A Reliability Study of Silicon Carbide Power Modules Using POL-kW Packaging Technology Technical Presentation. InterPACK2019-6531 Liang Yin, Christopher Kapusta, Arun Gowda, David Esler, Kaustubh Nagarkar , GE Global Research Center, Niskayuna, NY, United States, Risto Tuominen , GE Ventures, Niskayuna, NY, United States, Richard Eddins, Liqiang Yang, Robert George , GE Aviation, Pompano Beach, FL, United States
9:00AM	Thermomechanical Stress and Warpage Augmentation Using Auxetic Features in Electronic Design Technical Paper Publication. InterPACK2019-6424 Mahsa Montazeri, John Harris, David Huitink, Adithya Venkatanarayanan, Simon Ang , University of Arkansas, Fayetteville, AR, United States

TRACK 7: ENERGY CONVERSION AND STORAGE

Track Organizer: **Guangsheng Zhang**, University of Alabama in Huntsville, Huntsville, AL, United States

Track Co-Organizer: **Aritra Sur**, United Technologies Research Center, East Hartford, CT, United States, **Xuemin Li**, A123 Systems, Waltham, MA, United States, **Ayyoub Momen**, Oak Ridge National Laboratory, Oak Ridge, TN, United States, **Partha Mukherjee**, Purdue University, West Lafayette, IN, United States

7-2: THERMAL MANAGEMENT OPTIMIZATION STRATEGIES

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Menglong Hao**, University of California, Berkeley, Berkeley, CA, United States

Session Co-Organizer: **Sean Lubner**, Lawrence Berkeley National Laboratory, Berkeley, CA, United States

8:00AM	A Statistical Study to Evaluate the Performance of Liquid Cooling Garments Considering Thermal Comfort Technical Paper Publication. InterPACK2019-6325 Weicheng Shu, Jiawen Wang, Xinfeng Zhang, Xiaobing Luo , Huazhong University of Science and Technology, Wuhan, China
8:20AM	Analysis of Channel Layout of a Pulsating Heat Pipe Using Topology Optimization Technical Presentation. InterPACK2019-6360 Jonghyun Lim, Sung Jin Kim , KAIST, Daejeon, Korea (Republic)
8:40AM	Development and Optimization of Control Strategy for a Dynamic Cold Plate to Save Pumping Power and Increase the Reliability Technical Presentation. InterPACK2019-6536 Rajesh Kasukurthy, Amrutha Valli Rachakonda, Dereje Agonafer , University of Texas at Arlington, Arlington, TX, United States
9:00AM	Thermal Management of a Highly Optimized Power Dense Non-Rare Earth Permanent Magnet Based Electric Traction Motor Technical Presentation. InterPACK2019-6566 Aritra Sur, Zhentao Du, Robert H. Dold, Jagadeesh K. Tangudu , United Technologies Research Center, East Hartford, CT, United States

Technical Sessions

TUESDAY, OCTOBER 8

Tuesday, October 8, 10:45AM–12:15PM

TRACK 2: SERVERS OF THE FUTURE, EDGE AND CLOUD COMPUTING: WITH PAPERS HONORING MICHAEL ELLSWORTH FOR CONTRIBUTIONS AND SERVICE TO ASME INTERPACK, THE ELECTRONIC AND PHOTONIC PACKAGING DIVISION, AND LEADERSHIP IN LIQUID COOLING OF SERVER SYSTEMS

Track Organizer: **Saket Karajgikar**, Facebook Inc., Menlo Park, CA, United States

Track Co-Organizer: **Timothy Chainer**, IBM, Yorktown Heights, NY, United States, **Joshua Gess**, Oregon State University, Corvallis, OR, United States, **Baris Dogruoz**, Cisco Systems Inc., Santa Clara, CA, United States

2-6: IMMERSION COOLING I

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Nikhil Lakhkar**, Emerson Climate Technologies, Sidney, OH, United States

Session Co-Organizer: **Steve Moon**, 3M Company, St. Paul, MN, United States

10:45AM	Experimental Analysis for Optimization of Thermal Performance of a Server in Single Phase Immersion Cooling Technical Paper Publication. InterPACK2019-6590 Pravin Shinde, Pratik Bansode, Satyam Saini, Rajesh Kasukurthy, Tushar Chauhan, Jimil M. Shah, Dereje Agonafer , University of Texas at Arlington, Arlington, TX, United States
11:05AM	CFD Analysis of Thermal Shadowing and Optimization of Heatsinks in Third-Generation Open Compute Server for Single-Phase Immersion Cooling Technical Paper Publication. InterPACK2019-6600 Jimil M. Shah, Ravya Dandamudi, Chinmay Bhatt, Pranavi Rachamreddy, Pratik Bansode, Dereje Agonafer , University of Texas at Arlington, Arlington, TX, United States
11:25AM	Viability of Two Phase Immersion Cooling by Performing Thermal Testing Vehicle Experiments Using Enhanced Boilers Technical Presentation. InterPACK2019-6604 Jimil M. Shah , University of Texas at Arlington, Arlington, TX, United States

TRACK 4: FLEXIBLE AND WEARABLE ELECTRONICS

Track Organizer: **Valerie Marty**, Connected Micro, Corvallis, OR, United States

Track Co-Organizer: **E. Yegan Erdem**, Bilkent University, Ankara, Turkey, **Benjamin Leever**, Air Force Research Laboratory, Wright Patterson AFB, OH, United States, **Janos Veres**, PARC, Palo Alto, CA, United States, **Baris Dogruoz**, Cisco Systems Inc., Santa Clara, CA, United States

4-6: FHE DESIGN & MODELING DEMONSTRATIONS

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Tsung-Ching Jim Huang**, Hewlett Packard Labs, Palo Alto, CA, United States

Session Co-Organizer: **Philip Buskohl**, AFRL, WPAFB, OH, United States

10:45AM	Flexible Hybrid Electronics Process Design Kit (FHE-PDK) Invited Presentation. InterPACK2019-6756 Tsung-Ching Jim Huang , Hewlett Packard Labs, Palo Alto, CA, United States
11:05AM	Manufacturing Process Driven Design (MPDD) for Improved Flexible Hybrid Electronic Design Invited Presentation. InterPACK2019-6768 Kris Hill , International TechneGroup Inc., Milford, OH, United States
11:25AM	EDA Design and Analysis Methodology for Flexible Circuits Technical Presentation. InterPACK2019-6759 John Carney, James Chew, John Park , Cadence Design Systems, San Jose, CA, United States
11:45AM	Digital Qualification of Flexible and Wearable Electronics Invited Presentation. InterPACK2019-6767 Ian Campbell , OnScale, Redwood City, CA, United States

Tuesday, October 8, 10:45AM–12:15PM

TRACK 5: PHOTONICS AND OPTICS

Track Organizer: **Changqing Chen**, *Huazhong University of Science and Technology, Wuhan, China*

Track Co-Organizer: **Ping Zhou**, *LIX Optonics, Maryville, TN, United States*, **Haiding Sun**, *University of Science and Technology of China, Anhui, China*

5-6: LED, OLED AND PHOTO DEVICES

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Zhenghua An**, *Fudan University, Shanghai, Shanghai, China*

Session Co-Organizer: **Chao Shen**, *SaNoor Technologies, Thuwal, Saudi Arabia*

10:45AM

Printed OLED Display and Soluble Materials

Technical Presentation. InterPACK2019-6374

Junyou Pan, Jiahui Tan, Xi Yang, Yusheng Chen, *Guangzhou ChinaRay Optoelectronic Materials Co., Ltd., Guangzhou, China*

11:05AM

On the Development of Beta-Ga₂O₃-Based High-Performance Solar-Blind Photodetectors

Technical Presentation. InterPACK2019-6414

Yunbin He, Qile Wang, Mingkai Li, *Hubei University, Wuhan, Hubei, China*

11:25AM

Correlated Effects of Self-Heating, Light Output, and Efficiency of GaN Light-Emitting Diodes on Junction Temperature

Technical Paper Publication. InterPACK2019-6426

Bikramjit Chatterjee, *Pennsylvania State University, State College, PA, United States*, **James Spencer Lundh, Daniel Shoemaker**, *Pennsylvania State University, University Park, PA, United States*, **Tae Kyoung Kim, Joon Seop Kwak**, *Sunchon National University, Sunchon, Jeonnam, Korea (Republic)*, **Jaehee Cho**, *Chonbuk National University, Jeonju, Chonbuk, Korea (Republic)*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States*

11:45AM

High Performance Nonplar M-Plane InGaN Multiple-Quantum-Well Solar Cells With Improved Carrier Collection and High Temperature Spectral Response

Technical Presentation. InterPACK2019-6335

Xuanqi Huang, Houqiang Fu, Yuji Zhao, *Arizona State University, Tempe, AZ, United States*

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*

Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, State College, PA, United States*

6-4: METROLOGY TECHNIQUES

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Ronald Warzoha**, *United States Naval Academy, Annapolis, MD, United States*

Session Co-Organizer: **Brian Foley**, *Pennsylvania State University, State College, PA, United States*

10:45AM

Evaporation Rate Measurement at Multiple Scales Using Temperature-Sensitive Fluorescence Dyes

Technical Paper Publication. InterPACK2019-6372

Youngjoon Suh, Cheng-Hui Lin, Hamsa N. Gowda, Yoonjin Won, *University of California, Irvine, Irvine, CA, United States*

11:05AM

Advances in Nanoscale Thermoreflectance Thermal Imaging Calibration

Technical Presentation. InterPACK2019-6425

Kazuaki Yazawa, Dustin Kendig, *Microsanj LLC, Santa Clara, CA, United States*, **Ali Shakouri**, *Purdue University, West Lafayette, IN, United States*

11:25AM

Application of X-Ray CT Images and Phase-Shifted Sampling Moiré Method to Residual Strain Measurement in Electronic Packages

Technical Presentation. InterPACK2019-6486

Masaaki Koganemaru, Sho Nagato, *Kagoshima University, Kagoshima, Japan*, **Masakazu Uchino**, *Fukuoka Industrial Technology Center, Kitakyusyu, Japan*, **Toru Ikeda**, *Kagoshima University, Kagoshima, Japan*

11:45AM

Thermoreflectance Imaging of Electromigration in Aluminum Interconnects at Different Ambient Temperatures

Technical Paper Publication. InterPACK2019-6413

Sami Alajlouni, Kerry Maize, Peter Bermel, Ali Shakouri, *Purdue University, West Lafayette, IN, United States*

Technical Sessions

TUESDAY, OCTOBER 8

Tuesday, October 8, 10:45AM–12:15PM

TRACK 7: ENERGY CONVERSION AND STORAGE

Track Organizer: **Guangsheng Zhang**, University of Alabama in Huntsville, Huntsville, AL, United States

Track Co-Organizer: **Aritra Sur**, United Technologies Research Center, East Hartford, CT, United States, **Xuemin Li**, A123 Systems, Waltham, MA, United States, **Ayyoub Momen**, Oak Ridge National Laboratory, Oak Ridge, TN, United States, **Partha Mukherjee**, Purdue University, West Lafayette, IN, United States

7-3: PHASE-CHANGE COOLING

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Marc Dunham**, 3M, Golden Valley, MN, United States

Session Co-Organizer: **Kyle Gluesenkamp**, Oak Ridge National Laboratory, Knoxville, TN, United States

