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Professional Development Courses (PDCs):
Monday, September 30: 2-hour formats, by theme/track
  8:00 am – 10:00 am | 10:30 am – 12:30 pm
  1:00 pm – 3:00 pm | 3:30 pm – 5:30 pm

Registration:
Monday, September 30 – 7 AM - 5:30 PM
Tuesday, October 1 – 7 AM - 5:30 PM
Wednesday, October 2 – 7 AM - 6:30 PM
Thursday, October 3 – 7 AM - 12 PM

Technical Sessions:
Tuesday, October 1 – 2 PM - 5:40 PM
Wednesday, October 2 – 9:00 AM - 4:55 PM
Thursday, October 3 – 9:00 AM - 11:40 AM

Exhibition:
Monday, September 30 – SET-UP ONLY: 8 AM-5 PM
Tuesday, October 1 – SET-UP ONLY: 7 AM-10 AM – SHOW 11 AM - 5 PM
Wednesday, October 2 – 10 AM - 6:15 PM
Thursday, October 3 – MOVE-OUT ONLY: 8 AM - 12 PM
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Welcome from the General Chair

Hello IMAPS Members!

It has been a pleasure serving as this year’s General Chair for the 52nd International Symposium on Microelectronics and a privilege to be a part of such an amazing team of volunteers, speakers, and chairs. The energy and innovation generated by new semiconductor products have been key enablers to the advancement of semiconductor packaging. I look forward to a great week ahead as we will kick off the most engaging IMAPS symposium in the beautiful and historic city of Boston, Massachusetts!

This year we have an exceptional group of committee chairs, and together with the IMAPS staff, we have assembled a world-class technical program. As our industry grows, we see a continuing trend where semiconductor products span many packaging platforms. As a result, we have maintained last year’s technical program format where the tracks are alignment by package platform to improve the overall attendee’s experience. Key package platforms include SiP/SiM/CPI, Wafer Level/Panel Level, 2.5D/3D/Flip Chip/Optical, as well as High Rel/Performance and Advanced Process/Materials. The technical committee has put together over 130 technical presentations and posters on today’s most relevant topics in five parallel technical tracks.

This year, we will have some highly respected industry leaders for our four Keynote talks that will set the stage for exciting Plenary Sessions each morning:

- **Packaging Innovations for 5G Enablement** by Ahmer Syed, Qualcomm

- **Aristotle & Packaging: Making the Products Greater than Sum of their Chiplets** by Milind Bhagavat, Fellow, AMD

- **Navigating the Packaging Challenges of 5G and Beyond** by Mark Downey, Package Development Manager, Analog Devices

- **5G RF Possible Test Insertion Scenarios and Test Strategies** by Jeorge Hurtarte, Wireless Product Marketing Strategist, TERADYNE

The popular Posters and Pizza session has continued to grow each year, and we have also scheduled several activities and breaks for networking and to visit the 110+ exhibit booths at this year’s event.

We have a scheduled a tour of the MIT, nano facility, as well as another exciting addition this year is the IMAPS inaugural David C. Virissimo Memorial Fall Golf Classic. This event directly benefits the future professionals to IMAPS with proceeds going to the IMAPS Microelectronics Foundation that funds student involvement and awards. Both the tour and the golf outing are scheduled for Thursday, October 3 at the conclusion of the Symposium (tee off at 1:30pm sharp!).

This is an exciting time to be part of the microelectronics assembly and test supply chain as our industry becomes increasingly international and cross-disciplined. The advancements in connectivity continue to enhance our personal and professional lives. This, in turn, presents new challenges and opportunities for innovative solutions where the IMAPS community can experience and contribute.

Thanks to all of you and to the Symposium Committee for making the 52nd Symposium on Microelectronics such an exciting event! It’s been an honor and pleasure to work with my team to organize the symposium. I hope you enjoy your time at IMAPS 2019 here in Boston, Massachusetts.

Curtis Zwenger
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General Chair, IMAPS 2019
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Professional Development Courses (PDCs)

Professional Development Courses (PDCs)
Monday, September 30, 2019 • 8:00 AM - 5:30 PM

2-hour formats, by theme/track

8:00 am -10:00 am | 10:30 am – 12:30 pm | 1:00 pm – 3:00 pm | 3:30 pm – 5:30 pm

*Attendees can take ONE PDC during each timeslot*

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<th>Track B: Failure Analysis &amp; Thermal</th>
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8:00 AM-10:00 AM

- **A1:** Understanding the Wire Bonding Process
  - Lee Levine, Process Solutions Consulting, Inc.

- **B1:** Introduction to Failure Analysis in Semiconductor Package Assembly
  - Tom Dory, Fujifilm Electronic Materials USA

- **C1:** Passive Components and Integration for High-Bandwidth Computing and Communication
  - P M Raj, Florida International University/Georgia Tech PRC

- **D1:** Fan-Out Wafer/Panel-Level Packaging
  - John Lau, Unimicron Technology Corporation

10:00 AM-10:30 AM  Coffee / Networking Open to all PDC participants

10:30 AM -12:30 PM

- **A2:** Introduction to Solder Flip Chip with an Emphasis on Cu Pillar
  - Mark Gerber, ASE US, Inc.

- **B2:** Thermal and Dynamic Stress Failures in Electronic and Photonic Packaging: Prediction and Prevention
  - Ephraim Suhir, Portland State University

- **C2:** Achieving High Reliability for Lead-Free Solder Joints - Materials Considerations
  - CANCELLED

- **D2:** Evolution to Advanced Fan Out
  - John Hunt, ASE US Inc

12:30 PM-1:00 PM   Lunch Open ONLY to PDC participants taking morning AND afternoon courses.

1:00 PM-3:00 PM

- **A3:** Flip Chip Package Technology and Assembly Processes
  - Tom Dory, Fujifilm Electronic Materials USA

- **B3:** Preventing Product Failure
  - Jennie Hwang, H-Technologies Group

- **C3:** Fundamentals of 3D and 2.5D Packaging Integration
  - Urmi Ray, Consultant

- **D3:** Heterogeneous Integrations
  - John Lau, Unimicron Technology Corporation

3:30 PM-5:30 PM  Coffee / Networking Open to all PDC participants

3:30 PM-5:30 PM

- **A4:** Understanding the Role of Intermetallic Formation in Gold and Copper Wire Bonding
  - Lee Levine, Process Solutions Consulting, Inc.

- **B4:** Thermal Management using Thermal Interface
  - Rita Mohanty, Henkel Corporation

- **C4:** 5G/mmWave Package Development Requirements and Solutions
  - Urmi Ray, Consultant

- **D4:** Introduction to System in Package (SiP) - The Heterogeneous Integration Driver
  - Mark Gerber, ASE US, Inc.

5:30 PM-7:30 PM  WELCOME RECEPTION - Open to all IMAPS 2019 participants

Location: Boylston Hallway on the 3rd FLOOR

Cost for Each PDC: $425

Additive Manufacturing / Printed Electronics Workshop
(separate committee, registration, etc.) – co-located at IMAPS 2019 – Room 206

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Welcome Reception
5:30 PM - 7:00 PM  Hynes Convention Center
Location: Boylston Hallway on the 3rd FLOOR

Welcome Reception Sponsored by
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Breaking Through Barriers to Expand Opportunities
How a Diverse and Inclusive Workplace Fuels Innovation
7:00 PM – 8:15 PM
Room 206

The IMAPS 2019 Diversity and Inclusion Committee is proud to host Priya Mukundhan of Rudolph Technologies and Ellen Ferraro of Raytheon for a special 2-speaker event.

Registration for this speaker program is free and open to the public with the exhibit’s visitor badge. On-site registration only.

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With our unique atomizing technology, 5N Plus Micro Powders excels in the production of ultra-fine metallic powders with particle sizes ranging from 1 to 25 µm (Type 5 to Type 8) for the solder paste, conductive adhesive and PV metallization paste applications. We offer a wider range of Pb-free powders with melting temperatures ranging from as low as 61°C up to 1200°C. In addition, we have added Low alpha Sn alloy powders to our product line up. The flexibility of our process is ideally suited for custom alloy compositions and particle size distributions and enables us to meet your current and next generation powder requirements.
AMADA MIYACHI AMERICA, INC.
Booth #: 314
www.amadamiyachi.com
AMADA MIYACHI AMERICA is a leading manufacturer of equipment and systems for resistance welding, laser welding, laser marking, laser cutting, laser micromachining, hermetic sealing, projection welding, and hot bar bonding. The company provides products to a wide range of markets, including the medical device, battery, electric vehicle, and solar industries, as well as the global electronics, automotive, and general industrial markets. Since 1948, AMADA MIYACHI AMERICA has worked to achieve one goal: to solve our customer’s manufacturing challenges. Knowing there is no one solution that fits all, we strive to provide our customers with innovative and reliable manufacturing technology solutions so that we may be their single source provider. Our headquarters is located in Monrovia, California with state-of-the-art facilities for developing, producing and servicing the solutions offered to our worldwide customer base. A global company, AMADA MIYACHI AMERICA also has sales offices and applications laboratories located in Detroit, Michigan; El Paso, Texas; and Sao Paulo, Brazil.

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ASE Group
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ASE is blazing new trails in device miniaturization and integration, as demanded by the ongoing transformation of electronics and lifestyles. And so, alongside a broad portfolio of established technologies, ASE is delivering game-changing advanced packaging, System-in-Package and MEMS solutions to meet growth momentum across a broad range of end markets, such as automotive, 5G, AI, IoT, high performance computing, and more. To learn about our advances in Wire Bond, System-in-Package, Wafer Level Packaging, Fan Out, Flip Chip, MEMS & Sensors, and 2.5D & 3D technologies, please visit: www.aseglobal.com

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www1.asmpacific.com/en/
ASMPT is the World Leader in Advanced Packaging Equipment Solutions, SMT Equipment, and Lead frame Materials. With a vision of providing customer focused cost effective solutions, we offer IC Assembly, Opto-electronic, Electronic Manufacturing, Physical Vapor Deposition / Chemical Vapor Deposition Equipment and Lead frame technology that is in the forefront of the Semiconductor Industry. ASM Pacific Technology is the only IC Assembly Equipment provider recognized as one of 2018 Thomson Reuters Top 100 Global Technology Leaders.

Axus Technology
Booth #: 406
www.axustech.com
Axus Technology is a highly specialized technology supplier focused on engineering capability and efficiency to provide CMP, wafer cleaning and precision wafer grind process consulting services to emerging technology industries including MEMS, Automotive, Defense and Aerospace, Lifesciences and IoT as well as traditional semiconductor processing. The highly experienced Process Development team facilitates advances in wafer technology and efficient wafer production with new designs and novel applications. We implement turnkey solutions for process development, foundry processing and equipment tooling including tool installation and training, field service and consumable selection. Based in Chandler, Arizona, Axus Technology operations include a fully-equipped class 100 foundry cleanroom for development and foundry processing, as well as design, manufacturing, and worldwide service and parts support for existing equipment including over 6000 line items of CMP and grinder parts. Since 2002, Axus Technology has been remanufacturing legacy processing tools for the CMP of thin films of conducting layers, insulating layers, and semiconducting layers that are placed on the wafer surface. Specializing in CMP, Precision Grinding and Ultra-Thinning, plus Cleaning technology and associated metrology, Axus is differentiated by our exceptional technical expertise in engineering design and development for both process and tools.

BESI North America, Inc.
Booth #: 227
www.besi.com
BE Semiconductor Industries N.V. (Besi) develops leading edge assembly processes and equipment for leadframe, substrate and wafer level packaging applications in a wide range of end-user markets including electronics, mobile internet, cloud server, computing, automotive, industrial, LED and solar energy.

Binghamton University
Booth #: 224
www.binghamton.edu/ieec
The Integrated Electronics Engineering Center is committed to the advancement of electronic packaging technology and the electronics industry. Founded in 1991, this New York State Center for Advanced Technology conducts leading edge research in a wide variety of packaging areas that benefit technological advancements, and member companies.
Boschman Advanced Packaging Technology  
(shared with Neu Dynamics & Sales and Service Inc.)

Booth #: 601
www.boschman.nl

Boschman Advanced Packaging Technology is a high-tech, solution driven Dutch company focusing on advanced packaging solutions. We specialize in the development and supply of advanced transfer molding and sintering systems. Besides the development and supply of advanced equipment solutions we regularly join forces with R&D departments of our customers to co-develop and research innovative packaging concepts. We strongly believe that early involvement in the development process is a prerequisite to obtain the highest quality, reliable processes, the lowest cost of ownership and the shortest time to market. We provide a unique one-stop-shop concept – from idea to industrialization – offering our customers one point of contact for all packaging activities. We consider ourselves to be a niche player, focused on well defined high growth market segments for Power Modules + MEMS & Sensors for the Automotive, Industrial, Mobile and Medical market. With focus on technology leadership in Film Assisted Molding (encapsulation) and Ag sintering technology supported by our patented Dynamic Insert Technology we enable revolutionary package developments. Independent whether better performance, size reduction or cost reduction of a package is required we can support our customers achieving their goals.

BSET EQ
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www.bseteq.com

BSET EQ designs and manufactures gas plasma systems used for plasma etching, plasma cleaning, plasma surface treatment and plasma IC decapsulation for failure analysis and IC counterfeit detection. These dry processes are environmentally friendly and our systems are used worldwide in an increasing number of industries. BSET EQ is also the exclusive North American distributor for ATV Technologie GmbH IR vacuum solder reflow ovens and thermal processing systems. These systems range from small tabletop systems to high volume automated vacuum reflow systems. The product range also includes sintering presses, high vacuum Getter activation systems, atomic layer deposition systems, and diamond scribers. BSET EQ has both your plasma and thermal solutions, please visit us at booth 811 for more information.

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BTU International, Inc.
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BTU International, a wholly-owned subsidiary of Amtech Group (Nasdaq: ASYS), is a global supplier and technology leader of advanced thermal processing equipment solutions in the electronics manufacturing market. BTU's high-performance convection reflow ovens are used in the production of SMT printed circuit board assemblies and in semiconductor packaging processes. BTU also specializes in precision controlled, high-temperature belt furnaces for a wide range of custom applications, such as brazing, direct bond copper (DBC), diffusion, aluminum sintering and advanced solar cell processing. BTU has operations in Billerica, MA, USA, and Shanghai, China, with a sales and service presence in over 30 countries. Since 1950, and with over 10,000 units shipped, BTU International has been the trusted name for high-tech customers with a need to solve high-volume thermal processing challenges. BTU's products excel in processes where precise control of atmosphere and temperature are critical to product yield. Our extensive patent library includes traveling gas barrier technology among other advances.

