The 24th Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems

ITherm

DALLAS, TX

2025

Gaylord Texan Resort &
Convention Center
Dallas, TX
May 27 – 30, 2025

IEEE
Advancing Technology for Humanity

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WELCOME LETTER

On behalf of the organizing committee, it is a great pleasure to welcome you to *ITherm 2025*, the leading international conference for the scientific and engineering exploration of thermal, thermo-mechanical, and emerging technology issues associated with electronic devices, packages, and systems. ITherm is once again being held along with the *Electronic Components and Technology Conference* (ECTC), a premier electronic packaging conference.

ITherm 2025 is packed with many activities, including over 175 technical presentations across four technical tracks. Each morning will feature a keynote addressing the critical topics to the community: Dr. Raja Swaminathan will highlight the future of AI hardware enabled by advanced packaging, Mr. Scott Parent will discuss accelerating the energy transition through digital engineering and simulation, and Mr. Cullen Bash will focus on data center energy efficiency in the post-exascale era. ITherm 2025 is also excited for the invited presentation by Mr. Chandrakant Patel, the 2025 recipient of the Richard Chu ITherm Award for Excellence. Five technical Panel Sessions will provide highly interactive engagement with experts and five Technology Talk Sessions will feature deep dive talks on high profile topics. New this year, hear from successful start-up companies, small businesses, and government experts at our special panel on *Technology Transition: From Concept to Commercialization*, which will discuss the process, challenges, and best practices of moving emerging technologies from research and development into operational use. ITherm 2025 proudly continues a long tradition of supporting the next generation of thermal and packaging researchers and engineers with over an interactive poster session featuring over 50 student presenters and the final presentations for the 2026 ASME/K-16 and IEEE/EPS Student Cold Plate Design Competition.

Attendees are also highly encouraged to take advantage of networking opportunities with ECTC. Several exciting joint *ITherm* and *ECTC* events will be held starting on Tuesday with 16 professional development courses, followed by the Young Professionals Networking Panel. On Wednesday, check out a new Student & Start-Up Innovation Challenge where pitches will be evaluated by a panel of experts.

This year we have had unbelievable sponsorship from both industry and academia, which enables student travel grants to expand student participation at ITherm, along with enhancing our conference activities. Our thanks go out to each of this year's sponsors and exhibitors for the critical role their sponsorship provides to *ITherm*. Please visit their exhibition booths, benefit from the exchange of information.

Thank you for participating in the *ITherm 2025* conference! Building upon the success of previous conferences, *ITherm* continues to find innovative ways to grow and serve our community. *ITherm* wouldn't be possible without the hard work of the organizers. Thanks to everyone who has contributed to the success of *ITherm* including our track chairs/co-chairs, session chairs/co-chairs, panel/technology talk organizers, all reviewers, and many others! Finally, the support of our Executive Committee is highly appreciated. A complete list of key contributors and reviewers is listed later in this program.

Whether this is your first time attending or are regular at *ITherm*, we hope that you will feel energized by the interaction with your fellow attendees. For our first-time attendees, we hope you take advantage of all the networking opportunities to continue to grow your careers. *ITherm 2026* will be held in Orlando, FL, USA on May 26 – May 29, 2026, and we hope that you mark your calendars to be there as well. Please join us for the ITherm 2026 Program Planning meeting (open to all) to volunteer on Friday during the morning coffee break (10:30 – 11:30 am). We appreciate the dedication of this community and are eager to see you all again.

Prof. Amy Marconnet
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Program Chair

Prof. John (Jack) Maddox
Vice Program Chair

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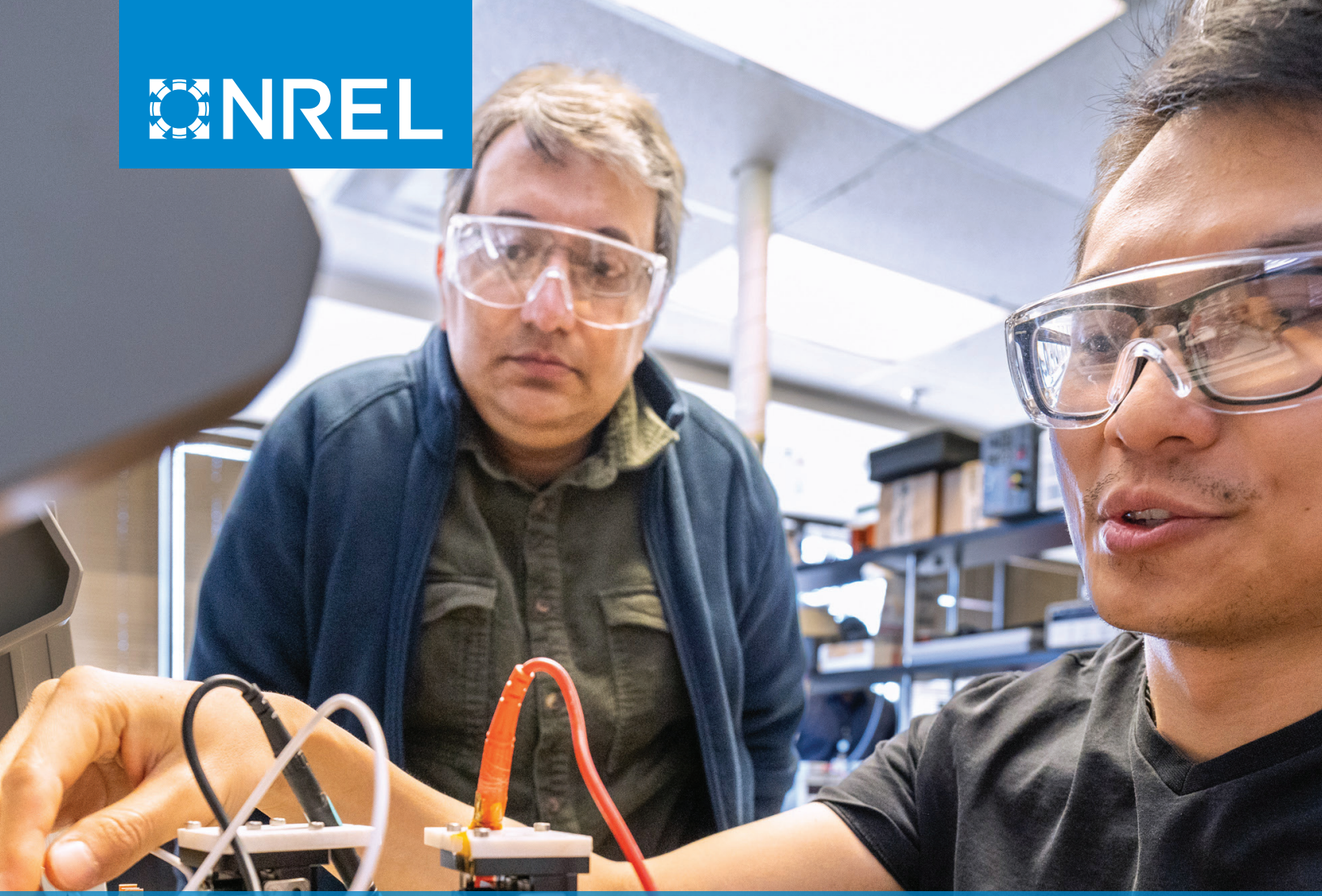
Communications Chair



Advanced Power Electronics and Electric Machines

NREL's Advanced Power Electronics and Electric Machines (APEEM) group works to overcome the most challenging technical barriers to cutting-edge, power-dense electronic packages and electric machines.

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Expertise
15 researchers

Innovation
15 patents

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CONFERENCE DESCRIPTION & SUMMARY

Sponsored by the IEEE's Electronics Packaging Society (EPS), ITherm 2025 is the leading international conference for the scientific and engineering exploration of thermal, thermomechanical and emerging technology issues associated with electronic devices, packages and systems. ITherm 2025 will be held along with the 75th Electronic Components and Technology Conference (ECTC 2025 - http://www.ectc.net), a premier electronics packaging conference at the Gaylord Texan Resort & Convention Center (Dallas, TX).

- **Over 175 Technical Papers and Presentations** organized across four Technical Tracks: Component-Level Thermal Management (TI), System-Level Thermal Management (TII), Mechanics & Reliability (M), and Emerging Technologies & Fundamentals (E)
- **3 Keynote Talks** on the future of AI hardware enabled by advanced packaging, energy transition through digital engineering and simulation, and data center energy efficiency in the post exascale era
- **Richard Chu ITherm Award and Seminar** by Chadrakant D. Patel, former HP SVP, Chief Engineer and Senior Fellow
- **8 Technology Talks** providing deep-dive talks on high-profile topics
- **4 Panels** discussing the latest industry challenges and trends
- **2 Special Interest Panels** on ARPA-E COOLERCHIPS and Technology Transition
- **54 Student Posters** showcasing the latest research in an interactive networking environment
- **ASME/K16 & IEEE/EPS Student Design Challenge Presentations**
- **ECTC/ITherm Young Professional Networking Event**
- **2025 ECTC Student and Start-Up Innovation Challenge** (open to ITherm delegates)
- **16 Professional Development Courses** offered as a collaboration with ECTC

GENERAL INFORMATION

REGISTRATION

Web Registration Link:
https://www.ieee-itherm.net/itherm-2025-registration/.

On-Site Registration Location:
Level 1, Vineyard Pre-Function

On-Site Registration Hours:
Tuesday, May 27: 3:30 PM – 5:30 PM
Wednesday, May 28: 6:30 AM – 5:30 PM
Thursday, May 29: 7:00 AM – 5:30 PM
Friday, May 30: 7:00 AM – 11:30 AM

Conference Registration Includes:

- Admission to All Conference Sessions and the ITherm Exhibit Hall
- Breakfast and Luncheons (Wednesday, Thursday, and Friday)
- Digital Conference Proceedings
- Access to select events at ECTC: the Young Professionals Networking Event, the ECTC Student & Start-Up Innovation Challenge, the EPS President's Panel, and limited access to the ECTC Exhibit Hall (Thursday 2 – 4 pm).

Fees (Onsite Registration)	IEEE Member	Non-Member	Student Member	Student Non-Member
Joint ITherm/ECTC Registration	$1665	$1995		
ITherm Registration	$925	$1075	$525	$625
One-Day Registration	$775	$925		

CONFERENCE POLICIES

Cancellation Policy: All refund/cancellation requests must be provided in writing and received by May 20, 2025. There will be an administrative fee of US$50 deducted from each refund.

Substitution Policy: All requests to substitute another person on an existing registration must be submitted in writing to the following email address support@ieee-itherm.net no later than May 20, 2025. There will be an administrative fee of US$50 for each substitution.

IEEE Membership Discount Policy: Attendees who selected an IEEE Membership discounted rate but are not members at the time of the conference will be charged the difference between member and non-member registration rates plus a processing fee of US$50.

Recording Policy: Attendees, including presenting authors, are strictly prohibited from recording or streaming presentations in any form (audio, video, still photography, etc.) without permission from ITherm. You are encouraged to follow up with presenters in between sessions to discuss their work or request additional information.

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Conduct Policy: IEEE has no tolerance for discrimination, harassment, or bullying in any form at IEEE-related events. All participants have the right to pursue shared interests without harassment or discrimination in an environment that supports diversity and inclusion. Participants are expected to adhere to these principles and respect the rights of others.

Age Policy: Any attendee under the age of 18 must be accompanied by an adult.

GENERAL EMERGENCY INFORMATION

If an accident or illness of a guest, visitor or employee occurs in your area, you should immediately:

- Call Hotel Emergency at extension 333 (guest/offices) or operator (public), and provide your name, location and accident or illness.
- If 9-1-1 is called, fire/EMT will respond in approximately 5 minutes.
- Visit the registration desk or the hotel information desk for medical facilities and pharmacy information (for non-emergencies). In case of emergency refer above.

In the event that an alarm is activated, an announcement will be made via the hotel's public address system regarding the situation and what action to take, if necessary. Please note that the fire department responds to all alarms, therefore, it is not unusual for them to be on property when an alarm is activated. The hotel's public address system is used only in emergency situations.

COMMITTEE MEETINGS

ITHERM 2026 PROGRAM PLANNING

Friday, May 30, 10:30 to 11:30 AM.
Level 2, Tate A3
Open to all current and future contributors.

ASME K-16 COMMITTEE AND JOURNAL OF ELECTRONIC PACKAGING

Wednesday, May 28, 7:00 to 8:00 PM.
Level 2, Tate A1
Open to all interested in becoming involved with K-16 and the Journal of Electronic Packaging

ITHERM EXECUTIVE COMMITTEE

Thursday, May 29, 7:00 to 7:30 PM.
Level 1, Davis 3-4
By invitation only.

ITHERM 2025 ORGANIZERS' DINNER

Thursday, May 29, 7:30 to 9:30 PM.
By invitation only.

ITHERM CONFERENCE APP

1. To get started, download the Ex Ordo app on your phone from either the App Store (iOS) or the Google Play Store (Android). You can also go directly to the app-store and search for the "Ex Ordo" app. The app is free and the ITherm guide will be downloaded from within this app.
2. The installation process will take a few minutes. Once the app is installed, click the Ex Ordo icon that now appears on your phone screen.
3. Once you have downloaded the app, go to "Find Guides" at the bottom right of the screen. Then to find the ITherm2025 guide, tap on "Have a passphrase" and add the passphrase. Then tap "Download Guide" (above the map) to add the ITherm2025 guide to your app and begin using it.

Passphrase (case-sensitive)
itherm2025

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- ITherm Website: https://www.ieee-itherm.net/
- Join the ITherm LinkedIn Group and follow ITherm on Linkedin.
- Tag ITherm in your LinkedIn Posts using @IEEE-ITherm
- Follow ITherm on X | X handle: @IEEE_ITherm
- Follow ITherm stories on Medium.com

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Poster Session Co-Chair	Karthekeyan Sridhar	TI
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Keynote Co-Chair	Vadim Gektin	Qualcomm
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PDC Short Course Co-Chair	Kitty Pearsall	IBM (Retired)
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EPS/K16 Student Design Competition	Han Hu	University of Arkansas
EPS/K16 Student Design Competition	Tiwei Wei	Purdue University

EPS/K16 Student Design Competition	Amy Marconnet	Purdue University
EPS/K16 Student Design Competition	P. Subrahmanyam	Dell
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Branding and Graphic Design	John (Jack) Maddox	University of Kentucky
Social Media	Chirag Kharangate	Case Western Reserve University
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Richard Chu ITherm Award Co-Chair	Koneru Ramakrishna	Thermal Consultant
Richard Chu ITherm Award Co-Chair	Yogendra K. Joshi	Georgia Institute of Technology
Best Paper Award Chair	Yogendra K. Joshi	Georgia Institute of Technology
Best Paper Award Co-Chair	Koneru Ramakrishna	Thermal Consultant
Best Paper Award Co-Chair	Jeffrey Suhling	Auburn University
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ITherm2024 Keynote Speakers, Dr. LaVan, Prof. Amon and Dr. Heydari

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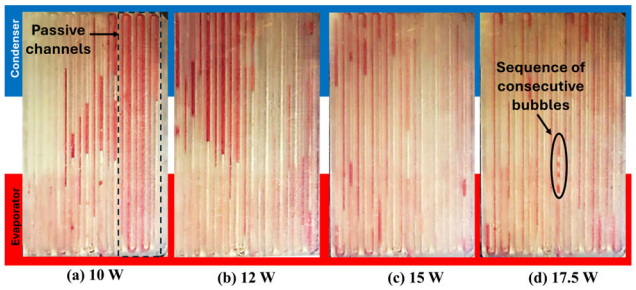
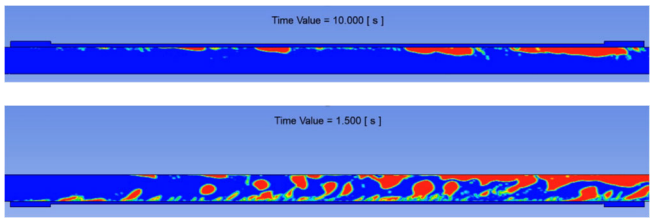
Micro Nano Devices and Systems Lab (MiNDS)

https://sites.gatech.edu/minds/



Flow behavior of an oscillating heat pipe, printed using transparent polymeric material, at different power inputs.

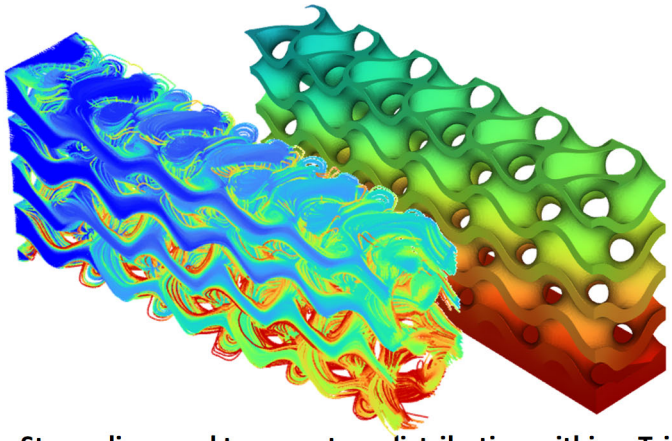


Top: Spatial vapor distribution of PF-5060 fluid in a mini channel with top wall heating at t = 10s. Mass flux: 395.5 kg/m²s, and hot spot heat flux: 4.17 W/cm² (54% of Critical Heat Flux).

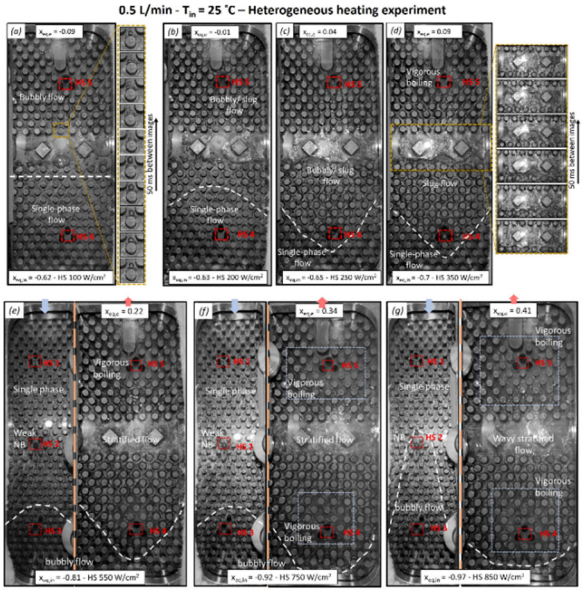
Bottom: Spatial vapor distribution of PF-5060 fluid a mini channel with bottom wall heating at t = 1.5s. Mass flux: 419.3 kg/m²s, and hot spot heat flux: 15.11 W/cm² (58% of Critical Heat Flux).

Microelectronics and Emerging Technologies Thermal Lab (METTL)

https://mettl.gatech.edu/



Streamlines and temperature distribution within a Triply Periodic Minimal Surface (TPMS) lattice featuring functionally graded porosity, exposed to a constant heat.



Visualization of the two-phase flow regimes at a 8.3 cm³/s (0.5 L/min) flowrate, (a) 100 W/cm², (b) 200W/cm², (c) 250W/cm², (d) 350 W/cm², (e) 550 W/cm², (f) 750 W/cm², and (g) 850W/cm².

CONFERENCE EXECUTIVE COMMITTEE

The Executive Committee is made up of past ITherm General Chairs who continue to assist the conference. It provides the leadership and continuity needed to carry forward the thrust of our Inter Society Conference.

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Prof. Justin Weibel, Purdue University

LAST YEAR'S BEST PAPERS (ITHERM 2024)

COMPONENT-LEVEL THERMAL MANAGEMENT TRACK

PROF. AVRAM BAR-COHEN BEST PAPER

AUTOMATED GIMBALING OF CONICAL NOZZLES FOR JET VECTORING IMPINGEMENT COOLING TO MITIGATE WORKLOAD DEPENDENT HOTSPOTS IN HIGH POWER DENSITY SILICON

Prabhakar Subrahmanyam, Sankarananda Basak, Vishnu P. Sugumar, Ying-Feng Pang, Arunkumar Krishnamoorthy, Mark Bianco

DOI: 10.1109/ITHERM55375.2024.10709530

RUNNER UP

DEVELOPMENT OF A HYBRID SINGLE/TWO-PHASE CAPILLARY-BASED MICRO-COOLER USING COPPER INVERSE OPALS WICK WITH SILICON 3D MANIFOLD FOR HIGH-HEAT-FLUX COOLING

H. Kwon, Q. Wu, D. Kong, S. Hazra, K. Jiang, C. Ahn, S. Narumanchi, H. Lee, J. Palko, E. M. Dede, M. Asheghi, K. E. Goodson

DOI: 10.1109/ITherm55375.2024.10708971

RUNNER UP

THERMAL CHARACTERIZATION OF TWO-PHASE COOLING USING EMBEDDED MICROCHANNELS IN A HIGH CURRENT DENSITY ELECTRIC MOTOR

Ryan Regan, Kimberly Saviers, Wenping Zhao, Andrzej Kuczek, Jagadeesh Tangudu, Justin A. Weibel

DOI: 10.1109/ITherm55375.2024.10709369

RUNNER UP

AN INTEGRATED SIMULATION FRAMEWORK FOR THERMAL-MECHANICAL PERFORMANCE ANALYSIS OF TWO-PHASE MICROCHANNEL EVAPORATORS

Sarwesh N. Parbat, David J. Apigo, Haoyun Qiu, Pouya Kabirzadeh, Rishav Roy, Syed Faisal, Nenad Miljkovic, Todd Salamon

DOI: 10.1109/ITherm55375.2024.10709519

SYSTEM-LEVEL THERMAL MANAGEMENT TRACK

PROF. AVRAM BAR-COHEN BEST PAPER

ULTRATHIN BLOWERS: A STUDY ON PARAMETERS INFLUENCING FLOW AND THERMAL PERFORMANCE IN NOTEBOOK APPLICATIONS

Ravishankar Srikanth, Amit Kumar, Arnab Sen

DOI: 10.1109/ITherm55375.2024.10709517

RUNNER UP

DESIGN AND CHARACTERIZATION OF A THERMAL TEST VEHICLE WITH EMBEDDED PHASE CHANGE MATERIAL

Meghavin Bhatasana, Amy Marconnet

DOI: 10.1109/ITherm55375.2024.10709582

RUNNER UP

AN ADVANCED 48U SINGLE PHASE IMMERSION COOLING SYSTEM DESIGN FOR COMMERCIAL DATA CENTER DEPLOYMENTS

Brant Chang, Jimmy Chang, Allen Liang, Jun Zhang, Carrie Chen, Jiahong Wu, Hu Tang, QingYi Kong

DOI: 10.1109/ITherm55375.2024.10709395

MECHANICS AND RELIABILITY TRACK

PROF. AVRAM BAR-COHEN BEST PAPER

ACCELERATED TESTING OF THERMAL GREASE DEGRADATION: COMBINED THERMAL GRADIENTS AND FORCED MECHANICAL CYCLING

Pranay P. Nagrani, Amy M. Marconnet

DOI: 10.1109/ITherm55375.2024.10709372

RUNNER UP

INVESTIGATION OF THE EFFECTS OF SUSTAINED HIGH-TEMPERATURE ON THE RELIABILITY OF LEAD-FREE SOLDER JOINT ASSEMBLIES IN VIBRATION

Pradeep Lall, Vishal Mehta, Jeff Suhling, David Locker

DOI: 10.1109/ITHERM55375.2024.10709586

EMERGING TECHNOLOGIES AND FUNDAMENTALS TRACK

PROF. AVRAM BAR-COHEN BEST PAPER

STATIC AND DYNAMIC THERMAL MODELLING OF SI PHOTONIC THERMO-OPTIC PHASE SHIFTER

David Coenen, Minkyu Kim, Herman Oprins, Kristof Croes, Peter De Heyn, Joris Van Campenhout, Ingrid De Wolf

DOI: 10.1109/ITherm55375.2024.10709411

RUNNER UP

CHARACTERIZATION OF ENHANCED TWO-PHASE JET IMPINGEMENT ON FEMTOSECOND LASER SURFACE PROCESSED (FLSP) ALUMINUM SURFACES

Alexander Ceperley, Gopinath Sahu, Andrew Reicks, Craig Zuhlke, George Gogos, Justin A. Weibel

DOI: 10.1109/ITherm55375.2024.10709496

RUNNER UP

DEVELOPMENT AND PERFORMANCE EVALUATION OF ADDITIVELY PRINTED IN-MOLD-ELECTRONIC SENSORS

Pradeep Lall, Ved Soni, Scott Miller

DOI: 10.1109/ITherm55375.2024.10709447

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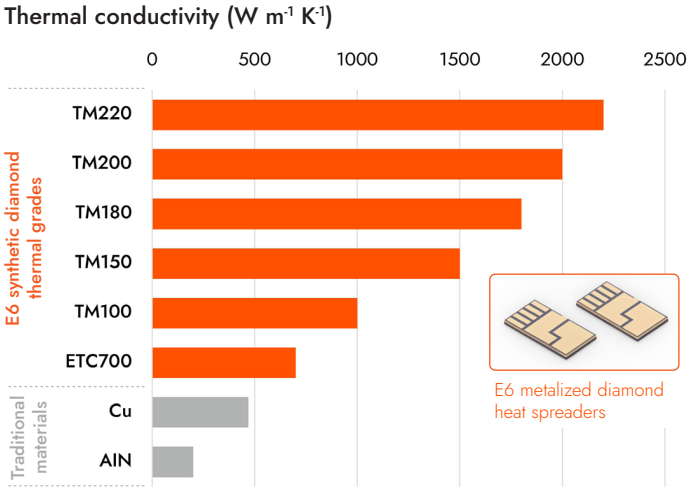
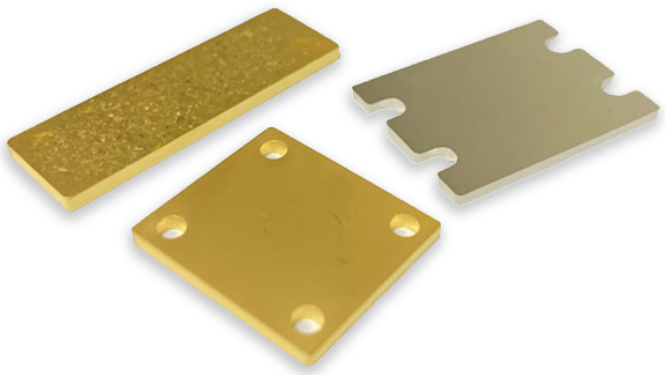
CVD diamond thermal grades



Thermal conductivity: 1000 - 2200 W m^{-1} K^{-1}
Thermal expansion coefficient: 1 ppm K^{-1}

Cu-Diamond



Thermal conductivity: 800 - 1000 W m^{-1} K^{-1}
Thermal expansion coefficient: ~7 - 9 ppm K^{-1}

Advantages

- Reduce thermal management bottlenecks
- Improve thermal performance of the device package
- Increase device reliability
- Enhance output power
- Reduce cooling requirements

Availability

E6's synthetic diamond materials can be supplied in sizes ranging from a few millimeters to several centimeters, and can be coated with thin metal layers, such as Au and Ni, for compatibility with standard die attach bonding. Complex shapes and tailored solutions can be produced according to customer requirements. Further details are available upon request.

ustechnologies@e6.com

KEYNOTES

Chairs: Justin Weibel (Purdue University) and Vadim Gektin (Qualcomm)

K-1: FUTURE OF AI HARDWARE ENABLED BY ADVANCED PACKAGING

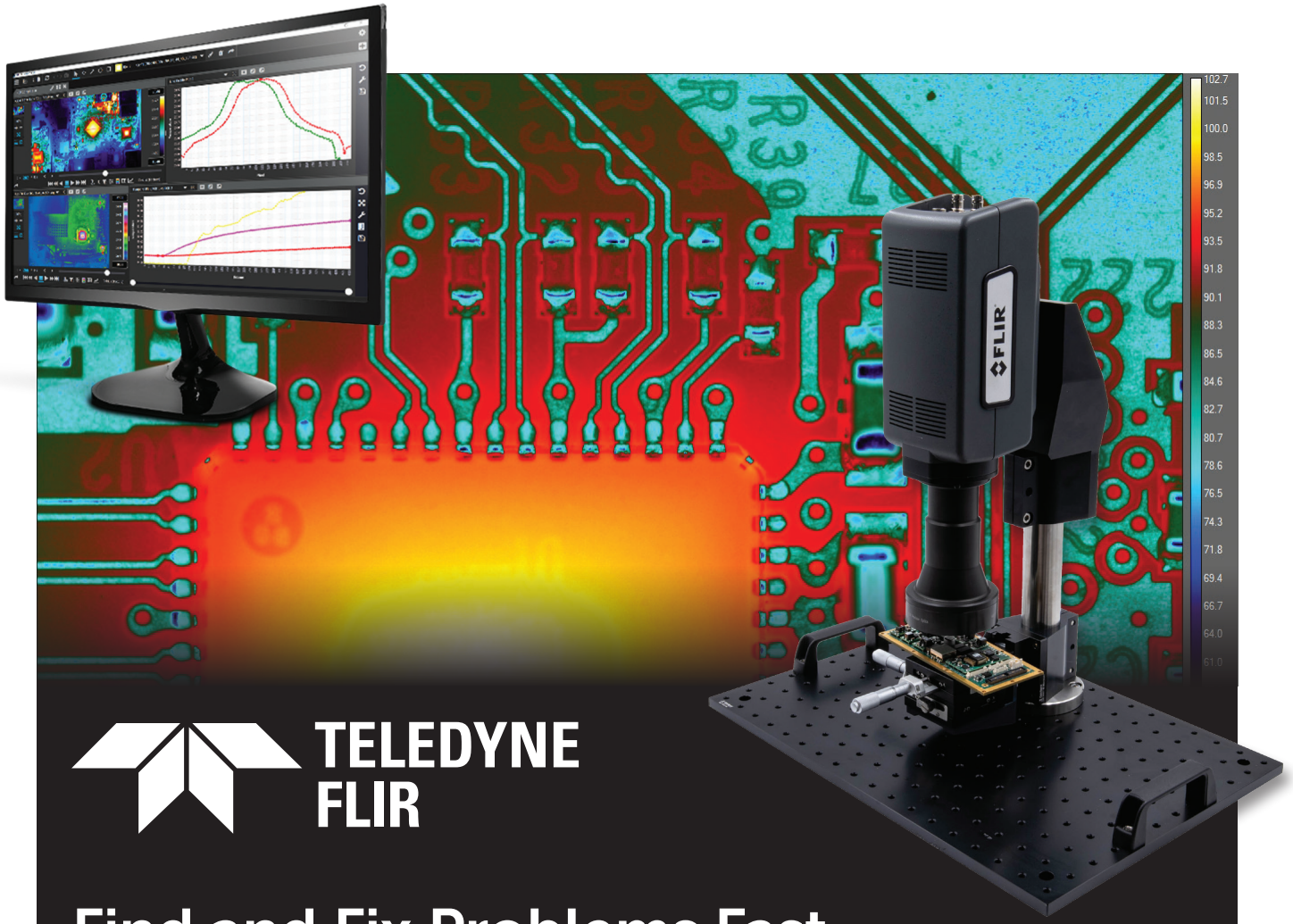
WEDNESDAY, MAY 28, 9:30 AM – 10:30 AM **LEVEL 1, TEXOMA**

Raja Swaminathan
Corporate Vice President

AMD

Abstract: Chiplet architectures are fundamental to the continued economic viable growth of power efficiency of AI, 5G and edge computing. The slowing of Moore's law has also placed advanced packaging at the critical juncture of technology-architecture intersection driving unique product capabilities. New heterogeneous architectures like 2.5D architectures and 3D Hybrid bonded architectures driving AMD's industry leading advanced technology roadmap to enable power, performance, area, and cost (PPAC) will be discussed. Other topics including Chiplets for AI, challenges and solutions for large chiplet modules etc. will also be discussed.