10:45AM	Mechanical Properties of Polyethylene Based Heat Storage Composite Containing Phase Change Material and Copper Sheet Technical Presentation. InterPACK2019-6464 Kohei Fukuchi, Kenichi Ohguchi, Kengo Kurosawa, Yuuki Sugimoto , Akita University, Akita, Japan, Katsuhiko Sasaki , Hokkaido University, Sapporo, Hokkaido, Japan
11:05AM	Characterizing Dynamic Response of Phase Change Materials Technical Presentation. InterPACK2019-6656 Alison Hoe , Texas A&M University, College Station, TX, United States, Michael Barako , Northrop Grumman, Manhattan Beach, CA, United States, Patrick Shamberger , Texas A&M University, College Station, TX, United States
11:25AM	Evaporation of Microdroplet Suspended on Porous Micropillar Structure: The Effect of Micropillar Height on Transport Performance Technical Presentation. InterPACK2019-6465 Junhui Li, Li Shan, Binjian Ma, Runzhi Zhang, Xinyu Jiang, Damena Agonafer , Washington University in St. Louis, St. Louis, MO, United States, Baris Dogruoz , Cisco Systems Inc., Santa Clara, CA, United States
11:45AM	Molecular Dynamics Simulation of Thin-Film Evaporation From Nanocoated Surfaces: The Asymptotic Relationship Between Evaporation Rate and Nanocoating Thickness Technical Presentation. InterPACK2019-6466 Binjian Ma, Rui Zhou, Li Shan, Junhui Li , Washington University in St. Louis, St. Louis, MO, United States, Baris Dogruoz , Cisco Systems Inc., Santa Clara, CA, United States, Damena Agonafer , Washington University in St. Louis, Saint Louis, MO, United States

Tuesday, October 8, 1:45PM–3:15PM

TRACK 1: HETEROGENEOUS INTEGRATION

Track Organizer: **Gamal Refai-Ahmad**, Xilinx, Santa Clara, CA, United States

Track Co-Organizer: **Leila Choobineh**, SUNY Polytechnic Institute, Utica, NY, United States, **Fabian Welschinger**, Robert Bosch GmbH, Renningen, Germany, **Winston Zhang**, Novark Technologies, Inc., Shenzhen, Guangdong, Guangdong, China

1-6: MICROSYSTEMS PACKAGING

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Subhasis Mukherjee**, Apple, Cupertino, CA, United States

Session Co-Organizer: **Subramanyaravi Annapragada**, United Technologies Research Center, East Hartford, CT, United States

1:45PM	Double Side System in Package Development Challenge for Heterogeneous Integration Technical Paper Publication. InterPACK2019-6354 Feng Kao, Yu Po Wang, Davidlion Wang, Jensen Tsai, Mike Tsai, Ryan Chiu, Eric He , Siliconware Precision Industries Co., Ltd., Taichung, Taiwan
2:05PM	Performance Analysis and Shape Optimization of Manifold in Liquid-Cooled Parallel Micro-Channel Heat Sinks Technical Presentation. InterPACK2019-6455 Yaser Hadad, Cong Hoang , Binghamton University, Binghamton, NY, United States, Srikanth Rangarajan , Binghamton University, Vestal, NY, United States, Paul R. Chiarot , State University of New York at Binghamton, Binghamton, NY, United States, Bahgat Sammakia , Binghamton University, Binghamton, NY, United States
2:25PM	Minimizing the Effects of On-Chip Hot-Spots Using Multi-Objective Optimization of Flow Distribution in Water-Cooled Parallel Micro-Channel Heat Sinks Technical Presentation. InterPACK2019-6459 Yaser Hadad, Vahideh Radmard, Mahdi Farahikia , Binghamton University, Binghamton, NY, United States, Paul R. Chiarot , State University of New York at Binghamton, Binghamton, NY, United States, Bahgat Sammakia , Binghamton University, Binghamton, NY, United States
2:45PM	High Strain Rate Mechanical Properties of SAC-Q With Sustained Elevated Temperature Storage at 100°C Technical Paper Publication. InterPACK2019-6576 Pradeep Lall, Vishal Mehta, Jeffrey Suhling , Auburn University, Auburn, AL, United States, David Locker , U.S. Army RDECOM, Redstone Arsenal, AL, United States

Tuesday, October 8, 1:45PM–3:15PM

TRACK 5: PHOTONICS AND OPTICSTrack Organizer: **Changqing Chen**, *Huazhong University of Science and Technology, Wuhan, China*Track Co-Organizer: **Ping Zhou**, *LDX Optronics, Maryville, TN, United States*, **Haiding Sun**, *University of Science and Technology of China, Anhui, China***5-7: ORGANIC MATERIALS AND DEVICES**

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Malte Gather**, *University of St. Andrews, St. Andrews, Fife, United Kingdom*Session Co-Organizer: **Yunbin He**, *Hubei University, Wuhan, Hubei, China*

1:45PM	Mechanical Instability in Organic Optoelectronics: Surface Wrinkling and Its Prediction Technical Presentation. InterPACK2019-6355 Yu-Lin Shen , <i>University of New Mexico, Albuquerque, NM, United States</i>
2:05PM	Organic Electronics for Neuromorphic Computing Technical Presentation. InterPACK2019-6375 Yoei van de Burgt , <i>Eindhoven University of Technology, Eindhoven, Netherlands</i>
2:25PM	Double Perovskites as p-Type Conducting Transparent Semiconductors: A High-Throughput Search Technical Presentation. InterPACK2019-6378 Haichen Wang, Miguel A.L. Marques , <i>Martin-Luther-Universität Halle-Wittenberg, Halle (Saale), Saxony-Anhalt, Germany</i>
2:45PM	Designed Silver Nanowires Transparent Conductive Electrodes for Efficient Optoelectronic Devices Technical Presentation. InterPACK2019-6380 Bin Hu , <i>Huazhong University of Science and Technology, Wuhan, China</i>

TRACK 6: POWER ELECTRONICSTrack Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States***6-8: MICROCHANNEL HEAT SINKS**

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Hyoungsoon Lee**, *Chung-Ang University, Seoul, Korea (Republic)*Session Co-Organizer: **Bladimir Ramos Alvarado**, *Pennsylvania State University, University Park, PA, United States*

1:45PM	Experimental Investigation of Single-Phase Cooling in Embedded Microchannels: 3D Manifold Heat Exchanger With R-245fa Technical Paper Publication. InterPACK2019-6400 Ki Wook Jung , <i>Stanford University, Stanford, CA, United States</i> , Hyoungsoon Lee , <i>Chung-Ang University, Seoul, Korea (Republic)</i> , Chirag R. Kharangate , <i>Case Western Reserve University, Cleveland, OH, United States</i> , Feng Zhou , <i>Toyota Research Institute North America, Ann Arbor, MI, United States</i> , Mehdi Asheghi , <i>Stanford University, Stanford, CA, United States</i> , Ercan Dede , <i>Toyota Research Institute of North America, Ann Arbor, MI, United States</i> , Kenneth Goodson , <i>Stanford University, Stanford, CA, United States</i>
2:05PM	Single-Phase Thermal and Hydraulic Performance of Embedded Micro-Pin Fin Using R245fa Technical Presentation. InterPACK2019-6382 Daeyoung Kong , <i>Chung-Ang University, Seoul, Korea (Republic)</i> , Ki Wook Jung , <i>Stanford University, Stanford, CA, United States</i> , Sangwoo Jung, Daewoong Jung , <i>Chung-Ang University, Seoul, Korea (Republic)</i> , Joseph Schaadt , <i>Villanova University, Sunnyvale, CA, United States</i> , Madhusudan Iyengar, Chris Malone , <i>Google LLC, Mountain View, CA, United States</i> , Chirag R. Kharangate , <i>Case Western Reserve University, Cleveland, OH, United States</i> , Mehdi Asheghi, Kenneth Goodson , <i>Stanford University, Stanford, CA, United States</i> , Hyoungsoon Lee , <i>Chung-Ang University, Seoul, Korea (Republic)</i>
2:25PM	Parametric Study of Silicon-Based Embedded Microchannels With 3D Manifold Coolers (EMMC) for High Heat Flux (~1 kW/cm²) Power Electronics Cooling Technical Paper Publication. InterPACK2019-6472 Ki Wook Jung, Sougata Hazra, Heungdong Kwon , <i>Stanford University, Stanford, CA, United States</i> , Alisha Piazza , <i>Stanford Nano-heat Lab, Stanford, CA, United States</i> , Edward Jih , <i>Ford Motor Co., Dearborn, MI, United States</i> , Mehdi Asheghi , <i>Stanford University, Stanford, CA, United States</i> , Man Prakash Gupta, Michael Degner , <i>Ford Motors, Dearborn, MI, United States</i> , Kenneth Goodson , <i>Stanford University, Stanford, CA, United States</i>

Technical Sessions

TUESDAY, OCTOBER 8

Tuesday, October 8, 1:45PM–3:15PM

TRACK 7: ENERGY CONVERSION AND STORAGE

Track Organizer: **Guangsheng Zhang**, *University of Alabama in Huntsville, Huntsville, AL, United States*

Track Co-Organizer: **Aritra Sur**, *United Technologies Research Center, East Hartford, CT, United States*, **Xuemin Li**, *A123 Systems, Waltham, MA, United States*, **Ayyoub Momen**, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, **Partha Mukherjee**, *Purdue University, West Lafayette, IN, United States*

7-1: BATTERIES, SUPERCAPACITORS, AND SOLAR CELLS I

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Amy Marconnet**, *Purdue University, West Lafayette, IN, United States*

Session Co-Organizer: **June Stanley**, *Sandia National Laboratories, Albuquerque, NM, United States*

1:45PM	Operando Measurements of the Dominant Thermal Resistance in Lithium-Ion Batteries Technical Presentation. InterPACK2019-6658 Sean Lubner, Sumanjeet Kaur, Yanbao Fu, Vince Battaglia, Ravi Prasher , <i>Lawrence Berkeley National Laboratory, Berkeley, CA, United States</i>
2:05PM	Lithium Plating and Dendrites in Li-Ion Batteries Under Thermal Gradient Technical Presentation. InterPACK2019-6432 Conner Fear, Aashutosh Mistry , <i>Purdue University, West Lafayette, IN, United States</i> , Rachel Carter, Corey T. Love , <i>U.S. Naval Research Laboratory, Washington, DC, United States</i> , Partha Mukherjee , <i>Purdue University, West Lafayette, IN, United States</i>
2:25PM	Effects of Non-Uniform Temperature Distributions on Lithium-Ion Battery Degradation Technical Presentation. InterPACK2019-6477 Gabriel M. Cavaleiro, Takuto Iriyama, Shan Huang, George Nelson, Guangsheng Zhang , <i>University of Alabama in Huntsville, Huntsville, AL, United States</i>
2:45PM	Effect of Transition Metal Prussian Blue Analogues as Mediators on the Performance of Mediator Supercapacitor Technical Presentation. InterPACK2019-6478 Xiangyang Zhou , <i>University of Miami, Coral Gables, FL, United States</i>

TRACK 8: AUTONOMOUS, HYBRID, AND ELECTRIC VEHICLES

Track Organizer: **Przemyslaw Jakub Gromala**, *Robert Bosch GmbH, Reutlingen, Germany*

Track Co-Organizer: **Gopi Krishnan**, *Tesla, Palo Alto, CA, United States*, **Ercan Dede**, *Toyota Research Institute of North America, Ann Arbor, MI, United States*, **Sven Rzepka**, *Fraunhofer ENAS, Chemnitz, Germany*

8-5: MATERIAL MODELING FOR AUTOMOTIVE PACKAGING II

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Adam Boros**, *Robert Bosch Kft, Budapest, Hungary*

Session Co-Organizer: **Anna Prakash**, *Intel Corp, Chandler, AZ, United States*

1:45PM	Nanoindentation Testing of SAC305 Solder Joints Subjected to Thermal Cycling Loading Technical Paper Publication. InterPACK2019-6471 Abdullah Fahim, S.M. Kamrul Hasan, Jeffrey Suhling, Pradeep Lall , <i>Auburn University, Auburn, AL, United States</i>
2:05PM	Constitutive Modeling and Experimental Characterization of Volumetric and Isochoric Nonlinear Viscoelasticity for Epoxy-based Molding Compounds Technical Presentation. InterPACK2019-6409 Fabian Welschinger , <i>Robert Bosch GmbH, Renningen, Germany</i> , Przemyslaw Jakub Gromala , <i>Robert Bosch GmbH, Reutlingen, Germany</i> , Hüsnü Dal , <i>Middle East Technical University Ankara, Ankara, Turkey</i> , Hyun Seop Lee, Bongtae Han , <i>University of Maryland, College Park, MD, United States</i>
2:25PM	Effects of Thermal Cycling on the Mechanical and Microstructural Evolution of SAC305 Lead-Free Solder Technical Paper Publication. InterPACK2019-6563 S.M. Kamrul Hasan, Abdullah Fahim, Jeffrey Suhling, Sa'd Hamasha, Pradeep Lall , <i>Auburn University, Auburn, AL, United States</i>
2:45PM	Investigation of the Effects of High Temperature Aging on Mechanical Behavior and Microstructural Changes in Lead Free Solders Technical Paper Publication. InterPACK2019-6571 Jing Wu, Mohammad S. Alam, Jeffrey Suhling, Pradeep Lall , <i>Auburn University, Auburn, AL, United States</i>

