InterPACK 2023

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

Program

CONFERENCE
October 24–26, 2023

Doubletree by Hilton
San Diego Mission Valley
San Diego, CA

https://event.asme.org/InterPACK

The American Society of Mechanical Engineers®
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SETTING THE STANDARD

Contents

Dear InterPACK Participants,

On behalf of the ASME Electronic and Photonic Packaging Division (EPPD), we welcome you to the 2023 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK) being held at the Doubletree by Hilton San Diego Mission Valley, San Diego, California, on October 24–26, 2023.

The InterPACK Conference is a premier event organized by the ASME EPPD and holds a rich history of serving as a platform for exchanging information on cutting-edge research in the areas of electronic and photonic packaging, thermal management, and reliability of electronic devices, components, and systems by bringing together numerous researchers and technical professionals from Academia, Government, and Industry. The organizers have developed a comprehensive technical program comprised of more than 210 technical presentations and posters, including more than 90 original technical papers as well as tutorials, panel discussions, workshops, and plenary talks aligned with the areas of (i) heterogeneous integration; (ii) data centers and modular edge systems; (iii) electronics packaging; (iv) power/RF electronics and photonics; (v) multiscale thermal transport and energy storage; (vi) flexible, wearable, and printed electronics; and (vii) transportation systems, AI, and machine learning. The program has been organized to promote networking between government, academia, and industry researchers and professionals and to offer opportunities for fostering collaborations. Students will have an opportunity to present their work during the interactive presentation session and get to discuss their future career path with senior researchers and industry leaders during a career fair.

We are pleased to announce that there will be seven plenary talks from distinguished professionals in the area of electronic and photonic packaging, including Waguih S. Ishak (Corning; Glass is a Key Material for the Connected World), Yogendra Joshi (DARPA; Three Decades of Microsystems Thermal Management Research at DARPA), Peter De Bock (ARPA-E; ARPA-E High Risk/High Reward Technology Programs in Heat Transfer and Electronics), Christopher G. Malone (Meta; Building a Global Gigawatt-Scale Data Center Fleet - Current and Future Challenges), Vincent (WooPoung) Kim (Samsung; Exciting Work Toward Advanced Packaging), Sumanta Acharya (NSF; Thermal Management of Electronics: Research Supported by the National Science Foundation), and John H. Lau (Unimicron; Chiplet Design and Heterogeneous Integration Packaging). We will continue to promote research and development in the emerging areas of electronics and photonics that align with the goal of the ASME EPPD through the conference. We are pleased to host panel sessions and tutorials to discuss the trending topics in electronic and photonic packaging, thermal management, and reliability of electronic devices and electrified systems. In addition, we will host workshops dedicated to the recently announced CHIPS and Science Act and learn how the U.S. domestic semiconductor manufacturing, design, and research can be strengthened in the near future.

We hope that you will enjoy the program that has been organized by numerous volunteers contributing as track chairs, session chairs, workshop organizers, tutorial instructors, panel moderators, and technical paper reviewers. We are indebted to our volunteers as well as the ASME Staff for their vigorous and passionate efforts to make this conference a premier event. We also thank all our sponsors across the globe for their generous support as well as participation in the technical sessions.

Thank you and we all look forward to meeting you at InterPACK 2023!

General Chair
Prof. Sukwon Choi
Penn State University

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Award & Communication Chair
Dr. Anna Prakash
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REGISTRATION INFORMATION

Registration will be located at the **Royal Foyer** on the First Floor of the hotel. The hours are as follows:

Monday, October 23
3:00PM–6:00PM

Tuesday, October 24
7:00AM–5:00PM

Wednesday, October 25
7:00AM–5:00PM

Thursday, October 26
7:00AM–4:00PM

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. Session chairs typically provide their laptops for all the author's presentations, or you may bring your own. Please bring your presentations on a jump drive 10–15 minutes before your presentation to upload it on the laptop provided by the session chair.

BADGE REQUIRED FOR ADMISSION

All conference attendees must always wear the official ASME 2023 InterPACK badge to gain admission to technical sessions, exhibits, poster sessions, meals, 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 AWARDS LUNCHEONS

PLENARY 2: 2023 ASME INTERPACK DISTINGUISHED LUNCHEON SPEECH

Tuesday, October 24
12:30PM–1:45PM
Gallery Room

2023 AVRAM BAR COHEN AND ALAN KRAUS AWARD

Wednesday, October 25
12:30PM–1:45PM
Gallery Room

InterPACK EPPD, JEP, AND NASSER GRAYELI POSTER AWARDS LUNCHEON

Thursday, October 26
12:30PM–1:45PM
Gallery Room

CONFERENCE NETWORKING BREAKS

Morning and afternoon breaks will be provided in the Royal Foyer located on the First Floor. Join your fellow attendees for a few minutes of networking and discussion. The schedule is as follows:

Tuesday, October 24 to Thursday, October 26
10:45AM–11:00AM and 4:15PM–4:30PM

General Information

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 conferencepubs@asme.org. Access to all 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 are registered with the Library of Congress and are submitted for abstracting and indexing. The proceedings are published in the ASME Digital Library.

REGISTRANTS WITH DISABILITIES

Whenever possible, we are pleased to plan 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.

CONFERENCE APP

InterPACK 2023 Symposium will be utilizing the ASME Events mobile app to enhance the experience for attendees and speakers in place of a printed program. Connect with Attendees, View Speaker Profiles, Access Session Information and more! Options may vary by event.

INTERNET ACCESS

Basic complimentary sleeping room Wi-Fi will be provided for you if you are staying at the Doubletree by Hilton. You will be given a Wi-Fi code to use your sleeping rooms during your stay.

ASME has provided Wi-Fi access in the meeting space, here is the network information and code:

Network Name: **DOUBLETREE-MEETING**
Access Code: **asme2023**

MEMBERSHIP TO ASME (4 MONTHS FREE)

Registrants who paid the non-member conference registration fees will receive a four-month complimentary ASME Membership. ASME will automatically activate this complimentary membership for qualified attendees. Please allow approximately four weeks after the conclusion of the conference for your membership to become active.

Visit www.asme.org/membership for more information about the benefits of ASME Membership.

PRESENTER ATTENDANCE POLICY

According to ASME's Presenter Attendance Policy, if a paper is not presented at the conference, the paper will not be published in the official Archival Proceedings, which are registered with the Library of Congress and are abstracted and indexed. The paper also will not be published in the ASME Digital Collection and may not be cited as a published paper.

HOTEL

Steps from vibrant dining and Fashion Valley, the **DoubleTree by Hilton Hotel San Diego – Mission Valley** is five minutes from Fashion Valley mall and Mission Valley's trendy dining. Find San Diego's top attractions, such as the zoo, Balboa Park, Old Town, and SeaWorld, in a 15-minute drive or less. Gaslamp Quarter and pristine beaches are 20 minutes away. Enjoy our indoor and outdoor pools. A warm chocolate chip cookie is yours on arrival.

EMERGENCY INFORMATION

- In case of a medical emergency, Dial 911 from any house phone
- In case of a non-life threatening emergency, Dial 0 from any house phone
- In the unlikely event of an emergency, there will be an announcement over the public address of what the particular incident is and providing further instruction as far as whether to evacuate or remain in place. All employees are familiar with evacuation procedures and will assist in giving direction.
- In the unlikely event of a fire emergency, visual strobes will activate with audible alarms, followed by an announcement over the public address of what the particular incident is and providing further instruction as far as whether to evacuate or remain in place. All employees are familiar with evacuation procedures and will assist in giving direction.
- Do not take elevators and follow all instructions given.

QUESTIONS ABOUT THE MEETING

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

ABOUT MISSION VALLEY, CALIFORNIA

Central, Convenient and Affordable

Just minutes away from the San Diego International Airport and within easy reach of all that San Diego has to offer, Mission Valley and Old Town are a great places to call home base. Conveniently located in the center of San Diego County, the area is within a 10-minute drive of the San Diego Zoo, SeaWorld San Diego, and the Downtown Gaslamp District and offers a wealth of affordable accommodations, family-friendly dining options, and great shopping at both the Fashion Valley and Mission Valley malls.

Outdoor enthusiasts can play 18 holes at the Riverwalk Golf Club in Mission Valley or go hiking and rock climbing in Mission Trails Regional Park. Cultural attractions in the area include the Mission San Diego de Alcala, the first of 21 missions established in California, and Old Town San Diego State Historic Park, with 12 acres of Mexican lore and historical sites.

Quaint boutiques, mouth-watering restaurants, colorful art galleries, and festive theaters also populate Old Town, making it a not-to-be-missed stop. Mexican cuisine is the specialty in Old Town. Here you'll find authentic, delectable fare at any of the many restaurants and cantinas. Just follow the aroma of freshly made tortillas and take a seat outside on the patio. Enjoy the sounds of local mariachi or watch traditional folkloric dancers as you sip on the best margaritas in town. Visit the Old Town San Diego Guide for an up-to-date list of attractions, restaurants, shopping, and hotels in or close to Old Town. The guide also includes a list of historic sites and a calendar of Old Town community events.

Here you'll also find the main boarding location for the Old Town Trolley Tours, which offers an excellent sightseeing tour of San Diego with on-and-off privileges. The Old Town Transit Center, located adjacent to the park, services passenger trains operating on Amtrak's Pacific Surfliner and the San Diego Coaster with a variety of stops Downtown, including the Convention Center and Petco Park. Free parking is offered in the Transit Center lot.

Program at a Glance

Pacific Time		Type	Speakers/Tech Sessions	Presentation Title		
Day 1 - Monday, October 23						
7:00PM	9:30PM		InterPACK Leadership Dinner - By Invitation Only			
3:00PM	6:00PM		Registration Opens			South Foyer
Day 2 - Tuesday, October 24						
8:15 AM	9:15 AM	Plenary 1	Waguih S. Ishak: Glass is a Key Material for the Connected World			Great Room I-III
9:15AM	10:45AM	Tutorial 1	"Rack Scale Two-Phase Cooling Systems for High-Performance Computing and AI Clusters"			Courtyard I
9:15AM	10:45AM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			01-01	03-01	04-01	06-01
10:45AM	11:00AM	Break	Coffee Break / Exhibitors			South Foyer
11:00AM	12:30PM	Panel 1	Thermal/Mechanical/Electrical Challenges of Advanced Mobile/ Telecom/Wireless/AI and High-Power Computing Devices			Brickstones
11:00AM	12:30PM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			02-01	05-01	06-02	07-01
12:30PM	1:45PM	Plenary 2/ Lunch	"2023 ASME InterPACK Distinguished Luncheon Speaker Yogendra Joshi: Three Decades of Microsystems Thermal Management Research at DARPA"			Gallery
1:45PM	2:45PM	Plenary 3	Peter De Bock: ARPA-E High Risk/High Reward Technology Programs in Heat Transfer and Electronics			Great Room I-III
2:45PM	4:15PM	Workshop 1	Introduction to Robotics, AI and Intel's OpenVINO™ Toolkit			Courtyard II
2:45PM	4:15PM	Panel 2	Printing & Additive Manufacturing Processes for Electronics Packaging			Brickstones
2:45PM	4:15PM	Tech Session	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			03-07	05-06	05-07	
4:15PM	4:30PM	Break	Coffee Break / Exhibitors			South Foyer
4:30PM	6:00PM	Workshop 2	K16 Mentorship Wokshop			Courtyard II
4:30PM	6:00PM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			03-02	04-02	05-02	07-02
6:00PM	7:00PM	Exhibitors Presentations and Career Fair				Gallery
7:00PM	8:00PM	Interactive Poster Session				Great Room I-III
8:00PM	8:30PM	K-16 Committee Meeting				Loft I
8:30PM	9:00PM	Journal of Electronic Packaging (JEP) meeting				Loft I
Day 3 - Wednesday, October 25						
8:15AM	9:15AM	Plenary 4	Sumanta Acharya: Thermal Management of Electronics: Research Supported by the National Science Foundation			Great Room I-III
9:15AM	10:45AM	Tutorial 2	Energy Efficient Computing – A Peek Into the Future / Thermal Management of Lithium-Ion Batteries			Courtyard I
9:15AM	10:45AM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			02-02	04-03	06-03	07-03

Pacific Time		Type	Speakers/Tech Sessions	Presentation Title		
10:45AM	11:00AM	Break	Coffee Break / Exhibitors			South Foyer
11:00AM	12:30PM	Panel 3	Scaling Data Centers Capacity with Advanced Cooling, Computing Architectures and Beyond			Brickstones
11:00AM	12:30PM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			03-03	04-04	05-03	06-04
12:30PM	1:45PM	Lunch	"Avram Bar Cohen Award InterPACK Allan Kraus Award"			Gallery
1:45PM	2:45PM	Plenary 5	Christopher G. Malone: Building a Global Gigawatt-Scale Data Center Fleet - Current and Future Challenges			Great Room I-III
2:45PM	4:15PM	Workshop 3	NIST Road Map Directions to Chip Act (Part 1)			Courtyard II
2:45PM	4:15PM	Tech Session	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			03-08	05-08	05-09	
4:15PM	4:30PM	Break	Coffee Break / Exhibitors			South Foyer
4:30PM	6:00PM	Workshop 4	NIST Road Map Directions to Chip Act (Part 2)			Courtyard II
4:30PM	6:00PM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			02-03	03-04	06-05	07-04
6:00PM	6:30PM	InterPACK Meeting (Open)				Loft I
6:30PM	7:00PM	InterPACK Meeting (Closed)				Loft I
7:00PM	7:30PM	EPPD Meeting				Loft I
Day 4 - Thursday, October 26						
8:15AM	9:15AM	Plenary 6	Vincent Kim: Exciting Work Toward Advanced Packaging			Great Room I-III
9:15AM	10:45AM	Tutorial 4	Electric Motor and Integrated Traction Drive Thermal Management			Courtyard I
9:15AM	10:45AM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			01-02	02-04	05-04	06-06
10:45AM	11:00AM	Break	Coffee Break / Exhibitors			South Foyer
11:00AM	12:30PM	Panel 4	AI for the Thermal Science Community			Brickstones
11:00AM	12:30PM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			02-05	03-05	04-05	06-07
12:30PM	1:45PM	Lunch	InterPACK & Nasser Grayeli Poster, EPPD & JEP Awards			Gallery
1:45PM	2:45PM	Plenary 7	John Lau: Chiplet Design and Heterogeneous Integration Packaging			Great Room I-III
2:45PM	4:15PM	Workshop 5	Ultra-Wide Bandgap Device Electro-Thermal Co-Design Workshop			Courtyard II
2:45PM	4:15PM	Panel 5	Women in Engineering			Brickstones
2:45PM	4:15PM	Tech Session	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			03-09	05-10		
4:15PM	4:30PM	Break	Coffee Break / Exhibitors			South Foyer
4:30PM	6:00PM	Tech Sessions	Shutters East I	Shutters East II	Shutters West I	Shutters West II
			03-06	04-06	05-05	07-05
6:00PM		CONFERENCE ENDS				

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National Renewable Energy Laboratory (NREL) researchers within the Advanced Power Electronics & Electric Machines (APEEM) Group have expertise in thermal, electrothermal, mechanical, and reliability of power electronics and electric machines for energy efficiency and renewable energy applications, such as electric-drive vehicles. In collaboration with research and industry partners, NREL's APEEM Group is developing novel thermal management technologies to improve the performance, cost, reliability, and volume of power electronics and electric machines. NREL has five facilities dedicated to APEEM research, featuring a range of equipment to investigate primary research areas of 1) electronic and power electronic devices and sensors, 2) power electronics thermal management, 3) power electronics packaging reliability and prognostics, 4) electric motor thermal management, 5) integrated electric drive thermal management.

Learn more about the capabilities and facilities at NREL on our website.

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GOOGLE

The Journal of Electronic Packaging publishes papers that use experimental and theoretical (analytical and computer-aided) methods, approaches, and techniques to address and solve various mechanical, materials, and reliability problems encountered in the analysis, design, manufacturing, testing, and operation of electronic and photonics components, devices, and systems.

The journal publishes papers that address: 1) thermal management, applied mechanics and technologies for microsystems packaging; 2) critical issues in systems integration; 3) emerging packaging technologies and materials with micro/nano structures; and 4) general small-scale systems.

The journal serves researchers and engineers working in academic and industrial settings. In addition, leaders in the field are invited to publish review articles on hot, emerging, and fundamental topics.

Scope: Electronic packaging; Thermal management; Applied mechanics; Microsystems packaging; Systems integration; Small scale systems in general. https://asmedigitalcollection.asme.org/electronicpackaging.

Contact:
Shi-Wei Ricky Lee, Ph.D.
The Hong Kong University of Science and Technology, Hong Kong
rickylee@ust.hk

Sponsors and Exhibitors

PennState Electronics & Thermography Lab

The **Penn State Electronics and Thermography Laboratory (ET-Lab)** is directed by Prof. Sukwon Choi. We are at the forefront of the electro-thermal co-design of next-generation semiconductor devices using state-of-the-art optical characterization methods and multi-physics simulation. Device technologies of our current interest include ultra-wide bandgap power switching devices for electrified transportation systems, and wide bandgap semiconductor devices and thin film piezoelectric MEMS for 5G/6G wireless communication. Our core expertise includes nanoscale device thermography, multi-physics device modeling, thermo-physical property measurement using laser-based pump-probe techniques, and device-level thermal management.

For more information, please visit our website: https://sites.psu.edu/choi/

With more than 60 faculty members, 290 graduate students and 650 undergraduate students, the Penn State Department of Mechanical Engineering embraces a culture that welcomes individuals with diverse backgrounds and expertise. Our faculty and students are innovating today what will impact tomorrow's solutions to meeting our energy needs, homeland security, biomedical devices, and transportation systems. We offer a bachelor's degree in mechanical engineering as well as resident (M.S., Ph.D.) and online (M.S., M.Eng.) graduate degrees in mechanical engineering.

We invite you to explore our department, academics, and research at: https://www.me.psu.edu/

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STRATEDGE

StratEdge Corporation designs, manufactures, and provides assembly services for a complete line of high-frequency and high-power semiconductor packages operating from DC to 63+ GHz. StratEdge offers post-fired ceramic and lower-cost molded ceramic packages, specializing in packages for extremely demanding gallium arsenide (GaAs) and gallium nitride (GaN) devices. Markets served include telecom for 5G, VSAT, broadband wireless, satellite, defense, test and measurement, automotive, clean energy, and down-hole. All packages are lead-free and most meet RoHS and WEEE standards. Our facility in Santee, California, near San Diego, is both ITAR registered and ISO 9001:2015 certified. Visit www.StratEdge.com.

Novark Technologies, Inc. leverages nearly two decades of experience and expertise in thermal management solutions of electronics. Its product lines include various heat pipe, vapor chamber, heat column, heat sink, liquid cooling and other advanced thermal solutions used in a variety of electronics cooling applications ranging from CPU to LED to industrial power systems to telecommunications to EV thermal management solutions and more. Routine support of academic research at various institutions in the US, Europe and China combines with constant exploration of new thermal management solutions to push the company's capabilities forward continuously.

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.

College of Engineering

The University of Texas at Arlington's College of Engineering has emerged as one of the most comprehensive engineering programs in North Texas and the nation. It offers 11 baccalaureate, 14 master's, and nine doctoral degree programs, and its programs are ranked by U.S. News and World Report as among the best in the nation. With more than 7,500 students and more than 34,000 alumni, the College of Engineering is the fourth largest in Texas, providing the local, regional, and national workforce with motivated and highly skilled graduates. The College boasts seven buildings, including the Science and Engineering Innovation and Research (SEIR) Building, which opened in Fall 2018. UTA is classified as a Research 1 University.

Electronics, MEMS and Nanoelectronics Systems Packaging Center 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.

More information at: https://blog.uta.edu/emnspc/

Sponsors and Exhibitors

BRONZE SPONSORS

S3IP brings together teams of experts from industry and academia to address pressing real-world problems in electronics manufacturing. Our research centers focus on packaging and thermal management, heterogeneous integration, energy-efficient electronic systems and energy harvesting and storage. Li-ion battery research is conducted by Dr. M. Stanley Whittingham, 2019 Nobel Laureate. Binghamton University, the premier public university in the Northeast, is home to S3IP, a New York State Center of Excellence. Our PhD-degreed staff members and affiliated faculty, in 6 constituent research centers and 9 laboratories, are ready to assist companies with collaborative problem solving. As a result of our combined efforts, our industry partners have reported over $1.9 billion of economic benefit. Binghamton.edu/s3ip

SUSS MicroTec is a leading supplier of equipment and process solutions for microstructuring in the semiconductor industry and related markets.

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DataRefiner provides unique expertise in analyzing complex, multidimensional data in the semiconductor industry. The platform utilizes Topological Data Analysis to:

- improve manufacturing yield by visual clustering;
- segment electron microscope imagery;
- extract critical patterns from raw data.

Our algorithms provide a visually engaging, user-friendly data analysis experience, significantly accelerating the speed of analysis, and discovery of hidden patterns, and enhancing manufacturing processes.

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WE THANK ALL OUR SPONSORS AND EXHIBITORS FOR THEIR GENEROUS AND CONTINUED SUPPORT. PLEASE BE SURE TO VISIT THEIR TABLETOP EXHIBITS DURING THE BREAKS OVER THE NEXT THREE DAYS IN THE SOUTH FOYER ON THE FIRST FLOOR OF THE HOTEL. THEIR CONTRIBUTIONS HELP MAKE THIS CONFERENCE SUSTAINABLE.

Track Keynotes

PLENARY TALK 1 – GLASS IS A KEY MATERIAL FOR THE CONNECTED WORLD

TUESDAY, OCTOBER 24
8:00AM–9:00AMGREAT ROOM I–III **FIRST FLOOR**

Moderator:
Sukwon Choi, *The Pennsylvania State University*

Abstract: We are living a highly creative era in which digital consumer electronics will drive much of high-technology research and products for the betterment of people, society, and the environment. High speed communications, artificial intelligence, autonomous cars, AR/VR, and quantum computing are just examples of what glass technology can make a big impact.

Plenary Speaker:
Dr. Waguih S. Ishak
Division VP & Chief Technologist, Corning Research & Development Corporation

Biography: Dr. Waguih Ishak is the Division VP and Chief Technologist for Corning Research & Development Corporation. He joined Corning in 2007 to establish a new Silicon Valley facility, the Corning West Technology Center (CWTC) in Palo Alto, California. CWTC was chartered to build strong relationships with high-tech industries and academia in Silicon Valley and grew to conduct advanced research on optical interconnects, novel displays, and semiconductor devices & sensors. The Center moved to Sunnyvale in 2017 and is now called Corning Technology Center – Silicon Valley (CTCSV). Ishak grew the Center and built a collaborative and joint research programs with other entities in Corning, applying glass and ceramic materials to semiconductor IC packaging, interposers, and AR/VR.

From 2005 to 2007, Ishak was the Chief Technology Officer and Vice President of Avago Technologies (now Broadcom) where he established the US R&D Center to do state of the art research in high-speed semiconductors, semiconductor photonics, and III-V compound semiconductor devices. From 2003 to 2005, Ishak was the Vice President and Director of the Photonics & Electronics Research Lab at Agilent Labs responsible for R&D programs in photonics, high-speed electronic ICs, semiconductor sensors, semiconductor tests, wireless communications, and consumer electronics. From 1987 to 2003, Ishak was the Director of the Communications & Optics Research Laboratory at Hewlett-Packard Labs, working on photonics and integrated electronics. From 1978 to 1987, Ishak was a Scientist/Project Manager for bubble memories, SAW devices, and MSW devices.

Ishak has authored approximately 100 journal and conference papers, and four chapters in the Handbook of Electronic Instruments. He was named an inventor on seven U.S. patents. He is on the technical advisory boards of USC, UCSDS, SCU, UCSB, and McMaster University. He was a member of the National Academics Committee on "Harnessing the Light" to write the book "Optics & Photonics – Essential Technologies for Our Nation," 2013, resulting in the White House announcement of the Integrated Photonics Manufacturing Institute in October 2014. In 2016, Ishak was selected a member of the Visiting Committee on Advanced Technologies (VCAT) of the National Institute of Standards and Technology and served for six years from 2017 to 2022.

Ishak received a B.S.E.E. (hon.) from Cairo University in 1971 and a B.S. in mathematics (hon.) from Ain Shams University, Egypt, in 1973. He obtained his M.S. and Ph.D., both in electrical engineering, from McMaster University, Canada, in 1975 and 1978, respectively. Ishak obtained the Stanford University Executive Program in 1999 and was awarded a Doctor of Science honoris causa from McMaster University in 2018. Ishak is a Life Fellow of the IEEE, a Fellow of the Canadian Academy of Engineering, a member of the National Academy of Engineering, and received the University of California Exemplary Service Award in 2015.

PLENARY TALK 2 – DISTINGUISHED LUNCHEON SPEECH – THREE DECADES OF MICROSYSTEMS THERMAL MANAGEMENT RESEARCH AT DARPA

TUESDAY, OCTOBER 24
12:30PM–1:45PM **GREAT ROOM I II III, FIRST FLOOR**

Moderator:
Pradeep Lall, *Auburn University*

Abstract: DARPA's interest in thermal management of microsystems spans over three decades. A summary of past programs with a strong thermal management focus, and an overview of ongoing and forthcoming thermal management initiatives will be presented. These programs have had a strong impact on the progress of high performance computing and radio frequency systems. Past DARPA programs have often been followed by continuing research and development efforts by the performer communities, often resulting in new thermal technology breakthroughs. A recurring theme, along with successful transition of developed technologies into actual commercial products, has been the continuing focus on helping enable the highest performance microsystems. Emerging focus areas of interest including three-dimensional heterogeneously integrated microsystems, and microsystems for harsh environments will also be described.

Plenary Speaker:
Yogendra Joshi
Program Manager, Microsystems Technology Office, Defense Advanced Research Projects Agency (DARPA)

Biography: Dr. Yogendra Joshi joined DARPA in July 2022 as a program manager in the Microsystems Technology Office (MTO). He is a professor and the John M. McKenney and Warren D. Shiver Distinguished Chair at Georgia Institute of Technology's G.W. Woodruff School of Mechanical Engineering. In addition, he has a courtesy appointment at Georgia Tech's School of Electrical and Computer Engineering. His research interests are in multi-scale thermal management.

Joshi is the author or co-author of more than 450 publications in this area, including more than 225 journal articles. He received his Bachelor of Technology in mechanical engineering from the Indian Institute of Technology (Kanpur) in 1979, Master of Science in mechanical engineering from the State University of New York at Buffalo in 1981, and doctorate in mechanical engineering and applied mechanics from the University of Pennsylvania in 1984. He has served as the principal investigator for multiple DARPA programs and for the Office of Naval Research–led Consortium for Optimally Resource-Secure Outposts. He also previously was site director for the National Science Foundation Industry/University Cooperative Research Center on Energy Efficient Electronic Systems.

Joshi is an elected fellow of the American Society of Mechanical Engineers (ASME), the American Association for the Advancement of Science, and IEEE. He's been recognized for his contributions through several awards, including the Inventor Recognition Award from the Semiconductor Research Corporation (2001), the IBM Faculty Award (2008), the IIT Kanpur Distinguished Alumnus Award (2011), the AIChE Donald Q. Kern Award (2018), and multiple honors from IEEE and ASME.

PLENARY TALK 3 – ARPA-E HIGH RISK/HIGH REWARD TECHNOLOGY PROGRAMS IN HEAT TRANSFER AND ELECTRONICS

TUESDAY, OCTOBER 24
1:45PM–2:45PM **GREAT ROOM I II III, FIRST FLOOR**

Moderator:
Saket Karajgikar, *Meta*

Abstract: The Department of Energy Advanced Research Projects Agency – Energy (ARPA-E)'s mission is to support transformational high risk/high reward projects in the areas of emissions, energy efficiency and increase leadership in critical technologies. Deployment of renewables, electrified transportation and rise in computing and datacenters, amongst others have led to an increasing role of electronics and electrical systems in our energy supply, transport and demand portfolio.

Due to the variable nature of power produced by renewables, it is projected that in the future up to 80% of all energy will flow through one form of power electronics to be suited for end-use. ARPA-E has supported transformational power electronics, motors, and thermal management projects through CIRCUITS, CABLES, and ASCEND programs. These projects are focused on the enablement of more efficient power conversion and electrified transportation of complex systems such as aircraft.

Additional areas of interest are the efficient thermal management of complex electronic systems such as Data Centers through the COOLERCHIPS program. By exploring differential approaches, it can be observed that if low thermal resistance heat rejection can be realized at relevant system cost and reliability, significant energy savings could be realized. The presentation will describe an overview of these programs and highlights of technology developments that are to provide a basis for a more energy efficient future.

Plenary Speaker:
Peter De Bock
Program Director, Advanced Research Projects Agency-Energy (ARPA-E)

Biography: Dr. Peter De Bock currently serves as Program Director at the Advanced Research Projects Agency-Energy (ARPA-E) for the US Department of Energy. At ARPA-E Dr. de Bock manages and supports over teams in zero-carbon hybrid aviation propulsion systems through the $63M ASCEND program and efficiency of cooling of Data Centers through the $42M COOLERCHIPS program.

Prior to joining ARPA-E, Dr. de Bock worked at GE Research as Principal Engineer ThermoSciences. Dr. de Bock is the former chair of ASME K-16 committee on Heat Transfer in Electronics equipment, ASME Fellow, AIAA member, and holds 50+ patents and publications with over 1000 citations.

Dr. de Bock received his Ph.D. in Mechanical Engineering from the University of Cincinnati and holds MSc degrees from University of Twente in the Netherlands and University of Warwick in the UK.

PLENARY TALK 4 – THERMAL MANAGEMENT OF ELECTRONICS: RESEARCH SUPPORTED BY THE NATIONAL SCIENCE FOUNDATION

WEDNESDAY, OCTOBER 25
8:15AM–9:15AM **GREAT ROOM I–III, FIRST FLOOR**

Moderator:
Damena Agonafer, *University of Maryland*

Abstract: Thermal management of electronics is an active area of research in the thermal transport community. With increasing packaging density of power electronics, target cooling goals of 1KW/cm2 to 2KW/cm2 and avoidance of localized hot spots are desired. A range of cooling strategies with single-phase cooling, two-phase cooling with boiling (phase change), impingement cooling, and thin film evaporation among others are being explored. Related areas of active research include the role and control of surface morphology to promote phase change and high heat transfer coefficients, reducing the thermal resistance at the chip interface using high conductance thermal interface materials (TIM), and replacing Silicon by materials with higher conductivity and carrier mobility (such as diamond). The body of literature in these and related fields is extensive.

The Thermal Transport Processes (TTP) program at the National Science Foundation (NSF) has been supporting electronics cooling research for several decades. The focus of the research supported by NSF is motivated by the need for transformational scientific discoveries with potential for broad impact in the field. This talk will review the spectrum of research supported by NSF on electronics cooling and will highlight some key achievements. Future program interests and topics in this area will be discussed and ideas will be sought from the community.