Bio: Dr. Raja Swaminathan is the Corporate Vice President of Packaging at AMD, spearheading the development of AMD's advanced packaging and heterogeneous integration roadmap. With a distinguished career spanning roles at Intel, Apple, and now AMD, Dr. Swaminathan's expertise in design-technology co-optimization and dedication to optimizing power, performance, area, and cost (PPAC) have led to significant technological advancements such as EMIB, Apple's Mx packages, 3D V-Cache, and 3.5D architectures for AI accelerators. Dr. Swaminathan holds a PhD from Carnegie Mellon University and an undergraduate degree from IIT Madras. With over 100 patents and more than 40 published papers to their name, Dr. Swaminathan was recently recognized as an IEEE Fellow and serves as a technical advisor to multiple startups. His unwavering commitment to heterogeneous integration continues to drive the boundaries of silicon technology.



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K-2: ACCELERATING THE ENERGY TRANSITION THROUGH DIGITAL ENGINEERING AND SIMULATION

THURSDAY, MAY 29, 9:30 AM – 10:30 AM **LEVEL 1, TEXOMA**

Scott Parent
Vice President & Field CTO,
Energy | Aerospace | Industrials

Ansys

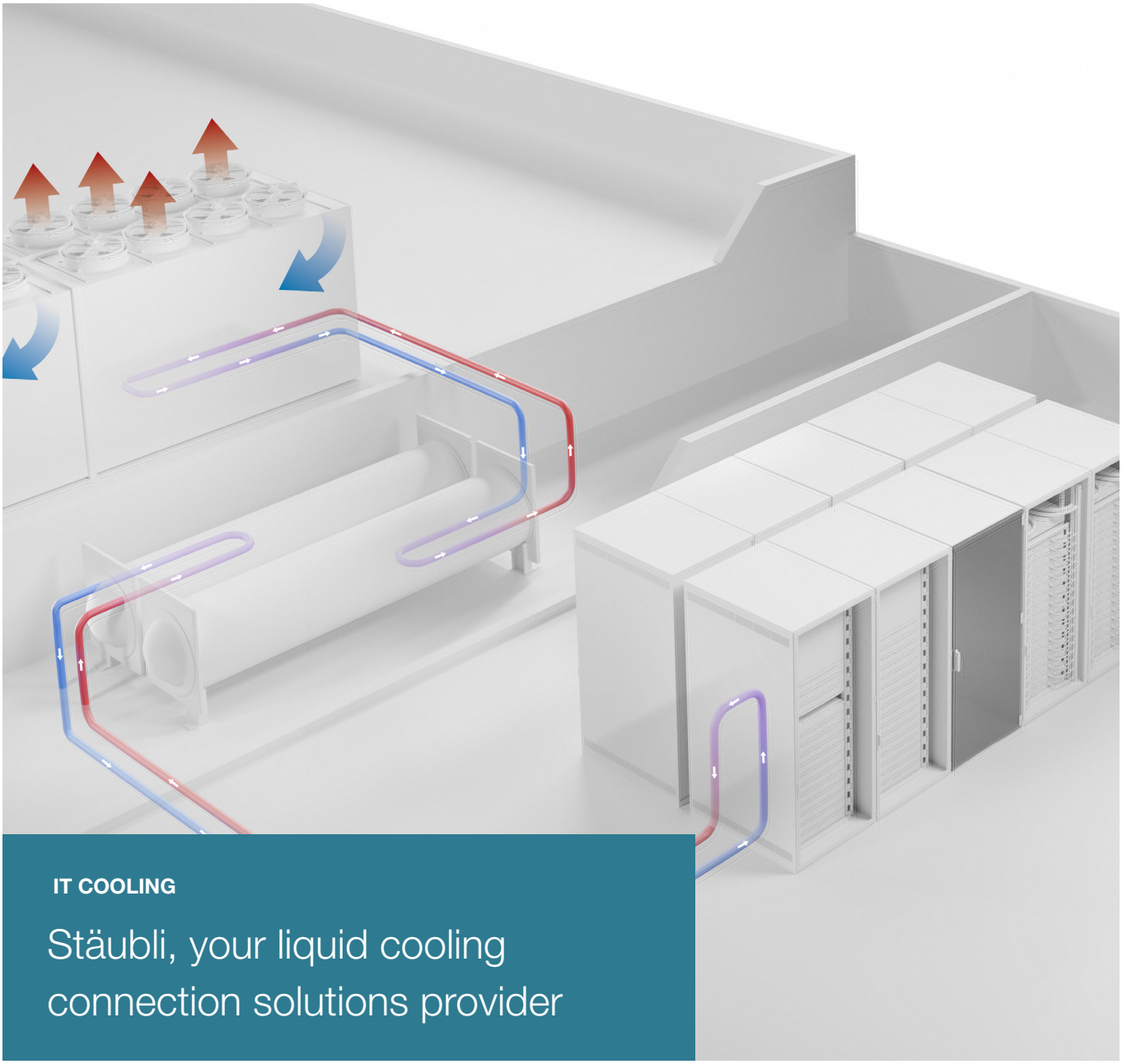
Abstract: The energy transition depends on three critical pillars. First, better efficiency as the world wastes over 65% of the energy produced, converted and consumed. Secondly, we need to have reliable, securable energy for a growing global demand. And thirdly, we need to mature rapidly new low-carbon energy solutions such as renewables, hydrogen, SMR and Fusion. There are five digital scalers: 1- High performance multi-physics simulation 2- High performance computing 3- AI/ML methodologies 4- IoT, cloud and connected sensing and 5- Digital engineering, comprised of model-based systems development, digital twinning and mission engineering. These five technologies, when brought together, become a digital hyper scaling ecosystem. This enables engineers to develop, adapt, deploy, mature and scale new products & technologies faster with less risk, accelerating our transition to a more efficient and sustainable future.

Bio: Scott is currently VP & Field CTO at Ansys, connecting globally with customers to understand their digital engineering development needs and aligning methodologies Ansys has to support their transitions. Scott had a number of preceding CTO/COO roles with GE, BP and Baker Hughes.

Scott has a broad leadership background in technology from multi-physics simulation to robotics, analytics, sensors development, asset health monitoring, AI/ML, additive, computer vision, edge analytics and other associated 5-IR technologies. He sits on Pennsylvania State University's Nuclear Engineering Advisory Council and is a Trained Six Sigma Blackbelt.

Scott has a bachelor's degree in mechanical engineering from the University of Maine, and a master's degree in aerospace engineering from Pennsylvania State University.

STÄUBLI



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K-3: DATA CENTER ENERGY EFFICIENCY IN A POST-EXASCALE ERA

FRIDAY, MAY 30, 9:30 AM – 10:30 AM **LEVEL 1, TEXOMA**

Cullen Bash
Vice President of Research & Development

Hewlett Packard Labs

Abstract: The growth of generative AI has led to unprecedented advances in information processing not thought possible a decade ago. It's also resulted in significant increases in energy consumption that are putting pressure on scalability and operations. This talk will cover recent research in improving the energy efficiency of data center and IT infrastructure.

Bio: Cullen is a Vice President of R&D at Hewlett Packard Labs and currently serves as Director of the Systems Architecture Lab. Focusing on a wide range of inter-related topics including system and fabric architecture, system software, simulation and modeling, software-hardware co-design, optimization and sustainability. The multidisciplinary lab is tasked with advancing next generation systems architecture from research to revenue.

Prior to his current focus on systems, he served as Director of the Platform Architecture Lab where he led a cross-functional hardware, software and architecture team that spanned several organizations and business units as part of the Machine program within Hewlett Packard Labs.

Cullen also served as interim Director of the Sustainable Ecosystems Research Group at HP Labs where he led wide-ranging research into the sustainability of IT equipment, and the use of IT to improve the sustainability of customer ecosystems. During this time, he was also Principal Investigator of the Sustainable Data Center project which investigated the design and operation of data centers to reduce overall resource consumption. In previous roles, he has led research in thermal technologies over a variety of different length scales, from integrated circuits to data centers. Cullen has also taught undergraduate and graduate level courses in heat transfer and electronics cooling. He is a Fellow of both IEEE and the American Society of Mechanical Engineers.

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ENERGY AND THERMAL MANAGEMENT OF CHIPS, SYSTEMS, AND DATACENTERS NECESSITATES A RETURN TO FUNDAMENTALS

WEDNESDAY, MAY 28, 12:30 PM – 2:00 PM **LEVEL 1, HIGH PLAINS**

2025 Richard Chu ITherm Awardee

Chandrakant D. Patel, P.E.
HP Chief Engineer and Senior Fellow (retired)

HP Inc.

Abstract: The mainframe era of high-performance computers led to innovative approaches in heat removal. The cooling solutions developed by Dr. Richard Chu and colleagues at IBM, including the thermal conduction module and multi-tier air-liquid hybrid cooling, were based on engineering fundamentals. Many individuals, including myself, referred to classic textbooks and models created by researchers at industrial and academic labs for heat transfer design and analysis. This comprehensive approach also included structural analysis due to the emergence of multi-chip modules in computer mainframes. In the late 20th century, compute utilities evolved into large-scale data centers with densely packed standard computing, storage, and networking equipment. Power requirements for these modern data centers are in multi-megawatts, while AI data centers using planetary-scale data may reach gigawatt levels, comparable to hydroelectric power plants. The electrical energy supplied to chips converts to heat, requiring active cooling methods that also consume power. Although many innovative measures have been implemented for heat removal and energy management in data centers, there is a notable gap in the application of engineering principles compared to the methods used by early contributors in Dr. Chu's era. For instance, early contributors often performed exergy (2nd law of thermodynamics) analysis for a comprehensive understanding. Indeed, many data centers today rely on power infrastructure established during the 19th century machine age. Contributors from that era, grounded in the 2nd law of thermodynamics, prioritized building hydro-electric power plants before constructing Aluminum factories. Given the continuous growth of data centers driven by AI and the associated energy demands, it is crucial to revisit these engineering fundamentals, especially considering environmental challenges. In my talk, I will present a holistic approach that traces the energy flow from a power plant to a chip, and from the chip core to the cooling tower.

Bio: A former SVP, Chief Engineer, and Senior Fellow at HP Inc., Chandrakant has been a Silicon Valley contributor for 42 years. Formerly leading HP Labs, he has shaped advancements in chips, high performance computing systems, storage, networking, 3D additive manufacturing systems, and software platforms. Pioneering energy-efficient data center solutions, he founded the Smart Data Center research program at HP Laboratories that led to multi-billion-dollar data center infrastructure and services business. He is a recognized leader in AI, energy efficient computing, and sustainability. With deep passion for fundamentals, and workforce development, he has also served as adjunct faculty in engineering at UC Berkeley, San Jose State, Santa Clara University and Chabot College for two decades. An IEEE Fellow, ASME Fellow, member of the National Academy of Engineering (NAE) and the Silicon Valley Engineering Hall of Fame, Chandrakant holds 167 US patents and has published more than 150 papers. He is a registered professional mechanical engineer in the State of California. Chandrakant has served on the company board of Mphasis, an IT Services Company in India. He has also served on the Industrial Advisory Boards in EECS at UC Berkeley and Mechanical Engineering at Santa Clara University.

Electrification Hub (EHub)

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Advanced Thermofluids Optimization, Modelling, and Simulation Laboratory

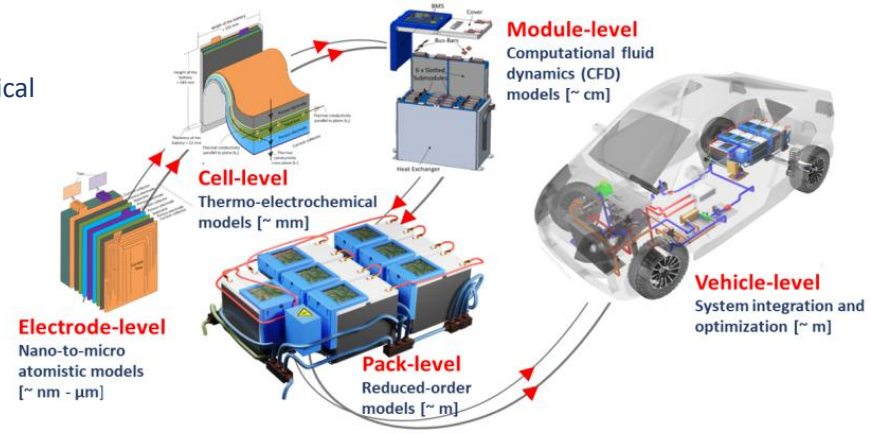
ATOMS Lab's Thermal Management Systems (TMS) Experimental Facility

Photo Credits: Aaron Demeter

Research Scope

ATOMS Lab's experimental-numerical research program on lithium-ion batteries and electric vehicles

Hierarchical thermal and electrochemical modeling, design optimization, and experimental research across multiple physical domains and length scales from battery electrode to vehicle levels



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Senior Research Associate
EHub Executive Director
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PROFESSIONAL DEVELOPMENT COURSES

A set of 16 Professional Development Courses (PDCs) are being offered as a collaboration between ITherm and ECTC conferences. Each of these courses are presented by world-class experts, enabling participants to broaden their technical knowledge base. All PDC courses will be held on Tuesday, May 27, 2025, the first day of the ITherm and ECTC conferences. A separate registration fee is required to attend these courses, and the PDC course registration can be performed at the ECTC registration website: https://www.ectc.net/registration/ or at the ECTC registration desk. See website for more information.

MORNING COURSES 8:00 AM – 12:00 PM

1. High Reliability Soldering in Semiconductor Packaging
Course Leader: Ning-Cheng Lee – Shinepure Hi-Tech

2. Photonic Technologies for Communication, Sensing, and Displays
Course Leader: Torsten Wipiejewski – Huawei Technologies

3. From Wafer to Panel Level Packaging
Course Leaders: Tanja Braun and Piotr Mackowiak – Fraunhofer IZM

4. Eliminating Failure Mechanisms in Advanced Packages
Course Leader: Darvin Edwards – Edwards Enterprises

5. Inroduction to and Advances in 2.3d Fan-Out Wafer Level Packaging (FO-WLP)
Course Leader: Beth Keser – Zero ASIC

6. Wafer-to-Wafer and Die-to-Wafer Hybrid Bonding for Advanced Interconnects
Course Leader: Viorel Dragoi – EV Group

7. Fundamentals of Fabrication Processes and RF Design of Advanced Packages including Fan-Out, Chiplets, Glass and Polymer Interposers
Course Leaders: Ivan Ndip – Brandenburg University of Technology/Fraunhofer IZM and Markus Wöhrmann – Fraunhofer IZM

8. Design of Reliable Data Center Cooling Systems
Course Leaders: Patrick McCluskey and Damena Agonafer – University of Maryland

AFTERNOON COURSES 1:30 PM – 5:30 PM

9. 3D Packaging Failure Analysis - Failure Mechanisms and Analytical Tools
Course Leader: Deepak Goyal – Independent Consultant

10. Diamond for Heterogeneous Integration
Course Leader: Joana Mendes – University of Aveiro

11. Chiplet, Heterogeneous Integration, and Co-Packaged Optics
Course Leader: John Lau – Unimicron

12. Analysis of Fracture and Delamination in Microelectronic Packages
Course Leader: Andrew Tay – National University of Singapore

13. Advanced Fan-Out Developments and Applications
Course Leaders: John Hunt and Jan Vardaman – Techsearch International, Inc.

14. Flip Chip Technologies
Course Leader: Shengmin Wen – TATA Electronics

15. Design-On-Simulation for Advanced Packaging Reliability and Life Prediction
Course Leaders: Kuo-Ning Chiang – National Tsing Hua University and Xuejun Fan – Lamar University

16. Current and Future Challenges and Solutions in AI & HPC System and Thermal Management
Course Leader: Gamal Refai-Ahmed – AMD

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HETEROGENEOUS INTEGRATION ROADMAP (HIR) SPECIAL SESSIONS

TUESDAY, MAY 27, 8:00 AM – 5:30PM **ECTC, TEXAS C**

Chairs: Ravi Mahajan (Intel) and William Chen (ASE)

- IoT & AI at the Edge
- Advancing Heterogeneous Integration through Metrology & AI
- Integrating Photonics in HPC & Network Systems
- Advances in Panels, Substrates and Printed Circuit Boards

YOUNG PROFESSIONALS NETWORKING PANEL

TUESDAY, MAY 27, 7:00 – 7:45 PM **ECTC, TEXAS C**

Chair: Aakrati Jain (IBM)

Join us for an invaluable opportunity to connect with industry leaders and fellow emerging talents! Tailored specifically for young professionals, including current graduate students, this event is crafted with your needs in mind. Engage in dynamic interactions with senior EPS members and professionals through a series of active and engaging activities. Seize the chance to delve deeper into packaging-related topics, pose career questions, and connect with industry professionals for a valuable learning experience.

STUDENT & START-UP INNOVATION CHALLENGE

WEDNESDAY, MAY 28, 6:30 – 8:30 PM **ECTC, TEXAS A-B**

Chair: Rozalia Beica (Rapidus), Farhang Yazdani (BroadPak) and Jason Rouse (Taiyo America, Inc.)

This session is organized as a competition and will have competing pitches of both student teams and start-ups followed by deliberation of a jury panel, awards announcements, and networking session. We will have three student pitches and six start-up pitches (7 min. each) followed by Q&A from the jury panel. The Q&A will be open to the audience. The jury will deliberate and choose the winning student team and start-up. The session will end with the announcement of the winners and a networking session.

EPS PRESIDENT'S PANEL SESSION

ECTC AT 75: CELEBRATING THE PAST, INNOVATING FOR THE FUTURE

FRIDAY, MAY 30, 8:00 - 9:15 AM **ECTC, TEXAS A-B**

Chair: Patrick Thompson (Texas Instruments)

Join EPS/ECTC luminaries as they share:

- Early memories of ECTC and key innovations that revolutionized the industry
- What's happening now that is exciting to them
- Their thoughts on what we'll be reviewing at the 100th ECTC

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Prof. Al Ortega: aortega@villanova.edu

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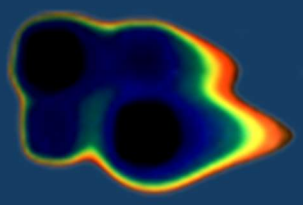

Laboratory for Advanced Thermal and Fluid Systems (LATFS)

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STUDENT POSTER & NETWORKING SESSION

THURSDAY, MAY 29, 5:30 – 7:00 PM **LEVEL 1, TEXOMA**

Chairs: Aakrati Jain (IBM), Kalind Baraya (IBM), Karthik Sridhar (TI)

In this interactive session, students present their research and network with conference attendees from industry and academia. For employers, this is a great chance to find your next talented engineering hire! Outstanding posters will be selected for awards and will be judged based on technical merit, clarity and self-sufficiency of the content, novelty and originality of the work, overall impact of the poster display, and oral presentation at the poster session.

COMPONENT-LEVEL THERMAL MANAGEMENT

Poster	Student Name	University	Paper	Paper Title
1	Naarendharan Meenakshi Sundaram	University of California, Los Angeles	45	Flash boiling of methanol/water mixtures in a microchannel cooler
2	Faisal Ahmed	Auburn University	53	Investigation of Air-Cooled Integrated Synthetic Jet and Heat Sink for Electronics Thermal Management
3	Zekun Wu	Purdue University	117	Topology optimization for embedded cooling of multiple and transient workloads in 3D semiconductor packages
4	Piyush Kulkarni	Binghamton University	129	Indium Solder TIM Stability under Temperature cycling
5	Md. Jubayer Hossain	Georgia Institute of Technology	130	Enhanced Thermal Management of Outer-Rotor Electric Motors Through Additively Manufactured Heat Exchangers With End-Winding Cooling
6	Arani Mukhopadhyay	University of Illinois Chicago	134	Graphene-enhanced heat spreaders for hotspot remediation in direct liquid cooling of electronics
7	Jacey Birkenmeyer	Purdue University	170	Evaluating the Degradation of Thermal Interface Materials in Liquid Immersion Cooling Systems using Ultrasonic Methods
8	Lindsay Sutherland	Purdue University	182	Impact of Slot Liner Compression on the Total Thermal Resistance of the Stator-Winding Assembly in Electric Motors
9	Daniel Shoemaker	Pennsylvania State University	216	Accurate Implementation of Gate Resistance Thermometry for GaN HEMTs with a Source Connected Field Plate

10	Anish Pal	University of Illinois Chicago	221	3-D Numerical Simulation and Optimization of Wick-Free Vapor Chambers for Enhanced Thermal Management in High-Power-Density Applications
11	Devang Tavkari	Purdue University	242	Multiphysics Topology Optimization of Metal-Polymer Composite Thermal Interface Materials
12	Lucas Oelkers	Texas A&M University	343	Measurement of Thermal Impedance in Heterogeneous Media
13	Luke Gyubin Min	Stanford University	354	Direct Visualization of Local Thermal Conductivity and Boundary Conductance of Diamond Particles
14	Matthew Coughlin	Stanford	369	Development of Liquid Metal and Silicon Pin Fin Composite Thermal Interface Materials
15	Saroj Majakoti	University of Arkansas, Fayetteville	380	Predicting Junction temperature and thermal resistance estimation of 1.7kV SiC power module using real time Vsd monitoring method
16	Seokjun Kim	Pennsylvania State University	417	Analysis of the Thermal Resistance Network of Packaged GaN HEMTs

SYSTEM-LEVEL THERMAL MANAGEMENT

Poster	Student Name	University	Paper	Paper Title
17	Kayden Maiorine	Drexel University	18	Thermal Characterization of Select Metallic Phase Change Materials for Transient Load Thermal Management
18	Oscar Alvarez Lemus	University of Toronto	31	Predicting multiscale thermal transport in high-capacity pouch-type lithium-ion batteries for stationary energy storage systems
19	Dayananda Swamy Kattimani Math	Binghamton University	122	Integrating Experimental, Numerical and Machine Learning Models for Real-Time, Efficient Data Center Cooling Control
20	Mingeun Choi	Georgia Institute of Technology	127	Automated Electro-Thermal Modeling Framework of Vertical Power Delivery Architectures with Substrate-Embedded Microfluidic Cooling
21	Sidharth Rajeev	Binghamton University	136	Reliability modeling of liquid cooled data centers
22	Faramarz Kahbandeh	Auburn University	316	Radial Manifold Microchannel Heat Sink for Electronics Thermal Management
23	Forouzan Naderi	Case western reserve university	320	Enhancing Thermal Management through Deep Learning-Based Analysis of Bubble Dynamics in Flow Boiling
24	Arthur Labalte	University of Sherbrooke	360	Experimental comparison of a liquid cooled and air cooled thermal ground plane-based battery thermal management system for a high-power density Lithium-ion battery
25	Derian Morphew	Texas A&M University	365	Rate of Thermal Energy Storage in Composite Phase Change Material Slabs

MECHANICS & RELIABILITY

Poster	Student Name	University	Paper	Paper Title
26	Mahbub Alam Maruf	Auburn University	265	Effects of Isothermal Aging and Mechanical Cycling on the Mechanical Behavior and Microstructure of SAC305 Lead-Free Solder Alloy
27	Golam Rakib Mazumder	Auburn University	267	Characterization of the Anand Model Parameters of SAC305 Lead Free Solder with Various Levels of Damage
28	Ritwik Kulkarni	Purdue University	331	Impact of Non-Flat Heat Sink Surface on Degradation of Thermal Greases
29	Padmanava Choudhury	Auburn University	333	Humidity and High-temperature Effects on non-PFAS Thermal Interface and Underfill Materials
30	Souvik Chakraborty	Auburn University	350	Micromechanical Properties of Mixed SAC/LTS Solder Alloys with Various Bismuth Contents
31	Omma Sumaiya	Auburn University	368	Finite Element Analysis of the Thermal Cycling Performances of PBGA Assemblies Subjected to Various Prior Isothermal Aging Conditions
32	Yunli Zhang	Auburn University	375	Thermal Conductivity Evolution Of Non-Pfas Automotive Packaging Material Under High Temperature And Humidity Exposure

EMERGING TECHNOLOGIES & FUNDAMENTALS

Poster	Student Name	University	Paper	Paper Title
33	Zane Oligee	Auburn University	28	An Experimental Study of the Thermal-Hydraulic Performance of an Additively Manufactured Mini-Channel Cold Plate
34	Harish Kumar Lattupalli	SUNY Binghamton	54	Direct printing of wick structures onto chips for two - phase jet impingement cooling
35	Josh Gerdes	University of Nebraska - Lincoln	86	Femtosecond Laser Surface Processing (FLSP) of 6061 Aluminum Exhibits Flow Boiling Enhancement Using Opteon™ 2P50 for Various Mass Fluxes
36	Sun Jianshi	Donghua University	121	The effects of electron-phonon interactions on the lattice thermal conductivity of wurtzite AlN
37	Mitchell Whiting	Universiteit Antwerpen	159	Numerical investigations linking fluid properties and the design of nucleate boiling cavity arrays.
38	Brandon Kibbel	University of Wisconsin - Platteville	168	Comparison of Operating Costs and Energy Use in a Thermo-Caloric Heat Pump and an Air-Cooled Chiller System for Data Center Cooling
39	Logan Pettit	University of Nebraska-Lincoln	197	Minichannel Flow Boiling Enhancement using Femtosecond Laser Surface Processed Stainless Steel Surfaces in Water: Effect of Laser Fluence
40	Ishan Tandon	Purdue University	232	Farication and experimental evaluation of bendable copper flat-plate oscillating heat pipe

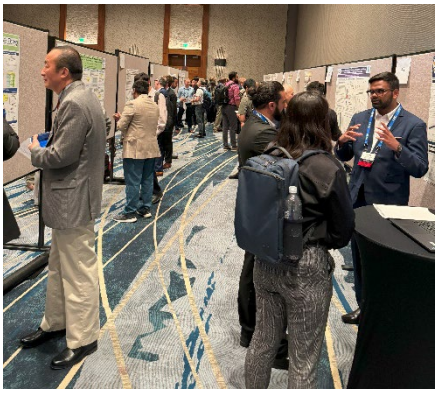
41	Md Shafiqul Islam	Auburn University	254	A Computational Study of a Mixed Multi Color LED Lighting System for Optical Uniformity
42	Aditya Amatya	Auburn University	306	Development Of High-Temperature Capable Semi-Additive Logic Gate Circuits on Copper-Clad Ceramic Substrates for Automotive Applications
43	Emran Hassan Bejoy	Auburn University	308	Seed Paper Based Sustainable Electronics with Water-Based Inks and Low-Temperature Processing for Additive Electronics
44	Jiayuan Li	Case Western Reserve University	317	An Experimental Study on the Local Heat Transfer Behavior of the Shell-Side Flow Condensation
45	Aditya Harsha	Auburn University	324	Thermal Cycling Reliability of Gravure Offset Additive Electronics with Water-Based Ink, Biodegradable Substrate and Room-Temperature Curable Adhesives
46	Shriram Kulkarni	Auburn University	328	Screen-Printed In-Mold Electronics Reliability on Polycarbonate Substrates under Sustained High-Temperature Conditions
47	Md Golam Sarwar	Auburn University	338	High-Temperature Operating Reliability of Direct-Write Additively Printed Sustainable Flexible Circuits
48	Bishal Bashyal	Auburn University	342	Evaluation Of High-Temperature Performance of Semi-Additive Rectifier Circuits up to 175ºC
49	Yujui Lin	Stanford University	344	Thermal Imaging and Flow Visualization of Capillary-Driven Two-Phase Boiling in Silicon Microchannels Coated with Porous Copper Wick
50	Priyanka Viswanath	University of Michigan - Ann Arbor	352	Pool boiling enhancement using engineered nucleation sites
51	Farshad Barghi Golezani	Case Western Reserve	353	3D Simulations of Microgravity Annular Flow Condensation with Two-Phase Inlets
52	Mohammadamin Hajikhodaverdian	Boston University	460	Steady-State Temperature Prediction Based on Compact Thermal Models Using Machine Learning

ELECTRONIC POSTER REVIEWERS

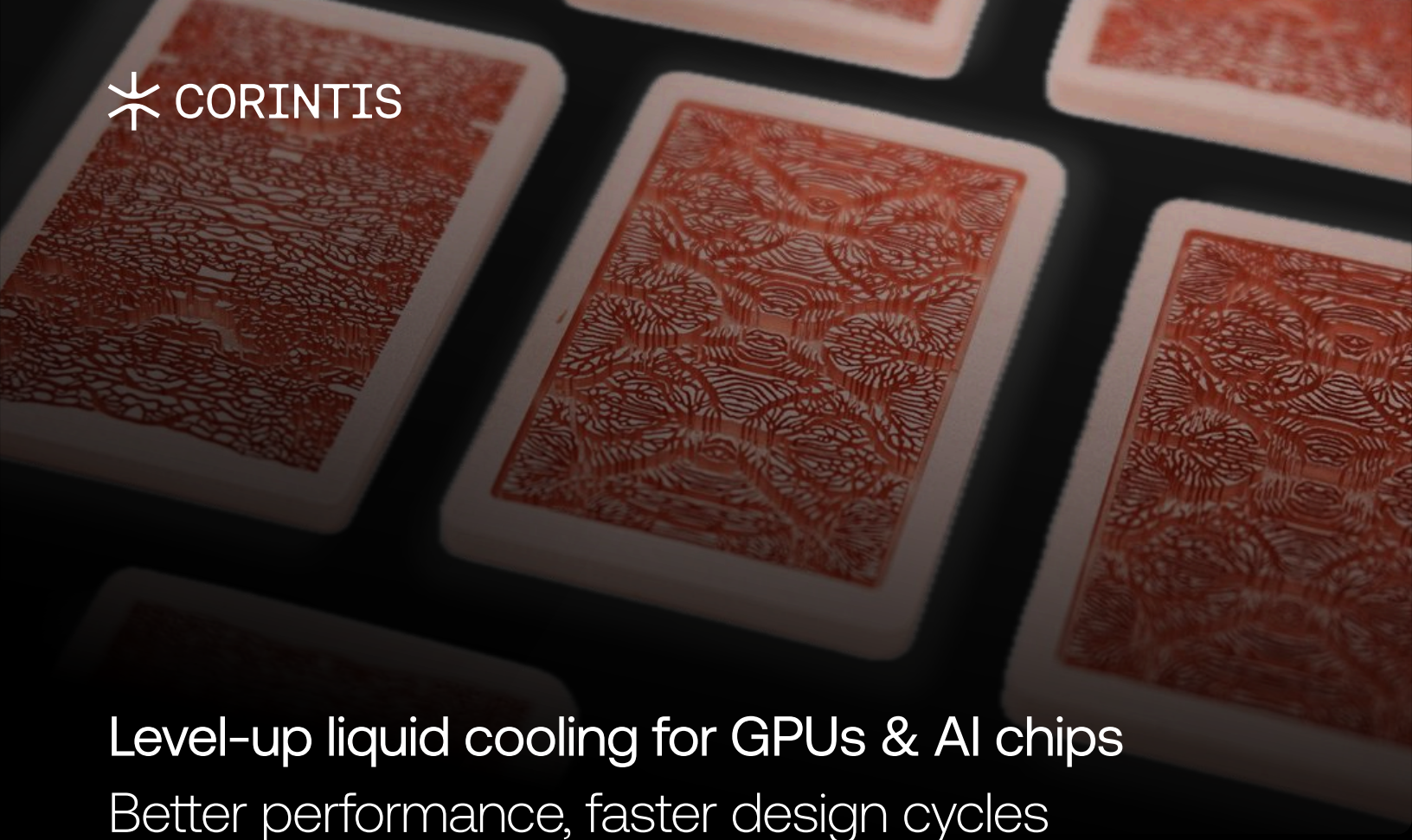
Each poster is thoroughly reviewed by multiple volunteer reviewers prior to the conference. We thank these experts for their time and effort in providing feedback and evaluating these student contributions.