Tuesday, October 8, 3:30PM–5:00PM

TRACK 5: PHOTONICS AND OPTICS

Track Organizer: **Changqing Chen**, *Huazhong University of Science and Technology, Wuhan, China*

Track Co-Organizer: **Ping Zhou**, *LIX Optronics, Maryville, TN, United States*, **Haiding Sun**, *University of Science and Technology of China, Anhui, China*

5-8: PACKAGING AND THERMAL MANAGEMENT I

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Firooz Faili**, *Element Six, Santa Clara, CA, United States*

Session Co-Organizer: **Duanjun Cai**, *Xiamen University, Xiamen, Fujian, China*

3:30PM	Numerical Analysis of Pulse Laser Assisted Curing Region of Photocurable Resins Technical Paper Publication. InterPACK2019-6356 Yuta Nakamura, Kazuyoshi Fushinobu , <i>Tokyo Institute of Technology, Meguro-ku, Tokyo, Japan</i> , Asato Tamura , <i>Tokyo Institute of Technology/Ricoh Co., Ltd., Ebinashi, Kanagawa, Japan</i>
3:50PM	Vandal Glass Heat Distribution and the Effect of Glass Gap Adjustments in Outdoor Digital Display Components Technical Paper Publication. InterPACK2019-6391 Jeho Kim , <i>Georgia Institute of Technology, Atlanta, GA, United States</i> , J. Michael Brown , <i>Manufacturing Resources International, Alpharetta, GA, United States</i> , Yogendra Joshi , <i>Georgia Institute of Technology, Atlanta, GA, United States</i> , Kevin O'Connor, Marcos Diaz , <i>Manufacturing Resources International, Alpharetta, GA, United States</i> , Zhuomin Zhang, Peiyan Yang , <i>Georgia Institute of Technology, Atlanta, GA, United States</i>
4:10PM	Topology Optimization of Time-Transient Heat Conduction for Thermo-Optic Devices Technical Presentation. InterPACK2019-6526 Ercan Dede , <i>Toyota Research Institute of North America, Ann Arbor, MI, United States</i> , Gil Ho Yoon , <i>Hanyang University, Seoul, Korea (Republic)</i> , Paul Schmalenberg, Tsuyoshi Nomura , <i>Toyota Research Institute of North America, Ann Arbor, MI, United States</i>
4:30PM	Modeling of Light Emitting Device Populations in the Electrical, Thermal, and Optical Domain for Luminaire Design Technical Paper Publication. InterPACK2019-6547 Gabor Farkas, Marta Rencz, Andras Vass Varnai, Lajos Gaal , <i>Mentor, Budapest, Hungary</i>

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*

Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States*

6-9: PHASE CHANGE MATERIALS

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Michael Fish**, *U.S. Army Research Laboratory, Adelphi, MD, United States*

Session Co-Organizer: **Jorge Padilla**, *Google LLC, Mountain View, CA, United States*

3:30PM	Evaluation of Thermal and Electrical Properties of Nano-Enhanced PCM for Usage in High-Voltage Systems Technical Paper Publication. InterPACK2019-6422 Ange-Christian Iradukunda, Joshua Kasitz, Fernando Moreno, David Huitink , <i>University of Arkansas, Fayetteville, AR, United States</i>
3:50PM	Metallic PCMs Microstructural Stability Under Repetitive Melting/Solidification Cycles Technical Paper Publication. InterPACK2019-6385 Rafael Baez, Luis Gonzalez , <i>University of Puerto Rico-Mayaguez, Mayaguez, PR, United States</i> , Lauren M. Boteler , <i>U.S. Army Research Laboratory, Highland, MD, United States</i> , Pedro Quintero , <i>University of Puerto Rico-Mayaguez, Mayaguez, PR, United States</i>
4:10PM	Lamellar Phase Change Material Composites for Power Electronics Thermal Management Technical Presentation. InterPACK2019-6751 Patrick Shamberger, Alison Hoe, Michael Deckard, Achutha Tamraparni, Alaa Elwany, Jonathan Felts , <i>Texas A&M University, College Station, TX, United States</i>
4:30PM	Multi-Scale Multi-Fidelity Approaches to Power and Thermal System Engineering Challenges Invited Presentation. InterPACK2019-6772 Nicholas Niedbalski , <i>U.S. Air Force, USAF, TX, United States</i>

Technical Sessions

TUESDAY, OCTOBER 8

Tuesday, October 8, 3:30PM–5:00PM	
6-10: THERMAL INTERFACE MATERIALS Concourse Level, Fourth Floor, Huntington C Session Organizer: Xuhui Feng , <i>National Renewable Energy Laboratory, Golden, CO, United States</i> Session Co-Organizer: Dinesh P.R. Thanu , <i>Intel Corporation, Chandler, AZ, United States</i>	
3:30PM	Evaluation of Contact Thermal Resistance of Metal Material in Low Contact Pressure Region Technical Presentation. InterPACK2019-6543 Yoshiki Hyodo , <i>Tomoyuki Hatakeyama</i> , <i>Toyama Prefectural University, Imizushi, Toyamaken, Japan</i> , Risako Kibushi , <i>Sanyo-Onoda City University, Sanyo-Onodashi, Yamaguchiken, Japan</i> , Masaru Ishizuka , <i>Toyama Prefectural University, Imizushi, Toyamaken, Japan</i>
3:50PM	Thermal Contact Resistance at DBC Interfaces Technical Presentation. InterPACK2019-6609 Lauren M. Boteler , <i>U.S. Army Research Laboratory, Highland, MD, United States</i> , Ronald Warzoha , <i>U.S. Naval Academy, Annapolis, MD, United States</i>
4:10PM	Thermo-Mechanical Degradation of Thermal Interface Materials: Accelerated Test Development and Reliability Analysis Technical Paper Publication. InterPACK2019-6416 Dustin Pense , Hayden Carlton , David Huitink , <i>University of Arkansas, Fayetteville, AR, United States</i>
TRACK 7: ENERGY CONVERSION AND STORAGE Track Organizer: Guangsheng Zhang , <i>University of Alabama in Huntsville, Huntsville, AL, United States</i> Track Co-Organizer: Aritra Sur , <i>United Technologies Research Center, East Hartford, CT, United States</i> , Xuemin Li , <i>A123 Systems, Waltham, MA, United States</i> , Ayyoub Momen , <i>Oak Ridge National Laboratory, Oak Ridge, TN, United States</i> , Partha Mukherjee , <i>Purdue University, West Lafayette, IN, United States</i>	
7-6: BATTERIES, SUPERCAPACITORS, AND SOLAR CELLS III Concourse Level, Fourth Floor, Palos Verdes A Session Organizer: Laura Spinella , <i>National Renewable Energy Laboratory, Golden, CO, United States</i> Session Co-Organizer: Kazuaki Yazawa , <i>Purdue University, West Lafayette, IN, United States</i>	
3:30PM	Three-Dimensional Modeling of Mediator-Enhanced Solid-State Supercapacitors Technical Presentation. InterPACK2019-6481 Xiangyang Zhou , <i>University of Miami, Coral Gables, FL, United States</i>
3:50PM	Application of Electronics Packaging Fundamentals to Photovoltaic Interconnects and Packaging Technical Paper Publication. InterPACK2019-6520 Laura Spinella , Nick Bosco , <i>National Renewable Energy Laboratory, Golden, CO, United States</i>
4:10PM	Development of Structural Supercapacitors With Epoxy Based Adhesive Polymer Electrolyte Technical Presentation. InterPACK2019-6480 Xiangyang Zhou , <i>University of Miami, Coral Gables, FL, United States</i>

Wednesday, October 9, 8:00AM–9:30AM

TRACK 1: HETEROGENEOUS INTEGRATION

Track Organizer: **Gamal Refai-Ahmad**, *Xilinx, Santa Clara, CA, United States*

Track Co-Organizer: **Leila Choobineh**, *SUNY Polytechnic Institute, Utica, NY, United States*, **Fabian Welschinger**, *Robert Bosch GmbH, Renningen, Germany*, **Winston Zhang**, *Novark Technologies, Inc., Shenzhen, Guangdong, Guangdong, China*

1-2: THERMAL MANAGEMENT APPLICATIONS I

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Srikanth Rangarajan**, *Binghamton University, Binghamton, NY, United States*

Session Co-Organizer: **Leila Choobineh**, *SUNY Polytechnic Institute, Utica, NY, United States*

8:00AM	Thermal Cycle Reliability of Package on Package (PoP) Assemblies Technical Presentation. InterPACK2019-6317 Reza Ghaffarian , <i>JET Propulsion Laboratory, Pasadena, CA, United States</i>
8:20AM	Optimal Arrangement of Multiple Heat Sources in Vertically Stacked Two-Layer 3D IC Using Genetic Algorithm Technical Paper Publication. InterPACK2019-6334 Srikanth Rangarajan , <i>Binghamton University, Vestal, NY, United States</i> , Yaser Hadad , <i>Binghamton University, Binghamton, NY, United States</i> , Leila Choobineh , <i>SUNY Polytechnic Institute, Utica, NY, United States</i> , Bahgat Sammakia , <i>Binghamton University, Binghamton, NY, United States</i>
8:40AM	Thermal-Switch-Enabled Power Electronics Isothermalization Technical Presentation. InterPACK2019-6738 Tianyu Yang , <i>University of Illinois at Urbana-Champaign, Urbana, IL, United States</i> , Fei Diao , Alan Mantooth , Yue Zhao , <i>University of Arkansas, Fayetteville, AR, United States</i> , William P. King , Nenad Miljkovic , <i>University of Illinois at Urbana-Champaign, Urbana, IL, United States</i>

TRACK 4: FLEXIBLE AND WEARABLE ELECTRONICS

Track Organizer: **Valerie Marty**, *Connected Micro, Corvallis, OR, United States*

Track Co-Organizer: **E. Yegan Erdem**, *Bilkent University, Ankara, Turkey*, **Benjamin Leever**, *Air Force Research Laboratory, Wright Patterson AFB, OH, United States*, **Janos Veres**, *PARC, Palo Alto, CA, United States*, **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States*

4-3: FLEXIBLE ELECTRONICS PACKAGING & ASSEMBLY

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Pradeep Lall**, *Auburn University, Auburn, AL, United States*

Session Co-Organizer: **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States*

8:00AM	Applying Ultrasonic Dehumidification Technology for Water Rejection in Wearable Electronics Technical Paper Publication. InterPACK2019-6387 Priyanka Deo , Samuel Graham , <i>Georgia Institute of Technology, Atlanta, GA, United States</i> , Ayyoub Momen , <i>Oak Ridge National Laboratory, Oak Ridge, TN, United States</i>
8:20AM	Foldable Thermal Ground Plane for Cooling of Foldable Smartphones Technical Presentation. InterPACK2019-6351 Ali Nematollahisarvestani , <i>University of Colorado Boulder, Boulder, CO, United States</i> , Ryan Lewis , <i>Kelvin Thermal Technologies, Lafayette, CO, United States</i> , Yung-Cheng Lee , <i>University of Colorado Boulder, Boulder, CO, United States</i>
8:40AM	Stretchable and Wearable Emitters Based on Corrugated Nickel for Personal Thermal Management Technical Presentation. InterPACK2019-6628 Anirudh Krishna , Martí Sala-Casanovas , Ziqi Yu , Jaeho Lee , <i>University of California, Irvine, Irvine, CA, United States</i>
9:00AM	How Ultrathin Die Enable Flexible Hybrid Electronics Invited Presentation. InterPACK2019-6769 Wilfried Bair , <i>NextFlex, San Jose, CA, United States</i>