Cadence Design Systems
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Cadence enables electronic systems and semiconductor companies to create innovative end products that are transforming our lives. Cadence software, hardware and semiconductor IP are used by customers to get to market faster. The company's Intelligent System Design strategy helps customers develop differentiated products—from chips to boards to intelligent systems—in mobile, consumer, automotive, aerospace, IoT, industrial and other markets.

centrotherm
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centrotherm has been developing and realizing innovative thermal solutions for more than 60 years. As a leading, globally active technology group, we offer production solutions for the photovoltaic, semiconductor and microelectronics industries. The continuous further development of our successful solutions in thermal processing and coating, such as for crystalline solar cell and semiconductor manufacturing, forms the basis for successful partnerships with industry, research and development.

Cicor Group
Booth #: 219
www.cicor.com
Cicor – Your technology partner The Cicor Group is a globally active development and manufacturing partner with innovative technology solutions for the electronics industry. With about 2100 employees at ten production sites, Cicor offers highly complex printed circuit boards, hybrid circuits (thin-film and thick-film substrates), 3D-MID and printed electronics, as well as comprehensive electronic manufacturing services (EMS) including microelectronic assembly, box building and plastic injection molding. Cicor supplies customized products and services from design to the finished product from one source.

Control Laser Corporation
Booth #: 524
www.control.laser.com
For over 50 years, we have been continuously improving the development and delivery of industrial laser system, with the processings of cutting, welding, marking or engraving, and micromachining, providing unmatched total solutions to our global customers. CLC offers risk free pre-sale application research in laser material processing, standard and customized laser automation system proposition, and the caring and fast responding service plans to ensure the systems perform as and beyond the customer’s expectation.

CWI Technical Sales:
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www.cwitechsales.com
CWI Technical Sales is a manufacturers’ representative organization offering products & solutions to the semiconductor, optoelectronic, wireless, defense/aerospace, life sciences and other related industries. Located in Central New Jersey, the company has been representing tier-one equipment suppliers on the east coast for over 30 years. These companies offer products in the test & measurement, wafer processing, inspection/metrology, backend operations and failure analysis areas. CWI has maintained very strong relationships with its customers and is committed to delivering top quality solutions to them. We are a hands-on organization, making sure we know the products intimately. Our sales staff prides itself with understanding how the products operate and apply to our customers’ applications. CWI Technical Sales also employs a technical service support staff highly knowledgeable in hardware, software and automation, reinforcing our commitment to each customer’s success.
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<th>Company</th>
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<th>Website</th>
<th>Description</th>
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<tr>
<td>Datum Alloys</td>
<td>429</td>
<td><a href="http://www.datumalloys.com">www.datumalloys.com</a></td>
<td>Datum is a worldwide leading supplier of precision stainless steel foil to the electronics industry from sites in the UK and USA. Our customers demand tools that work and materials that perform. Datum provides the tooling, materials and know-how necessary for technological advancement. We enable companies to build smaller, more complex devices and products.</td>
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<tr>
<td>DfR Solutions</td>
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<td><a href="http://www.dfrsolutions.com">www.dfrsolutions.com</a></td>
<td>DfR Solutions is world-renowned for its expertise in applying Reliability Physics Analysis to electronics technologies and is a leading provider of quality, reliability, and durability research and consulting to the electronics industry. The company pioneered the use of Reliability Physics with its innovative, Sherlock Automated Design Analysis™ software providing crucial insights and solutions early in product design and throughout the product life cycle. Sherlock is the only Reliability Physics electronics design tool that analyzes and predicts product failure before it happens. DfR Solutions empowers its customers to accelerate and maximize product development while saving time, managing resources, and improving customer satisfaction. The company supports Fortune 500 clients in every industry including aerospace/avionics, automotive, consumer, industrial, medical, military, solar and telecommunications. For more information about DfR Solutions, visit <a href="http://www.dfrsolutions.com">www.dfrsolutions.com</a>.</td>
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<tr>
<td>DuPont Electronics &amp; Imaging</td>
<td>512</td>
<td><a href="http://www.dupont.com/electronic-solutions">www.dupont.com/electronic-solutions</a></td>
<td>DuPont Electronics &amp; Imaging is a global supplier of materials and technologies serving the semiconductor, advanced chip packaging, circuit board, electronic and industrial finishing, display, and digital and flexographic printing industries. From advanced technology centers worldwide, teams of talented research scientists and application experts work closely with customers, providing solutions, products and technical service to enable next-generation technologies. DuPont E&amp;I’s portfolio includes metallization, dielectric, lithography and assembly materials designed to meet the most demanding needs for advanced semiconductor packaging applications, such as bumping, copper pillars and redistribution layer (RDL), passivation, underbump metallization (UBM), thermal interface and lid seal adhesive used for the latest fan-out wafer level packaging (FOWLP), flip chip, system in package (SIP), and 2.5D/3D chip packages.</td>
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<tr>
<td>ECSI Fibrotools, Inc.</td>
<td>414</td>
<td><a href="http://www.fibrotools.com">www.fibrotools.com</a></td>
<td>As the leading manufacturer of ground breaking electroplating technologies in the United States, ECSI Fibrotools, Inc. has been disrupting the industry since 1993. We are a small electrochemical engineering company located in Raleigh, NC, specializing in the manufacturing of benchtop electroplating machines for micro and nano structures for MEMS applications. We take pride in building the best electroplating equipment possible and providing superior support, knowledge and customer service to help our customers achieve their goals. Our clients rest easy knowing we are just a phone call away, eager and willing to assist them with whatever their needs may be. Leading our scientific conquests is our founder, President and CEO, Dr. Igor Kadija, who has 40+ years of experience in the electroplating field. Leading everything else is our COO, Ms. Christine Montella. Together these two have taken ECSI Fibrotools, Inc. to a new level of growth and discovery, but this is just the beginning. We invite anyone who is interested in seeing what all the buzz is about to visit our website, fibrotools.com, to learn more about our technologies and how ECSI Fibrotools, Inc. can elevate your projects to new heights.</td>
</tr>
<tr>
<td>F&amp;K Delvotec</td>
<td>622</td>
<td><a href="http://www.fkdelvotec.com">www.fkdelvotec.com</a></td>
<td>F&amp;K Delvotec is the only company provide different wire bonding solutions. We have traditional ultrasonic wire bonding equipment and also the only laser bonder equipment that could do heavy copper ribbons. Please visit our booth 622 for more info or contact Dominic Sha at <a href="mailto:Dominic.sha@fkdelvotecusa.com">Dominic.sha@fkdelvotecusa.com</a></td>
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<tr>
<td>Ferro Corporation</td>
<td>400</td>
<td><a href="http://www.ferro.com">www.ferro.com</a></td>
<td>Ferro is one of the leading manufacturers of materials and engineered products for devices in the electronic industry. Leveraging Ferro’s glass, Metal, Ceramics and Organic competencies, we provide our customers performance-enhancing engineered formulations.</td>
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<tr>
<td>Finetech</td>
<td>422</td>
<td><a href="http://www.finetechusa.com">www.finetechusa.com</a></td>
<td>Finetech supplies sub-micron accuracy die bonders for die attach, advanced packaging and micro assembly applications. Manual, motorized and automated models provide a pathway from prototyping to production. These modular, flexible systems allow high process flexibility. Bonding technologies include thermo-compression, ultrasonic, eutectic, epoxy, sintering, ACF/ACP, Indium and precision vacuum die bonding. Applications areas cover C2W, optical packages, sensors, Si photonics, microLEDs, Cu pillar, focal plane arrays, chip-on-glass, clip-on-flex and more. The deep process knowledge we have gained through decades of experience adds value to our equipment. Our engineers work with customers to create effective solutions for specific applications - they understand that “one size” does not necessarily fit all.</td>
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<tr>
<td>Forgione Engineering Inc.</td>
<td>600</td>
<td><a href="http://www.forgioneengineering.com">www.forgioneengineering.com</a></td>
<td>Forgione Engineering, a Massachusetts-based company established in 2008, is an inspirational and visionary design and consulting firm with a vast network of resources available to solve client problems. Driven by a passion for success, we are a team of cross functional experts operating in a high-efficiency mode under trained leadership. Valued partnerships with many industry experts ensure unprecedented service. We have employees with many years of experience and the following Titles, Licenses, &amp; Certifications: Structural Engineer, Mechanical Engineer, and Professional Engineer.</td>
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FRT manufactures powerful surface metrology tools for various sectors such as development, production and quality control. Due to the design and construction of these multi-sensor devices, FRT tools can be used for many applications. As your global business partner, we offer worldwide services and will accompany you as a reliable partner during the entire cooperation.

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[www.haikutech.com](http://www.haikutech.com)

Customized technical and equipment solutions for the manufacture of Multilayer Ceramics, e.g. LTCC, HTCC, MLCC, SOFC, Solid State Batteries, etc. Products’ portfolio includes: dielectric powders, binders, tape casters, sheet blankers, mechanical punches, screen printers, stackers, isostatic laminators, green chip (hot knife) dicers, termination equipment, furnaces, and visual inspection equipment. In our brand-new R&D Facility located in South Florida, we offer ceramic tape development (tape casting) and prototyping services to produce Ceramic Multilayer Structures.

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Hary Manufacturing Inc. (HMI) is a premier supplier of Precision Screen Printers for the printed electronics industry including thick-film hybrid and other precision deposition applications. Complimenting products include infrared conveyor dryers and substrate handling automation for a wide range of applications. HMI offers spare parts and technical support for AMI Presco printers as well as all HMI equipment. Our consumable product lines provide printing squeegee and lint-free cleaning cloths to satisfy the production needs of our customers. Please visit www.hmiprinters.com for more information.

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Our Electronics business area offers customers from the electronics industry a specialized portfolio of innovative high-technology adhesives and materials for the manufacture of microchips, electronic assemblies and thermal management systems.

**Heraeus Electronics**  
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[www.heraeus-electronics.com](http://www.heraeus-electronics.com)

Heraeus Electronics is a leader in the electronics packaging industry. Heraeus boasts a large portfolio of products such as Thick Film Ink, Solder Paste, Direct Bond Copper substrates, Sinter Pastes, and Bonding wire. Heraeus’ position as a technical expert has helped our customers in the Semiconductor, Automotive, Power Electronic, LED, and consumer electronic industries keep pace with our technical expertise and product know-how. With technical and production facilities around the world Heraeus has the resources to optimize your processes and utilize the best products and equipment to strengthen our customer’s position in the market. See the latest Heraeus has to offer with developments in Thick Film Ink Heaters and Advanced packaging technologies.

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Hesse Mechatronics, Inc. is a wholly-owned subsidiary of Hesse GmbH, one of the world’s leading producers of fully automated wedge bonders. The main expertise of Hesse GmbH is the development, manufacturing and marketing of fully automated machines for interconnect and assembly technologies, including standard and product-specific automation solutions. Hesse GmbH was founded in 1986.

**Hi-Rel Laboratories**  
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[www.hrlabs.com](http://www.hrlabs.com)

Hi-Rel Laboratories, Inc. is an independently owned and operated corporation whose main concentration of activity is in the materials evaluation of the micro-electronic oriented phases of commercial, aerospace and defense industries. We specialize in the solution of process, production and application problems requiring knowledge and experience in such diverse fields as microelectronics and materials technology. Using proven analytical techniques such as metallography, light and scanning electron optics coupled with energy dispersive spectroscopy, FTIR and FIB, we are able to isolate and solve your materials related issues. The largest activity in the laboratory is the performance of DPA testing for a wide variety of commercial, civil, and military space programs. Hi-Rel was the first commercial test lab in the U.S. to perform DPA testing in a support role to “in house” OEM Laboratories beginning in 1972. We also have over 40 years of experience in performing root cause failure analysis of electrical and electronic components; from passive components like resistors, inductors and capacitors, to transistors, integrated circuits and hybrids. In response to industry requests, Hi-Rel also offers non-electrical testing upgrade services such as P.I.N.D., Real-time Radiography, Acoustic Microscopy, Hermeticity testing, and Dot Marking. All operations are carried out in our 100% ESD protected Upgrade services Lab.
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IBM Bromont is a world leader in semiconductor packaging technology, products and services. Now available to customers worldwide, we invite you to take advantage of our experience, system level mindset, and skilled engineers to execute your most advanced packaging and test solutions. Tap into our deep competencies as the industry continues to shift to custom SoCs and SiPs. IBM is known for its multi-chip packaging and heterogeneous integration. We offer full turnkey solutions from modelling and characterization through Burn-in and test. Our test capability spans digital, analog, mixed signal, RF as well as multi-site programming, test pattern conversion, and load board design. We provide high quality mechanical, thermal and electrical design (including high speed/SERDES, signal integrity and power integrity), ensuring effective execution of new and updated platforms. Services include materials and process characterization, optimized substrate design, and failure analysis while package platforms range from large organic substrates to 2.3D technologies. We invite you to discuss your next generation requirements – our developments in areas such as silicon photonics are unrivaled. IBM will help you deliver differentiated solutions while providing personalized, expert support to meet even the toughest application goals.

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Booth #: 401
www.integra-tech.com
Integra Technologies is a global leader in the sourcing, packaging, testing and characterization of highly specialized, mission-critical semiconductor components and related value-added services for high-reliability (“Hi-Rel”) applications where dependability and failure-free performance are of paramount importance.

JCET
Booth #: 300
www.jcetglobal.com
Founded in 1972, Jiangsu Changjiang Electronics Technology Co., Ltd. (“JCET”) is one of the top semiconductor packaging and test providers in the world and the largest provider in China. With full turnkey services encompassing design and characterization, wafer bump, packaging and test, JCET is a strategic partner for semiconductor companies across a broad range of markets and applications. The comprehensive packaging portfolio of JCET and its subsidiaries include discrete, leaded, laminate, flip chip, Molded Interconnect System, wafer level packaging and System-in-Package technologies. Headquartered in Jiangyin, Jiangsu, China, JCET has an extensive global manufacturing base with operations in China, Singapore and South Korea. JCET is a publicly-traded company that is listed on the Shanghai Stock Exchange. Further information is available at www.jcetglobal.com.

JFE Shoji Electronics Corporation
Booth #: 427
www.jfe-shoji-ele.co.jp/en
In this drastically changing society, JFE SHOJI ELECTRONICS CORPORATION serves as a partner to our customers by focusing on the future and utilizing our technical support abilities and system proposal skills. In this way, we not only handle a wide lineup of unique products such as semiconductor devices and various types of electronic equipment, but also continually offer solutions and support leveraging these products.