Aakrati Jain
Amina Cheikh
Anna Haywood
Awni Qasaimeh
Carlos DaSilva
Carol Caceres
Casey Carte
Chetan Edara
Damion Gastelum
Eldad Levy
Georges Pavlidis
Harsha Bojja
Hitoshi Sakamoto
Jagadeesh Radhakrishnan
Jinesh Narangaparambil
John Ditri
John Maddox
Joseph Hanson Vazquez
Kalind Baraya
Karthekeyan Sridhar
Kenny Yu
Lin Jiang
Mehdi Asheghi
Meiying
Min Park
Mohamed M. Awad
Nazmiye Akbay
Nitin Karwa
Peter de Bock
Ram Ramaraju
Rinaldo Miorini
Sandeep Tonapi
Shreyas Bindiganavale
Sneha Sondur
Subramanya Sadasiva
Vaibhav Agrawal
Ying Feng Pang

POSTER & NETWORKING SESSION AT ITHERM 2024, DENVER CO



CORINTIS



Level-up liquid cooling for GPUs & AI chips

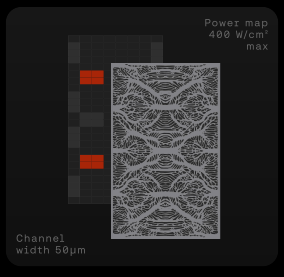
Better performance, faster design cycles

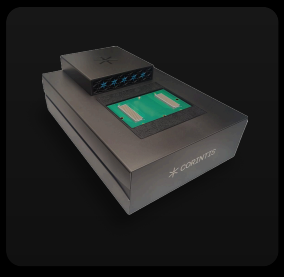
Every chip is unique, so don't rely on one-size-fits-all cold plates. Design liquid cooling at the micro-scale, tailored to the chip, to deliver the right liquid to the right location.

Discover how our platform can help you **design**, **build**, **test** and **mass produce** the best liquid cooling in the shortest time, to bring better products to the market faster.

CORINTIS PLATFORM

CHIP DESIGN





LIQUID COOLING

DESIGN

Rapidly design and simulate microfluidic cooling adapted to your chip with our platform GLACIERWARE

BUILD

Prototype and manufacturing services of copper cold plates with channels & fins down to 70 MICROMETERS

TEST

Programmable silicon thermal test vehicles with 2x2 mm resolution to validate cooling systems on heterogeneous power maps before tape-out powered by our THERMINATOR

MASS PRODUCTION

Global supply chain with volume production capabilities of microfluidic cores, cold plate assembly and cooling loops, up to MILLIONS OF PARTS PER YEAR

LAST YEAR'S BEST POSTERS (ITHERM 2024)

BEST OVERALL POSTER

ASSESSMENT OF BUBBLE PUMP MODEL FOR FLUID DIRECTIONAL MOTION FROM ASYMMETRIC HEATED RATCHETS
G. Prudhvi Reddy (UC Davis)

COMPONENT-LEVEL THERMAL MANAGEMENT TRACK

BEST POSTER

TWO-PHASE COOLING WITH EMBEDDED MICROCHANNELS IN A HIGH CURRENT DENSITY ELECTRIC MOTOR FOR AVIATION APPLICATIONS
Ryan Regan (Purdue University)

RUNNER-UP

MODELING OF BACKSIDE POWER DELIVERY AND THERMAL MANAGEMENT IN SEMICONDUCTOR DIE PACKAGES
Zekun Wu (Purdue University)

SYSTEM-LEVEL THERMAL MANAGEMENT TRACK

BEST POSTER

NOVEL SUBCOOLED BOILING CHAMBER WITH SUBMERGED CONDENSATION FOR HIGH HEAT FLUX REMOVAL FOR DATA CENTER APPLICATION
Maharshi Shukla (RIT)

RUNNER-UP

CLOSED-LOOP ANALYSIS OF THERMAL ENERGY STORAGE DEVICE ARRANGEMENT IN A THERMAL MANAGEMENT SYSTEM
Pandu Dewanatha (Purdue University)

EMERGING TECHNOLOGIES AND FUNDAMENTALS TRACK

BEST POSTER

MODIFICATION OF FLOW BOILING REGIMES AND MECHANISMS IN NEAR-CRITICAL FLOWS
Trevor Whitaker (University of Utah)

RUNNER-UP

ADVANCING SUSTAINABILITY IN PRINTED ELECTRONICS: LOW TEMPERATURE INTERCONNECTS AND WATER-BASED INK PERFORMANCE
Sabina Bimali (Auburn University)

RUNNER-UP

REPAIRABILITY OF ADDITIVELY PRINTED CIRCUITS USING SUSTAINABLE AQUEOUS-BASED SILVER NANOPARTICLE INK ON POLYIMIDE SUBSTRATES
Daniel Karakitie (Auburn University)

MECHANICS AND RELIABILITY TRACK

BEST POSTER

PREDICTIVE DAMAGE MODELING AT POTTED ELECTRONIC ASSEMBLIES UNDER HIGH G SHOCK LOADS
Aathi Pandurangan (Auburn University)

RUNNER-UP

INVESTIGATION OF THE EFFECTS OF SUSTAINED HIGH-TEMPERATURE ON THE RELIABILITY OF LEAD-FREE SOLDER JOINT ASSEMBLIES IN VIBRATION
Vishal Mehta (Auburn University)

RUNNER-UP

RELIABILITY OF SAC305 ALLOY IN DROP SHOCK AT ELEVATED TEMPERATURE
Palash Vyas (Auburn University)

NEUCOOL™

Our 2-Phase Direct-to-Chip Liquid Cooling Solution

Designed for the Mission Critical

Brought to you by

ACCELSIUS™

We Bring the Cool™

Accelsius empowers data center and edge operators to achieve their business, financial and sustainability goals through advanced cooling solutions. The proprietary NeuCool platform provides best-in-class thermal efficiencies through a safe, two-phase liquid cooling system that scales from single racks to entire data centers. For more information, visit accelsius.com or follow us on LinkedIn.

ASME/K16 & IEEE/EPS STUDENT DESIGN CHALLENGE

WEDNESDAY, MAY 28, 5:30 – 6:30 PM **LEVEL 2, TATE A1**

Chairs: Lang Yuan (Intel), Han Hu (University of Arkansas), Tiwei Wei (Purdue), Amy Marconnet (Purdue), P. Subrahmanyam (Dell), Sameer Rao (University of Utah) & Chirag Kharangate (Case Western Reserve University)

The Student Design Challenge is a team competition in which students design, analyze, and optimize an additively manufactured cold-plate to cool constant heat flux power electronics modules that are subjected to forced convection liquid cooling using water. The design from each student team is evaluated based on a series of design and manufacturing criteria. Those with the highest predicted performance and creativity, will be 3D printed and tested. Thanks to our printing sponsor (Fabric8Labs), testing sponsors (Intel and the S-PACK lab at Purdue University) and competition sponsors (Accelsius and Toyota).

ACCELSIUS™

TOYOTA

FABRIC8LABS

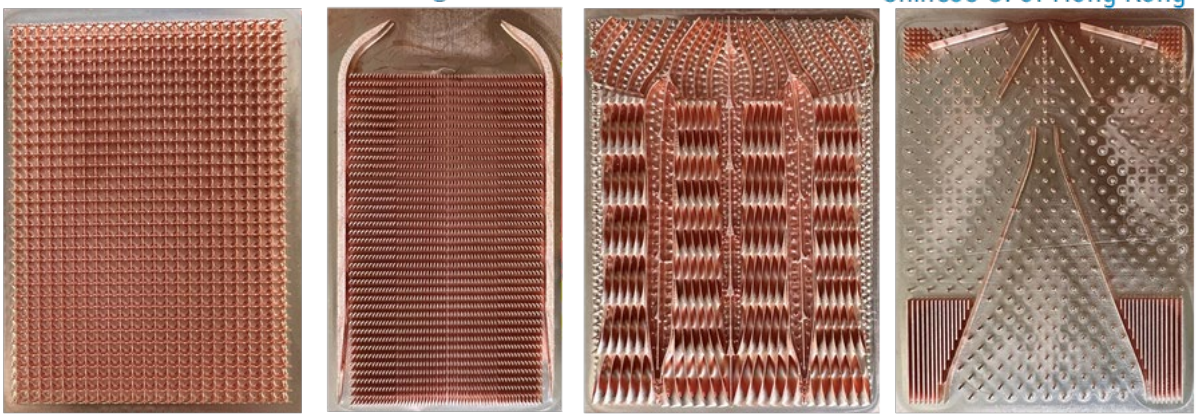
intel.

Semiconductor Packaging Laboratory
(All-in-one for Semiconductor Packaging, Heat transfer, and Assembly Lab)

FINALISTS

Aero Product
U. Of Nottingham - China

CUHK MAE
Chinese U. of Hong Kong



Chilly Platter
U. of Bristol, U. of Sheffield,
U. of Nottingham, & Loughborough U.

MSAM MDAM
U. of Waterloo
U. of Alberta

Team Members:

Chilly Platter: Yue Heng Tan, Adam Blackwood, Nimrit Kanwal, and Derin Catstaban

Aero Product: Congrui Ma, Junren Mao, Hongzhuo Zhu, and Jikun Qian

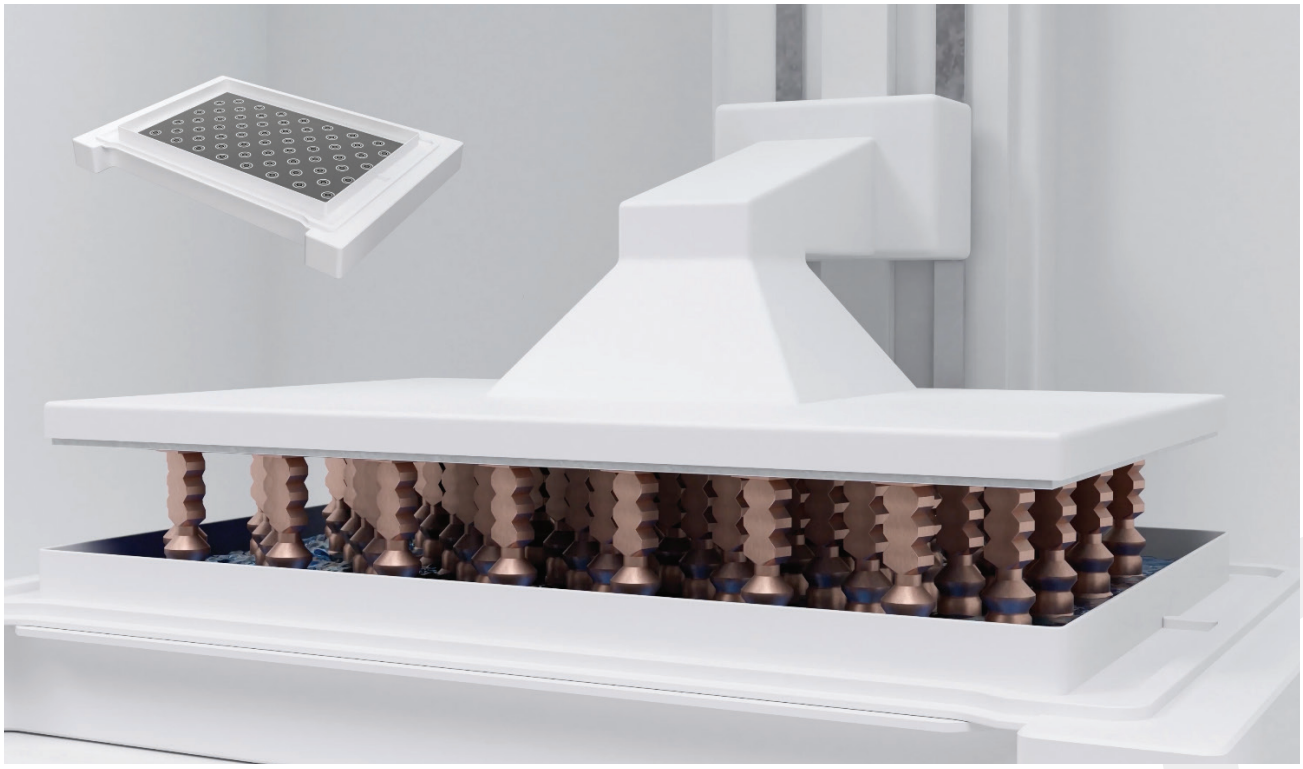
MSAM MDAM: Joseph Nonso Orakwe and Alex Inoma

CUHK MAE: Xiaotong Wang and Zijun Gao

Our Company

Founded in 2015, Fabric8Labs is headquartered in San Diego, USA. The company has a 43,530 sq ft. production facility to support the foundry based business model. Fabric8Labs is set to produce high resolution and high performance components for customers worldwide. With a strong investor profile, Fabric8Labs is committed to a growth trajectory to support our customer needs in semiconductor, automotive, defense and aerospace industries.

FABRIC8LABS

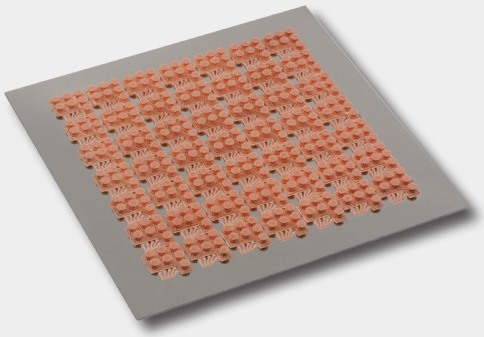


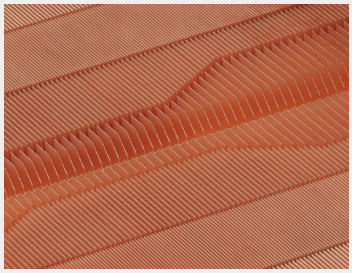
Technology

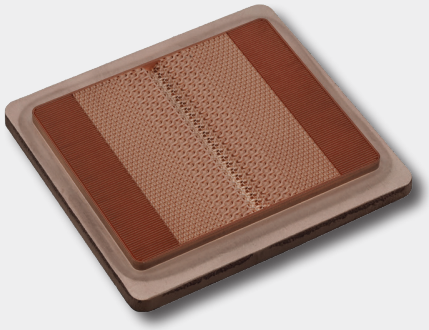
Electrochemical Additive Manufacturing (ECAM) is a room-temperature 3D metal printing technology that produces complex, dense metal parts without thermal processing. ECAM builds rapidly at the atomic level from a water-based feedstock containing dissolved metal ions. The electrochemical approach allows for micron-scale feature resolution, complex internal features, high-purity materials, and rapid scalability to support mass manufacturing. Fabric8Labs can leverage generative design techniques and realize the potential of improved performance through mass customization of application optimized designs.

Thermal Management

Fabric8Labs optimizes designs to maximize the convective and conductive heat transfer. Due to the pure quality of copper that is printed using ECAM, the thermal conductivity is measured to be 380 W/m-K. ECAM also presents a unique opportunity to direct print on any metallized substrate. This allows for cooling structures to be printed directly on substrates such as ceramic and silicon eliminating thermal interface material boosting performance. ECAM technology enables revolutionary liquid cooling solutions via custom cold plates and high surface area structures for immersion cooling.

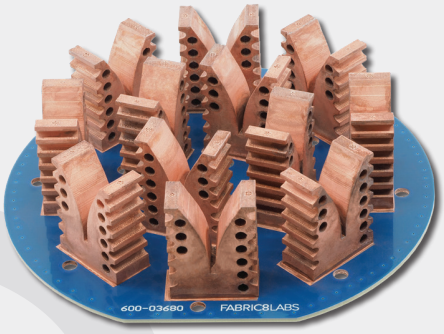


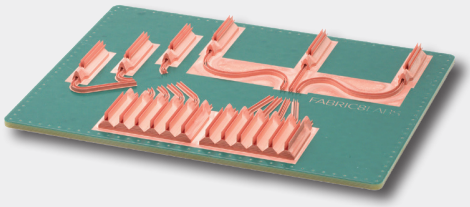


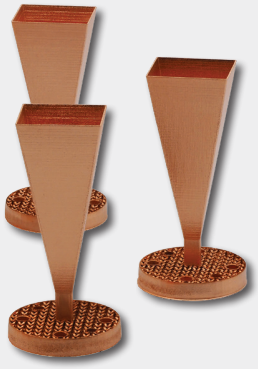


RF

Fabric8Labs can print 3D antenna structures on pre-patterned PCBs. Three dimensional antenna structures can allow for increased antenna gain and bandwidth, improving system level performance and eliminating unnecessarily redundant systems in final deployment. ECAM method of 3D printing can also direct write an RF structure on any metallized substrate. By controlling print parameters this 3D printing technique achieves uniform roughness (Ra) along the internal surface of the antenna for optimal performance.







To find out more email **contact@fabric8labs.com**
or visit **fabric8labs.com**

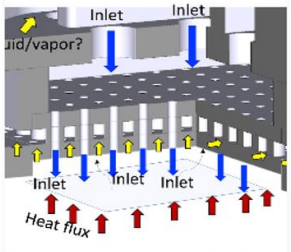
Semiconductor Packaging Laboratory

PURDUE UNIVERSITY

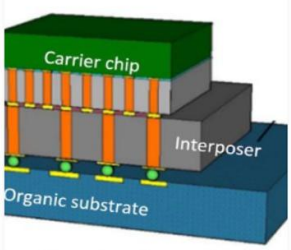
Semiconductor Packaging Laboratory

(All-in-one for Semiconductor Packaging, Heat transfer, and Assembly Lab)

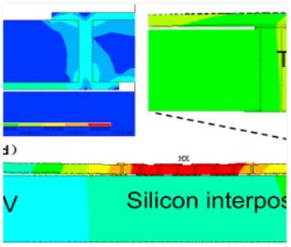
COOLERCHIPS



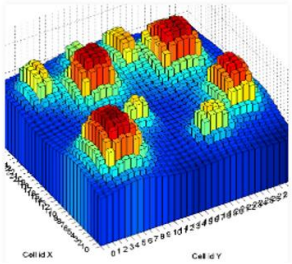
Electronic Cooling & Efficient Thermal Packaging Materials



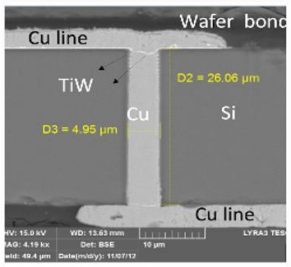
Materials, Processing & Architecture Development for Semiconductor Packaging



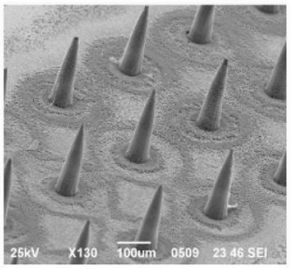
Thermomechanical Reliability Modeling & Characterization of Advanced Packaging



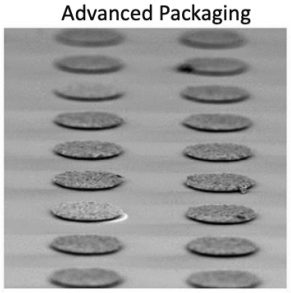
Hot Spots Targeted Cooling Technologies



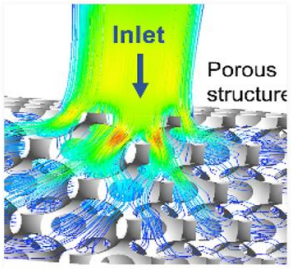
Advanced Semiconductor Nanoscale 3D Interconnections



Through Glass Via for 3D Heterogenous Integration



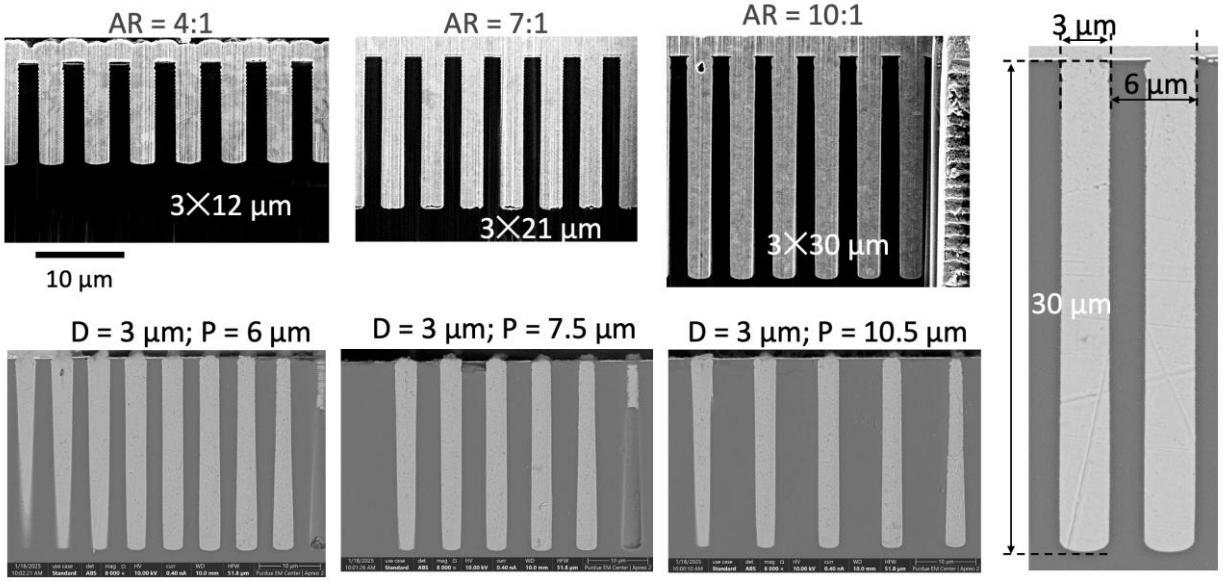
Micro-bump Bonding, Cu/dielectric Hybrid Bonding and Characterization



Surface Engineering Enhancement of Advanced Cooling Technology

Principal investigator: Dr. Tiwei Wei tiwei@purdue.edu Research website: https://s-pack.org/

Fabrications of different TSV aspect ratios 4:1 → 7:1 → 10:1



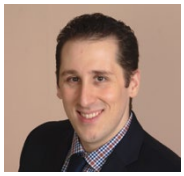
Lyu, S., ... Wei, T., *IEEE 74th Electronic Components and Technology Conference (ECTC)*, IEEE, 2025.

TECHNOLOGY-TALKS

Chairs: Georges Pavlidis (University of Connecticut), Qian Han (Sorrento Solution), Rinaldo Miorini (GE), Mehdi Asheghi (Stanford University)

TT-01: DATA CENTER STANDARDS FOR SUSTAINABILITY

WEDNESDAY, MAY 28, 8:15 – 9:15 AM **LEVEL 2, TATE A5**



WHAT'S NEEDED TO DECARBONIZE DATA CENTERS?

Dustin Demetriou
Senior Technical Staff Member
IBM Infrastructure - Advanced Thermal Energy Efficiency Lab
IBM

Abstract: Technology and digitization are key to achieving the net zero goals necessary to mitigate the worst impacts of climate change. The data center industry has been at the forefront of working towards these goals with continual innovation in IT and data center cooling designs. With the growing demand for AI, the industry needs to again refocus around the conversation of lifecycle emissions impact. This Tech Talk session will provide a review of the relevant industry sustainability frameworks, how they apply to the data center industry, and where the biggest opportunities exist to continue pushing towards Net Zero. It will discuss targets and metrics across multiple disciplines - energy efficiency, renewable energy, water, circular economy, and heat reuse – and the latest research going on in these areas. Lastly, it will talk about the evolving data center landscape, from enterprise to colocation services to cloud services and how these impact an organization's emissions.

Bio: Dustin Demetriou is a Senior Technical Staff Member and leads sustainability and data center innovation for IBM Infrastructure. He is an Accredited Sustainability Advisor by the Uptime Institute and an ASHRAE Distinguished Lecturer. He holds a Ph.D. in Mechanical and Aerospace Engineering from Syracuse University. He is a globally recognized expert in the field of thermal management and data center energy efficiency and is the current Chair of the ASHRAE Technical Committee 9.9 (TC 9.9) IT Subcommittee and the past Chair of ASHRAE TC 9.9. He is a past Chair of the IEEE ITherm conference and currently serves on the Executive Committee.

THE NEXT CHAPTER OF LIQUID COOLING FOR DATA CENTERS

Moises Levy
Managing Director
DCD > Intelligence

Abstract: The intersection of AI and data center cooling presents a significant challenge: as computational capabilities expand, the demand for efficient thermal management systems intensifies, putting traditional cooling methods to the test. AI-dedicated data centers, or AI factories, currently handle power densities nearing 120kW per rack, with future projections surpassing 300kW, 600kW, and possibly 1MW per rack. Liquid cooling is solidifying its role in the transformation towards more environmentally friendly next-generation data centers. This presentation will cover liquid cooling technologies, advancements, drivers and challenges, sustainability, and promising innovations, along with an exploration of new business models and recent acquisitions shaping the industry.

Bio: Moises Levy, PhD, is a seasoned engineer, data center subject matter expert, trusted advisor and entrepreneur. With more than 25 years of professional experience in the industry, and more than 15 years dedicated mainly to data center physical infrastructure projects, Dr. Levy has a diverse background in planning, design, management, risk assessment, and strategic consulting of engineering projects. He has founded and managed engineering firms, leading numerous engineering projects across different verticals, and providing advisory services for data center projects and new technologies. In 2023 he was honored to serve as a reviewer for the US Department of Energy's ARPA-E COOLERCHIPS initiative. Researcher, contributor to standards, author of numerous publications, and regular speaker at conferences. He holds a PhD, MS and BS in Electrical Engineering, and a BS in Civil Engineering.

TT-03: HIGH FIDELITY SIMULATION OF BOILING COOLANTS, NEW APPROACHES, CHALLENGES AND OPPORTUNITIES

WEDNESDAY, MAY 28, 2:00 - 3:30 PM **LEVEL 2, TATE A5**

The Role of High-Performance Computing for the Advancement of Multi-Phase Heat Transfer Flows in Electronics Cooling

Constantine M. Megaridis
James P. Hartnett Professor of Energy Engineering
University Distinguished Professor
University of Illinois Chicago

Abstract: 3D Heterogeneous Integration (3DHI) of electronic components has attracted attention due to its promise to produce advanced packages with superior power-handling capabilities. But 3DHI faces critical challenges posed by the ever-increasing power requirements, the limited space available for the package, the reduced access to the hot spots and the inability of single-phase cooling approaches to handle the required power loads. Among several approaches that are considered for cooling 3D-integrated stacks, microchannel flows of phase-changing fluids offer an attractive option for keeping the heat sensitive components within their safe temperature limits. Multiphysics modeling can guide the design of microchannel cooling strategies where heat fluxes may exceed 1 kW/cm2 in packages with characteristic length scales below a few centimeters. These conditions necessitate refrigerant flows whose residence times are in the millisecond range. When one considers the transient nature of these flows, along with the wide range of length scales (microns to cm) and time scales (milliseconds to seconds) that must be resolved, the computing requirements exceed those available in typical laboratory installations. High Performance Computing (HPC) resources offer an attractive option, but these become prohibitive -due to high licensing fees- when commercial CFD packages are employed. We present examples of a public-domain model (OpenFOAM) used to analyze diverging microchannel flows with Reynolds numbers in the turbulent regime. These examples offer a glimpse of how such models can be enhanced to create tools for analyzing complex multi-phase, multi-dimensional flows encountered in cooling of electronic packages. Challenges and opportunities are discussed, and ideas are offered on how various computational approaches can be used in a complementary fashion to promote technological advancement.

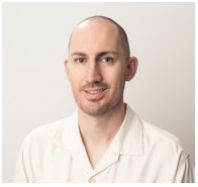
Bio: Dr. Megaridis holds the James P. Hartnett Chair of Energy Engineering and is the Director of the Micro/Nanoscale Fluid Transport Laboratory at the U Illinois Chicago (UIC). He received his Ph.D. in Fluid/Thermal Sciences from Brown University, and a M.S. in Applied Mathematics also from Brown. He is a Fellow of the American Physical Society and the American Society of Mechanical Engineers. He was named UIC Distinguished Professor in 2018, UIC Inventor of the Year in 2015, and University of Illinois Scholar in 2012. His current research activities focus on thermal management, multiphase heat and mass transfer, multifunctional coatings and interfacial phenomena relevant to micro and nanotechnologies.

Advances in Two-Phase Modeling Research to Meet Future Thermal Management Challenges

Chirag Kharangate
Assistant Professor
Mechanical and Aerospace Engineering
Case Western Reserve University

Abstract: Developments in many modern applications are encountering rapid escalation in heat dissipation, coupled with a need to decrease the size of thermal management hardware. These developments have spurred unprecedented interest in replacing single-phase hardware with other more efficient configurations including two-phase boiling and condensation counterparts. However, accurately modeling of two-phase thermal transport has been a challenge for decades leading to limited implementation of these technologies. In today's talk, I will showcase fundamental research being conducted to gain clarity on thermal transport in flow boiling and flow condensation configurations. For both flow boiling and flow condensation, a combination of theoretical, computational, and data sciences driven approaches to modeling phase-change will be covered. In the theoretical part, control volume-based approaches to modeling phase-change performance parameters will be discussed. In the computational part, various approaches to developing computational fluid dynamics (CFD) simulations for predicting transient and steady-state boiling and condensation configurations will be discussed. In the data sciences part, machine learning approaches like physics-informed neural network (PINN) for model discovery and PINNs-based CFD modeling will be discussed. With development of novel thermal design tools, this research effort aims to increase the implementation of boiling and condensation across systems and devices to meet their future heat dissipation needs.

Bio: Chirag Kharangate is an Assistant Professor of Mechanical and Aerospace Engineering at Case Western Reserve University and Director of the Two-Phase Flow and Thermal Management Laboratory, where his group addresses research and development needs in electronics packaging and thermal management technologies utilizing single-phase and two-phase flows for automotive, computer, defense, and aerospace applications. Dr. Kharangate's research group explores methodologies for testing and modeling flow boiling, flow condensation, and single-phase cooling schemes. He complements his experimental and theoretical work with the development of computational fluid dynamics (CFD) as well as novel machine learning tools for predicting phase change phenomena. Dr. Kharangate has co-authored over 90 refereed journal and conference papers (h-index of 25). He has been recognized by the Case School of Engineering Research Award, ASME K-16 Outstanding Early Faculty Career in Thermal Management Award, ASME EPPD Early Career Engineer Award, and the Office of Naval Research Young Investigator Program Award.