Technical Sessions

WEDNESDAY, OCTOBER 9

Wednesday, October 9, 8:00AM–9:30AM	
TRACK 5: PHOTONICS AND OPTICS	
Track Organizer: Changqing Chen , <i>Huazhong University of Science and Technology, Wuhan, China</i> Track Co-Organizer: Ping Zhou , <i>LDX Optronics, Maryville, TN, United States</i> , Haiding Sun , <i>University of Science and Technology of China, Anhui, China</i>	
5-9: PACKAGING AND THERMAL MANAGEMENT II	
Concourse Level, Fourth Floor, Huntington C	
Session Organizer: Niamh Richardson , <i>University of Limerick, Co. Limerick, Ireland</i> Session Co-Organizer: Ercan Dede , <i>Toyota Research Institute of North America, Ann Arbor, MI, United States</i>	
8:00AM	Study on the Precise Measurement of LED Thermal Resistance Based on LEDs With an Internal Sensor Unit Technical Presentation. InterPACK2019-6321 Yugang Zhou, Renbao Tian, Zili Xie, Bin Liu, Rong Zhang, Youdou Zheng , <i>Nanjing University, Nanjing, Jiangsu Province, China</i>
8:20AM	Prediction and Control Technique of the Paper Media Temperature After Fusing in Electrophotographic Process Technical Paper Publication. InterPACK2019-6396 Shunsuke Kawasaki, Shinichi Kuramoto, Kazuyoshi Fushinobu , <i>Tokyo Institute of Technology, Meguroku, Tokyo, Japan</i> , Koichi Kato , <i>Ricoh Co., Ltd./Tokyo Institute of Technology, Ebina-shi, Kanagawa, Japan</i> , Kimiharu Yamazaki, Kaori Hemmi , <i>Ricoh Co., Ltd., Ebina-shi, Kanagawa, Japan</i>
8:40AM	Reducing CTE Mismatch and Maximizing Heat Transport on Single Emitter Laser Diodes Using Diamond Heat Spreaders Technical Presentation. InterPACK2019-6599 Firooz Faili, Alex Muhr, Thomas Obeloer, Daniel Twitchen , <i>Element Six Technologies USA, Santa Clara, CA, United States</i>
TRACK 6: POWER ELECTRONICS	
Track Organizer: Lauren M. Boteler , <i>U.S. Army Research Laboratory, Highland, MD, United States</i> Track Co-Organizer: Damena Agonafer , <i>Washington University in St. Louis, Saint Louis, MO, United States</i> , Ram Ranjan , <i>United Technologies Research Center, East Hartford, CT, United States</i> , Sukwon Choi , <i>Pennsylvania State University, University Park, PA, United States</i>	
6-5: HIGH TEMPERATURE ELECTRONICS PACKAGING	
Concourse Level, Fourth Floor, Palos Verdes B	
Session Organizer: Douglas DeVoto , <i>National Renewable Energy Laboratory, Golden, CO, United States</i> Session Co-Organizer: Christina DiMarino , <i>Virginia Tech, Arlington, VA, United States</i>	
8:00AM	Aging Dependent Anand Parameters of SAC305 Lead Free Solder at Extreme High Temperatures Technical Presentation. InterPACK2019-6564 K.M. Rafidh Hassan, Mohammad S. Alam, Jeffrey Suhling, Pradeep Lall , <i>Auburn University, Auburn, AL, United States</i>
8:20AM	Evaluation of a Lead Glass for Encapsulating High-Temperature Power Modules for Aerospace Application Technical Paper Publication. InterPACK2019-6393 Lanbing Liu, David Nam , <i>Virginia Tech, Blacksburg, VA, United States</i> , Ben Guo , <i>United Technologies, East Hartford, CT, United States</i> , Rolando Burgos, Guo-Quan Lu , <i>Virginia Tech, Blacksburg, VA, United States</i>
8:40AM	Health Monitoring of PCBs Under Mechanical Shock Loads Technical Paper Publication. InterPACK2019-6578 Pradeep Lall, Tony Thomas, Jeffrey Suhling , <i>Auburn University, Auburn, AL, United States</i> , Ken Blecker , <i>U.S. Army CCDC-AC, Picatinny Arsenal, NJ, United States</i>
9:00AM	Advances in Organic Substrate Approaches for High Voltage Power Electronics Packaging Invited Presentation. InterPACK2019-6770 Douglas Hopkins , <i>North Carolina State University, Raleigh, NC, United States</i>

Wednesday, October 9, 8:00AM–9:30AM

6-11: SYSTEM-LEVEL THERMAL DESIGN I

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Todd Bandhauer**, Colorado State University, Fort Collins, MD, United States

Session Co-Organizer: **David Huitink**, University of Arkansas, Fayetteville, AR, United States

8:00AM	Modular Heat Sinks for Enhanced Thermal Management of Electronics Technical Presentation. InterPACK2019-6665 Muhammad Jahidul Hoque, Ahmet Gunay, Andrew Stillwell, Yashraj Gurumukhi , University of Illinois at Urbana-Champaign, Urbana, IL, United States, Robert Pilawa-Podgurski , University of California, Berkeley, Berkeley, CA, United States, Nenad Miljkovic , University of Illinois at Urbana-Champaign, Urbana, IL, United States
8:20AM	Thermal Analysis of High Efficiency High Speed Drives Technical Paper Publication. InterPACK2019-6534 Yasmin Khakpour, Weilun Warren Chen, Parikshith Channegowda, Matthew R. Pearson, Yongduk Lee, Luis Arnedo , United Technologies Research Center, East Hartford, CT, United States
8:40AM	Evaluation of Low Order Stress Models for Use in Co-Design Analysis of Electronics Packaging Technical Paper Publication. InterPACK2019-6381 Lauren M. Boteler , U.S. Army Research Laboratory, Highland, MD, United States, Steven Miner , U.S. Naval Academy, Annapolis, MD, United States
9:00AM	Multi-Scale Thermal Analysis for Design of SiC-Based Medium Voltage Motor Drive Technical Paper Publication. InterPACK2019-6631 J. Emily Cousineau, Kevin Bennion , National Renewable Energy Laboratory, Golden, CO, United States, Karun Potty, He Li, Risha Na, Longya Xu, Jin Wang , Ohio State University, Columbus, OH, United States

Wednesday, October 9, 10:45AM–12:15PM

TRACK 1: HETEROGENEOUS INTEGRATION

Track Organizer: **Gamal Refai-Ahmad**, Xilinx, Santa Clara, CA, United States

Track Co-Organizer: **Leila Choobineh**, SUNY Polytechnic Institute, Utica, NY, United States, **Fabian Welschinger**, Robert Bosch GmbH, Renningen, Germany, **Winston Zhang**, Novark Technologies, Inc., Shenzhen, Guangdong, Guangdong, China

1-8: THERMAL MANAGEMENT APPLICATIONS II

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Yuling Niu**, State University of New York at Binghamton, Vestal, NY, United States

Session Co-Organizer: **Leila Choobineh**, SUNY Polytechnic Institute, Utica, NY, United States

10:45AM	Thermal Analysis of 3D ICs With TSVs Placement Optimization Technical Paper Publication. InterPACK2019-6417 Zongqing Ren, Ayed Alqahtani, Nader Bagherzadeh, Jaeho Lee , University of California, Irvine, Irvine, CA, United States
11:05AM	Fabrication Steps and Thermal Modeling of Three-Dimensional Asynchronous Field Programmable Gate Array (3D-AFPGA) Technical Paper Publication. InterPACK2019-6514 Robert Carroll , SUNY Polytechnic Institute, Albany, NY, United States, Carlos Gutierrez, Leila Choobineh , SUNY Polytechnic Institute, Utica, NY, United States, Robert Geer , SUNY Polytechnic Institute, Albany, NY, United States
11:25AM	Power Delivery and Thermal Management for the Silicon Interconnect Fabric Technical Presentation. InterPACK2019-6550 Ujash Shah, Pranav Ambhore, Umesha Mogera, Subramanian Iyer, Timothy Fisher, Boris Vaisband , University of California, Los Angeles, Los Angeles, CA, United States
11:45AM	Generating Ultra-Packed Thermal Greases with Ellipsoidal Fillers and Evaluation of Their Effective Properties Technical Presentation. InterPACK2019-6669 Huanyu Liao, Sukshitha Achar Puttur Lakshminarayana, Ganesh Subbarayan , Purdue University, West Lafayette, IN, United States

Technical Sessions

WEDNESDAY, OCTOBER 9

Wednesday, October 9, 10:45AM–12:15PM

TRACK 4: FLEXIBLE AND WEARABLE ELECTRONICS

Track Organizer: **Valerie Marty**, *Connected Micro, Corvallis, OR, United States*

Track Co-Organizer: **E. Yegan Erdem**, *Bilkent University, Ankara, Turkey*, **Benjamin Leever**, *Air Force Research Laboratory, Wright Patterson AFB, OH, United States*, **Janos Veres**, *PARC, Palo Alto, CA, United States*, **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States*

4-4: INTERCONNECT RELIABILITY IN FLEXIBLE SYSTEMS

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **Vaibhav Agrawal**, *Intel, Tempe, AZ, United States*

Session Co-Organizer: **Benjamin Leever**, *Air Force Research Laboratory, Wright Patterson AFB, OH, United States*

10:45AM	Damage of Flexible Electronic Line Printed With Ag Nanoparticle Ink due to High-Current Density Technical Paper Publication. InterPACK2019-6408 Daiki Saito, Kazuhiko Sasagawa, Takeshi Moriwaki, Kazuhiro Fujisaki , <i>Hirosaki University, Hirosaki, Japan</i>
11:05AM	Stress Evaluation of Flexible Displays With Multiple-Laminations Architecture Enabled by Experimental Measurement and Simulation Based Factorial Design Technical Paper Publication. InterPACK2019-6541 Chang-Chun Lee, Pei-Chen Huang, Chi-Wei Wang, Oscar Chuang , <i>National Tsing Hua University, Hsinchu, Taiwan</i>
11:25AM	Folding-Reliability of Flexible Electronics in Wearable Applications Technical Paper Publication. InterPACK2019-6584 Pradeep Lall, Hyesoo Jang , <i>Auburn University, Auburn, AL, United States</i> , Benjamin Leever , <i>Air Force Research Laboratory, Wright Patterson AFB, OH, United States</i> , Scott Miller , <i>NextFlex, San Jose, CA, United States</i>
11:45AM	Flexure and Twist Test Reliability Assurance of Flexible Electronics Technical Paper Publication. InterPACK2019-6579 Pradeep Lall, Jinesh Narangaparambil , <i>Auburn University, Auburn, AL, United States</i> , Benjamin Leever , <i>Air Force Research Laboratory, Wright Patterson AFB, OH, United States</i> , Scott Miller , <i>NextFlex, San Jose, CA, United States</i>

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*

Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States*

6-12: SYSTEM-LEVEL THERMAL DESIGN II

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Nicholas Niedbalski**, *U.S. Air Force, USAF, TX, United States*

Session Co-Organizer: **Kristen Hines**, *Johns Hopkins Applied Physics Laboratory, Laurel, MD, United States*

10:45AM	System Electrothermal Transient Analysis of a High Current (40A) Synchronous Step Down Converter Technical Paper Publication. InterPACK2019-6384 Rajen Murugan, Jie Chen, Todd Harrison , <i>Texas Instruments, Dallas, TX, United States</i> , C.T. Kao , <i>Cadence Design Systems, San Jose, CA, United States</i> , Nathan Ai , <i>Cadence Design, Dallas, TX, United States</i>
11:05AM	Direct Bonding of Aluminum Foam With AlSiC for Rapid Fabrication of Power Electronic Packages Technical Presentation. InterPACK2019-6733 Darshan Pahinkar, Chidinma Imediegwu , <i>Georgia Institute of Technology, Atlanta, GA, United States</i> , Jordon Hoyer , <i>Mississippi State University, Mississippi State, MS, United States</i> , Brian Kelly, Samuel Graham , <i>Georgia Institute of Technology, Atlanta, GA, United States</i>
11:25AM	Effects of Cooling Architecture and PCB Layout Co-Design on the Concurrent Thermal and Electrical Performance of an On-Board Electric Vehicle Charger Technical Paper Publication. InterPACK2019-6434 Omri Tayyara, Kshitij Gupta, Carlos Da Silva, Miad Nasr, Amir Assadi, Olivier Trescases, Cristina H. Amon , <i>University of Toronto, Toronto, ON, Canada</i>