KEMLAB INC.
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www.kemlab.com
KemLab is a photoresist manufacturer and photolithography research and innovation company located in Woburn, Massachusetts. We are focused on quality and cost-competitive high-tech photosensitive imaging materials used in the electronics industry. We offer Positive and Negative photoresists for advanced packaging, MEMS & Microfluidics, integrated circuits, metal lift-off, compound semiconductors, LED, image reversal, diffraction gratings, and sensor markets.

King Industries
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King Industries, Inc. designs, manufactures, and distributes additives for small and large companies throughout the world who make their own branded products we all know and use like engine oils, greases, hydraulic oils, paints, coatings, and rubber goods.

For the most part, our products are used at a fraction of the total formula size, however their importance within the formula to maintain performance standards or properties is critical.
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Booth #: 522
www.kns.com
Kulicke & Soffa (NASDAQ: KLIC) is a leading provider of semiconductor packaging and electronic assembly solutions supporting the global automotive, consumer, communications, computing and industrial segments. As a pioneer in the semiconductor space, K&S has provided customers with market leading packaging solutions for decades. In recent years, K&S has expanded its product offerings through strategic acquisitions and organic development, adding advanced packaging, electronics assembly, wedge bonding and a broader range of expendable tools to its core offerings. Combined with its extensive expertise in process technology and focus on development, K&S is well positioned to help customers meet the challenges of packaging and assembling the next-generation of electronic devices.

Kyocera International Inc. -
Semiconductor Components Group
Booth #: 518
https://americas.kyocera.com/sc/
Kyocera International Inc. is a turnkey provider of ceramic substrates and packages, organic multilayer boards and PWBs, design capabilities and assembly services and materials.

LFG Micro
Booth #: 330
www.lfgmicro.com
We take pride in the company we keep. For 35+ years we’ve offered best in class for microelectronics and SMT equipment, materials, supplies and services. Technical sales backed up years in both quality and process engineering for semiconductor and multi-chip module microelectronic assembly with extensive experience in hermetic packaging all the way through assembly operations and environmental testing.

LINTEC OF AMERICA, INC.
Booth #: 222
www.lintec-usa.com
LINTEC is a worldwide leader in adhesive technologies. For 30+ years, LINTEC has created equipment and materials to solve difficult semiconductor process issues. With a catalog of hundreds of tapes and equipment, and decades of application experience, LINTEC is positioned to help. Whether you are looking for tape, equipment to mount, peel or UV cure - our staff stands ready to assist you to provide the Adwill Advantage.

LPKF Laser & Electronics
Booth #: 225
www.lpktusa.com
LPKF is a leading supplier of laser-based solutions for the technology industry. Our laser systems are vital in the manufacture of printed circuit boards, microchips, automotive parts, solar panels and many other components. Our machines allow our customers to manufacture smaller and higher-precision components. At the same time, the functionality of the components can be increased and new design options can be used. This creates products on the cutting edge of technology, both for the industry and for consumers.

Materion Corporation
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www.materion.com
We provide truly innovative material solutions to solve our customers’ most complex technical challenges. As the world changes, so do we. Our expert chemists and engineers are continually pushing the boundaries of advanced material solutions—innovating to ensure our customers are on the cutting edge in their respective markets. Our Materion team works tirelessly to serve our customers, staying at the forefront of technologies essential to their success.

Metalor Technologies USA
Booth #: 318
http://www.metalor.com/
Metalor is the worlds leading supplier of Silver Powders and Flakes to the automotive, electrical, renewable energy and electronic industries. Based on our proprietary technology with ionic purity levels of less than 10 PPM for Sodium, Potassium, & Chloride ions, Metalor products have found applications in a wide variety of applications: Polymer Thick Film (PTF), Membrane Touch Switches (MTS), formable gaskets, RFID antennas and Printed Electronics (PE) Silver Chloride and Silver flake for EKG and Blood Glucose biosensors. Electrically and thermally conductive die attach and adhesives for microelectronic applications. Ceramic interconnect, low temperature co-fired ceramic (LTCC) fabrication and passive component terminations. Engineered silver powders and flakes for Renewable Energy applications. (PV Shingling and HJT) Silver powders for spray-able inks, formable gaskets and other shielding materials. Metalor scientists & engineers are experts in surface chemistry and morphology control enabling joint development programs for optimizing Electrical/Thermal conductivity, dispensing properties and applications where precise Particle Size Distribution is required.

Micro Systems Technologies
Booth #: 315
https://www.mst.com
The Micro Systems Technologies group comprises four technology companies providing innovative electronic modules for high-reliability/high-performance markets, like medical technology, aerospace & defense, telecommunication and various industrial segments. The offering includes HDI/microvia PCBs in flex, rigid-flex and rigid technology, LCP substrates, ceramic substrates, electronic module design and manufacturing, advanced assembly and semiconductor packaging technologies.

MicroChem Corp
Booth #: 324
www.microchem.com
MicroChem Corp, now Kayaku Advanced Materials, Inc.TM, is a leading manufacturer of electronic materials for over 27 years focusing on providing innovative chemical solutions to the MEMS, microelectronic and semiconductor markets. Along with our exclusive distribution partnership with DuPont Electronic Materials, Kayaku Advanced Materials specializes in photoimageable epoxy; e-beam, bi-layer lift-off and dielectric resists; and a suite of ancillary lithography products, as well as plating and RDL materials for Advanced Packaging requirements. Kayaku Advanced Materials is a wholly owned subsidiary of Nippon Kayaku Co., Ltd. in Tokyo, Japan.
Featured Products: Photoresists, Dielectrics and RDL chemistries
MicroCircuit Laboratories
Booth #: 514
www.microcircuitlabs.com
MicroCircuit Laboratories provides customized development and production services for component level, low temperature hermetic package encapsulation and testing. Process deliverables exceed space level hermetic packaging requirements including leak testing, external visual testing, 80Au20Sn solder void testing, particle testing in addition to specific device, package and feedthrough stress requirements. MCL's capability includes materials design, class 10 cleanroom, pre-seal moisture removal processing, headspace control with inert 0.1 PPM H2O and O2; parallel seam sealing, testing with automated gross and fine leak testing, Particle Impact Noise Detection, Hitachi SEM, Real Time X-Ray, Olympus Opto-Digital Microscope, Mitutoyo CNC Measuring. www.microcircuitlabs.com

MicroScreen LLC
Booth #: 430
www.microscreenllc.com
MicroScreen LLC manufactures thick film screens and large format/solar screens in a wide variety of mesh and frame sizes, with highly controlled coating machines for uniform emulsion. Lines and spaces resolution down to 25um, and frame sizes from 3x4 to 43x59. MicroScreen also manufactures surface mount stencils for solder paste printing. All stencils are 100% inspected using ScanCheck AOI. Options include Nano Coating, PhD and Tension materials, step stencils, large format stencils for LED printing, and Wizard frame and Space Saver frame systems. MicroScreen is ITAR Registered and ISO 9001:2015 compliant. Screens and stencils now being manufactured at our NEW facility in New Braunfels, TX!

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5 Micron Die Bonder
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MRSI-M3
3 Micron Die Bonder

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YOUR STANDARD IN PRECISION AUTOMATION®
2019 Exhibitor Directory

Midas Technology
Booth #: 328
www.midastechnology.com
We’re a made-in-USA manufacturer, specializing in equipment used to rework or inspect “Hi-Rel” (high-reliability) microelectronics. Midas-pioneered advanced rework processes are now in common use worldwide, supported by a network of exclusive distributors and sales representatives. We provide two vital capabilities for Hi-Rel rework: “De-Lid” (removing lids from hermetic packages) and “Hot Gas” removing specific components with precision application of hot gas. Our systems accomplish this without changing package dimensions and without contamination, vibration or thermal damage.

Mini-Systems, Inc.
Booth #: 327
www.minisystemsinc.com
Mini-Systems, Inc. (MSI) is a world class leader in the manufacture of high-reliability passive components and hermetic packages. For over 50 years MSI has been delivering superior quality products for Military, Aerospace, Communications, Medical and Industrial applications. MSI manufactured products consist of precision: Thin/Thick film Chip Resistors/Networks, QPL Resistors to MIL-PRF-55342, MOS Chip Capacitors, Chip Attenuators, Full Line of RoHS Compliant Products, QPL Jumpers to MIL-PRF-32159/Mounting Pads, Glass-to-metal seal packages, and Custom Design Packages. Resistors values from 0.1 Ohm to 100 GOhm and operating frequencies up to 40 GHz. Absolute tolerances starting at 0.005% and TCRs as low as ±2ppm/°C. Sizes start at 0101. The hermetic packages meet or exceed all requirements for fine and gross leak inspection with precision application of hot gas. Our systems accomplish this without changing package dimensions and without contamination, vibration or thermal damage.

MRSI Systems
Booth #: 306
www.mrsisystems.com
MRSI Systems, part of Mycronic Group, is the leading manufacturer of fully automated, high-speed, high-precision and complex systems for die bonding. We offer our “one-stop-shop” solutions for research and development, low-to-medium volume production, and high volume manufacturing of photonic devices such as lasers, detectors, modulators, AOCs, WDM/EML TO-Cans, Optical transceivers, LiDAR, VR/AR, sensors, and optical imaging products. With 30+ years of industry experience and our worldwide local technical support team, we provide the most effective systems and assembly solutions for all packaging levels including chip-on-wafer (CoW), chip-on-carrier (CoC), PCB, and box packaging. For more information visit www.mrsisystems.com.

Midas Technology
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NorCom Systems, Inc.
Booth #: 209
www.norcomsystemsinc.com
NorCom Systems, Inc. is the exclusive manufacturer of OPTICAL LEAK TEST SYSTEMS for fine and gross leak inspection of hermetically sealed components. The NorCom 2020 series Optical Leak Test System, provides automated in-line, full matrix leak testing of hermetically sealed microelectronic, optoelectronic and wafer level devices. The 2020 eliminates the need for helium mass spectroscopy and gross leak bubble testing through use of a patented laser interferometer to simultaneously measure gross and fine leaks in hermetic devices. The system provides quantitative leak test results in the industry standard of cc-atm/second helium and is MIL STD compliant and CE marked. The NorCom 2020 is ideal for optoelectronic, semiconductor, MEMS, and PC board mounted devices for military, aerospace and telecommunication applications. Our advanced technology has made us the leader in leak test technology for over twenty years.

Neu Dynamics Corp
(Shared with Boschman & Sales and Service Inc.)
Booth #: 601
www.neudynamics.com
Neu Dynamics Corp is an ISO 9001:2015 certified Tool, Mold and Die manufacturer specializing in tooling and equipment used in building Semiconductors, Electronics components and a wide variety of the devices used in automotive, telecommunications, solar and medical applications. We further offer small to medium volume contract molding services for microelectronic packages such as BGA, QFN, MLP, optical components etc. We also have capability to provide insert molding services for inserts such as connectors. Our Sister company, NDC International offers a complete line of specialized assembly equipment built for today’s high-tech semiconductor assembly processes.

Midas Technology
Booth #: 328
www.midastechnology.com
We’re a made-in-USA manufacturer, specializing in equipment used to rework or inspect “Hi-Rel” (high-reliability) microelectronics. Midas-pioneered advanced rework processes are now in common use worldwide, supported by a network of exclusive distributors and sales representatives. We provide two vital capabilities for Hi-Rel rework: “De-Lid” (removing lids from hermetic packages) and “Hot Gas” removing specific components with precision application of hot gas. Our systems accomplish this without changing package dimensions and without contamination, vibration or thermal damage.

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# Schedule-at-a-Glance

## Monday, September 30

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM - 5:30 PM</td>
<td>Professional Development Courses</td>
</tr>
<tr>
<td></td>
<td>Track A: Wire Bonding &amp; Flip Chip - Room 201</td>
</tr>
<tr>
<td></td>
<td>Track B: Failure Analysis &amp; Thermal - Room 202</td>
</tr>
<tr>
<td></td>
<td>Track C: Packaging Integration &amp; Design - Room 203</td>
</tr>
<tr>
<td></td>
<td>Track D: Heterogeneous Integration &amp; Fan Out - Room 204</td>
</tr>
<tr>
<td>7:30 AM - 4:30 PM</td>
<td>Additive Manufacturing / Printed Electronics Workshop – co-located at IMAPS 2019 – Room 206</td>
</tr>
<tr>
<td>5:30 PM - 7:00 PM</td>
<td>WELCOME RECEPTION - Open to all IMAPS 2019 participants - Location: Boylston Hallway on the 3rd FLOOR sponsored by SemiDice / Analog Devices</td>
</tr>
</tbody>
</table>

## Tuesday, October 1

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 AM - 5:30 PM</td>
<td>Registration Open – Pre-Function Hall C</td>
</tr>
<tr>
<td>11:00 AM - 5:00 PM</td>
<td>Exhibit Hall Open – Exhibit Hall C</td>
</tr>
<tr>
<td>7:30 AM - 8:30 AM</td>
<td>Breakfast &amp; Coffee in Foyer (Third Floor) sponsored by SemiDice, Inc. / Analog Devices</td>
</tr>
</tbody>
</table>

### IMAPS 2019 Opening Plenary Session & Keynotes – Rooms 302-304-306 (Third Floor)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 AM - 11:30 AM</td>
<td>IMAPS Business Meeting, Awards, Exec Council, etc. Welcome to IMAPS 2019!</td>
</tr>
<tr>
<td>9:15 AM - 10:00 AM</td>
<td>Keynote Presentation 1 – Rooms 302-304-306 (Third Floor) PACKAGING INNOVATIONS FOR 5G ENABLEMENT sponsored by Samtec</td>
</tr>
<tr>
<td>10:00 AM - 10:30 AM</td>
<td>Coffee Break in Foyer (Third Floor) sponsored by EMD Performance Materials</td>
</tr>
<tr>
<td>10:30 AM - 11:15 AM</td>
<td>Keynote Presentation 2 – Rooms 302-304-306 (Third Floor) ARISTOTLE &amp; PACKAGING: MAKING THE PRODUCTS GREATER THAN SUM OF THEIR CHIPLETS sponsored by Samtec</td>
</tr>
<tr>
<td>11:00 AM - 2:00 PM</td>
<td>Student - Exhibitor Interchange sponsored by Honeywell</td>
</tr>
<tr>
<td>11:30 AM - 2:00 PM</td>
<td>Lunch &amp; Networking in Exhibit Hall sponsored by EMD Performance Materials</td>
</tr>
<tr>
<td>2:00 PM - 5:40 PM</td>
<td>Technical Presentations</td>
</tr>
</tbody>
</table>