Plenary Speaker:
Sumanta Acharya
Program Director, Thermal Transport Processes Program, National Science Foundation (NSF)

Biography: Dr. Sumanta Acharya is currently the Program Director of the Thermal Transport Processes (TTP) program at the National Science Foundation (2022–present) and a Professor in the Department of Mechanical, Materials, and Aerospace Engineering at the Illinois Institute of Technology (IIT) in Chicago. From 2016 to 2022, he was also the Chair of Mechanical, Materials, and Aerospace Engineering, IIT Chicago.

Dr. Acharya's primary area of research is in computational and experimental thermal-fluid sciences. In recognition of his research, he was awarded the ASME Heat Transfer Memorial Award in the Science category, the AIChE Donald Q Kern Award, and the AIAA Thermophysics Award. Dr. Acharya was previously the Chair of the ASME Heat Transfer Division. He is a Fellow of the ASME (American Society of Mechanical Engineers) and ASTFE (American Society of Thermal and Fluids Engineers) and Assoc. Fellow of AIAA (American Institute of Aeronautics and Astronautics).

PLENARY TALK 5 – BUILDING A GLOBAL GIGAWATT-SCALE DATA CENTER FLEET – CURRENT AND FUTURE CHALLENGES

WEDNESDAY, OCTOBER 25
1:45PM–2:45 PM **GREAT ROOM I—III, FIRST FLOOR**

Moderator:
Yoonjin Won, *University of California, Irvine*

Abstract: Meta has designed, built and operated its own data centers since 2010. Building a global network of efficient, large-scale data centers requires flexible designs to accommodate local conditions and constraints, while accommodating rapidly changing IT hardware and software requirements. AI represents a substantial change in hardware and data center requirements. This talk will share some of Meta's work to enable leading-edge AI systems via a new AI-first data center design and highlight key issues for the industry.

Plenary Speaker:
Christopher G. Malone, PhD,
ASME Fellow, Meta

Biography: Dr. Christopher G. Malone works with multi-disciplinary teams across Meta to develop integrated next-generation data centers, hardware and software solutions, and associated R&D investments. He supports the Meta sustainability teams on energy and carbon reduction technology investments.

Previously, Chris was a Distinguished Engineer at Google with responsibility for data center infrastructure design, technology strategy, and R&D investments. He built and led teams covering chip packaging, IT hardware thermal solutions, and data center power, cooling, and systems architecture. He led the development of multiple generations of Google data center designs that have been deployed globally at the gigawatt scale.

Chris has authored numerous technical papers and has been granted over 100 patents. He is a co-author of the first paper on Power Usage Effectiveness (PUE), which has since become the industry standard data center efficiency metric. He is an ASME Fellow and was awarded the iMasons Industry Luminary award in 2022 for his contributions to the data center industry. Chris received his MS and PhD in Mechanical Engineering from the Massachusetts Institute of Technology, Cambridge, MA, and the BEng (with Highest Honors) from Dalhousie University, Halifax, Nova Scotia.

PLENARY TALK 6 – EXCITING WORK TOWARD ADVANCED PACKAGING

THURSDAY, OCTOBER 26
8:15AM–9:15AM **GREAT ROOM I–III, FIRST FLOOR**

Moderator:
Jimil Shah, *Stealth Startup*

Abstract: Heterogeneous Integration is highlighted as a key driver for the next era of Moore's law. By partitioning a large die into smaller chaplets and adopting an optimal process for each one, it significantly improves the overall yield and reduces manufacturing cost. Heterogeneous integration can also enhance the performance of chips by filling the gap between Logic performance and Memory bandwidth. With three-dimensional integration, in which one chip sits directly on top of another, signal paths can be reduced to several micrometer lengths, resulting in greatly improved latency. In addition, finer interconnect pitch in 3D integration enables extremely high bandwidth and memory density, resulting in higher performance. This talk will share Samsung's exciting work toward Advanced Package with a specific focus on Specialized Memory Integration.

Plenary Speaker:
Vincent (WooPoung) Kim
Corporate EVP / Head of Advanced Packaging in SAMSUNG-DSRA

Biography: Dr. Vincent (WooPoung) Kim is currently working as Corporate EVP / Head of DSRA-AVP in San Jose, CA. SAMSUNG has launched a new business unit to support the need of the semiconductor industry's advanced packaging for high-performance systems. The name of the new business is AVP (Advanced Packaging). Prior to joining Samsung, he was system architect for Signal Integrity and Power Integrity at Apple, path-finding for leading-edge consumer computers. Previously, he was with Qualcomm as SI manager in Snapdragon packaging. Earlier than Qualcomm, he was with Wireless Business Unit of Texas Instruments as co-design engineer optimizing the electrical design of OMAP packages/ systems. Before TI, he was with Rambus as SI engineer to design and analyze memory systems. Dr. Kim received his Ph.D. Degree in ECE at Georgia Tech in 2004 and M.S. & B.A. degrees from KAIST, Korea in 1999 and 1997.

PLENARY TALK 7 – CHIPLET DESIGN AND HETEROGENEOUS INTEGRATION PACKAGING

THURSDAY, OCTOBER 26
1:45PM–2:45 PM **GREAT ROOM I–III, FIRST FLOOR**

Moderator:
Anna Prakash, *Intel Corporation*

Abstract: Chiplet is a chip design method and heterogeneous integration is a chip packaging method. Chiplet design and heterogeneous integration packaging have been generated lots of tractions lately. For the next few years, we will see more implementations of a higher level of Chiplet designs and heterogeneous integration packaging, whether it is for cost, time-to-market, performance, form factor, or power consumption. In this lecture, the following topics will be covered:

- System-on-Chip (SoC)
- Why Chiplet Design?
- Chiplet Design and Heterogeneous Integration Packaging
  - Chip partition and Heterogeneous Integration
  - Chip split and Heterogeneous Integration
  - Advantages and Disadvantages
- Lateral Communication between Chiplets (e.g., Bridges)
- Bridge Embedded in Build-up Package Substrate
  - Bridge Embedded in Fan-Out EMC with RDLs
  - UCIe
  - Hybrid Bonding Bridge
- Chiplet Design and Heterogeneous Integration Packaging - Multiple System and Heterogeneous Integration
  - Multiple System and Heterogeneous Integration with Package Substrate (2D IC Integration)
  - Multiple System and Heterogeneous Integration with Thin Film layer on the Package Substrate (2.1D IC Integration)
  - Multiple System and Heterogeneous Integration with TSV-less (Organic) Interposer (2.3D IC Integration)
  - Multiple System and Heterogeneous Integration with Passive TSV-Interposer (2.5D IC Integration)
  - Multiple System and Heterogeneous Integration with Active TSV-Interposer (3D IC Integration)
- Summary
- Potential R&D Topics in Chiplet Design and Heterogeneous Integration Packaging

Track Keynotes

Plenary Speaker:
John H. Lau
Senior Special Project Assistant, Unimicron Technology Corporation

Biogtaphy: Dr. John H. Lau, with more than 40 years of R&D and manufacturing experience in semiconductor packaging, has published more than 515 peer-reviewed papers (375 are the principal investigator), 40 issued and pending U.S. patents (25 are the principal inventor), and 23 textbooks (all are the first author). John is an elected IEEE fellow, IMAPS Fellow, and ASME Fellow and has been actively participating in industry, academy, society meetings, and conferences to contribute, learn, and share. He received many awards, e.g., the ASME Worcester Reed Warner Medal and the IEEE Components Packaging and Manufacturing Technology Field Award.

WORKSHOP 1 – INTRODUCTION TO ROBOTICS, AI, AND INTEL'S OPENVINO™ TOOLKIT

TUESDAY, OCTOBER 24
2:45PM–4:15PM **COURTYARD II, FIRST FLOOR**

Abstract: Have fun as you learn about virtual robotics using the CoderZ platform, AI using Jupyter notebooks, & Intel's OpenVINO™ toolkit, with this introductory course. From understanding sensors to programming missions, this course will equip you with virtual coding experience in programing robots or drones and understanding AI. No robot required. No prior experience required. A laptop with internet access and Chrome browser will do. This course will also enable you to set up after-school robotics/AI clubs for your local community children. These lessons are taught by award winning teams from Education Empowers Inc. (501 (c) non-profit) as well as Intel Industry professionals.

Be the first 30 to register and receive an Intel Movidius Neural Compute Stick (NCS2, $70 value) and access to CoderZ platform from the nonprofit, Education Empowers Inc. www.educationempowers.org.

Presenters:
Stewart Christie
Intel Corporation, Education Empowers Inc. Chandler, AZ

Stewart Christie is an AI/IoT Evangelist in the Developer Enabling Team at Intel. His day job includes developing demos and teaching classes on AI Enhanced Computer Vision, primarily for use in the Retail and Hospitality industries, including remote management and digital signage use cases. Stewart is focused on the software side of the ecosystem, guiding developers building Inference at the Edge Applications in C/C++ and Python. He is an expert in the deployment of the Intel Distribution of OpenVINO™ Toolkit, and the vPRO/AMT software solutions. While not working at Intel, Stewart plays with cameras and robots, and builds robots with cameras. For his dedication and community outreach, Stewart has received the prestigious Presidential Service Awards.

Elaina Ashton
Arizona State University, Arizona, NXPI, & Education Empowers Inc.

Elaina Ashton is an Electrical Engineering student at Arizona State University, Tempe, Arizona, & Co-founder of Education Empowers Inc. As a STEM Ambassador for Education Empowers Inc., she spends her weekends creating engaging STEM curriculum, teaching robotics for girls and underserved children living in the Arizona community. For her dedication to STEM outreach, she received the Cox connect2STEM award, 18 under 18 award, and the Chandler Mayor's Youth of the Year award.

Veronica Tanner
Southern Methodist University, Texas, & Education Empowers Inc.

Veronica Tanner is a junior studying Computer Science and minoring in Chinese at Southern Methodist University. She is a STEM Ambassador for Education Empowers Inc. She has experience in cybersecurity research and interests in software engineering and artificial intelligence.

Anna Prakash
Intel Corporation, & Education Empowers Inc.

Anna Prakash, Ph.D., Principal Engineer, Intel Corporation, began her engineering career working on LCDs, HDTVs, and handheld communication devices. She joined Intel in 2004 as a Packaging R&D Engineer, focusing on automotive components, microLEDs, and Aurora super computers. Anna has several patents and papers covering sensors and semiconductor packaging materials and process. Outside of work, Anna is passionate about promoting STEM education for local children. Along with her daughter Elaina, she co-founded Education Empowers Inc. (www.educationempowers.org), a non-profit, to promote STEM education. Anna is the recipient of the 2019 Intel Hero award, Society of Women Engineers "Prism Award" and the IEEE STEM outreach award for her contribution to technology and the community.

WORKSHOP 2 – K16 MENTORSHIP WORKSHOP

TUESDAY, OCTOBER 24
4:30PM–6:00PM **COURTYARD II, FIRST FLOOR**

Organizers:
Ronald Warzoha, *U.S. Naval Academy*
Adam Wilson, *U.S. DEVCOM Army Research Laboratory*
Luca Amalfi, *Seguente*
Darshan Pahinkar, *Florida Institute of Technology*
Ashutosh Giri, *University of Rhode Island*
Amy Marconnet, *Purdue University*

Abstract: This workshop is designed to help students and junior scientists navigate career decisions, from choosing the right individual career path to advancing within a scientific enterprise. A group of panelists will discuss the experiences they have had within their own careers and the advice they received from colleagues and mentors along the way. After a series of brief discussions, each panelist will host a round table group to have targeted and casual conversations with members of the audience.

Food and beverages will be served during the round table discussions.

Presenters:
Jorge Padilla
Google

Jorge Padilla is a Staff Product Design Engineer at Google where, since 2014, he has developed and delivered end-to-end, chip-to-chiller thermal technologies at scale for thermal management of data center IT equipment. He has co-chaired technical sessions and co-organized tracks at the ASME InterPACK conference since 2017. He has published in ASME conference proceedings, peer-reviewed journals and is a co-inventor on 10 issued U.S. patents. Prior to joining Google, he earned a Ph.D. in mechanical engineering from the University of California, Berkeley, where he focused on water droplet vaporization from nanostructured surfaces in the Energy and Multiphase Transport Laboratory led by Prof. Van Carey. Jorge holds a Bachelor of Science degree in mechanical engineering from MIT.

Jingjing Shi
University of Florida

Jingjing Shi is an assistant professor in the Mechanical & Aerospace Department at the University of Florida. Her research is about multiscale energy transport and thermal management in both computational modeling and experimental characterization. She joined UF MAE in August 2022, and before that, she was a postdoctoral fellow at Georgia Tech. She obtained her Ph.D. degree from Purdue University in 2018. She got InterPACK best paper award and MRS best poster award in 2020.

Ryan Enright
Seguente

Ryan Enright is the Chief Technology Officer of Seguente LLC. Prior to taking on this role, he was a Senior Member of Technical Staff at Nokia Bell Labs for nine years in the Efficient Energy Transfer Department, where his research spanned the areas of materials interface engineering, micro/nanoscale heat/mass transfer, passive heat transfer mechanisms and integrated RF, and photonic and electronic thermal management. He received his B.Eng. and Ph.D. degrees in Mechanical Engineering from the University of Limerick, Ireland. He was a Research Assistant at Bell Labs (USA) during his doctoral work. After receiving his Ph.D., he was a SFI CTVR postdoctoral associate from 2008 to 2009 and a Marie-Curie postdoctoral fellow at MIT. Ryan has (co-) authored over 100 journal and conference publications and has filed more than 20 patent applications.

Georges Pavlidis
University of Connecticut

Georges Pavlidis joined the Department of Mechanical Engineering at the University of Connecticut in 2022 as an Assistant Professor. He earned his M.Eng. in Mechanical Engineering from Imperial College London in 2013 and his M.S., Ph.D. degrees in Mechanical Engineering from the Georgia Institute of Technology in 2018. His doctoral research was focused on assessing the reliability of new generation wide bandgap transistors using optical and electrical techniques with high spatial and temporal resolution. He also was awarded the National Science Foundation (NSF) EAPSI fellowship to investigate the thermal conductivity of GaN in Japan under the supervision of 2014 Nobel Prize winner Hiroshi Amano. Prior to joining the department, Pavlidis was a National Research Council (NRC) Postdoctoral fellow at the National Institute of Standards and Technology (NIST), Gaithersburg. He leveraged Atomic Force Microscopy (AFM) methods to investigate transport mechanisms in isotopically enriched two-dimensional (2D) materials using techniques such as photothermal induced resonance (PTIR). Pavlidis' research focuses on developing new technology for solving today's big data, energy, medical, space, and quantum engineering challenges. His plan is to develop novel methods which will reveal complex processes that occur on the nanoscale. Examples of his research range from studying how heat is transferred in wireless devices to understanding the failure mechanisms in neuromorphic devices. By doing so, Pavlidis aims to improve the efficiency and performance of the next generation radio frequency (6G+) and power electronics (electric vehicles). His future research interests include monitoring the degradation in high performance systems as well as understanding the thermal properties of 2D materials with outlook to quantum technologies.

WORKSHOP 3 – NIST ROADMAP DIRECTIONS TO CHIP ACT (PART 1)

WEDNESDAY, OCTOBER 25
2:45PM–4:15 PM **COURTYARD II, FIRST FLOOR**

Organizers:
Ravi Mahajan, *Intel Fellow*
S.B. Park, *Binghamton University*

Abstract:

- NIST Manufacturing Roadmap for Heterogeneous Integration and Electronics Packaging (MRHIEP)
- NIST 5G/6G mmWave Materials and Electrical Test Technology Roadmap (5G/6G MAESTRO)

Presenters:
Subramanian S. Iyer
MMRHIP

Subramanian S. Iyer (Subu) is Distinguished Professor and holds the Charles P. Reames Endowed Chair in the Electrical Engineering Department and a joint appointment in the Materials Science and Engineering Department at the University of California at Los Angeles. He is Director of the Center for Heterogeneous Integration and Performance Scaling (UCLA CHIPS). Prior to that he was an IBM Fellow. His key technical contributions have been the development of the world's first SiGe base HBT, Salicide, electrical fuses, embedded DRAM, and 45nm technology node used to make the first generation of truly low power portable devices as well as the first commercial interposer and 3D integrated products. He has been exploring new packaging paradigms and device innovations that may enable wafer-scale architectures, in-memory analog computation medical engineering applications. He is a fellow of IEEE, APS, iMAPS, and NAI as well as a Distinguished Lecturer of IEEE EDS and EPS. He is on the Board of Governors of IEEE EPS. He is a Distinguished Alumnus of IIT Bombay and received the IEEE Daniel Noble Medal for emerging technologies in 2012 and the 2020 iMAPS Daniel C. Hughes Jr Memorial award and the iMAPS distinguished educator award in 2021. Prof. Iyer is also Prof. Ramakrishna Rao Visiting Chair Professor ationt IISc, Bengaluru.

Shekhar Chandrashekhar
INEMI

Shekhar Chandrashekhar has over 30 years' experience as a leader, strategist, and innovator with a history of driving improvements that streamline operations, drive growth, and increase profitability on a global scale. Shekhar has a Ph.D. in Mechanical Engineering from Concordia University (Montreal, Canada) and a Bachelor of Technology degree in Mechanical Engineering from the Indian Institute of Technology (Mumbai). His background in business and technology leadership, and his deep knowledge and advanced training in engineering management, have provided him with a unique talent—the ability to transform organizations, influence product positioning, and drive a laser focus on priorities that support the company's vision and goals.

Prior to joining iNEMI, Shekhar was responsible for managing the national network of Smart Manufacturing Innovation Centers (SMICs) for the Clean Energy & Smart Manufacturing Institute (CESMII). In this role, he worked with the SMICs to demonstrate the value of deploying Industry 4.0 solutions to the manufacturing industry. Similarly, with California Manufacturing Technology Consulting, he oversaw the implementation of Industry 4.0 and digital technology solutions, building a network of systems integrators that impacted more than 35,000 small and medium sized manufacturers in California in their deployment of smart manufacturing solutions.

Shekher received the Advanced Technology Excellence Award from Bell Laboratories and the Outstanding Young Manufacturing Engineer Award from SME. He is a member of the editorial board for the International Journal of Concurrent Engineering Research and Applications and has published over 25 papers in international journals and conferences.

WORKSHOP 4 – NIST ROADMAP DIRECTIONS TO CHIP ACT (PART 2)

WEDNESDAY, OCTOBER 25
4:30PM–6:00 PM **COURTYARD II, FIRST FLOOR**

Organizers:
Gamal Refai-Ahmed, *Senior Fellow AMD*
Amr Helmy, *University of Toronto*

Abstract:

- NIST Microelectronic and Advanced Packaging Technologies (MAPT) Roadmap
- Heteronomous integration Roadmap HIR (IEEE/ASME/SEMI) Roadmap

Presenters:
John Oakley
SRC

John Oakley, a Science Director at SRC, is focused on leading several collaborative research programs including Hardware Security (HWS), Packaging (PKG), Automotive Electronics (Auto), AI Hardware (AIHW), and Supply Chain AI Realized Future (SCARF). John works closely with government, industry, and university partners to advance these research topics. Through this work John has created and managed research programs in collaboration with industry, government, and academia; like the joint SRC/NSF program Secure and Trustworthy Cyberspace (SaTC). John also serves as a Board member of the Florida Institute for Cybersecurity Research (FICS) and is a highly sought speaker at cybersecurity and advanced packaging conferences (ECS, TAME, IEEE SELSE in 2022; MEST, IEEE MDTS, NSF, IEEE HIR in 2021).

A graduate of Texas A&M University, John has over 20 years of successful digital design and architecture experience in industry and was formerly a RF Control Architect at Intel Corporation, at Motorola, Freescale, Fujitsu. John has 14 issued patents and has developed more than 55 successful integrated devices, several of which have shipped in high volumes. He has worked in numerous digital system spaces and was focused on the transceiver and modem fields and on the control planes of cellular platforms. An expert in 3GPP standards and their application to real world devices, John was Vice Chairman of the MIPI RFFE working group and a member of the MIPI RIO and TSG working groups. Beyond the work environment, John is a Ruby Life Master at American Contract Bridge League (ACBL) and is avid player of strategy and role-playing games.

William Chan
ASE

William T. Chen received his engineering education at University of London (B.Sc), Brown University (M.Sc), and Cornell University (PhD). He joined IBM Corporation at Endicott New York in 1963. At IBM he worked in a broad range of IBM microelectronic packaging products. In 2001 he joined ASE Group, where he holds the position of ASE Fellow and Senior Technical Advisor. In this assignment he has responsibilities for guidance to technology strategic directions for ASE Group.

He is Senior Past President of the IEEE/CPMT Society. He is the Co-Chair of the ITRS Assembly and Packaging Roadmap Technical Working Group. He is chair of the Semicon West Packaging Committee. He has been elected to a member of the iNEMI Board. He is a member of the Technology Committee of GSA. He has been elected to Fellow of IEEE and Fellow of ASME. He has served as an Associate Editor of ASME Journal of Electronic Packaging and IEEE/CPMT Transaction.

WORKSHOP 5 – ULTRA-WIDE BANDGAP DEVICE ELECTRO-THERMAL CO-DESIGN WORKSHOP (SPONSORED BY NSF FUSE AND MICROSANJ)

THURSDAY, OCTOBER 26
2:45PM–4:15PM **COURTYARD II, FIRST FLOOR**

Organizers:
Sukwon Choi, *Pennsylvania State University*

Abstract: Leading research institutions and U.S. government laboratories are actively pursuing the development of ultra-wide bandgap (UWBG) semiconductor devices to enable next-generation electric power conversion systems. Devices based on β-phase gallium oxide (Ga2O3) offer the potential to achieve higher power switching performance and efficiency than today's wide bandgap (WBG) electronics based on GaN and SiC. Ultimately, UWBG devices promise to improve system-level size, weight, and power (SWaP), and efficiency. However, a consensus has been met that, of the most critical challenges to the commercialization of UWBG device technologies is to overcome adverse thermal effects that impact the device performance and reliability. In fact, no UWBG device reported to this day has achieved the performance expected by the superior electronic properties because a thermally limited technological plateau has been reached. Efforts to counter the overheating at the package/system-level not only significantly increase the system size and weight but also have proven to be ineffective in cooling ultra-high-power density WBG/UWBG devices. Therefore, the device-level electro-thermal co-design of novel device architectures that can simultaneously achieve the lowest thermal resistance and highest electrical performance is essential to enable the commerciali-zation of UWBG device technologies. In this workshop, device and thermal experts working in this field will discuss an electro-thermal co-design practice that minimizes the junction-to-package thermal resistance of a Ga2O3 MOSFET while improving its electrical output characteristics.

Presenters:
Sukwon Choi
Pennsylvania State University

Sukwon Choi (Penn State University) is an expert in the thermal characterization, electro-thermal modeling, and thermal management of wide bandgap (WBG) and ultra-wide bandgap (UWBG) semiconductor devices. He has performed electro-thermal analysis of various UWBG devices based on Ga2O3, AlGaN, and diamond through the AFOSR Young Investigator Program. Since 2015, he has demonstrated leadership in the electro-thermal co-design of UWBG electronics, participating in organizing annual UWBG U.S. government workshops as a thermal representative of the research field.

Samuel Graham
University of Maryland

Samuel Graham (University of Maryland) is an expert in the experimental and computational analysis of interfacial phonon transport within WBG and UWBG heterostructures (currently PI of the ONR Thermal Interfaces MURI). He has contributed to phonon transport studies of Ga2O3 through the AFOSR GAME MURI. He is internationally recognized for his work on GaN/diamond integration; he was a key contributor to the DARPA NJTT and led the DARPA Diamond program that explored the development of GaN-on-diamond radio frequency (RF) power amplifiers.

Sriram Krishnamoorthy
University of California, Santa Barbara

Sriram Krishnamoorthy (UC Santa Barbara) is an expert in the epitaxial growth and fabrication of Ga2O3 devices. He has made pioneering contributions to the Ga2O3 research field including the delta doping in Ga2O3, creation of modulation-doped (AlxGa1-x)2O3/Ga2O3 heterostructures, and the establishment of low temperature MOVPE growth of Ga2O3 thin films for both high quality channel layers as well as record performance Ohmic contacts.

Srabanti Chowdhury
Stanford University

Srabanti Chowdhury (Stanford University) is internationally recognized for her work on diamond as a material for both electronics and thermal management. She has contributed towards several diamond and GaN electronics programs in the U.S. including ARPA-E Switches and DOE EFRC. She is also an expert in wide bandgap technologies that includes material and device development for radio frequency (RF) and logic, power applications, as well as fundamental transport studies.

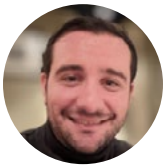
Christina DiMarino
Virginia Tech

Christina DiMarino (Virginia Tech) is an expert in WBG and UWBG device packaging. She has made contributions to the high-density packaging of high-voltage (≥10 kV) SiC power semiconductors through ARPA-E OPEN, and to the electro-thermal modeling and packaging of Ga2O3 power devices through NSF EPCN. She is leading a new ARPA-E OPEN program on advanced packaging and integration technologies for high-density, medium-voltage power converters.

TUTORIAL 1 – RACK SCALE TWO-PHASE COOLING SYSTEMS FOR HIGH-PERFORMANCE COMPUTING AND AI CLUSTERS

TUESDAY, OCTOBER 24
9:15AM–10:45AM **COURTYARD I, FIRST FLOOR**

Abstract: Computing workloads increasingly require thermal performance exceeding air-cooling limits to manage rising heat dissipation across multiple length scales in data centers and telecom installations. Direct liquid cooling offers a solution to this thermal challenge with the main objective being the efficient extraction of heat from multiple heat sources within the servers, with the smallest thermal resistance possible, and then rejecting this heat outside the rack envelope. A promising liquid-cooling strategy is the extension of two-phase thermal management to rack scale via active and passive systems that can provide high thermal performance, reliability, and advantageous total cost of ownership. Two-phase cooling loops incorporate high-performance evaporators and condensers enabling a scalable rack cooling system that can operate safely over the entire range of power dissipation and dynamic changes in workload. Active two-phase systems require pumps for flow circulation, while passive two-phase systems can be implemented without the need for active controls leveraging the thermosyphon operating principle. These approaches fit into a hybrid cooling paradigm complimenting the significant investment in current air-cooling technology and provides key differentiators. In this talk, we will outline how active and passive two-phase cooling systems at rack scale address the growing thermal challenges facing the ICT industry.



Presenters:
Raffaele Luca Amalfi
SEGUENTE Inc.

Raffaele Luca Amalfi is the CEO and Co-Founder of SEGUENTE Inc., and he is considered an innovator, visionary, and industry influencer driving the company's strategic business activities, technology roadmap, capital objectives, and financial growth goals, as well as managing relationships with the shareholders. Prior to this role, he was a Principal Innovator at Nokia Bell Labs USA, where he led R&D and commercialization activities in the field of thermal management of high-performance communications and computing systems. Since 2016, he worked as a Scientific Collaborator and Laboratory Operations Manager at the Swiss Federal Institute of Technology of Lausanne in Switzerland (EPFL). In 2015, he joined Alcatel-Lucent USA, where he developed innovative liquid cooling technologies for network equipment. In 2012, he joined IBM in Switzerland, where he worked on a novel cooling system for high-performance servers. He has received a Ph.D. in Mechanical Engineering from the EPFL. He has authored over 60 scientific publications in leading journals, conference proceedings, and handbooks, and authored numerous patents. Dr. Amalfi is a Member of the ASME and IEEE Committees, Member of the OCP Heat Reuse Steering Committee, Former Guest Editor for the ASME Journal of Electronic Packaging, Secretary of the K-16 Heat Transfer Committee, and recipient of numerous industry and Government Awards.

Ryan Enright
SEGUENTE Inc.

Ryan Enright has been the Chief Technology Officer and Co-Founder of SEGUENTE Inc. since April 2022. As the CTO, he led the global R&D, product and deployment teams in the Company. Prior to taking on this role, he was a Senior Member of Technical Staff at Nokia Bell Labs for nine years in the Efficient Energy Transfer Department, where his technology developments spanned the areas of materials interface engineering, heat and mass transfer, passive heat transfer mechanisms, and integrated photonic and electronic thermal management. He received his B.Eng. (Hons) and Ph.D. degrees in Mechanical Engineering from the University of Limerick, Ireland in 2004 and 2008, respectively. He was a Research Assistant at Bell Labs (USA) from 2005 to 2007 during his doctoral work. After receiving his Ph.D., he was a SFI CTVR postdoctoral associate from 2008 to 2009 and a Marie-Curie postdoctoral fellow at the Massachusetts Institute of Technology (MIT) from 2009 to 2012. Dr. Enright has authored over 100 journal and conference publications and more than 20 patent applications.

TUTORIAL 2 – EFFICIENT ENERGY SYSTEMS AND INDUSTRY APPLICATIONS

WEDNESDAY, OCTOBER 25
9:15AM–10:45AM **COURTYARD I, FIRST FLOOR**

Title: Energy Efficient Computing – A Thermal Perspective

Abstract: Demand for digital transformation, high performance computing, and AI will continue to fuel significant datacenter growth for decades to come. In this tutorial, the author will provide an overview of different workstreams to make computing more efficient. Although there have been several advances in silicon design over the last decade to increase the performance per watt, the appetite for more computation has offset this gain resulting in net increase in energy consumption. Cooling infrastructure for electronics is a key component that consumes significant amount of energy within the datacenter, and this tutorial will discuss strategies to improve cooling efficiency including heat reuse among others.

Presenter:
Girish Anant Kini
AMD

Girish Kini currently works as Member of Technical Staff at Advanced Micro Devices in their Data Center GPU and Accelerated Processing unit. His work focuses on thermal design and architecture of advanced semiconductor products. He received his Ph.D. from Georgia Institute of Technology. Kini has published over 15 papers in the field of energy systems, electronics thermal management including corrosion in liquid cooled systems. Kini is an active member of the OCP OAI Cooling sub-committee and guest editor for Numerical Heat Transfer Part B.

Title: Thermal Management of Lithium-Ion Batteries

Abstract: Heat transfer is a limiting factor in reliability and performance of next-generation batteries, fuel cells, and supercapacitors, as well as the devices they power. While researchers focus on optimizing device performance to improve, for example, battery capacity or charging rate, thermal effects have often been relegated to a secondary concern. But recently, overheating batteries have been a major topic of concern as they have caused fires in many consumer products. Further, mobile platforms (e.g., electric vehicles) and massive energy storage systems both with limited heat dissipation pathways are becoming ubiquitous while requiring integration of dissimilar materials with a high density of interfaces and placing additional constraints on device performance (e.g., charging and discharging rate, as well as capacity, for batteries). A combined understanding of the thermal, electrochemical, and mechanical response is required for efficient, thermally informed design of such energy storage systems. This talk will discuss thermal energy generation and thermal transport considerations for batteries systems from the chemical reactions that generate heat to the integration with cooling systems. Ultimately, thermal informed design of batteries can lead to more efficient, reliable, and safe energy storage systems.