Wednesday, October 9, 10:45AM–12:15PM

TRACK 7: ENERGY CONVERSION AND STORAGE

Track Organizer: **Guangsheng Zhang**, University of Alabama in Huntsville, Huntsville, AL, United States

Track Co-Organizer: **Aritra Sur**, United Technologies Research Center, East Hartford, CT, United States, **Xuemin Li**, A123 Systems, Waltham, MA, United States, **Ayyoub Momen**, Oak Ridge National Laboratory, Oak Ridge, TN, United States, **Partha Mukherjee**, Purdue University, West Lafayette, IN, United States

7-7: THERMAL CHARACTERIZATION

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Ayyoub Momen**, Oak Ridge National Laboratory, Oak Ridge, TN, United States

Session Co-Organizer: **Aritra Sur**, United Technologies Research Center, East Hartford, CT, United States

10:45AM	Pressure-Dependent Thermal Characterization of Inverse Opal Copper Structures Technical Presentation. InterPACK2019-6606 Cheng-Hui Lin, Youngjoon Suh, Yoonjin Won , University of California, Irvine, Irvine, CA, United States
11:05AM	Combined Experimental-Numerical Investigation of Microstructure and Thermal Conduction in Dispensed and Squeezed Thermal Interface Materials Technical Presentation. InterPACK2019-6462 Rajath Kantharaj, Jackson Santana, Carl Wassgren, Aaron Morris, Amy Marconnet , Purdue University, West Lafayette, IN, United States
11:25AM	Surface Temperature Measurements Using Infrared Thermometry Considering Background Radiation From High-Temperature Environment Technical Presentation. InterPACK2019-6505 Mingeon Kim , Korea Advanced Institute of Science and Technology, Daejeon, Korea (Republic), Dong Hwan Shin, Jinsub Kim, Jung-ho Lee , Korea Institute of Machinery and Materials, Daejeon, Korea (Republic), Bong Jae Lee , Korea Advanced Institute of Science and Technology, Daejeon, Korea (Republic)
11:45AM	Experimental Investigation of Asymmetrical Microdroplet Evaporation on Heated Porous Pillar Array Structures Technical Presentation. InterPACK2019-6449 Li Shan, Runzhi Zhang, Xinyu Jiang, Binjian Ma , Washington University in St. Louis, St. Louis, MO, United States, Jorge Padilla , Google LLC, Mountain View, CA, United States, Damena Agonafer , Washington University in St. Louis, Saint Louis, MO, United States

TRACK 8: AUTONOMOUS, HYBRID, AND ELECTRIC VEHICLES

Track Organizer: **Przemyslaw Jakub Gromala**, Robert Bosch GmbH, Reutlingen, Germany

Track Co-Organizer: **Gopi Krishnan**, Tesla, Palo Alto, CA, United States, **Ercan Dede**, Toyota Research Institute of North America, Ann Arbor, MI, United States, **Sven Rzepka**, Fraunhofer ENAS, Chemnitz, Germany

8-1: ECU-LEVEL RELIABILITY

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Ercan Dede**, Toyota Research Institute of North America, Ann Arbor, MI, United States

Session Co-Organizer: **Hyun Seop Lee**, University of Maryland, College Park, MD, United States

10:45AM	Effects of Test Temperature and Prior Aging on the Cyclic Stress-Strain Behavior of Lead Free Solders Technical Paper Publication. InterPACK2019-6562 Mohammad Ashraful Haq, Mohd Aminul Hoque, Jeffrey Suhling, Pradeep Lall , Auburn University, Auburn, AL, United States
11:05AM	A Study on Relationship Between Low Cycle Fatigue Strength and Load Conditions for Lead Free Solder Material Technical Presentation. InterPACK2019-6446 Takashi Kawakami, Takahiro Kinoshita, Yuki Murai , Toyama Prefectural University, Imizu, Japan
11:25AM	The Effect of Low Temperature Conditions on Vibration Durability of SAC105 Interconnects Technical Presentation. InterPACK2019-6509 David Leslie , University of Maryland, College Park, College Park, MD, United States, Karsten Meier, Maximilian Ochmann , Technische Universität Dresden, Dresden, Germany, Tamara Storz , Hochschule Mannheim - University of Applied Sciences, Mannheim, Germany, Abhijit Dasgupta , University of Maryland, College Park, College Park, MD, United States
11:45AM	Automated Method Using Finite Element Analysis to Identify Plated Through Holes and Microvia Stacks at Failure Risk in Complex PCB Designs Technical Paper Publication. InterPACK2019-6347 Kourosh Kalayeh , DfR Solutions, Beltsville, MD, United States, Natalie Hernandez , ANSYS Inc., Beltsville, MD, United States, Nathan Blatta , Craig Hillman, DfR Solutions, Beltsville, MD, United States

Technical Sessions

WEDNESDAY, OCTOBER 9

Wednesday, October 9, 1:45PM–3:15PM

TRACK 2: SERVERS OF THE FUTURE, EDGE AND CLOUD COMPUTING: WITH PAPERS HONORING MICHAEL ELLSWORTH FOR CONTRIBUTIONS AND SERVICE TO ASME INTERPACK, THE ELECTRONIC AND PHOTONIC PACKAGING DIVISION, AND LEADERSHIP IN LIQUID COOLING OF SERVER SYSTEMS

Track Organizer: **Saket Karajgikar**, Facebook Inc., Menlo Park, CA, United States

Track Co-Organizer: **Timothy Chainer**, IBM, Yorktown Heights, NY, United States, **Joshua Gess**, Oregon State University, Corvallis, OR, United States, **Baris Dogruoz**, Cisco Systems Inc., Santa Clara, CA, United States

2-7: IMMERSION COOLING II

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Nikhil Lakhkar**, Emerson Climate Technologies, Sidney, OH, United States

Session Co-Organizer: **Steve Moon**, 3M Company, St. Paul, MN, United States

1:45PM	Impact of Immersion Cooling on Thermo-Mechanical Properties of PCBs and Reliability of Electronic Packages Technical Paper Publication. InterPACK2019-6568 Shrinath Ramdas, Pavan Rajmane, Tushar Chauhan, Abel Misrak, Dereje Agonafer , University of Texas at Arlington, Arlington, TX, United States
2:05PM	Computational Analysis for Thermal Optimization of Server for Single Phase Immersion Cooling Technical Paper Publication. InterPACK2019-6587 Dhruvkumar Gandhi, Dereje Agonafer, Tushar Chauhan, Uschas Chowdhury, Satyam Saini, Pratik Bansode, Jimil M. Shah , University of Texas at Arlington, Arlington, TX, United States
2:25PM	Computational Form Factor Study of a Third-Generation Open Compute Server for Single-Phase Immersion Cooling Technical Paper Publication. InterPACK2019-6602 Jimil M. Shah, Chinmay Bhatt, Pranavi Rachamreddy, Ravya Dandamudi, Satyam Saini, Dereje Agonafer , University of Texas at Arlington, Arlington, TX, United States

TRACK 3: INTERNET OF THINGS

Track Organizer: **Baris Dogruoz**, Cisco Systems Inc., Santa Clara, CA, United States

Track Co-Organizer: **Damena Agonafer**, Washington University in St. Louis, Saint Louis, MO, United States

3-1: IOT APPLICATIONS

Concourse Level, Fourth Floor, Huntington A

Session Organizer: **Baris Dogruoz**, Cisco Systems Inc., Santa Clara, CA, United States

Session Co-Organizer: **Damena Agonafer**, Washington University in St. Louis, Saint Louis, MO, United States, **Anil Yuksel**, IBM Corporation, Austin, TX, United States, **Mehmet Arik**, Ozyegin University, Istanbul, Turkey

1:45PM	Thermal Characterization of Composite Ultra-High Molecular Weight Polyethylene Fabrics Technical Presentation. InterPACK2019-6412 Aaditya Candadai, Justin Weibel, Amy Marconnet , Purdue University, West Lafayette, IN, United States
2:05PM	Packaging Environmental Sensors for an Internet-of-Things Solution for Urban-Microclimate Studies Technical Paper Publication. InterPACK2019-6515 Shuv Dey, Yogendra Joshi , Georgia Institute of Technology, Atlanta, GA, United States, J. Michael Brown , Manufacturing Resources International, Alpharetta, GA, United States
2:25PM	Ultra-Low SWaP CO₂ Sensing for Demand Control Ventilation Technical Presentation. InterPACK2019-6747 Elif Karatay, Eric Cocker, Kyle Arakaki, David Schwartz , PARC, Palo Alto, CA, United States
2:45PM	An RF-Powered Self-Locating Flexible Building Environment Sensor System Technical Presentation. InterPACK2019-6306 David Schwartz, Shabnam Ladan, Vijay Venkatasubramanian, Clinton Smith, Joseph Lee, Ping Mei, Brent Krusor, Shakthi Gowri , PARC, Palo Alto, CA, United States

Wednesday, October 9, 1:45PM–3:15PM

TRACK 4: FLEXIBLE AND WEARABLE ELECTRONICSTrack Organizer: **Valerie Marty**, *Connected Micro, Corvallis, OR, United States*Track Co-Organizer: **E. Yegan Erdem**, *Bilkent University, Ankara, Turkey*, **Benjamin Leever**, *Air Force Research Laboratory, Wright Patterson AFB, OH, United States*, **Janos Veres**, *PARC, Palo Alto, CA, United States*, **Baris Dogruoz**, *Cisco Systems Inc., Santa Clara, CA, United States***4-5: PROCESS DEVELOPMENT AND CHARACTERIZATION OF FLEXIBLE SYSTEMS**

Concourse Level, Fourth Floor, Huntington B

Session Organizer: **David Schwartz**, *PARC, Palo Alto, CA, United States*Session Co-Organizer: **Janos Veres**, *PARC, Palo Alto, CA, United States*, **Vaibhav Agrawal**, *Intel, Tempe, AZ, United States*

1:45PM	Process Capability of Aerosol-Jet Additive Processes for Long-Runs up to 10 Hours Technical Paper Publication. InterPACK2019-6569 Pradeep Lall, Amrit Abrol, Nakul Kothari , <i>Auburn University, Auburn, AL, United States</i> , Benjamin Leever , <i>Air Force Research Laboratory, Wright Patterson AFB, OH, United States</i> , Scott Miller , <i>NextFlex, San Jose, CA, United States</i>
2:05PM	Effect of Charge-Discharge Depth and Environment Use Conditions on Flexible Power Sources Technical Paper Publication. InterPACK2019-6570 Pradeep Lall, Amrit Abrol, Ved Soni , <i>Auburn University, Auburn, AL, United States</i> , Benjamin Leever , <i>Air Force Research Laboratory, Wright Patterson AFB, OH, United States</i> , Scott Miller , <i>NextFlex, San Jose, CA, United States</i>
2:25PM	Effect of Process Parameters on Aerosol Jet Printing of Multi-Layer Circuitry Technical Paper Publication. InterPACK2019-6574 Pradeep Lall, Kartik Goyal, Nakul Kothari , <i>Auburn University, Auburn, AL, United States</i> , Benjamin Leever , <i>Air Force Research Laboratory, Wright Patterson AFB, OH, United States</i> , Scott Miller , <i>NextFlex, San Jose, CA, United States</i>
2:45PM	Acceleration Factors for Flexible Electronics in Wearable Applications From Actual Human Body Measurements Technical Paper Publication. InterPACK2019-6580 Pradeep Lall, Tony Thomas, Vikas Yadav, Jinesh Narangaparambil, Wei Liu , <i>Auburn University, Auburn, AL, United States</i>

TRACK 6: POWER ELECTRONICSTrack Organizer: **Lauren M. Boteler**, *U.S. Army Research Laboratory, Highland, MD, United States*Track Co-Organizer: **Damena Agonafer**, *Washington University in St. Louis, Saint Louis, MO, United States*, **Ram Ranjan**, *United Technologies Research Center, East Hartford, CT, United States*, **Sukwon Choi**, *Pennsylvania State University, University Park, PA, United States***6-13: SYSTEM INTEGRATION**