### TPM1: High Density / System Solutions - Room 207

### TPM2: Wafer-level Fan Out & Advance RDL - Room 208

### TPM3: Package Reliability & High Reliability in Harsh Environments - Room 204

### TPM4: Flip Chip Technology - Room 203

### TPM5: Substrate Technology - Room 202

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:25 PM - 4:15 PM</td>
<td>Coffee Break in Exhibit Hall sponsored by Geib Refining Corp.</td>
</tr>
<tr>
<td>6:00 PM - 8:00 PM</td>
<td>InEMI/IMAPS Special Session - Room 207</td>
</tr>
</tbody>
</table>

## Wednesday, October 2

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 AM - 6:30 PM</td>
<td>Registration Open – Pre-Function Hall C</td>
</tr>
<tr>
<td>10:00 AM - 6:15 PM</td>
<td>Exhibit Hall Open – Exhibit Hall C</td>
</tr>
<tr>
<td>7:00 AM - 8:00 AM</td>
<td>Breakfast &amp; Coffee in Foyer (Third Floor) sponsored by SemiDice, Inc. / Analog Devices</td>
</tr>
<tr>
<td>8:00 AM - 8:55 AM</td>
<td>Day 2 Announcements &amp; Plenary Session Keynote 3 – Rooms 302-304-306 (Third Floor):</td>
</tr>
</tbody>
</table>
## Schedule-at-a-Glance

### Wednesday, October 2 (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:10 AM - 8:55 AM</td>
<td>Keynote 3: NAVIGATING THE PACKAGING CHALLENGES OF 5G AND BEYOND sponsored by Samtec</td>
</tr>
<tr>
<td>9:00 AM - 12:25 PM</td>
<td>Technical Presentations</td>
</tr>
<tr>
<td>WAM1: Modeling / CPI - Room 207</td>
<td></td>
</tr>
<tr>
<td>WAM2: Panel-level Fan Out - Room 208</td>
<td></td>
</tr>
<tr>
<td>WAM3: RF Packaging &amp; Antennas - Room 204</td>
<td></td>
</tr>
<tr>
<td>WAM4: 2.5D/3D Technologies - Room 203</td>
<td></td>
</tr>
<tr>
<td>WAM5: Novel Materials, Polymers &amp; Processes - Room 202</td>
<td></td>
</tr>
<tr>
<td>10:25 AM - 11:00 AM</td>
<td>Coffee Break in Exhibit Hall sponsored by Spectrum Semiconductor Materials, Inc.</td>
</tr>
<tr>
<td>12:25 PM - 1:45 PM</td>
<td>Lunch &amp; Networking in Exhibit Hall sponsored by MRSI</td>
</tr>
<tr>
<td>1:45 PM - 4:55 PM</td>
<td>Technical Presentations</td>
</tr>
<tr>
<td>WPM1: INVITED SESSION: Heterogeneous Integration Roadmap - Room 207</td>
<td></td>
</tr>
<tr>
<td>WPM2: WLCSP (Fan In and Advance Material) - Room 208</td>
<td></td>
</tr>
<tr>
<td>WPM3: Packaging for RF and High-Reliability Applications - Room 204</td>
<td></td>
</tr>
<tr>
<td>WPM4: Optical - Room 203</td>
<td></td>
</tr>
<tr>
<td>WPM5: Additive Manufacturing - Room 202</td>
<td></td>
</tr>
<tr>
<td>2:40 PM - 3:30 PM</td>
<td>Coffee Break in Exhibit Hall</td>
</tr>
<tr>
<td>5:00 PM - 6:15 PM</td>
<td>Happy Hour in Exhibits &amp; Foundation Auction Happy Hour sponsored by SemiDice, Inc. / Analog Devices</td>
</tr>
<tr>
<td>6:30 PM - 8:00 PM</td>
<td>Panel Session (w/drinks) – Rooms 302-304-306 (Third Floor) 5G Spectrum Challenge: Key Packaging and Test Considerations for mmWave and sub 6GHz</td>
</tr>
</tbody>
</table>

### Thursday, October 3

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 AM - 8:00 AM</td>
<td>Breakfast &amp; Coffee in Foyer (Third Floor) sponsored by SemiDice, Inc. / Analog Devices</td>
</tr>
<tr>
<td>8:00 AM - 8:55 AM</td>
<td>Day 3 Announcements &amp; Plenary Session Keynote 4 – Rooms 302-304-306 (Third Floor):</td>
</tr>
<tr>
<td>8:10 AM - 8:55 AM</td>
<td>Keynote 4: 5G RF POSSIBLE TEST INSERTION SCENARIOS AND TEST STRATEGIES sponsored by Samtec</td>
</tr>
<tr>
<td>9:00 AM - 11:40 AM</td>
<td>Technical Presentations</td>
</tr>
<tr>
<td>THAM1: IoT / Sensors/ Passives - Room 207</td>
<td></td>
</tr>
<tr>
<td>THAM2: INVITED SESSION: Future Semiconductor Packages for AI Hardware - Room 208</td>
<td></td>
</tr>
<tr>
<td>THAM3: High Reliability Semi-fab and Processing - Room 204</td>
<td></td>
</tr>
<tr>
<td>THAM4: BUMP / Interconnect - Room 203</td>
<td></td>
</tr>
<tr>
<td>THAM5: Device Interconnections - Room 202</td>
<td></td>
</tr>
<tr>
<td>9:55 AM - 10:15 AM</td>
<td>Coffee Break in Foyer</td>
</tr>
<tr>
<td>11:45 AM - 12:45 PM</td>
<td>Posters &amp; Pizza - Pre-Function Hall C sponsored by Northrop Grumman</td>
</tr>
<tr>
<td>12:45 PM</td>
<td>Closing Remarks</td>
</tr>
<tr>
<td>1:30 PM</td>
<td>MIT.nano Tour departs</td>
</tr>
</tbody>
</table>
Nordson DAGE
Booth #: 210
www.nordsondage.com
The Nordson DAGE Prospector™ is a multipurpose micro mechanical tester designed for testing interconnects, components and entire devices. It is suited for R&D and New Product Introduction engineers working in the micro-electronics industry. Built on Dage’s heritage of bondtesters, the Prospector aims to be an invaluable tool for finding unique and complex failure modes. The launch of this new machine brings a host of new technologies together for the first time. Within Prospector we have the ability to perform mechanical testing in combination with thermal, electrical, acoustic and optical measurements. This means it is now possible to thermally cycle and mechanically test simultaneously in a reproducible manner. The thermal cooler is capable of sweeping between -40 and +155 while creep, shear or bi-directional fatigue is performed. On top of the traditional tests such as wirepull, ball shear, die shear, Cu pillar pull we have added a range of new tests such as scratch and hardness. Prospector can also perform peel, tensile, compression and 3-point bending tests while external meters read live values simultaneously (i.e. resistance or capacitance). The integrated camera systems mean failure modes can be recorded from multiple perspectives with each test recording a video or automatically.

Nordson SONOSCAN
Booth #: 223
www.nordsonsonoscan.com
Founded in 1973 and headquartered in Chicago, IL, Nordson SONOSCAN is a worldwide leader in the Acoustic Micro Imaging (AMI) technology. Nordson SONOSCAN manufacturers and markets acoustic microscope instruments and accessories to nondestructively inspect and analyze products. Our C-SAM scanning acoustic microscope provides unmatched accuracy and robustness setting the standard in AMI for the inspection of products for hidden internal defects such as poor bonding, delaminations between layers, cracks and voids. In addition, Nordson SONOSCAN offers analytical services through regional testing laboratories in Asia, Europe and the U.S. and educational workshops for beginners to advanced on AMI technology.

Noritake
Booth #: 515
https://www.noritake.co.jp/eng/company/jigyoudo/ceramic_material
Over 100 years of experience, lessons learned, and know-how. Noritake is the leading industrial ceramics and materials company in all of Asia, United States and other points locally. This allows Noritake and its partners to share in development and innovation. New innovations include, any kinds of ceramics PCB and the materials for all Electronics application.

NTK Technologies, Inc.
Booth #: 207
www.ntktech.com
NTK Technologies is a leader in IC Ceramic Packaging. With global service centers, NTK offers a wide range of packaging materials and package design services for Medical, Automotive, SiP/MCM, Opto, RF, CMOS Image Sensors, Hi-Rel, Satellite, FCBGA, FCCSP, FPGA, CPU and MPU applications. Monolithic package designs for Medical and Mobile applications. Optimum package designs for 10G, 40G, and 100/400G. Large and small scale Ceramic STFs are manufactured for high-speed/high density probe-cards for semiconductor wafer test. Large and small scale ceramic substrates can be configured with narrow pitches and a wide range of pin count capabilities. NTK supports fast paced product cycle times with our advanced design and production flows featuring high precision processes for fast turn-around with the highest quality.

Oneida Research Services, Inc.
Booth #: 217
www.orslabs.com
Oneida Research Services, Inc. (ORS) offers specialized laboratory testing services to support the microelectronic, telecommunication, aerospace, automotive, medical, and defense industries. Our services focus on research, development and quality control of our client’s products: exclusively for our client. ORS strives to develop long term relationships with our clients through unwavering professionalism, flexibility and attention to detail. 1-855-ORS-LABS / www.orslabs.com

Palomar Technologies Inc.
Booth #: 212
www.palomartech.com
Palomar Technologies is a leading supplier of automated microelectronic assembly systems and contract assembly services, specializing in precision die attach, wire bonding and vacuum reflow processes. High-precision assembly systems enable customers to increase yield and reduce costs in the manufacturing of microelectronic, photonic, RF/wireless and power module packages. Palomar, and its SST Vacuum Reflow Systems subsidiary, deliver stand-alone machines and custom integration of multiple systems and processes into complete automated turnkey assembly lines. The end-result is a total solution that improves production quality and yield, reduce assembly times, and increase profits. With its headquarters in the USA, Palomar provides direct sales, service, and application support in Europe and Asia.

Particle Measuring Systems
Booth #: 428
www.pmeasuring.com
Particle Measuring Systems specializes in viable and nonviable particle counters that measure and monitor contamination levels in clean and controlled environments. Since 1972, our knowledgeable and experienced team has been developing innovative technologies to advance the cleanroom monitoring industry. Led by our technology which provides accurate and reliable results and information for our clients, Particle Measuring Systems is one of the world’s leading companies and manufacturers for particle counting instruments, and molecular and microbial monitoring.

PCB Technologies
Booth #: 339
www.pcb.co.il
PCB Technologies Ltd; is a leader in the manufacturer of PCB/PCBA. Located within Israel, with offices in the USA & Germany; We are one of the world’s top producers of Rigid, Rigid-flex, Flex and Hybrid Solutions. PCBT serves the global market sectors within Mil/Aero/Defense/Medical & Industrial. Maintaining a full complement of industry certifications including; NADCAP, AS9100, EAU & ITAR compliancy with the Department of State. We support our customers from product concept, NPI, pre-production to full production; with complete turnkey also available. Our portfolio of products falls under the High Density / High Reliability realm of the product spectrum. With expertise in complex stack-ups and RF/Microwave we are well adept at meeting the high demands of todays market.
Perfection Products, Inc.
Booth #: 317
www.perfection-products.com
Perfection Products manufactures Process Magazines and Carriers. Such products are Film Frames, Grip Rings, Magazines for Frames and Rings. Lead Frame Magazines, Process Boats (formed & flat style) & Magazines, Antistatic Shippers for Frames and Rings. Also, available are the 12.0” (300 mm) Wafer Frames and Magazines. Perfection – Accept Nothing Less

Plasmatreat
Booth #: 431
www.plasmatreat.com
Plasmatreat manufactures atmospheric plasma equipment for surface preparation requirements of microelectronics packaging. Surface cleanliness, wettability and adhesion needs are met with this automated in-line plasma technology that increases manufacturing throughput, reduces factory floor space and lowers the cost of normal vacuum plasma batch processing. Come to the Plasmatreat booth to see this unique manufacturing solution. A live operational system will be on site demonstrating the treatment of pcb board material for wettability.

Protavic America
Booth #: 509
www.protavicamerica.com
Protavic America has been supplying adhesives and encapsulants to the electronic and assembly market since 2001. Our expanding technical toolbox includes epoxy, silicone, acrylic, urethane, polyimide, and hybrid chemistries. Protavic’s technical team develops and formulates a broad portfolio of electrically and thermally conductive adhesives, potting compounds, conformal coatings, underfills, UV light cure materials, polymer inks, and acoustic materials. With development and manufacturing locations in the U.S., Europe, and Asia, Protavic supports a variety of applications in various markets including automotive, consumer electronics, medical, smart cards, semiconductor and LED packaging, oil and gas industry, ultrasonic probes, and aerospace. Our committed team is ready to support your electronic material requirements. Visit our website at www.protavicamerica.com for additional information.

Pyromet
Booth #: 508
www.pyromet999.com
Pyromet is a privately owned Precious Metals Manufacturer and Refiner of Silver, Gold, and Platinum Group Metals. We manufacture anodes and other silver products for many industries including; automotive, electronics, aerospace, medical, investment, and jewelry to name a few. Since 1969, Pyromet is the trusted name in Precious Metals and Precious Metals Management. Silver’s low contact resistance, along with its high electrical and thermal conductivity, makes it an excellent choice of materials for the Microwave/RF industry. Along with its high quality products, Pyromet is also a leader for the refining of precious metals. Founded upon a patented process, Pyromet strives to maintain and develop the latest chemistries and methods for refining. Through one of a kind Film Wash Processes, the latest in Thermal Reduction and Electrolytic capabilities, and proprietary equipment and techniques, Pyromet offers our customers maximum and precious metal yields and the highest quality products. We believe that TRUST (Transparency, Responsibility, Uncompromised quality, Self Initiative, and Team work) is Pyromet’s core values. Come visit us at booth number 508 to see what Pyromet has to offer.

Quik-Pak
Booth #: 238
www.icproto.com
Quik-Pak Santa Clara, CA United States http://www.icproto.com; www.promex-ind.com Quik-Pak, a division of Promex, provides IC packaging, assembly, and wafer preparation services in its ISO 9001:2015, 13485: 2016 and ITAR registered facility in San Diego, California. Quik-Pak manufactures overmolded QFN packages and pre-molded air cavity QFN packages that provide a fast, convenient solution for prototype to full production needs. Same-day assembly services are provided to shorten time to market. Due to customer demand, Quik-Pak now provides high volume IC assembly services utilizing its automated assembly and molding equipment for production runs in the 10,000s of units. In addition to wire bond assembly, the company assembles flip chips, BGAs, stacked die, sensors, MEMS, and chip-on-board and chip-on-flex assemblies.

Raytheon
Booth #: 426
www.raytheon.com
Raytheon Company is a technology and innovation leader specializing in defense, civil government and cybersecurity solutions. Founded in 1922, Raytheon provides state-of-the-art electronics, mission systems integration, C5I™ products and services, sensing, effects and mission support services. Raytheon is headquartered in Waltham, Massachusetts.