HYBRID METHODS FOR OPTIMAL MODELING OF COMPONENTS AND SYSTEMS WITH TWO PHASE FLOW AND HEAT TRANSFER

David Geb
Applications Engineer
ANSYS

Abstract: Liquid cooling has emerged as a prominent solution for electronics thermal management and has gained mainstream application in areas such as datacenters (e.g. processor cooling in servers), and electric vehicles (e.g. battery, motor and inverter cooling). While single phase is common, two-phase flow and heat transfer designs are beneficial in many cases. Methods for modeling two phase flow hydraulics and heat transfer have been established. However, they can be costly (in terms of computing resources), difficult to implement, or lacking fidelity. An optimal modeling method might consider a complementary, hybrid modeling approach. However, such hybrid modeling methods are less established. One potential hybrid modeling method could implement co-simulation of a 3D model and a 0D/1D model representing different domains, coupled across a heat transfer interface. Another could implement embedded thermal Reduced Order Models (ROMs) within a CFD model. Such approaches have benefits but come with challenges. This talk will highlight such approaches. An optimized hybrid model that balances cost and accuracy can overcome modeling challenges and enable improved design space exploration for components and systems with two phase flow and heat transfer.

Bio: David Geb is an Application Engineer at Ansys, specializing in electronics thermal management applications. He has been with Ansys for over 10 years. Prior to Ansys he received his Ph.D. in Mechanical Engineering from UCLA and was a postdoctoral scholar at University of Colorado Boulder.

ITherm 2024 Tech Talk

TT-07: ELECTRIC VEHICLE THERMAL MANAGEMENT

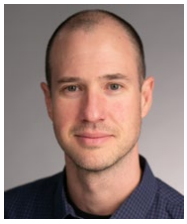
THURSDAY, MAY 29, 2:00 – 3:30 PM **LEVEL 2, TATE A5**

ADVANCED POWER ELECTRONICS AND ELECTRIC MACHINES PACKAGING AND THERMAL MANAGEMENT

Sreekant Narumanchi
Distinguished Member of Research Staff
Advanced Power Electronics and Electric Machines Group Manager
National Renewable Energy Laboratory (NREL)

Abstract: Power electronics and electric machines are being used and envisioned for use in vehicles as well as in other applications. In this presentation, I will describe some challenges and opportunities for power electronics and electric machines for vehicular applications. After that, I will give an overview of my group's recent research activities in power electronics, electric machines and integrated traction drive systems with a focus on packaging and thermal management.

Bio: Sreekant Narumanchi is a Distinguished Member of Research Staff, and the Group Manager of the Advanced Power Electronics and Electric Machines (APEEM) Group within the Energy Conversion and Storage Systems Center at the National Renewable Energy Laboratory, in Golden, CO, U.S.A., where he is currently in his 21st year. He leads a Group of 15 full-time researcher staff members focused on electro-thermal, thermal-fluids, thermo-mechanical and reliability aspects of power electronics and electric machines for electric-drive vehicles and multiple other applications. Over the years, his group has collaborated with almost 100 institutions cutting across industry, universities, national labs, federal agencies, and other research institutions. Sreekant is an American Society of Mechanical Engineers (ASME) Fellow, and an Institute of Electrical and Electronics Engineers (IEEE) Senior Member. He has published over 125 peer-reviewed journal- and conference papers and book chapters. Professionally, he is active in leadership roles on multiple committees, advisory boards, conferences, and journals – including those under IEEE and ASME. Some of the external awards Sreekant has received include the 2023 ASME Avram Bar-Cohen Memorial Medal, and the 2022 THERMI Award. Sreekant received a Ph.D. from Carnegie Mellon University (2003), M.S. from Washington State University (1999), and B. Tech. from Indian Institute of Technology Kanpur (1997), all in Mechanical Engineering.



SELECT TECHNOLOGIES FOR COOLING OF HIGH HEAT FLUX POWER SEMICONDUCTOR DEVICES

Ercan Dede
Director, Electronics Research Department
Toyota Research Institute of North America

Abstract: The aim of this talk is to examine advancements in cooling technologies for high-performance power semiconductor devices, and particular focus is placed on concepts researched and developed in the last ~15 years. Starting from a summary of a preceding strategic analysis in the late-2000 timeframe, we more deeply explore technologies categorized into four main groups: single-phase (especially jet impingement) cooling, microchannel cooling, two-phase cooling, and embedded (or near-junction) cooling. Based on the research outcomes, we highlight the significance of effective thermal management utilizing these technologies in enhancing the performance of power electronics, especially as devices operate at higher power densities. Key findings include the rapid growth of novel thermal-fluid design methods, such as multiphysics topology optimization for conjugate heat transfer, and exploration of associated prototypes, such as combined single-phase jet impingement plus microchannel, two-phase jet impingement, and near-junction chip-embedded coolers. Demonstrated design methods and cold plate concepts are shown to have promise in reducing thermal resistance and improving heat transfer efficiency, and tradeoffs between the various cooling technology categories are identified. Finally, we will cover the ongoing need for innovative cooling solutions to meet the demands of next-generation power electronics and directions for future research in this critical area.

Bio: Ercan (Eric) Dede received his BS degree and PhD in mechanical engineering from the University of Michigan and an MS degree in mechanical engineering from Stanford University. Currently, he is the Director of the Electronics Research Department at the Toyota Research Institute of North America. He is a Fellow of the American Society of Mechanical Engineers (ASME) and a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE). His team focuses on vehicle systems involving advanced sensors, human-machine interfaces, power semiconductors, electronics and photonics packaging, and thermal management technology. He has 240+ issued patents and has published more than 125 articles in archival journals and conference proceedings on topics related

to design and structural optimization of thermal, mechanical, and electromagnetic systems. He is an author of a book entitled “Multiphysics Simulation: Electromechanical System Applications and Optimization.” His team has received two R&D 100 Awards for the development of technologies related to next-generation electronics for electrified vehicles. He currently serves as an Associate Editor for the ASME Open Journal of Engineering and a Guest Editor for IEEE Transactions on Components, Packaging and Manufacturing Technology.

EV High Voltage System Thermal Performance and Impact on Reliability

Unique Rahangdale
Senior Staff/Lead Reliability Engineer
Rivian

Abstract: The burgeoning electric vehicle (EV) market demands systems with increased power output and efficiency. Battery and power electronics, including inverters, motors, and energy management systems, are crucial for converting chemical energy into final kinetic energy. To achieve sustainability goals, minimizing losses and maximizing the conversion of input power to useful power is paramount. This necessitates sophisticated thermal management strategies. Battery systems require optimal operating temperatures, achieved through both active cooling and heating, while other high-voltage systems rely on efficient cooling to minimize losses. Critically, the temperature of these systems is intrinsically linked to their reliability, making accurate assessment of component lifespan a primary concern. This presentation discusses the approach and overview that prioritizes both thermal performance and reliability, especially within the context of dynamic vehicle operation, including demanding off-road scenarios. The drive definition is critical in knowing required load for vehicle in development therefore using virtual simulation techniques, incorporating realistic drive cycle inputs to analyze thermal profiles and assess reliability is part of development process. This virtual prototyping enables iterative design optimization, where thermal management solutions are refined based on Simulink simulation results. The outcome assures the system runs within the rated temperature limit but design for reliability assess distribution of thermal over life and can provide stricter rated limit to demonstrate better life. By integrating these considerations, we can develop robust and efficient thermal management strategies for high-performance electric vehicles.

Bio: Unique Rahangdale is a Senior Lead Reliability Engineer at Rivian Automotive Inc., where he has worked for over four years. He leads the reliability of electric power conversion systems, including inverters, motors, and energy management systems. With nearly a decade of experience, patent, and published research in electronics reliability, Unique has a proven track record of implementing innovative solutions that enhance product durability. Prior to Rivian, he honed his expertise at Joby Aviation as a Design for Reliability Engineer, focusing on electric vertical takeoff and landing (eVTOL) aircraft. His diverse background also includes a role as a Reliability Simulation Scientist at Waymo, where he contributed to the development of high safety lidar and computing product for autonomous vehicles. Unique holds a master's degree and has returned to academia to pursuing a Ph.D. under the guidance of Professor Dr. Dereje Agonafer, further deepening his knowledge of reliability challenges in heterogeneous packaging.

EMNSPC

Electronic, MEMS and Nanoelectronics Systems Packaging Center

Electronic, MEMS and Nanoelectronics Systems Packaging Center

The Electronic, MEMS, and Nanoelectronics Systems Packaging Center (EMNSPC) at the University of Texas at Arlington (UTA) is a leading research facility that advances the field of electronic packaging technologies. The center, directed by Dr. Dereje Agonafer, a member of the National Academy of Engineering (NAE), focuses on multidisciplinary research to solve thermo-mechanical challenges in microelectronics, MEMS (Micro-Electro-Mechanical Systems), and nanoelectronics. These research areas address the need for reliable and efficient packaging solutions in high-performance electronics that are critical for various industries, including AI, hyperscale data centers, automotive and aerospace.

At the heart of EMNSPC's work are key research areas such as liquid cooling, immersion cooling, and data center contamination. These technologies are essential in the development of next-generation data centers, particularly hyperscale data centers, which are characterized by vast processing power and heat generation. As data centers grow in size and complexity, managing the heat produced by densely packed electronics becomes a critical factor for both performance and sustainability. EMNSPC has pioneered liquid and immersion cooling technologies, which replace traditional air-cooling methods with more efficient solutions, enabling faster and more reliable operations while reducing energy consumption and environmental impact

One of EMNSPC's significant contributions to the field is its focus on reliability testing, ensuring that the packaging solutions developed can withstand the physical and thermal stresses associated with various applications. This is particularly important in industries like aerospace and telecommunications, where the failure of electronic systems can lead to severe consequences. By addressing these challenges, EMNSPC supports the creation of electronics that are smaller, faster, and more durable, without compromising performance

Notable Achievements

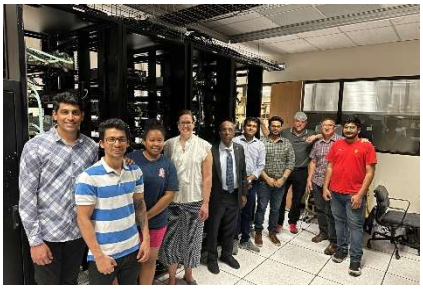
More than **250** students graduated

400 journal and conference publications

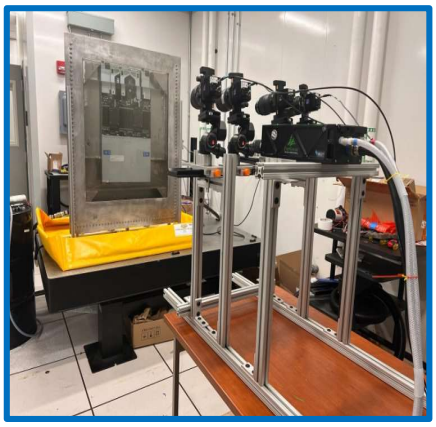
Several best and outstanding paper awards

15 industry and government collaborations

State of the art **Thermal, Thermo-Mechanical and Reliability** Equipment



Immersion, Liquid and Hybrid Cooling



Immersion cooling is an innovative technique that submerges electronic components in a non-conductive dielectric fluid, enhancing heat transfer and eliminating the need for air-based cooling, which increases efficiency and lowers energy use. In contrast, liquid cooling circulates a cooling fluid through channels connected using a cold plate to heat-generating components, allowing for precise temperature control, making it ideal for high-performance applications. Hybrid systems combine both methods, optimizing cooling efficiency in data centers by applying liquid cooling to high-heat-density components and using air cooling for others, thus improving performance and sustainability.

Packaging and Reliability

Packaging technologies are essential for ensuring the reliability and performance of electronic components, particularly in applications requiring durability and longevity. Modern packaging encapsulates components like processors and memory chips in protective materials that shield them from mechanical stress, extreme temperatures, and environmental contaminants. Key techniques include flip-chip bonding, which enables efficient thermal management by mounting the chip upside-down, and methods like wire bonding and ball grid arrays (BGAs) for connecting chips to packages and external circuits. Thermal interface materials (TIMs) enhance heat dissipation by minimizing thermal resistance. Reliability testing methods, such as accelerated life testing (ALT) and failure analysis techniques like scanning electron microscopy (SEM), help evaluate and identify potential weaknesses in packaging, ensuring modern electronics can perform effectively even in demanding conditions.

Industry Collaborations

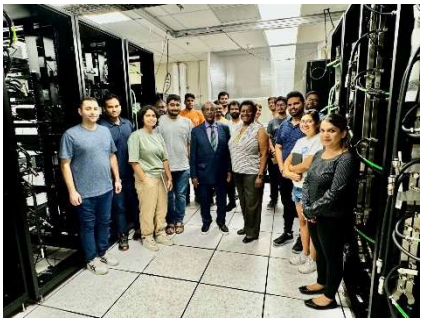
- Intel
- Nvidia
- Meta
- Google
- Chemours
- Texas Instruments
- LiquidStack
- Fabric8Labs

and more...

NSF IUCRC Research Center

ARPA-E COOLERCHIPS Awardee

DARPA NGMM Sub-Awardee - TIE



NSF

COOLERCHIPS™

THE UNIVERSITY OF TEXAS AT ARLINGTON

Dept. of Mechanical and Aerospace Engineering
500 W 1st St
agonafer@uta.edu

PANEL SESSIONS

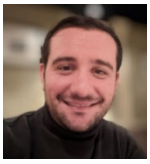
SPONSORED BY:

P-02: DATA CENTER / LIQUID COOLING

WEDNESDAY, MAY 28, 11:00 AM – 12:30 PM **LEVEL 2, TATE A5**

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 transformation", 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. A panel of distinguished members will share their vision on the future of liquid-cooling technology for data centers.

MODERATOR



Dr. Raffaele Luca Amalfi
SEGUENTE Inc.

Bio: Dr. Raffaele Luca Amalfi is the CEO and Co-Founder of SEGUENTE Inc., considered an Innovator, visionary, and industry influencer driving Seguente's strategic business, technology & product roadmap, capital objectives, and growth goals. Before SEGUENTE, he had strategic roles in large corporate companies, leading R&D and commercialization activities in the field of thermal management, and advanced liquid-cooling technologies of high-performance communications and computing systems. He authored over 75 scientific publications in leading journals, conference proceedings, and handbooks, and 20 patents. Dr. Amalfi is the Secretary of the ASME K-16 Heat Transfer Committee, Member of the OCP Heat Reuse Steering Committee, former Guest Editor for the ASME Journal of Electronic Packaging, and recipient of numerous IEEE, ASME and Government Awards

PANELISTS

Dr. Remco van Erp
Corintis

SINGLE-PHASE LIQUID COOLING FOR DATA CENTER CHIPS BEYOND SKIVED COLD PLATES: CO-DESIGNED AND CO-PACKAGED MICROFLUIDIC COOLING FOR HIGH-POWER GPUS.

Bio: Dr. Remco van Erp is co-founder and CEO of Corintis, a Swiss-based company that develops liquid cooling solutions for data center applications. Remco received B.S. and M.S. degrees in mechanical engineering from the Eindhoven University of Technology, Eindhoven, The Netherlands and holds a Ph.D. degree in microsystems and microelectronics with the École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland.

BEYOND THE COLD PLATE: CHALLENGES IN SCALING TWO-PHASE DIRECT TO CHIP COOLING FOR DATA CENTERS

Dr. Alfonso Ortega
Villanova University

Bio: Dr. 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. Dr. 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. Dr. Ortega is a teacher of thermal sciences and experimental methods. Dr. 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, 5 postdoctoral researchers, and more than 70 undergraduate research students. He is the author of over 300 journal and symposia papers, 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.

Dr. Nitin Karwa
Honeywell

SUSTAINABLE REFRIGERANT TRANSITION IN DATA CENTERS

Bio: Dr. Nitin Karwa currently works as the Principal R&D Engineer at Honeywell's Buffalo Research Labs. In this role, he focuses on developing new heat transfer fluids for various applications such as electronic cooling, air conditioning, and industrial heat pumps. Dr. Karwa holds a PhD in Mechanical Engineering from the Technical University of Darmstadt in Germany and has spent 3 years on postdoctoral research at universities in Germany and Australia. With 11 years of industry experience, he specializes in vapor compression systems for HVAC and industrial heating, and two-phase heat transfer systems for electronics cooling. Additionally, he has authored over 25 articles in peer-reviewed international journals and conferences on heat transfer and energy systems, making significant contributions to the academic community.

DIRECT-TO-CHIP SOLUTIONS: A THERMAL AND MANUFACTURING PERSPECTIVE

Dr. Filippo Cataldo
Wieland

Bio: Filippo Cataldo got his Master degree and Ph.D. in Mechanical Engineering at University of Naples "Federico II". Later he joined the Laboratory of Heat and Mass Transfer (LTCM) at EPFL. His works and studies converged toward Energy Conversion and Thermal Management, with specialization in two-phase flow heat transfer and heat pipes. After more than six years of academic experience, he is now R&D Manager in Wieland Thermal Solutions, focusing on single- and two-phase flow-based technologies for electronics cooling. He is the author and co-author of more than 20 journal and conference papers.

Stephanie Allard
IBM

IMPACTS OF DATA CENTERS PERFORMANCE CHALLENGES ON HIGH POWER COMPUTING PROCESSOR 1ST LEVEL ASSEMBLY

Bio: Ms. Stephanie Allard started her career 25 years ago at IBM as a process engineer in wirebond technologies. Through the years, she specialized in heat spreader assembly, thermal performance development and characterization of flip chip packages. Currently, she is a senior engineer and technical lead for end-to-end 1st level bond and assembly packaging development and manufacturing of IBM P and Z processor modules and associated packages. She plays a critical role in the IBM next generation systems and assures good integration of system level solutions and needs to 1st level processor production constraints.

P-04: THERMAL/MECHANICAL/ELECTRICAL CHALLENGES AND OPPORTUNITIES OF ADVANCED MOBILE/AI/IOT COMPUTING DEVICES AND BEYOND

WEDNESDAY, MAY 28, 4:00 – 5:30 PM **LEVEL 2, TATE A5**

The digital era demands higher performance, increased data processing, and faster processors. Heterogeneous computing, which includes CPUs, GPUs, high-speed interconnects, and other elements, is driving advancements in the industry. The rise of 5G/6G technologies is accelerating mobile communication, AI, and IoT, creating infrastructure for vast amounts of data and fostering smarter, more connected environments. This panel will explore the future of thermal management in electronics and address advanced system-level thermal, mechanical, and electrical challenges, as well as technical and business solutions.

MODERATOR

Dr. Victor Chiriac
GCTG LLC.

Bio: ASME Fellow, CEO and Managing Director of Global Cooling Technology Group, LLC. Held technology/engineering leadership roles, led corporate thermal technology teams and roadmaps, worked on leading-edge wireless technologies with Motorola (1999-2010), Qualcomm (2010 – 2018) and Futurewei (2018 – 2019). Elected Chair of the ASME K-16 Electronics Cooling Committee in 2015 and the Arizona and New Mexico IMAPS (International Microelectronics and Packaging Society) Chapter President in 2010. Co-editor of Electronics Cooling Magazine since 2016 and leading member of the organizing committees of ASME/InterPack, IMECE and IEEE/ITherm. 25 U.S. and International issued patents, 2 US Trade Secrets, 1 US Defensive Publication and 117 papers in scientific journals and at conferences. Recipient of the ASME K-16 Clock award in 2018 for "scientific contributions and leadership in promoting best thermal management of electronics engineering practices". Diamond Innovation and Technology Leadership Awards at Qualcomm in 2016-2017, and the Corporate Award for Technology Innovation at Motorola in 2002. PhD (1999) in Aerospace and Mechanical Engineering, University of Arizona, Tucson, USA.

PANELISTS

Eric Bert
Exentis AG
USA

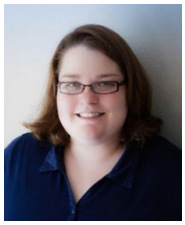
3D Additive Screen-Printing - A Cost-Effective, High-Volume Technology Platform to Produce Complex Cooling Structure Geometries

Bio: Eric Bert holds a BSME from UMass-Amherst and has a 30+ year track record in disruptive manufacturing technology introduction and management. Eric currently serves as President of Exentis North America and is responsible for building a North American beachhead for Switzerland based Exentis Group AG. Prior roles in Additive Manufacturing included; SVP Commercial at Inkbit, COO at 3DMEDiTech, SVP Global Sales at ARCAM (a GE Additive company), and SVP at Stratasys North America during its high growth period. Earlier, Eric held technology and management positions in the high-volume printed circuit and electronics assembly sectors. He further completed expat assignments in Thailand and Australia starting-up, building, and operating large-scale manufacturing operations.

Programs on Thermal Packaging

Prof. Yogendra Joshi
DARPA

Bio: 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 four hundred fifty publications in this area, including over two hundred twenty-five journal articles. He is an elected Fellow of the ASME, the American Association for the Advancement of Science, and IEEE. He is a recipient of 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.



Prof. Amy Marconnet
Purdue University

THERMAL ENGINEERING OF MATERIALS FOR ADVANCED PACKAGING

Bio: Professor Amy Marconnet is an associate professor of Mechanical Engineering and associate professor of Materials Engineering (by Courtesy), as well as 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 PhD 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, ITherm 2019, and ITherm 2023. 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 2021-22 academic year.

SINGLE CRYSTAL DIAMOND (SCD), THE ULTIMATE THERMAL MANAGEMENT SOLUTION

Russell Kempt
Diamond Foundry

Bio: Russell Kempt is a seasoned tech sales and marketing executive with nearly 30 years of experience in Silicon Valley. With a proven track record of building and leading successful revenue growth from early startup phase to IPO. He is currently a Vice President of Worldwide Sales and Marketing for Diamond Foundries, USA His expertise in developing and executing go-to-market strategies, building customer relationships, and driving revenue growth has made him a valuable asset to numerous tech companies throughout his career.

Rozalia Beica
Rapidus

FROM CHIPS TO SYSTEMS: HOW ADVANCED PACKAGING IS EMPOWERING AI AND HIGH-PERFORMANCE COMPUTING

Bio: Rozalia Beica is a distinguished leader in the Semiconductor and Advanced Packaging industry, with more than 25 years of experience. Her expertise encompasses a unique mix of broad cross-industry expertise, including electronic materials, substrates, equipment, device & system manufacturing, and market intelligence. She held senior positions at industry leading companies, including AT&S, DuPont, Yole Developpement, Lam Research and Applied Materials. She recently joined Rapidus, as Field CTO, focusing on Packaging Technologies. An active participant in industry activities, Rozalia led numerous symposiums globally, consortia activities, technical working groups and industry roadmaps activities. Rozalia served on the advisory board of IEEE EPS, IMAPS and 3DinCites, and currently she is a member of the Advisory Board at IMPACT and Terecircuits. Rozalia's academic achievements include a M.Sc. in Chemical Engineering from Polytechnic University Timisoara, a M.Sc. in Management of Technology from KWU, and a Global Executive MBA from Instituto de Empresa.

THERMAL CONSIDERATIONS IN DISTRIBUTED COMPUTING FOR WEARABLE DEVICES

Dr. Rajendra D. Pendse
Meta

Bio: Dr. Raj Pendse is Sr. Director of Si Packaging at Facebook Reality Labs (FRL) and leads the development of advanced Si/Packaging solutions for AR/VR hardware. Raj was previously Vice President of Package Engineering at Qualcomm and played various leadership roles in Package development at STATS ChipPAC, Hewlett-Packard Labs and National Semiconductor. Raj's work spans from packaging of microprocessors, ASIC's and GPU's for High Performance Computing to low-cost packaging solutions for logic and analog devices that find use in Mobile platforms and Consumer Electronics. His most recent focus has been on 3D and Wafer Level Packaging for AR/VR hardware. Raj completed his BS in Materials Science from IIT Bombay with Top in Class honors and his Doctorate in Materials Science from UC Berkeley.

Vikas Gupta
ASE US, Inc.

ADVANCED PACKAGING FOR AUTOMOTIVE: MECHANICAL CHALLENGES AND OPPORTUNITIES

Bio: Vikas Gupta has more than 20 years' experience in semiconductor packaging through various academic and industry roles at Lucent Technologies, Lehigh University, Texas Instruments and ASE Group. Currently, he is a director in engineering, technical promotion, and marketing team at ASE. Vikas holds 25+ US patents and forty+ industry publications. Vikas is co-chair of the Applied Reliability committee for IEEE ECTC and chairs the Automotive technical working group of Heterogeneous Integration Roadmap.

P-05: INTEGRATED ELECTROMECHANICAL, FLEXIBLE AND THERMAL DEVICES

THURSDAY, MAY 29, 8:15 – 9:15 AM **LEVEL 2, TATE A5**

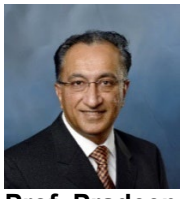
Advanced Packaging is becoming critically important for semiconductor scaling as we are approaching the limits of miniaturization. In turn, packaging architectures of increasing complexity require managing not only electrical, but also mechanical, thermal, and environmental effects. As scales of integration are converging from silicon to entire systems, these effects must be addressed at ever higher level. Multi-functional, integrated electromechanical systems are emerging, with examples in medical, wearable, robotics, automotive and aerospace applications. The panel will discuss trends in multi-functional integration and their impact on design automation, materials, process technologies, manufacturing, and supply chains.

MODERATOR

Janos Veres
NextFlex US

Bio: Dr. Janos Veres is Director of Hybrid Electronics Strategy at NextFlex, the US Institute of Flexible Hybrid Electronics Manufacturing Innovation. He is a seasoned technologist, with over 30 years' experience in printed, flexible, hybrid electronics and related fields, successfully driving multimillion dollar revenue programs with major electronics, automotive, chemical and consumer product companies. Janos has held R&D, manufacturing and management positions at PARC, PolyPhotonix, Kodak, Merck, Avecia, Zeneca and Gestetner, where he developed printed circuits, electronic 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 65 patents.

PANELISTS



Prof. Pradeep Lall
Auburn University

ROLE OF ADDITIVE PACKAGING IN DEFENSE SYSTEMS SUSTAINMENT

Bio: Pradeep Lall is the MacFarlane Endowed Distinguished Professor and Alumni Professor with the Department of Mechanical Engineering and Director of Auburn University's Electronics Packaging Research Institute. 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 2-books, 15 book chapters, and over 1000 journal and conference papers in the field of electronics. Dr. 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 SEMI's FLEXI R&D Achievements Award for landmark contributions to Additive Printed Electronics, ASME Avram Bar-Cohen Memorial Medal, IEEE Biedenbach Outstanding Engineering Educator Award, IEEE Sustained Outstanding Technical Contributions Award, NSF Alex Schwarzkopf Award, Alabama Academy of Science Wright A, Gardner Award, IEEE Exceptional Technical Achievement Award, ASME-EPPD Applied Mechanics Award, Three-Motorola Outstanding Innovation Awards, Five-Motorola Engineering Awards, and over Fifty Best-Paper Awards.

ELECTROCHEMICAL ADDITIVE MANUFACTURING FOR POWER ELECTRONIC MODULES

Mike Matthews
Fabric8Labs

Bio: Mike has over twenty-five years of experience in the electronic materials industry where he led the development and commercialization of new materials and technologies for the Electronics industry. Mike is currently Vice President of Commercialization for Fabric8Labs where he leads the company's market strategy and business development efforts. Michael holds a BS in Materials Engineering from Rensselaer Polytechnic Institute, Troy, NY and an MBA from Pepperdine University, Malibu, CA.

Dr. Andras Vass-Varnai
Siemens

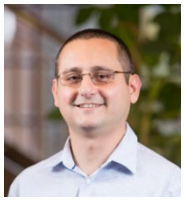
Novel EDA Toolkits as Enablers for High-Density Advanced Packaging

Bio: Dr. Andras Vass-Varnai obtained his MSc and PhD degrees in Electrical Engineering from the Budapest University of Technology and Economics. He spent over a decade at Mentor Graphics as a product manager, leading various R&D projects focused on thermal test hardware and methodologies. Before assuming his current role as a 3D IC reliability solution engineer, Andras served as a business development lead in South Korea and the United States. Now based in Chicago, IL, he is dedicated to contributing to the development of a novel 3D IC package toolchain, leveraging his experience in thermal and reliability engineering. His main areas of interest include thermal management of electronic systems, advanced applications of thermal transient testing and modeling, semiconductor packaging, characterization of TIM materials, and reliability testing of semiconductor devices.

Additive Fabrication of High Temperature and Power Electronics Applications

Dr. Mark Polis
SUNY Binghamton

Bio: Mark D. Poliks is a SUNY Distinguished Professor and Empire Innovation Professor of Materials Science and Engineering and Systems Science and Industrial Engineering at the Thomas J. Watson College of Engineering and Applied Science, Binghamton University, State University of New York. He is the founding director of the Center for Advanced Microelectronics Manufacturing (CAMM), a New York State Center of Advanced Technology and home to the New York Node of the federally supported NextFlex Manufacturing USA. Poliks has made sustained contributions to the fields of materials processing, electronics packaging, flexible, hybrid and additive electronics that are relevant to a variety of medical and industrial applications. Poliks was the General Chair of the 69th IEEE Electronic Components and Technology Conference (ECTC). He was a recipient of the 2017 SUNY Chancellor's Award for Excellence in Research, is a Fellow of NextFlex, an elected member of the IEEE Electronics Packaging Society (EPS) Board of Governors and serves as the director of student programs and is an IEEE Distinguished Lecturer.



Felippe Pavinato
GE Aerospace

Integrated Electronics for Flexible Soft Robotic Platforms Used in Aerospace

Bio: Dr. Felippe Pavinatto is a Material Scientist and Engineer that has been working with additive electronics manufacturing for over 14 years in academia and industry. His expertise is centered on advanced materials, electronic inks formulation and direct-write, conformal, panel-based and roll-to-roll (R2R) printed electronics technologies. Over the years, Dr. Felippe has used his additive manufacturing specialization to develop scalable fabrication processes for flexible hybrid electronic (FHE) in the fields of bioelectronics, energy devices, and wearable electronics. Since joining GE Aerospace in January of 2023, his research focus has been on high-temperature electronic inks, printed components and devices; conformal direct-write 3D printing manufacturing; and additive electronics packaging. Dr. Felippe has been committed throughout his career to generating innovative technologies and solutions to meet industrial demands via collaborative and multi-disciplinary research projects.

Coffee Breaks and Panels at ITherm 2024

P-08: THERMAL MANAGEMENT TECHNOLOGIES FOR HIGH-POWER SYSTEMS

THURSDAY, MAY 29, 4:00 PM – 5:30 PM **LEVEL 2, TATE A5**

As aerospace systems continue to push the boundaries of performance, efficient thermal management is critical to ensuring reliability and operational efficiency. This panel will bring together experts to discuss cutting-edge approaches, challenges, and innovations in electronics cooling for high-power, aerospace, and space applications. Topics will include advancements in thermal management techniques, novel cooling technologies, integration strategies, and emerging applications. With increasing power densities and demanding environmental conditions, cooling techniques such as liquid cooling, two-phase heat transfer, and advanced thermal materials are required to address thermal challenges. These innovative approaches enable improved heat dissipation, allowing electronics to operate with higher power, higher power density, more efficiently, and more reliably.