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Ramchandra Kotecha**, *National Renewable Energy Laboratory, Golden, CO, United States*Session Co-Organizer: **Sangbeom Cho**, *Qualcomm, San Diego, CA, United States*

1:45PM	Comparative Study on Power Module Architectures for Modularity and Scalability Technical Paper Publication. InterPACK2019-6443 Mei-Chien Lu , <i>Monte Rosa Technology, Saratoga, CA, United States</i>
2:05PM	Integration Challenges of SiC Power Module for High Temperature and High Frequency Operation Technical Presentation. InterPACK2019-6548 Shohei Suenaga, Shailesh N. Joshi , <i>Toyota Motor North America, Ann Arbor, MI, United States</i>
2:25PM	Parametric and Sensitivity Analysis of Power Module Design Technical Paper Publication. InterPACK2019-6592 Lauren M. Boteler , <i>U.S. Army Research Laboratory, Highland, MD, United States</i> , Michael Fish, Morris S. Berman , <i>U.S. Army Research Laboratory, Adelphi, MD, United States</i>
2:45PM	Packaging and Integration of an Additively Manufactured Photovoltaic Inverter Technical Presentation. InterPACK2019-6411 Akanksha Singh , <i>National Renewable Energy Laboratory, Golden, CO, United States</i>

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TRACK 7: ENERGY CONVERSION AND STORAGE	
Track Organizer: Guangsheng Zhang , <i>University of Alabama in Huntsville, Huntsville, AL, United States</i> Track Co-Organizer: Aritra Sur , <i>United Technologies Research Center, East Hartford, CT, United States</i> , Xuemin Li , <i>A123 Systems, Waltham, MA, United States</i> , Ayyoub Momen , <i>Oak Ridge National Laboratory, Oak Ridge, TN, United States</i> , Partha Mukherjee , <i>Purdue University, West Lafayette, IN, United States</i>	
7-8: THERMAL SWITCHES AND THERMAL METAMATERIALS	
Concourse Level, Fourth Floor, Palos Verdes A	
Session Organizer: Menglong Hao , <i>University of California, Berkeley, Berkeley, CA, United States</i> Session Co-Organizer: Sean Lubner , <i>Lawrence Berkeley National Laboratory, Berkeley, CA, United States</i>	
1:45PM	3D Architected Packaging Structures for Thermal Management Technical Presentation. InterPACK2019-6415 Shiva Farzinazar, Jaeho Lee , <i>University of California, Irvine, Irvine, CA, United States</i>
2:05PM	Continuously Tunable Thermal Switch Based on Compressible Graphene Foams Technical Presentation. InterPACK2019-6554 Luis Delgado , <i>Purdue University, West Lafayette, IN, United States</i> , Tingting Du , <i>Shandong University, Purdue University, Jinan, China</i> , Amy Marconnet , Xiulin Ruan , <i>Purdue University, West Lafayette, IN, United States</i>
2:25PM	Modeling and Analysis of a Shape Memory Alloy-Based Adaptive Regulator for Thermal Management Technical Paper Publication. InterPACK2019-6402 Gary Liang, Ashkan Sadeghifard, Anirudh Krishna, Jaeho Lee, Edwin Peraza Hernandez , <i>University of California, Irvine, Irvine, CA, United States</i>
2:45PM	Environmental Testing of a Temperature Regulator Based on Compressible Graphene Foams Technical Presentation. InterPACK2019-6557 Tingting Du , <i>Shandong University, Purdue University, Jinan, China</i> , Weizhi Liao, Luis Delgado, Joseph Peoples, Amy Marconnet, Xiulin Ruan , <i>Purdue University, West Lafayette, IN, United States</i>
Wednesday, October 9, 3:30PM –5:00PM	
TRACK 4: FLEXIBLE AND WEARABLE ELECTRONICS	
Track Organizer: Valerie Marty , <i>Connected Micro, Corvallis, OR, United States</i> Track Co-Organizer: E. Yegan Erdem , <i>Bilkent University, Ankara, Turkey</i> , Benjamin Leever , <i>Air Force Research Laboratory, Wright Patterson AFB, OH, United States</i> , Janos Veres , <i>PARC, Palo Alto, CA, United States</i> , Baris Dogruoz , <i>Cisco Systems Inc., Santa Clara, CA, United States</i>	
4-2: MICROFLUIDICS FOR FLEXIBLE ELECTRONICS	
Concourse Level, Fourth Floor, Huntington B	
Session Organizer: Azar Alizadeh , <i>GE, Niskayuna, NY, United States</i> Session Co-Organizer: E. Yegan Erdem , <i>Bilkent University, Ankara, Turkey</i>	
3:30PM	Textured Superoleophobic Surfaces: Fabrication and Characterization Technical Presentation. InterPACK2019-6713 Ecem Yelekli, E. Yegan Erdem , <i>Bilkent University, Ankara, Turkey</i>
3:50PM	Experimental Study of Flexible Electrohydrodynamic Conduction Pumping for Electronics Cooling Technical Presentation. InterPACK2019-6746 Alexander J. Castaneda , <i>Worcester Polytechnic Institute, Worcester, MA, United States</i> , Nathaniel O'Connor , <i>Worcester Polytechnic Institute, Oxford, MA, United States</i> , Jamal Yagoobi , <i>Worcester Polytechnic Institute, Worcester, MA, United States</i>
4:10PM	Bio-Applications of Wearable Sensors Invited Presentation. InterPACK2019-6775 Andrew Burns , <i>GE, Niskayuna, NY, United States</i>
4:30PM	Microfluidic Devices for Health Monitoring Invited Presentation. InterPACK2019-6774 Leanna Levine , <i>Aline Inc., Rancho Dominguez, CA, United States</i>

Wednesday, October 9, 3:30PM –5:00PM

TRACK 6: POWER ELECTRONICS

Track Organizer: **Lauren M. Boteler**, U.S. Army Research Laboratory, Highland, MD, United States

Track Co-Organizer: **Damena Agonafer**, Washington University in St. Louis, Saint Louis, MO, United States, **Ram Ranjan**, United Technologies Research Center, East Hartford, CT, United States, **Sukwon Choi**, Pennsylvania State University, University Park, PA, United States

6-14: ADDITIVE MANUFACTURING

Concourse Level, Fourth Floor, Huntington C

Session Organizer: **Douglas Hopkins**, North Carolina State University, Raleigh, NC, United States

Session Co-Organizer: **Stephen Lynch**, Penn State University, University Park, PA, United States

3:30PM	Additive Manufactured, Low EMI, Non-Metallic Convective Heat Spreader Design and Optimization Technical Paper Publication. InterPACK2019-6442 Reece Whitt, David Huitink, Skyler Hudson, Bakhtiyar Mohammad Nafis, Zhao Yuan, Balaji Narayanasamy, Amol Deshpande, Fang Luo, Asif Imran , University of Arkansas, Fayetteville, AR, United States, Zion Clarke, Sonya Smith , Howard University, Washington, DC, United States
3:50PM	A Numerical Investigation of Additive Manufactured Foam Structures for Single Phase Hotspot Thermal Management Technical Paper Publication. InterPACK2019-6519 Justin Broughton, Yogendra Joshi , Georgia Institute of Technology, Atlanta, GA, United States
4:10PM	Advanced Packaging and Thermal Management of High-Power DC-DC Converters Technical Paper Publication. InterPACK2019-6559 Sevket Umut Yuruker, Raphael Mandel, Patrick McCluskey, Michael Ohadi, Shiladri Chakraborty, Yongwan Park, He Yun, Alireza Khaligh , University of Maryland, College Park, College Park, MD, United States, Lauren M. Boteler , U.S. Army Research Laboratory, Highland, MD, United States, Miguel Hinojosa , U.S. Army Research Laboratory, Adelphi, MD, United States
4:30PM	Additive Manufactured Hybrid Cold Plates for Efficient Thermal Management of High Power Density Electronics Technical Presentation. InterPACK2019-6664 Muhammad Jahidul Hoque, Nithin Vinod Upot, Nenad Miljkovic , University of Illinois at Urbana-Champaign, Urbana, IL, United States

6-15: EMERGING TECHNOLOGIES

Concourse Level, Fourth Floor, Palos Verdes A

Session Organizer: **Paul Paret**, National Renewable Energy Laboratory, Golden, CO, United States

Session Co-Organizer: **Patrick McCluskey**, University of Maryland, College Park, MD, United States

3:30PM	Evolution of Anand Parameters With Elevated Temperature Aging for SAC Leadfree Alloys Technical Paper Publication. InterPACK2019-6577 Pradeep Lall, Vikas Yadav, Jeffrey Suhling , Auburn University, Auburn, AL, United States, David Locker , U.S. Army RDECOM, Redstone Arsenal, AL, United States
3:50PM	Simulating the Effect of Elastic Particle Inclusion on the Mechanical Properties of Transient Liquid Phase Sintered (TLPS) Alloys Technical Presentation. InterPACK2019-6435 Gilad Nave, Erick Gutierrez, Patrick McCluskey , University of Maryland, College Park, College Park, MD, United States
4:10PM	Quantitative Characterization of Sapphire and Silicon Nitride for Space Applications Circuit Subassemblies Using Cryogenic Cycling Technical Paper Publication. InterPACK2019-6499 Kirsten Lovelace, Sonya Smith , Howard University, Washington, DC, United States
4:30PM	Effect of Low Melting Point Bridge With High Melting Point Fine Filler on the Conductivity of Conductive Adhesive Technical Presentation. InterPACK2019-6403 Michiya Matsushima, Shogo Minami, Naoki Ito, Shinji Fukumoto, Kozo Fujimoto , Osaka University, Suita, Osaka, Japan

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WEDNESDAY, OCTOBER 9

Wednesday, October 9, 3:30PM–5:00PM

TRACK 7: ENERGY CONVERSION AND STORAGE

Track Organizer: **Guangsheng Zhang**, *University of Alabama in Huntsville, Huntsville, AL, United States*

Track Co-Organizer: **Aritra Sur**, *United Technologies Research Center, East Hartford, CT, United States*, **Xuemin Li**, *A123 Systems, Waltham, MA, United States*, **Ayyoub Momen**, *Oak Ridge National Laboratory, Oak Ridge, TN, United States*, **Partha Mukherjee**, *Purdue University, West Lafayette, IN, United States*

7-10: BATTERIES, SUPERCAPACITORS, AND SOLAR CELLS II

Concourse Level, Fourth Floor, Palos Verdes B

Session Organizer: **Xiangyang Zhou**, *University of Miami, Coral Gables, FL, United States*

Session Co-Organizer: **Chuanbo Yang**, *National Renewable Energy Laboratory, Golden, CO, United States*

3:30PM	Li-Ion Battery Impact Testing Technical Presentation. InterPACK2019-6710 <i>June Stanley, Sandia National Laboratories, Albuquerque, NM, United States</i>
3:50PM	The Role of Interfacial Thermal Resistance in Li-Ion Battery Thermal Management Technical Paper Publication. InterPACK2019-6594 <i>Chuanbo Yang, Lei Cao, National Renewable Energy Laboratory, Golden, CO, United States</i>
4:10PM	In-Situ Diagnosis of Li-Ion Battery Internal Short Circuit Technical Presentation. InterPACK2019-6757 <i>Shan Huang, Guangsheng Zhang, University of Alabama in Huntsville, Huntsville, AL, United States</i>
4:30PM	A High-Performance Polymer Electrolyte Membrane Based on Poly (Vinylidene Fluoride) and Graphene Oxide Doped With Redox Species Technical Presentation. InterPACK2019-6479 <i>Xiangyang Zhou, University of Miami, Coral Gables, FL, United States</i>

TRACK 8: AUTONOMOUS, HYBRID, AND ELECTRIC VEHICLES

Track Organizer: **Przemyslaw Jakub Gromala**, *Robert Bosch GmbH, Reutlingen, Germany*

Track Co-Organizer: **Gopi Krishnan**, *Tesla, Palo Alto, CA, United States*, **Ercan Dede**, *Toyota Research Institute of North America, Ann Arbor, MI, United States*, **Sven Rzepka**, *Fraunhofer ENAS, Chemnitz, Germany*