Presenter:
Amy Marconnet
Purdue University

Amy Marconnet is an associate professor of Mechanical Engineering and a Perry Academic Excellence Scholar at Purdue University. She received a B.S. in Mechanical Engineering from the University of Wisconsin–Madison in 2007, and an M.S. and a Ph.D. in Mechanical Engineering at Stanford University in 2009 and 2012, respectively. Her dissertation focused on thermal phenomena in nanostructured materials. She then worked briefly as a postdoctoral associate at the Massachusetts Institute of Technology, before joining the faculty at Purdue University in August 2013. Her work has won outstanding paper awards at ITherm 2012, InterPACK 2017, and ITherm 2019.

In 2017, she won the Woman in Engineering Award from the ASME Electronics & Photonics Packaging Division (EPPD). In 2020, she won the Bergles-Rohsenow Young Investigator Award in Heat Transfer and the Outstanding Graduate Student Mentor from the Official Mechanical Engineering Graduate Association (OMEGA) and the College of Engineering. She recently won a Humboldt Fellowship for Experienced Researchers and conducted research at Karlsruhe Institute of Technology in the 2021–2022 academic year.

TUTORIAL 3 – SILICON PHOTONICS FOR NEXT-GENERATION COMPUTING SYSTEMS

WEDNESDAY, OCTOBER 25
2:45PM–4:15 PM **COURTYARD I, FIRST FLOOR**

Title: Opportunities and Challenges in Co-Packaged Si Photonics

Abstract: In this tutorial, we aim to explore the essential tools, technologies, and methodologies that lay the foundation for harnessing the significant potential of Silicon (Si) photonics. Our focus will be on how Si photonics plays a pivotal role in driving and supporting the ongoing co-packaged optics initiatives within the industry's current landscape. As the industry strategically pivots towards co-packaged optics, understanding the nuances of Si photonics becomes indispensable, as its capabilities and functionalities wield a substantial influence over the advantages that co-packaged optics can offer to the broader CMOS ecosystem. Through this tutorial, participants will gain a profound understanding of the interconnected relationship between Si photonics and co-packaged optics. An illustrative example of this synergy can be observed in how co-packaged optics can amplify the scalability of Systems in Package (SiP) configurations by augmenting interconnection density. By grasping these interwoven concepts, participants will be well-equipped to navigate the dynamic intersection of co-packaged optics and Si photonics, enabling them to make informed decisions and contributions in this rapidly evolving field.

Presenter:
Amr S. Helmy
University of Toronto

Amr S. Helmy is a professor in the department of electrical and computer engineering at the University of Toronto. Prior to his academic career, Amr held a position at Agilent Technologies - UK, between 2000 and 2004. At Agilent his responsibilities included developing lasers and monolithically integrated optoelectronic circuits. He received his Ph.D. and M.Sc. from the University of Glasgow with a focus on photonic integration technologies, in 1999 and 1995 respectively. His research interests include photonic device physics, with emphasis on plasmonic nanostructures, nonlinear and quantum photonics addressing applications in information processing/sensing, and data communications. Amr is an active volunteer and leader of the IEEE Photonics Society, currently serving as an Elected Member of the Society's Board of Governors and as a Distinguished Lecturer. He was also the recipient of the Society's 2019 Distinguished Service Award.

Title: Silicon photonics solutions for datacenter networking and high-performance computing

Abstract: Modern optical networks require scalable interconnect technologies, some of which are based on silicon photonics (SiPh). Silicon photonics are solid state devices based in silicon that convert between optical and electrical transmission states and may or may not contain analog and/or logic functional blocks designed and built within the same die. SiPh interconnects use a high degree of integration and are built via standard CMOS fabrication methods. These characteristics enable SiPh solutions to reduce cost per bit while enjoying a high degree of integration and reliability similar to electronics. While pluggable transceivers have been the backbone of datacenters for decades, increase in speed and power requirements bring new challenges to the current architectures. Novel solutions such as co-packaged optics (CPO) have been proposed, leveraging SiPh advantages of scalability and high degree of integration. Such approaches can push boundaries of speed and power savings, making SiPh technology indispensable in the future of datacenter networking and edge computing.

Presenter:
Rezaie Farnood
Cisco

Farnood is currently a Technical Leader at Cisco Systems Inc. Farnood's expertise is in developing optical networking technologies and silicon photonics-based interconnects. Previously at Tower Semiconductor, Farnood developed industry leading silicon photonics technologies for applications in optical transceivers, A.I. and LiDARs and sensors. Before Tower, Farnood worked on heterogenous integration of III-V materials onto silicon photonics platform. Farnood is chair of IEEE-EPS Photonics technical committee, vice chair of IEEE REPP conference, technical committee member of IEEE OI conference and co-chairs JEDEC Silicon Photonics Qualification and Reliability Standards Task Group (within JC 14.3). Farnood received his PhD from the University of Central Florida in 2015.

Title: Packaging for Silicon Photonics IO in High-Performance and Data Center Applications - Electrical and Optical Perspective

Abstract: Silicon Photonics has emerged as a leading technology to enable continued scaling of communication bandwidth in high performance computing systems, crucial with the emergence of communication-heavy applications such as machine learning and artificial intelligence. Due to challenges with integration of photonic components with cutting edge process nodes that are necessary for the computing ASIC cores (CPUs, GPUs), the packaging of the photonic-enabled computing nodes is assuming a central place in the design and architecting such systems. In this tutorial, we will review the directions for packaging of photonic-enabled computing modules and explore the challenges and promises of the migration to co-packaged optics (CPO) and optics on interposer. The audience will learn about numerous packaging challenges from electrical and optical perspective and

understand how different thermal and mechanical solutions affect the photonic devices and electrical circuits, consequently having a strong impact to the link architecture, manufacturability, and cost in several ways. The exposure to the electrical, mechanical, and thermal requirements for the packaging of Silicon Photonic modules will allow the packaging community to better understand what Silicon Photonics IO needs are, which will aid in designing computing systems capable of enabling emerging and future applications.

Presenter:
Nikola Nedovic
Nvidia

Nikola Nedovic is a principal research scientist at NVIDIA Corp., Santa Clara, CA. He received a Dipl.Ing. degree in electrical engineering from the University of Belgrade, Serbia, in 1998 and the Ph.D. degree from the University of California at Davis, in 2003. Since 2016 he has been affiliated with NVIDIA Research where he works on system and circuit design for low-power high-speed links. Among his research interests is a range of aspects of high-speed electrical and optical wireline communications, from device modeling and signal integrity, CMOS circuit design, to system design and modeling. He is a co-author of one book, two book chapters, and a number of conference and journal papers, and the inventor of over fifty US and international patents.

TUTORIAL 4 – ELECTRIC MOTOR AND INTEGRATED TRACTION DRIVE THERMAL MANAGEMENT

THURSDAY, OCTOBER 26
9:15AM–10:45AM **COURTYARD I, FIRST FLOOR**

Abstract: The share of vehicles with fully electric propulsion systems is constantly increasing, and so is their traction drive power. The continuous push to increase power of electric vehicle (EV) traction drives necessitates their efficient cooling to prevent damage to temperature sensitive components of the drive system and achieving higher power outputs in a smaller footprint. With increasing power and power density of electric traction drives, their thermal management is becoming increasingly challenging. This tutorial will provide an overview of thermal management approaches for electric motors and power electronics in EV applications. It will review examples of current industry solutions for power-dense electric motor cooling, power electronics (inverter) cooling, their integration concepts and thermal management system solutions. We'll look at the advantages and challenges of power electronics integration into a single traction drive unit and respective thermal management system concepts. We'll talk about barriers to implementation of a unified thermal management system. The tutorial will also review key aspects of thermal management system design: modeling and simulation using FEA and CFD tools, experimental characterization, and general workflow for thermal manage¬ment system evaluation.

Presenters:
Bidzina Kekelia
NREL

Bidzina Kekelia's professional experience in engineering spans over 30 years and he has numerous publications on thermal management and clean energy technologies. Currently he is a Senior Research Engineer in the Advanced Power Electronics and Electric Machines (APEEM) Group within the Center of Integrated Mobility Sciences at the National Renewable Energy Laboratory (NREL). Since joining NREL in 2015, Bidzina's research efforts are focused on vehicle thermal management, exploring novel cooling methods for power electronics, and traction drives for ground electric vehicles (EV) and electrified aviation. Before coming to NREL, he was a postdoctoral research associate at the University of Utah, working on development of a thermal battery prototype for cabin climate control in electric vehicles. Bidzina has also worked in the power generation and energy sector. Under the auspices of the U.S. Agency for International Development, he provided technical expertise and advisory support to the Ministry of Energy of Georgia. Bidzina developed a power generation dispatch optimization model to identify the export capacity of existing and proposed electricity production facilities in the country, prepared pre-feasibility techno-economic studies for attracting funding to major power sector projects, including high-voltage transmission line, hydropower plants, and provided consulting services and engineering oversight on several power sector-related rehabilitation projects. Bidzina earned his Bachelor's (Hons) in Mechanical Engineering from Georgian Technical University (1992), M.S. in Renewable Energy (Solar Thermal & PV) from the University of Oldenburg (1999), and Ph.D. in Mechanical Engineering from the University of Utah (2012).

Xuhui Feng
NREL

Xuhui Feng started his research career at the National Renewable Energy Laboratory (NREL) in 2012, and he is now a senior research engineer in the Advanced Power Electronics and Electric Machines group at NREL. His primary duties involve modeling, testing, and analysis with a focus on thermal management in the key components in electric vehicle tractive drive system – electric machines and power electronics, including system design, analysis, characteri¬zation, and testing. Other than EVs, he has also conducted research on power-dense system cooling/thermal management for a broad range of applications, including aviation, grid-tied power converters, solar system, and nuclear fusion systems. He has led or contributed to multiple projects supported by the DOE Vehicle Technologies Office, Advanced Manufacturing Office, ARPA-E, DARPA, and automotive manufacturers/suppliers. Dr. Feng earned his Ph.D. degree in mechanical engineering from Iowa State University, his master's degree in mechanical engineering from the University of Nebraska-Lincoln, and his bachelor's degree in thermal science and energy engineering from the University of Science and Technology of China.

PANEL 1 – THERMAL/MECHANICAL/ ELECTRICAL CHALLENGES OF ADVANCED MOBILE/TELECOM/WIRELESS/AI AND HIGH-POWER COMPUTING DEVICES

TUESDAY, OCTOBER 24
11:00AM–12:30PM **BRICKSTONES, FIRST FLOOR**

Moderator:
Victor Chiriac
CEO, Global Cooling Technology Group

Dr. Victor Chiriac, Thermal Technologist, Fellow of American Society of Mechanical Engineers, made outstanding industry wide contributions to the cooling of electronic packages and mobile/portable consumer electronic devices. Co-Founder, CEO and Managing Director of Global Cooling Technology Group, LLC. Previously held technology/engineering leadership roles, led corporate thermal technology teams and roadmaps, working on leading-edge mobile/wireless technologies with Motorola (1999–2010), Qualcomm (2010–2018), and Futurewei (2018–2019). Dr. Chiriac was elected Chair of the ASME K-16 Electronics Cooling Committee in 2015 and was elected the Arizona and New Mexico IMAPS (International Microelectronics and Packaging Society) Chapter President in 2010. He is a co-editor of Electronics Cooling Magazine since 2016 and a leading member of the organizing committees of ASME/InterPack, ASME/IMECE, and IEEE/CPMT ITherm Conferences. Has 22 U.S. issued patents, two U.S. Trade Secrets, one U.S. Defensive Publication, and has published over 107 papers in scientific journals and at international conferences. Recipient of the ASME K-16 Clock award in 2018 in recognition of his scientific contributions and leadership in promoting U.S. and worldwide best thermal management of electronics engineering practices. Diamond Innovation and Technology Leadership Award at Qualcomm and the Award for Technology at Motorola. Ph.D. (1999) in Aerospace and Mechanical Engineering, University of Arizona, Tucson, USA.

Abstract: The digital world requires higher performance, more data, and faster processors. Heterogeneous Computing involves the central processing units (CPUs), the graphics processing units (GPUs), high speed interconnects, and other elements that push forward the computing industry. The emergence of 5G/6G leads to significant rise in mobile communication, IoT technology, providing the infrastructure needed to carry large amounts of data, allowing for a smarter and more connected world – enabling Smart Cities, connected roads, advanced transportation. A Panel of distinguished industry, government, and academia members will share their vision on the future of small to large electronics thermal management and other advanced system level thermo-mechanical challenges and solutions of the future.

Panelists:
Sreekant Narumanchi
Group Manager, NREL

Sreekant Narumanchi is the Group Manager of the Advanced Power Electronics and Electric Machines (APEEM) Group within the Center of Integrated Mobility Sciences at the National Renewable Energy Laboratory, in Golden, CO, U.S.A., where he has completed 19 years. He leads a group of 15 researchers focused on electro-thermal, thermal-fluids, thermo-mechanical and reliability aspects of power electronics and electric machines for electric-drive vehicles and several energy efficiency and renewable energy applications. He is an American Society of Mechanical Engineers (ASME) Fellow, an Institute of Electrical and Electronics Engineers (IEEE) Senior Member, has published over 110 peer-reviewed journal and conference papers and book chapters. He is an Associate Editor of the ASME Journal of Electronic Packaging, Associate Editor of the IEEE Components, Packaging and Manufacturing Technologies Journal, Vice Chair of the Executive Committee of the ASME Electronic and Photonic Packaging Division, and Chair of the IEEE Electronic Packaging Society Thermal-Mechanical Technical Committee. Sreekant serves on several external advisory boards and graduate student thesis committees. Sreekant has received the 2023 ASME Avram Bar-Cohen Memorial Medal, the 2022 THERMI Award, the 2021 United States Council on Automotive Research Team Award, the 2020-21 Associate Editor of the Year Award from the ASME Journal of Electronic Packaging, the 2018 ASME EPPD-K16 Clock Award, a 2016 R&D 100 Award, the Best Paper Award from the ASME Journal of Electronic Packaging (2003), and the ASME 2013 InterPACK Conference Outstanding Paper Award.

Presentation Title: Advanced Power Electronics and Electric Machines for Electric-Drive Vehicle Applications

Presentation Abstract: Electronics, power electronics, and electric machines are becoming important for an array of mobility/transportation, renewable energy and energy efficiency applications. I will describe the current efforts, status, and some challenges and opportunities for power electronics, electric machines and electric traction drives for vehicular applications with a focus on advanced packaging, thermal management, and thermomechanical reliability aspects.

Bill Ishii
Marketing Manager, Sumitomo Inc.

Bill Ishii is a 20+ year veteran in the Semiconductor components industry. Started with IC packages and mixed assembly services. For the last 10 years, he has focused on passive thermal management, heat spreaders. Bill Ishii's area of concentration is on high reliability applications, demanding the highest quality and reliability.

Presentation Title: Heating Up the Reliability (Advanced Heat Spreader Materials)

Presentation Abstract: Sumitomo Electric USA (Thermal Solutions Group), and sister division ALMT, manufactures advanced thermal management material options to help with ever increasing thermal challenges. Demands are driving devices for higher power, increased performance with increased life. Smaller footprints drive intense areas of heat. Finding suitable material to meet those heat spreading demands reliably can be a task. This presentation will focus on silver-diamond materials (with a thermal conductivity up to 2,000 W/mK) well suited for GaN and GaAs devices, but also cover other effective thermal solutions.

Yogendra Joshi
Program Director, DARPA

Yogendra Joshi is Professor and John M. McKenney and Warren D. Shiver Distinguished Chair at the G.W. Woodruff School of Mechanical Engineering at the Georgia Institute of Technology. He is currently a Program Manager at the Defense Advanced Research Projects Agency (DARPA) Microsystems Technology Office. He is the author or co-author of over 450 publications in this area, including over 225 journal articles. He is an elected Fellow of the ASME, the American Associa¬tion for the Advancement of Science, and IEEE. He is a recipient of the IEEE SemiTherm Significant Contributor Award (2009), IIT Kanpur Distinguished Alumnus Award (2011), ASME InterPack Achievement Award (2011), ITherm Achievement Award (2012), ASME Heat Transfer Memorial Award (2013), and AIChE Donald Q. Kern Award (2018). He currently serves as Senior Area Editor for IEEE Transactions on Components, Packaging and Manufacturing Technology.

Presentation Title: Thermal Management Challenges Under Dynamic Conditions

Presentation Abstract: [TBD]

John Thome
CTO, GCTG LLC

John Thome is Technical Director of Global Cooling Technology Group in Phoenix, AZ developing pulsating heat pipe technologies for the mobile electronics market as well as JJ Cooling Innovation in Lausanne, Switzerland, a micro-two-phase cooling technology development company for other industries. He has 20+ years of experience with development of micro-two-phase cooling systems for electronics (pumped systems, thermosyphons and pulsating heat pipes and high-fidelity simulators for them). He is the author of five books and is editor-in-chief of the Encyclopedia of Two-Phase Heat Transfer and Flow (16 volumes). He received the 2017 Nusselt-Reynolds Prize, the 2019 IEEE ITHERM Award, the 2019 ASME InterPACK Medal, the ASME Heat Transfer Division's Journal of Heat Transfer Best Paper Award in 1998, the UK's Institute of Refrigeration J.E. Hall Gold Medal in 2008, the 2010 ASME Heat Transfer Memorial Award, among others.

Presentation Title: Advanced Cooling of Mobile Electronics

Presentation Abstract: Pulsating heat pipes (PHPs) are an emerging two-phase cooling technology for cooling of mobile and portable electronics. A PHP consists of a serpentine channel that runs back-and-forth from the hot end (cooling electronics) to the cold end within a thin plate. The two-phase flow inside the serpentine is designed to be inherently unstable, with bubbles growing in the evaporator zone and condensing in the cold zone, and by transporting latent and sensible heat from the hot end to the cold end is able to cool devices with moderate up to high heat loads with a very thin shape factor. PHPs are particularly effective as they can operate in any orientation and can transport heat to large cooling surface areas. Innovative PHP studies of Global Cooling Technology Group and related thermal performance results will be presented together with prospects for future applications.

Mike Ohadi
Professor, University of Maryland

Michael Ohadi is a Minta Martin Professor of Mechanical Engineering and a co-founder of the Center for Environmental Energy Engineering (CEEE) at the University of Maryland, College Park. Ohadi's research has focused on heat transfer enhancement of single-phase and two-phase flows through process intensification utilizing multi-scale design optimization, materials, and manufacturing techniques. For more than 25 years, he has led an industrial consortium in Advanced Heat Exchangers and Process Intensification techniques with member companies from the U.S., Asia, and Europe. From 2016 to 2020, Ohadi served as Program Director (PD) at the U.S. Department of Energy, Advanced Research Project Agency-Energy (ARPAE), where he led the development of programs in thermal management and energy conversion systems, including lightweight and

ultra-efficient electric motors, and associated power electronics for de-carbonization/electrification of aviation. Ohadi is a Fellow member of both ASME and ASHRAE. He has published more than 300 peer-reviewed technical articles in his fields of expertise. He is the recipient of the 2021 ASME Heat Transfer Memorial Award and the IEEE 2022 Richard Chu Award for Excellence in Thermo-Mechanical Management of Electronics.

Presentation Title: Energy-Efficient and Sustainable Cooling of High-Flux Electronics

Presentation Abstract: To efficiently remove the increasingly higher heat fluxes from electronic chips with increasing package size limitations, highly efficient innovative embedded single-phase and two-phase cooled technologies are needed. Added to these requirements are the demand for much smaller power consumption and, the use of environmentally sustainable working fluids, among others. This presentation will briefly review the recent progress while outlining the remaining challenges and opportunities.

Navid Kazem
CEO, Arieca Inc.

Navid Kazem is CEO and co-founder of Arieca, which is an advanced material technology startup that was formed after him completing his Ph.D. in computational mechanics at Carnegie Mellon, where he developed the core technology behind Liquid Metal Embedded Elastomers (LMEE). He is a former Swartz Center for Entrepreneurship Fellow at Tepper School of Business at CMU, with multiple high-impact publications and patents. Navid leads product development of LMEEs, commercial strategic partnerships, as well as fund raising.

Presentation Title: Liquid Metal Embedded Elastomers (LMEEs) as TIMs for next generation semiconductor packages

Presentation Abstract: Thermal management issues in the semiconductor industry are driven by a sharp increase in power densities and have created ever-growing concerns over the last decade. To resolve this concern, many attempts are being investigated in device packaging to extract the heat generated away and maintain the functionality of the device. Inside the package thermal interface materials (TIM1) play an important role in transferring the heat efficiently. Design of an optimum material for TIM1 has been an ongoing challenge due to problems associated with interfacial contact thermal resistance, optimized distribution of TIM over the die surface, pump-out and delamination. To accommodate some of these concerns, we introduce a TIM that has liquid metal embedded in elastomeric matrix (LMEE). This material has high stretchability and adhesion properties to accommodate large deformation in the semiconductor packages and has shown superior reliability performance. To address these growing thermal challenges, I will highlight performance of LMEEs as a TIM1 by making packaged microprocessors (TTV) and measuring Junction-to-Case thermal resistance (Rjc) at T0 and after HAST, Thermal Shock, Bake, and reflow (5x) reliability tests.

PANEL 2 – PRINTING & ADDITIVE MANUFACTURING PROCESSES FOR ELECTRONICS PACKAGING

TUESDAY, OCTOBER 24
2:45PM–4:15 PM **BRICKSTONES, FIRST FLOOR**

Moderator:
Ben Leever
Air Force Research Laboratory

Abstract: Processes and materials for additively manufactured electronics have matured rapidly in the last few years, to a significant extent based on the promise of rapid prototyping and low-cost manufacturing for smaller lot sizes. However, with recent demonstrations of approaches for multi-layer circuit design and the robust integration of unpackaged die, additive processes appear promising for more pervasive impacts in electronics packaging. This panel will discuss trends in printed and flexible electronics processes and their potential for broad impacts in electronics packaging and manufacturing.

Panelists:
Pradeep Lall
MacFarlane Endowed Distinguished Professor, Alumni Professor, and Director, Auburn University

Pradeep Lall is the MacFarlane Endowed Distinguished Professor and an Alumni Professor with the Department of Mechanical Engineering. He is Director of the NSF-CAVE3 Electronics Research Center at Auburn University. He holds Joint Courtesy Appointments in the Department of Electrical and Computer Engineering and the Department of Finance. He is a member of the technical council and academic co-lead of automotive and asset monitoring TWGs of NextFlex Manufacturing Institute. He is the author and co-author of two books, 15 book chapters, and over 900 journal and conference papers in the field of electronics reliability, manufacturing, safety, test, energy efficiency, and survivability. Lall is a fellow of the ASME, fellow of the IEEE, a Fellow of NextFlex Manufacturing Institute, and a Fellow of the Alabama Academy of Science. He is recipient of the IEEE Biedenbach Outstanding Engineering Educator Award, Auburn University Research Advisory Board's Advancement of Research and Scholarship Achievement Award, IEEE Sustained Outstanding Technical

Contributions Award, NSF-IUCRC Association's Alex Schwarzkopf Award, Alabama Academy of Science Wright A, Gardner Award, IEEE Exceptional Technical Achievement Award, ASME-EPPD Applied Mechanics Award, SMTA's Member of Technical Distinction Award, Auburn University's Creative Research and Scholarship Award, SEC Faculty Achievement Award, Samuel Ginn College of Engineering Senior Faculty Research Award, Three-Motorola Outstanding Innovation Awards, Five-Motorola Engineering Awards, and over 40 Best-Paper Awards at national and international conferences. Lall is the founding faculty advisor for SMTA student chapter at Auburn University and member of editorial advisory board for SMTA Journal.

Presentation Title: Sustainable Additive Printed Flexible Electronics

Presentation Abstract: Increased awareness of the impact of electronics product life cycle on the environment-social-geographic factors has brought increased attention to the design of sustainable electronics. Additive print processes have the potential for the realization of sustainable electronics through weight reduction, reduction of waste streams and the elimination of harmful chemicals used in plate-and-etch processes. A number of additive printing electronics processes have emerged including aerosol-jet printing, inkjet printing, direct-write printing, gravure offset printing, and screen printing. Nanoparticle based inks have been used to realize conductive interconnects for the fabrication of circuits. Initial generation of additive processes used volatile organic solvents and surfactants on non-biodegradable substrates. A number of new inks have emerged formulated with the use of low-environmental impact solvents. Energy savings can be realized through weight reduction achieved through the transition of electronics form-factors to additive flexible electronics from rigid electronics and low temperature processing. A total product life cycle approach is needed to enable assessment of the true environmental impact of electronics materials, manufacturing, use-life, recycle, repair, and reclamation procedures.

Janos Veres
Director of Engineering, NextFlex

Janos Veres is Director & VP of Engineering at NextFlex, the US Institute of Flexible Hybrid Electronics Manufacturing Innovation. He is a seasoned technologist, passionate about the future of manufacturing and the new ecosystems enabled by digital technologies. Janos has held R&D, manufacturing and management positions in electronics, displays, specialty materials and printing companies including PARC, PolyPhotonix, Kodak, Merck, Avecia, Zeneca and Gestetner, where he developed printed circuits, functional materials, OLEDs, displays, medical devices as well as novel process technologies. He brings experience of industrial partnerships and joint development projects in the US, Europe and Asia. Janos holds a Ph.D. in Solid State Electronics from Imperial College, London. He is author of over 50 patents.

Presentation Title: Additive electronics opportunities for packaging

Presentation Abstract: Printing and additive processes, combined with chiplets and discrete components open up unique opportunities for novel integration. Printing can help erase boundaries between packaging and circuit boards. New design rules emerge, including conformal, 3D integration, embedding chips and antennas, replacing wire bonding with printed traces as well as integrating connectors to packages. Additive workflows also offer disruptive solutions to enable lower capital, compact manufacturing platforms. This panel discussion will explore additive processes as enabler for packaging increasingly at system level.

Daniel Hines
RURI Co-Director, Raytheon

Daniel Hines obtained an MS in Physics from Michigan State University and a Ph.D. from the University of Maryland. He has worked at Schlumberger's research center in Ridgefield, CT, at the NEC Research Institute (NECI) in Princeton, NJ, and at the Laboratory for Physical Sciences (LPS) in College Park MD. Recently, he has been developing additive manufacturing methods for the fabrication of printed hybrid electronics and is currently the co-director at the Raytheon-UMass Lowell Research Institute (RURI) in Lowell, MA.

Presentation Title: Creating Tech Transition Opportunities for Printed Hybrid Electronics (PHE) Manufacturing

Presentation Abstract: Additive manufacturing (AM) methods are coming of age and being used to not only fabricate structural and prototype parts but also to fabricate high-quality electronic components and circuits. Direct-write (DW) printing is emerging as one of the more promising AM methods for the fabrication of printed circuitization, printed interconnects, and other printed passive circuit components. These printed hybrid electronics (PHE) fabrication methods provide specific advantages for heterogeneous integration at both the package and board levels, for RF electronics, and for conformal electronics. Examples include: i) rapid prototyping, ii) printed interconnects, and iii) new form factors for integrating electronics directly into structural parts. Such PHE fabrication capabilities will be highlighted primarily in terms of tech adoption opportunities.

John Williams
Technical Fellow, Boeing Research & Technology

John Williams is a Technical Fellow and the lead engineer for Additive Electronics Manufacturing at Boeing Research and Technology (BR&T) in Huntsville. After completing his Ph.D., John served as the science and technology lead for the Metal Micromachining effort at Sandia National Laboratories in Albuquerque, NM. He later joined the University of Alabama in Huntsville as an Assistant Professor of Electrical, Materials, and Optical Engineering and Associate Director of the Nano and Micro Devices Center. Williams has 20 years of experience as a PI lead for prototype development of microelectromechanical systems (MEMS) with over 27 patents and 40 peer reviewed publications in the areas of materials processing, metals, microfabrication, photonics, and RF electronics and bioMEMS. Williams' research has been funded by NSF, DARPA, NASA, NIH, and US ARMY-SMDC. He has been a proposal author, PI, Co-PI, or PM on 12 NextFlex NextFlex projects used to improve manufacturing readiness of materials and processes to multilayer layer printing of DC electronics, antennas, and complex multilyaer printed circuit boards for RF applications. He is a NextFlex fellow, has spoken at numerous NextFlex workshops, serves on the NextFlex Technical Council, has co-lead the NextFlex Materials Technical Working Group, and served on other working groups and committees for NextFlex since the first members meeting.

Presentation Title: Prototype Studies on Flexible Hybrid Electronics Board Packaging Technologies at Boeing

Presentation Abstract: Flexible Hybrid Electronics promises a low cost conformal wire board technology for rapid prototyping, attritable peel-n-stick, and point of use applications. However, there are several challenges that must be overcome to realize its commercial viability. First among these challenges is a reliable low cost packaged electronic attachment approach. To date, several options have been developed. Additive and Flexible Electronics often requires low temperature polymers patterned and processed in close proximity to printed silver and copper conductors. This prevents the use of standard solders above 180 degrees Celsius. As such the attachment reliability of packaged electronics has proven difficult to achieve at an industrial scale. To date, the industry experts have met this challenge using a combination of different yet potentially viable techniques. Anisotropic conductive silver epoxies have been used successfully, but require expensive and high precision equipment. Conductive particles in polymer blends have been attempted with moderate success, but still have reliability issues with complex integrated circuit (IC) packages. Low temperature solder processes have been applied, but lack the geometric resilience of fully reflowed solder interconnects. Finally, direct write processes between face up pads and wire board substrates has proven itself packages imbedded into the substrate or direct attachment to unpackaged ICs. Boeing has tested many of these approaches for use on circuits operating between direct current (DC) and 60 GHz. There is promise in conductive particle polymer blends for lighting applications, low temperature soldering combined with conformal surface coatings for IoT and RF applications, and direct write printing onto exposed electronic pads. All of these low cost solutions provide a means to move direct write circuity to the garage where millions of people can begin generating products. What is needed now, is to assess which techniques are most viabile, demonstrate any additional supporting processes such as surface coatings, passivation layers, and improved patterning techniques required to achieve reliability. Additional work has just begun on sustainable substrates, recyclable materials, and electronic packaging for extreme temperatures. Boeing and the NextFlex community are working collaboratively to make these techniques available to the U.S. manufacturing community at large.