Reldan Metals Co., Division of Abington Reldan Metals LLC
Booth #: 425
www.armetals.com
Reldan Metals Co. Div. of Abington Reldan Metals, LLC refinery has been operating and handling precious metal scrap for over 35 years. Our goal is to maximize the value of your precious metal scrap. The company's State of the Art, LEED certified facility is ISO 14001:2004 certified, OHSAS 18001:2007, e-Steward 2.0:2013 , R2:2013 certified, GreenCircle certified , CHWMEG reviewed and ITAR registered. LEED certification sets forth strict standards for energy-efficient and environmentally responsible workplaces. Abington Reldan Metals reflects its commitment to environmental sustainability at every step of the refining process. Our expertise, knowledge and skills help us serve many customers in an ever changing industry as well as providing the highest level of service for your precious metal recovery program.

Riv Inc - Precision Printing Screens
Booth #: 325
www.rivinc.com
Riv Inc. is a leading manufacturer of high quality printing screens; we cater to the Thick Film Hybrid Microelectronics, Flex Circuitry, Membrane Switches, RFID Antennas, Solar Cell Manufacturing and any other related industries. Since 1986 we have been helping our customers Print with Quality. With our 32 years of experience we can help screen printers find the perfect combination of Mesh and Emulsion maximize their printing skill. We use nothing but the highest quality material available in the industry. Service and Quality is what Riv Inc is. We look forward to helping you.
Rochester Electronics, LLC  
**Booth #: 501**
www.rocelec.com

Rochester Electronics, The Semiconductor Lifecycle Solution™ Inventory lifecycle solutions: Rochester is a 100% authorized distributor of over 70 leading semiconductor manufacturers. With over 15 billion authorized devices in stock, Rochester can deliver the solution you need today. Whether it’s a product that is EOL, is facing a lifetime buy, or is simply facing long factory lead times, let us know how we can help. Continuing source products: Rochester is a licensed manufacturer of devices no longer produced by the original component manufacturer, offering continuing source capability of over 20,000 products in a wide variety of packaging. If you have a critical device requiring continuing support, call Rochester today. Manufacturing services: Rochester is a qualified manufacturing service provider to many semiconductor manufacturers and OEM’s alike. With extensive design, assembly, packaging, test operations in-house, we provide high quality and professional services. Contact us about your needs today. Visit us at the show for more information or online at www.rocelec.com. We are located globally for local service and support.

Royce Instruments

**Booth #: 506**
www.royceinstruments.com

Consider Royce Instruments your preeminent supplier for Bond Testing and Die Sorting equipment. Our equipment provides outstanding accuracy to meet a full range of bond test and die sorting requirements. Because bond testing and die sorting are our sole focus, we are able to dedicate ourselves to developing and supplying leading, high-precision solutions for our customers. The Royce 600 Series Bond Test Instruments brings unparalleled networking capability and scalability to the bond test market. With a choice of 3 bond testers, Royce offers an instrument solution to meet the evolving needs of manufacturers and institutions worldwide. Royce Die Sorters (DE35-ST, AutoPlacer and AP+) offer semi-automatic and fully-automatic die sorting solutions for today’s challenging applications, including die as small as 200 um square or 50 um thick. The AP+ has the capability to handle the output mediums your process requires (carrier tape, waffle pack, Gel-Pak®, JEDEC tray, film frame, grip ring, and/or custom trays) while maintaining input to output traceability at the die level. Come visit us at booth #506 to learn more!

Rudolph Technologies, Inc.

**Booth #: 423**
www.rudolphtech.com

Rudolph Technologies collaborates with its customers around the globe to develop innovative, data-driven solutions that increase the yield and profitability of their microelectronics and display manufacturing operations. Rudolph’s comprehensive, state-of-the-art inspection, measurement, data analysis and lithography solutions for semiconductor manufacturing and advanced packaging processes accelerate product and process development, increase yields and reduce costs to enable its customers to be first-to-market with premium products at premium prices. Headquartered in Wilmington, Massachusetts, Rudolph supports its customers with a worldwide sales and service organization.

Sales & Service, Inc.

(Shared with Boschman & Neu Dynamics)
**Booth #: 601**
www.salesandserviceinc.com

Realizing the need for a service and a relationship based representative company, Bill Winn founded Sales & Service Incorporated in 1989. Located in the heart of Orange County, SSI has emerged as a proven and dedicated manufacturer’s representative for over 20 years. Our mission is to provide an exceptional level of service that is mutually beneficial to our customers and principals. We at SSI understand the importance of communication and strive to provide a smooth channel of correspondence that ensures a productive and supportive link to facilitate the flow of business. At SSI, all of our efforts are focused towards building strong, long term relationships between ourselves, the customer, and the principal. SSI’s product line includes industry leading consumable products and equipment for the packaging, testing, and reliability areas of the Semiconductor, Aerospace, and Hybrid industries. SSI takes great care in selecting our partners and are proud to offer products from these companies.

Samtec

**Booth #: 307**
www.samtectech.com

Known as the worldwide service leader for electronic connectors and cables, Samtec has focused on leading edge High Speed Products and services for the last two decades. The tremendous success in these areas has driven Samtec to further move into faster and smaller arenas. We now provide full turnkey solutions for your entire signal chain from chips, through substrates, packages, connectors and cables. Samtec can help you design, model, layout, and assemble your products. Samtec continues to focus on our industry- leading Firefly™ mid-board optical/photonic engine design and manufacturing. In addition, Samtec has new capabilities in glass interposers and substrates with low loss electrical characteristics for RF Front-End devices, biomedicals, military/aerospace, sensors, connectivity, and industrial applications.

SemiDice, Inc. / Analog Devices

**Booth #: 319**
www.semidice.com

SemiDice is the global leader for wafer and bare die components. Lines including both active and passive devices including, but not limited to: Adesto Tech, Analog Devices, Atmel, Fairchild Semi, Linear Tech, Micron, MicroChip, Microsemi, NXP, ON Semi, Texas Instruments, Vishay, Wolfspeed and more. SemiDice is the only wafer processor with a High Reliability Division dedicated to providing due to the military, aerospace, medical and robust industrial market segments.

Siltronics

**Booth #: 229**
www.siltronics.com

Leader in design and assembly of SiP Modules for Silicon Photonics, IoT, Carbon Sensors, LiDAR, Bio-Medical, Networking and Defense application!
**SMART Microsystems**  
**Booth #: 523**  
www.smartmicrosystems.com  
SMART Microsystems works with Design Engineers who need high-quality, low volume microelectronic sub-assemblies for their innovative new products. As North America’s leading full-service microelectronic assembly supplier, SMART Microsystems takes complete responsibility for custom process development for your new design, taking it from prototyping through launch in less time, and at a lower cost, than other package assembly suppliers.

**Specialty Coating Systems**  
**Booth #: 531**  
www.scscoatings.com  
Specialty Coating Systems is the leader in Parylene conformal coating services and technologies with 19 worldwide locations and over 45 years of experience. Ultra-thin and pinhole-free, SCS Parylenes offer unmatched protection to components in the electronics, aerospace, defense, transportation and medical device industries. Parylene coatings provide excellent moisture, chemical and dielectric barrier properties, thermal stability, corrosion protection and controlled thickness down to 500 angstroms. For high temperature applications, SCS designed Parylene HT™ to protect components in harsh environments with thermal stability up to 450°C (short-term) and excellent UV stability. SCS’ new halogen-free Parylene, ParyFree®, offers manufacturers the same host of beneficial properties that they receive from other Parylenes, but with improved barrier properties over traditional halogen-free variants. In addition, SCS ParyFree-coated electronics have been shown to meet IPX7 and IPX8 test requirements, demonstrating their usefulness to provide waterproof protection to electronic device and components.

**Stellar Industries Corp**  
**Booth #: 331**  
www.stellarind.com  
Stellar’s custom products include precision lapped and polished electronic grade ceramics composed of Alumina, Beryllium Oxide, Aluminum Nitride, and other specialty dielectrics. Stellar also provides custom/design specific metallization services on these ceramics using a variety of thick film, thin film, refractory, plated, and Direct Bond Copper technologies.

**StratEdge Corporation**  
**Booth #: 234**  
www.stratedge.com  
StratEdge designs and manufactures high performance semiconductor packages as well as provides chip assembly and test services. We have a complete line of post-fired and molded ceramic semiconductor packages operating from DC to 50+ GHz. Our patented electrical transition designs give StratEdge packages exceptionally low electrical losses. StratEdge specializes in packaging high frequency and very high power Gallium Arsenide (GaAs) and Gallium Nitride (GaN) devices. We feature two options for packaging GaN and high-power semiconductor devices—the LL family of leaded laminate copper-moly-copper (CMC) base packages and the new off-the-shelf line of molded ceramic packages that can be configured to meet the requirements for chips with frequencies up to 18 GHz. These packages dissipate heat and come in fully-hermetic versions in over 200 standard outlines. StratEdge offers complete automated assembly and test services in Santee, CA for these packages, including gold-tin solder die attach. StratEdge is an ISO 9001:2015 facility.

**SUSS MicroTec**  
**Booth #: 228**  
www.suss.com  
SUSS MicroTec is a leading supplier of equipment and process solutions for micro-structuring in the semiconductor industry and related markets. In close cooperation with research institutes and industry partners SUSS MicroTec contributes to the advancement of next-generation technologies such as 3D Integration and Nanoimprint Lithography as well as key processes for MEMS and LED manufacturing. These include lithography, permanent and temporary wafer bonding, mask cleaning and laser ablation. With a global infrastructure for applications and service SUSS MicroTec supports more than 8,000 installed systems worldwide. SUSS MicroTec is headquartered in Garching near Munich, Germany, with its North American headquarters in Corona, CA.

**SVXR**  
**Booth #: 510**  
www.svxr.com  
SVXR’s mission is to bring data rich transmissive inspection techniques and advanced analytics to the semiconductor packaging and microelectronics manufacturing floor. High resolution – Automated X-ray Inspection (HR-AXI) is a new category of inline transmissive inspection and metrology equipment designed to bring front of line semiconductor fab-like inspection to the backend manufacturing line.

**TechSearch International, Inc.**  
**Booth #: 312**  
techsearchinc.com  
TechSearch International, Inc. has a 31-year history of market and technology trend analysis focused on semiconductor packaging, materials, and assembly. Research topics include WLP, FO-WLP and panel-level processing, Flip Chip, CSPs, BGAs, 3DICs, Si Interposers, System-in-Package (SiP) and automotive electronics, and power devices. In conjunction with SavanSys Solutions, wire bond, flip chip, WLP, and 3D IC cost models are offered. Multi-client and single client consulting services are offered. TechSearch International professionals have an extensive network of more than 19,000 contacts in North America, Asia, and Europe and travel extensively, visiting major electronics manufacturing operations and research facilities worldwide.

**Torrey Hills Technologies, LLC**  
**Booth #: 236**  
www.torreyyhillstech.com  
Your best source for low cost CuW, CuMo and Cu/Mo/Cu heat sink materials, and for reliable belt furnaces!
TRIMECH
Booth #: 513
www.trimech.com
TriMech provides thousands of engineering teams with a range of 3D design and rapid prototyping solutions that work hand-in-hand from sketch to manufacturing.
We offer the entire SOLIDWORKS product portfolio, Stratasys 3D printers, rapid prototyping services and other engineering solutions servicing the East Coast from Maine to Florida. We boast the largest and most knowledgeable engineering team in the country, providing world-class technical support, robust training, consulting and implementation services to our clients.

UnitySC
Booth #: 500
www.unity-sc.com
UnitySC European Leader in Metrology & Inspection - Innovative Technology and Solution for Semiconductor. UnitySC offers a wide product range for defect detection down to nanometer range at very high throughput. Full automatic equipment using leading edge technologies are designed to fulfill high volume manufacturing requirements. By an extensive mastering of optical technologies, UnitySC metrology equipment offers a unique solution for high accuracy dimensionnaal metrology.

UTZ Technologies
Booth #: 619
www.utz.com
For over 50 years UTZ has been servicing the thick film with its premium Hybrid screens. If your are printing diodes, solar cells, conductive inks, we can help. Utz also has 5 SMT lasers in the USA for the assembly and pcb markets as well. visit us at www.utz.com.

Yincae Advanced Materials, LLC
Booth #: 530
www.yincae.com
YINCAE Advanced Materials is a leading manufacturer and supplier of high-performance coatings, adhesives and electronic materials used in the microchip & optoelectronic devices. YINCAE products provide new technologies to support manufacturing processes from wafer level, to package level, to board level and final devices while facilitating smarter and faster production and supporting green initiatives.
Products:
- Solder Joint Encapsulants
- Underfill Materials
- Die Attach Adhesives
- Thermal Interface Materials
- Optical Adhesive
- Board Level Assembly

ZESTRON Americas
Booth #: 211
www.zestron.com/us/home.html
Headquartered in Manassas, Virginia, and operating in more than 35 countries, ZESTRON is the globally leading provider of high precision cleaning products, services and training solutions for the electronics and semiconductor manufacturing industries. With eight worldwide technical centers and the largest team of engineers focused on high precision cleaning, ZESTRON’s commitment to ensuring that its customers surpass even the most stringent cleaning requirements is without equal. For additional information and to tour one of our unparalleled technical centers, please visit www.zestron.com.
IMAPS Society Awards - 2019 Winners

Lifetime Achievement Award
Dr. Ephraim Suhir

Daniel C. Hughes, Jr. Memorial Award
Howard Imhof

William D. Ashman – John A. Wagnon Technical Achievement Award
Dr. Eric Beyne

Fellows of the Society

Dr. Kuo-Ning Chiang
Dr. Chuan Seng Tan

Corporate Recognition Award
EMD Performance Materials

Sidney J. Stein International Award
E. Jan Vardaman

Outstanding Educator Award
Benson Chan

Emerging Leadership Award
Dr. Zhenzhen Shen

President’s Award
Bill Ishii
## Technical Program At-a-Glance

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<td><strong>Wafer Level / Panel Level</strong>&lt;br&gt; (Advanced RDL) Track Chairs: Beth Keser, Intel; Rey Alvarado, Qualcomm</td>
<td><strong>High Performance &amp; High Reliability</strong> Track Chairs: Erica Folk, Northrop Grumman; Ivan Ndip, Fraunhofer IZM</td>
<td><strong>Advanced Package (Flip Chip, 2.5D, 3D, Optical)</strong> Track Chairs: Sandeep Sane, Intel; Frank Eberle, Northrop Grumman Corp.; Jaimal Williamson, Texas Instruments</td>
<td><strong>Advanced Process &amp; Materials (Enabling Technologies)</strong> Track Chairs: Benson Chan, Binghamton Univ.; Mark Hoffmeyer, IBM</td>
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<th><strong>Tuesday, October 1, 2019</strong></th>
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<td>THAM1: IoT / Sensors/ Passives &lt;br&gt;Session Chairs: Santosh Kudtarkar, Analog Devices; Fang Luo, University of Arkansas</td>
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<td>TPM5: Substrate Technology &lt;br&gt;Session Chairs: Sylvain Pharand, IBM; Aric Shorey, Mosaic Microsystems</td>
<td>WAM5: Novel Materials, Polymers &amp; Processes &lt;br&gt;Session Chairs: Kevin Demartini, DuPont; Jeff Golro, Innocentrix</td>
<td>THAM5: Device Interconnections &lt;br&gt;Session Chairs: Martin Schneider, Ramelow IZM Fraunhofer; Michael McKeown, Hesse Mechatronics</td>
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**Posters & Pizzas - 11:45 AM - 12:45 PM - Pre-Function Hall C**
Technical Program