8-7: RELIABILITY OF ELECTRONIC COMPONENTS FOR HARSH ENVIRONMENT

Concourse Level, Fourth Floor, Redondo

Session Organizer: **Fabian Welschinger**, *Robert Bosch GmbH, Renningen, Germany*

Session Co-Organizer: **David Huitink**, *University of Arkansas, Fayetteville, AR, United States*

3:30PM	Effects of Shear Cycling on the Mechanical Properties of SAC and SAC+X Lead Free Solder Joints Technical Paper Publication. InterPACK2019-6567 <i>Mohd Aminul Hoque, Md. Mahmudur Chowdhury, Jeffrey Suhling, Sa'd Hamasha, Pradeep Lall, Auburn University, Auburn, AL, United States</i>
3:50PM	Demonstration of Two-Layer Wicks for High-Heat-Flux Dissipation in Vapor Chambers Technical Presentation. InterPACK2019-6367 <i>Srivathsan Sudhakar, Justin Weibel, Purdue University, West Lafayette, IN, United States, Feng Zhou, Toyota Research Institute North America, Ann Arbor, MI, United States, Ercan Dede, Toyota Research Institute of North America, Ann Arbor, MI, United States, Suresh Garimella, University of Vermont, Burlington, VT, United States</i>
4:10PM	Effect of Drop Angle Variation and Restraint Mechanisms on Surface Mount Electronics Under High G Shock Technical Paper Publication. InterPACK2019-6575 <i>Pradeep Lall, Aathi Raja Ram Pandurangan, Jeffrey Suhling, Auburn University, Auburn, AL, United States, John Deep, Air Force Research Laboratory, Eglin AFB, AL, United States, Ryan Lowe, ARA Associates, Littleton, CO, United States, Venkata Kalyan Reddy Dornala, Auburn University, Auburn, AL, United States</i>
4:30PM	Modeling of Underfilled PBGA Assemblies Using Both Viscoelastic and Elastic Material Properties Technical Paper Publication. InterPACK2019-6561 <i>Promod Chowdhury, Jeffrey Suhling, Pradeep Lall, Auburn University, Auburn, AL, United States</i>

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		InterPACK2019-6501	Comparative Evaluation of Algorithms for Achieving Ultrapacked Thermal Greases: Microstructural Models and Effective Behavior
		InterPACK2019-6697	Generating Ultra-Packed Thermal Greases With Ellipsoidal Fillers and Evaluation of Their Effective Properties
		InterPACK2019-6696	Comparative Evaluation of Algorithms for Achieving Ultrapacked Thermal Greases: Microstructural Models and Effective Behavior
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		InterPACK2019-6466	Molecular Dynamics Simulation of Thin-Film Evaporation From Nanocoated Surfaces:The Asymptotic Relationship Between Evaporation Rate and Nanocoating Thickness
		InterPACK2019-6449	Experimental Investigation of Asymmetrical Microdroplet Evaporation on Heated Porous Pillar Array Structures
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		InterPACK2019-6601	Development of a Technique to Measure Deliquescent Relative Humidity of Particulate Contaminants and Determination of the Operating Relative Humidity of a Data Center
		InterPACK2019-6590	Experimental Analysis for Optimization of Thermal Performance of a Server in Single Phase Immersion Cooling
		InterPACK2019-6600	CFD Analysis of Thermal Shadowing and Optimization of Heat Sinks in Third-Generation Open Compute Server for Single-Phase Immersion Cooling
		InterPACK2019-6568	Impact of Immersion Cooling on Thermo-mechanical Properties of PCBs and Reliability of Electronic Packages
		InterPACK2019-6587	Computational Analysis for Thermal Optimization of Server for Single-Phase Immersion Cooling
		InterPACK2019-6602	Computational Form Factor Study of a Third-Generation Open Compute Server for Single-Phase Immersion Cooling
		InterPACK2019-6536	Development and Optimization of Control Strategy for a Dynamic Cold Plate to Save Pumping Power and Increase the Reliability
		InterPACK2019-6651	Computational Analysis for Thermal Optimization of Server for Single-Phase Immersion Cooling
		InterPACK2019-6653	Artificial Neural Network Based Prediction of Control Strategies for Multiple Air Cooling Units in a Raised Floor Data Center
		InterPACK2019-6671	Experimental Analysis for Optimization of Thermal Performance of a Server in Single Phase Immersion Cooling
		InterPACK2019-6677	Study of Hybrid Cooled Servers Using Warm Water Cooling and Comparing Distributed Pumping System With and Without Controlling Pumps
		InterPACK2019-6723	Comparative CFD Analysis of the Effect of Air and Liquid Cooling on the Form Factor of GPU Server
		InterPACK2019-6724	Comparative Rack Level CFD Analysis of Air to Hybrid Cooling
		InterPACK2019-6521	Numerical Investigation on Electromigration Oriented Failure of Lead Free Solder Joints With Aging Effects
		InterPACK2019-6384	System ElectroThermal Transient Analysis of a High Current (40A) Synchronous Step Down Converter
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		InterPACK2019-6730	System-Level Thermal Management and Reliability of Automotive Electronics: Goals and Opportunities in the Next Generation of Electric and Hybrid Electric Vehicles
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		InterPACK2019-6571	Investigation of the Effects of High Temperature Aging on Mechanical Behavior and Microstructural Changes in Lead Free Solders
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		InterPACK2019-6642	Microstructural Evolution in SAC+X Solders Subjected to Aging
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		InterPACK2019-6661	Thermal Management Approaches for Next-Generation Fast Charging of Electric Vehicles
Allred	Taylor	InterPACK2019-6308	The Critical Role of Dynamic Surface Wettability on Bubble Dynamics and Boiling Performance
		InterPACK2019-6622	The Critical Role of Dynamic Surface Wettability on Bubble Dynamics and Boiling Performance
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		InterPACK2019-6400	Experimental Investigation of Single-Phase Cooling in Embedded Microchannels: 3D Manifold Heat Exchanger With R-245fa
		InterPACK2019-6382	Single-Phase Thermal and Hydraulic Performance of Embedded Micro-Pin Fin Using R245fa
		InterPACK2019-6472	Design and Optimization of Silicon-Based Embedded Microchannel and 3D Manifold for High Heat Flux (>1 kW/cm ²) Power Electronics Cooling Applications

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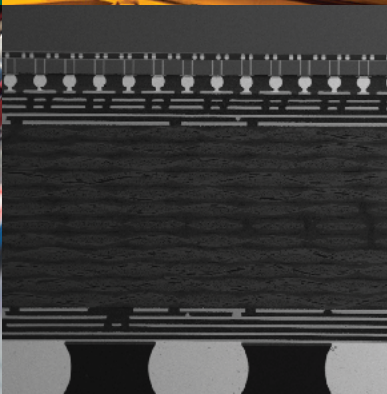
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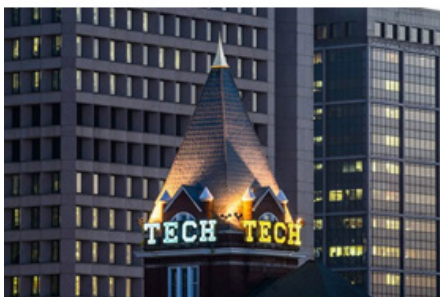
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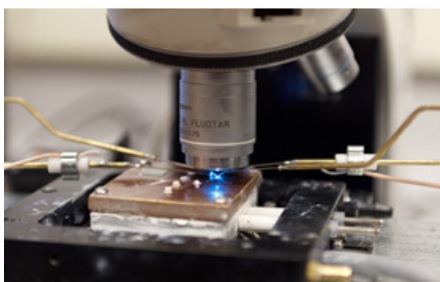
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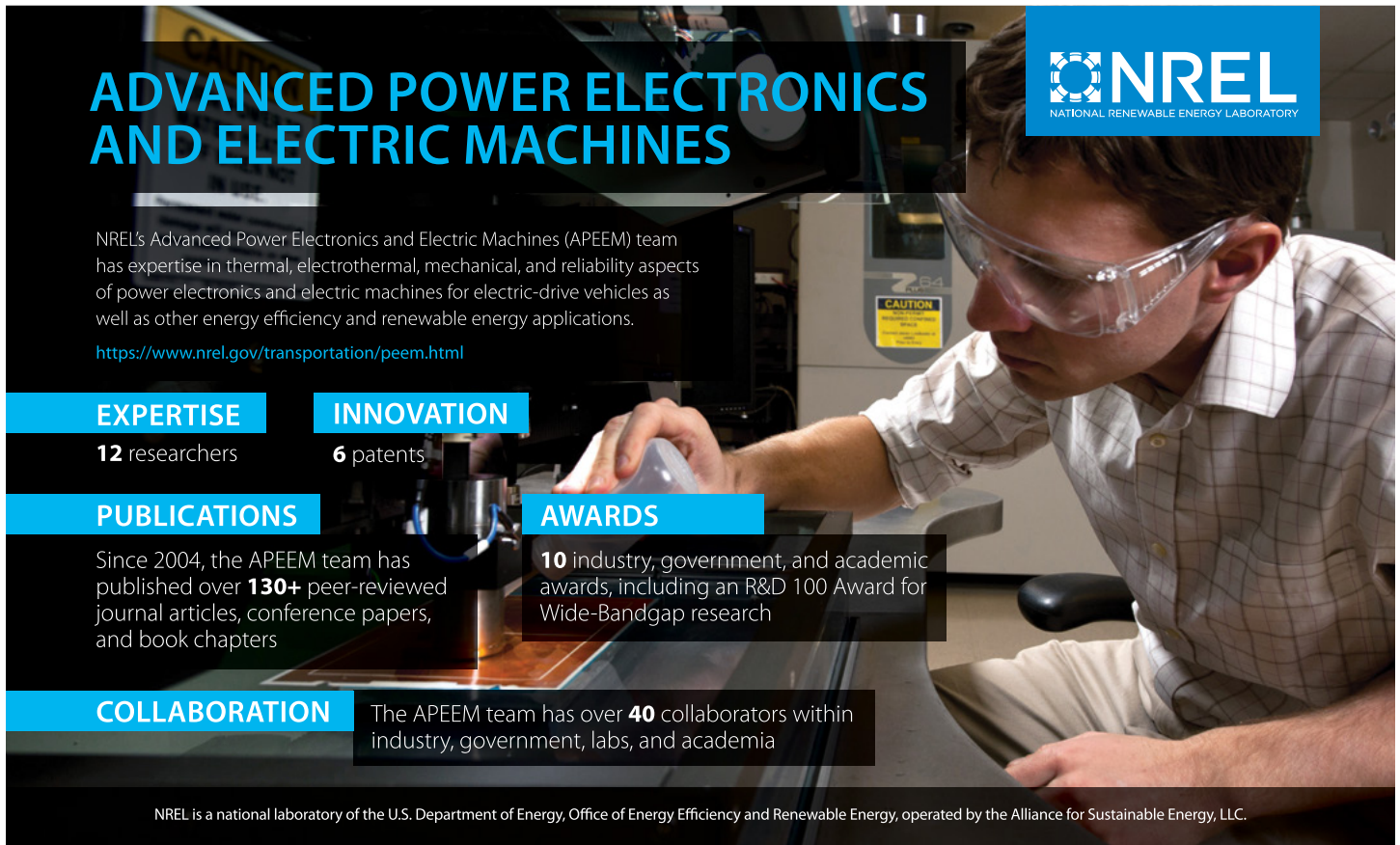
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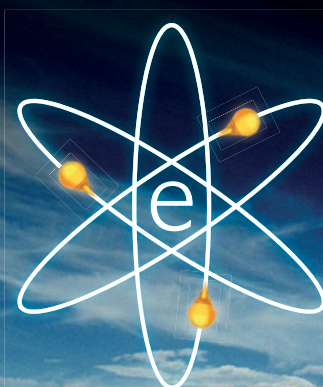
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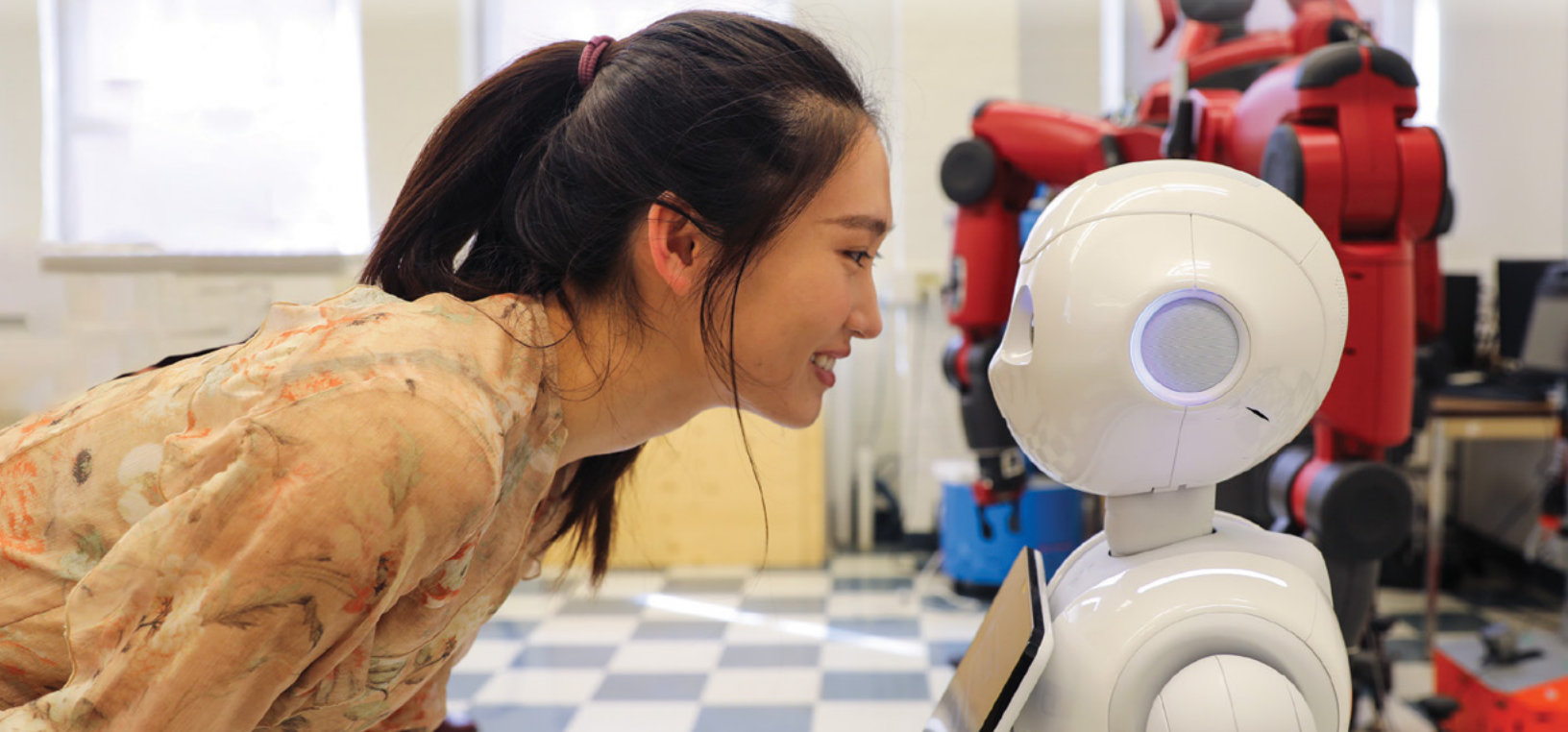