PANEL 3 – SCALING DATA CENTERS CAPACITY WITH ADVANCED COOLING, COMPUTING ARCHITECTURES AND BEYOND

WEDNESDAY, OCTOBER 25
11:00AM–12:30PM **BRICKSTONES, FIRST FLOOR**

Moderator:
Raffaele Luca Amalfi
CEO, SEGUENTE Inc.

Raffaele Luca Amalfi is the CEO and Co-Founder of SEGUENTE Inc., and he is considered an innovator, visionary, and industry influencer driving company's strategic business activities, technology roadmap, capital objectives, and financial growth goals, as well as managing relationships with the shareholders. Prior to this role, he was a Principal Innovator at Nokia Bell Labs USA, where he led R&D and commercialization activities in the field of thermal management of high-performance communications and computing systems. Since 2016, he worked as a Scientific Collaborator and Laboratory Operations Manager at the Swiss Federal Institute of Technology of Lausanne in Switzerland (EPFL). In 2015, he joined Alcatel-Lucent USA, where he developed innovative liquid cooling technologies for network equipment. In 2012, he joined IBM in Switzerland, where he worked on a novel cooling system for high-performance servers. He has received a Ph.D. in Mechanical Engineering from the EPFL. He has authored over 60 scientific publications in leading journals, conference proceedings, and handbooks, and authored numerous patents. Dr. Amalfi is a Member of the ASME and IEEE Committees, Member of the OCP Heat Reuse Steering Committee, Former Guest Editor for the ASME Journal of Electronic Packaging, Secretary of the K-16 Heat Transfer Committee, and recipient of numerous industry and Government Awards.

Abstract: Data processing, transport, and storage demands are exponentially increasing, driven by applications in mobile broadband, video/gaming, cloud, 5G networks, Artificial Intelligence, and Internet of Things. Such trends are directly linked to next-generation “digital transfor-mation”, which is dominated by intelligent machine-to-machine and human-to-machine communications, automating “everything everywhere” in a new ecosystem. This has profound implications in terms of overall design that mandates greater system functionalities per unit volume, inevitably associated with higher heat densities. Consequently, thermal management using liquid-cooling approaches will be critical to solve increasingly onerous sustainability and performance challenges pressing the large-scale computing and telecommunication systems, which are driving the integration of digital technology into nearly every corner of a society at an unprecedented pace.

Panelists:
John Kim
SEGUENTE Inc.

John Kim is the Chief Innovation Officer and Co-Founder of SEGUENTE Inc., where he leads the commercialization effort of innovative products, including IoT features and backend software services for advanced thermal management solutions. He also oversees the development of IP and Trade Secrets, covering both hardware and software aspects. Prior to his role at SEGUENTE, he was the department head in the Artificial Intelligence (AI) organization at Nokia Bell Labs, where he led numerous projects with a multi-disciplinary team of engineers and scientists to create novel devices coupled with back-end AI analytics for applications in industrial automation. He received his Chemistry Ph.D. from Rutgers University and had international working experience as a research fellow at Korea Advanced Institute of Science and Technology (KAIST), where he applied computational techniques to study infectious diseases and gene editing techniques. He has authored numerous papers in high profile peer-reviewed journals, and conferences, and has received numerous prestigious fellowships and awards.

Presentation Title: Challenges and Opportunities with Liquid Cooling in Sustainable Data Center Management

Nicolas Monnier
Staubli

Nicolas Monnier is the head of business for IT Cooling with Stäubli Fluid Connector Systems in North America. He has been with the company for 19 years previously working as a project manager in R&D for Stäubli in France, where he led the design and the adaptation of fluid connectors for a wide range of demanding industries. Thirteen years ago, he moved to Stäubli’s North American headquarters in Duncan, S.C., to provide technical support to the sales network and assist in the development of custom fluid connectors dedicated to special applica¬tions. Over the last decade, the use of liquids for thermal management of electronic systems has increased significantly in quantity and also in technical requirements. Nicolas’ intrinsic knowledge of fluid connector design positioned him perfectly to address the demanding requests of an industry that requires the highest level of technological innovation and reliability. Nicolas graduated with a M.A.S. in Integrated Product and Process Design from The University of Grenoble (Joseph Fournier University).

Presentation Title: The Next Challenges in Thermal Management

Alfonso Ortega
Villanova University

Alfonso Ortega is the James R. Birle Professor of Energy Technology at Villanova University and Professor of Mechanical and Sustainable Engineering. He is the Director of the Laboratory for Advanced Thermal and Fluid Systems and the Founding Director of the Villanova site of the NSF Center for Energy Smart Electronic Systems (ES2) founded in 2011. He currently is the co-Director of the Villanova Strategic Initiative for Climate, Justice, and Sustainability. Formerly he was the Associate Dean for Graduate Programs and Research in the College of Engineering and Villanova’s inaugural Associate Vice President for Research and Graduate Programs. Ortega received his B.S. from The University of Texas-El Paso, and his M.S. and Ph.D. from Stanford University, all in Mechanical Engineering. He was on the faculty of the Department of Aerospace and Mechanical Engineering at The University of Arizona in Tucson for 18 years. For two years, he served as the Program Director for Thermal Transport and Thermal Processing in the Chemical and Transport Systems Division of The National Science Foundation, where he managed the NSF’s primary program funding heat transfer and thermal technology research in U.S. universities. Ortega is a teacher of thermodynamics, thermal and energy sciences, and design. He is currently developing a new graduate course on Thermodynamics for Sustainable Engineering Systems. He is an internationally recognized expert in thermal and energy management in electronic systems. He has supervised over 40 M.S. and Ph.D. candidates to degree completion, five postdoctoral researchers, and more than 70 undergraduate research students. He is the author of over 300 journal and symposia papers, book chapters, and monographs and is a frequent short course lecturer and consultant on thermal and energy management and experimental measurements. He is a Fellow of the ASME and received the 2003 SEMITHERM Thermie Award and the 2017 ITHERM Achievement Award in recognition of his contributions to the field of electronics thermal measurements.

Presentation Title: Towards Sustainable Data Center Power and Cooling

Milan Djordjevic
Proctorio Inc

Milan Dordevic, MBA, PMP, is a project management expert, author, and business and technology mentor for high-tech startups. During the last 15 years, his focus has been in research and product development of emerging technologies. Milan drives product innovation, automatization, digitalization, program efficiency, and scaling agility through dynamic leadership and creative vision. Milan Dordevic has an MBA from Grand Canyon University, an MSc in Engineering Management from the University of Novi Sad, and a BSc from the University of Belgrade. Due to his diverse knowledge and experience, Milan was awarded the "Outstanding Leadership" award for the contribution to the technology field, at the 2022 Internet 2.0 Conference. As the Director of Product Development at Proctorio, he leads the Research and Development of Proctorio solutions. Before joining Proctorio, Milan managed multi-million dollar cutting-edge software development projects for some of the largest Fortune 500 companies in the world, including BMW, Audi, Samsung, Harman Kardon, and Toyota. With these projects, he's developed a diverse background in delivering solutions in Cloud computing, Artificial Intelligence, Software for Autonomous Vehicles, the Internet of Things, Entertainment, and Augmented and Virtual Reality (AR/VR). Additionally, Milan is passionate about giving back. He serves as board director at Project Management Institute Phoenix Chapter, as a venture mentor for SeedSpot accelerator, Forbes Technology Council expert, and also as an active member of IEEE, PMI, IPMA, and the PMO Leader.

Presentation Title: AI-Driven Solutions Fueling the Computational Surge

Presentation Abstract: Artificial Intelligence (AI) and Machine Learning (ML) have transformed industries, driven innovation, and brought about a technological revolution. However, this progress comes with a cost: a skyrocketing demand for computational power. As AI models grow in complexity and data sets increase in size, the need for advanced CPUs and GPUs has surged, leading to unprecedented challenges in data storage, hardware design, and data center thermal management.

PANEL 4 – AI FOR THE THERMAL SCIENCE COMMUNITY

THURSDAY, OCTOBER 26
11:00AM–12:30PM **BRICKSTONES, FIRST FLOOR**

Moderator:
Yoonjin Won
UC Irvine

Yoonjin Won's overarching research goal is to gain fundamental insights into nanoscale interfacial and transport physics, centering on keywords—data-driven approach, machine learning models, extreme computing, and materials design. The research efforts aim to bring transformational efficiency enhancements in energy, water, manufacturing processes, and electronics cooling by fundamentally manipulating liquid-solid-vapor interactions and transport phenomena across multiple length and time scales. Won is recognized with an NSF CAREER in 2018 and has also received several awards including the ASME EPPD Early Career Award 2018, The Emerging Innovation/Early Career Innovator of the Year 2020 from UCI Beall Innovation Center, ASME EPPD Women Engineer Award 2020, ASME ICNMM Outstanding Leadership Award 2019, UCI Samueli Career Development Fellowship, and numerous best paper and poster awards.

Abstract: The purpose of this panel is to foster interdisciplinary discussions regarding the application of advanced AI and machine learning (ML) techniques in the field of thermal energy science and its practical applications. Heat transfer plays a pivotal role in energy conversion and thermal management systems, and the capacity to comprehend and design such systems is crucial for reducing future carbon emissions. One of the longstanding challenges in fully understanding heat transfer phenomena is the absence of diagnostic, analytic, and predictive tools capable of exploring flows near liquid-vapor boundaries and temperature maps. However, recent advancements in computer vision and ML offer an exciting opportunity to address these challenges. Computer vision techniques can be utilized to understand better phenomenological insights. ML will help you enhance data readings, assist with formular discoveries, and design of optimized heat transfer surfaces or systems. The primary objective of this panel is to discuss new opportunities that can potentially addressed the integration of computer vision and machine learning tools.

Panelists:
Sumanta Acharya
NSF, IIT

Sumanta Acharya is currently the Program Director of the Thermal Transport Processes (TTP) program at the National Science Foundation (2022-present) and a Professor in the Department of Mechanical, Materials, and Aerospace Engineering at the Illinois Institute of Technology (IIT) in Chicago. From 2016 to 2022 he was also the Chair of Mechanical, Materials, and Aerospace Engineering, IIT Chicago.

Acharya's primary area of research is in computational and experimental thermal-fluid sciences. In recognition of his research, he was awarded the ASME Heat Transfer Memorial Award in the Science category, the AIChE Donald Q Kern Award, and the AIAA Thermophysics Award. He was previously the Chair of the ASME Heat Transfer Division. He is a Fellow of the ASME (American Society of Mechanical Engineers) and ASTFE (American Society of Thermal and Fluids Engineers) and Assoc. Fellow of AIAA (American Institute of Aeronautics and Astronautics).

Matteo Bucci
MIT

Matteo Bucci is Associate Professor of Nuclear Science and Engineering at MIT. He joined the MIT faculty in 2016, where he teaches undergraduate and graduate courses in nuclear reactor engineering and design, and two-phase heat transfer. His thermal-hydraulics group at MIT focuses on two major research axes related to nuclear reactor safety and design: (1) New understanding of heat transfer mechanisms in nuclear reactors, (2) Engineered surfaces and coatings to enhance two-phase heat transfer. His group also develops and uses advanced diagnostics, such as high-speed infrared thermometry, and post-processing algorithms to perform unique heat transfer experiments. Matteo has published over 40 articles in the areas of two-phase flow and heat transfer, and surface engineering technology. For his research work and his teaching, he won several awards, among which the MIT Ruth and Joel Spira Award for Excellence in Teaching (2020), ANS/PAI Outstanding Faculty Award (2018), the UIT-Fluent Award (2006), the European Nuclear Education Network Award (2010), and the 2012 ANS Thermal-Hydraulics Division Best Paper Award (2012). In 2022, Matteo received the inaugural DOE Early Career Award for Nuclear Energy. Matteo is Editor of Applied Thermal Engineering and a consultant for the nuclear industry.

Ramin Bostanabad
University of California, Irvine

Ramin Bostanabad is an assistant professor in the Mechanical and Aerospace Engineering Department at the University of California, Irvine (UCI). He is the founding director of PMACS lab, the recipient of 2021 NASA Early Career faculty award, NSF CAREER award, the chair of the ASME student chapter at UCI, and an editorial board member of the SMO journal. Bostanabad earned his Ph.D. in 2019 from Northwestern University where his works were recognized with a number of awards including Terminal Year Fellowship, Martin Outstanding doctoral Fellowship, Predictive Science and Engineering Design Fellowship, and Walter P. Murphy Fellowship. At UCI, his groups' research area is at the interface of uncertainty quantification, scientific machine learning, and computational mechanics.

Nikola Kovachki
NVIDIA

Nikola Kovachki is working on machine learning methods for the physical sciences in theory and practice at NVIDIA. interest include anything mathematically beautiful or machine learning related. He is interested in the approximation theory of neural networks, the application of data-driven techniques to inverse problems, the theory and application of operator learning techniques for imaging and the computational sciences, and the development of uncertainty quantification techniques with deep neural networks. He is also interested in the large-scale deployment and integration of learning systems in super computers for more efficient physical simulations or in computationally limited hardware for consumer and commercial products.

PANEL 5 – WOMEN IN ENGINEERING

THURSDAY, OCTOBER 26
2:45PM–4:15PM **BRICKSTONES, FIRST FLOOR**

Abstract: The Panel on "Women in Engineering" will be composed of exemplary female educators and industry leaders who will discuss their career paths and challenges as well as their advice to younger females. Thriving while preserving through STEM journey can be hard. These extraordinary women will share their journey, career paths, constantly evolving with different challenges, uncertainties, frustrations, and setbacks but to emerge as leaders in their fields of Engineering, Science, and Technology. The goal of this session is to share reflections, challenges, and practical actions to empower you through your STEM journey. The panel will have representation from a wide range of educators from university level and leaders from industries.

Moderator:
Anna Prakash, Ph.D.
Principal Engineer, Intel

Anna Prakash, Ph.D., Principal Engineer, Intel Corporation, began her engineering career working on LCDs, HDTVs, and handheld communication devices. She joined Intel in 2004 as a Packaging R&D Engineer, focusing on automotive components, microLEDs, and Aurora super computers. Anna has several patents and papers covering sensors and semiconductor packaging materials and process. Outside of work, Anna is passionate about promoting STEM education for local children. Along with her daughter Elaina, she co-founded Education Empowers Inc. (www.educationempowers.org), a non-profit, to promote STEM education. Anna is the recipient of the 2019 Intel Hero award, Society of Women Engineers "Prism Award" and the IEEE STEM outreach award for her contribution to technology and the community.

Panelists:
Amy Marconnet
Purdue University

Amy Marconnet is an associate professor of Mechanical Engineering and a Perry Academic Excellence Scholar at Purdue University. She received a B.S. in Mechanical Engineering from the University of Wisconsin–Madison in 2007, and an M.S. and a Ph.D. in Mechanical Engineering at Stanford University in 2009 and 2012, respectively. Her dissertation focused on thermal phenomena in nanostructured materials. She then worked briefly as a postdoctoral associate at the Massachusetts Institute of Technology, before joining the faculty at Purdue University in August 2013. Her work has won outstanding paper awards at ITherm 2012, InterPACK 2017, and ITherm 2019. In 2017, she won the Woman in Engineering Award from the ASME Electronics & Photonics Packaging Division (EPPD). In 2020, she won the Bergles-Rohsenow Young Investigator Award in Heat Transfer and the Outstanding Graduate Student Mentor from the Official Mechanical Engineering Graduate Association (OMEGA) and the College of Engineering. She recently won a Humboldt Fellowship for Experienced Researchers and conducted research at Karlsruhe Institute of Technology in the 2021–2022 academic year.

Joyce Weiner
Principal Engineer, AI Software Architecture, Intel

Joyce Weiner is a Principal Engineer, AI Software Architecture at Intel Corporation. As a Lean expert and Data Scientist, she focuses on using data to drive change and improve efficiency. Joyce is currently working on projects to use AI to assist system designers, and to unlock insights from text fields. Her book, Why AI/Data Science Projects Fail: How to Avoid Project Pitfalls, was published in 2021. Joyce has a BS in Physics from Rensselaer Polytechnic Institute and an MS in Optical Sciences from the University of Arizona. She is married and in her free time enjoys drawing, calligraphy, and reading.

Nazli Donmezer
Associate Professor, Boğaziçi University in Istanbul, Turkey

Nazlı Donmezer is an Associate Professor in the Department of Mechanical Engineering at Boğaziçi University in Istanbul, Turkey, where she has held her position since 2017. She earned her M.Sc. degree from the Middle East Technical University in Ankara, Turkey, in 2009, and completed her Ph.D. degree at the Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA, USA, in 2013. Donmezer's current research interests encompass multiscale electrothermal device modeling, the thermal properties of novel semiconductor materials, and nanoscale heat transport. She has disseminated her research findings through multiple publications in journals such as IEEE Transactions on Electron Devices, IEEE Nanotechnology, and the Journal of Applied Physics. In addition to her scholarly work, Dr. Donmezer serves as a reviewer and board member for the Scientific and Technological Council of Turkey (TUBITAK). She is the recipient of the METU Young Researcher Award and the Schlumberger Faculty for the Future Scholarship, which is granted to women excelling in STEM disciplines.

Jayati Athavale
Thermal Engineer, Meta

Jayati Athavale earned the Masters' degree from Virginia Polytechnic Institute and State University in 2013. She received her PhD from Georgia Institute of Technology in 2018 where her research was focused on thermal management and more specifically data center infrastructure management and optimization. Since graduating she has been working as a Thermal Engineer with Meta. Outside of her work, Jayati loves to hike, backpack and travel.

Sriya Sanyal, Ph.D.
Program Manager, BD – Becton Dickinson

Dr. Sriya Sanyal drives the successful development and launch of key Omni-channel campaigns through the application of scrum and agile ways of working to deliver an exceptional customer experience while unlocking value for BD, a medical devices company. Sriya also provides Program Management support to strategic customer and digital projects. Sriya joined BD from Amazon Canada where she held the position of Operations Manager and led a large team while driving operational improvements and associate engagement. Sriya's previous experience includes roles in Market Development (Tucows Inc.), Product Development (Diodes FabTech), and Process Technology Development (Intel Corporation). Sriya's academic achievements include a Bachelor of Technology, Chemical Engineering from the National Institute of Technology in Durgapur, India, a Ph. D in Chemical Engineering from Arizona State University and an MBA from Schulich School of Business, York University. Sriya's work has been published in peer-reviewed journals and she is a research grant recipient from the Society of Women Engineers.

Interactive Sessions (Posters)

INTERPACK 2023 INTERACTIVE PRESENTATIONS (POSTERS) SCHEDULE

Poster Session - Monday, October 25 - 5:30PM–7:00PM

Submission Code	Author Last Name	Author First Name	Title
111390	Inamdar	Adwait	Monitoring Thermal and Hygroscopic Degradation of Electronic Packages - a Hybrid Digital Twinning Approach
111540	Huang	Yanbo	Prediction of Fin Array Heat Sink Performance Under Two-Phase Immersion Cooling
111543	Guerrero	Margie	Multiple Sprays and Spray Angles Affect Coating Thickness Growth and Roughness of Cold Gas Sprayed Copper on Aln Substrates
111549	Banthiya	Abhijeet	Topology Optimization of Two-Layer Pin-Fin Cold Plates
111569	Pai	Saeel Shrivallabh	Topology Optimization of Heat Exchange Surfaces Using Neural Network-Based Surrogate Models
111658	Park	Junrae	Thermal Management for Enhancing Power Efficiency in Gan Hemts Devices for Rf Applications
111967	Manepalli	Vivek	Thermal Management of Sic Power Module Under Pulsed Loading Using Three-Component Composite Phase Change Material
112352	Saydullayev	Anas	Making Photonic Crystals
113590	Huitink	David	Variable Area Jet Impingement Cooling for High Voltage Power Electronics
113594	Vinson	Whit	Performance of Sac305 Solder Joints Under Simultaneous Tensile and Electromigration Stressing
113825	Ruby	Collin	Characterization of Sac305 Solder Joints Under Elevated Current, Temperature, and Shear Stress Conditions
113836	Medina Garcia	Alicia	Enhancing Mechanical Reliability of Silver Sintered Joints With Copper Nanowires in High-Power Electronic Devices
113844	Tunon	Bryan	Study of Flow-Dependent Characteristics of Hfe7500 Coolant Dielectric Strength
114214	Guye	Kidus	Artificial Neural Networks Based Prediction of Heat Transfer Performance From Microdroplet-Based Evaporative Cooler
119269	Zhou	Yimin	Pool Boiling on Textured Oil-Impregnated Surfaces
119679	Kil	Min Jong	Solar-Thermal Cylindrical Graphite for Thermal Interface Materials
120152	Jang	Hyesoo	Fabrication and Experiment of the Reliability of an Additively Fabricated Biosensor for Wearable Use in Extreme Conditions
120158	Mehta	Vishal	Effects of High-Temperature Surrounding on the Reliability of Lead-Free Solder Joint Assemblies Subjected to Vibrations
120180	Bimali	Sabina	Reparability Test on an Ajp-Printed Differentiator Circuit With Eco-Friendly Silver Ink
120182	Saha	Mrinmoy	Evaluating the Impact of Prolonged Storage on High Strain Rate Performance of Sac-R Solders Under Varying Operating Temperatures
120183	Soni	Ved	Evaluation of Thermoformability on Gravure-Offset Printed In-Mold Electronic Circuits on Different Substrates

Submission Code	Author Last Name	Author First Name	Title
120191	Pandurangan	Aathi	A Novel Method to Predict Damage at High G Potted Electronic Assemblies Using Cohesive Zone Modeling
120198	Karakitie	Daniel	Sustainable Water-Based Silver Nanoparticle Ink With Surface-Mount Component Attachment Using Aerosol Jet Printer.
120200	Musa	Fatahi	Influence of Component Interconnectivity on the Mechanical and Electrical Properties on Printed Water-Based Silver Ink Circuits.
120217	Zhang	Yunli	Effect of Isothermal Aging on the Damage Performance in Tim/copper Interface
120359	Jung	Sungmo	Curves of Polarization, Package-Level Cu85al15 and Cu94al6 Wb Corrosion in High Voltage Devices for Automotive and Rugged Environment Applications Using Comsol Multiphysics Simulation, With Intermetallic Variables Predicted by Linear Regression Functions
120361	Kim	Jihyun	Thermal Conductivity Measurement of Gallium Nitride Thin Films Using Thermoreflectance
120364	Song	Changhwan	Thermal Management of Gan-on-Diamond Hemts Through Electro-Thermal Modeling
120368	Kasturi	Madhu	Fracture Toughness Measurements of Tim to Copper Bi-Material Samples Under Monotonic and Fatigue Loading After Thermal Cycling
120372	Sarwar	Md Golam	Additively Printed Circuitry Utilizing Direct Write Technique With Thermoformable Ag Conductive Ink and Eca for Smds Attachment for in Mold Electronics
120383	Gupta	Gautam	A Numerical Study for the Optimization of Extruded Fin Heat Sinks in a Two Socket Immersion Cooled Server
120384	Bansode	Pratik Vithoba	Impact of Immersion Cooling on Thermomechanical Properties of Halogen-Free Substrate Core
120385	Simon	Vibin Shalom	Energy Analysis of Rear Door Heat Exchangers in Data Centers With Spatial Workload Distribution
120436	Choudhury	Padmanava	Reliability Assessment for Pad Cratering at Board Resin-Glass Interface Under Various Reflows
120456	Ahsan	Mohammad Al	Evolution of Mechanical Behavior in Bulk and Joint Sac+bi Solders Subjected to Various Thermal Exposure Profiles
120457	Mondal	Debabrata	Analysis of Crystallographic Slip Shear Strains in Sac Polycrystals Subjected to External Shear Loads
120459	Mazumder	Golam Rakib	Evolution on the Creep Response of Sac305 Due to Damage Accumulation During Mechanical Cycling at Elevated Temperature
120464	Kulkarni	Shriram	Evaluation of the Performance and Repairability of Inkjet-Printed Functional Circuits Printed Using Non-Volatile Water-Based Silver Ink
120465	Maruf	Mahbub Alam	The Effects of Mechanical Cycling and Aging on the Mechanical Properties and Microstructure of Lead-Free Solder Alloys
120466	Chakraborty	Souvik	Comparative Analysis of Thermal Cycling Performances of Sac, Lts, and Hybrid Sac-Lts Bgas Using the Finite Element Method
120470	Shoemaker	Daniel	Cross-Sectional Thermal Analysis of Multilayer Ceramic Capacitors

Interactive Sessions (Posters)

Submission Code	Author Last Name	Author First Name	Title
120471	Karim	Anwarul	Thermal Analysis of α-Phase Gallium Oxide Mosfets Using Micro-Raman Spectroscopy
120473	Song	Yiwen	Thermal Characterization of Lead Zirconate Titanate (Pzt) Piezoelectric Mems Actuators
120475	Kang	Kyuhwe	Thermal Conductivity of Aluminum Boron Nitride for Ferroelectric Random-Access Memory Applications
120488	Kasitz	Joshua	Encapsulated Phase Change Materials for Thermal Gradient Mitigation Embedded in Silicone Gel Insulation
120489	Sarma	Bhaskarjyoti	Characterization of Capillary Pressure and Two-Phase Relative Permeability in Porous Sintered Copper Vapor Chamber Wicks

Committee Meetings

COMMITTEE MEETINGS			
Date	**Time**	**Event**	**Room**
Monday, October 23	7:00PM–9:30PM	InterPACK Leadership Dinner (By Invitation Only)	
Tuesday, October 24	8:00PM–8:30PM	K-16 Committee Meeting	Loft I
Tuesday, October 24	8:30PM–9:00PM	JEP Meeting	Loft I
Wednesday, October 25	6:00PM–6:30PM	InterPACK Meeting (Open)	Loft I
Wednesday, October 25	6:30PM–7:00PM	InterPACK Advisory Board Meeting (Closed)	Loft I
Wednesday, October 25	7:00PM–7:30PM	EPPD Meeting	Loft I

TUESDAY, OCTOBER 24, 2023

01-01 HETEROGENEOUS INTEGRATION I
9:15AM–10:45AM **SHUTTERS EAST I**

Chair: **Hussameddine Kabani** - *Facebook*

Advances in Air-Cooling for Modern Semiconductor Chips

Technical Presentation Only: InterPACK2023-119704

Girish Anant Kini - *Advanced Micro Devices,* **Mark Steinke** - *Advanced Micro Devices*

Computational Analysis of Thermal Performance of Water-Cooled Cold Plate for Chips With Hotspots

Technical Paper Publication: InterPACK2023-111725

Mahdi Farahikia - *SUNY New Paltz,* **Ping-Chuan Wang** - *SUNY New Paltz*

Experimental and Numerical Investigation of Single-Phase Liquid Cooling for Heterogeneous Integration Multi-Chip Module

Technical Paper Publication: InterPACK2023-112452

Ahmad R. Gharaibeh - *Binghamton University,* **Qusai Soud** - *Binghamton University,* **Yaman Manaserh** - *Binghamton University,* **Mohammad Tradat** - *Binghamton University,* **Bahgat Sammakia** - *Binghamton University*

Corrosion of Aluminum Nitride in Integrated Cooling With Water and Mitigation Strategies

Technical Presentation Only: InterPACK2023-114691

Muhammad Rubaiet Shattique - *University of California, Merced,* **James W. Palko** - *University of California, Merced*

06-01 WEARABLE ELECTRONICS
9:15AM–10:45AM **SHUTTERS WEST II**

Chair: **Kyungjin Kim** - *University of Connecticut*
Co-Chair: **Beth Paquette** - *National Aeronautics and Space Administration*

Human Digital Twin: Enhancing Human Performance Using Motion Tape Wearable Sensors

Technical Presentation Only: InterPACK2023-119770

Kenneth Loh - *University of California, San Diego*

A Fully Integrated Wearable Ultrasound System to Monitor Deep Tissues in Moving Subjects

Technical Presentation Only: InterPACK2023-119421

Muyang Lin - *University of California, San Diego,* **Ziyang Zhang** - *University of California, San Diego,* **Xiaoxiang Gao** - *University of California, San Diego,* **Sheng Xu** - *University of California, San Diego*

Development and Reliability Evaluation of Additively Printed Biosensing Device for Wearable Applications in Harsh Environment

Technical Paper Publication: InterPACK2023-111968

Pradeep Lall - *Auburn University,* **Hyesoo Jang** - *Auburn University,* **Jinesh Narangaparambil** - *Auburn University,* **Curtis Hill** - *NASA Marshall Space Flight Center*

Thermal Design and Analysis of On-the-Market Smartwatches

Technical Presentation Only: InterPACK2023-110433

Kevin Ibarra - *Electronic Cooling Solutions, Inc.*

04-01 POWER/RF ELECTRONICS AND PHOTONICS I
9:15AM–10:45AM **SHUTTERS WEST I**

Chair: **Bikramjit Chatterjee** - *Lawrence Livermore National Laboratory*
Co-Chair: **Michael Fish** - *U.S. Army DEVCOM Army Research Laboratory*

Additively Manufactured Hybrid Two-Phase Cold Plate

Technical Paper Publication: InterPACK2023-109991

Mohammad Reza Shaeri - *Advanced Cooling Technologies, Inc.,* **Richard Bonner** - *Advanced Cooling Technologies, Inc.,* **Jana Catuche** - *University of the District of Columbia*

Topology Optimization of Two-Layer Pin-Fin Cold Plates

Technical Presentation Only: InterPACK2023-111542

Abhijeet Banthiya - Purdue University, **Liang Pan** - *Purdue University,* **Justin A. Weibel** - *Purdue University*

Thermal Management of SiC Power Module Under Pulsed Loading Using Three-Component Composite Phase Change Material

Technical Presentation Only: InterPACK2023-114323

Vivek Manepalli - *University of Maryland, College Park,* **Andoniaina Randriambololona** - *University of Maryland, College Park,* **Bidisha Ojha** - *Washington University in St. Louis,* **Kidus Guye** - *University of Maryland, College Park,* **Damena Agonafer** - *University of Maryland, College Park*

Thermal Environments and Testing for NASA's X-57 Maxwell All-Electric Aircraft

Technical Presentation Only: InterPACK2023-112020

Jarred Wilhite - *NASA Glenn Research Center,* **Nicholas Borer** - *NASA Langley Research Center*

03-01 SOLDER JOINTS AND RELIABILITY I
9:15AM–10:45AM **SHUTTERS EAST II**

Chair: Nakul Kothari, *Qualcomm*
Co-Chair: Pradeep Lall, *Auburn University*

Performance of SAC305 Solder Joints Under Simultaneous Tensile and Electromigration Stressing

Technical Paper Publication: InterPACK2023-111909

Whit Vinson - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Evolution in Lead-Free Solder Alloys Subjected to Both Mechanical Cycling and Aging