Tuesday, October 1, 2019

7:00 AM - 5:30 PM – Registration Open – Pre-Function Hall C

11:00 AM - 5:00 PM – Exhibit Hall Open – Exhibit Hall C

7:30 AM - 8:30 AM – Breakfast & Coffee in Foyer

IMAPS 2019 Opening Plenary Session & Keynotes – Rooms 302-304-306 (Third Floor)

8:30 AM  - 11:30 AM:
IMAPS Business Meeting & Awards Ceremony
Rich Rice, President

Welcome to IMAPS 2019!
Curtis Zwenger, Amkor Technology, Inc., General Chair, IMAPS 2019

9:15 AM - 10:00 AM: Keynote Presentation 1 – Rooms 302-304-306 (Third Floor):
PACKAGING INNOVATIONS FOR 5G ENABLEMENT
Ahmer Syed

Ahmer Syed is a Vice President of Engineering at Qualcomm and leads a team responsible for packaging technology development and implementation in mass production. Prior to joining Qualcomm in 2013, Ahmer served as VP engineering at Amkor and led technical teams in simulations and board level reliability. Ahmer has over 28 years of packaging industry experience and has authored more than 50 technical publications and articles on simulations, board level reliability, electromigration, and surface mount technologies for advanced packaging solutions.

10:00 AM - 10:30 AM: Coffee Break

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IMAPS 2019 • 52nd Annual Symposium on Microelectronics
Tuesday, October 1, 2019...continued

10:30 AM - 11:15 AM: Keynote 2:

Keynote Presentation 2 – Rooms 302-304-306 (Third Floor):

ARISTOTLE & PACKAGING: MAKING THE PRODUCTS GREATER THAN SUM OF THEIR CHIPLETS

With ever shrinking advanced CMOS nodes and evolution of systems with increasing complexity, the traditional SoC paradigm is facing extensive challenges in terms of yields and heterogeneity. The emerging industry solution to this has been to partition the SoCs into smaller units, with each unit performing a certain (though exclusive) function. This drove the birth of “chiplets”. With advent of chiplets, the traditional function of packaging as an after-thought to chip development has got a revolutionary face-lift. Packaging is now enabling interconnects to replace on-chip global interconnects. The onus now is on packaging to get the chiplets to integrate and communicate with each other such that the net performance is equivalent to or better than SoC. This has spawned a renaissance in field of semiconductor packaging, with newer multi-die packaging technologies being productized to realize newer and better interconnects. Some examples of these emerging technologies include advanced flip-chip, 2.5D, 2.1D, 3D, Wafer Level Fan-Out, and Bridge Technologies. AMD is at forefront of chiplet technologies, with extensive 7nm chiplet based product portfolio catering to the HPC market. This talk will discuss the current state of chiplet packaging technologies.

Milind Bhagavat, Fellow, AMD

Milind Bhagavat is a AMD Fellow managing the Advanced Packaging Technology Group with charter to develop novel Packaging Technologies for High Performance Computing. Through his 18+ years in the industry, Milind has served in various technology management and product development roles at leading semiconductor companies like Apple, Broadcom, & Analog Devices. He has a number of issued as well in-process US and international patents encompassing advanced packaging, MEMS & silicon fabrication. Milind has a PhD from SUNY @ Stony Brook NY and a MTech degree from Indian Institute of Technology, Madras India.

11:15 AM  - 11:30 AM – Rooms 302-304-306 (Third Floor):

What’s Ahead this Week & IMAPS Future Events

Curtis Zwenger, Amkor Technology, Inc., General Chair, IMAPS 2019

11:30 AM - 2:00 PM:  Lunch & Networking in Exhibit Hall

The IMAPS Microelectronics Foundation will host the FIRST Robotics Competition Team 4909 – Bionics of Billerica Memorial High School for the annual high school–exhibitor interchange

Tuesday, October 1st • 11am-2pm

Students from Billerica Memorial High School’s FIRST team will be on the show floor on Tuesday, October 1st from 11am-2pm. They will demonstrate their most current robot, discuss their program and outreach efforts, then meet and greet with exhibitors and industry leaders.

Registered university students are invited to pose for a complimentary professional headshot on Wednesday, October 2nd from 5pm-6pm. These professional photos are complimentary, courtesy of the IMAPS Microelectronics Foundation. Check in at the registration desk on Wednesday for the specific shoot location. The final edited photograph will be sent via email after the conclusion of the conference.
**IMAPS 2019 TECHNICAL TRACKS:**

**SESSIONS:**

**ROOM 207**

**TPM1:**
High Density / System Solutions  
Session Chairs: Tarak Raikar, Qorvo; Kristen Parrish, Wolfspeed  
091 Assembly challenges with Flip Chip Multi-die and Interposer-based SiP Modules  
Akhilesh Singh, NXP Semiconductors (Kevin Sullivan, George Leal, Tony Gong)

**TPM2:**
Wafer-level Fan Out & Advance RDL  
Session Chairs: Tong Cui, C&B Tech; Chris Selle, SPIE  
092 Low Temperature Curable Low Df Photosensitive Polyimide  
Masao Tomikawa, Toray Industries Inc. (Hitoshi Araki, Yohi Kiuchi, Ogasawara Hitoshi, Masaya Jukel, Akira Shimada)

**TPM3:**
Package Reliability & High Reliability in Harsh Environments  
Session Chairs: Zhenzhen Shen, Baker Hughes GE; Konstantin Yamnitskiy, Intel  
126 Evaluation of Reliability of Lead-free Solders in Silver-free Hybrids  
Zhenzhen Shen, Baker Hughes GE (Aleksy Reiderman)

**TPM4:**
Flip Chip Technology  
Session Chairs: Frank Eberle, Northrop Grumman Corp.; Jaimal Williamson, TI  
003 Study to Lower Cu Pillar Flip-Chip Failure Rate  
Shannon Pan, Qorvo (Bong Rosario, Joseph Holyoak, Mohsen Haji-Rahim, Gene Lambird, Yong Wang, Kendra Lyons, Todd Johnson, Paul Makowenskyj, Brian Myers)

**TPM5:**
Substrate Technology  
Session Chairs: Sylvain Pharand, IBM; Aric Shorey, Mosaic Microsystems  
030 Low Thermal Resistance Packaging for High Power Electronics  
Naga Shashidhar, Corning Inc. (Abhijit Rao)

**ROOM 208**

**TPM1:**
High Density / System Solutions  
Session Chairs: Tarak Raikar, Qorvo; Kristen Parrish, Wolfspeed  
097 Prospects for Automotive SiP Modules Applying IC Assembly and Packaging Technology  
Tomohiro Furukawa, Shinko Electric Industries Co., Ltd.

**TPM2:**
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030 Low Thermal Resistance Packaging for High Power Electronics  
Naga Shashidhar, Corning Inc. (Abhijit Rao)

**ROOM 202**

**TPM1:**
High Density / System Solutions  
Session Chairs: Tarak Raikar, Qorvo; Kristen Parrish, Wolfspeed  
097 Prospects for Automotive SiP Modules Applying IC Assembly and Packaging Technology  
Tomohiro Furukawa, Shinko Electric Industries Co., Ltd.

**TPM2:**
Wafer-level Fan Out & Advance RDL  
Session Chairs: Tong Cui, C&B Tech; Chris Selle, SPIE  
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High Density / System Solutions  
Session Chairs: Tarak Raikar, Qorvo; Kristen Parrish, Wolfspeed  
097 Prospects for Automotive SiP Modules Applying IC Assembly and Packaging Technology  
Tomohiro Furukawa, Shinko Electric Industries Co., Ltd.

**TPM2:**
Wafer-level Fan Out & Advance RDL  
Session Chairs: Tong Cui, C&B Tech; Chris Selle, SPIE  
092 Low Temperature Curable Low Df Photosensitive Polyimide  
Masao Tomikawa, Toray Industries Inc. (Hitoshi Araki, Yohi Kiuchi, Ogasawara Hitoshi, Masaya Jukel, Akira Shimada)

**TPM3:**
Package Reliability & High Reliability in Harsh Environments  
Session Chairs: Zhenzhen Shen, Baker Hughes GE; Konstantin Yamnitskiy, Intel  
126 Evaluation of Reliability of Lead-free Solders in Silver-free Hybrids  
Zhenzhen Shen, Baker Hughes GE (Aleksy Reiderman)

**TPM4:**
Flip Chip Technology  
Session Chairs: Frank Eberle, Northrop Grumman Corp.; Jaimal Williamson, TI  
003 Study to Lower Cu Pillar Flip-Chip Failure Rate  
Shannon Pan, Qorvo (Bong Rosario, Joseph Holyoak, Mohsen Haji-Rahim, Gene Lambird, Yong Wang, Kendra Lyons, Todd Johnson, Paul Makowenskyj, Brian Myers)

**TPM5:**
Substrate Technology  
Session Chairs: Sylvain Pharand, IBM; Aric Shorey, Mosaic Microsystems  
030 Low Thermal Resistance Packaging for High Power Electronics  
Naga Shashidhar, Corning Inc. (Abhijit Rao)
### IMAPS 2019 TECHNICAL TRACKS:

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<th>Time</th>
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<th>Room 204</th>
<th>Room 203</th>
<th>Room 202</th>
</tr>
</thead>
</table>
| 4:15 PM - 4:40 PM | 066 Ferrites in Transfer Molded Power SiPs - Challenges in Packaging  
Tina Thomas, Fraunhofer IZM (Marius van Dijk, Hans Walter, Stefan Hoffmann, Karl-Friedrich Becker, Marc Dreissigacker, Martin Schneider-Ramelow)  
063 Optimized ECD Cu RDL Process with Via Filling Capability for Next Generation Packaging  
Ralf Schmidt, Atootech GmbH  
055 A New Halogen-free Parylene for High Performance & Reliability of Microelectronics in Harsh Environments  
Rakesh Kumar, Specialty Coating Systems, Inc. (Frank Ke, Dustin England, Angie Summers, Lamar Young)  
111 Flip-Chip Flux Evolution  
Sze Pei Lim, Indium Corporation (Yan Liu, Dr. Jo; Tae Hyun Park, Richard McDonough, Andy Mackie)  
010 Passive Die Alignment in Glass Embedded Fan-Out Packaging  
Rafael Santos, LPKF Laser & Electronics AG (Roman Ostholt, Florian Roik, Norbert Ambrosius, Daniel Dunker, Jean-Pol Delrue) | 028 Designing Software Configurable Chips and SiPs using Chiplets and zGlue  
Jawad Nasrullah, zGlue Inc. (Zhiquan Luo, Greg Taylor) | 120 Package Reliability and Integrity Improvements for a Thermally Enhance Non-Conductive Die Attach Adhesive for ASIC Devices on Exposed Pad Packages  
Alvin Denoyo, ON Semiconductors (Ivan Gil Costa, Allen Menor, Darwin De Lazo)  
122 4-2-4 Laminate Hotspot Identification and Joule Heating Effect Assessment via Thermoelectrical Simulation  
Zhi Yang, GLOBALFOUNDRIES (Katie Rivera, Janak Patel, Eric Tremble, David Stone, Kwang Won Choi, Edmund Blackshear)  
099 Ultra-thin Wafer Level Chip Scale Packaging  
Doug Hackler, American Semiconductor (Dale Wilson, Ed Prack) |
| 4:45 PM - 5:10 PM | 131 Designing Software Configurable Chips and SiPs using Chiplets and zGlue  
Jawad Nasrullah, zGlue Inc. (Zhiquan Luo, Greg Taylor)  
028 Low-Density Fan-Out Heterogeneous Integration of MEMS Tunable Capacitor and RF SOI Switch  
Rameen Hadizadeh, WiSpry, Inc. (Anssi Laitinen, Niko Kuusniemi, Volker Blaschke, David Molinero, WiSpry, Inc.; Eoin O'Toole, Marcio Pinheiro, Amkor Technology, Inc.) | 120 Package Reliability and Integrity Improvements for a Thermally Enhance Non-Conductive Die Attach Adhesive for ASIC Devices on Exposed Pad Packages  
Alvin Denoyo, ON Semiconductors (Ivan Gil Costa, Allen Menor, Darwin De Lazo)  
122 4-2-4 Laminate Hotspot Identification and Joule Heating Effect Assessment via Thermoelectrical Simulation  
Zhi Yang, GLOBALFOUNDRIES (Katie Rivera, Janak Patel, Eric Tremble, David Stone, Kwang Won Choi, Edmund Blackshear)  
099 Ultra-thin Wafer Level Chip Scale Packaging  
Doug Hackler, American Semiconductor (Dale Wilson, Ed Prack) |
| 5:15 PM - 5:40 PM | 125 A Miniaturized Dual Band Antenna for Harmonic RFID Tag  
Saikat Mondal, Michigan State University (Saranraj Karuppuswami, Deepak Kumar, Amanpreet Kaur, Premjeet Chahal)  
029 Ni Via Fill Metallization  
Shaopeng Sun, MacDermid Alpha (Elie Najjar, Eric Gongora, Wenbo Shao, Eric Yakobson, Shaopeng Sun)  
088 Controlling Extrinsic Chloride Ions Effect on Copper Wirebond Reliability  
Sheila Chopin, NXP Semiconductor (Varughese Mathew) | 056 Fluxes with Decreased Viscosity After Reflow for Flip Chip and SIP Assembly  
Ning-Cheng Lee, Indium Corporation (Runsheng Mao, Fen Chen)  
041 Deformable Interconnects with Embedded Devices in Flexible Fan-Out Packages  
Sk Yeahia Been Sayeed, Florida International University (Daniel Wilding, Jose Solis Camara, Dieff Vital, Shubhendu Bhardwaj, P. M Raj) |

### Tuesday...continued

6:00 pm - 8:00 pm | Room 207  
iNEMI/IMAPS Special Session:  
Design and Test Challenges of SiP and Advanced Packages  
Must register separately from IMAPS 2019 Registration
Wednesday, October 2, 2019

7:00 AM - 6:30 PM – Registration Open – Pre-Function Hall C

10:00 AM - 6:15 PM – Exhibit Hall Open – Exhibit Hall C

7:00 AM - 8:00 AM – Breakfast & Coffee in Foyer

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8:00 AM - 8:55 AM: Day 2 Announcements & Plenary Session Keynote 3 – Rooms 302-304-306 (Third Floor):

8:10 AM - 8:55 AM: Keynote 3:
Navigating the Packaging Challenges of 5G and Beyond

5G is all the buzz with significant developments and investments underway. With promises of tremendous bandwidth and reduced latencies there is no limit to the possibilities this platform can enable. In addition to exploring 5G, we will look some areas where it’s challenging the packaging development industry.