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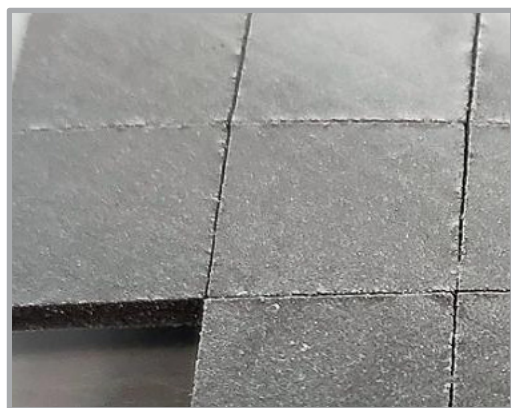
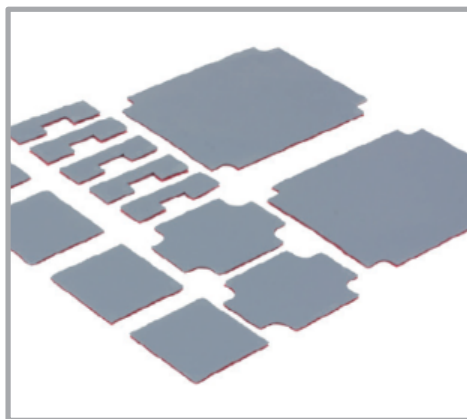
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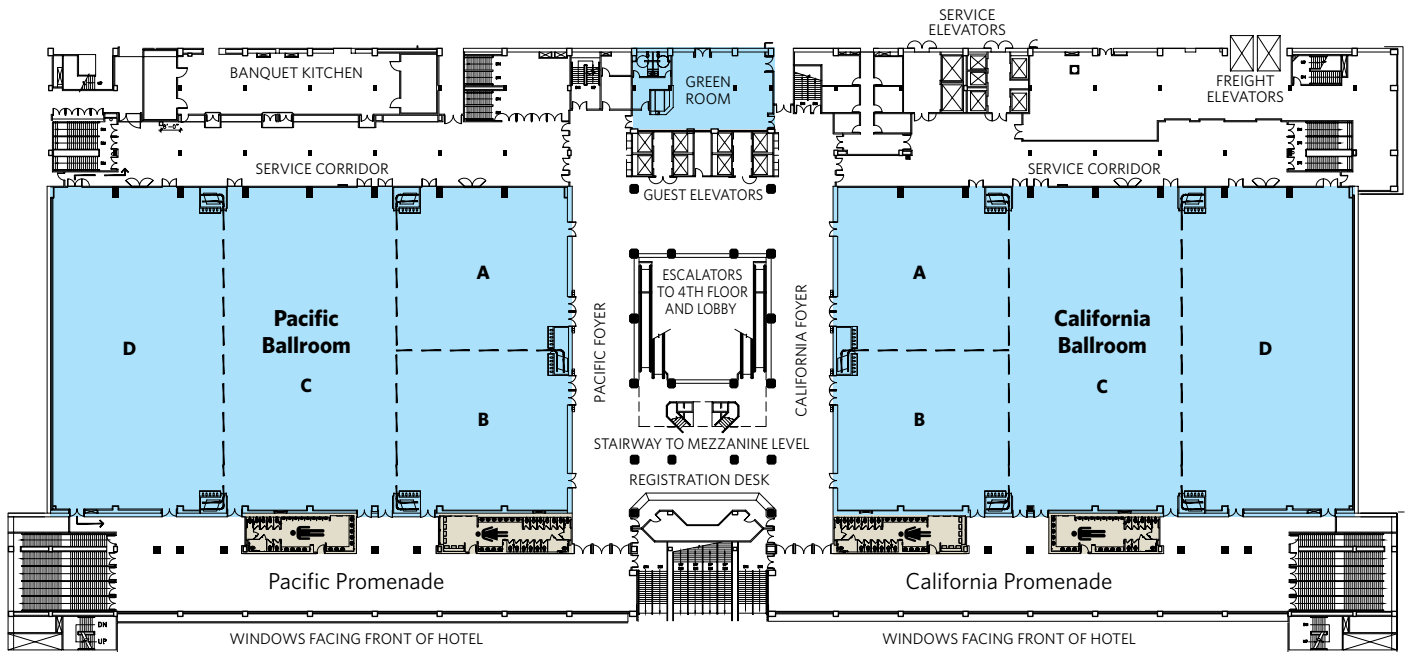
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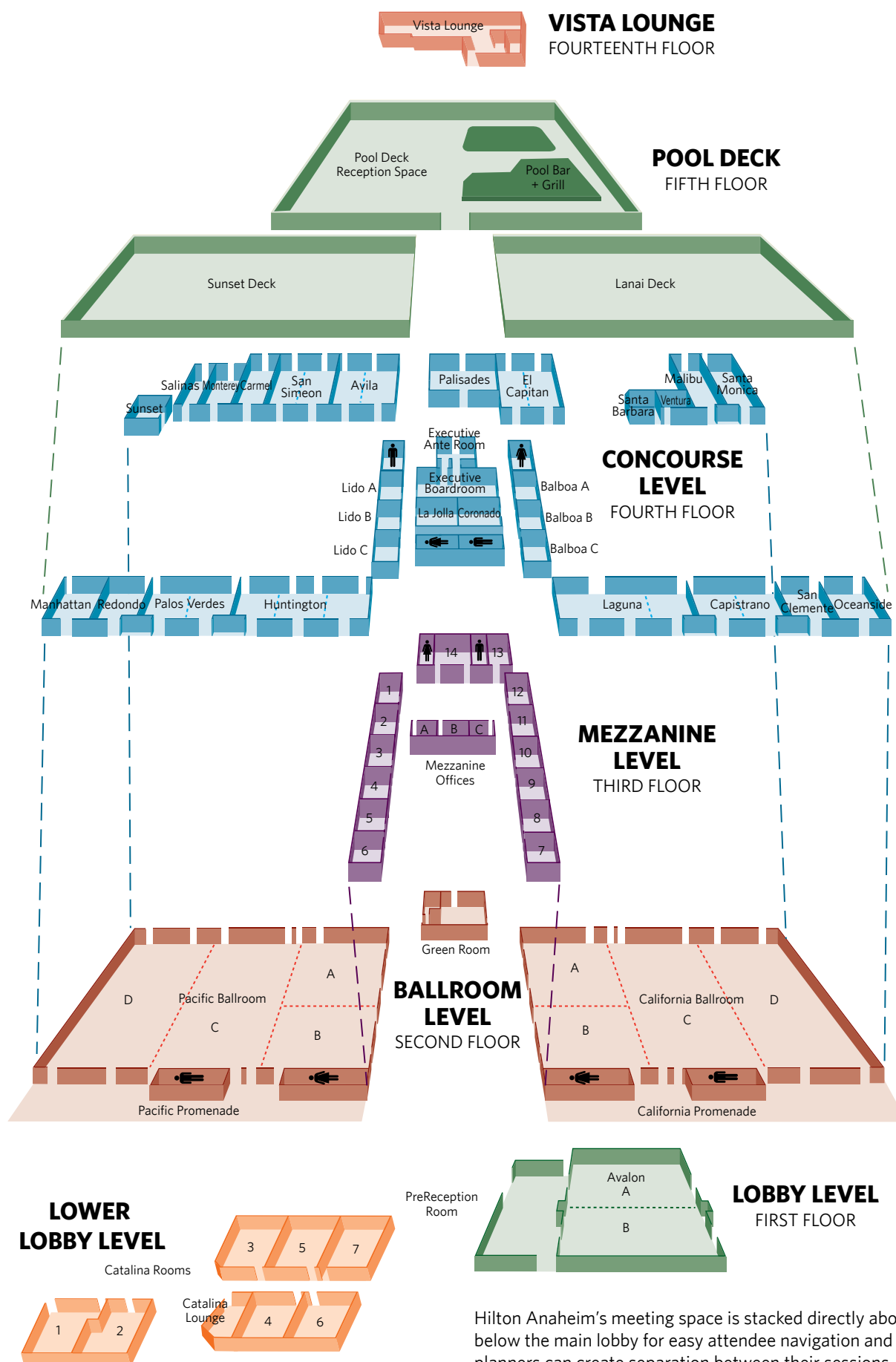
SECOND FLOOR



CONCOURSE LEVEL

FOURTH FLOOR





Hilton Anaheim's meeting space is stacked directly above and below the main lobby for easy attendee navigation and so planners can create separation between their sessions.

10. *Journal of the American Medical Association*, 2000; 284: 2689-2695.

This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal grey lines across its entire width, typical of notebook or legal stationery. The paper is otherwise completely empty, with no text, markings, or illustrations.



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