Technical Paper Publication: InterPACK2023-112023

Mahbub Alam Maruf - *Auburn University,* **Golam Rakib Mazumder** - *Auburn University,* **Souvik Chakraborty** - *Auburn University,* **Jeffrey Suhling** - *Auburn University,* **Pradeep Lall** - *Auburn University*

Incorporation of Damage in Creep Models for SAC305 Lead Free Solder

Technical Paper Publication: *InterPACK2023-112030*

Golam Rakib Mazumder - *Auburn University,* **Souvik Chakraborty** - *Auburn University,* **Mahbub Alam Maruf** - *Auburn University,* **Jeffrey Suhling** - *Auburn University,* **Pradeep Lall** - *Auburn University*

Comparative Finite Element Analyses of the Thermal Cycling Performances of BGA Packages With SAC, LTS, and Mixed SAC-LTS Solder Joints

Technical Paper Publication: InterPACK2023-112041

Souvik Chakraborty - *Auburn University,* **Debabrata Mondal** - *Auburn University,* **Golam Rakib Mazumder** - *Auburn University,* **Mahbub Alam Maruf** - *Auburn University, Jeffrey Suhling - Auburn University,* **Pradeep Lall** - *Auburn University*

05-01 NANOSCALE THERMAL TRANSPORT PROCESSES IN ELECTRONIC SYSTEMS
11:00AM–12:30PM - SHUTTERS EAST II

Chair: Ronald Warzoha - *U.S. Naval Academy*
Co-Chair: Adam Wilson - *U.S. Army Research Laboratory*

Hacking Thermoreflectance: Extensions of Thermal Characterization Methods That May (or May Not) Be Useful

Technical Presentation Only: InterPACK2023-111606

Dr. Brian Donovan - *U.S. Naval Academy, Lian Dunlevy - U.S. Naval Academy,* **Adam Wilson** - *U.S. Army Research Laboratory,* **Ron Warzoha** - *U.S. Naval Academy,* **Brian Jenkins** - *U.S. Naval Academy,* **Andrew Smith** - *U.S. Naval Academy*

Thermal Conductivity of Carbon Nanotube Forests via Frequency Domain Thermoreflectance Technique

Technical Presentation Only: InterPACK2023-111941

Zechen Zhang - *Binghamton University,* **Piyush Kulkarni** - *Binghamton University,* **Morteza Bagheri** - *Binghamton University,* **Christine Jacob** - *Massachusetts Institute of Technology,* **John Hart** - *Massachusetts Institute of Technology, Scott Schiffres - Binghamton University*

Origin of Ultra-Low Thermal Conductivities in Ruddlesden-Popper Phases of Perovskite Chalcogenide BaZrS3

Technical Presentation Only: InterPACK2023-114055

Md Shafkat Bin Hoque - *University of Virginia*

Thickness Dependent Cross-Plane Thermal Conductivity of H-Bn Grown by Pulsed Laser Deposition

Technical Presentation Only: InterPACK2023-110583

Gustavo Alvarez - *Cornell University,* **Joyce Christiansen-Salameh** - *Cornell University,* **Abhijit Biswas** - *University of Michigan,* **Eugene Jeong** - *Cornell University,* **Pulickel M. Ajayan** - *University of Michigan,* **Zhiting Tian** - *Cornell University*

02-01 IMMERSION COOLING I

11:00AM–12:30PM **SHUTTERS EAST I**

Chair: Tiwei Wei - *Purdue University*
Co-Chair: Manasa Sahini - *Meta*

Electrochemical Additive Manufacturing Based Design of a Heat Sink for Single Phase Natural Convection Immersion Cooling Application

Technical Paper Publication: InterPACK2023-111804

Jacob Lamotte-Dawaghreh - *The University of Texas at Arlington,* **Joseph Herring** - *The University of Texas at Arlington,* **Sai Pundla** - *The University of Texas at Arlington,* **Rohit Suthar** - *The University of Texas at Arlington,* **Vivek Nair** - *The University of Texas at Arlington,* **Pratik Bansode** - *The University of Texas at Arlington, Gautam Gupta - The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington,* **Joseph Madril** - *Fabric8Labs,* **Tim Ouradnik** - *Fabric8Labs,* **Michael Matthews** - *Fabric8Labs,* **Ian Winfield** - *Fabric8Labs*

A Numerical Study on the Influence of Mixed Convection Heat Transfer in Single-Phase Immersion Cooling

Technical Paper Publication: InterPACK2023-112005

Satyam Saini - *The University of Texas at Arlington,* **Gautam Gupta** - *The University of Texas at Arlington,* **Pratik Bansode** - *The University of Texas at Arlington,* **Pardeep Shahi** - *The University of Texas at Arlington,* **Vibin Shalom Simon** - *The University of Texas at Arlington,* **Himanshu Modi** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington,* **Jimil Shah** - *Stealth Startup*

Parametric Multi-Objective Optimization of Cold Plate for Single-Phase Immersion Cooling

Technical Paper Publication: InterPACK2023-112010

Vibin Shalom Simon - *The University of Texas at Arlington,* **Geevarghese Joseph** - *The University of Texas at Arlington,* **Anto Barigala** - *The University of Texas at Arlington,* **Satyam Saini** - *The University of Texas at Arlington,* **Pardeep Shahi** - *The University of Texas at Arlington,* **Lochan Sai Reddy Chinthaparthy** - *The University of Texas at Arlington,* **Pratik Vithoba Bansode** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington*

Single-Phase Immersion Cooling Multi-Design Variable Heat Sink Optimization for Natural Convection

Technical Paper Publication: InterPACK2023-112019

Joseph Herring - *The University of Texas at Arlington,* **Gautam Gupta** - *The University of Texas at Arlington,* **Jacob Dawaghreh** - *The University of Texas at Arlington,* **Pratik Bansode** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington*

06-02 RELIABILITY & REPAIRABILITY OF ADDITIVE ELECTRONICS

11:00AM–12:30PM **SHUTTERS WEST I**

Chair: Pradeep Lall - *Auburn University*
Co-Chair: Dainel Hines - *Raytheon Technologies*

Extreme Drop Durability of Sintered Silver Traces Printed With Extrusion and Aerosol Jet Processes

Technical Paper Publication: InterPACK2023-111312

Hisham Abusalma - *University of Maryland,* **Hayden Richards** - *University of Maryland,* **Abhijit Dasgupta** - *University of Maryland,* **Andres Bujanda** - *U.S. Army Research Laboratory,* **Jian Yu** - *U.S. Army Research Laboratory,* **Harvey Tsang** - *U.S. Army Research Laboratory*

Repairability of SMDs on 3D Printed Circuitry for Sustainable Electronics Utilizing Direct Write Technique

Technical Paper Publication: InterPACK2023-112061

Pradeep Lall - *Auburn University,* **Md Golam Sarwar** - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** - *NextFlex*

Survivability and Reliability Testing and Modeling of Printed Hybrid Electronic (PHE) Assemblies Subject to Extreme Acceleration Levels

Technical Paper Publication: InterPACK2023-111895

Hayden Richards - *University of Maryland,* **Hisham Abusalma** - *University of Maryland,* **Abhijit Dasgupta** - *University of Maryland,* **Jian Yu** - *Army Research Lab,* **Andres Bujanda** - *U.S. Army Research Laboratory,* **Harvey Tsang** - *U.S. Army Research Laboratory*

Reparability Test of Aerosol-Jet Printed Sustainable Silver Ink Circuit

Technical Paper Publication: InterPACK2023-112064

Pradeep Lall - *Auburn University,* **Sabina Bimali** - *Auburn University,* **Scott Miller** - *NextFlex*

07-01 AI/ML-ASSISTED DESIGN FOR MANUFACTURABILITY AND RELIABILITY

11:00AM–12:30PM **SHUTTERS WEST II**

Chair: Joyce Weiner - *Intel*
Co-Chair: Przemyslaw Gromala - *Robert Bosch GmbH*

Explainable Machine Learning Approach to Yield and Quality Improvements Using Deep Topological Data Analytics

Technical Paper Publication: InterPACK2023-111525

Janhavi Giri - *Intel Corporation,* **Attila Lengyel** - *Intel Corporation*

Topology Optimization of Heat Exchange Surfaces Using Neural Network-Based Surrogate Models

Technical Presentation Only: InterPACK2023-111537

Saeel Shrivallabh Pai - *Purdue University,* **Abhijeet Banthiya** - *Purdue University,* **Liang Pan** - *Purdue University,* **Justin A. Weibel** - *Purdue University*

Machine Learning-Based Prediction of Heat Transfer Performance From Arrays of Evaporating Microdroplets

Technical Presentation Only: InterPACK2023-113793

Kidus Guye - *University of Maryland, College Park,* **Andoniaina Mariah Randriambololona** - *University of Maryland, College Park,* **Vivek Manepalli** - *University of Maryland, College Park, Damena Agonafer* - *University of Maryland*

A Machine Learning Enhanced Return Mapping Approach for Efficient Fe Solution of Damage-Coupled Viscoplasticity Constitutive Formulations

Technical Paper Publication: InterPACK2023-111835

Youssef Maniar - *Robert Bosch GmbH,* **Alexander Kabakchiev** - *Robert Bosch GmbH,* **Peter Binkele** - *University of Stuttgart,* **Siegfried Schmauder** - *University of Stuttgart*

03-07 SINTERED ATTACH AND ADDITIVE MANUFACTURING

2:45PM–4:15PM **LOFT I**

Chair: Nakul Kothari, *Qualcomm*
Co-Chair: Pardeep Shahi, *NVIDIA*

Laser Powder Bed Fusion Additive Manufacturing of Copper and Copper Alloys: Opportunities and Challenges

Technical Presentation Only: InterPACK2023-111905

David Deisenroth - *National Institute of Standards and Technology*

Harnessing Interfacial Delamination of Materials in Liquid for Eco-Friendly Transfer Printing Technology

Technical Presentation Only: InterPACK2023-119743

Baoxing Xu - *University of Virginia*

Effects of Pores on Crack Propagation in Sintered-Silver Die Attach: A Baseline Model

Technical Paper Publication: InterPACK2023-113208

Emmanuel Arriola - *Virginia Tech,* **Guo-Quan Lu** - *Virginia Tech,* **Aristotle Ubando** - *De La Salle University*

Enhancing Mechanical Reliability of Silver Sintered Joints With Copper Nanowires in High-Power Electronic Devices

Technical Paper Publication: InterPACK2023-113792

Alicia Medina Garcia - *University of Arkansas,* **John Harris** - *University of Arkansas,* **David Huitink** - *University of Arkansas*

05-06 NANOSCALE THERMAL TRANSPORT PROCESSES IN ELECTRONIC SYSTEMS II

2:45 PM TO 4:15 PM **SHUTTERS EAST II**

Chair: Adam Wilson - *US Army Research Laboratory*

Experimental Investigation of Heat Transfer and Hydrodynamics in Flow Immersion Cooling of Electronics, {InterPACK2023-110408}

Technical Presentation Only

Arielle Gamboa - *University of Illinois, Urbana/Champaign,* **Luke Markuson** - *University of Illinois, Urbana/Champaign,* **Eric Roman** - *University of Illinois, Urbana/Champaign,* **Woo Young Park** - *University of Illinois, Urbana/Champaign,* **Michael Barako** - *NG Next Basic Research Laboratory, Northrop Grumman Corporation,* **Nenad Miljkovic** - *University of Illinois, Urbana/Champaign*

Reduced Order Design Optimization of Cold Plates for Electronics Cooling, {InterPACK2023-111703}

Technical Presentation Only

Aniket Ajay Lad - *University of Illinois at Urbana Champaign,* **Nenad Miljkovic** - *University of Illinois at Urbana Champaign,* **William King** - *University of Illinois at Urbana Champaign*

Development of a Multimodal Acoustic Sensing System for Non-Intrusive Thermal Characterization of Liquid Cooling, {InterPACK2023-112117}

Technical Presentation Only

Jackson Marsh - *University of Arkansas,* **Stephen Pierson** - *University of Arkansas,* **Hari Pandey** - *University of Arkansas,* **Christy Dunlap** - *University of Arkansas,* **Josef Frankhouse** - *University of Arkansas,* **Han Hu** - *University of Arkansas*

Thermal Performance of Cooling Devices Directly Printed on a Commercial Off-the-Shelf Microprocessor by Laser Powder Bed Fusion (L-Pbf) Additive Manufacturing, {InterPACK2023-112937}

Technical Presentation Only

Arad Azizi - *Binghamton University,* **Michael Kim** - *Binghamton University,* **Piyush Kulkarni** - *Binghamton University,* **Matthew Heitner** - *Binghamton University,* **Bharath Ramakrishnan** - *Microsoft Corporation,* **Hussam Alissa** - *Microsoft Corporation,* **Washington Kim** - *Microsoft Corporation,* **Bahgat Sammakia** - *Binghamton University,* **Scott Schiffres** - *Binghamton University*

05-07 NANOSCALE AND MICROSCALE THERMAL CONDUCTION PHENOMENA IN ELECTRONIC MATERIALS II

2:45 PM TO 4:15 PM **SHUTTERS WEST I**

Chair: Hyejin Jang - *Seoul National University*

Thermal Conductivity Degradation of Nmc811 Cathode During Failure Caused by Electrolytic Leakage., {InterPACK2023-111994}

Technical Presentation Only

Kunal Dixit - *Imperium3,* **Jiwei Wang** - *Binghamton Univeristy,* **Qinglu Fan** - *Binghamton University,* **Morteza Haji Bagheri** - *Binghamton University,* **Piyush Kulkarni** - *Binghamton University,* **Zechen Zhang** - *Binghamton University,* **Hao Liu** - *Binghamton University,* **Scott Schiffres** - *Binghamton University*

The Impact of Deposition Temperature on the In-Plane Thermal Conductivity of Aluminum Scandium Alloys, {InterPACK2023-113457}

Technical Presentation Only

Daniel Hirt - *University of Virginia,* **Md. Shafkat Bin Hoque** - *University of Virginia,* **Md. Rafiqul Islam** - *University of Virginia,* **Patrick E. Hopkins** - *University of Virginia*

Nanoscale Thermal Transport in Alxga1-Xn Alloys, {InterPACK2023-119749}

Technical Presentation Only

Abhishek Pathak - *Carnegie Mellon University,* **Kyuhwe Kang** - *The Pennsylvania State University,* **Yiwen Song** - *The Pennsylvania State University,* **Sukwon Choi** - *The Pennsylvania State University,* **Jonathan Malen** - *Carnegie Mellon University,* **Alan Mcgaughey** - *Carnegie Mellon University*

An Investigation Into Heat Transfer and Flow Characteristics of Dispersed Micro and Nano Photoluminescent Phosphor Particles in a Dielectric Fluid in a Compact Led Package, {InterPACK2023-119767}

Technical Presentation Only

Erphan Safdari - *Ozyegin university,* **Shahriyar Rahbarshahlan** - Ozyegin university, **Mehmet Arik** - Auburn university, **Altug Basol** - Ozyegin university, **Mete Budakli** - Ozyegin university

05-02 NANOSCALE AND MICROSCALE THERMAL CONDUCTION PHENOMENA IN ELECTRONIC MATERIALS

4:30PM–6:00PM **SHUTTERS WEST I**

Chair: **Brian Donovan** - *U.S. Naval Academy*
Co-Chair: **Hyejin Jang** - *Seoul National University*

Thermal Property Estimation of Thin Layered Structures by Means of Thermoreflectance Measurement and NID Algorithm

Technical Paper Publication: InterPACK2023-111269

Daiki Higuma - *Tokyo Institute of Technology,* **João Vitor Thomsen Silveira** - *Tokyo Institute of Technology,* **Kazuyoshi Fushinobu** - *Tokyo Institute of Technology*

Non-Destructive Testing of Thermal Interface Materials in Electronic Packages Using Modulated Heating

Technical Presentation Only: InterPACK2023-111626

Piyush Kulkarni - *Binghamton University,* **Zechen Zhang** - *Binghamton University,* **Fatemeh Hejripour Rafsanjani** - *Binghamton University,* **Je-Young Chang** - *Intel Corporation,* **Charles Arvin** - *IBM Corporation,* **Bahgat Sammakia** - *Binghamton University,* **Scott Schiffres** - *Binghamton University*

3D Graphene-Nanowire "Sandwich" Thermal Interface Material for Efficient Heat Dissipation

Technical Presentation Only: InterPACK2023-111890

Lin Jing - *Carnegie Mellon University,* **Rui Cheng** - *Carnegie Mellon University,* **Sheng Shen** - *Carnegie Mellon University*

Spatial Thermal Property Variation of Particulate-Filled Thermal Interface Materials

Technical Presentation Only: InterPACK2023-111931

Zechen Zhang - *Binghamton University,* **Piyush Kulkarni** - *Binghamton University,* **Matthias Daeumer** - *Binghamton University,* **Je-Young Chang** - *Intel Corporation,* **Charles Arvin** - *IBM Corporation,* **Bahgat Sammakia** - *Binghamton University,* **Scott Schiffres** - *Binghamton University*

03-02 SOLDER JOINTS AND RELIABILITY II

4:30PM–6:00PM **SHUTTERS EAST I**

Chair: **Pardeep Shahi**, *NVIDIA*
Co-Chair: **Mahendra Harsha**, *Qualcomm*

Characterization of SAC305 Solder Joints Under Elevated Current, Temperature, and Varying Shear Stress Conditions

Technical Paper Publication: InterPACK2023-113756

Collin Ruby - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Comparison of Bulk and Joint Mechanical Behavior Evolutions for SAC+Bi Solders Subjected to Various Thermal Exposures

Technical Presentation Only: InterPACK2023-112009

Mohammad Al Ahsan - *Auburn University,* **Souvik Chakraborty** - *Auburn University,* **Jeffrey Suhling** - *Auburn University,* **Pradeep Lall** - *Auburn University*

Cyclic Creep-Fatigue Behavior of Oligocrystalline SAC305 Solder Joint

Technical Presentation Only: InterPACK2023-111704

Aniket Bharamgonda - *University of Maryland,* **Abhijit Dasgupta** - *University of Maryland,* **Torsten Hauch** - *NXP Semiconductor, Yaxiong Chen - NXP Semiconductor*

Quick Turn Methodology for High Temperature Solder Fatigue Reliability

Technical Paper Publication: InterPACK2023-113999

Matthew Norris - *University of Arkansas,* **David Huitink** - *University of Arkansas*

04-02 POWER/RF ELECTRONICS AND PHOTONICS II

4:30PM–6:00PM **SHUTTERS EAST II**

Chair: Nazli Donmezer - *Bogazici University*

Variable Area Jet Impingement for High Voltage Power Electronics

Technical Paper Publication: InterPACK2023-111996

Reece Whitt - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Investigation of Silicon Carbide Embedded Cooling Technology for Compact Electronic Systems

Technical Paper Publication: InterPACK2023-111613

Jarred Wilhite - *NASA Glenn Research Center,* **Chirag Kharangate** - *Case Western Reserve University*

Cross-Sectional Thermal Analysis of Multilayer Ceramic Capacitors

Technical Presentation Only: InterPACK2023-112116

Daniel Shoemaker - *The Pennsylvania State University,* **Pedram Yousefian** - *The Pennsylvania State University,* **Yiwen Song** - *The Pennsylvania State University,* **Angela Ellmore** - *Knowles (UK) Ltd.,* **Michael Lanagan** - *The Pennsylvania State University,* **Clive Randall** - *The Pennsylvania State University,* **Susan Trolier-Mckinstry** - *The Pennsylvania State University,* **Sukwon Choi** - *The Pennsylvania State University*

Au, Ag Inverse Opals for Improved Cooling Performance in GaN HEMTs RF Amplifier

Technical Presentation Only: InterPACK2023-111650

Euibeen Jung - *Chungang University,* **Minsoo Kang** - *Chungang University,* **Junrae Park** - *Chungang University,* **Daeyoung Kong** - *Chungang University,* **Kiwan Kim** - *Chungang University,* **Hyun-Wook Jung** - *Electronics and Telecommunications Research Institute,* **Ho-Kyun Ahn** - *Electronics and Telecommunications Research Institute,* **Haecheon Kim** - *Electronics and Telecommunications Research Institute,* **Hyoungsoon Lee** - *Chungang University*

07-02 DESIGN FOR MANUFACTURABILITY AND RELIABILITY IN TRANSPORTATION APPLICATIONS

4:30PM–6:00PM **SHUTTERS WEST II**

Chair: Joyce Weiner - *Intel*
Co-Chair: Fabian Welschinger - *Robert Bosch GmbH*

Converter-Integrated Variable-Pole Induction Machine Drive for Heavy-Duty Vehicles

Technical Presentation Only: InterPACK2023-111462

Kaushik Chettiar - *University of Illinois at Urbana-Champaign,* **Aniket Lad** - *University of Illinois at Urbana-Champaign,* **Elie Libbos** - *University of Illinois at Urbana-Champaign,* **Holton Miller** - *University of Illinois at Urbana-Champaign,* **Arijit Banerjee** - *University of Illinois at Urbana-Champaign,* **Nenad Miljkovic** - *University of Illinois at Urbana-Champaign*

Enhancing Manual Visual Inspection Process by Using OpenCV AI and Anomalib for Defect Detection in Automotive Assembly and Manufacturing Process

Technical Paper Publication: InterPACK2023-111936

Stewart Christie - *Intel,* **Anna Prakash** - *Intel,* **Elaina Ashton** - *Arizona State University,* **Veronica Tanner** - *Southern Methodist University*

Polarization Curves, Package-Level Multiphysics Simulation of Cu85Al15 and Cu94Al6WB Corrosion for Automotive and Rugged Environment Applications

Technical Paper Publication: InterPACK2023-112067

Pradeep Lall - *Auburn University,* **Sungmo Jung** - *Auburn University*

08-01 INTERACTIVE PRESENTATIONS

7:00PM–8:00PM **GREAT ROOM I-III**

Chair: Georges Pavlidis - *University of Connecticut*
Co-Chair: Solomon Adera - *University of Michigan*
Co-Chair: Tiwei Wei - *Purdue University*

Monitoring Thermal and Hygroscopic Degradation of Electronic Packages: A Hybrid Digital Twinning Approach

Student Poster Presentation: InterPACK2023-111390

Adwait Inamdar - *Delft University of Technology,* **Willem Van Driel** - *Delft University of Technology,* **Guoqi Zhang** - *Delft University of Technology*

Prediction of Fin Array Heat Sink Performance Under Two-Phase Immersion Cooling

Student Poster Presentation: InterPACK2023-111540

Yanbo Huang - *Purdue University,* **Bhaskarjyoti Sarma** - *Purdue University,* **Justin Weibel** - *Purdue University*

Enhancing Mechanical Reliability of Silver Sintered Joints With Copper Nanowires in High-Power Electronic Devices

Student Poster Presentation: InterPACK2023-113836

Alicia Medina Garcia - *University of Arkansas,* **John Harris** - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Study of Flow-Dependent Characteristics of HFE 7500 Coolant Dielectric Strength

Student Poster Presentation: InterPACK2023-113844

Bryan Tunon - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Artificial Neural Networks Based Prediction of Heat Transfer Performance From Microdroplet-Based Evaporative Cooler

Student Poster Presentation: InterPACK2023-114214

Kidus Guye - *University of Maryland, College Park,* **Andoniaina Mariah Randriambololona** - *University of Maryland, College Park,* **Vivek Manepalli** - *University of Maryland, College Park,* **Damena Agonafer** - *University of Maryland*

Pool Boiling on Textured Oil-Impregnated Surfaces

Student Poster Presentation: InterPACK2023-119269

Yimin Zhou - *University of Michigan,* **Solomon Adera** - *University of Michigan*

Solar-Thermal Cylindrical Graphite for Thermal Interface Materials

Student Poster Presentation: InterPACK2023-119679

Min Jong Kil - *University of California, Los Angeles,* **Timothy Fisher** - *University of California, Los Angeles*

Fabrication and Experiment of the Reliability of an Additively Fabricated Biosensor for Wearable Use in Extreme Conditions

Student Poster Presentation: InterPACK2023-120152

Hyesoo Jang - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Jinesh Narangaparambil** - *Auburn University,* **Scott Miller** - *NextFlex*

Effects of High-Temperature Surrounding on the Reliability of Lead-Free Solder Joint Assemblies Subjected to Vibrations

Student Poster Presentation: InterPACK2023-120158

Vishal Mehta - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Jeff Suhling** - *Auburn University,* **David Locker** - *U.S. Army DEVCOM - Armament Center*

Reparability Test on an AJP-Printed Differentiator Circuit With Eco-Friendly Silver Ink

Student Poster Presentation: InterPACK2023-120180

Sabina Bimali - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Scott Miller** - *NextFlex*

Evaluating the Impact of Prolonged Storage on High Strain Rate Performance of SAC-R Solders Under Varying Operating Temperatures

Student Poster Presentation: InterPACK2023-120182

Mrinmoy Saha - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Jeffrey Suhling** - *Auburn University*

Evaluation of Thermoformability on Gravure-Offset Printed In-Mold Electronic Circuits on Different Substrates

Student Poster Presentation: InterPACK2023-120183

Ved Soni - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Jinesh Narangaparambil** - *Auburn University,* **Scott Miller** - *NextFlex*

Multiple Sprays and Spray Angles Affect Coating Thickness Growth and Roughness of Cold Gas Sprayed Copper on AlN Substrates

Student Poster Presentation: InterPACK2023-111543

Margie Guerrero-Fernandez - *University of Puerto Rico,* **Pedro Quintero** - *University of Puerto Rico at Mayaguez,* **Ozan Ozdemir** - *Northeastern University*

A Novel Method to Predict Damage at High G Potted Electronic Assemblies Using Cohesive Zone Modeling

Student Poster Presentation: InterPACK2023-120191

Aathi Raja Ram Pandurangan - *Auburn University,* **Pradeep Lall** - *Auburn University*

Sustainable Water-Based Silver Nanoparticle Ink With Surface-Mount Component Attachment Using Aerosol Jet Printer

Student Poster Presentation: InterPACK2023-120198

Daniel Karakitie - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Scott Miller** - *NextFlex*

Influence of Component Interconnectivity on the Mechanical and Electrical Properties on Printed Water-Based Silver Ink Circuits

Student Poster Presentation: InterPACK2023-120200

Fatahi Musa - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** - *NextFlex*

Effect of Isothermal Aging on the Damage Performance in TIM/ Copper Interface

Student Poster Presentation: InterPACK2023-120217

Yunli Zhang - *Auburn University,* **Pradeep Lall** - *Auburn University*

Curves of Polarization, Package-Level Cu85Al15 and Cu94Al6WB Corrosion in High Voltage Devices for Automotive and Rugged Environment Applications Using Comsol Multiphysics Simulation, With Intermetallic Variables Predicted by Linear Regression Functions

Student Poster Presentation: InterPACK2023-120359

Sungmo Jung - *Auburn University*

Thermal Conductivity Measurement of Gallium Nitride Thin Films Using Thermoreflectance

Student Poster Presentation: InterPACK2023-120361

Jihyun Kim - *Sungkyunkwan University,* **Jaeyoon Ko** - *Sungkyunkwan University,* **Jungwan Cho** - *Sungkyunkwan University*

Thermal Management of GaN-on-Diamond HEMTs Through Electro-Thermal Modeling

Student Poster Presentation: InterPACK2023-120364

Changhwan Song - *Sungkyunkwan University,* **Sukwon Choi** - *The Pennsylvania State University,* **Jungwan Cho** - *Sungkyunkwan University*

Fracture Toughness Measurements of TIM to Copper Bi-Material Samples Under Monotonic and Fatigue Loading After Thermal Cycling

Student Poster Presentation: InterPACK2023-120368

Madhu Kasturi - *Auburn University,* **Pradeep Lall** - *Auburn University*

Additively Printed Circuitry Utilizing Direct Write Technique With Thermoformable Ag Conductive Ink and ECA for SMDs Attachment for in Mold Electronics

Student Poster Presentation: InterPACK2023-120372

Md Golam Sarwar - *Auburn University,* **Ved Soni** - *Auburn University,* **Pradeep Lall** - *Auburn University,* **Scott Miller** - *NextFlex*

A Numerical Study for the Optimization of Extruded Fin Heat Sinks in a Two Socket Immersion Cooled Server

Student Poster Presentation: InterPACK2023-120383

Gautam Gupta - *The University of Texas at Arlington,* **Saket Karajgikar** - *Meta Platforms Inc.,* **Pratik Bansode** - *The University of Texas at Arlington,* **Rohit Suthar** - *The University of Texas at Arlington,* **Sai Abhideep Pundla** - *The University of Texas at Arlington,* **Vibin Shalom** - *The University of Texas at Arlington,* **Krishna Bhavana Sivaraju** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington,* **Veerendra Mulay** - *Meta Platforms Inc.*

Topology Optimization of Two-Layer Pin-Fin Cold Plates

Student Poster Presentation: InterPACK2023-111549

Abhijeet Banthiya - *Purdue University,* **Liang Pan** - *Purdue University,* **Justin A. Weibel** - *Purdue University*

Impact of Immersion Cooling on Thermomechanical Properties of Halogen-Free Substrate Core

Student Poster Presentation: InterPACK2023-120384

Pratik Bansode - *The University of Texas at Arlington*

Rohit Suthar - *The University of Texas at Arlington,* **Mohan Sai Ramalingam** - *The University of Texas at Arlignton,* **Rabin Bhandari** - *The University of Texas at Arlington,* **Akshay Lakshminarayana** - *The University of Texas at Arlington,* **Gautam Gupta** - *The University of Texas at Arlington,* **Vibin Shalom Simon** - *The University of Texas at Arlington,* **Himanshu Modi** - *The University of Texas at Arlington,* **Vivek Nair** - *The University of Texas at Arlington,* **Krishna Bhavana Sivaraju** - *The University of Texas at Arlington,* **Pardeep Shahi** - *The University of Texas at Arlington,* **Satyam Saini** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington*

Energy Analysis of Rear Door Heat Exchangers in Data Centers With Spatial Workload Distribution

Student Poster Presentation: InterPACK2023-120385

Vibin Shalom Simon - *The University of Texas at Arlington,* **Saket Karajgikar** - *Meta Platforms Inc.,* **Sai Abhideep Pundla** - *The University of Texas at Arlington,* **Pratik Bansode** - *The University of Texas at Arlington,* **Gautam Gupta** - *The University of Texas at Arlington,* **Veerendra Mulay** - *Meta Platforms Inc.,* **Dereje Agonafer** - *The University of Texas at Arlington*

Reliability Assessment for Pad Cratering at Board Resin-Glass Interface Under Various Reflows

Student Poster Presentation: InterPACK2023-120436

Padmanava Choudhury - *Auburn University,* **Pradeep Lall** - *Auburn University*

Evolution of Mechanical Behavior in Bulk and Joint SAC+Bi Solders Subjected to Various Thermal Exposure Profiles