Mark Downey, Package Development Manager, Analog Devices

Mark Downey is a Package Development Manager at Analog Devices. He currently leads a successful development team supporting a broad array of packaging technology solutions for high value markets. Mark serves on the Engineering and Robotics advisory committees as well as the General Advisory Board at Minuteman Career and Technical High School in Lexington Massachusetts. Mark has 27 years of experience in microelectronics and holds a BSEE from the University of Massachusetts at Lowell.

sponsored by
### IMAPS 2019 TECHNICAL TRACKS:

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<th>Room</th>
<th>Session</th>
<th>Topic</th>
<th>Authors</th>
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</thead>
<tbody>
<tr>
<td>ROOM 207</td>
<td>WAM1:</td>
<td>Modeling / CPI</td>
<td>Christian Klewer, GLOBALFOUNDRIES (Frank Kuechenmeister, Jens Paul, Simone Capocchi, Dirk Breuer, Bjorn Boehme, Jae Kyu Cho, Michael Thiele)</td>
</tr>
<tr>
<td></td>
<td>WAM2:</td>
<td>Panel-level Fan Out</td>
<td>Nobuo Oghara, NAGASE &amp; CO., Ltd. and Georgia Institute of Technology (Siddharth Ravichandran, Tailong Shi, Atom Watanabe, Mohanalingam Kathaperumal, Vanessa Smet, Rao Tummala, Georgia Institute of Technology; Shuhei Yamada, Murata Manufacturing Co., Ltd., Japan &amp; Georgia Tech)</td>
</tr>
<tr>
<td></td>
<td>WAM3:</td>
<td>RF Packaging &amp; Antennas</td>
<td>Ken Kuang, Torrey Hills Technologies; John Hunt, ASE</td>
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<tr>
<td></td>
<td>WAM4:</td>
<td>2.5D/3D Technologies</td>
<td>Manish Dubey, Intel; John Hunt, ASE</td>
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<tr>
<td></td>
<td>WAM5:</td>
<td>Novel Materials, Polymers &amp; Processes</td>
<td>Kevin Demartini, DuPont; Jeff Grotz, Innocentix</td>
</tr>
</tbody>
</table>

### SESSIONS:

**WEDNESDAY MORNING SESSIONS:**

- **9:00 AM - 9:25 AM**
  - **021** Package Qualification Envelope for 22FDX® Technology
  - **008** First Demonstration of Ultra-Thin Glass Panel Embedded (GPE) Package with Sheet Type Epoxy Molding Compound for 5G/mm-wave Applications
  - **011** Evaluation of Die to Organic Laminate to PCB Interconnects up to 50GHz

- **9:30 AM - 9:55 AM**
  - **064** Cu Pillar Bump Development for 7nm Chip Package Interaction (CPI) Technology Qualification
  - **048** FOWLP / FOPLP Lithography Solutions to Overcome Die Placement Error, Predict Yield, Increase Throughput and Reduce Cost
  - **012** A Flexible Down-Converter for Satellite Communication in the Ka-Band

- **10:00 AM - 10:25 AM**
  - **067** Thermal Decoupling in Power Electronics Modules Using Thermal Pyrolytic Graphite
  - **065** Automated Optical Inspection (AOI) for FOPLP with Simultaneous Die Placement Metrology
  - **112** Quasi Half-Loop Bond Wire Antennas for Emerging Wireless Radar Sensor Systems

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10:25 AM – 11:00 AM: Coffee Break in Exhibit Hall

**sponsored by**

[IMAPS SEMICONDUCTOR MATERIALS, INC.]
**IMAPS 2019 TECHNICAL TRACKS:**

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<th>Room</th>
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<th>Title</th>
<th>Speaker(s)</th>
<th>Affiliation(s)</th>
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<tbody>
<tr>
<td>207</td>
<td>11:00 AM-11:25 AM</td>
<td>Mechanical Modeling and Continuous Process Improvement</td>
<td>Mercedes Hernandez, Shane Harker, Gene Lambird</td>
<td>Qorvo, Inc.</td>
</tr>
<tr>
<td>208</td>
<td>101</td>
<td>Enhanced PECVD coatings for Panel Level Processing</td>
<td>Sebastian Gatz, Meyer Burger</td>
<td>SPARK PLUG CO., LTD.</td>
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<tr>
<td>204</td>
<td>070</td>
<td>LTCC Slot Array Antenna for 5G Application</td>
<td>Hiroyuki Takahashi</td>
<td>NGK SPARK PLUG CO., LTD.</td>
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<tr>
<td>203</td>
<td>025</td>
<td>Non-destructive In-line IMC Thickness Measurement Using Acoustic Metrology for 3D Stacking</td>
<td>Priya Mukundhan, J. Derakhshandeh</td>
<td>Rudolph Technologies (IMEC)</td>
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<td>202</td>
<td>106</td>
<td>Development of High Thermally Conductive Die Attach for TIM Applications</td>
<td>Maciej Patelka, Hoekstra</td>
<td>NAMICS (Sho Ikeda, Hiroki Myodo)</td>
</tr>
<tr>
<td>207</td>
<td>11:30 AM-11:55 AM</td>
<td>Development of EDA Techniques for Power Module EMI Modeling and Layout Optimization</td>
<td>Tristan Evans, University of Arkansas</td>
<td>Petkovic, D. Narayanasamy</td>
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<tr>
<td>208</td>
<td>105</td>
<td>Innovative Panel Plating for Finer Line Spacing and Better Uniformity to Allow Semiconductor or Embedded Die Assembly for Heterogeneous Integration</td>
<td>Robert Moon</td>
<td>ASM NEXX</td>
</tr>
<tr>
<td>204</td>
<td>084</td>
<td>Flip Chip Underfill RF Characterization</td>
<td>Robert Paul</td>
<td>San Diego State University</td>
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<tr>
<td>203</td>
<td>103</td>
<td>New Thin Adhesive for High Density 2.5D Heterogeneous Device Integration with Cu-Cu Hybrid Bonding</td>
<td>Yasuhiro Kayaba, Mitsui Chemicals, Inc.</td>
<td>Nakamura, K. Kohamura</td>
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<td>202</td>
<td>108</td>
<td>Advanced Assembly Materials Development for Enabling Heterogeneous Integration and 3D Packaging</td>
<td>Ramachandran Trichur, Henkel Corporation</td>
<td>Bao, Jay Chao, Tim Champagne, Rose Guino, Rong Zhang</td>
</tr>
<tr>
<td>207</td>
<td>12:00 PM-12:25 PM</td>
<td>How Relevant is Packaging for 5G?</td>
<td>Ivan Ndip</td>
<td>Fraunhofer IZM</td>
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<tr>
<td>208</td>
<td>073</td>
<td>Study PID (Photo Imageable Dielectric) and Non-PID on Process, Fabrication and Reliability by Using Panel Glass Substrate for Next Generation Interconnection</td>
<td>Chun-Hsien Chien</td>
<td>University of Arkansas</td>
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<tr>
<td>204</td>
<td>075</td>
<td>A Novel Fabrication Process for High Density Silicon Capacitors by using Metal-Assisted Chemical Etching</td>
<td>Susumu Obata</td>
<td>Toshiba Corp.</td>
</tr>
<tr>
<td>203</td>
<td>085</td>
<td>Advanced Package Design: Inter-Domain Design Methodologies</td>
<td>William Acito</td>
<td>Cadence Design Systems</td>
</tr>
<tr>
<td>202</td>
<td>002</td>
<td>Contact Electroplating Technology (CET)</td>
<td>Igor Kadija</td>
<td>ECSI Fibrotech, Inc.</td>
</tr>
</tbody>
</table>

**Wednesday...continued**

**1:45 PM – 3:00 PM:** Lunch & Networking in Exhibit Hall

**3:00 PM – 3:15 PM:** Authors of Selected Presentations

**3:15 PM – 3:45 PM:** Technical Session: High Performance & High Reliability

**3:45 PM – 4:00 PM:** Authors of Selected Presentations

**4:00 PM – 4:15 PM:** Technical Session: Advanced Package (Flip Chip, 2.5D, Optical)

**4:15 PM – 4:30 PM:** Authors of Selected Presentations
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</thead>
</table>

**IMAPS 2019 TECHNICAL TRACKS:**

**SIP/SIM/CPI (Systems Solutions)**
- **Track Chairs:** Mak Kulkarni, Texas Instruments; Suresh Jayaraman, Amkor Technology

**Wafer Level / Panel Level (Advanced RDL)**
- **Track Chairs:** Beth Kesser, Intel; Rey Alvarado, Qualcomm

**High Performance & High Reliability**
- **Track Chairs:** Erica Folk, Northrop Grumman; Ivan Neip, Fraunhofer IZM

**Advanced Package (Flip Chip, 2.5D, 3D, Optical)**
- **Track Chairs:** Sandeep Sane, Intel; Frank Eberle, Northrop Grumman Corp.; Jaimal Williamson, Texas Instruments

**Advanced Process & Materials (Enabling Technologies)**
- **Track Chairs:** Benson Chan, Binghamton Univ.; Mark Hoffmeyer, GM

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**Wednesday...continued**

**WEDNESDAY AFTERNOON SESSIONS 1:45 PM-4:55 PM**

**1:45 PM-2:10 PM**
- **Summary and Highlights of Heterogeneous Integration Roadmap**
  - **William “Bill” Chen**, ASE
  - **WPM1: INVITED SESSION: Heterogeneous Integration Roadmap**
    - **Session Chairs:** Umni Ray, Consultant; Varughese Mathew, NXP Semiconductor
  - **WPM2: WL CSP (Fan in and Advance Material)**
    - **Session Chairs:** Keith Best, Rudyolph Tech.; Masao Tomikawa, Toray
  - **WPM3: Packaging for RF and High-Reliability Applications**
    - **Session Chairs:** Ivan Ndip, Fraunhofer IZM; Ege Engin, San Diego State University
  - **WPM4: Optical**
    - **Session Chairs:** Tolga Tokin, Fraunhofer IZM; Stephane Bernabe, CEA LETI
  - **WPM5: Additive Manufacturing**
    - **Session Chairs:** Doug Shelton, Canon USA; Doug Hopkins, NCSU

**2:15 PM-2:40 PM**
- **System in Package (SIP)**
  - **Andreas Grassmann**, Infineon
  - **WPM2: WL CSP (Fan in and Advance Material)**
    - **Session Chairs:** Keith Best, Rudyolph Tech.; Masao Tomikawa, Toray
  - **WPM3: Packaging for RF and High-Reliability Applications**
    - **Session Chairs:** Ivan Ndip, Fraunhofer IZM; Ege Engin, San Diego State University
  - **WPM4: Optical**
    - **Session Chairs:** Tolga Tokin, Fraunhofer IZM; Stephane Bernabe, CEA LETI
  - **WPM5: Additive Manufacturing**
    - **Session Chairs:** Doug Shelton, Canon USA; Doug Hopkins, NCSU

**2:40 PM – 3:30 PM: Coffee Break in Exhibit Hall**

**3:30 PM-3:55 PM**
- **Mobile**
  - **Benson Chan**, Binghamton University
  - **WPM2: WL CSP (Fan in and Advance Material)**
    - **Session Chairs:** Keith Best, Rudyolph Tech.; Masao Tomikawa, Toray
  - **WPM3: Packaging for RF and High-Reliability Applications**
    - **Session Chairs:** Ivan Ndip, Fraunhofer IZM; Ege Engin, San Diego State University
  - **WPM4: Optical**
    - **Session Chairs:** Tolga Tokin, Fraunhofer IZM; Stephane Bernabe, CEA LETI
  - **WPM5: Additive Manufacturing**
    - **Session Chairs:** Doug Shelton, Canon USA; Doug Hopkins, NCSU

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- **Mobile**
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    - **Session Chairs:** Doug Shelton, Canon USA; Doug Hopkins, NCSU

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**2:40 PM – 3:30 PM: Coffee Break in Exhibit Hall**