MODERATOR

Dr. Kimberly Saviers
RTX Tech Research Center

Bio: Bio: Dr. Kimberly Saviers is a Senior Manager at RTX Technology Research Center (RTRC), leading the Heat Transfer Team and multiple research programs focused on thermal management for power electronics, aerospace, space, and data center applications. Her expertise includes heat transfer, design optimization, and thermal design for additive manufacturing. She has driven innovations in advanced cooling solutions, including additively manufactured cold plates, heat sinks, and heat exchangers. At RTRC, she previously oversaw the 5,000 sq. ft. Thermal Systems Lab, supporting experimental validation of novel thermal technologies such as heat exchangers, thermal interface materials, and thermoelectrics. Kimberly earned her Ph.D. in Mechanical Engineering from Purdue University, where she researched advanced thermal interface materials. She is currently the Principal Investigator for the ARPA-E COOLERCHIPS EXTRACT project, the thermal lead for the ARPA-E ASCEND ULTRA-COMPACT project, and the Research Principal Investigator for the NASA additive condensing heat exchanger project.

PANELISTS

Dr. Chirag Kharangate
Case Western Reserve University

CRYOGENICS FLUID MANAGEMENT RESEARCH FOR FUTURE SPACE MISSIONS

Bio: Chirag Kharangate is an Assistant Professor of Mechanical and Aerospace Engineering at Case Western Reserve University and Director of the Two-Phase Flow and Thermal Management Laboratory, where his group addresses research and development needs in electronics packaging, thermal management, and fluid management technologies for automotive, computer, defense, and aerospace applications. Dr. Kharangate's research group explores methodologies for testing and modeling flow boiling, flow condensation, and single-phase cooling schemes. He complements his experimental and theoretical work with the development of computational fluid dynamics (CFD) as well as novel machine learning tools for predicting phase change phenomena. Dr. Kharangate has co-authored over 90 refereed journal and conference papers (h-index of 25). He has been recognized by the Case School of Engineering Research Award, ASME K-16 Outstanding Early Faculty Career in Thermal Management Award, ASME EPPD Early Career Engineer Award, and the Office of Naval Research Young Investigator Program Award.

ADVANCED THERMAL MANAGEMENT OF ELECTRIC MACHINES

Prof. Satish Kumar
Georgia Tech

Bio: Dr. Satish Kumar is currently a Professor in George W. Woodruff School of Mechanical Engineering at Georgia Tech. Prior to joining Georgia Tech in 2009 as an Assistant Professor, he worked at IBM Corporation, Austin, TX, where he was responsible for the thermal management of electronic devices. Kumar received his Ph.D. in Mechanical Engineering and M.S. degree in Electrical and Computer Engineering from Purdue University, West Lafayette in 2007; and B.Tech. degree in Mechanical Engineering from the Indian Institute of Technology, Guwahati in 2001. His research interests are in thermal management and electro-thermal transport studies in electronic devices using experiments, computational fluid dynamics models and machine learning methods. He is the author or co-author of over 160 journal or conference publications. Dr. Kumar is an ASME Fellow and recipient of 2005 Purdue Research Foundation Fellowship, 2012 Summer Faculty Fellow from Air Force Research Lab, 2014 Sigma Xi Young Faculty Award, 2014 DARPA Young Faculty Award, 2017 Woodruff Faculty Fellow, and 2020 ASME K-16 Clock Award. Dr. Kumar has been named as Frank H. Neely Professor, at Georgia Tech.

Prof. Patrick McCluskey
University of Maryland

Thermal-Energy-Reliability Co-Design of Data Centers Using MOSTCOOL

Bio: Dr. Patrick McCluskey is a Professor of Mechanical Engineering at the University of Maryland, College Park, and the Department's Director of Undergraduate Studies. He has over 25 years of research experience in the areas of thermal management, reliability, and packaging of electronic systems for use in extreme temperature environments and power applications. Dr. McCluskey has co-authored three books, 5 US Patents, and over 175 peer-reviewed technical articles with nearly 4000 citations.

Advanced Thermal Management for Aerospace and Energy Systems: Harnessing Additive Manufacturing for Rapid Prototyping

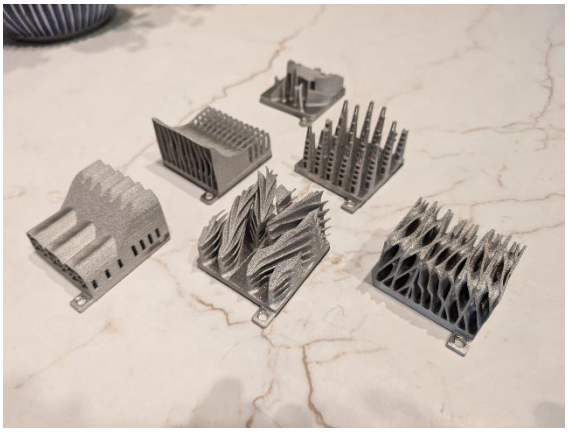
Dr. Arun Muley
Boeing

Bio: Dr. Arun Muley is a Boeing Fellow and an internationally recognized thermal management leader. At Boeing Research and Technology, he is leading thermal technology portfolio and is responsible for development of enterprise strategy and its execution. He is also Boeing's SE Asia Technology Director and Global Integrator for Boeing Additive Manufacturing (BAM) and Integrated Vehicle Systems. His prior positions include R&D Manager at Koch Heat Transfer, and Principal Engineer at Honeywell Aerospace. Dr. Muley, a Fellow of ASME, has held several professional leadership roles, which include past chair of the Heat Transfer Division and the Process Industries Divisions of ASME. He received his PhD and MS from the University of Cincinnati, and BS from the National Institute of Technology, Calicut, Kerala, India.

Darin Sharar
TauMat

Novel Solid-Solid Phase Change Materials (SS-PCMs) for Transient Electronic Thermal Management

Bio: Dr. Darin Sharar is CTO and Founder of TauMat, LLC, a business focused on transient thermal management hardware and software for high power electronic, radio frequency, and photonic applications. Since inception of the company in 2023, he has developed and led thermal management and materials development programs for NASA, NAVAIR, ONR, Army Soldier Center, the Joint Hypersonics Transition Office (JHTO), and the National Science Foundation (NSF). Prior to the founding of TauMat, Dr. Sharar worked as an engineer and Team Lead at the U.S. Army Research Laboratory for 15 years; he is a recognized expert in the specialized fields of thermal management, materials, and high-power electronics with a proven track record of technical and programmatic development and leadership on high-impact internal-, DARPA-, OUSD-, and customer-funded programs. He has authored/co-authored over 60 journal papers, refereed proceedings papers, and chapters in books; has delivered over 40 invited lectures, tech-talks, and Keynotes at major technical conferences/meetings and has authored 5 U.S. patents. Notably, he was awarded DOD Scientist of the Quarter amongst the over 40,000 DOD scientists nationally for his discovery and use of novel metallic alloys for thermal energy storage.



Student Design Competition and Luncheons at ITherm 2024

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Meta

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- **TDTR:** Time-domain thermoreflectance for bulk, thin film, and interface analysis.
- **OPP:** 2D surface mapping for 3DICs, GaN, GaAs, Si, and defect detection.
- **emSCOPE™:** Over-the-air electromagnetic near-field imaging for antenna and EM applications.

Why Microsanj?

- **250 nm Spatial Resolution:** Pinpoint submicron hot spots in advanced materials
- **500 Picosecond Response:** Capture nanosecond-scale thermal events
- **Seamless Integration:** Works with RF, semiconductor, and photonics testing
- **Non-Destructive Analysis:** Precise insights without altering your device
- **Expert Support:** Decades of proven results, trusted by industry leaders

Applications

- Semiconductor device analysis
- Advanced packaging & stacked die
- Silicon photonics
- GaN & wide bandgap devices
- RF/microwave circuits
- Antenna & EM field analysis

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SPECIAL INTEREST PANELS

SI-06: TECHNOLOGY TRANSITION: FROM CONCEPT TO COMMERCIALIZATION

THURSDAY, MAY 29, 11:00 AM – 12:30 PM **LEVEL 2, TATE A5**

This panel will discuss the process, challenges, and best practices of moving emerging technologies from research and development into operational use. Panelists will include start-up companies and small businesses describing their experiences, as well as federal and private funding representatives speaking to expectations and pitfalls of the commercialization process. This panel will explore key factors such as funding, commercialization strategies, and collaboration models that facilitate successful transitions. Panelists will share individual case studies and insights on overcoming barriers, followed by a moderated discussion and Q&A session with the audience.

MODERATORS

Prof. Patrick Shamberger
Texas A&M

Bio: Dr. Patrick Shamberger has a background in functional inorganic materials, including crystal structure–property relationships, and applied thermodynamics. Currently, he is an assistant professor with the Dept. of Materials Science and Engineering at Texas A&M University. His current research focuses on the development of rapid, low-temperature thermal storage materials based on phase change, physisorption, and chemical dissociation processes.

Bio: Dr. Satish Kumar is currently Frank N. Neely Professor in George W. Woodruff School of Mechanical Engineering at Georgia Tech. Prior to joining Georgia Tech in 2009 as an Assistant Professor, he worked at IBM Corporation, Austin, TX, where he was responsible for the thermal management of electronic devices. His research interests are in thermal management and electro-thermal transport studies in electronic devices and materials.

Prof. Satish Kumar
Georgia Tech

Dr. Sreekant Narumanchi
NREL

Bio: Dr. Sreekant Narumanchi is a Distinguished Member of Research Staff, and the Group Manager of the Advanced Power Electronics and Electric Machines (APEEM) group within the Energy Conversion and Storage Systems Center at the National Renewable Energy Laboratory, in Golden, CO, U.S.A., where he is in his 21st year. He leads a Group of 15 full-time staff members focused on (power) electronics, electric machines, and traction drive systems for vehicles and multiple other applications. His group has collaborated with almost 100 institutions.

PANELISTS

Dr. Richard Bonner
Accelsius

Bio: Dr. Richard Bonner is a distinguished heat transfer researcher with 18 years in thermal product development, specializing in two-phase cooling. He has authored over fifty papers and holds five U.S. patents, having designed cooling products for 125+ clients in various sectors. He is a former AIChE Transport and Energy Processes Division Director and holds a B.S., M.S., and Ph.D. in Chemical Engineering from Lehigh University. Currently, he serves as the Chief Technology Officer for Accelsius, a two-phase, direct-to-chip liquid cooling company.

Dr. Craig Green
Carbice

Bio: Craig Green is a world leader in thermal management with dozens of publications and numerous patents in the field. As CTO, Craig leads Carbice's engineering team and is responsible for overall technical execution, IP development, and customer solution engineering. Craig has over 20 years of professional and research experience driving innovation in the thermal sciences. Craig earned his B.S. in mechanical engineering from Cornell University before starting his career in the power industry at Exelon Nuclear. To further develop his expertise, Craig pursued a Ph.D at Georgia Tech, where he focused on semiconductor thermal management. He has published research ranging from transistor to system level cooling, investigating passive and active cooling technologies that utilize microfluidics, embedded phase change materials and solid state cooling.

Dr. Darin Sharar
TauMat

Bio: Dr. Darin Sharar is CTO and Founder of TauMat, LLC, a business focused on transient thermal management hardware and software for high power electronic, radio frequency, and photonic applications. Since inception of the company in 2023, he has developed and led thermal management and materials development programs for NASA, NAVAIR, ONR, Army Soldier Center, the Joint Hypersonics Transition Office (JHTO), and the National Science Foundation (NSF). Prior to the founding of TauMat, Dr. Sharar worked as an engineer and Team Lead at the U.S. Army Research Laboratory for 15 years; he is a recognized expert in the specialized fields of thermal management, materials, and high-power electronics with a proven track record of technical and programmatic development and leadership on high-impact internal-, DARPA-, OUSD-, and customer-funded programs. He has authored/co-authored over 60 journal papers, refereed proceedings papers, and chapters in books; has delivered over 40 invited lectures, tech-talks, and Keynotes at major technical conferences/meetings and has authored 5 U.S. patents. Notably, he was awarded DOD Scientist of the Quarter amongst the over 40,000 DOD scientists nationally for his discovery and use of novel metallic alloys for thermal energy storage.

Dr. Brent Ridley
ARPA-E

Bio: Dr. Brent Ridley serves as a Technology-to-Market Advisor at the Advanced Research Projects Agency-Energy (ARPA-E), supporting technology development and commercialization efforts for a range of programs, including those focused on energy use in data centers. He is interested in new materials, the built environment, renewables, and waste reuse. Previously, Dr. Ridley was a founder of Skyscrape, a temperature-responsive apparel spinout from Otherlab. Based on a natural materials response, Skyscrape's insulating textile changes shape and insulation level in response to changes in ambient temperature, without the use of wires or sensors. He also co-founded Kovio, a printed inorganic microelectronics company.

Prof. Yogendra Joshi
DARPA

Bio: 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 four hundred fifty publications in this area, including over two hundred twenty-five journal articles. He is an elected Fellow of the ASME, the American Association for the Advancement of Science, and IEEE. He is a recipient of 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.

SI-09 & SI-10: ARPA-E COOLERCHIPS RESEARCH OVERVIEW

FRIDAY, MAY 30 **LEVEL 2, TATE A5**

8:15 – 9:15 AM (PART I) & 11:30 AM – 12:30 PM (PART II)

The $42M ARPA-E COOLERCHIPS program supports high risk/high reward technology concepts to cool high density (AI) compute systems to enable next generation high density computing. The teams have to achieve this performance while simultaneously achieving a transformational reduction in cooling energy use and achieving similar or higher reliability and cost effectiveness than systems today. The teams supported have developed their first server concepts and will share their progress, learnings and projection for the future.

MODERATORS

Dr. Peter de Bock
ARPA-E

Bio: 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.

Bio: Dr. Brent Ridley serves as a Technology-to-Market Advisor at the Advanced Research Projects Agency-Energy (ARPA-E), supporting technology development and commercialization efforts for a range of programs, including those focused on energy use in data centers. He is interested in new materials, the built environment, renewables, and waste reuse. Previously, Dr. Ridley was a founder of Skyscrape, a temperature-responsive apparel spinout from Otherlab. Based on a natural materials response, Skyscrape's insulating textile changes shape and insulation level in response to changes in ambient temperature, without the use of wires or sensors. He also co-founded Kovio, a printed inorganic microelectronics company.

Dr. Brent Ridley
ARPA-E

PANELISTS

Dr. Michael Cumbie
HP

EMBEDDED MICROFLUIDIC COOLING FOR NEXTGEN HIGH POWER SERVER ARCHITECTURES

Dr. Kimberly Saviers
RTRC

EXTRACT: EXTRA EFFICIENT DATA CENTERS WITH AEROSPACE COOLING TECHNOLOGY

Prof. Dereje Agonafer
UT Arlington

HOLISTIC AND RETROFITTABLE CO-DESIGN USING A NOVEL HYBRID COOLING TECHNOLOGY FOR ENERGY EFFICIENT DATA CENTER OF THE FUTURE

Dr. Ali Heydari
Nvidia

GREEN REFRIGERANT COMPACT HYBRID SYSTEM FOR ULTRA-EFFICIENT AND SUSTAINABLE HPC COOLING

Prof. Michael Ohadi
UMD

HIGHLY EFFICIENT PREFABRICATED MODULAR LIQUID-COOLED MICRO DATA CENTER

Dr. Chris Roper
HRL Labs.

ALIGNED GRAPHITE MICROCHANNEL COOLING WITH ADDITIVELY MANUFACTURED MANIFOLDS

Dr. Evgeny Shatskiy
UIUC

HOLISTIC RACK-TO-PROCESSOR POWER AND THERMAL CO-DESIGN FOR FUTURE SERVERS

Prof. Saeed Moghaddam
University of Florida

WATER-BASED SUB-AMBIENT PRESSURE SYSTEM FOR ULTRA-EFFICIENT HPC COOLING AND WASTE HEAT RECOVERY

Prof. Chanwoo Park
University of Missouri

DUAL-MODE HYBRID TWO-PHASE LOOP FOR DATA CENTER COOLING

Prof. Todd Salomon
Bell Labs.

DELIVERING ENERGY AND EXERGY EFFICIENCY IN THE CONVERGED 5G RAN/EDGE COMPUTE NETWORK

Dr. Pritish Parida
IBM

SYSTEMS TWO PHASE COOLING

Prof. Tiwei Wei
Purdue

IN-PACKAGE, CHIP-LEVEL TWO-PHASE JET IMPINGEMENT COOLING FOR HIGH-PERFORMANCE AI COMPUTING

Prof. Patrick McCluskey
UMD

DESIGN DECISION SUPPORT TOOL FOR NEXT GENERATION DATA CENTER COOLING

S2TS Smart and Small Thermal Systems Laboratory

If you can imagine it, we can deliver it!

PI: Prof. Michael M. Ohadi; University of Maryland

Key Personnel:
Prof. Michael Ohadi: ohadi@umd.edu;
Prof. Amir Shooshtari: amir@umd.edu;
Dr. Andres Sarmiento: apsc@umd.edu

Who We Are

S2TS Laboratory at the University of Maryland, College Park, utilizes innovative design/optimization, materials, and manufacturing techniques to introduce next-generation thermal management systems. S2TS R&D areas of focus:

- Advanced heat exchangers for diverse energy conversion applications
- Thermal management of next-generation electronics
- Micro/Nano Systems for process intensification and optimization
- Energy audit and system efficiency and resiliency analysis

Recent Projects

- Thermal Management of a Heterogeneously-Integrated Electronics Application
- A Low Cost and High-Performance Modular Thermal Energy Storage for Building Equipment
- Prefab Modular Liquid Cooled Micro Data Center
- Highly Compact Metallic Heat Exchangers for Extreme Environments
- Thermal Management of High Flux Electronics Using Film Evaporation and Enhanced Fluid Delivery
- A Highly Efficient Thermal Management System for Next-generation Electric Aircraft
- ML-Enabled Rapid Energy Auditing for Building Clusters

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ITHERM 2025 AVRAM BAR-COHEN BEST PAPER AWARD NOMINEES

Congratulations to all the best paper award nominees! Make sure to attend the conference lunch banquet on Friday to find out which researchers win this prestigious award!

COMPONENT-LEVEL THERMAL MANAGEMENT

Phasor-Based Dehomogenisation for Microchannel Cooling Topology Optimisation
Hao Li[1], Peter Dørffler Ladegaard Jensen[2], Rebekka Vaarum Woldseth[3] & Joe Alexandersen[1]
[1]University of Southern Denmark, [2]Technical University of Denmark, [3]Centre Inria de l'Université de Lorraine

Multiscale Evaluation of Thermal Conductance of Thermal Interface Materials
Jaehyung Song, Hyun Woo, Hakjun Kim, Sung-Jun Kim, Chan Park, Woong-Ryeol Yu & Hyejin Jang
Seoul National University

Quantitative and Qualitative Evaluation on the Influence of Heat Spreader Topography and Thermal Interface Material Properties on Thermal Performance of High-Power Computing (HPC) Semiconductor Packaging
Alexis Jacques-Fortin, Stéphanie Allard & Kenneth Marston
IBM Corporation

Embedded Cooling of Planar Magnetic Components for High Power Density Power Converters
Yanghe Liu[1], Tianzhu Fan[1], Feng Zhou[1], Shailesh Joshi[1], Ashwini Kumar Dubey[2], Sayan Paul[2], Dragan Maksimovic[2] & E. M. Dede[1]
[1]Toyota Research Institute of North America, [2]University of Colorado Boulder

Experimental Characterization of a Low Thermal Resistance Microchannel Evaporator Utilizing Low GWP Refrigerant for High Power GPU Applications
David J. Apigo[1], Sarwesh N. Parbat[1], Haotian Jia[2], Haoyun Qiu[3], Pouya Abirzadeh[3], Manohar Bongarala[1], Syed Faisal[1], Rishav Roy[1], Nenad Miljkovic[3] & Todd Salamon[1]
[1]Nokia Bell Labs., [2]Tufts University, [3]University of Illinois Urbana-Champaign

Direct Visualization of Local Thermal Conductivity and Boundary Conductance of Diamond Particles
Luke Gyubin Min, Heungdong Kwon, Christopher Perez, Mehdi Asheghi & Kenneth E. Goodson
Stanford University

Development of Liquid Metal and Silicon Pin Fin Composite Thermal Interface Materials
Matthew Coughlin, Andrew Clements, Fangzhou Wang, Luke Gyubin Min, Kaiying Jiang, Heungdong Kwon, Mehdi Asheghi & Kenneth Goodson
Stanford University

SYSTEM-LEVEL THERMAL MANAGEMENT

Comparison of 3D Manifold Architectures for Cooling of Internal Heatsinks Using External Airflow
G. Farrell[1], R. Nimmagadda[1], S. N. Joshi[2], D. J. Lohan[2], E. M. Dede[2], T. Persoons[1]
[1]Trinity College Dublin, [2]Toyota Research Institute of North America

Automated Electro-Thermal Modeling Framework of Distributed Vertical Power Delivery Architectures with Substrate-Embedded Microfluidic Cooling
Mingeun Choi[1], Sriharini Krishnakumar[2], Yaroslav Popryho[2], Ramin Rahimzadeh Khorasani[3], Madhavan Swaminathan[3], Inna Partin-Vaisband[2] and Satish Kumar[1]
[1]Georgia Tech, [2]University of Illinois – Chicago, [3]Pennsylvania State University

System Level Reliability Modeling of Direct-to-Chip Liquid Cooled Data Centers
Sidharth Rajeev[1], Venkata Achyuth Kunchapu[1], Ryan Enright[2], Tiwei Wei[3], Srikanth Rangarajan[1], Bahgat Sammakia[1]
[1]SUNY Binghamton, [2]Seguente, [3]Purdue University

Enhanced Thermal Management in High-Performance Computing: A Novel Cascaded Solid-Solid Phase Change Material Honeycomb Heat Sink Design
Mayank Maroliya and Sandip Kumar Saha
Indian Institute of Technology - Bombay

Hybrid Static Immersion Cooling of a Single Lithium-Ion Prismatic Battery Cell
Rajesh Nimmagadda, David W. Salter, Kantharuphan Annathurai, Daniel Trimble and Seamus M. O'Shaughnessy
Trinity College Dublin

Resiliency of Liquid-to-Liquid Cooling Systems in Data Centers Under Failure Scenarios
Ali Heydari[1], Himanshu Modi[1], Pardeep Shahi[1], Lochan Sai Reddy Chintaparthy[2], Anto Barigala[2], Mohammad Raisul Islam[2], Dereje Agonafer[2], Mohammad Tradat[1], Saket Karajgikar[1], Jeremy Rodriguez[1]
[1]Nvidia Corp., [2]University of Texas Arlington

Organizer and Paper Awards at ITherm 2024

MECHANICS AND RELIABILITY

HALT With PoF for Class P Electronics Assembly
Reza Ghaffarian
NASA-JPL

Development of a Reduced-Order Nodal Reliability Framework for Data Center Applications
Tyler Schostek[1], Nirmal Rai[2], Kimberly Saviers[2] & Davide Ziviani[1]
[1]Purdue University, [2]RTX Technology Research Center

Evaluation of Board-Level Drop Test Reliability of Flexible In-Mold Electronics under after Isothermal Exposure
Aathi Raja Ram Pandurangan[1], Md Golam Sarwar[1], Pradeep Lall[1] & Scott Miller[2]
[1]Auburn University, [2]NextFlex

Impact of Non-Flat Heat Sink Surface on Degradation of Thermal Greases
Ritwik V. Kulkarni, Nolan P. Gronowski, Pranay P. Nagrani, Amy M. Marconnet
Purdue University

High Strain Rate Property Prediction and the Effect of Bismuth Concentration on the High-G Level Shock Damage with Sustained High-Temperature Operation
Vishal Mehta[1], Pradeep Lall[1], David Locker[2] & Jeff Suhling[1]
[1]Auburn University, [2]US Army CCDC

EMERGING TECHNOLOGIES AND FUNDAMENTALS

Concept Design of a Confined Direct Two-Phase Jet Impingement Cooler with Phase Separation of Low-Surface-Tension Fluids
Gopinath Sahu, Ketan Yogi, Tiwei Wei & Justin Weibel
Purdue University

Fabrication and Experimental Evaluation of Bendable Copper Flat-Plate Oscillating Heat Pipes
Ishan Tandon, Qian Qian, Zekun Wu, Ahmad Rosmahidi, Justin A. Weibel & Liang Pan
Purdue University

Enhancing Power-Dense and Reliability-Oriented Heat Sink Structures through Additive Manufacturing for Power Electronics in Aviation Applications
Jannes Kai Briese, Hendrik Schefer, Lukas Radomsky, Robert Keilmann & Regine Mallwitz
TU Braunschweig

Exploring the Impact of Nanoscale Roughness on the Pool Boiling Performance of Femtosecond Laser Processed Copper in Dielectric Fluid
Graham Kaufman, Josh Gerdes, Mohamed Marey, George Gogos & Craig Zuhlke
University of Nebraska Lincoln

Thermal Imaging and Flow Visualization of Capillary-Driven Two-Phase Boiling in Silicon Microchannels Coated with Porous Copper Wick
Yujui Lin[1], Heungdong Kwon[1], Kewei Xiao[2], Man Prakash Gupta[2], Michael Degner[2], Mehdi Asheghi[1], H. Alan Mantooth[3] & Kenneth E. Goodson[1]
[1]Stanford University, [2]Ford Motor company, [3]University of Arkansas Fayetteville

TECHNICAL PROGRAM OVERVIEW

TRACKS & SESSIONS

COMPONENT-LEVEL THERMAL MANAGEMENT

- TI-01 Jet Impingement
- TI-02 TIM and Heat Spreader Characterization
- TI-03A TIM and Heat Spreader Design
- TI-03B Packaging and Thermoelectrics
- TI-04 Topology Optimization
- TI-05 Capillary-Driven Two-Phase Flow
- TI-06 Pump-Driven Two-Phase Flow
- TI-07A Embedded and Immersion Cooling
- TI-07B Advanced Modeling and Characterization
- TI-08 Power Electronics Cooling
- TI-09 TIM and Heat Spreader Development
- TI-10 Thermosiphons, Heat Pipes and Vapor Chambers

EMERGING TECHNOLOGIES & FUNDAMENTALS

- E-01 Heat Pipes and Wicking Structures
- E-02 Power Electronics, Photonics, and Flexible Electronics
- E-03 Thermophysical Properties and Interfacial Thermal Transport
- E-04 Additive Manufacturing I
- E-05 Boiling and Condensation
- E-06 Boiling Enhancement
- E-07 Machine Learning and AI
- E-08 Advanced Modeling Technique
- E-09 Additive Manufacturing II
- E-10 Data Centers

SYSTEM-LEVEL THERMAL MANAGEMENT

- TII-01 Liquid Cooling Solutions
- TII-02 PCM and Transient Cooling
- TII-03 Data Center Liquid Cooling Reliability and Leak Mitigation
- TII-04 Data Center Scaling and Machine Learning
- TII-05 Immersion Cooling I
- TII-06 Data Center Direct Liquid and Immersion Cooling
- TII-07 Next-Gen Electronics Systems Co-Design
- TII-08 Air Cooling and Heat Exchangers
- TII-09 Microchannels and Jet Impingement
- TII-10 Immersion Cooling II

MECHANICS & RELIABILITY

- M&R-01 Modeling and Simulations I
- M&R-02 High Temperature Reliability
- M&R-04 Material Characterization
- M&R-05 Modeling and Simulations II
- M&R-06 Accelerated TestingM-08 Solder Metallurgy
- M&R-08 Design Optimization

DAY 1: WEDNESDAY, MAY 29

7:00 AM	**Breakfast**				***High Plains***
8:15 AM	**TI-01 Jet Impingement** ***Tate Ballroom A1***	**TII-01 Liquid Cooling** ***Tate Ballroom A2***	**M-01 Modeling and Simulation I** ***Tate Ballroom A3***	**E-01 Heat Pipes and Wicking Structures** ***Tate Ballroom A4***	**TT-01 Data Centers Standards for Sustainability** (see page 37) ***Tate Ballroom A5***
9:15 AM	**Break**				
9:30 AM	 **Keynote K-1: Future of AI Hardware Enabled by Advanced Packaging** **Raja Swaminathan, Corporate Vice President, AMD** (see page 13)				***Texoma***
10:30 AM	**Coffee Break**				***Tate Prefunction A***
11:00 AM	**TI-02 TIM and Heat Spreader Characterization** ***Tate Ballroom A1***	**TII-02 PCM and Transient Cooling** ***Tate Ballroom A2***	**M-02 High Temperature Reliability** ***Tate Ballroom A3***	**E-02 Power Electronics, Photonics, and Flexible Electronics** ***Tate Ballroom A4***	**P-02 Data Center / Liquid Cooling** (see page 44) ***Tate Ballroom A5***
12:30 PM	**Luncheon: Richard Chu ITherm Award Presentation**				***High Plains***
2:00 PM	**TI-03A TIM and Heat Spreader Design and Selection** ***Tate Ballroom A1***	**TII-03 Data Center Liquid Cooling Reliability and Leak Mitigation** ***Tate Ballroom A2***	**TI-03B Packaging & Thermoelectrics** ***Tate Ballroom A3***	**E-03 Thermophysical Properties and Interfacial Thermal Transport** ***Tate Ballroom A4***	**TT-03 High Fidelity Simulation of Boiling Coolants, New Approaches, Challenges and Opportunities** (see page 38) ***Tate Ballroom A5***
3:30 PM	**Coffee Break**				***Tate Prefunction A***
4:00 PM	**TI-04 Topology Optimization** ***Tate Ballroom A1***	**TII-04 Data Center Scaling and Machine Learning** ***Tate Ballroom A2***	**M-04 Material Characterization** ***Tate Ballroom A3***	**E-04 Additive Manufacturing I** ***Tate Ballroom A4***	**P-04 Thermal/ Mechanical/ Electrical Challenges and Opportunities of Advanced Mobile/AI/ IOT Computing Devices and Beyond** (see page 46) ***Tate Ballroom A5***
5:30 PM	**Student Heat Sink Design Challenge**				***Tate Ballroom A1***
6:30 PM	**ECTC/Student & Start-Up Innovation Challenge**				***Texas A-B***
7:00 PM	**ASME K-16 & Journal of Electronic Packaging Meeting**				***Tate Ballroom A1***

Day 1: Wed, May 28th 8:15 AM–9:15 AM

TI-01 Jet Impingement

TATE A1 — Chairs: *Tiwei Wei (Purdue University), Onur Yenigun (imec)*

8:15 AM (#53) **Investigation of an Air-Cooled Integrated Synthetic Jet Heat Sink for Electronics Thermal Management**; ***Faisal Ahmed***[1], ***Mehmet Arik***[1]; [1]*Auburn University*

8:30 AM (#109) **Novel Multi-Nozzle Jet Impingement Liquid Cold Plate for Cooling of High-Power Density Electronic Chip**; ***Sangram Kumar Samal***[1], ***Chi-Chuan Wang***[1], ***Yogesh Fulpagare***[2]; [1]*National Yang Ming Chiao Tung University,* [2]*Cooler Master Co., Ltd.*