Student Poster Presentation: InterPACK2023-120456

Mohammad Al Ahsan - *Auburn University,* **Souvik Chakraborty** - *Auburn University,* **Jeffrey Suhling** - *Auburn University,* **Pradeep Lall** - *Auburn University*

Analysis of Crystallographic Slip Shear Strains in SAC Polycrystals Subjected to External Shear Loads

Student Poster Presentation: InterPACK2023-120457

Debabrata Mondal - *Auburn University,* **Jeffrey Suhling** - *Auburn University,* **Elham Mirkoohi** - *Auburn University,* **Pradeep Lall** - *Auburn University*

Evolution on the Creep Response of SAC305 Due to Damage Accumulation During Mechanical Cycling at Elevated Temperature

Student Poster Presentation: InterPACK2023-120459

Golam Rakib Mazumder - *Auburn University,* **Souvik Chakraborty** - *Auburn University,* **Mahbub Alam Maruf** - *Auburn University,* **Jeff Suhling** - *Auburn University*

Evaluation of the Performance and Repairability of Inkjet-Printed Functional Circuits Printed Using Non-Volatile Water-Based Silver Ink

Student Poster Presentation: InterPACK2023-120464

Shriram Kulkarni - *Auburn University,* **Pradeep Lall** - *Auburn University*

The Effects of Mechanical Cycling and Aging on the Mechanical Properties and Microstructure of Lead-Free Solder Alloys

Student Poster Presentation: InterPACK2023-120465

Mahbub Alam Maruf - *Auburn University,* **Golam Rakib Mazumder** - *Auburn University,* **Souvik Chakraborty** - *Auburn University,* **Jeffrey C. Suhling** - *Auburn University,* **Pradeep Lall** - *Auburn University*

Comparative Analysis of Thermal Cycling Performances of SAC, LTS, and Hybrid SAC-LTS BGAs Using the Finite Element Method

Student Poster Presentation: InterPACK2023-120466

Souvik Chakraborty - *Auburn University,* **Debabrata Mondal** - *Auburn University,* **Jeffrey C. Suhling** - *Auburn University, Pradeep Lall - Auburn University*

Cross-Sectional Thermal Analysis of Multilayer Ceramic Capacitors

Student Poster Presentation: InterPACK2023-120470

Daniel Shoemaker - *The Pennsylvania State University,* **Pedram Yousefian** - *The Pennsylvania State University,* **Yiwen Song** - *The Pennsylvania State University,* **Angela Ellmore** - *Knowles (UK) Ltd.,* **Michael Lanagan** - *The Pennsylvania State University,* **Clive Randall** - *The Pennsylvania State University,* **Susan Trolier-Mckinstry** - *The Pennsylvania State University,* **Sukwon Choi** - *The Pennsylvania State University*

Topology Optimization of Heat Exchange Surfaces Using Neural Network-Based Surrogate Models

Student Poster Presentation: InterPACK2023-111569

Saeel Shrivallabh Pai - *Purdue University,* **Abhijeet Banthiya** - *Purdue University,* **Liang Pan** - *Purdue University,* **Justin A. Weibel** - *Purdue University*

Thermal Analysis of α-Phase Gallium Oxide MOSFETs Using Micro-Raman Spectroscopy

Student Poster Presentation: InterPACK2023-120471

Anwarul Karim - *The Pennsylvania State University,* **Yiwen Song** - *The Pennsylvania State University,* **Daniel Shoemaker** - *The Pennsylvania State University,* **Dae-Woo Jeon** - *Korea Institute of Ceramic Engineering and Technology,* **Jae Kyoung Mun** - *Electronics and Telecommunications Research Institute,* **Sukwon Choi** - *The Pennsylvania State University*

Thermal Characterization of Lead Zirconate Titanate (PZT) Piezoelectric Mems Actuators

Student Poster Presentation: InterPACK2023-120473

Yiwen Song - *The Pennsylvania State University,* **Daniel Shoemaker** - *The Pennsylvania State University,* **Kyuhwe Kang** - *The Pennsylvania State University,* **Pannawit Tipsawat** - *The Pennsylvania State University,* **Christopher Cheng** - *The Pennsylvania State University,* **Wanlin Zhu** - *The Pennsylvania State University,* **Michael Labella** - *The Pennsylvania State University,* **Susan Trolier-Mckinstry** - *The Pennsylvania State University,* **Sukwon Choi** - *The Pennsylvania State University*

Thermal Conductivity of Aluminum Boron Nitride for Ferroelectric Random-Access Memory Applications

Student Poster Presentation: InterPACK2023-120475

Kyuhwe Kang - *The Pennsylvania State University,* **Yiwen Song** - *The Pennsylvania State University,* **Joseph Casamento** - *The Pennsylvania State University,* **Nathaniel Mcilwaine** - *The Pennsylvania State University,* **Daniel Shoemaker** - *The Pennsylvania State University,* **Jon-Paul Maria** - *The Pennsylvania State University,* **Susan Trolier-Mckinstry -** *The Pennsylvania State University,* **Sukwon Choi** - *The Pennsylvania State University*

Encapsulated Phase Change Materials for Thermal Gradient Mitigation Embedded in Silicone Gel Insulation

Student Poster Presentation: InterPACK2023-120488

Joshua Kasitz - *University of Arkansas,* **Muhammad Ghufran** - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Characterization of Capillary Pressure and Two-Phase Relative Permeability in Porous Sintered Copper Vapor Chamber Wicks

Student Poster Presentation: InterPACK2023-120489

Bhaskarjyoti Sarma - *Purdue University,* **Justin A. Weibel** - *Purdue University,* **Srivathsan Sudhakar** - *Purdue University,* **Dominik Tomasz Nasilowski** - *Purdue University*

Making Photonic Crystals

Student Poster Presentation: InterPACK2023-112352

Anas Saydullayev - *OOO YUNI ORG TRANS*

Thermal Management for Enhancing Power Efficiency in GaN HEMTs Devices for RF Applications

Student Poster Presentation: InterPACK2023-111658

Junrae Park - *Chung-Ang University,* **Minsoo Kang** - *Chung-Ang University,* **Hyun-Wook Jung** - *Electronics and Telecommunications Research Institute,* **Ho-Kyun Ahn** - *Electronics and Telecommunications Research Institute,* **Haecheon Kim** - *Chung-Ang University,* **Hyoungsoon Lee** - *Chung-Ang University*

Thermal Management of SiC Power Module Under Pulsed Loading Using Three-Component Composite Phase Change Material

Student Poster Presentation: InterPACK2023-111967

Vivek Manepalli - *University of Maryland, College Park,* **Andoniaina Randriambololona** - *University of Maryland, College Park,* **Bidisha Ojha** - *Washington University in St. Louis,* **Kidus Guye** - *University of Maryland, College Park,* **Damena Agonafer** - *University of Maryland, College Park*

Variable Area Jet Impingement Cooling for High Voltage Power Electronics

Student Poster Presentation: InterPACK2023-113590

Reece Whitt - *University of Arkansas, David Huitink - University of Arkansas*

Performance of SAC305 Solder Joints Under Simultaneous Tensile and Electromigration Stressing

Student Poster Presentation: InterPACK2023-113594

Whit Vinson - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Characterization of SAC305 Solder Joints Under Elevated Current, Temperature, and Shear Stress Conditions

Student Poster Presentation: InterPACK2023-113825

Collin Ruby - *University of Arkansas,* **David Huitink** - *University of Arkansas*

WEDNESDAY, OCTOBER 25, 2023

06-03 PRINT PROCESS OPTIMIZATION I
9:15 AM TO AM–10:45 AM **SHUTTERS WEST I**

Chair: Dainel Hines - *Raytheon TechnologiesBenjamin Leever - Air Force Research Laboratory*
Co-Chair: Benjamin Leever - *Air Force Research LaboratorySukwon Choi - The Pennsylvania State University*

Control and Reliability in Aerosol Jet Printed Electronics via In-Line Monitoring of the Aerosol Stream, {InterPACK2023-111251}

Technical Presentation Only: InterPACK2023-111251

Ethan Secor - *Iowa State University,* **Jeremy Rurup** - *Iowa State University*

Effect of Orientation on the Dual-Orifice Synthetic Jet Impingement Over a Flat Heated Surface, {InterPACK2023-119586}

Technical Presentation Only

Faisal Ahmed - *Auburn University,* **Mohammad Azarifar** - Auburn University, **Mehmet Arik** - *Auburn University*

Process Performance Interactions for Additively Printed Water-Based Nanoparticle Sustainable Silver-Ink With Ultrasonic Atomization on Aerosol Jet Printer, {InterPACK2023-111958}

Technical Paper Publication: InterPACK2023-111958

Pradeep Lall - *Auburn University,* **Daniel Karakitie** - *Auburn University,* **Scott Miller** - *NextFlex*

Sustainable Silver Ink Flexible Circuits Fabrication Using Direct Write Additive Manufacturing Techniques, {InterPACK2023-112001}

Technical Paper Publication: InterPACK2023-112001

Pradeep Lall - *Auburn University,* **Fatahi Musa** - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** - *NextFlex*

02-02 IMMERSION COOLING II
9:15 AM TO AM–10:45 AM **SHUTTERS EAST I**

Chair: Girish Anant Kini - *AMDdvanced Micro Devices*
Co-Chair: Aalok Gaitonde - *Purdue University*

A New Low-GWP Dielectric Fluid for Two-Phase Immersion Cooling, {InterPACK2023-111743}

Technical Paper Publication: InterPACK2023-111743

Gustavo Pottker - *The Chemours Company,* **Abigail Van Wassen** - *The Chemours Company,* **Drew Brandt** - *The Chemours Company*

Optimization of an Air-Cooled Heatsink for Immersion Cooling Application, {InterPACK2023-112054}

Technical Paper Publication: InterPACK2023-112054

Gautam Gupta - *The University of Texas aAt Arlington,* **Vivek Nair** - *The University of Texas at Arlington,* **Sai Abhideep Pundla** - *The University of Texas at Arlington,* **Pratik Bansode** - *The University of Texas at Arlington,* **Rohit Suthar** - *The University of Texas at Arlington,* **Joseph Herring** - *The University of Texas at Arlington,* **Jacob Lamotte-Dawaghreh** - *The University of Texas at Arlington,* **Krishna Bhavana Sivaraju** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington,* **Poornima Mynampati** - *Silent-Aire USA Inc.,* **Mike Sweeney** - *Silent-Aire USA Inc.*

A Numerical Study Comparing Forced and Natural Convection in a High-Density Single-Phase Immersed Cooled Server (InterPACK2023-112065)

Technical Paper Publication: InterPACK2023-112065

Gautam Gupta - *The University of Texas at Arlington,* **Vivek Nair** - *The University of Texas at Arlington,* **Pratik Bansode** - *The University of Texas at Arlington,* **Rohit Suthar** - *The University of Texas at Arlington,* **Sai Abhideep Pundla** - *The University of Texas at Arlington,* **Joseph Herring** - *The University of Texas at Arlington,* **Jacob Lamotte-Dawaghreh** - *The University of Texas at Arlington,* **Krishna Bhavana Sivaraju** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington*, **Poornima Mynampati** - *Silent-Aire USA Inc.,* **Mike Sweeney** - *Silent-Aire USA Inc.*

Compact Modeling and Thermal Analysis of Immersion Based Hybrid Cooled Server, {InterPACK2023-112084}

Technical Paper Publication: InterPACK2023-112084

Vibin Shalom Simon - *The University of Texas aAt Arlington,* **Bhavana Reddy Mandadi** - *The University of Texas at Arlington,* **Pardeep Shahi** - *The University of Texas at Arlington,* **Himanshu Modi** - *The University of Texas at Arlington,* **Pratik Vithoba Bansode** - *The University of Texas at Arlington, Dereje Agonafer - The University of Texas at Arlington*

07-03 RELIABILITY OF PPOLYMERS AND IINTERFACES

9:15 AM TO AM–10:45 AM **SHUTTERS WEST II**

Chair: Joyce Weiner - *Intel*
Co-Chair: Fabian Welschinger - *Robert Bosch GmbHh*

Evolution of Thermal Interface Material-to-Copper Interfacial Fracture Toughness Subjected to Monotonic and Fatigue Loading After Thermal Cycling, {InterPACK2023-111977}

Technical Paper Publication: InterPACK2023-111977

Pradeep Lall - *Auburn University,* **Madhu Kasturi** - *Auburn University*

Assessment of Propensity for Pad Cratering at the Board Resin-Glass Interface Under Assembly and Rework, {InterPACK2023-112014}

Technical Paper Publication: InterPACK2023-112014

Pradeep Lall - *Auburn University,* **Padmanava Choudhury** - *Auburn University,* **Aathi Pandurangan** - *Auburn University*

Prediction of Pad Cratering Performance at Copper-Resin Interfaces With Multiple Reflows, {InterPACK2023-111925}

Technical Paper Publication: InterPACK2023-111925

Pradeep Lall - *Auburn University,* **Aathi Pandurangan** - *Auburn University,* **Padmanava Choudhury** - *Auburn University*

Effect of Thermal Cycling on Interfacial Fracture Toughness of Electronic Mold Compound-to-Substrate Interface Subjected to Monotonic and Fatigue Loading, {InterPACK2023-111976}

Technical Paper Publication: InterPACK2023-111976

Pradeep Lall - *Auburn University,* **Madhu Kasturi** - *Auburn University*

04-03 POWER/RF ELECTRONICS AND PHOTONICS III

9:15 AM TO AM–10:45 AM **SHUTTERS EAST II**

Chair: Michael Fish - *United U.States S. Army Combat Capabilities Development EVCommandOM Army Research Laboratory*

Thermal Evaluation of Emerging Ultra-Wide Bandgap Semiconductors for Power Electronics, {InterPACK2023-119573}

Technical Presentation Only: InterPACK2023-119573

Georges Pavlidis - *University of Connecticut,* **Bivek Bista** - *University of Connecticut,* **Muhammad Jamil** - *University of Connecticut,* **Francis Vasquez** - *University of Connecticut,* **Ismael Morales Soto** - *University of Connecticut*

Thermal Analysis of α-Phase Gallium Oxide MOSFETosfets Using Micro-Raman Spectroscopy, {InterPACK2023-111942}

Technical Presentation Only: InterPACK2023-111942

Anwarul Karim - *The Pennsylvania State University,* **Yiwen Song** - *The Pennsylvania State University,* **Daniel Shoemaker** - *The Pennsylvania State University,* **Dae-Woo Jeon** - *Korea Institute of Ceramic Engineering and Technology,* **Jae Kyoung Mun** - *Electronics and Telecommunications Research Institute,* **Sukwon Choi** - *The Pennsylvania State University*

Thermal Conductivity of Aluminum Boron Nitride for Ferroelectric Random-Access Memory Applications, {InterPACK2023-111983}

Technical Presentation Only: InterPACK2023-111983

Kyuhwe Kang - *The Pennsylvania State University,* **Yiwen Song** - *The Pennsylvania State University,* **Joseph Casamento** - *The Pennsylvania State University,* **Nathaniel Mcilwaine** - *The Pennsylvania State University,* **Daniel Shoemaker** - *The Pennsylvania State University,* **Jon-Paul Maria** - *The Pennsylvania State University,* **Susan Trolier-Mckinstry** - *Pennsylvania State University,* **Sukwon Choi** - *The Pennsylvania State University*

Wide and Ultrawide Bandgap Photoconductor Based Optically Addressed Light Valve, {InterPACK2023-120487}

Technical Presentation Only: InterPACK2023-120487

Bikramjit Chatterjee - *Lawrence Livermore National Laboratory,* **Soroush Ghandiparsi** - *Lawrence Livermore National Laboratory, Qinghui Shao - Lawrence Livermore National Laboratory,* **Miranda Gottlieb** - *Lawrence Livermore National Laboratory,* **Clint Frye** - *Lawrence Livermore National Laboratory,* **Lars Voss** - *Lawrence Livermore National Laboratory*

06-04 PRINT PROCESS OPTIMIZATION II
11:00 AM TO AM–12:30 PM PM **SHUTTERS WEST II**

Chair: Beth Paquette - *National Aeronautics and Space AdministrationBenjamin Leever - Air Force Research Laboratory*
Co-Chair: Benjamin Leever - *Air Force Research LaboratorySukwon Choi - The Pennsylvania State University*

Direct Write Aerosol Jet Printing at Sandia National Laboratories, {InterPACK2023-119416}

Technical Presentation Only: InterPACK2023-119416

Judi Lavin - *Sandia National Laboratories*

Line Width and Electrical Performance Prediction for Inkjet Printed Conductors-Resistors-Inductors-Capacitors, {InterPACK2023-111980}

Technical Paper Publication: InterPACK2023-111980

Pradeep Lall - *Auburn University,* **Shriram Kulkarni** - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** - *NextFlex*

Evaluation of Additive Circuits Printed With Sustainable Aqueous Silver Inks Using Aerosol Jet Printing and Gravure Offset Printing and Investigation of Circuit Repairability, {InterPACK2023-112058}

Technical Paper Publication: InterPACK2023-112058

Pradeep Lall - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** - *NextFlex*

Investigation of Performance and Repairability of Additively Printed Functional Circuits With Water-Based Silver Ink on an Inkjet Platform, {InterPACK2023-114686}

Technical Paper Publication: InterPACK2023-114686

Pradeep Lall - *Auburn University,* **Shriram Kulkarni** - *Auburn University,* **Scott Miller** - *NextFlex*

05-03 SINGLE-PPHASE AND TWO-PPHASE FLOW
11:00 AM TO AM–12:30 PM PM SHUTTERS WEST I

Chair: Jorge Padilla - *Google LLC*
Co-Chair: Nenad MiljkovicRonald Warzoha - *United University of Illinois Urbana-ChampaignU.States S. Naval Academy*

Evolution of Physical Properties of Liquid Film During Evaporation Process: Drying and Evaporation Process of Inkjet Liquid Film, {InterPACK2023-111660}

Technical Paper Publication: InterPACK2023-111660

Keisuke Kichise - *Tokyo Institute of Technology,* **Yoshihiro Harada** - *Tokyo Institute of Technology,* **Shinichi Kuramoto** - *Tokyo Institute of Technology,* **Masami Kadonaga** - *Tokyo Institute of Technology,* **Kazuyoshi Fushinobu** - *Tokyo Institute of Technology,* **Koichi Kato** - *Tokyo Institute of Technology*

Boiling Limit on Textured Oil-Impregnated Surfaces, {InterPACK2023-111736}

Technical Paper Publication: InterPACK2023-111736

Yimin Zhou - *University of Michigan-Ann arbor,* **Solomon Adera** - *University of Michigan-Ann Arbor*

Development of Ceramic Pulsating Heat Pipes for Medium-Voltage Power Electronics, {InterPACK2023-111917}

Technical Paper Publication: InterPACK2023-111917

Ramy Abdelmaksoud - *Advanced Cooling Technologies, Inc.,* **Jeffrey Diebold** - *Advanced Cooling Technologies, Inc.,* **Sai Kiran Hota** - *Advanced Cooling Technologies, Inc.,* **Kuan-Lin Lee** - *Advanced Cooling Technologies, Inc.,* **Shivangi Sinha** - *University of Colorado Boulder,* **Dragan Maksimovic** - *University of Colorado, Boulder*

Thermal and Hydraulic Performance Analyses of Machined and Hybrid Printed Oblique-Fin Cold Plates, {InterPACK2023-111575}

Technical Paper Publication: InterPACK2023-111575

Matthew Law - *National University of Singapore,* **Sin Liang Soh** - *National University of Singapore,* **Wei Wang** - *National University of Singapore,* **Poh Seng Lee** - *National University of Singapore,* **Wen Feng Lu** - *National University of Singapore*

03-03 THERMAL MANAGEMENT AND RELIABILITY I
11:00 AM TO AM–12:30 PM PM **SHUTTERS EAST I**

Chair: Mahendra Harsha, *Qualcomm*
Co-Chair: Nakul Kothari, *Qualcomm*

Experimental Characterization of Confined, Package-Level Direct Two-Phase Jet Impingement Cooling With Micro-Pin Fin Surface Enhancement, {InterPACK2023-109944}

Technical Paper Publication: InterPACK2023-109944

Qianying Wu - *Stanford University,* **Zheng Gong** - *Purdue University,* **Chih-Yao Chan** - *Purdue University,* **Heungdong Kwon** - *Stanford University,* **Kenneth Goodson** - *Stanford University,* **Tiwei Wei** - *Purdue University*

Reliability of Copper Inverse Opal Surfaces for Extreme-Heat-Flux Micro-Coolers in Low-Global-Warming-Potential Refrigerant R-1233zd Pool Boiling Experiments, {InterPACK2023-113781}

Technical Paper Publication: InterPACK2023-113781

Bidzina Kekelia - *National Renewable Energy Laboratory,* **Qianying Wu** - *Stanford University,* **Sreekant Narumanchi** - *National Renewable Energy Laboratory,* **Joshua Major** - *National Renewable Energy Laboratory,* **Gilbert Moreno** - *National Renewable Energy Laboratory,* **Mehdi Asheghi** - *Stanford University,* **Ercan Dede** - *Toyota Research Institute of North America,* **James Palko** - *University of California, Merced,* **Kenneth Goodson** - *Stanford University*

Enhanced Boiling Heat Transfer on a Capillary-Driven Two-Layer Thin Evaporator, {InterPACK2023-111878}

Technical Presentation Only: InterPACK2023-111878

Daeyoung Kong - *Chung-Ang University,* **Heungdong Kwon** - *Stanford University,* **Kiwan Kim** - *Chung-Ang University,* **Roman Giglio** - *University of California, Merced,* **Muhammad Shattique** - *University of California, Merced,* **Chi Zhang** - *Stanford University,* **James Palko** - *University of California, Merced,* **Mehdi Asheghi** - *Stanford University,* **Kenneth Goodson** - *Stanford University,* **Hyoungsoon Lee** - *Chung-Ang University*

Experimental Investigation on Thermo-Hydraulic Performance of 3-D Manifold Microchannel (MmcMC) for Embedded Cooling, {InterPACK2023-112047}

Technical Presentation Only: InterPACK2023-112047

Young Jin Lee - *KAIST,* **Sung Jin Kim** - *KAIST*

04-04 POWER/RF ELECTRONICS AND PHOTONICS IV
11:00 AM TO AM–12:30 PM PM **SHUTTERS EAST II**

Chair: Sevket Yuruker, *Tesla Inc.*

Prediction of the Localized Heating-Induced Size Effects in Semiconductors Based on the Heat Generation Characteristics and the Material Thermophysical Properties, {InterPACK2023-111501}

Technical Paper Publication: InterPACK2023-111501

Amir Abdolhosseinzadeh - *Boğaziçi University,* **Emine Goktepe** - *Boğaziçi University,* **Nazli Donmezer** - *Boğaziçi University*

Thermal Characterization of Lead Zirconate Titanate (PZTzt) Piezoelectric Mems Actuators, {InterPACK2023-111926}

Technical Presentation Only: InterPACK2023-111926

Yiwen Song - *The Pennsylvania State University,* **Daniel Shoemaker** - *The Pennsylvania State University,* **Kyuhwe Kang** - *The Pennsylvania State University,* **Pannawit Tipsawat** - *The Pennsylvania State University,* **Christopher Cheng** - *The Pennsylvania State University,* **Wanlin Zhu** - *The Pennsylvania State University,* **Michael Labella** - *The Pennsylvania State University,* **Susan Trolier-Mckinstry** - *The Pennsylvania State University,* **Sukwon Choi** - *The Pennsylvania State University*

Thermal Transport in Cubic Silicon Carbide Crystals and Cross Integrated Interfaces, {InterPACK2023-111503}

Technical Presentation Only: InterPACK2023-111503

Zhe Cheng - *University of Illinois at Urbana-Champaign,* **Jianbo Liang** - *Osaka Metropolitan University,* **Keisuke Kawamura** - *Air Water Inc.,* **Tianli Feng** - *The University of Utah,* **Hidetoshi Asamura** - *Air Water Inc.,* **Hiroki Uratani** - *Air Water Inc.,* **Samuel Graham** - *Georgia Institute of Technology,* **David Cahill** - *University of Illinois at Urbana-Champaign*

Thermal Conductivity Measurement of Gallium Nitride Thin Films Using Thermoreflectance, {InterPACK2023-111785}

Technical Presentation Only: InterPACK2023-111785

Jihyun Kim - *Sungkyunkwan University,* **Jaeyoon Ko** - *Sungkyunkwan University,* **Jungwan Cho** - *Sungkyunkwan University*

03-08 MEASUREMENT OF PROPERTIES AND CHARACTERISTICS

2:45 PM TO PM–4:15 PM PM **LOFT I**

Chair: Pardeep Shahi, *NVIDIA Corporatio*
Co-Chair: Mahendra Harsha, *Qualcomm*

Transient Thermal Analysis of Electronic Devices Under Solar Radiation, {InterPACK2023-111809}

Technical Presentation Only: InterPACK2023-111809

Ryuta YasuiASUI - *Tokyo Institute of Technology,* **Kazuyoshi Fushinobu** - *Tokyo Institute of Technology*

Condition Monitoring of Semiconductors Using Wide Band Acoustic Emission Sensors, {InterPACK2023-111922}

Technical Paper Publication: InterPACK2023-111922

Josef Frankhouse - *University of Arkansas,* **Jackson Marsh** - *University of Arkansas,* **Han Hu** - *University of Arkansas*

Characterization of the Thermal Performance of an FCBGAcbga With High-K Graphite TIMim, {InterPACK2023-112021}

Technical Presentation Only: InterPACK2023-112021

JoonyoungOONYOUNG ChoiHOI - *JCET STATS ChipPAC Korea,* **Woosoon Kim** - *JCET STATS ChipPAC Korea,* **Sukbin Yoon** - *JCET STATS ChipPAC Korea,* **Seongkwon Hong** - *JCET STATS ChipPAC Korea,* **Yonghyuk Jeong** - *JCET STATS ChipPAC Korea,* **Soohan Park** - *JCET STATS ChipPAC Korea,* **Yongtaek Lee** - *JCET STATS ChipPAC Korea*

Study of Flow-Dependent Characteristics of HFE 7500 Coolant Dielectric Strength, {InterPACK2023-111951}

Technical Paper Publication: InterPACK2023-111951

Bryan Tunon - *University of Arkansas, David Huitink - University of Arkansas*

05-08 SINGLE-PHASE AND TWO-PHASE FLOW II

2:45 PM TO 4:15 PM **SHUTTERS EAST II**

Chair: Ronald Warzoha - *United States Naval Academy*

Two-Tier Vertically Aligned Carbon Nanotube Channels for Significantly Enhanced Flow Boiling Heat Transfer, {InterPACK2023-110777}

Technical Presentation Only

Jungho Ahn - *Sungkyunkwan University,* **Wonjae Jeon** - *Sungkyunkwan university,* **Hyeong-Geun Kim** - *Sungkyunkwan University,* **Sung-Min Kim** - *Sungkyunkwan University,* **Seunghyun Baik** - *Sungkyunkwan University*

Effects of the Porosity Variation in a Pin-Fin Heat Sink on Flow Boiling Heat Transfer, {InterPACK2023-112110}

Technical Presentation Only

Juhyeon Lee - *KAIST,* **Sung Jin Kim** - *KAIST*

Two-Phase Cold Plate Evaporator Designs for High Power Dissipation, {InterPACK2023-113373}

Technical Presentation Only

David Apigo - *Nokia Bell Labs,* **Sarwesh Parbat** - *Nokia Bell Labs,* **Syed Faisal** - *Nokia Bell Labs,* **Rishav Roy** - *Nokia Bell Labs,* **Haoyun Qiu** - *University of Illinois Urbana-Champaign,* **Pouya Kabirzadeh** - *University of Illinois Urbana-Champaign,* **Nenad Miljkovic** - *University of Illinois Urbana-Champaign,* **Todd Salamon** - *Nokia Bell Labs*

Extraordinary Two-Phase Heat Transfer Enhancement Using Femtosecond Laser Surface Processed (Flsp) Metallic Surfaces in Pool Boiling, {InterPACK2023-118766}

Technical Presentation Only

Justin Costa-Greger - *University of Nebraska-Lincoln,* **Alfred Tsubaki** - *University of Nebraska-Lincoln,* **Andrew Reicks** - *University of Nebraska-Lincoln,* **Craig Zuhlke** - *University of Nebraska-Lincoln,* **George Gogos** - *University of Nebraska-Lincoln*

05-09 PHASE CHANGE MATERIALS AND TRANSIENT THERMAL MANAGEMENT II

2:45 PM TO 4:15 PM **SHUTTERS WEST I**

Chair: Nenad Miljkovic - *University of Illinois At Urbana-Champaign*

Non-Leaking Healable Phase Change Thermal Interface Materials by Chemical Functionalization, {InterPACK2023-111444}

Technical Presentation Only

SHABAS AHAMMED ABDUL JALEEL - *Sungkyunkwan University,* **Taehun Kim** - *Sungkyunkwan University,* **Seunghyun Baik** - *sungkyunkwan university*

Adaptive Evaporative Cooling for Energy-Efficient Transient Thermal Control, {InterPACK2023-111918}

Technical Presentation Only

Li Shan - *University of Texas at Dallas,* **Deepak Monga** - *University of Texas at Dallas,* **Dylan Boylan** - *University of Texas at Dallas,* **Fangying Chen** - *University of Texas at Dallas,* **Xianming Dai** - *University of Texas Dallas*

Dynamical System Analysis of an Oscillating Heat Pipe to Guide Sustained Oscillations, {InterPACK2023-112490}

Technical Presentation Only

Rishav Roy - *Nokia Bell Labs,* **Sarwesh Parbat** - *Nokia Bell Labs,* **Todd Salamon** - *Nokia Bell Labs*

06-05 ADVANCED PROCESSING & MODELING FOR PRINTED & FLEXIBLE ELECTRONICS

4:30 PM TO PM–6:00 PM PM **SHUTTERS WEST I**

Chair: Benjamin Leever - *Air Force Research Laboratory*
Co-Chair: Kyungjin Kim - *University of Connecticut*

Advancing Printed RFf Design Through Statistical Analysis, Functional Materials, and Conformal Design, {InterPACK2023-110768}

Technical Presentation Only: InterPACK2023-110768

Samuel Fedorka - *University of Massachusetts Lowell,* **Basil Vanderbie** - *University of Massachusetts Lowell,* **Christopher Molinari** - *University of Massachusetts Lowell,* **Lucas Unger** - *University of Massachusetts Lowell,* **Bradley Pothier** - *University of Massachusetts Lowell,* **Katherine Berry** - *University of Massachusetts Lowell,* **Gary Walsh** - *DEVCOM Soldier Center,* **Corey Shemelya** - *University of Massachusetts UMass Lowell*

Modeling Curing Process Using Multi-Physics FEMem Simulation and CNNnn Based U-Net Model, {InterPACK2023-110827}