**3:30 PM-3:55 PM**
- **Mobile**
  - **Benson Chan**, Binghamton University
  - **WPM2: WL CSP (Fan in and Advance Material)**
    - **Session Chairs:** Keith Best, Rudyolph Tech.; Masao Tomikawa, Toray
  - **WPM3: Packaging for RF and High-Reliability Applications**
    - **Session Chairs:** Ivan Ndip, Fraunhofer IZM; Ege Engin, San Diego State University
  - **WPM4: Optical**
    - **Session Chairs:** Tolga Tokin, Fraunhofer IZM; Stephane Bernabe, CEA LETI
  - **WPM5: Additive Manufacturing**
    - **Session Chairs:** Doug Shelton, Canon USA; Doug Hopkins, NCSU
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<th>Presenters</th>
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<tr>
<td>4:00 PM-</td>
<td>High Performance Computing (HPC)</td>
<td>Dale Becker, IBM</td>
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<tr>
<td>4:25 PM</td>
<td>Study Electromigration in SnBiAg / SAC(305) Mixed Solder Alloy</td>
<td>Faramarz Hadian, Binghamton University (Mohammed Genanu, Eric Cotts)</td>
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<tr>
<td></td>
<td>The Case of Failure Analysis of the PCB Wire Corrosion under High Reliability Requirements</td>
<td>Jie Zheng, CEPREI (Yabing Zou, Yingjie Zhang, Ying Yang, Hongqin Wang, Jianghua Shen)</td>
</tr>
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<td></td>
<td>Characterization and Electrical Performance of Glass Diplexer Modules</td>
<td>Charles Woychik, i3 Electronics, Inc. (John Lauffer, Michael Gaige, William Wilson, James Carey, Matthew Neely, i3 Electronics, Inc., Scott Pollard, Raj Parmar, Corning; Feng Ling, Lijun Chen, Xpeedic Technology)</td>
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<td>Novel Material &amp; Processing Equipment Integration to Provide Smart, Reliable &amp; Low-Cost Solution to Today’s Packaging Challenges</td>
<td>Pawel Miskiewicz, Merck KGaA (Matthias Koch, Daniel Walker, Frank Meyer, Stephan Wieder, Merck KGaA; James Haley, Vivek Dutta, EMD Performance Materials)</td>
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<tr>
<td>4:30 PM-</td>
<td>Fanout</td>
<td>John Hunt, ASE; Rozalia Beica, DuPont</td>
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<tr>
<td>4:55 PM</td>
<td>Cu Core Column Application for Fine Pitch 3D Mounting</td>
<td>Hiroki Sudo, Senju Metal Industry Co., Ltd. (Daisuke Soma, Hiroshi Okada)</td>
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<td></td>
<td>Laser Etching of Different Conductors for RF Applications</td>
<td>Stephanie Edwards, Heraeus (Stephen Feltham, Daniel Macko, Geoffrey Lott, Ryan Persons)</td>
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<tr>
<td>5:00 PM - 6:15 PM: Happy Hour in Exhibits &amp; Foundation Auction</td>
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<tr>
<td>6:30 PM - 8:00 PM: Panel Session (w/drinks) – Rooms 302-304-306 (Third Floor):</td>
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<tr>
<td>5:00 PM - 6:15 PM:</td>
<td>5G Spectrum Challenge: Key Packaging and Test Considerations for mmWave and sub 6GHz</td>
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<td>6:30 PM - 8:00 PM:</td>
<td>Moderators: Jan Vardaman, President and Founder of TechSearch International, Inc.; Urmi Ray, Consultant</td>
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<td></td>
<td>The introduction of 5G brings new package design and test considerations. This panel discussion discusses these trends and challenges.</td>
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<td>Panelists: Ron Huemoeller, Amkor Technology Jeorge Hurtarte, TERADYNE Michael Liu, JCET Tarak Raiikar, Qorvo ASE, Name TBD Plus others</td>
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<td></td>
<td>Includes Beer, Wine and Appetizers</td>
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<td>Happy hour sponsored by:</td>
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<td>Analog Devices</td>
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<td>Honeywell</td>
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IMAPS 2019 • 52nd Annual Symposium on Microelectronics
Thursday, October 3, 2019

7:00 AM - 8:00 AM – Breakfast & Coffee in Foyer

8:00 AM - 8:55 AM: Day 3 Announcements & Plenary Session Keynote 4 – Rooms 302-304-306 (Third Floor):

8:10 AM - 8:55 AM: Keynote 4:

**5G RF POSSIBLE TEST INSERTION SCENARIOS AND TEST STRATEGIES**

As 5G products begin its early production phase in 2019, several RF test insertion scenarios and test flows are being evaluated for the next phase of high volume production. For 5G millimeter wave products, over-the-air radiated tests present a new set of test challenges as compared to sub-6 GHz products. This presentation provides an overview of the possible test insertion scenarios for 5G RF devices, their intended fault coverage objectives and possible test strategies to address such.

**Jeorge Hurtarte, Wireless Product Marketing Strategist, TERADYNE**

Dr. Jeorge S. Hurtarte is currently Wireless Product Marketing Strategist at Teradyne. Prior to joining Teradyne, Dr. Hurtarte held various technical and management positions at LitePoint, TranSwitch, and Rockwell Semiconductors. He holds Ph.D. and B.S. degrees in electrical engineering, an M.S. in telecommunications, and an M.B.A. Dr. Hurtarte has served on the Advisory Board of Directors of the Global Semiconductor Alliance, TUV Rheinland of North America, and the NSF’s Wireless Internet Center for Advanced RF Technology. He is the secretary of the IEEE 802.11ay task group. He is also the lead co-author of the book Understanding Fabless IC Technology.

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<tbody>
<tr>
<td>9:00 AM</td>
<td><strong>THAM1</strong>: IoT / Sensors/ Passives Session Chairs: Santhosh Kuttikara, Analog Devices; Fang Luo, University of Arkansas</td>
<td><strong>THAM2</strong>: INVITED SESSION: Future Semiconductor Packages for AI Hardware Session Chair: Yasumitsu Ori, NAGASE Group</td>
<td><strong>THAM3</strong>: High Reliability Semi-fab and Processing Session Chairs: Tim LeClair, Carapax; Erica Folk, Northrop Grumman</td>
<td><strong>THAM4</strong>: BUMP / Interconnect Session Chairs: Aditi Bajwa, UCLA; Jim Will, Micron</td>
<td><strong>THAM5</strong>: Device Interconnections Session Chairs: Martin Schneider, Ramelow IZM Fraunhofer; Michael McKeown, Hesse Mechatronics</td>
</tr>
<tr>
<td>9:30 AM</td>
<td><strong>THAM1</strong>: Highly Miniaturized Integrated Sensor Nodes for Industry 4.0 Tina Thomas, Fraunhofer IZM (Steve Voges, Karl-Friedrich Becker, D. Schröder, P. Fruehauf, M. Heimann, S. Nerrer, R. Blank, S. Gottwald, A. Hofmeister, M. Schmied, T. Braun, M. Schneider-Ramelow, K.-D. Lang)</td>
<td><strong>THAM2</strong>: 3D Integration for AI Architectures Mukta Farooq, 3D Integration Leader for the Artificial Intelligence Center (AIC), IBM Research</td>
<td><strong>THAM3</strong>: How to Secure the Fabrication of Gallium Nitride on Si Wafers Dario Alliata, UnitySC (Neal Anderson, Mayeul Durand de Gevigney, Isabelle Bergwendi, Philippe Gastaldo)</td>
<td><strong>THAM4</strong>: Bumping Co-planarity Collocation for Different UBM Size by Geometry Integration Wei-Wei “Xenia” Liu, ASE Group (Berdy Weng, Lu-Ming Lai, Kuang-Hsiung Chen)</td>
<td><strong>THAM5</strong>: Impact of Multi-Dimensional Vibration Trajectories on Quality and Failure Modes in Ultrasonic Bonding Reinhard Schemmel, Paderborn University (Collin Dymel, Tobias Hesmeil, Walter Sextro, Paderborn University; Florian Eacock, Infineon Technologies AG; Matthias Hunstig, Michael Brökelmann, Hesse GmbH)</td>
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<td>10:15 AM</td>
<td><strong>THAM1</strong>: Direct Bonded Heterogeneous Integration Kamal Sikka, Senior Technical Staff Member, IBM Research</td>
<td><strong>THAM2</strong>: Optimizing the Within Wafer Non-uniformity at the Chemical Mechanical Planarization Step in Interposers and RDL Fabrication Process for 3D IC Stacking Amit Kumar, BRIDG (Jose Chacon, Peter Gelzinis, Ankineedu Velaga)</td>
<td><strong>THAM3</strong>: 060 Manufacturing Technology Solution of Fan-out Packaging for Heterogeneous Integration Yasuhiro Morikawa, ULVAC</td>
<td><strong>THAM4</strong>: 037 Control of Solder Bump Growing Morphology in Lead Free Plating Berdy Weng, ASE Group (Wei-Wei “Xenia” Liu, Lu-Ming Lai, Kuang-Hsiung Chen)</td>
<td><strong>THAM5</strong>: Controlling Surface Sensitive Processes in Microelectronics Manufacturing to improve Wire Bonded Joint Reliability Elizabeth Kidd, BTG Labs (Brooke Campbell, R. Giles Dillingham)</td>
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<td>Development of Materials Informatics Platform</td>
<td>Yasumitsu Orii, NAGASE Group</td>
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<td>11:45 AM-</td>
<td>Advanced Fiber Optic and Ultrasonic Sensor Systems for Structural Health Monitoring of Pipes in Nuclear Waste Sites</td>
<td>Michael Thompson, Aparna Aravelli, Florida International University (Dwayne McDaniel, Mathew Krutch, Mike McNeilley, Ken Imrich, Bruce Wiersma)</td>
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<td>12:00 PM-</td>
<td>A Wirebonding Instrument for Insulated and Coaxial Wires</td>
<td>Mitchell Meinhold, The Charles Stark Draper Laboratory, Inc. (Caprice Gray, Jeffery Delisio, Ernest Kim, Christian Wells, Daniela Torres, Peter Lewis, David Hagerstrom)</td>
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<td>12:15 PM-</td>
<td>On Chip Diffusion Bonding Creates Stable Interconnections Usable at Temperatures Over 300°C</td>
<td>Jessica Richter, Department of Microelectronics, HSD University of Applied Sciences (Anna Steenmann, Benjamin Schellscheidt, Thomas Licht)</td>
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<td>026</td>
<td>“Drop-in” Conventional Reflow Oven Sinter-Able Pressure-Less Silver Paste for Die Attach Assembly Mass Production</td>
<td>Shihai Chen, Indium Corporation (Evan Wernicki, Sara Wright, Christine Labarbera, Ning-Cheng Lee)</td>
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<td>079</td>
<td>On-Site Hydrogen and Nitrogen Provide Multiple Advantages</td>
<td>John Stevenson, Dave Wolff, Nel Hydrogen (formerly Proton OnSite) (Michael Montesi)</td>
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<td>Combining Advantages of Rheometry and Inline Viscometry for Improved Viscosity Modeling</td>
<td>Jonas Strobelt, Fraunhofer IZM (J. Bauer; M. Dreissigacker; T. Thomas; O. Hoelck; T. Braun; K.-F. Becker; M. Schneider-Ramelow; K.-D. Lang)</td>
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<td>053</td>
<td>Additive Manufacturing Approaches for Customization and Personalization in a Connected Ecosystem</td>
<td>Girish Wable, Jabil</td>
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<td>054</td>
<td>Advances in Hermetic Projection Weld Sealing</td>
<td>Tom Salzer, Hermetic, Inc.</td>
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<td>093</td>
<td>ZnO Nanowire-Array Chemical Vapor Sensor</td>
<td>Bruce Kim, City University of New York (Michael McKeown, Sang-Bock Cho)</td>
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<td>094</td>
<td>A 3D Simulation Tool for Electronics Thermal Graphite Applications</td>
<td>Rick Beyerle, Neograf Solutions, LLC (Prashanth Subramanian)</td>
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<td>114</td>
<td>Recent Advances in X-ray for Semicon Applications</td>
<td>Keith Bryant, Independent Consultant (Jeff Urbanski, Ragnar Vaga, YXLON International)</td>
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<td>Design and Evaluation of a Thermal Interface Material Automated Cycling Durability Test Program</td>
<td>Dave Saums, DS&amp;A LLC (Tim Jensen, Ron Hunadi, Indium Corporation; Mohammad Abu Ras, Berliner Nanotest und Design GmbH)</td>
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<td>042</td>
<td>Three-Dimensional Thermal Modeling and Management of System on Package with Gold and Nano Based Material</td>
<td>Be-nazir Khan, IXYS ICD, a part of Littelfuse Inc.</td>
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<td>119</td>
<td>A Study on Reduced/Absent Adhesion/Cap Layers for Optimized BEOL RC Performance</td>
<td>Dewei Xu, GLOBALFOUNDRIES (Zhiguo Sun, Haojun Zhang, Scott Pozder, Patrick Justison, Seung-Yeop Kook, Rod Augur, Robert Fox)</td>
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<td>071</td>
<td>A High Performance Full SiC Power Module Based on a Novel Stacked DBCs Hybrid Packaging Structure</td>
<td>Zhiwei Wang, Huazhong University of Science &amp; Technology (Chi Zhang, Zhizhao Huang, Cai Chen, Fang Luo)</td>
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<td>072</td>
<td>An EMI Suppression Method in SiC Half-bridge Power Module Design</td>
<td>Zhiwei Wang, Huazhong University of Science &amp; Technology (Chi Zhang, Yiyan Yang, Cai Chen, Yong Kang)</td>
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<td>129</td>
<td>Reliability Analysis of Bonding Wire based on Stacked Substrate Packaging Structure</td>
<td>Chi Zhang, Huazhong University of Science and Technology (Yifan Tan, Zhizhao Huang, Cai Chen, Yong Kang)</td>
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<td>035</td>
<td>Evaluation of the Thermal Performance of a Light Emitting Diode (LED) Package Manufactured Using POL-kW Packaging Technology</td>
<td>Anisha Walwaikar, Binghamton University (Christopher Kapusta, Kaustubh Nagarkar, Krishnaswami Srinari, Daryl Santos, Liang Yin)</td>
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**POSTERS & PIZZA**

11:45 am - 12:45 pm: Pre-Function Hall C

12:45 PM: CLOSING REMARKS at Conclusion of Poster Session
Thursday, October 3, 2019
1:30pm Start - “Scramble”
Shuttle will depart the Hynes Convention Center at 12 PM

Newton Commonwealth Golf Course
212 Kenrick Street, Newton, MA 02458
www.SterlingGolf.com

The IMAPS Microelectronics Foundation Fall Golf invitational will be held at the Newton Commonwealth Golf Course. Redesigned in 1920 by the renowned architect, Donald Ross, this course is short but challenging, featuring quick greens and relatively narrow fairways. Course management is essential as many a big hitter has discovered, with water and sand bunkers appearing frequently.

Cost is $125 per person ($500/four-some).
Register online under “sessions” (page after you select conference registration but before payment details). Hole sponsorships available. All proceeds from this event will benefit the IMAPS Microelectronics Foundation.

Golf/Sponsor fees include: shuttle service from hotel/course, green fees, cart fees, with dinner and awards following the round. CLUB RENTALS: are available at an additional expense and will be billed directly to the players. Contact bschieman@imaps.org to request rentals (specify male/female, right/ left handed).

Special Awards and Activities tentatively planned:
- Closest to the Pin;
- Longest Drive
- Mulligans for sale!

Golfers will tee off promptly at 1:30pm and not one minute later! Due to the earlier sunset, we will be teeing off promptly and anyone arriving late will need to “catch up” out on the course!
Tour of MIT.nano

Thursday, October 3, 2019
Tour of MIT.nano
2:00 PM - 3:00 PM

MIT.nano is a new interdisciplinary facility for nanoscale research, under the oversight of the Vice President for Research. Our shared facilities are open to faculty, students, and researchers from any school, or department at MIT. We’re also open to other academic and industry users from outside of MIT.

The tour shuttle will depart from the Hynes at 1:30pm and return at approximately 3:30pm.
Conference Planner

Booths to Visit

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Session Notes:

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53rd International Symposium on Microelectronics
October 5-8, 2020

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