8:45 AM (#166) **Numerical Investigation of Surface Structures for Enhancement of Liquid Jet Impingement Cooling**; ***Georg Elsinger***[1], ***Herman Oprins***[2], ***Vladimir Cherman***[2], ***Geert Van der Plas***[2], ***Eric Beyne***[2], ***Ingrid De Wolf***[1]; [1]*KU Leuven, imec,* [2]*imec*

TII-01 Liquid Cooling

TATE A2 — Chairs: *Arad Azizi (Honeywell International Inc), Srikanth Rangarajan (Binghamton University)*

8:15 AM (#49) **The Study of Cold Plate Liquid Cooling Solution for Optics and ASIC on 51.2T Switch**; ***Yaoyin Fan***[1], ***Yan Liu***[1], ***Peng Xiao***[1]; [1]*Celestica*

8:30 AM (#189) **Prediction of the Behavior of a Two-Phase Closed-Loop System Coupled With a Single-Phase Cooling System**; ***Shahin N.Oskouie***[1], ***Sukhvinder Kang***[1], ***Jan Visser***[1]; [1]*Boyd Corporation*

8:45 AM (—) **Cracking the Code: Testing Liquid Cooling Reliability With Barbed Sealing Interfaces**; ***Alex Sherman***[1]; [1]*CPC - Colder Products Company*

9:00 AM (#360) **Thermal Performance of Liquid Cooled and Air Cooled Thermal Ground Plane-Based Battery Thermal Management Systems for a High-Power Density Lithium-Ion Battery**; ***Arthur S. Labalte***[1], ***Amrid Amnache***[1], ***Alihossein Nikkhah***[1], ***Nooshin Karami***[1], ***Luc G. Fréchette***[1]; [1]*University of Sherbrooke*

M&R-01 Modeling and Simulation I

TATE A3 Chairs: *Tiwei Wei (Purdue University)*

8:15 AM (#132) **The Reliability Impact of 3D Package TSV Materials on Interfacial Cracks**; ***Unique Rahangdale***[1], ***Akshay Lakshminarayana***[1], ***Rohit Kumar Suthar***[1], ***Dereje Agonafer***[1]; [1]*The University of Texas at Arlington*

8:30 AM (#142) **Enhancing EMI Shield Design for EV Inverter Using Advanced Simulation Techniques**; ***Nitish Jetithor***[1], ***Matthew Graham***[2]; [1]*senior technical lead,* [2]*Engineering Manager*

8:45 AM (#368) **Finite Element Analysis of the Thermal Cycling Performances of PBGA Assemblies Subjected to Various Prior Isothermal Aging Conditions**; ***Omma Sumaiya***[1], ***Souvik Chakraborty***[1], ***Golam Rakib Mazumder***[1], ***Mahbub Alam Maruf***[1], ***Jeffrey Suhling***[1], ***Pradeep Lall***[1]; [1]*Auburn University*

9:00 AM (#407) **Considerations on Thermal Analysis of Inertial Microsystems Including Microsensors and Readout Analog Integrated Circuit.**; ***Jacek Nazdrowicz***[1], ***Mariusz Jankowski***[1]; [1]*Lodz University of Technology*

E-01 Heat Pipes and Wicking Structures

TATE A4 Chairs: *Paul Paret (National Renewable Energy Laboratory)*

8:15 AM (#48) **Nucleate Flow Boiling Enhancement in Copper Inverse Opal-Coated Manifold Microchannel**; ***Youngseob Lee***[1], ***Jaewon Hwang***[1], ***Daeyoung Kong***[2], ***Jungwan Cho***[3], ***Hyoungsoon Lee***[1]; [1]*Chung-Ang University,* [2]*Stanford University,* [3]*Sungkyunkwan University*

8:30 AM (#54) **Direct Printing of Wick Structures Onto Chips for Two-Phase Jet Impingement Cooling**; ***Harish Kumar Lattupalli***[1], ***Emilt Stallbaumer-Cyr***[1], ***Md Asif Iqbal***[1], ***Sina Ghadi***[1], ***Tiwei Wei***[2], ***Scott Schiffres***[1]; [1]*Binghamton University,* [2]*Purdue University*

8:45 AM (#232) **Fabrication and Experimental Evaluation of Bendable Copper Flat-Plate Oscillating Heat Pipes**; ***Ishan Tandon***[1], ***Qian Qian***[1], ***Zekun Wu***[1], ***Ahmad Rosmahidi***[1], ***Liang Pan***[1], ***Justin A. Weibel***[1]; [1]*Purdue University*

9:00 AM (#344) **Thermal Imaging and Flow Visualization of Capillary-Driven Two-Phase Boiling in Silicon Microchannels Coated With Porous Copper Wick**; ***Yujui Lin***[1], ***Heungdong Kwon***[1], ***Kewei Xiao***[2], ***Man Prakash Gupta***[2], ***Michael Degner***[2], ***Mehdi Asheghi***[1], ***Alan Mantooth***[3], ***Kenneth Goodson***[1]; [1]*Stanford University,* [2]*Ford Motor Company,* [3]*University of Arkansas*

Day 1: Wed, May 28th 11:00 AM–12:30 PM

TI-02 TIM and Heat Spreader Characterization

TATE A1

Chairs: *Prabudhya Roy Chowdhury (IBM Research), Rehan Khalid (Google LLC)*

11:00 AM (#72) **Multiscale Evaluation of Thermal Conductance of Thermal Interface Materials**; ***Jaehyung Song***[1], ***Hyun Woo***[1], ***Hakjun Kim***[1], ***Sung-Jun Kim***[1], ***Woong-Ryeol Yu***[1], ***Chan Park***[1], ***Hyejin Jang***[1]; [1]*Seoul National University*

11:15 AM (#129) **Indium Solder TIM Stability Under Temperature Cycling**; ***Piyush Kulkarni***[1], ***Ali Davoodabadi***[2], ***Zechen Zhang***[1], ***Scott Schiffres***[1]; [1]*Binghamton University,* [2]*Universal Instruments Corporation*

11:30 AM (#170) **Evaluating the Degradation of Thermal Interface Materials in Liquid Immersion Cooling Systems Using Ultrasonic Methods**; ***Jacey Birkenmeyer***[1], ***Bijay Bansal***[1], ***Shubhra Bansal***[1], ***Luz D. Sotelo***[1]; [1]*Purdue University*

11:45 AM (#285) **Thermal Interface Material Characterization Using Thermal Test Vehicle Assemblies With Bare Die and Lidded Packages**; ***Onur Yenigun***[1], ***Vladimir Cherman***[1], ***Herman Oprins***[1], ***Michiaki Yajima***[2], ***Shinichi Suzuki***[2], ***Hitoshi Onozeki***[2], ***Kei Togasaki***[2], ***Masatoshi Katagiri***[2], ***Takahiro Iseki***[2], ***Geert Van der Plas***[1], ***Eric Beyne***[1]; [1]*imec,* [2]*Resonac*

12:00 PM (#343) **Measurement of Thermal Impedance in Heterogeneous Media**; ***Lucas Oelkers***[1], ***Patrick Shamberger***[1], ***Adam Wilson***[2], ***Rachel McAfee***[3], ***Michael Fish***[2]; [1]*Texas A&M,* [2]*DEVCOM Army Research Laboratory,* [3]*University of Maryland*

12:15 PM (#354) **Direct Visualization of Local Thermal Conductivity and Boundary Conductance of Diamond Particles**; ***Luke Gyubin Min***[1], ***Heungdong Kwon***[1], ***Christopher Perez***[1], ***Mehdi Asheghi***[1], ***Kenneth Goodson***[1]; [1]*Stanford University*

TII-02 PCM and Transient Cooling

TATE A2

Chairs: *Solomon Adera (University of Michigan)*

11:00 AM (#18) **Thermal Characterization of Select Metallic Phase Change Materials for Transient Load Thermal Management**; ***Kayden Maiorine***[1], ***Rachel McAfee***[2], ***Harshil Patel***[1], ***Adam Wilson***[3], ***Michael Fish***[3]; [1]*Drexel University,* [2]*University of Maryland,* [3]*DEVCOM Army Research Laboratory*

11:15 AM (#31) **Hierarchical Thermal Transport Across Multiple Length Scales in High-Capacity Lithium-Ion Batteries for Stationary Energy Storage Systems**; ***Oscar A. Alvarez***[1], ***Carlos Da Silva***[1], ***Cristina H. Amon***[1]; [1]*University of Toronto*

11:30 AM (#97) **Novel Predictive Model of Thermal Transient Behavior**; ***Hwanjoo Park***[1], ***Jaewon Yun***[1], ***Wook Moon***[1], ***Byunghan Ko***[1], ***Duksoo Kim***[1], ***Sunghoon Chun***[1]; [1]*Samsung Electronics Co., Ltd.*

11:45 AM (#154) **Enhanced Thermal Management in High-Performance Computing: A Novel Cascaded Solid-Solid Phase Change Material Honeycomb Heat Sink Design**; ***Mayank Maroliya***[1], ***Sandip Kumar Saha***[1]; [1]*Indian Institute of Technology Bombay*

12:00 PM (#365) **Rate of Thermal Energy Storage in Composite Phase Change Material Slabs**; ***Derian Morphew***[1], ***Emmanuel Nwoye***[1], ***Hyunji Park***[1], ***Sophia Ahmed***[1], ***Choongho Yu***[1], ***Jonathan Felts***[1], ***Patrick Shamberger***[1]; [1]*Texas A&M*

M&R-02 High Temperature Reliability

TATE A3

Chairs: *David Huitink (University of Arkansas), Saroj Majakoti (Department of Mechanical Engineering, University of Arkansas, Fayetteville, AR)*

11:00 AM (#293) **Evaluation of Board-Level Drop Test Reliability of Flexible in-Mold Electronics Under After Isothermal Exposure**; ***Aathi Raja Ram Pandurangan***[1], ***Md Golam Sarwar***[1], ***Pradeep Lall***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

11:15 AM (#329) **Damage Model for Assessment of the Combined Effects of High-Temperature Storage and Harmonic Vibration on Reliability of Lead-Free Doped Solder Joint Assemblies**; ***Vishal Mehta***[1], ***Pradeep Lall***[1], ***Ken Blecker***[2], ***Jeff Suhling***[1]; [1]*Auburn University,* [2]*US Army CCDC-AC*

11:30 AM (#331) **Impact of Non-Flat Heat Sink Surface on Degradation of Thermal Greases**; ***Ritwik Kulkarni***[1], ***Nolan Gronowski***[1], ***Pranay Nagrani***[1], ***Amy Marconnet***[1]; [1]*Purdue University*

11:45 AM (#333) **Humidity and High-Temperature Effects on Non-Pfas Thermal Interface and Underfill Materials**; ***Padmanava Choudhury***[1], ***Pradeep Lall***[1], ***Aathi Raja Ram Pandurangan***[1]; [1]*Auburn University*

12:00 PM (#375) **Thermal Conductivity Evolution of Non-Pfas Automotive Packaging Material Under High Temperature and Humidity Exposure**; ***Yunli Zhang***[1], ***Pradeep Lall***[1], ***Daniel Harris***[1]; [1]*Auburn University*

12:15 PM (#377) **Evaluating High Temperature Die Attachment Materials: Reliability and Fatigue Performance Beyond 175°C**; ***Saroj Majakoti***[1], ***Okafor G.***[2], ***David Huitink***[2]; [1]*Department of Mechanical Engineering, University of Arkansas, Fayetteville, AR,* [2]*University of Arkansas*

E-02 Power Electronics, Photonics, and Flexible Electronics

TATE A4

Chairs: *Georges Pavlidis (University of Connecticut), Yiwen Song*

11:00 AM (#66) **Evaluating the Environmental and Performance Impact of Bio-Based Epoxy Composites for Semiconductor Packaging**; ***Visakhan Vijayan Nambiar***[1], ***Sameer Abass***[2], ***Karthik Gundala***[2], ***Bharat Gopathi***[2], ***Hongbing Lu***[1], ***Nandika D'Souza***[1], ***Varughese Mathew***[3], ***Abdullah Fahim***[3], ***Greta Terzariol***[3]; [1]*University of Texas at Dallas,* [2]*University of North Texas,* [3]*NXP Semiconductors*

11:15 AM (#128) **Effect of Two-Step Methane Concentration on the Quality and Growth Rate of Diamond Film Grown by Hot-Filament Chemical Vapor Deposition (HFCVD)**; ***Dipa Devkota***[1], ***Florence Nugera***[1], ***Jonathan W Anderson***[1], ***Anival Ayala***[1], ***Anupum K.C***[1], ***Biddhut Lamichhane***[1], ***Chris Engdahl***[2], ***Edwin L Piner***[1], ***Mark Holtz***[1]; [1]*Texas State University,* [2]*Crystallume Inc.,*

11:30 AM (#254) **A Computational Study of a Mixed Multi Color LED Lighting System for Optical Uniformity**; ***Md Shafiqul Islam***[1], ***Ozlem Ozturk***[2], ***Mehmet Arik***[1]; [1]*Auburn University,* [2]*Antolin North America*

11:45 AM (#308) **Seed Paper Based Sustainable Electronics With Water-Based Inks and Low-Temperature Processing for Additive Electronics**; ***Emran Hassan Bejoy***[1], ***Pradeep Lall***[1], ***Md Golam Sarwar***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

12:00 PM (#431) **Thermal Management of GaN HEMTs Through Electro-Thermal Modeling**; ***Changhwan Song***[1], ***Hyeonjin Nam***[1], ***Jisu Kim***[1], ***Daeyoung Kong***[2], ***Hyoungsoon Lee***[3], ***Jungwan Cho***[1]; [1]*Sungkyunkwan University,* [2]*Stanford University,* [3]*Chung-Ang University*

Day 1: Wed, May 28th 2:00 PM–3:30 PM

TI-03A TIM and Heat Spreader Design and Selection

TATE A1 Chairs: *Vincent Wheeler, Aakrati Jain (IBM Research)*

2:00 PM (#42) **Effect of Pressure-Dependent TIM Thermal Resistance on Thermal Performance of First-Level Packages**; ***Kalind Baraya***[1], ***Krishna Tunga***[1], ***Phil Buchling***[1]; [1]*IBM Systems*

2:15 PM (—) **Intro To FLIR MIX: Blending Visible and Infrared Light for Improved Analysis**; ***Desmond Lamont***[1]; [1]*FLIR*

2:30 PM (#81) **Polymer-Based Thermal Interface Material Modeling and Selection**; ***Liangkai Ma***[1], ***Brian Clark***[1], ***Joe Sootsman***[1]; [1]*The Dow Chemical Company*

2:45 PM (—) **Telops Radia Family: Entry-Level Thermal Imaging for Scientific and Industrial Research and Development**; ***Joseph Carrock***[1]; [1]*Telops*

3:00 PM (#240) **Quantitative and Qualitative Evaluation on the Influence of Heat Spreader Topography and Thermal Interface Material Properties on Thermal Performance of High-Power Computing (HPC) Semiconductor Packaging**; ***alexis Jacques-Fortin***[1], ***Ken Marston***[1], ***Stephanie Allard***[1]; [1]*IBM Infrastructure*

3:15 PM (—) **Infratec Exhibitor Presentation**; ***Stephan Larmann***[1]; [1]*InfraTec*

TII-03 Data Center Liquid Cooling Reliability and Leak Mitigation

TATE A2 Chairs: *Jessica Gullbrand*

2:00 PM (#87) **Investigation on Negative Pressure Cold Plate Liquid Cooling Solution for Data Center Application**; ***Wenbin Tian***[1], ***Ting Tian***[2], ***Chenglong Gui***[2], ***Yulong Wang***[2], ***Chen Shen***[2], ***Tangbo Jing***[2], ***Yuanlin Ren***[2], ***Jialiang Xu***[1], ***Xiaoguo Liang***[1], ***Nishi Ahuja***[1]; [1]*Intel,* [2]*ByteDance Technology*

2:15 PM (#94) **Experimental Investigation on Molding Isolation Process to Eliminate Liquid Leakage on Connection Areas of Liquid Cooling Cold Plate**; ***Wenbin Tian***[1], ***Chengjian Wang***[2], ***Yangfan Zhong***[2], ***Xiaopeng Li***[2], ***Yangyang Xu***[2], ***Lu She***[1], ***Lijie Yang***[1], ***Haifeng Gong***[1], ***Nishi Ahuja***[1]; [1]*Intel,* [2]*Alibaba*

2:30 PM (—) **Modular Design of Data Centers for AI Requirements**; ***Alex Sherman***[1]; [1]*Staubli*

2:45 PM (#383) **Resiliency of Liquid-to-Liquid Cooling Systems in Data Centers Under Failure Scenarios**; ***Ali Heydari***[1], ***Himanshu Modi***[1], ***Pardeep Shahi***[1], ***Lochan Sai Reddy Chinthaparthy***[2], ***Anto Barigala***[3], ***Md Raisul Islam***[2], ***Dereje Agonafer***[2], ***Mohammad Tradat***[1], ***Saket Karajgikar***[1], ***Jeremy Rodriguez***[1]; [1]*Nvidia Corporation,* [2]*University of Texas at Arlington,* [3]*The University of Texas at Arlington*

TI-03B Packaging and Thermoelectrics

TATE A3 Chairs: *Mustafa Ozsipahi, Omidreza Ghaffari (University of Sherbrooke)*

2:00 PM (#80) **Silicon TTV for Advanced Thermal Investigations of High Powered Lidless Package AI Silicon**; ***Jonathan Stever***[1], ***Cheng Yang***[2], ***Yin Hang***[1], ***Pascale El Kallassi***[1], ***Chloe Xu***[1], ***Chen Wang***[2], ***Yanbo (Herry) Tang***[2], ***Shuainan Lin***[2], ***Dongkai Shangguan***[3]; [1]*Meta,* [2]*JCET,* [3]*TEA*

2:15 PM (#145) **Analysis of Thermal Characteristics According to Semiconductor Package Structure and Application**; ***Youngsang Cho***[1], ***Wonsik Shin***[1], ***Moonseob Jeong***[1], ***Junso Pak***[1], ***Seungwook Yoon***[1], ***Ilryong Kim***[1]; [1]*Samsung Electronics Co., Ltd.*

2:30 PM (#147) **A Multiscale Workflow for Thermal Analysis of 3DI Chip Stacks**; ***Max Bloomfield***[1], ***Amogh Wasti***[1], ***Zongmin Yang***[1], ***Matthew Galarza***[1], ***Theodorian Borca-Tasciuc***[1], ***Jacob Merson***[1], ***Timothy Chainer***[2], ***Prabudhya Roy Chowdhury***[3], ***Aakrati Jain***[3]; [1]*Rensselaer Polytechnic Institute,* [2]*IBM TJ Watson Research Center,* [3]*IBM Research*

2:45 PM (#400) **Thermal Challenges in Co-Packaging of Si-Iii/v Components in Silicon Photonics**; ***Krishna Bhavana Sivaraju***[1], ***Sai Abhideep Pundla***[1], ***Akhil Kalapala***[1], ***Pratik Bansode***[1], ***Gautam Gupta***[1], ***Dereje Agonafer***[1]; [1]*University of Texas at Arlington*

E-03 Thermophysical Properties and Interfacial Thermal Transport

TATE A4 Chairs: *Zhe Cheng (Peking University), Husam Walwil (The Pennsylvania State University)*

2:00 PM (#121) **The Effects of Electron-Phonon Interactions on the Lattice Thermal Conductivity of Wurtzite AlN**; ***Chuang Zhang***[1], ***Jianshi Sun***[1], ***Xiangjun Liu***[1], ***Shouhang Li***[2]; [1]*Institute of Micro/Nano Electromechanical System and Integrated Circuit, College of Mechanical Engineering, Donghua University,* [2]*Centre de Nanosciences et de Nanotechnologies, CNRS, Université Paris-Saclay*

2:15 PM (#362) **Experimental Cross-Plane Thermal Transport Characterization of BEOL Materials and Sensitivity to in-Plane Thermal Transport**; ***Amogh Wasti***[1], ***Zongmin Yang***[1], ***Matthew Galarza***[1], ***Jonas Kendra***[1], ***Davis Knight***[1], ***Timothy Chainer***[2], ***Roy Yu***[3], ***Prabudhya Roy Chowdhury***[3], ***Aakrati Jain***[3], ***Max Bloomfield***[1], ***Jacob Merson***[1], ***Theodorian Borca-Tasciuc***[1]; [1]*Rensselaer Polytechnic Institute,* [2]*IBM TJ Watson Research Center,* [3]*IBM Research*

2:30 PM (#376) **Interfacial Thermal Resistance Evolution of Non-Pfas Thermal Interface Materials Under High Temperature and Humidity Exposure**; ***Yunli Zhang***[1], ***Pradeep Lall***[1], ***Daniel Harris***[1], ***Jeff Suhling***[1]; [1]*Auburn University*

2:45 PM (#429) **Thermal Conductivity Measurements of BeO Thin Films Grown by Plasma Enhanced Atomic Layer Deposition**; ***Jihyun Kim***[1], ***Jonghyun Bae***[2], ***Dongyun Seo***[1], ***Dohwan Jung***[2], ***Jungwoo Oh***[2], ***Jungwan Cho***[1]; [1]*Sungkyunkwan University,* [2]*Yonsei University*

3:00 PM (#430) **Thermal Conductivity Measurements of CVD-grown H-Bn Films**; ***Taeyeon Kim***[1], ***Sungsan Kang***[2], ***Minkyu Je***[1], ***Jihyun Kim***[1], ***Sangyeon Pak***[2], ***Jungwan Cho***[1]; [1]*Sungkyunkwan University,* [2]*Hongik University*

3:15 PM (#445) **Systematic Errors in Non-Ideal ASTM D5470 Measurements**; ***Andres Becerra***[1], ***Daniel Ramirez***[1]; [1]*The Dow Chemical Company*

Day 1: Wed, May 28th 4:00 PM–5:30 PM

TI-04 Topology Optimization

TATE A1 Chairs: *Solomon Adera (University of Michigan), Anil Yuksel*

4:00 PM (#11) **3d-Printed SiC Cold Plate With Evaporator Wicks**; ***Mohammad Reza Shaeri***[1], ***Maksym Demydovych***[1]; [1]*Advanced Cooling Technologies, Inc.*

4:15 PM (#29) **Multi-Objective 3D Topology Optimisation for Heat Sinks With Multiple Heat Sources**; ***Zihan Zhang***[1], ***Henry Martin***[1], ***Willem van Driel***[1], ***René Poelma***[1], ***Guoqi Zhang***[1]; [1]*Delft University of Technology*

4:30 PM (#117) **Topology Optimization for Embedded Cooling of Multiple and Transient Workloads in 3D Semiconductor Packages**; ***Zekun Wu***[1], ***Ashwin Kidambi***[1], ***Yu-Tao Yang***[2], ***Chih-Ming Hung***[3], ***Shurong Tian***[4], ***Xin Zhang***[4], ***Justin A. Weibel***[1], ***Liang Pan***[1]; [1]*Purdue University,* [2]*MediaTek USA Inc.,* [3]*MediaTek Inc.,* [4]*IBM TJ Watson Research Center*

4:45 PM (#242) **Multiphysics Topology Optimization of Metal-Polymer Composite Thermal Interface Materials.**; ***Devang Prabhu Tavkari***[1], ***Xiulin Ruan***[1], ***Amy Marconnet***[1], ***Tiwei Wei***[1]; [1]*Purdue University*

5:00 PM (#373) **Optimal Heat Spreading Solutions for Three-Dimensional Heterogeneously Integrated Modules Using a Multigrid Topology Optimization Method**; ***Chun-Pei Chen***[1], ***Xiaoyue Zhang***[2], ***Chung-Shuo Lee***[2], ***Ganesh Subbarayan***[2]; [1]*Apple,* [2]*Purdue University*

TII-04 Data Center Scaling and Machine Learning

TATE A2 Chairs: *Tina M Seeholzer (HRL, LLC), Gautam Gupta (Fabric8Labs)*

4:00 PM (#63) **Liquid Cooling Optimization for Data Centers With Reinforcement Learning**; ***Avisek Naug***[1], ***Antonio Guillen-Perez***[1], ***Vineet Gundecha***[1], ***Ricardo Luna Gutiérrez***[1], ***Paolo Faraboschi***[1], ***Cullen Bash***[1], ***Soumyendu Sarkar***[1]; [1]*Hewlett Packard Enterprise*

4:15 PM (#68) **Long-Term Reliability Characterization of High-Speed Cables in Immersion-Cooled Data Center Environments**; ***Ying Zhang***[1], ***Pengfei Cheng***[1], ***Hongrui Peng***[1], ***Bing Chen***[2], ***Dong Xu***[3], ***Jialiang Xu***[4], ***Wenxi Yang***[4], ***Wenbin Tian***[4], ***Kai Wang***[4], ***Nishi Ahuja***[4]; [1]*ByteDance China,* [2]*Lenovo,* [3]*IEIT Systems,* [4]*Intel*

4:30 PM (#122) **Integrating Experimental, Numerical and Machine Learning Models for Real-Time, Efficient Data Center Cooling Control**; ***Dayananda swamy Kattimani math***[1], ***Venkata Achyuth Kunchapu***[1], ***Srikanth Rangarajan***[1], ***Kanad Ghose***[1], ***Bahgat Sammakia***[1], ***Mohammad Tradat***[2]; [1]*State University of New York at Binghamton,* [2]*Nvidia Corporation*

4:45 PM (#320) **Enhancing Thermal Management Through Deep Learning-Based Analysis of Bubble Dynamics in Flow Boiling**; ***Forouzan Naderi***[1], ***Farshad Barghi Golezani***[1], ***Chirag Kharangate***[1]; [1]*Case Western Reserve University*

5:00 PM (#359) **From Air to Liquid: Cooling Methods in Data Center Network Switch Technology**; ***Bharath Ravi***[1], ***Alex Massicotte***[1], ***Jiwon Yu***[1], ***Stephen Keefe***[1]; [1]*Celestica*

5:15 PM (#433) **Scaling Liquid Cooling for Google Data Center AI Applications to a 1 GW Fleet**; ***Madhusudan Iyengar***[1], ***Jorge Padilla***[1]; [1]*Google LLC*

M&R-04 Material Characterization

TATE A3 Chairs: *Jeffrey Suhling (Auburn University)*

4:00 PM (#125) **Study of Moisture Analysis Technology Based on Embedded Silicon Bridge Substrates**; ***yang yang***[1], ***jie zhang***[1], ***rui ma***[1], ***zijun zhong***[1], ***peng sun***[1], ***Meiying Su***[1], ***Qidong Wang***[1], ***Liqiang Cao***[1], ***Fengze Hou***[1]; [1]*Institute of Microelectronics of the Chinese Academy of Sciences*

4:15 PM (#267) **Characterization of the Anand Model Parameters of SAC305 Lead Free Solder With Various Levels of Damage**; ***Golam Rakib Mazumder***[1], ***Mahbub Alam Maruf***[1], ***Souvik Chakraborty***[1], ***Omma Sumaiya***[1], ***Jeffrey Suhling***[1], ***Pradeep Lall***[1]; [1]*Auburn University*

4:30 PM (#327) **Process-Performance-Thermal Reliability Evaluation of Screen-Printed Electronics on BPET Substrates**; ***Shriram Kulkarni***[1], ***Pradeep Lall***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

4:45 PM (#332) **High Strain Rate Property Prediction and the Effect of Bismuth Concentration on the High-G Level Shock Damage With Sustained High-Temperature Operation**; ***Vishal Mehta***[1], ***Pradeep Lall***[1], ***David Locker***[2], ***Jeff Suhling***[1]; [1]*Auburn University,* [2]*US Army CCDC-AvMC*

5:00 PM (#347) **Specific Heat Capacity Measurements of Thin Films Using Nanocalorimetry**; ***Feng Yi***[1], ***John Pettibone***[1], ***Lakshmi Ravi Narayan***[1], ***Meghavin Bhatasana***[1], ***William Osborn***[1]; [1]*National Institute of Standards and Technology*

5:15 PM (#350) **Micromechanical Properties of Mixed SAC/LTS Solder Alloys With Various Bismuth Contents**; ***Souvik Chakraborty***[1], ***Mahbub Alam Maruf***[1], ***Golam Rakib Mazumder***[1], ***Jeffrey Suhling***[1], ***Pradeep Lall***[1]; [1]*Auburn University*

E-04 Additive Manufacturing I

TATE A4 Chairs: *Rachel McAfee (University of Maryland), Timothy Chainer (IBM TJ Watson Research Center)*

4:00 PM (#28) **An Experimental Study of the Thermal-Hydraulic Performance of an Additively Manufactured Mini-Channel Cold Plate**; ***Zane Oligee***[1], ***Nicholas Tsolas***[1]; [1]*Auburn University*

4:15 PM (#255) **Enhancing Power-Dense and Reliability-Oriented Heat Sink Structures Through Additive Manufacturing for Power Electronics in Aviation Applications**; ***Jannes Kai Briese***[1], ***Hendrik Schefer***[1], ***Lukas Radomsky***[1], ***Robert Keilmann***[1], ***Regine Mallwitz***[1]; [1]*TU Braunschweig*

4:30 PM (—) **Electrochemical Additive Manufacturing & Application-Optimized Thermal Management Components**; ***Joseph Madril***[1]; [1]*Fabric8 Labs*

4:45 PM (#306) **Development of High-Temperature Capable Semi-Additive Logic Gate Circuits on Copper-Clad Ceramic Substrates for Automotive Applications**; ***Aditya Amatya***[1], ***Pradeep Lall***[1], ***Ved Soni***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

5:00 PM (#338) **High-Temperature Operating Reliability of Direct-Write Additively Printed Sustainable Flexible Circuits**; ***Md Golam Sarwar***[1], ***Pradeep Lall***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

5:15 PM (#342) **Evaluation of High-Temperature Performance of Additive Rectifier Circuits at 175C**; ***Bishal Bashyal***[1], ***Pradeep Lall***[1], ***Ved Soni***[1], ***Aditya Amatya***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

DAY 2: THURSDAY, MAY 30

7:00 AM	**Breakfast**				***High Plains***
8:15 AM	**TI-05 Capillary-Driven Two-Phase Flow** ***Tate Ballroom A1***	**TII-05 Microchannels and Jet Impingement** ***Tate Ballroom A2***	**M-05 Thermal Interface Reliability** ***Tate Ballroom A3***	**V-05 Virtual Presentations** ***Tate Ballroom A4***	**P-05 Integrated Electromechanical, Flexible and Thermal Devices** (see page 48) ***Tate Ballroom A5***
9:15 AM	**Break**				
9:30 AM	 **Keynote K-2: Accelerating the Energy Transition Through Digital Engineering and Simulation** **Scott Parent, Vice President & Field CTO, Energy | Aerospace | Industrials, Ansys** (see page 15)				***Texoma***
10:30 AM	**Coffee Break**				***Tate Prefunction A***
11:00 AM	**TI-06 Pump-Driven Two-Phase Flow and Forced Convection** ***Tate Ballroom A1***	**TII-06 Data Center Direct Liquid and Immersion Cooling** ***Tate Ballroom A2***	**M&R-06 Accelerated Testing** ***Tate Ballroom A3***	**E-06 Boiling Enhancement** ***Tate Ballroom A4***	**SI-06 Technology Transition: From Concept to Commercialization** (see page 54) ***Tate Ballroom A5***
12:30 PM	**Luncheon: ITherm Sponsors and Partners**				***High Plains***
2:00 PM	**TI-07A Embedded and Immersion Cooling** ***Tate Ballroom A1***	**TII-07 Next-Gen Electronic Systems Co-Design** ***Tate Ballroom A2***	**TI-07B Advanced Modeling and Characterization** ***Tate Ballroom A3***	**E-07 Machine Learning and AI** ***Tate Ballroom A4***	**TT-07 Electric Vehicle Thermal Management** (see page 40) ***Tate Ballroom A5***
3:30 PM	**Coffee Break**				***Tate Prefunction A***
4:00 PM	**TI-08 Power Electronics Cooling** ***Tate Ballroom A1***	**TII-08 Air Cooling and Heat Exchangers** ***Tate Ballroom A2***	**M&R-08 Design Optimization** ***Tate Ballroom A3***	**E-08 Advanced Modeling Techniques** ***Tate Ballroom A4***	**P-08 Thermal Management Technologies for High-Power Systems** (see page 50) ***Tate Ballroom A5***
5:30 PM	**Student Poster and Networking Session** (see page 25)				***Texoma***
7:00 PM	**Executive Committee Meeting (by Invitation)**				***Davis 3-4***