Technical Presentation Only: InterPACK2023-110827

KyeongBin Kim - *Sungkyunkwan University,* **Eun-Ho Lee** - *Sungkyunkwan University*

Impact of Component Interconnectivity on Mechanical and Electrical Properties of Flexible Hybrid Electronics Wwith Printed Water-Bbased Silver Ink Circuits, {InterPACK2023-112012}

Technical Paper Publication: InterPACK2023-112012

Pradeep Lall - *Auburn University,* **Fatahi Musa** - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** - *NextFlex*

Comparison of Machine Learning Approaches for Correlating Print Process Parameters to Realized Physical and Electrical Characteristics of Printed Electronics Using Inkjet Platform, {InterPACK2023-112056}

Technical Paper Publication: InterPACK2023-112056

Pradeep Lall - *Auburn University,* **Ved Soni** - *Auburn University,* **Shriram Kulkarni** - *Auburn University,* **Scott Miller** - *NextFlex*

02-03 HARDWARE COOLING

4:30 PM TO PM–6:00 PM PM **SHUTTERS EAST I**

Chair: Mehmet Arik - *Auburn University*
Co-Chair: Solomon Adera - *University of Michigan*

"Thermal, Hydraulic and Reliability Analysis of Single-Phase Liquid Coolants for Direct-to-Chip Cold Plate Cooling in High-Performance Computing Systems", {InterPACK2023-110576}

Technical Paper Publication: InterPACK2023-110576

Pardeep Shahi - *NVIDIA Corporation,* **Ali Heydari** - *NVIDIA Corporation,* **Chandraprakash Hinge** - *The University of Texas at Arlington,* **Lochan Sai Reddy Chinthaparthy** - *The University of Texas at Arlington,* **Himanshu Modi** - *The University of Texas at Arlington,* **Harold Miyamura** - *NVIDIA Corporation,* **Mohammad Tradat** - *NVIDIA Corporation,* **Uschas Chowdhury** - *NVIDIA Corporation,* **Vahideh Radmard** - *NVIDIA Corporation,* **Dereje Agonafer** - *The University of Texas at Arlington, Jeremy Rodriguez - NVIDIA Corporation*

Thermal-Hydraulic Characterization of Thermosyphon Cooling System for Highly Compact Edge MicroDataCenter. Part I: Design and Experiments, {InterPACK2023-111837}

Technical Paper Publication: InterPACK2023-111837

Gautier Rouaze - *JJ Cooling Innovation SÀRL,* **Enzo Minazzo** - *JJ Cooling Innovation SÀRL,* **Jackson Marcinichen** - *JJ Cooling Innovation SÀRL,* **John Thome** - *JJ Cooling Innovation SÀRL,* **Fred Buining** - *HIRO-MicroDataCenters BV*

Thermal-Hydraulic Characterization of Thermosyphon Cooling System for Highly Compact Edge MicroDataCenter. Part II: Solver Validation, {InterPACK2023-111848}

Technical Paper Publication: InterPACK2023-111848

Enzo Minazzo - *JJ Cooling Innovation SÀRL,* **Gautier Rouaze** - *JJ Cooling Innovation SÀRL,* **Jackson Marcinichen** - *JJ Cooling Innovation SÀRL,* **John Thome** - *JJ Cooling Innovation SÀRL,* **Fred Buining** - *HIRO-MicroDataCenters BV*

Prediction of Fin Array Heat Sink Performance Under Two-Phase Immersion Cooling, {InterPACK2023-111533}

Technical Presentation Only: InterPACK2023-111533

Yanbo Huang - *Purdue University,* **Bhaskarjyoti Sarma** - *Purdue University,* **Justin Weibel** - *Purdue University*

03-04 THERMAL MANAGEMENT AND RELIABILITY II

4:30 PM TO PM–6:00 PM PM **SHUTTERS EAST II**

Chair: Pardeep Shahi, *NVIDIA Corporation*
Co-Chair: Nakul Kothari, *Qualcomm*

"Development of Thermal Metrology Standards for Experimental Characterization of Thermal Resistance for Single-Phase Liquid Cold Plates", {InterPACK2023-113883}

Technical Paper Publication: InterPACK2023-113883

Alfonso Ortega - *Villanova University,* **Victor Martinez** - *Villanova University,* **Carol Caceres** - *Villanova University,* **Ali Heydari** - *NVIDIAvidia Corporation,* **Uschas Chowdhury** - *NVIDIAvidia Corporation*

Numerical Modeling of Forced Air Convection for Thermal Management in Automotive ECU: A Component and System Level Study, {InterPACK2023-110688}

Technical Paper Publication: InterPACK2023-110688

Joseph Oh - *Hitachi America Ltd.,* **Kenneth Taylor** - *Hitachi Astemo Americas, Inc.*

Passive Check Valves for Flat-Plate Pulsating Heat Pipes, {InterPACK2023-112049}

Technical Presentation Only: InterPACK2023-112049

Chuljae Jung - *KAIST,* **Sung Jin Kim** - *KAIST*

Experimental Investigation on the Thermal Performance of the Pulsating Heat Pipe With the Transversely Grooved Channel, {InterPACK2023-112050}

Technical Presentation Only: InterPACK2023-112050

Young Jong Lee - *KAIST,* **Sung Jin Kim** - *KAIST*

07-04 RELIABILITY OF IINTERFACES

4:30 PM TO PM–6:00 PM PM **SHUTTERS WEST II**

Chair: Joyce Weiner - *Intel*
Co-Chair: Przemyslaw Gromala - *Robert Bosch GmbHh*

Propensity for Fatigue Failure of the FCBGA UF-Substrate Interface After Prolonged Storage, {InterPACK2023-112052}

Technical Paper Publication: InterPACK2023-112052

Pradeep Lall - *Auburn University,* **Padmanava Choudhury** - *Auburn University*

Effect of Surface Treatment on the Fatigue Crack Propagation in a TIM/Copper Interface Subjected to High-Temperature Long-Term Exposure, {InterPACK2023-112070}

Technical Paper Publication: InterPACK2023-112070

Pradeep Lall - *Auburn University,* **Yunli Zhang** - *Auburn University*

Prediction of Failure at FCBGA Interfaces Under Thermo-Mechanical Loads Using a Competing Risk Cohesive Zone Model, {InterPACK2023-111937}

Technical Paper Publication: InterPACK2023-111937

Pradeep Lall - Auburn University, **Aathi Pandurangan** - *Auburn University,* **Madhu Kasturi** - *Auburn University*

Predictive Modeling of High-G Potted Assemblies With Fine Pitch Electronics After Sustained High-Temperature Exposure, {InterPACK2023-111950}

Technical Paper Publication: InterPACK2023-111950

Pradeep Lall - *Auburn University,* **Aathi Pandurangan** - *Auburn University,* **Ken Blecker** - *U.S. Army CCDC-AC*

THURSDAY, OCTOBER 26, 2023

05-04 PHASE CHANGE MATERIALS AND TRANSIENT THERMAL MANAGEMENT

9:15AM–10:45AM **SHUTTERS WEST I**

Chair: **Adam Wilson** - *U.S. Army Research Laboratory*
Co-Chair: **Ronald Warzoha** - *U.S. Naval Academy*

Experimental Validation of a Heuristic Control Strategy for a Transient Thermal Management System With Latent Thermal Energy Storage

Technical Paper Publication: InterPACK2023-111816

Michael Shanks - *Purdue University,* **Uduak Inyang-Udoh** - *Purdue University,* **Neera Jain** - *Purdue University*

Thermal and Electrical Performance of Silicone Gel Insulation With Encapsulated Phase Change Material Additives

Technical Paper Publication: InterPACK2023-111964

Joshua Kasitz - *University of Arkansas,* **Muhammad Ghufran** - *University of Arkansas,* **David Huitink** - *University of Arkansas*

Efficient and Rapid Electro-Thermal Pulse Deicing, Defrosting, and Desnowing for Electrified Aircraft Systems

Technical Presentation Only: InterPACK2023-113739

Muhammad Jahidul Hoque - *University of Illinois at Urbana Champaign,* **Siavash Khodakarami** - *University of Illinois Urbana-Champaign,* **Alex Solecki** - *University of Illinois at Urbana-Champaign,* **Wentao Yang** - *University of Illinois Urbana-Champaign,* **Pouya Kabirzadeh** - *University of Illinois at Urabana-Champaign,* **Nicole Stokowski** - *University of Illinois at Urbana-Champaign,* **Andrew Stillwell** - *University of Illinois at Urbana-Champaign,* **Ari Chatterji** - *Ampaire, Incorporated,* **Ed Lovelace** - *Ampaire Incorporated,* **Nenad Miljkovic** - *University of Illinois at Urbana-Champaign*

Strong Temperature Dependence of Thermal Conductivity and Heat Capacity Impacts Their Measured Values During Pulsed Heating Conditions

Technical Presentation Only: InterPACK2023-111884

Adam A. Wilson – *US DEVCOM Army Research Laboratory,* **Michael Fish** – *US DEVCOM Army Research Laboratory,* **Rachel McAfee** – *US DEVCOM Army Research Laboratory,* **Jay Maddux** – *Liberty Technical Services & US DEVCOM Army Research Laboratory,* **Mustafa Ozsipahi** – *National Academies of Sciences & US DEVCOM Army Research Laboratory,* **Ronald Warzoha** – *US Naval Academy,* **Darin J. Sharar** – *TauMat LLC, Silver Spring*

02-04 DATA CENTER COOLING I

9:15AM–10:45AM **SHUTTERS EAST II**

Chair: **Vibin Shalom Simon** - *The University of Texas at Arlington*
Co-Chair: **Ronald Warzoha** - *U.S. Naval Academy*

Methodology to Characterize Row Manifolds for High Power Direct to Chip Liquid Cooling Data Centers

Technical Paper Publication: InterPACK2023-110587

Pardeep Shahi - *NVIDIA Corporation,* **Ali Heydari** - *NVIDIA Corporation,* **Bahareh Eslami** - *NVIDIA Corporation,* **Vahideh Radmard** - *NVIDIA Corporation,* **Chandraprakash Hinge** - *The University of Texas at Arlington,* **Himanshu Modi** - *The University of Texas at Arlington,* **Lochan Sai Reddy Chinthaparthy** - *The University of Texas at Arlington,* **Mohammad Tradat** - *NVIDIA Corporation,* **Dereje Agonafer** - *The University of Texas at Arlington,* **Jeremy Rodriguez** - *NVIDIA Corporation*

At Scale Development of Thermal Test Vehicles for Data Center Liquid Cooling Developments

Technical Paper Publication: InterPACK2023-111307

Ali Heydari - *NVIDIA Corporation,* **Harold Miyamura** - *NVIDIA Corporation,* **Uschas Chowdhury** - *NVIDIA Corporation,* **Yaman Mohammad Ali Manaserh** - *NVIDIA Corporation,* **Mohammad Tradat** - *NVIDIA Coporation,* **Pardeep Shahi** - *NVIDIA Corporation,* **Vahideh Radmard** - *NVIDIA Corporation,* **Bahareh Eslami** - *NVIDIA Corporation,* **Dwayne Kalma** - *NVIDIA Corporation,* **Jeremy Rodriguez** - *NVIDIA Corporation*

L2A CDUs Performance and Considerations for Server Rooms Upgrade With Conventional Air Conditioning

Technical Paper Publication: InterPACK2023-111564

Ali Heydari - *NVIDIA Corporation,* **Qusai Soud** - *Binghamton University,* **Mohammad Tradat** - *NVIDIA Corporation,* **Ahmad Gharaibeh** - *Binghamton University,* **Najmeh Fallahtafti** - *Binghamton University,* **Jeremy Rodriguez** - *NVIDIA Corporation,* **Bahgat Sammakia** - *Binghamton University*

A Comparative Data Center Energy Efficiency and TCO Analysis for Different Cooling Technologies

Technical Paper Publication: InterPACK2023-111959

Ali Heydari - *NVIDIA,* **Bahareh Eslami** - *NVIDIA,* **Uschas Chowdhury** - *NVIDIA,* **Vahideh Radmard** - *NVIDIA,* **Pardeep Shahi** - *NVIDIA,* **Harold Miyamura** - *NVIDIA,* **Mohammad Tradat** - *NVIDIA,* **Peter Chen** - *Chunghwa Telecom,* **Drew Tuholski** - *Vertiv Group Corp.,* **Kevin Gray** - *Vertiv Group Corp.,* **Tyler Buell** - *Vertiv Group Corp.,* **Greg Stover** - *Vertiv Group Corp.,* **Jeremy Rodriguez** - *NVIDIA*

01-02 HETEROGENEOUS INTEGRATION

9:15AM–10:45AM **SHUTTERS EAST I**

Chair: Girish Anant Kini - *Advanced Micro Devices*

Visualization and Quantification of Buried GaN-Diamond Interfaces via Hyperspectral Frequency-Domain Thermoreflectance

Technical Presentation Only: InterPACK2023-111914

Amun Jarzembski - *Sandia National Laboratories,* **Anthony Mcdonald** - *Sandia National Laboratories,* **Matthew Bahr** - *Sandia National Laboratories,* **Zachary Piontkowski** - *Sandia National Laboratories,* **William Delmas** - *Sandia National Laboratories,* **Wyatt Hodges** - *Sandia National Laboratories,* **Greg Pickrell** - *Sandia National Laboratories,* **Elbara Ziade** - *Apple, Inc.,* **Luke Yates** - *Sandia National Laboratories*

Cure-Dependent Viscoelastic Behavior of Epoxy Molding Compound (EMC)

Technical Presentation Only: InterPACK2023-114045

Sukrut Prashant Phansalkar - *University of Maryland, College Park,* **Roshith Mittakolu** - *University of Maryland, College Park,* **Bongtae Han** - *University of Maryland, College Park*

Thermal Transport of Mechanically Deformed Heterostructures in 2D Electronics

Technical Presentation Only: InterPACK2023-119742

Baoxing Xu - *University of Virginia*

Microporous Surface Modification for Fine-Pitch Microbump Bonding in 3D Integration

Technical Presentation Only: InterPACK2023-120374

Keyu Wang - *Purdue University ,* **Shuhang Lyu** - *Purdue University,* **Tiwei Wei** - *Purdue University*

06-06 FHE PROCESSING & COMPONENT ATTACH

9:15AM–10:45AM **SHUTTERS WEST II**

Chair: Benjamin Leever - *Air Force Research Laboratory*
Co-Chair: Pradeep Lall - *Auburn University*

Printed Hybrid Electronics in a Flight Environment: 3-D Printed Electronics on Suborbital Technology Experiment Carrier 9

Technical Presentation Only: InterPACK2023-120401

Beth Paquette - *National Aeronautics and Space Administration,* **Jason Fleischer** - *Laboratory for Physical Sciences*

Component Attach Process Recipe and Performance on Aerosol Printed Sustainable Silver Ink

Technical Paper Publication: InterPACK2023-112066

Pradeep Lall - *Auburn University,* **Sabina Bimali** - *Auburn University,* **Scott Miller** - *NextFlex,* **Jinesh Narangaparambil** - *Auburn University*

Surface-Mount Component Attachment on Aerosol Jet Printed Sustainable Water-Base Silver Nanoparticle Ink

Technical Paper Publication: InterPACK2023-111957

Pradeep Lall - *Auburn University,* **Daniel Karakitie** - *Auburn University,* **Scott Miller** - *NextFlex*

Comparative Study of SMD Components Attached Using Electrically Conductive Adhesive and Magnetically Oriented Anisotropic Conductive Adhesive on Inkjet Printed Structures

Technical Paper Publication: InterPACK2023-111979

Pradeep Lall - *Auburn University,* **Shriram Kulkarni** - *Auburn University,* **Jinesh Narangaparambil** - *Auburn University,* **Scott Miller** - *NextFlex*

02-05 DATA CENTER COOLING II

11:00AM–12:30PM **SHUTTERS EAST I**

Chair: Himanshu Modi - *The University of Texas at Arlington*
Co-Chair: Rajesh Kasukurthy - *ECS*

Energy Analysis of Rear Door Heat Exchangers in Data Centers With Spatial Workload Distribution

Technical Paper Publication: InterPACK2023-112078

Vibin Shalom Simon - *The University of Texas at Arlington,* **Saket Karajgikar** - *Meta Platforms, Inc.,* **Veerendra Mulay** - *Meta Platforms, Inc.,* **Abhideep Sai Pundla** - *The University of Texas at Arlington,* **Krishna Bhavana Sivaraju** - *The University of Texas at Arlington,* **Gautam Gupta** - *The University of Texas at Arlington,* **Pratik Vithoba Bansode** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington*

Performance Analysis of Liquid-to-Air Heat Exchangers of High-Power Density Racks

Technical Paper Publication: InterPACK2023-112404

Ali Heydari - *NVIDIA Corporation,* **Ahmad R. Gharaibeh** - *Binghamton University,* **Mohammad Tradat** - *NVIDIA Corporation,* **Qusai Soud** - *Binghamton University,* **Yaman Manaserh** - *NVIDIA Corporation,* **Vahideh Radmard** - *NVIDIA Corporation,* **Bahareh Eslami** - *NVIDIA Corporation,* **Bahgat Sammakia** - *Binghamton University,* **Jeremy Rodriguez** - *NVIDIA Corporation*

Experimental and CFD Analysis of a Rack Manifold for High Power Density Liquid-Cooled Rack

Technical Paper Publication: InterPACK2023-114351

Pardeep Shahi - *NVIDIA Corporation,* **Ali Heydari** - *NVIDIA Corporation,* **Pratik Bansode** - *The University of Texas at Arlington,* **Ashwin Siddarth** - *The University of Texas at Arlington,* **Uschas Chowdhury** - *NVIDIA Corporation,* **Harold Miyamura** - *NVIDIA Corporation,* **Himanshu Modi** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington,* **Mohammad Tradat** - *NVIDIA Corporation,* **Jeremy Rodriguez** - *NVIDIA Corporation*

Single-Phase and Two-Phase Liquid Immersion Cooling of Data Center Power Supply Units for Heat Capture

Technical Presentation Only: InterPACK2023-111657

Haoyun Qiu - *University of Illinois at Urbana-Champaign,* **Pouya Kabirzadeh** - *University of Illinois at Urbana-Champaign,* **Todd Salamon** - *Nokia Bell Labs,* **Nenad Miljkovic** - *University of Illinois at Urbana-Champaign*

03-05 STRESS MODELING AND RELIABILITY

11:00AM–12:30PM **SHUTTERS EAST II**

Chair: Mahendra Harsha, *Qualcomm*
Co-Chair: Pardeep Shahi, *NVIDIA Corporation*

Effects of Grain to Sample Volume Ratio on the Deformation Behavior of Polycrystal SAC Samples Subjected to Shear Loads

Technical Paper Publication: InterPACK2023-112034

Debabrata Mondal - *Auburn University,* **Jeffrey Suhling** - *Auburn University,* **Elham Mirkoohi** - *Auburn University,* **Pradeep Lall** - *Auburn University*

Application of the Reflowable Magnetic Jig on Thin MCM Package for Warpage Control

Technical Paper Publication: InterPACK2023-109453

Jongchan Park - *StatsChipPAC Korea,* **Youngmin Kim** - *StatsChipPAC Korea,* **Gilho Lee** - *StatsChipPAC Korea,* **Hyeongkwan Kim** - *StatsChipPAC Korea,* Taekeun **Lee** - *StatsChipPAC Korea*

Neural Network Based Prediction to Obtain Effective Thermal and Mechanical Property of Semiconductor Package Substrate

Technical Presentation Only: InterPACK2023-111513

Jeong-Hyeon Park - *Sungkyunkwan University,* **Eun-Ho Lee** - *Sungkyunkwan University,* **Jaechoon Kim** - *Samsung Electronics, Hwanjoo Park - Samsung Electronics, Taehwan Kim - Samsung Electronics*

A Method for Determining Board Level Reliability During Mechanical Shock

Technical Presentation Only: InterPACK2023-112136

Jonathan Kordell - *Ansys,* **Arvind Purushotaman** - *Ansys*

04-05 POWER/RF ELECTRONICS AND PHOTONICS V

11:00AM–12:30PM **SHUTTERS WEST I**

Chair: Lizheng Winston Zhang - *Novark*

Design of Power Transistor Embedded in PCB Supported by 3D Simulations

Technical Paper Publication: InterPACK2023-111389

Aleš Chvála - *Slovak University of Technology in Bratislava,* **Juraj Marek** - *Slovak University of Technology in Bratislava,* **Alexander Satka** - *Slovak University of Technology in Bratislava,* **Jue Chen** - *Schweizer Electronic AG*

Simulation Method Development for Accurate Power Inductor Itemp Prediction With Maxwell-Icepak Coupling

Technical Presentation Only: InterPACK2023-111647

Tae Hyun Kim - *Samsung Electro Mechanics*

Electro-Thermal Performance Analysis of Direct Cooling for GaN-on-SiC RF Amplifier

Technical Presentation Only: InterPACK2023-111782

Minsoo Kang - *Chungang University,* **Junrae Park** - *Chungang University,* **Hyun-Wook Jung** - *Electronics and Telecommunications Research Institute,* **Sung Il Kim** - *Electronics and Telecommunications Research Institute,* **Ho-Kyun Ahn** - *Electronics and Telecommunications Research Institute,* **Haecheon Kim** - *Chungang University,* **Hyoungsoon Lee** - *Chungang University*

Thermal Management of GaN-on-Diamond HEMTs Through Electro-Thermal Modeling

Technical Presentation Only: InterPACK2023-112013

Changhwan Song - *Sungkyunkwan University,* **Sukwon Choi** - *The Pennsylvania State University,* **Jungwan Cho** - *Sungkyunkwan University*

06-07 IN-MOLD ELECTRONICS

11:00AM–12:30PM **SHUTTERS WEST II**

Chair: Daniel Hines - *Raytheon Technologies*
Co-Chair: Beth Paquette - *National Aeronautics and Space Administration*

Additive Printing of Wearable EDA Sensors on In-Mold Electronics on Automotive Platform

Technical Paper Publication: InterPACK2023-111973

Pradeep Lall - *Auburn University,* **Hyesoo Jang** - *Auburn University,* **Scott Miller** - *NextFlex*

Evaluation of Thermoformability of Additively Printed Circuits Printed Using Gravure Offset Printing Technique and Investigation of In-Mold Electronic Circuits

Technical Paper Publication: InterPACK2023-112060

Pradeep Lall - *Auburn University,* **Ved Soni** - *Auburn University,* **Jinesh Narangaparambil** - *Auburn University,* **Scott Miller** - *NextFlex*

Functional Circuit Performance of Printable Formable Inks for In-Mold Electronics Applications

Technical Paper Publication: InterPACK2023-112069

Pradeep Lall - *Auburn University,* **Jinesh Narangaparambil** - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** – *NextFlex*

Direct Write Thermoformed Additive Silver Circuits With SMDs Attachment for In-Mold Electronics

Technical Paper Publication: InterPACK2023-112063

Pradeep Lall - *Auburn University,* **Md Golam Sarwar** - *Auburn University,* **Ved Soni** - *Auburn University,* **Scott Miller** - *NextFlex*

03-09 DEVICE AND MATERIALS RELIABILITY

2:45PM–4:15PM **LOFT I**

Chair: **Pardeep Shahi**, *NVIDIA*
Co-Chair: **Patrick McCluskey**, *University of Maryland*

A Semi-Quantitative Version of Tape Test Evaluation of Coating Adhesion

Technical Presentation Only: InterPACK2023-111891

Prabhat Janamanchi - *University of Maryland,* **Abhijit Dasgupta** - *University of Maryland*

On the Evaluation of Cure Kinetics Model Constants Using Exothermic Heat Generation

Technical Presentation Only: InterPACK2023-114565

Sukrut Prashant Phansalkar - *University of Maryland, College Park,* **Roshith Mittakolu** - *University of Maryland, College Park,* **Bongtae Han** - *University of Maryland, College Park*

Optimum Test Procedure to Measure Time-Dependent Properties of Highly Filled Polymers by Dynamic Mechanical Analysis

Technical Presentation Only: InterPACK2023-114567

Roshith Mittakolu - *University of Maryland, College Park,* **Sukrut Prashant Phansalkar** - *University of Maryland, College Park,* **Bongtae Han** - *University of Maryland, College Park*

Study of Reliable Chip Last Process for Fan Out Wafer Level Package

Technical Paper Publication: InterPACK2023-111450

Shuai-Lin Liu - *Siliconware Precision Industries Co., Ltd.,* **Nicholas Kao** - *Siliconware Precision Industries Co., Ltd.,* **Vito Lin** - *Siliconware Precision Industries Co., Ltd.,* **Ken Zhang** - *Siliconware Precision Industries Co., Ltd.,* **Yu-Po Wang** - *Siliconware Precision Industries Co., Ltd.*

05-10 THERMAL TRANSPORT PHENOMENA IN EMERGING TECHNOLOGIES II

2:45 PM TO 4:15 PM **SHUTTERS EAST II**

Chair: **Jorge Padilla** - *Google LLC*

Artificial Intelligence Platform on Thin Film Evaporation in Hierarchical Structures, {InterPACK2023-110887}

Technical Presentation Only

Hadi Ghasemi - *University of Houston,* **Amir Jahanbakhsh** - *University of Houston*

Wickless Vapor Chamber Featuring Distributed-Wettability Surfaces, {InterPACK2023-118689}

Technical Presentation Only

Constantine Megaridis - *University of Illinois Chicago,* **George Damoulakis** - *University of Illinois Chicago*

Effect of Sintering Conditions on Electrical Resistivity of Printed Silver Inks, {InterPACK2023-111648}

Technical Paper Publication: InterPACK2023-111648

Hua Xu - *The Hong Kong University of Science and Technology,* **Jeffery C. C. Lo** - *The Hong Kong University of Science and Technology,* **Xing Qiu** - *HKUST Shenzhen-Hong Kong Collaborative Innovation Research Institute,* **Yuanjie Cheng** - *The Hong Kong University of Science and Technology*, **Mian Tao** - *The Hong Kong University of Science and Technology*, **S. W. Ricky Lee** - *The Hong Kong University of Science and Technology*, **Lawrence C. L. Ko** - *Advanced Assembly Materials International Limited.,* **Ho Ki Yeung** - *Advanced Assembly Materials International Ltd.Limited,* **Chun Ho Yau** - *Advanced Assembly Materials International Ltd.Limited*

03-06 POWER ELECTRONICS MODULES AND RELIABILITY

4:30PM–6:00PM **SHUTTERS EAST I**

Chair: Nakul Kothari, *Qualcomm*
Co-Chair: Mahendra Harsha, *Qualcomm*

Simulation of Integrated Jet Impingement Housing for Cooling Electro-Thermal Power Device Modules

Technical Paper Publication: InterPACK2023-112045

Zion Clarke - *Howard University,* **Sonya Smith** - *Howard University*

Design and Fabrication of an Inverter Module Co-Designed With the Busbar and Gate Driver

Technical Paper Publication: InterPACK2023-111921

Aishworya Roy - *Virginia Polytechnic and State University,* **Christina Dimarino** - *Virginia Polytechnic and State University,* **Jesi Miranda-Santos** - *Virginia Polytechnic and State University*

Convection Cooling of Power Electronics Operating in Deep-Space

Technical Paper Publication: InterPACK2023-111414

Jessica Harsono - *Johns Hopkins University,* **Joseph Kozak** - *Johns Hopkins University,* **Hala Tomey** - *Johns Hopkins University,* **William Yerkes** - *Johns Hopkins University,* **Jonathan Neville** - *Johns Hopkins University*

Impact of Immersion Cooling on Thermomechanical Properties of Halogen-Free Substrate Core

Technical Paper Publication: InterPACK2023-111056

Pratik Bansode - *The University of Texas at Arlington,* **Mohan Sai Ramalingam** - *The University of Texas at Arlington,* **Rohit Suthar** - *The University of Texas at Arlington,* **Rabin Bhandari** - *The University of Texas at Arlington,* **Akshay Lakshminarayana** - *The University of Texas at Arlington,* **Gautam Gupta** - *The University of Texas at Arlington,* **Vibin Shalom Simon** - *The University of Texas at Arlington*

Himanshu Modi - *The University of Texas at Arlington,* **Vivek Nair** - *The University of Texas at Arlington,* **Krishna Bhavana Sivaraju** - *The University of Texas at Arlington,* **Pardeep Shahi** - *The University of Texas at Arlington,* **Satyam Saini** - *The University of Texas at Arlington,* **Dereje Agonafer** - *The University of Texas at Arlington*

05-05 THERMAL TRANSPORT PHENOMENA IN EMERGING TECHNOLOGIES

4:30PM–6:00PM **SHUTTERS WEST I**

Chair: Nenad Miljkovic - *University of Illinois at Urbana-Champaign*
Co-Chair: Dohwan Kim - *Qualcomm*

Challenges and Opportunities in MK System Thermal Management

Technical Presentation Only: InterPACK2023-120749

Alexander Marakov - *Northrop Grumman Corporation*

Wetting Behavior of Droplet on Inclined Surface: From Inkjet Printing on Non-Paper Media

Technical Paper Publication: InterPACK2023-111666

Riki Kawano - *Tokyo Institute of Technology,* **Kimiharu Yamazaki** - *Ricoh Company, Ltd.,* **Shinichi Kuramoto** - *Tokyo Institute of Technology,* **Koichi Kato** - *Tokyo Institute of Technology,* **Kazuyoshi Fushinobu** - *Tokyo Institute of Technology*

Virtual Testbed for Economical and Reliability Analysis of Battery Thermal Management Control Strategies

Technical Paper Publication: InterPACK2023-111825

Sagar Singh - *University of Illinois at Urbana-Champaign,* **Mostafa Olyaei** - *University of Illinois at Urbana-Champaign,* **Kaiying Jiang** - *Stanford University,* **Yashraj Gurumukhi** - *University of Illinois at Urbana-Champaign,* **Kenneth Goodson** - *Stanford University,* **Mehdi Asheghi** - *Stanford University,* **Nenad Miljkovic** - *University of Illinois at Urbana-Champaign*

The Effect of Al Composition on the Thermal Conductivity of Algao

Technical Presentation Only: InterPACK2023-112037

Jingjing Shi - *University of Florida*

07-05 RELIABILITY OF SOLDERS

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Chair: Joyce Weiner - *Intel*
Co-Chair: Przemyslaw Gromala - *Robert Bosch Gmbh*

High-G Level Shock Damage-Accrual in Doped/Undoped SnAgCu Solders Under 100°C Sustained Operation Up to 1-Year

Technical Paper Publication: InterPACK2023-111981

Pradeep Lall - *Auburn University,* *Vishal Mehta* - *Auburn University,* **Jeff Suhling** - *Auburn University,* Ken **Blecker** - *U.S. Army CCDC-AC*