Day 2: Thu, May 29th 8:15 AM–9:15 AM

TI-05 Capillary-Driven Two-Phase Flow

TATE A1 — Chairs: *Rachel McAfee (University of Maryland), Georg Elsinger (KU Leuven, imec)*

8:15 AM (#13) **Thermohydraulic Characterization of 3d-Printed Metallic Wick Flow Condensers**; ***Durga Ghosh***[1], ***Behzad Ahmadi***[1], ***Vivek Mohan***[1], ***Mohammad Reza Shaeri***[2], ***Sajjad Bigham***[1]; [1]*North Carolina State University,* [2]*Advanced Cooling Technologies, Inc.*

8:30 AM (#118) **Performance Characterization of Capillary-Driven Thin-Film Boiling Under Sub-Atmospheric (25-100 kPa) Environment**; ***Yujui Lin***[1], ***Heungdong Kwon***[1], ***Kewei Xiao***[2], ***Man Prakash Gupta***[2], ***Michael Degner***[2], ***Mehdi Asheghi***[1], ***Alan Mantooth***[3], ***Kenneth Goodson***[1]; [1]*Stanford University,* [2]*Ford Motor Company,* [3]*University of Arkansas*

8:45 AM (#356) **Enhanced Capillary-Driven Boiling in Two-Phase Micro-Cooler With Engineered Copper Inverse Opals (CIOs) Wick and Silicon 3D Manifold for High Heat Flux Cooling Application**; ***Heungdong Kwon***[1], ***Daeyoung Kong***[1], ***James Palko***[2], ***Ercan M. Dede***[3], ***Mehdi Asheghi***[1], ***Kenneth Goodson***[1]; [1]*Stanford University,* [2]*University of California, Merced,* [3]*Toyota Research Institute of North America*

TII-05 Microchannels and Jet Impingement

TATE A2 — Chairs: *Himanshu Modi (Nvidia Corporation), Sachin Deshmukh*

8:15 AM (#99) **Experimetal Study of Oil Cooling of Large Electric Machine for High Power Application**; ***Stephane Saddour***[1], ***Riadh Boubaker***[1], ***Safouene Ouenzefi***[1], ***Aurelie Fasquelle***[2], ***Daniel Laloy***[3], ***Hakim El Bahi***[4], ***Souad Harmand***[1]; [1]*Université Polytechnique Hauts-de-France,* [2]*Framatome,* [3]*Jeumont Electric,* [4]*TOTAL Marketing & Services*

8:30 AM (#127) **Automated Electro-Thermal Modeling Framework of Distributed Vertical Power Delivery Architectures With Substrate-Embedded Microfluidic Cooling**; ***Mingeun Choi***[1], ***Sriharini Krishnakumar***[2], ***Yaroslav Popryho***[2], ***Ramin Rahimzadeh Khorasani***[3], ***Madhavan Swaminathan***[3], ***Inna Partin-Vaisband***[2], ***Satish Kumar***[1]; [1]*Georgia Institute of Technology,* [2]*University of Illinois Chicago,* [3]*The Pennsylvania State University*

8:45 AM (#158) **A Novel Liquid Cooled Heat Sink With Adjacent Micro Synthetic Jets for Thermal Management in Microelectronic Devices**; ***Delara Soltani***[1], ***Tim Persoons***[2], ***Sajad Alimohammadi***[1]; [1]*Department of Mechanical Engineering, TUDublin,* [2]*Trinity College Dublin*

9:00 AM (#316) **Radial Manifold Microchannel Heat Sink for Electronics Thermal Management**; ***Faramarz Kahbandeh***[1], ***Mohammad Azarifar***[1], ***Mehmet Arik***[1], ***Daniel Harris***[1]; [1]*Auburn University*

M&R-05 Modeling and Simulations II

TATE A3 — Chairs: *Patrick McCluskey (University of Maryland)*

8:15 AM (#96) **Multi-Physics Modeling of Dissipation Analysis for Lithium-Ion Batteries**; ***Tae-Hyun Kim***[1], ***Eun-Ho Lee***[1]; [1]*Sungkyunkwan university*

8:30 AM (#171) **Modeling of Microstructural Evolution Within TSVs Using Atomistic Simulations**; ***Shengfeng Yang***[1], ***Jiali Lu***[1]; [1]*Purdue University*

8:45 AM (#266) **Impact of Solder Joint Design Profile on the Reliability of QFN Packages**; ***Unique Rahangdale***[1], ***Rishikesh Tendulkar***[1], ***Sai Abhideep Pundla***[1], ***Dereje Agonafer***[1]; [1]*The University of Texas at Arlington*

V-05 Virtul Presentations

TATE A4 — Chairs: *John Maddox (University of Kentucky)*

8:15 AM (#50) **Phasor-Based Dehomogenisation for Microchannel Cooling Topology Optimisation**; ***Hao Li***[1], ***Peter Dørffler Ladegaard Jensen***[2], ***Rebekka Vaarum Woldseth***[3], ***Joe Alexandersen***[1]; [1]*University of Southern Denmark,* [2]*Technical University of Denmark,* [3]*Centre Inria de l'Université de Lorraine*

8:30 AM (#62) **Design and Development of Cold Plate for 4.4 kW Solid State Power Amplifier**; ***Kiran S K***[1], ***Pankaj Gupta***[1], ***Sudip Kumar Murmu***[1]; [1]*Bharat Electronics Ltd*

8:45 AM (#233) **Parameterized Thermal Compact Modeling for Effective Thermal Management of Advanced Common Multigate Transistors in Sub-7nm Technology Nodes**; ***Harsh Kumar***[1], ***Vivek Kumar***[1]; [1]*National Institute of Technology Uttarakhand*

Day 2: Thu, May 29th 11:00 AM–12:30 PM

TI-06 Pump-Driven Two-Phase Flow and Forced Convection

TATE A1

Chairs: *Gopinath Sahu (Purdue University), Xiangyu Li (University of Tennessee Knoxville)*

11:00 AM (#12) **Additively Manufactured Stacked Refrigerant-to-Water Condenser**; ***Mohammad Reza Shaeri***[1], ***Sajjad Bigham***[2], ***Vivek Mohan***[2], ***Maksym Demydovych***[1]; [1]*Advanced Cooling Technologies, Inc.*, [2]*North Carolina State University*

11:15 AM (#45) **Flash Cooling With Methanol/Water Mixtures for 1 W/Mm2 Fluxes Without Lateral Heat Spreading**; ***Naarendharan Meenakshi Sundaram***[1], ***Rishi Pugazhendhi***[2], ***Subramanian S Iyer***[1], ***Timothy Fisher***[1]; [1]*University of California, Los Angeles*, [2]*Intel*

11:30 AM (#98) **Comparsion of Pumped vs. Capillary-Driven Two-Phase Microcoolers for High Heat Flux Applications**; ***Daeyoung Kong***[1], ***Roman Giglio***[2], ***Chi Zhang***[1], ***Katherine Jiang***[1], ***James Palko***[3], ***Hyoungsoon Lee***[4], ***Mehdi Asheghi***[1], ***Kenneth Goodson***[1]; [1]*Stanford University*, [2]*University of California Merced*, [3]*University of California, Merced*, [4]*Chung-Ang University*

11:45 AM (#106) **Two-Phase Counter-Flow Expanding Channels for Compliant Direct Attach**; ***Mark Schultz***[1], ***Pritish Parida***[1], ***Shurong Tian***[1], ***Cory VanDeventer***[2], ***Brian Werneke***[2], ***Timothy Chainer***[1]; [1]*IBM TJ Watson Research Center*, [2]*IBM Infrastructure*

12:00 PM (#294) **Experimental Characterization of a Low Thermal Resistance Microchannel Heatsink Utilizing Low GWP Refrigerant for High Power GPU Applications**; ***David Apigo***[1], ***Sarwesh Parbat***[1], ***Haotian Jia***[2], ***Haoyun Qiu***[3], ***Pouya Kabirzadeh***[3], ***Manohar Bongarala***[1], ***Syed Faisal***[1], ***Rishav Roy***[1], ***Nenad Milijkovic***[3], ***Todd Salamon***[1]; [1]*Nokia Bell Labs*, [2]*Tufts University*, [3]*Department of Mechanical Science and Engineering, University of Illinois Urbana-Champaign*

12:15 PM (#363) **Experimental Investigation of Heating Orientation Effects on Flow Boiling in Manifold Microchannel Heat Sinks**; ***Huigang Wang***[1], ***Chirag Kharangate***[1]; [1]*Case Western Reserve University*

TII-06 Data Center Direct Liquid and Immersion Cooling

TATE A2

Chairs: *SUNILKUMAR PINNU (ZT Systems)*

11:00 AM (#34) **Revolutionary Thermal Solution for Hot Chips**; ***Ron Zhang***[1], ***Laura Mirkarimi***[1], ***Belgacem Haba***[1], ***Gill Fountain***[1], ***KM Bang***[1], ***Suhail Sadiq***[1], ***Arianna Avellan***[1]; [1]*Adeia*

11:15 AM (#41) **Performance Comparison of R1233zd(E) and R515B for Two-Phase Direct-to-Chip Cooling**; ***Qingyang Wang***[1], ***Akshith Narayanan***[1], ***Serdar Ozguc***[1], ***Jacob Moore***[1], ***Richard Bonner***[1]; [1]*Accelsius*

11:30 AM (#51) **Thermal Performance Evaluation of Single-Phase Immersion Cooling for High-Power (>1kW) AI Processors**; ***Hyunhee Kim***[1], ***Youngsang Cho***[1], ***Junso Pak***[1], ***Seungwook Yoon***[1]; [1]*Samsung Electronics Co., Ltd.*

11:45 AM (#136) **System Level Reliability Modeling of Direct-to-Chip Liquid Cooled Data Centers**; ***Sidharth Rajeev***[1], ***Venkata Achyuth Kunchapu***[1], ***Ryan Enright***[2], ***Tiwei Wei***[3], ***Srikanth Rangarajan***[1], ***Bahgat Sammakia***[1]; [1]*Binghamton University*, [2]*Seguente*, [3]*Purdue University*

12:00 PM (#280) **G-Flow Immersion Cooling Solution for High-Power Data Center Servers**; ***Yuehong Fan***[1], ***Chuanlou Wang***[1], ***Yang1 Yao***[1], ***Yingqiong Bu***[1], ***Guangying Zhang***[1], ***Liguang Du***[1], ***Xiang Que***[1], ***Luping Zhao***[2], ***Shuisheng Fan***[2], ***Hongming Xie***[2], ***Libo Chen***[3], ***Xinxin Wang***[3], ***Zhitao Xin***[3], ***Jiaying Huang***[3], ***Shanshan Zhang***[4], ***Feiyang Wu***[4], ***Xiaohan Sun***[4]; [1]*Intel*, [2]*Eco-atlas Technology Corp*, [3]*New H3C Technologies Co., Ltd*, [4]*ExxonMobil Asia Pacific Research and Development Co.,Ltd*

12:15 PM (#405) **A Comparative Analysis of Single Phase Liquid Cooled Data Center Coolants Using ASTM D1384 & D8040 Standards**; ***Ali Heydari***[1], ***Lochan Sai Reddy Chinthaparthy***[2], ***Pardeep Shahi***[1], ***Himanshu Modi***[1], ***Anto Barigala***[2], ***Ivneet Banga***[2], ***Sean Sivapalan***[1], ***Harold Miyamura***[1], ***Dereje Agonafer***[2], ***Mohammad Tradat***[1], ***Saket Karajgikar***[1], ***Jeremy Rodriguez***[1]; [1]*Nvidia Corporation*, [2]*University of Texas at Arlington*

M&R-06 Accelerated Testing

TATE A3 Chairs: *David Huitink (University of Arkansas)*

11:00 AM (#55) **HALT With PoF for Class P Electronics Assembly**; ***Reza Ghaffarian***[1]; [1]*NASA-JPL*

11:15 AM (#56) **FCBGA1657 Assemblies Under Thermal Cycle and Drop**; ***Reza Ghaffarian***[1]; [1]*NASA-JPL*

11:30 AM (#210) **Reliability of Opto-Electronics :Thermal Cycles Plus Vibrations**; ***Reza Ghaffarian***[1], ***Alireza Azizi***[1]; [1]*NASA-JPL*

11:45 AM (#265) **The Combined Effects of High-Temperature Aging, Mechanical Cycling, and Exposure Sequence on the Constitutive Behavior of SAC305 Solder**; ***Mahbub Alam Maruf***[1], ***Souvik Chakraborty***[1], ***Golam Rakib Mazumder***[1], ***Jeffrey Suhling***[1], ***Pradeep Lall***[1]; [1]*Auburn University*

12:00 PM (#304) **Comparison of Non-Pfas and Pfas Underfills in Fcbgas Based on Evolution of Bulk and Interfacial Properties Under Long-Term Isothermal Exposure**; ***Aathi Raja Ram Pandurangan***[1], ***Padmanava Choudhury***[1], ***Madhu Kasturi***[1], ***Pradeep Lall***[1]; [1]*Auburn University*

12:15 PM (#323) **Screen-Printed Thermoformed Additive in-Mold Electronics Thermal Cycling Reliability for Automotive Applications.**; ***Aditya Harsha***[1], ***Pradeep Lall***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

E-06 Boiling Enhancement

TATE A4 Chairs: *Solomon Adera (University of Michigan)*

11:00 AM (#83) **Femtosecond Laser Surface Processing (FLSP) of Silicon for Pool Boiling Enhancement Using Dielectric PF-5060**; ***Josh Gerdes***[1], ***Andrew Butler***[1], ***Suchit Sarin***[1], ***Rahul Rajan***[1], ***Truman Stoller***[1], ***Jeffrey Shield***[1], ***Craig Zuhlke***[1], ***George Gogos***[1]; [1]*University of Nebraska - Lincoln*

11:15 AM (#86) **Femtosecond Laser Surface Processing (FLSP) of 6061 Aluminum Exhibits Flow Boiling Enhancement Using Opteon™ 2P50 for Various Mass Fluxes**; ***Josh Gerdes***[1], ***Logan Pettit***[1], ***Graham Kaufman***[1], ***Craig Zuhlke***[1], ***George Gogos***[1]; [1]*University of Nebraska - Lincoln*

11:30 AM (#197) **Minichannel Flow Boiling Enhancement Using Femtosecond Laser Surface Processed Stainless Steel Surfaces in Water: Effect of Laser Fluence**; ***Logan Pettit***[1], ***Josh Gerdes***[1], ***Andrew Reicks***[1], ***Craig Zuhlke***[1], ***George Gogos***[1]; [1]*University of Nebraska - Lincoln*

11:45 AM (#290) **Exploring the Impact of Nanoscale Roughness on the Pool Boiling Performance of Femtosecond Laser Processed Copper in Dielectric Fluid**; ***Graham Kaufman***[1], ***Josh Gerdes***[1], ***Mohamed Marey***[1], ***George Gogos***[1], ***Craig Zuhlke***[1]; [1]*University of Nebraska - Lincoln*

12:00 PM (#297) **Performance of a Novel 1.5U Boiling Chamber With Higher Coolant Temperatures for High Heat Flux Dissipation in Data Center Applications**; ***Maharshi Shukla***[1], ***Nooruldeen Mustafa***[1], ***Satish Kandlikar***[1]; [1]*Rochester Institute of Technology*

12:15 PM (#352) **Pool Boiling Enhancement Using Engineered Nucleation Sites**; ***Priyanka Viswanath***[1], ***Tomasz Kulakowski***[1], ***Yimin Zhou***[1], ***Solomon Adera***[1]; [1]*University of Michigan*

Day 2: Thu, May 29th 2:00 PM–3:30 PM

TI-07A Embedded and Immersion Cooling

TATE A1 Chairs: *Risa Miyazawa (IBM Research), Aalok Gaitonde*

2:00 PM (#8) **A Thermo Responsive Film With High Thermal Conductivity Embedded Into a Stacked PBA**; ***Min Park***[1], ***Jihyeon Son***[1], ***Jinhwan Jung***[1], ***Jeonggen Yoon***[1], ***Jieun Hwang***[1], ***Yoonhee Chang***[1]; [1]*Samsung Electronics*

2:15 PM (#131) **Experimental Investigation of Phase Change Material Embedded in Lattice Structures via Additive Manufacturing**; ***Vedat Yağcı***[1], ***Orkun Doğu***[1], ***Ahmet Koyuncu***[1], ***Atakan Kabukcu***[1]; [1]*ASELSAN INC.*

2:30 PM (#143) **Thermal-Electrical Co-Analysis of Microchannel-Embedded TSV Interposers for Double-Sided Cooling in 3D HPC Stacks**; ***Yunting Liu***[1], ***Rong Fu***[2], ***Jianyu Feng***[2], ***Chuan Chen***[2], ***Chenglin Yang***[2], ***Huimin He***[2], ***Fengman Liu***[2]; [1]*School of Integrated Circuits, University of Chinese Academy of Sciences,* [2]*State Key Laboratory of Fabrication Technologies for Integrated Circuits Institute of Microelectronics, Chinese Academy of Sciences*

2:45 PM (#225) **Thermo-Hydraulic Performance of Targeted Flow in Aluminum and Copper Heat Sinks for Immersion Cooling Applications**; ***Prasanna Jayaramu***[1], ***Meysam Emami***[2], ***Vishal Talari***[1], ***Md Raisul Islam***[1], ***Kaustubh Adsul***[2], ***Rohit Kumar Suthar***[1], ***Lochan Sai Reddy Chintha-parthy***[1], ***Dereje Agonafer***[1], ***Pratik Bansode***[3], ***Ahson Hussain***[3], ***Puxuan Li***[3], ***Tao Geng***[3]; [1]*University of Texas at Arlington,* [2]*The University of Texas at Arlington,* [3]*LiquidStack*

3:00 PM (#246) **Embedded Cooling of Planar Magnetic Components for High Power Density Power Converters**; ***Yanghe Liu***[1], ***Tianzhu Fan***[1], ***Feng Zhou***[1], ***Shailesh N. Joshi***[1], ***Ashwini Dubey***[2], ***Sayan Paul***[2], ***Dragan Maksimovic***[2], ***Ercan M. Dede***[1]; [1]*Toyota Research Institute of North America,* [2]*University of Colorado Boulder*

3:15 PM (#288) **Effect of Pin-Shapes on Chip-Embedded Two-Phase Cooling**; ***Pritish Parida***[1]; [1]*IBM TJ Watson Research Center*

TII-07 Next-Gen Electronic Systems Co-Design

TATE A2 Chairs: *Dhruvalkumar Shah (Intel Corporation), Shoaib Ahmed*

2:00 PM (#6) **Two-Phase Cooling System Performance Under Different Operating Scenario**; ***Pritish Parida***[1], ***Timothy Chainer***[1]; [1]*IBM TJ Watson Research Center*

2:15 PM (#77) **Topology Optimization of EV Battery Immersion Cooling Channel**; ***Seunghwan Keum***[1], ***Peter Andruskiewicz***[1], ***Erik Yen***[1], ***Ronald Grover***[1]; [1]*General Motors*

2:30 PM (#144) **Thermal Aware Floorplan Methodology Considering Heat Transfer Coefficient of Package to SOC Power Scenario**; ***Youngsang Cho***[1], ***Heonwoo Kim***[1], ***Haerim Kim***[1], ***Hyunhee Kim***[1], ***Seungwook Yoon***[1], ***Ilryong Kim***[1]; [1]*Samsung Electronics Co., Ltd.*

2:45 PM (#149) **Thermal Management Studies of the Bulk Capacitor Through Design Evolution for the EV Inverter**; ***Himanshu Agrawal***[1], ***Abhijit Kaisare***[2], ***Ted Zeunik***[3]; [1]*Technical Lead,* [2]*Manager,* [3]*Staff Mechanical Design Engineer*

3:00 PM (#434) **Harnessing Ocean Thermal Gradients Using Thermoelectric-Based Submersibles for Ocean Power Applications**; ***Prashant Saini***[1], ***Julian Osorio***[1]; [1]*National Renewable Energy Laboratory*

TI-07B Advanced Modeling and Characterization

TATE A3 Chairs: *Filippo Cataldo*

2:00 PM (#107) **Experimental Characterization and Numerical Simulation of Liquid Flow and Heat Transfer Through Offset Strip Fins**; ***Saeel S. Pai***[1], ***Eoin Oude Essink***[2], ***Abhijeet Banthiya***[1], ***Liang Pan***[1], ***Justin A. Weibel***[1]; [1]*Purdue University,* [2]*TU Dublin*

2:15 PM (#198) **A Simulation Study of Impact of Defect Configuration at Die-Attach Solder Joint on LED Performance and Applicability of MIL-STD-883**; ***Erik Sorensen***[1], ***Roy Luo***[1]; [1]*Excelitas*

2:30 PM (#201) **Methodology for Thermal Performance Evaluation Using Linear Parameter Varying Thermal Resistance Matrix Modeling of Mobile SoC**; ***Myunghoon Lee***[1], ***Subodh Deodhar***[1], ***Vamsi Krishna***[1], ***Yunhyeok Im***[2], ***Gyuick Jung***[1], ***Ankit Adhiya***[1]; [1]*Ansys Inc,* [2]*Georgia Tech*

2:45 PM (#236) **Molecular Dynamics Simulations of the Phonon Bridge Effect at Interfaces Between Si and Diamond.**; ***Youhwan Jo***[1], ***Kyeongjae Cho***[1]; [1]*University of Texas at Dallas*

3:00 PM (#393) **Numerical and Experimental Investigation of High-Powered Chips for Efficient Cooling Using Optimized Electrochemical Additive Manufacturing Based Cold Plates**; ***Gautam Gupta***[1], ***Douglas Castro***[2], ***Joseph Madril***[2], ***Tim Ouradnik***[2], ***Ian Winfield***[2], ***Michael Matthews***[2], ***Dereje Agonafer***[1]; [1]*University of Texas at Arlington,* [2]*Fabric8Labs*

E-07 Machine Learning and AI

TATE A4 Chairs: *Jorge Padilla (Google LLC), Bikramjit Chatterjee*

2:00 PM (#82) **Predicting Thermomechanical Degradation in Bonded Interfaces Using Enhanced Image Processing and Deep Learning Techniques**; ***Sang Hyeon Chang***[1], ***Paul Paret***[2], ***Sreekant Narumanchi***[2], ***Yoonjin Won***[1]; [1]*University of California, Irvine,* [2]*National Renewable Energy Laboratory*

2:15 PM (#173) **Adaptive Gain Controller With State Restrictions for Fan Speed Control in Temperature Stabilization During Thermal Margin Testing**; ***Marlene Cobian***[1], ***David Arana***[1], ***Kevin Mistofsky***[1], ***Dhruvalkumar Shah***[1], ***Alexander Eamons***[1], ***Lang Yuan***[1]; [1]*Intel*

2:30 PM (#336) **Predicting Flow Boiling Heat Transfer Coefficient Utilizing Physics-Informed Machine Learning Model**; ***Thanh Hoang Phan***[1], ***Logan Pirnstill***[1], ***Jiayuan Li***[1], ***Chirag Kharangate***[1]; [1]*Case Western Reserve University*

2:45 PM (#427) **Physics-Driven Learning for Two-Phase Heat Transfer**; ***Haeun Lee***[1], ***Hyoungsoon Lee***[2]; [1]*Stanford University,* [2]*Chung-Ang University*

3:00 PM (#460) **Steady-State Temperature Prediction Based on Compact Thermal Models Using Machine Learning**; ***Mohammadamin Hajikhodaverdian***[1], ***Sherief Reda***[2], ***Ayse Coskun***[1]; [1]*Boston University,* [2]*Brown University*

Day 2: Thu, May 29th 4:00 PM–5:30 PM

TI-08 Power Electronics Cooling

TATE A1 Chairs: *Remco van Erp, Travis Mayberry*

4:00 PM (#79) **Thermal & Electrical Performance Characterization of Power Modules in Single-Phase Liquid Immersion Cooling Environments**; ***Rohit Kumar Suthar***[1], ***Amit Kumar***[1], ***Akshay Lakshminarayana***[1], ***Vishal Talari***[1], ***Dereje Agonafer***[1], ***Karthekeyan Sridhar***[2], ***Rajen Murugan***[2], ***Lalith Karsani***[2], ***Osvaldo (Ozzie) Lopez***[2], ***Nicolas Forcade-Perkins***[2]; [1]*University of Texas at Arlington,* [2]*Texas instruments*

4:15 PM (#130) **Enhanced Thermal Management of Outer-Rotor Electric Motors Through Additively Manufactured Heat Exchangers With End-Winding Cooling**; ***Md. Jubayer Hossain***[1], ***Amitav Tikadar***[1], ***Bidzina Kekelia***[2], ***Rajneesh Chaudhary***[2], ***Sreekant Narumanchi***[2], ***Yogendra Joshi***[1], ***Satish Kumar***[1]; [1]*Georgia Institute of Technology,* [2]*National Renewable Energy Laboratory*

4:30 PM (#182) **Impact of Slot Liner Compression on the Total Thermal Resistance of the Stator-Winding Assembly in Electric Motors**; ***Lindsay Sutherland***[1], ***Shanmukhi Sripada***[1], ***Amy Marconnet***[1]; [1]*Purdue University*

4:45 PM (#216) **Accurate Implementation of Gate Resistance Thermometry for GaN HEMTs With a Source Connected Field Plate**; ***Daniel Shoemaker***[1], ***Seokjun Kim***[1], ***Emils Gustav Jurcik***[2], ***Matthew DeJarld***[3], ***Maher Tahhan***[3], ***Eduardo Chumbes***[3], ***Jeffrey Laroche***[3], ***Samuel Graham***[2], ***Nicholas Miller***[4], ***Sukwon Choi***[1]; [1]*The Pennsylvania State University,* [2]*University of Maryland,* [3]*Raytheon,* [4]*Michigan State University*

5:00 PM (#238) **Thermal Management for a Stacked Die Power Module**; ***Himel Barua***[1], ***Shajjad Chowdhury***[1], ***Pedro Ribeiro***[1], ***Burak Ozpineci***[1]; [1]*Oak Ridge National Laboratory*

5:15 PM (#417) **Analysis of the Thermal Resistance Network of Packaged GaN HEMTs**; ***Seokjun Kim***[1], ***Daniel Shoemaker***[1], ***Husam Walwil***[1], ***Bill Zivasatienraj***[2], ***Isaac Wildeson***[2], ***Sukwon Choi***[1]; [1]*The Pennsylvania State University,* [2]*BAE Systems*

TII-08 Air Cooling and Heat Exchangers

TATE A2 Chairs: *Dhruvalkumar Shah (Intel Corporation), Shoaib Ahmed*

4:00 PM (#33) **Design-Simulation-Improvement of Thermal Management System Combining Two Passives Cooling for Electromechanical Actuators in Aerospace Industry**; ***Leopold Nzonou***[1], ***Faridreza Attarzadeh***[1], ***Jiajun Xu***[1]; [1]*University of the District of Columbia*

4:15 PM (#76) **Comparison of 3D Manifold Architectures for Cooling of Internal Heatsinks Using External Airflow**; ***Gearóid Farrell***[1], ***Rajesh Nimmagadda***[1], ***Shailesh N. Joshi***[2], ***Danny J. Lohan***[2], ***Ercan M. Dede***[2], ***Tim Persoons***[1]; [1]*Trinity College Dublin,* [2]*Toyota Research Institute of North America*

4:30 PM (#101) **Comparison of Entropy and Exergy-Based Dynamic Optimization of Air Cycle Machine Architectures**; ***Ara Bolander***[1], ***Trevor Bird***[1], ***Kevin McCarthy***[1], ***Neera Jain***[2]; [1]*PC Krause and Associates,* [2]*Purdue University*

4:45 PM (#163) **Computational Investigation of the Thermal Performance of an Adjustable Air Amplifier**; ***David Salter***[1], ***Eoin Oude Essink***[1], ***Tim Persoons***[2], ***Sajad Alimohammadi***[1]; [1]*TU Dublin,* [2]*Trinity College Dublin*

5:00 PM (#168) **Comparison of Operating Costs and Energy Use in a Thermo-Caloric Heat Pump and an Air-Cooled Chiller System for Data Center Cooling**; ***Brandon Kibbel***[1], ***Bryce Cox***[1]; [1]*University of Wisconsin-Platteville*

M&R-08 Design Optimization

TATE A3 — Chairs: *Paul Paret (National Renewable Energy Laboratory)*

4:00 PM (#30) **Bond Optimization for Ceramic LGA Image Sensor Solder Joint Under Thermal & Mechanical Fatigue**; ***Unique Rahangdale***[1], ***Rohit Kumar Suthar***[1], ***Akshay Lakshminarayana***[1], ***Dereje Agonafer***[1]; [1]*University of Texas at Arlington*

4:15 PM (#65) **Development of a Reduced-Order Nodal Reliability Framework for Data Center Applications**; ***Tyler Schostek***[1], ***Nirmal Rai***[2], ***Kimberly Saviers***[2], ***Davide Ziviani***[1]; [1]*Purdue University,* [2]*RTX Technology Research Center*

4:30 PM (#399) **Optimization of Copper Filled Through Package via Geometry to Minimize Thermal Induced Stresses at Glass - TPV Interface in Borosilicate Glass Interposer**; ***Krishna Bhavana Sivaraju***[1], ***Pratik Bansode***[1], ***Sai Abhideep Pundla***[1], ***Rabin Bhandari***[1], ***Akhil Kalapala***[1], ***Dereje Agonafer***[1]; [1]*University of Texas at Arlington*

E-08 Advanced Modeling Techniques

TATE A4 — Chairs: *Jungwan Cho (Sungkyunkwan University), James Spencer Lundh (US Naval Research Laboratory)*

4:00 PM (#102) **Investigation of Heat Sinks With Hybrid Pin-Fin/Absorber-Fin Arrays Considering Multiphysics Thermal-Acoustic Performance**; ***Ziqi Yu***[1], ***Taehwa Lee***[1], ***Ercan M. Dede***[1]; [1]*Toyota Research Institute of North America*

4:15 PM (#159) **Numerical Investigations Into Boiling Surface Design**; ***Mitchell Whiting***[1], ***Ilya T'Jollyn***[1]; [1]*Universiteit Antwerpen*

4:30 PM (#257) **Molecular Dynamics Simulations of Water Evaporation in Nanochannels**; ***Ahmet Ata Ersoy***[1], ***Mustafa Ozsipahi***[2], ***Adam Wilson***[2], ***Ali Beskok***[1]; [1]*Southern Methodist University,* [2]*DEVCOM Army Research Laboratory*