Study of Sustained High-Temperature on the Reliability of Lead-Free Solder Joint Assemblies Under Vibration

Technical Paper Publication: InterPACK2023-111984

Pradeep Lall - *Auburn University,* **Vishal Mehta** - *Auburn University,* **Jeff Suhling** - *Auburn University,* **David Locker** - *U.S. Army CCDC-AvMC*

Assessment of Effect of Operating Temperature on SAC-R Solders at High Strain Rates After Prolonged Storage

Technical Paper Publication: InterPACK2023-112036

Pradeep Lall - *Auburn University,* **Mrinmoy Saha** - *Auburn University,* **Jeff Suhling** - *Auburn University,* **David Locker** - *U.S. Army CCDC-AvMC*

04-06 POWER/RF ELECTRONICS AND PHOTONICS VI

4:30PM–6:00PM **SHUTTERS EAST II**

Chair: Jungwan Cho - *Sungkyunkwan University*

Development of Thermal Interface Materials Tape Using Vertically Aligned Copper Nanowire-PDMS Composites

Technical Paper Publication: InterPACK2023-113126

Hansen Qiao - *Stanford University,* **Katherine Jiang** - *Stanford University,* **Tiwei Wei** - *Purdue University,* **Yujui Lin** - *Stanford University,* **Chris Perez** - *Stanford University,* **Mehdi Asheghi** - *Stanford University,* **Kenneth Goodson** - *Stanford University*

Cold Gas Spraying Copper Metal on AlN Ceramics as an Alternative to Thick DBC Substrates for Power Electronics

Technical Paper Publication: InterPACK2023-111534

Margie Guerrero - *University of Puerto Rico-Mayaguez,* **Pedro Quintero** - *University of Puerto Rico-Mayaguez,* **Ozan Ozdemir** - *Northeastern University*

Package and Die Attach Materials Comparisons for a High Power Gallium Nitride Device

Technical Presentation Only: InterPACK2023-110733

Casey Krawiec - *StratEdge Corporation,* **Erik Sanchez** - *StratEdge Corporation,* **Gayle Collins** - *Obsidian Microwave*

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Kulkarni	Shriram	120464	Evaluation of the Performance and Repairability of Inkjet-Printed Functional Circuits Printed Using Non-Volatile Water-Based Silver Ink	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
Lall	Pradeep	111950	Predictive Modeling of High-G Potted Assemblies With Fine Pitch Electronics After Sustained High-Temperature Exposure	07-04 Reliability of Interfaces	10/25/2023, 04:30PM–06:00PM	Shutters West II
Lall	Pradeep	112056	Comparison of Machine Learning Approaches for Correlating Print Process Parameters to Realized Physical and Electrical Characteristics of Printed Electronics Using Inkjet Platform	06-05 Advanced Processing & Modeling for Printed & Flexible Electronics	10/25/2023, 04:30PM–06:00PM	Shutters West I
Lamotte-Dawaghreh	Jacob	111804	Electrochemical Additive Manufacturing Based Design of a Heat Sink for Single Phase Natural Convection Immersion Cooling Application	02-01 Immersion Cooling I	10/24/2023, 11:00AM–12:30PM	Shutters East I
Lavin	Judi	119416	Direct Write Aerosol Jet Printing at Sandia National Laboratories	06-04 Print Process Optimization II	10/25/2023, 11:00AM–12:30PM	Shutters West II
Law	Matthew	111575	Thermal and Hydraulic Performance Analyses of Machined and Hybrid Printed Oblique-Fin Cold Plates	05-03 Single-Phase and Two-Phase Flow	10/25/2023, 11:00AM–12:30PM	Shutters West I

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Lee	Young Jong	112050	Experimental Investigation on the Thermal Performance of the Pulsating Heat Pipe With the Transversely Grooved Channel	03-04 Thermal Management and Reliability II	10/25/2023, 04:30PM–06:00PM	Shutters East II
Lin	Muyang	119421	A Fully Integrated Wearable Ultrasound System to Monitor Deep Tissues in Moving Subjects	06-01 Wearable Electronics	10/24/2023, 09:15AM–10:45AM	Shutters West II
Liu	Shuai-Lin	111450	Study of Reliable Chip Last Process for Fan Out Wafer Level Package	03-09 Device and Materials Reliability	10/26/2023, 02:45PM–04:15PM	Loft I
Loh	Kenneth	119770	Human Digital Twin: Enhancing Human Performance Using Motion Tape Wearable Sensors	06-01 Wearable Electronics	10/24/2023, 09:15AM–10:45AM	Shutters West II
Mandadi	Bhavana Reddy	112084	Compact Modeling and Thermal Analysis of Immersion Based Hybrid Cooled Server	02-02 Immersion Cooling II	10/25/2023, 09:15AM–10:45AM	Shutters East I
Manepalli	Vivek	111967	Thermal Management of SiC Power Module Under Pulsed Loading Using Three-Component Composite Phase Change Material	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
Manepalli	Vivek	114323	Thermal Management of SiC Power Module Under Pulsed Loading Using Three-Component Composite Phase Change Material	04-01 Power/RF Electronics and Photonics I	10/24/2023, 09:15AM–10:45AM	Shutters West I
Maniar	Youssef	111835	A Machine Learning Enhanced Return Mapping Approach for Efficient Fe Solution of Damage-Coupled Viscoplasticity Constitutive Formulations	07-01 AI/ ML-Assisted Design for Manufacturability and Reliability	10/24/2023, 11:00AM–12:30PM	Shutters West II

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Maruf	Mahbub Alam	120465	The Effects of Mechanical Cycling and Aging on the Mechanical Properties and Microstructure of Lead-Free Solder Alloys	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
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MAZUMDER	GOLAM RAKIB	120459	Evolution on the Creep Response of SAC305 Due to Damage Accumulation During Mechanical Cycling at Elevated Temperature	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
Medina Garcia	Alicia	113792	Enhancing Mechanical Reliability of Silver Sintered Joints With Copper Nanowires in High-Power Electronic Devices	03-07 Sintered Attach and Additive Manufacturing	10/24/2023, 02:45PM–04:15PM	Loft I
Medina Garcia	Alicia	113836	Enhancing Mechanical Reliability of Silver Sintered Joints With Copper Nanowires in High-Power Electronic Devices	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
Mehta	Vishal	111981	High-G Level Shock Damage-Accrual in Doped/Undoped SnAgCu Solders Under 100°C Sustained Operation Up to 1-Year	07-05 Reliability of Solders	10/26/2023, 04:30PM–06:00PM	Shutters West II
Mehta	Vishal	111984	Study of Sustained High-Temperature on the Reliability of Lead-Free Solder Joint Assemblies Under Vibration	07-05 Reliability of Solders	10/26/2023, 04:30PM–06:00PM	Shutters West II
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Mondal	Debabrata	120457	Analysis of Crystallographic Slip Shear Strains in SAC Polycrystals Subjected to External Shear Loads	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
Musa	Fatahi	112001	Sustainable Silver Ink Flexible Circuits Fabrication Using Direct Write Additive Manufacturing Techniques	06-03 Print Process Optimization I	10/25/2023, 09:15AM–10:45AM	Shutters West I
Musa	Fatahi	112012	Impact of Component Interconnectivity on Mechanical and Electrical Properties of Flexible Hybrid Electronics With Printed Water-Based Silver Ink Circuits	06-05 Advanced Processing & Modeling for Printed & Flexible Electronics	10/25/2023, 04:30PM–06:00PM	Shutters West I
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Narangaparambil	Jinesh	112069	Functional Circuit Performance of Printable Formable Inks for In-Mold Electronics Applications	06-07 In-Mold Electronics	10/26/2023, 11:00AM–12:30PM	Shutters West II
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Ortega	Alfonso	113883	Development of Thermal Metrology Standards for Experimental Characterization of Thermal Resistance for Single-Phase Liquid Cold Plates	03-04 Thermal Management and Reliability II	10/25/2023, 04:30PM–06:00PM	Shutters East II
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Pandurangan	Aathi Raja Ram	120191	A Novel Method to Predict Damage at High G Potted Electronic Assemblies Using Cohesive Zone Modeling	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
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Prakash	Anna	111936	Enhancing Manual Visual Inspection Process by Using OpenCV AI and Anomalib for Defect Detection in Automotive Assembly and Manufacturing Process	07-02 Design for Manufacturability and Reliability in Transportation Applications	10/24/2023, 04:30PM–06:00PM	Shutters West II
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Pundla	Sai Abhideep	120383	A Numerical Study for the Optimization of Extruded Fin Heat Sinks in a Two Socket Immersion Cooled Server	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
Qiao	Hansen	113126	Development of Thermal Interface Materials Tape Using Vertically Aligned Copper Nanowire-PDMS Composites	04-06 Power/RF Electronics and Photonics VI	10/26/2023, 04:30PM–06:00PM	Shutters East II

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Quintero	Pedro	111534	Cold Gas Spraying Copper Metal on AIN Ceramics as an Alternative to Thick DBC Substrates for Power Electronics	04-06 Power/RF Electronics and Photonics VI	10/26/2023, 04:30PM–06:00PM	Shutters East II
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Shaeri	Mohammad Reza	109991	Additively Manufactured Hybrid Two-Phase Cold Plate	04-01 Power/RF Electronics and Photonics I	10/24/2023, 09:15AM–10:45AM	Shutters West I
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Shoemaker	Daniel	120470	Cross-Sectional Thermal Analysis of Multilayer Ceramic Capacitors	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
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Song	Yiwen	120473	Thermal Characterization of Lead Zirconate Titanate (PZT) Piezoelectric Mems Actuators	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
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Xu	Baoxing	119742	Thermal Transport of Mechanically Deformed Heterostructures in 2D Electronics	01-02 Heterogeneous Integration	10/26/2023, 09:15AM–10:45AM	Shutters East I
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Zhou	Yimin	119269	Pool Boiling on Textured Oil-Impregnated Surfaces	08-01 Interactive Presentations	10/24/2023, 07:00PM–08:00PM	Great Room I-III
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Track Chairs

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		Track Co-Chair	Amanie Abdelmessih
		Track Co-Chair	Jin Yang
		Track Co-Chair	Yunhyeok Im
		Track Co-Chair	Timothy Chainer
2	Data Centers and Modular Edge Systems	Track Chair	Chen Cheng
		Track Co-Chair	Jayati Athavale
		Track Co-Chair	Solomon Adera
		Track Co-Chair	Anil Yuksel
		Track Co-Chair	Hyoungsoon Lee
3	Electronics Packaging	Track Chair	Patrick McCluskey
		Track Co-Chair	Pardeep Shahi
		Track Co-Chair	Sven Rzepka
		Track Co-Chair	David Huitink
4	Power/RF Electronics and Photonics	Track Chair	Michael Fish
		Track Co-Chair	Winston Zhang
		Track Co-Chair	Nazli Donmezer
		Track Co-Chair	Jungwan Cho
		Track Co-Chair	Bikramjit Chatterjee
		Track Co-Chair	Emre Gurpinar
5	Multiscale Thermal Transport and Energy Storage	Track Chair	Ron Warzoha
		Track Co-Chair	Jorge Padilla
		Track Co-Chair	Hyejin Jang
		Track Co-Chair	Adam Wilson
		Track Co-Chair	Nenad Milkovic

TRACK	TRACK NAME	ROLE	NAME
6	Flexible, Wearable, and Printed Electronics	Track Chair	Benjamin Leever
		Track Co-Chair	Beth Paquette
		Track Co-Chair	Pradeep Lall
		Track Co-Chair	Kyungjin Kim
		Track Co-Chair	Sheng Xu
		Track Co-Chair	Daniel Hines
7	Transportation Systems, AI and Machine Learning	Track Chair	Joyce Weiner
		Track Co-Chair	Fabian Welschinger
		Track Co-Chair	Przemyslaw Jakub Gromala
8	Interactive Presentations	Track Chair	Georges Pavlidis
		Track Co-Chair	Tiwei Wei
		Track Co-Chair	Solomon Adera
9	Panels, Tutorials, and Workshops	Track Chair	Victor Chiriac
		Track Co-Chair	Raffaele Luca Amalfi

Session Organizers

Topic/Session	Topic/Session Primary Chair Last Name	Topic/Session Primary Chair First Name	Topic/Session Primary Chair Affiliation
01-01 Heterogeneous Integration I	Kabbani	Hussameddine	Meta
01-02 Heterogeneous Integration II	Kini	Girish	AMD
02-01 Immersion Cooling I	Wei	Tiwei	Purdue University
02-01 Immersion Cooling I	Sahini	Manasa	Meta
02-02 Immersion Cooling II	Kini	Girish	AMD
02-02 Immersion Cooling II	Gaitonde	Aalok	Purdue University
02-03 Hardware Cooling	Arik	Mehmet	Auburn University
02-03 Hardware Cooling	Adera	Solomon	University of Michigan
02-04 Data Center Cooling I	Simon	Vibin	University of Texas at Arlington
02-04 Data Center Cooling I	Warzoha	Ron	United States Naval Academy
02-05 Data Center Cooling II	Modi	Himanshu	University of Texas at Arlington I UTA
02-05 Data Center Cooling II	Kasukurthy	Rajesh	ECS
03-01 Solder Joints and Reliability I	Kothari	Nakul	Qualcomm
03-02 Solder Joints and Reliability II	Shahi	Pardeep	NVIDIA
03-03 Thermal Management and Reliability I	Harsha	Mahendra	Qualcomm
03-04 Thermal Management and Reliability II	Shahi	Pardeep	NVIDIA
03-05 Stress Modeling and Reliability	Harsha	Mahendra	Qualcomm
03-06 Power Electronic Modules and Reliability	Kothari	Nakul	Qualcomm
03-07 Sintered Attach and Additive Manufacturing	Kothari	Nakul	Qualcomm
03-08 Measurement of Properties and Characteristics	Shahi	Pardeep	NVIDIA
03-09 Device and Materials Reliability	Shahi	Pardeep	NVIDIA
04-01 Power/RF Electronics and Photonics I	Chatterjee	Bikramjit	Lawrence livermore national laboratory
04-02 Power/RF Electronics and Photonics II	Donmezer	Nazli	Bogazici University
04-03 Power/RF Electronics and Photonics III	Fish	Michael	Army Research Laboratory
04-04 Power/RF Electronics and Photonics IV	Yuruker	Sevket	Tesla
04-05 Power/RF Electronics and Photonics V	Zhang	Winston	University of Illinois at Urbana-Champaign
04-06 Power/RF Electronics and Photonics VI	Cho	Jungwan	Sungkyunkwan University
05-01 Nanoscale Thermal Transport Processes in Electronic Systems	Warzoha	Ron	United States Naval Academy

Topic/Session	Topic/Session Primary Chair Last Name	Topic/Session Primary Chair First Name	Topic/Session Primary Chair Affiliation
05-02 Nanoscale and Microscale Thermal Conduction Phenomena in Electronic Materials	Donovan	Brian	United States Naval Academy
05-03 Single-phase and Two-phase Flow	Padilla	Jorge	Google
05-04 Phase Change Materials and Transient Thermal Management	Wilson	Adam	Army Research Laboratory
05-05 Thermal Transport Phenomena in Emerging Technologies	Miljkovic	Nenad	University of Illinois at Urbana-Champaign
05-05 Thermal Transport Phenomena in Emerging Technologies	Kim	Dohwan	Qualcomm
05-06 Nanoscale Thermal Transport Processes in Electronic Systems II	Wilson	Adam	US Army Research Laboratory
05-07 Nanoscale and Microscale Thermal Conduction Phenomena in Electronic Materials II	Jang	Hyejin	Seoul National University
05-08 Single-Phase and Two-Phase Flow II	Warzoha	Ronald	United States Naval Academy
05-09 Phase Change Materials and Transient Thermal Management II	Miljkovic	Nenad	University of Illinois At Urbana-Champaign
05-10 Thermal Transport Phenomena in Emerging Technologies II	Padilla	Jorge	Google LLC
06-01 Wearable Electronics	Kim	Kyungjin Kim	University of Connecticut
06-02 Reliability & Repairability of Additive Electronics	Lall	Pradeep	Auburn University
06-03 Print Process Optimization I	Hines	Daniel	Raytheon Technologies
06-04 Print Process Optimization II	Paquette	Beth	NASA
06-05 Advanced Processing & Modeling for Printed & Flexible Electronics	Leever	Benjamin	Air Force Research Laboratory
06-06 FHE Processing & Component Attach	Leever	Benjamin	Air Force Research Laboratory
06-06 In-Mold Electronics	Hines	Daniel	Raytheon Technologies
07-01 AI/ML-assisted design for manufacturability and reliability	Weiner	Joyce	Intel Corporation
07-02 Design for manufacturability and reliability in transportation applications	Welschinger	Fabian	Robert Bosch GmbH
07-03 Reliability of polymers and interfaces	Weiner	Joyce	Intel Corporation
07-04 Reliability of interfaces	Gromala	Przemyslaw	Robert Bosch GmbH
07-05 Reliability of solders	Weiner	Joyce	Intel Corporation
08-01 Interactive Presentations	Pavlidis	Georges	University of Connecticut
08-01 Interactive Presentations	Adera	Solomon	University of Michigan
08-01 Interactive Presentations	Wei	Tiwei	Purdue University

The Department of Mechanical Engineering at the Pennsylvania State University is seeking a Postdoctoral Scholar. The successful candidate will work in the Electronics and Thermography Lab under the supervision of Dr. Sukwon Choi.

Duties include, but are not limited to:

- Perform thermal property measurement and modeling of wide bandgap semiconductor epitaxial material stacks.
- Perform thermal imaging and modeling of wide bandgap semiconductor devices.
- Publish results in journals, prepare reports, and present research outcomes at conferences.
- Mentor PhD, MS, and undergraduate students.

Qualifications and Requirements:

- Ph.D. by the start date in Mechanical Engineering or a related discipline.
- Experience in thermo-physical property measurement using laser-based pump-probe techniques.
- Experience in modeling of phonon transport within solids and across interfaces.
- Good interpersonal, communication, writing, and documentation skills.

For more information, please contact Dr. Sukwon Choi at: sukwon.choi@psu.edu

The Pennsylvania State University is committed to and accountable for advancing diversity, equity, and inclusion in all of its forms. We embrace individual uniqueness, foster a culture of inclusive excellence that supports both broad and specific diversity initiatives, leverage the educational and institutional benefits of diversity, and engage all individuals to help them thrive. We value inclusive excellence as a core strength and an essential element of our public service mission.

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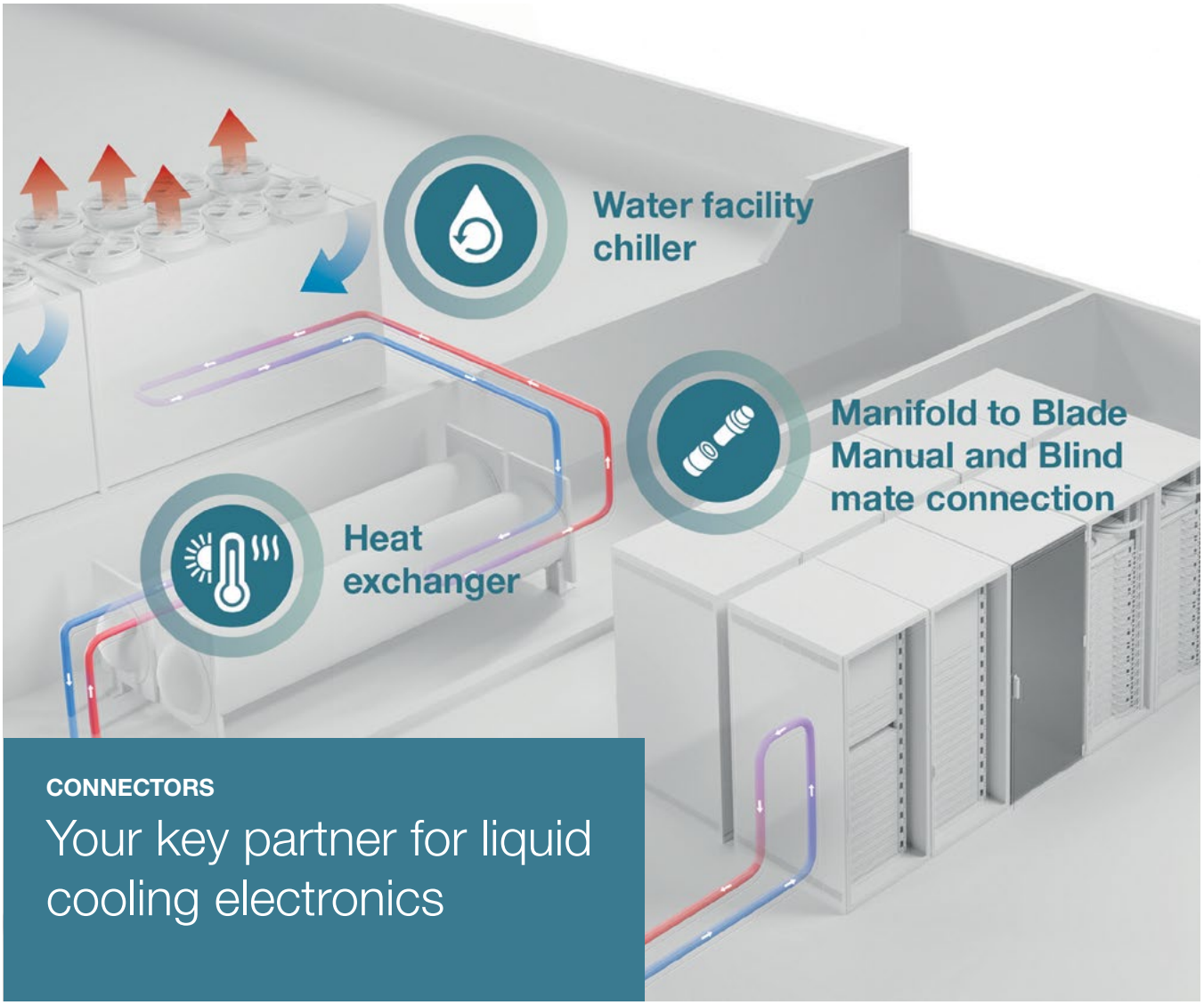

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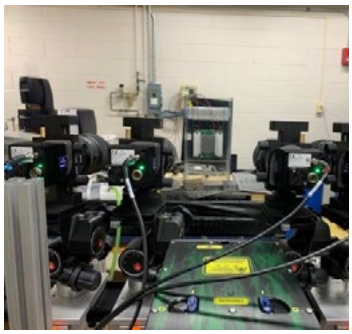
Centers: Electronics, MEMS, and Nanoelectronics Systems Packaging Center (EMNSPC), NSF - IUCRC for Energy-Smart Electronic Systems (ES2), and Reliability Assessment in Heterogenous Integrated Systems (RAHIS).

Mission – Advancement of cooling technology and reliability for electronics at the chip, server, rack, and room level. **Research focus** – Air cooling, Liquid cooling, Immersion cooling & Reliability. **3000 sq. ft** of new lab space & **2 faculty lines** allocated. **Current funding sources** – CoolIT, Google, Fabric8Labs, Honeywell, Intel, Lockheed Martin, Mestex, META, Microsoft, NVIDIA, Silent-Aire, Vertiv, Chemours & NSF, NRC and ARPA-E+. **Current Personnel** – 2 Postdoctoral scholars, 11 PhDs, and several MS students.

Liquid cooling rack system built from ground up with CDUs and underfloor manifolds.



LaVision Tomographic PIV with PLIF capabilities for **Immersion cooling** studies.
Other equipment: 2U SPIC & 2PIC tanks.

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+*"HOLISTIC CO-DESIGN OF NOVEL HYBRID-COOLING TECHNOLOGY FOR THE DATA CENTER OF THE FUTURE."*

TEAM – University of Texas Arlington, University of Maryland, Illinois Institute of Technology, & University of Illinois Urbana-Champagne.

FUNDING – $2,843,223
DURATION – 3 YEARS

https://arpa-e.energy.gov/news-and-media/press-releases/us-department-energy-announces-40-million-more-efficient-cooling-data

Hysitron TI 980 TI Nano-indenter with 10,000+ indentation density, 1000 $_{m}$m x 1000 $_{m}$m test area for **Reliability** testing.
Other equipment includes - TMA, DMA, Environmental chamber, & vacuum thermal chamber.

Airflow bench setup for measuring system impedance for components and servers and characterizing system performance when utilizing **Air cooling**.

Other Research Areas - Active control of cooling systems utilizing AI and Machine Learning, Multi-objective design optimization of heatsinks.

Future Acquisitions – SONIX S.A.M, S.E.C 865 Flip chip bonder, thermal shock chamber, HALT chamber.

InterPACK 2023

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

CALL FOR PAPERS

Special Issue – InterPACK 2023 of ASME Journal of Electronic Packaging

InterPACK is a premier international forum for the exchange of state-of-the-art knowledge in research, development, manufacturing, and applications of electronic packaging and micro/nano-electromechanical systems. It is also the flagship conference of the ASME Electronic and Photonic Packaging Division (EPPD). The Journal of Electronic Packaging (JEP) publishes papers that use experimental and theoretical methods, approaches, and techniques to address and solve various mechanical, materials, thermal, and reliability problems encountered in the analysis, design, manufacturing, testing, and operation of electronic and photonics components, devices, and systems.

Authors are invited to submit their manuscripts revised from their original conference papers to be considered for the Special Issue. These papers will be reviewed by the AE/GE and go through the normal JEP review process. Presentation-only contributors are also invited to develop full-length manuscripts and submit them for review. The aim of this InterPACK Special Issue is to publish outstanding papers with a diversity of scientific works representing all tracks of InterPACK2023.

Submission Instructions

Should you have any questions, please contact Prof. Ron Warzoha at Ronald.Warzoha@gmail.com.

1. The SI is targeted to publish honorary-quality papers with InterPACK2023 flavor, but it's not equivalent to conference proceedings.
2. Please revise an original InterPACK2023 conference paper with new contents to meet "similarity" requirement of <50% compared to original conference paper.
3. The submission should be directly revised from the InterPACK2023 paper or technical presentation. Please include the original InterPACK paper in the appendix of your submission to this SI through the ASME Journal Tool.

Topic Areas

The scope of this issue includes but not limited to:

- Heterogeneous Integration
- Data Centers and Modular Edge Systems
- Electronics Packaging
- Power/RF Electronics and Photonics
- Multiscale Thermal Transport and Energy Storage
- Flexible, Wearable, and Printed Electronics
- Transportation Systems, AI and Machine Learning

Publication Dates

2024 Jan 31	Paper Submission Deadline
2024 Apr 03	Initial Review Completed
2024 Sep	Publication Date

Guest Editors

Prof. Ronald Warzoha, United States Naval Academy (ronald.warzoha@gmail.com)

Prof. Ashutosh Giri, University of Rhode Island (ashgiri@uri.edu)

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Dr. Jimil Shah, Stealth Startup (jimilshahphd@gmail.com)

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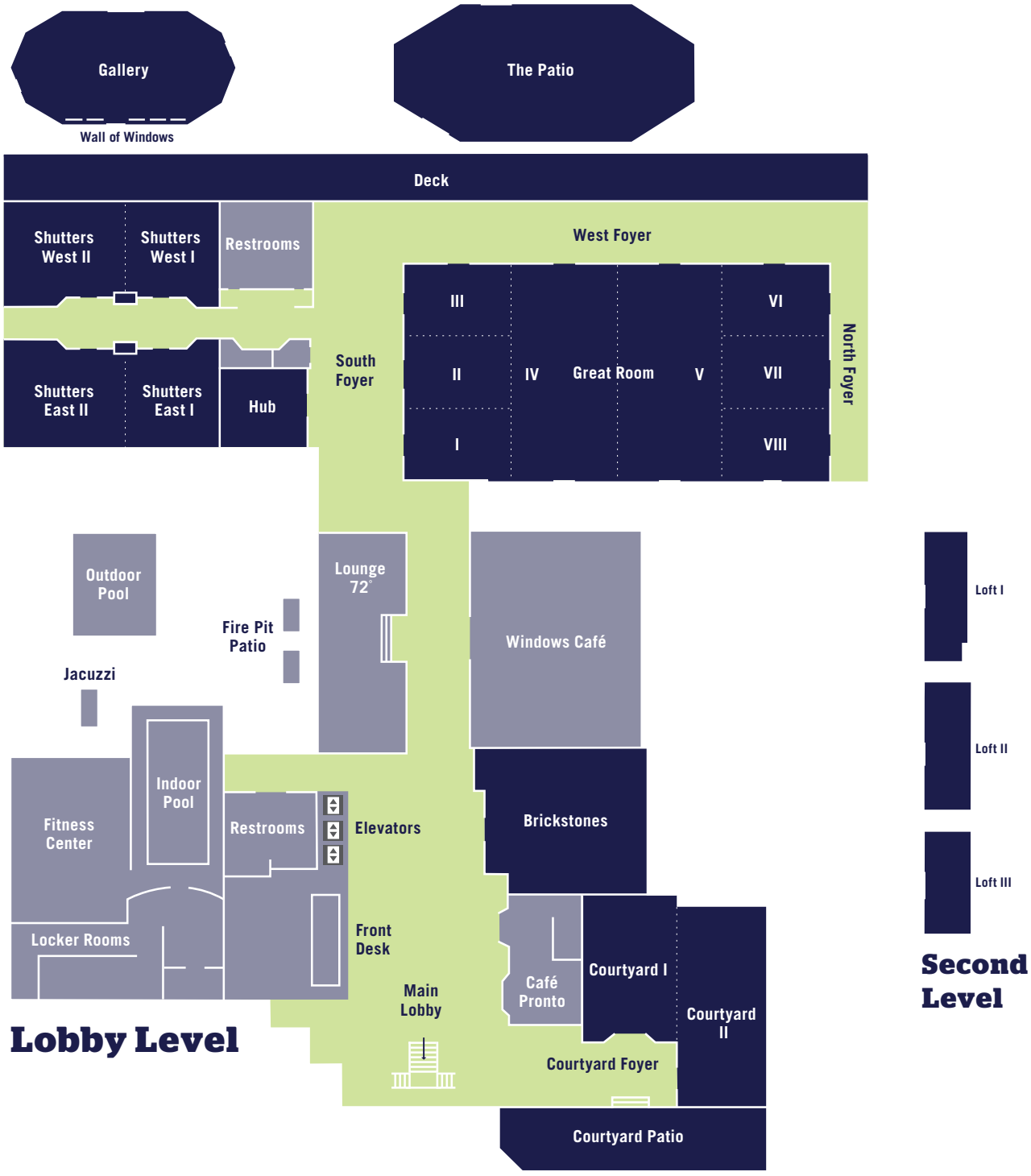

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- Elevators
- Meeting & Event Space
- Amenities/Services
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SEE YOU IN 2024!