4:45 PM (#353) **3D Simulations of Microgravity Annular Flow Condensation With Two-Phase Inlets**; ***Farshad Barghi Golezani***[1], ***Jayachandran Narayanan***[1], ***Chirag Kharangate***[1]; [1]*Case Western Reserve University*

5:00 PM (#385) **Numerical Analysis of Thermal Transport Through a Lithium-Ion Battery Module**; ***Elifalet Garcia***[1], ***Shadi Mahjoob***[1]; [1]*California State University Northridge*

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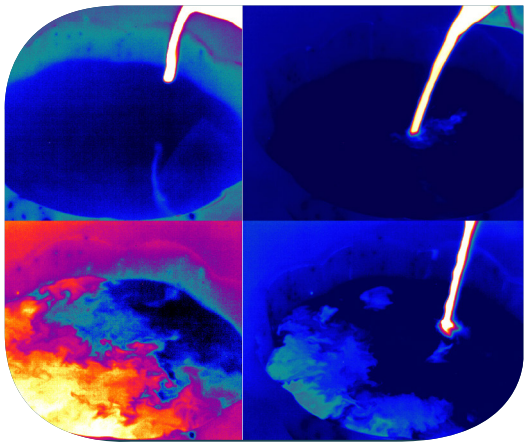

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DAY 3: FRIDAY, MAY 31

7:00 AM	**Breakfast**				***High Plains***
8:00 AM	**IEEE EPS President's Panel: Celebrating the Past, Innovating for the Future** (see page 23, ends at 9:15 AM)				***ECTC, Texas A-B***
8:15 AM	**TI-09 TIM and Heat Spreader Development** ***Tate Ballroom A1***	**TII-09 Immersion Cooling I** ***Tate Ballroom A2***	***Tate Ballroom A3***	**E-09 Additive Manufacturing II** ***Tate Ballroom A4***	**SI-09 ARPA-E COOLERCHIPS Research Overview** (see page 56) ***Tate Ballroom A5***
9:15 AM	**Break**				
9:30 AM	 **Keynote K-3: Data Center Energy Efficiency in a Post-Exascale Era** **Cullen Bash, Vice President of Research & Development, Hewlett Packard Labs** (see page 17)				***Texoma***
10:30 AM	**Coffee Break / ITherm 2026 Planning**				***Tate Prefunction A/ Tate Ballroom A3***
11:30 AM	**TI-10 Thermosiphons, Heat Pipes and Vapor Chambers** ***Tate Ballroom A1***	**TII-10 Immersion Cooling II** ***Tate Ballroom A2***	***Tate Ballroom A3***	**E-10 Boiling and Condensation** ***Tate Ballroom A4***	**SI-10 ARPA-E COOLERCHIPS Research Overview** (see page 56) ***Tate Ballroom A5***
12:30 PM	**Luncheon: ITherm Awards and Organizer Recognition**				***High Plains***

Day 3: Fri, May 30th 8:15 AM–9:15 AM

TI-09 TIM and Heat Spreader Development

TATE A1 Chairs: *Ken Marston (IBM Infrastructure)*

8:15 AM (#108) **High-Performance Low-Loss Ceramic Filler With Enhanced Surface for Next-Generation Thermal Management in Electronics**; ***Bei Xiang***[1], ***Jiarui Yan***[1], ***Kade McGarrity***[1], ***Anand Murugaiah***[1]; [1]*Momentive Technologies*

8:30 AM (#134) **Graphene-Enhanced Heat Spreaders for Hotspot Remediation in Direct Liquid Cooling of Electronics**; ***Arani Mukhopadhyay***[1], ***Anish Pal***[1], ***Roshan Y. Nemade***[1], ***Sungjoon Kim***[1], ***Vikas Berry***[1], ***Constantine Megaridis***[1]; [1]*University of Illinois Chicago*

8:45 AM (—) **Enhanced Performance of High-Power Density Chips Using CVD Diamond Heat Spreaders**; ***Ian Friel***[1]; [1]*Element Six*

9:00 AM (#369) **Development of Liquid Metal and Silicon Pin Fin Composite Thermal Interface Materials**; ***Matthew Coughlin***[1], ***Andrew Clements***[1], ***Fangzhou Wang***[1], ***Luke Gyubin Min***[1], ***Katherine Jiang***[1], ***Heungdong Kwon***[1], ***Mehdi Asheghi***[1], ***Kenneth Goodson***[1]; [1]*Stanford University*

TII-09 Immersion Cooling I

TATE A2 Chairs: *Pratik Bansode (LiquidStack)*

8:15 AM (#110) **Investigation on Thermal Characteristics of Solid State Drive Under Single Phase Immersion Cooling Environment**; ***Byunghan Ko***[1], ***Heechul lee***[1], ***Woochul Jeong***[1], ***Hwanjoo Park***[1], ***Duksoo Kim***[1], ***Sunghoon Chun***[1]; [1]*Samsung Electronics Co., Ltd.*

8:30 AM (#181) **Experimental Parametric Study of Direct Dielectric Fluid Cooling of Lithium-Ion Batteries for Electric Vehicles**; ***Safouene Ouenzefi***[1], ***Rodrigo Amorim Dias***[2], ***Julien Plet***[2], ***Souad Harmand***[1]; [1]*Université Polytechnique Hauts-de-France,* [2]*MOTUL, Vaires sur Marne*

8:45 AM (#204) **Hybrid Static Immersion Cooling of a Single Lithium-Ion Prismatic Battery Cell**; ***Rajesh Nimmagadda***[1], ***David Salter***[1], ***Kantharuphan Annathurai***[1], ***Daniel Trimble***[1], ***Seamus O'Shaughnessy***[1]; [1]*Trinity College Dublin*

9:00 AM (#205) **Single Phase Immersion Cooling: Going Above and Beyond 400W**; ***Shiraz Gulraiz***[1], ***John Bean***[1], ***Bachar Geha***[1]; [1]*Green Revolution Cooling*

E-09 Additive Manufacturing II

TATE A4 Chairs: *Mustafa Ozsipahi*

8:15 AM (#324) **Thermal Cycling Reliability of Gravure Offset Additive Electronics With Water-Based Ink, Biodegradable Substrate and Room-Temperature Curable Adhesives**; ***Aditya Harsha***[1], ***Pradeep Lall***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

8:30 AM (#328) **Screen-Printed in-Mold Electronics Reliability on Polycarbonate Substrates Under Sustained High-Temperature Conditions**; ***Shriram Kulkarni***[1], ***Pradeep Lall***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

8:45 AM (#334) **High Temperature, High Humidity and Thermal Cycling Effects on Gravure Offset Printed Additive Circuits for Automotive Applications.**; ***Padmanava Choudhury***[1], ***Pradeep Lall***[1], ***Ved Soni***[1], ***Scott Miller***[2]; [1]*Auburn University,* [2]*NextFlex*

9:00 AM (#335) **Additively Manufactured Electrocardiogram Wire Profiles Compared to Commercially Available Wire Connections**; ***Pradeep Lall***[1], ***Devin Palmer***[1], ***Abigail Winn***[2], ***John Morris***[2], ***Stefanie Ledbetter***[2]; [1]*Auburn University,* [2]*EAH*

Day 3: Fri, May 30th 11:30 AM–12:30 PM

TI-10 Thermosiphons, Heat Pipes and Vapor Chambers

TATE A1

Chairs: *Nitin Karwa (Honeywell International Inc), Kevin McCarthy (PC Krause and Associates)*

11:30 AM (#167) **Experimental Investigation of Heat Pipe Embedded Cold Plates in Conduction Cooled Chassis**; ***Vedat Yağcı***[1], ***Sertaç Çadırcı***[2], ***Murat Parlak***[1]; [1]*ASELSAN INC.*, [2]*Istanbul Technical University*

11:45 AM (#221) **3-D Numerical Simulation and Optimization of Wick-Free Vapor Chambers for Enhanced Thermal Management in High-Power-Density Applications**; ***Anish Pal***[1], ***MD Naim Hossain***[1], ***Arani Mukhopadhyay***[1], ***Rajneesh Chaudhary***[2], ***Sreekant Narumanchi***[2], ***Constantine Megaridis***[1]; [1]*University of Illinois Chicago*, [2]*National Renewable Energy Laboratory*

12:00 PM (#283) **Experimental Investigation of Flow Pattern in a Loop Thermosyphon With Horizontal Evaporator**; ***Prem Kumar***[1], ***Aalekh Srivastava***[2], ***Susmita Dash***[1], ***Amrit Ambirajan***[1], ***Pradip Dutta***[1]; [1]*Indian Institute of Science, Bangalore*, [2]*Indian Institute of Science*

12:15 PM (#367) **Thermofluidic Performance of a Two-Phase Loop Thermosyphon for Server Cooling: Effects of Condenser Secondary Side**; ***Manohar Bongarala***[1], ***Rishav Roy***[1], ***David Apigo***[1], ***Sarwesh Parbat***[1], ***Syed Faisal***[1], ***Yang Liu***[1], ***Todd Salamon***[1]; [1]*Nokia Bell Labs*

TII-10 Immersion Cooling II

TATE A2

Chairs: *Neera Jain (Purdue University)*

11:30 AM (#214) **Optimize the Use of the CDU Return Flow to Enhance Single Phase Immersion Cooling**; ***Chuanlou Wang***[1], ***David Zhou***[1], ***Guangying Zhang***[1], ***Yuehong Fan***[1], ***Yingqiong Bu***[1], ***Xiang Que***[1], ***Yang1 Yao***[1]; [1]*Intel*

11:45 AM (#235) **Forced Convective Liquid Immersion Cooling of a Prismatic Battery Module**; ***David Salter***[1], ***Rajesh Nimmagadda***[1], ***Kantharuphan Annathurai***[1], ***Daniel Trimble***[1], ***Seamus O'Shaughnessy***[1]; [1]*Trinity College Dublin*

12:00 PM (#401) **Performance Analysis of Single-Phase Immersion Cooling in High Powered Electronic Components**; ***Ali Heydari***[1], ***Anto Barigala***[2], ***Pardeep Shahi***[1], ***Himanshu Modi***[1], ***Lochan Sai Reddy Chinthaparthy***[3], ***Md Raisul Islam***[3], ***Dereje Agonafer***[3], ***Mohammad Tradat***[1], ***Saket Karajgikar***[1], ***Jeremy Rodriguez***[1]; [1]*Nvidia Corporation*, [2]*The University of Texas at Arlington*, [3]*University of Texas at Arlington*

12:15 PM (#380) **Prediction of Junction Temperature to Estimate Thermal Resistance in 1.7kV SiC Power Module Using Real-Time VSD Monitoring Method**; ***Saroj Majakoti***[1], ***Okafor G.***[2], ***David Huitink***[2], ***Liyang Du***[3], ***Alan Mantooth***[2]; [1]*Department of Mechanical Engineering, University of Arkansas, Fayetteville, AR*, [2]*University of Arkansas*, [3]*Department of Electrical Engineering, University of Arkansas*

E-10 Boiling and Condensation

TATE A4

Chairs: *Hyoungsoon Lee (Chung-Ang University)*

11:30 AM (#179) **Concept Design of a Confined Direct Two-Phase Jet Impingement Cooler With Phase Separation of Low-Surface-Tension Fluids**; ***Gopinath Sahu***[1], ***Ketan Yogi***[1], ***Tiwei Wei***[1], ***Justin A. Weibel***[1]; [1]*Purdue University*

11:45 AM (#317) **An Experimental Study on the Local Heat Transfer Behavior of the Shell-Side Flow Condensation**; ***Jiayuan Li***[1], ***Jayachandran Narayanan***[1], ***XiaoYang Gao***[1], ***Chirag Kharangate***[1]; [1]*Case Western Reserve University*

12:00 PM (#351) **Optimal Contact Angle for Dropwise Condensation**; ***Tomasz Kulakowski***[1], ***Yimin Zhou***[1], ***Grzegorz Celichowski***[2], ***Maciej Psarski***[2], ***Solomon Adera***[1]; [1]*University of Michigan*, [2]*University of Lodz*

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Center for UTD-CHIP at UT Dallas

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Thermal Packaging and Heat Dissipation for Chiplets and Heterogeneous Microsystems

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Computational Thermal Design for Device and System

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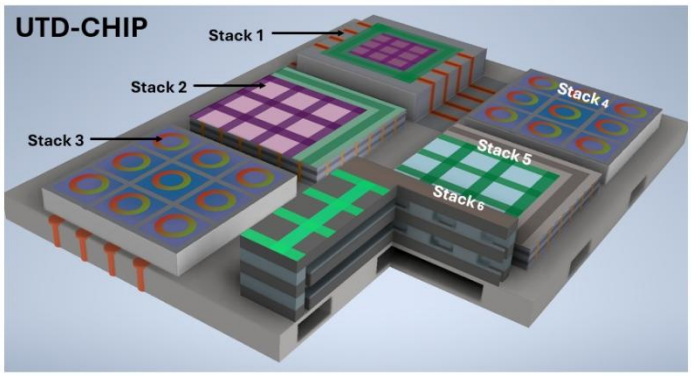

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Thermal Conduction for Heat Spreading Through High-Thermal-Conductivity Material
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Ongoing and Recent Research Activities

Device and System
○ Designing Flow-Separation Evaporative Cooling for 3D Heterogeneous Microsystems
○ Electro-Thermo-Mechanically Coupled Computational Design for Heterogeneous Integration
○ Advanced Thermal Management for High-Efficiency Power Amplifiers Operating in High Compression Regimes
○ Thermo-Mechanical Behavior of Wafer Level Chip Scale Packaging (WLCSP) for Extreme Temperature Cycles in Space Applications
Material and Interface
○ High Thermal Conducting Materials for Chiplet Level Thermal Management
○ Nanophononics Interlayer Design of Heterostructure Thermal Boundary Resistance

Abstracts Due: September 8, 2025

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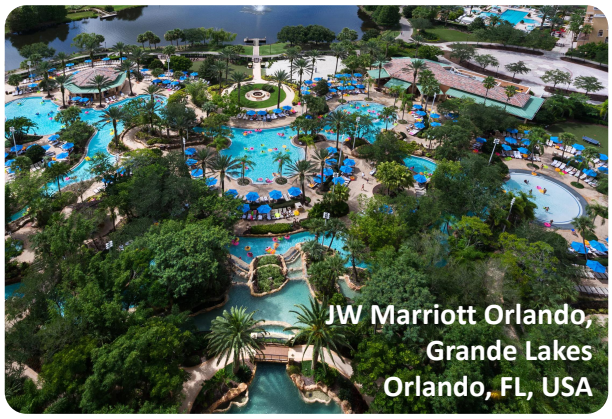

Important Dates

Abstract Deadline:	**Sept. 8, 2025**
Notification of Acceptance:	Oct. 6, 2025
Draft Paper Submission:	Dec. 15, 2025
Reviews Returned:	Feb. 2, 2026
Final Paper Submission:	Mar. 2, 2026

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The IEEE ITherm Conference is the leading international conference for scientific and engineering exploration of thermal, thermomechanical, and emerging technology issues associated with electronic devices, packages, and systems. ITherm 2026 will be a physical conference held along with the 76th ECTC. Joint ITherm/ECTC registrations will be available at a significant discount. All abstracts are followed by full papers to be peer reviewed and published in the IEEE Xplore ITherm proceedings. Student first authors will have the opportunity to apply for ITherm travel grants, to participate in the Student Poster and Networking Session. ITherm 2026 will also feature keynotes by prominent speakers, vendor exhibits, panel discussions, invited technology talks, ECTC/ITherm joint networking events and short courses, and a student design competition. Original papers are solicited in the following areas of interest:

Component-Level Thermal Management

- 3D Packaging & Heterogeneous Integration
- Package-Integrated Thermal Management
- Embedded Cooling
- Hotspot and Impingement Cooling
- Thermal Interface Materials and Heat Spreaders
- Thermoelectric and Peltier Devices
- Heat Pipes, Vapor Chambers and Thermosyphons
- Single / Two-Phase Cold Plates and Heat Sinks
- RF and Power Electronics
- LEDs, Photovoltaics, and Optoelectronics
- Thermal Management of Electric Machines
- Pulsed Power Dissipation

System-Level Thermal Management

- Air Cooling Techniques and Heat Exchangers
- Liquid Cooling Solutions
- Immersion Cooling and Refrigeration
- Pumps, Compressors, Fans, and Blowers
- Phase Change Materials
- Automotive, Batteries, and Thermal Storage
- Mobile and Internet of Things
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- Thermal Management in Electric Aircraft
- Modeling of Complex Thermal Systems
- Next-Gen Electronics Systems Co-Design

Mechanics and Reliability

- Thermo-Mechanical Modeling and Simulation
- Mechanics and Reliability of Solder Joints and Interconnects
- Materials Characterization, Processing, and Models
- Failure Mechanics, Fatigue, and Damage Modeling
- Measurement of Deformations, Strains and Stresses
- Shock, Drop and Vibrational Analysis
- TSV / 3D Reliability and Packaging
- Mechanics in Assembly and Manufacturing
- Applied Reliability and Failure Analysis
- Process-Structure-Property Relations / Multi-Scale Analyses
- Accelerated Stress Testing and Modeling
- Lifetime Prognostics and Condition Monitoring

Emerging Technologies and Fundamentals

- Boiling, Evaporation, and Condensation
- Convection in Microchannels, Microgaps, and Jets
- Pulsating / Oscillating and Non-Conventional Heat Pipes
- Nanoscale and Transistor-Level Thermal Transport
- Novel Materials and Fabrication Techniques
- Measurement and Diagnostic Techniques
- Numerical and Experimental Methods, Nano-to-Macro Scale
- Prognostic Health Management and Reliability Analysis
- Wearable, Flexible, and Printed Electronics
- Additive Manufacturing
- Silicon Fabrication for Thermal Management Devices
- Predictive Analytics, Machine Learning, and AI
- Sustainable Electronics and Data Center Decarbonization

ITherm provides an opportunity for industrial and university participation in the form of financial support to ITherm 2026. All contributors will be given strong recognition both onsite and in the conference materials.

Join the ITherm LinkedIn Group
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IEEE Advancing Technology for Humanity

Dr. Milnes P. David, General Chair, general-chair@ieee-itherm.net
ITherm Website: https://ieee-itherm.net/

IEEE Electronics Packaging Society

Networking Bingo!

Network with ITherm attendees. When you find someone who fits each category below, ask them to sign in the appropriate box. Complete 5 in a row, column, or diagonally for "BINGO". First three attendees to turn in at the registration desk will win small prizes.

Liquid Cooling Expert	**Presented a Poster**	**Investigates New Materials**	**Is Pursuing their PhD**	**Is Attending ITherm for the First Time**
Potential New Collaborator	**Works at a National Lab or in the Government**	**Uses AI or Machine Learning**	**Travelled to ITherm from Outside the US**	**Develops Additive Manufacturing Technology**
Tech Talk Presenter	**Sponsored ITherm**	**Is Enjoying ITherm!**	**Can See the Heat with Thermal Imaging**	**Teaches Courses on Thermal Management**
Solves the Challenges of High-Powered Electronics	**Works in the Aerospace or Automotive Industry**	**Presented on a Panel**	**Gave an Amazing Presentation**	**Loves Coffee**
Develops Simulations or Digital Twins	**Works at a Start-up Company**	**Has Attended ITherm at least 3 Times**	**Knows a Lot about TIMs**	**Focuses on Sustainability**

InfraTec.

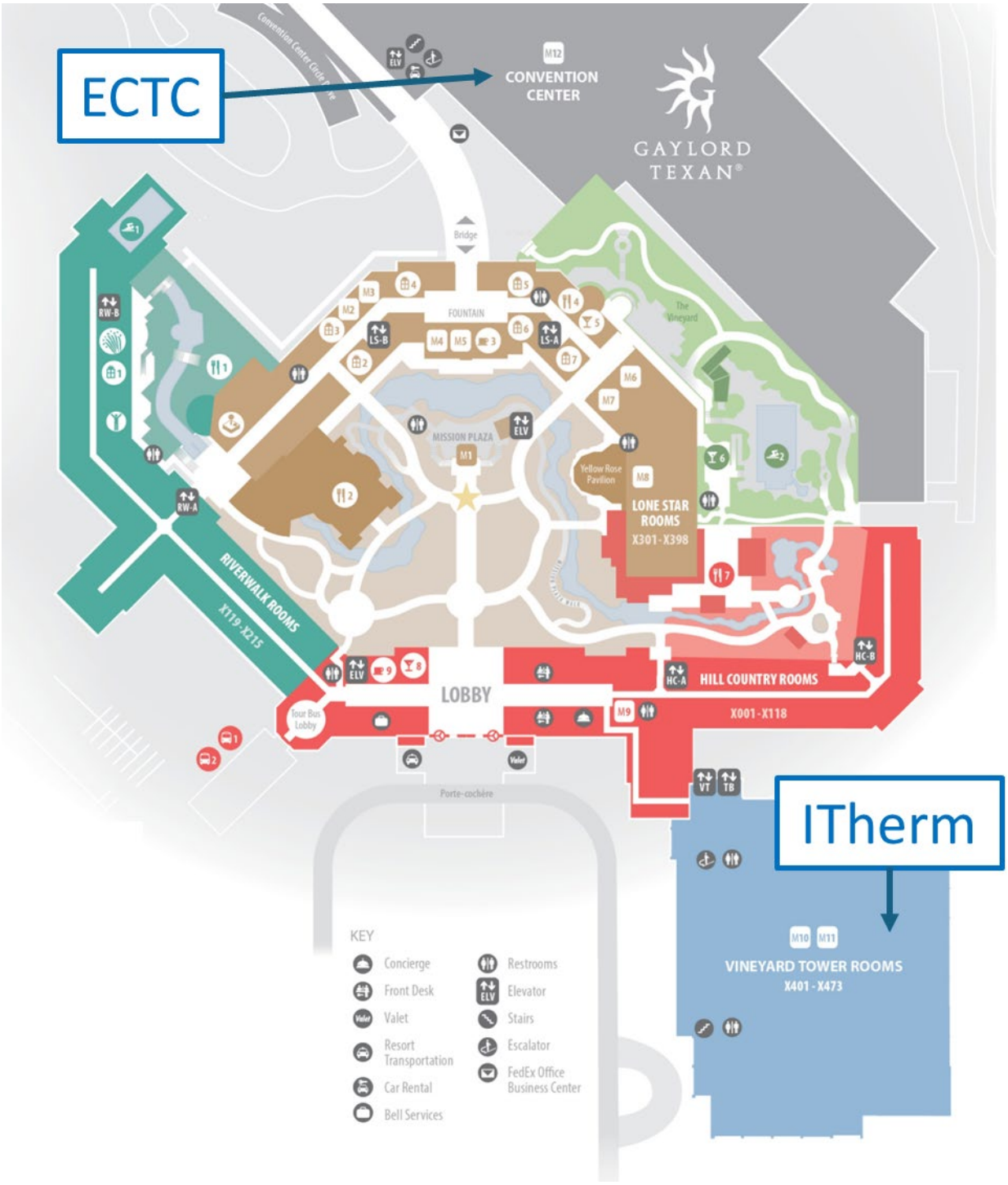
TarisIR® mini

Size matters.

Notes

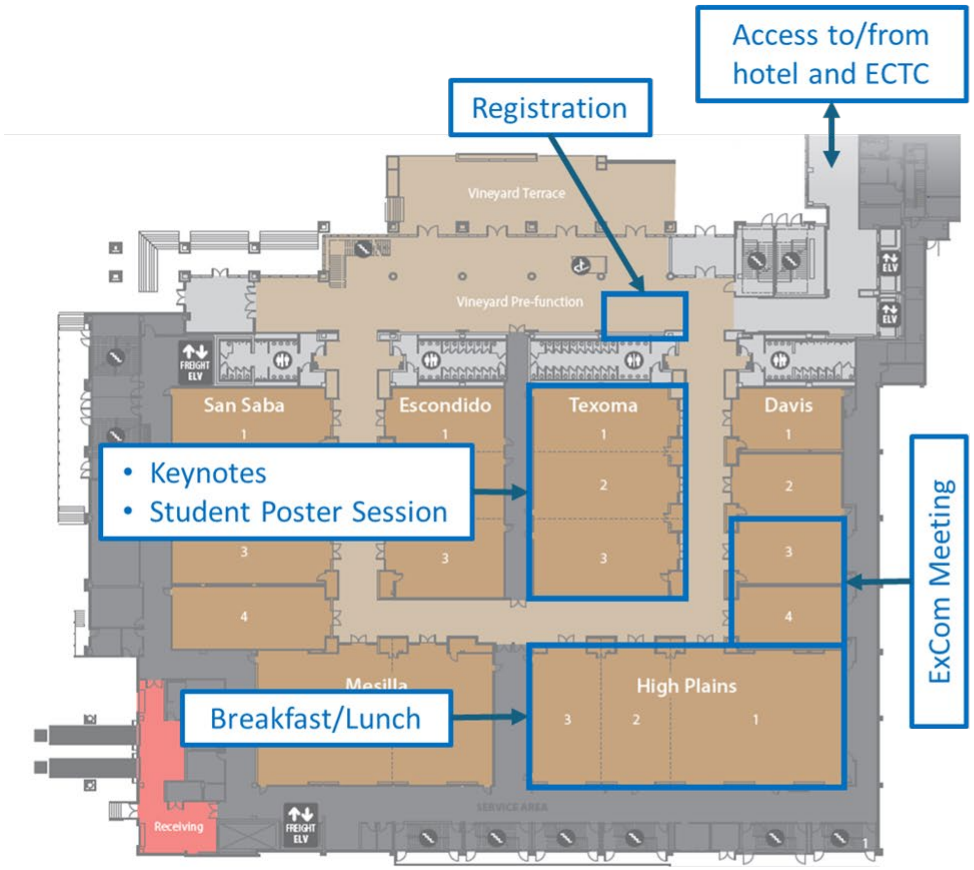
Notes

HOTEL AND CONFERENCE MAPS

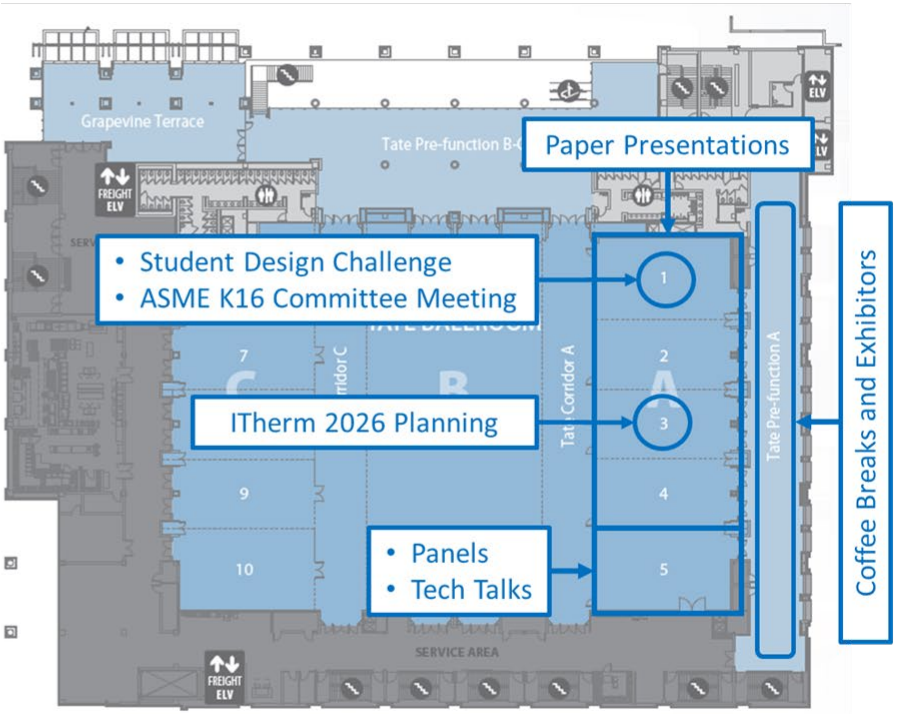


ITHERM 2025 EVENTS MAP

Vineyard Tower



Level 1



Level 2

Conference Program Overview

Day-0: Tuesday, May 27, 2025

8:00 - 12:00	12:00 - 1:30	1:30 - 5:30	BREAK	6:45 - 7:45
ECTC/ITherm Joint Professional Development Courses (PDC)	Luncheon for PDC Course Attendees	ECTC/ITherm Joint Professional Development Courses (PDC)		ECTC Young Professionals Networking Event
HIR Workshop				
Registration (11:00 am - 5:00 pm)				

Day-1: Wednesday, May 28, 2025

7:00 - 8:15	8:15 -9:15	BREAK	9:30-10:30	COFFEE BREAK	11:00 - 12:30	12:30 - 2:00	2:00 - 3:30	COFFEE BREAK	4:00 - 5:30	5:30 - 6:30	6:30-8:30
Breakfast	TI-01		K-1 Keynote		TI-02	**Luncheon** Richard Chu ITherm Award Presentation	TI-03A		TI-04	Student Heat Sink Design Challenge	2025 ECTC Student & Start-Up Innovation Challenge 6:30-8:30
	TII-01				TII-02		TII-03		TII-04		ASME K-16 & JEP Meetings (6:45 - 7:45)
	M-01				M-02		TI-03B		M-04		
	E-01				E-02		E-03		E-04		
	TT-01				P-02		TT-03		P-04		
							ITherm Sponsors & Exhibits				
Registration (6:30 am - 5:30 pm)											

Day-2: Thursday, May 29, 2025

7:00 - 8:15	8:15 -9:15	BREAK	9:30-10:30	COFFEE BREAK	11:00 - 12:30	12:30 - 2:00	2:00 - 3:30	COFFEE BREAK	4:00 - 5:30	5:30 - 7:00	ExCom Meeting (7:00 - 7:30)	7:30-9:30
Breakfast	TI-05		K-2 Keynote		TI-06	**Luncheon** ITherm Sponsors and Partners	TI-07A		TI-08	Student Poster Networking Session and Reception		ITherm Organizers' Dinner
	TII-05				TII-06		TII-07		TII-08			
	M-05				M-06		TI-07B		M-08			
	V-05				E-06		E-07		E-08			
	P-05				Tech Transition Panel		TT-07		P-08			
		ITherm Sponsors & Exhibits					ITherm Sponsors & Exhibits				by Invitation	
Registration (7:00 am - 5:30 pm)												

Day-3: Friday, May 30, 2025

7:00 - 8:00	8:15 -9:15	BREAK	9:30-10:30	10:30-11:30	11:30 - 12:30	12:30 - 2:00
Breakfast	TI-09		K-3 Keynote	COFFEE BREAK & ITherm 2026 Planning (open)	TI-10	**Luncheon** ITherm Awards & Organizer Recognitions
	TII-09				TII-10	
	E-09				E-10	
	Coolerchips				Coolerchips	
EPS President's Panel		ITherm Sponsors & Exhibits				
Registration (7:00 am - 12:00 pm)						

Legend:	
TI: Component Thermal	Keynote
TII: System Thermal	Special Events
M: Mech & Reliabiltiy	Meetings
E: Emerging Tech.	PDCs
TT: Tech Talks	P: Panels
V: Virtual	Meals & Breaks

ITherm DALLAS, TX 2025