2019 IWIPP

Toulouse, France | April 24-26

International Workshop on Integrated Power Packaging 2019

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Welcome from the General Chair

On behalf of the organizing committee, it is my great pleasure to welcome you to Toulouse for the 2019 IEEE International Workshop on Integrated Power Packaging (IWIPP). Our purpose is to bring together researchers from industry and academia, acting in the field of power electronics, components, electrical insulating materials, and packaging technologies to rapidly promote the development and commercialization of high-density and high-efficiency power converters.

IWIPP is sponsored by the IEEE Power Electronics Society (PELS), Electronics Packaging Society (CPMT), and Dielectrics and Electrical Insulation Society (DEIS), as well as Power Sources Manufacturers Association (PSMA) and the European Consortium on Power Electronics (ECPE). Such a technical sponsorship allows to gather a unique panel of leading experts in these fields.

The technical committee has built a very exciting program assembling tutorial lecturers, plenary and invited speakers from all around the world, from device scientists through system engineers to discuss their most recent results in this ever-changing and endlessly-evolving field during these 3 days in Toulouse.

Toulouse is at the same time the center of the European Aerospace industry, and home to one of the oldest universities in Europe (founded in 1229). The city will provide you with many aesthetic pleasures during your visit and the local committee has worked very hard to make IWIPP an event to be remembered. I wish you a pleasant and fruitful workshop. Welcome to IWIPP 2019!

Thierry Lebey, Ph.D.

General Chair

We are excited to welcome you to the 3rd bi-annual International Workshop on Integrated Power Packaging (IWIPP). Power electronics packaging has reached a critical point in modern history where applications such as electric vehicles, electric aircraft, rail, smart grid, and renewable energy are demanding new power packaging solutions that enable higher performance and reliability to gain the full benefit of state-of-the-art power devices developed over the last decade. To address these challenges, IWIPP has called upon industry, academic, and research experts in the field of power electronics packaging.

IWIPP is unique from other conferences and workshops in the sense that it demands expertise from electrical engineering, mechanical engineering, thermal engineering, physics, and material science to address a variety of multi-discipline challenges in power packaging. In addition, a collection of societies (IEEE, PSMA, CPMT, PELS, DEIS, and ECPE) with different technical missions are all active sponsorship partners for IWIPP to reinforce the need for a diversity of technical experts. This year IWIPP will host plenary, invited, and technical speakers over a three-day span that will discuss challenges and break-through technologies consisting of novel die interconnections, thermal challenges, novel power module technologies, novel dielectric materials and test methods, modeling and reliability of components, and EMI and parasitic implications. Interactive discussions will be focused on these topics during the technical sessions, networking breaks, and evening events. Abbreviated tutorial sessions will kick-off the first two days as part of the standard program.

We are fortunate to be able to hold IWIPP in the charming city of Toulouse, France. In addition to the daily technical activities, there will be nightly events that will allow everyone a chance to explore the city attractions and network with their colleagues. We are all looking forward to sharing this unique experience with you in Toulouse.

Brandon Passmore, Ph.D.

Technical Chair

IWIPP 2019 Schedule at a Glance

WEDNESDAY, APRIL 24

8:00 AM – 8:15 AM	Welcome Comments
8:15 AM – 9:35 AM	Power Module Design Tutorial
9:35 AM – 10:20 AM	Plenary 1: Silicon Carbide for Power Devices
10:20 AM – 10:45 AM	PowerUp & Networking Break
10:45 AM – 11:30 AM	Plenary 2: Electrification Challenges in Aeronautics
11:30 PM – 1:00 PM	Networking Lunch & Poster Session 1
1:00 PM – 3:05 PM	Systems & Circuits Technical Session
3:05 PM – 3:30 PM	PowerUp & Networking Break
3:30 PM – 5:35 PM	Power Modules Technical Session
5:35 PM – 7:00 PM	Welcome Reception
7:00 PM – 8:15 PM	Laboratory Tours

THURSDAY, APRIL 25

8:00 AM – 8:15 AM	Welcome Comments
8:15 AM – 9:35 AM	Tutorial 2: Conducted EMI in Power Electronics Systems
9:35 AM – 10:20 AM	Plenary 3: Novel Thermal & Packaging Paradigms
10:20 AM – 10:45 AM	PowerUp & Networking Break
10:45 AM – 11:30 PM	Plenary 4: Reliability in Power Electronics Modules
11:30 PM – 1:00 PM	Networking Lunch & Poster Session 2
1:00 PM – 3:05 PM	Packaging & Interconnects Technical Session
3:05 PM – 3:30 PM	PowerUp & Networking Break
3:30 PM – 5:10 PM	Modeling and Reliability Technical Session
5:10 PM – 7:00 PM	Social Event: Wine Tasting
7:00 PM – 10:00 PM	Conference Banquet Dinner

FRIDAY, APRIL 26

8:00 AM – 10:05 AM	Dielectrics and Insulation Technical Session
10:05 AM – 10:15 AM	PowerUp & Networking Break
10:15 AM – 12:20 PM	EMI and Parasitic Implications Technical Session
12:20 PM – 1:00 PM	Networking Lunch
1:00 PM – 2:40 PM	Thermal Challenges Technical Session
2:40 PM – 3:00 PM	Concluding Remarks

REGISTRATION OPEN DAILY FROM 7:30 AM — END OF TECHNICAL SESSIONS.

LOCATION COLOR KEY:

Technical Session Room (Building C, Thesis Room)

Exhibition Room (Building C, Atrium)

Offsite (Additional Information can be found on page 27)

TUTORIAL 1:
RELIABILITY AND SYSTEM LEVEL DESIGN CONSIDERATIONS FOR SIC POWER MODULES

DR. TY MCNUTT
DIRECTOR OF BUSINESS DEVELOPMENT
WOLFSPEED, A CREE COMPANY
WEDNESDAY, APRIL 24, 8:15 AM – 9:35 AM

PLENARY 1:
SILICON CARBIDE FOR POWER DEVICES: HISTORY, EVOLUTION, APPLICATIONS, AND PROSPECTS

DR. AHMED ELASSER
PRINCIPAL SYSTEMS ENGINEER
GE GLOBAL RESEARCH CENTER
WEDNESDAY, APRIL 24, 9:35 AM – 10:20 AM

PLENARY 2:
ELECTRIFICATION CHALLENGES IN AERONAUTICS

DR. CHRISTOPHE LOCHOT
ELECTRICAL SYSTEM R&T GROUP LEADER
AIRBUS
WEDNESDAY, APRIL 24, 10:45 AM – 11:30 AM

TUTORIAL 2:
CONDUCTED ELECTROMAGNETIC INTERFERENCE IN POWER ELECTRONICS SYSTEMS

Dr. Aaron Brovont
Assistant Professor
The University of Alabama
Thursday, April 25, 8:15 AM – 9:35 AM

PLENARY 3:
NOVEL THERMAL & PACKAGING PARADIGMS FOR NEXT GENERATION POWER ELECTRONICS

Dr. Ercan Dede
Research Scientist
Toyota Research Institute of North America
Thursday, April 25, 9:35 AM – 10:20 AM

PLENARY 4:
RELIABILITY IN POWER ELECTRONICS MODULES

Dr. Laurent Dupont
Chargé de recherche
IFSTTAR - SATIE
Thursday, April 25, 10:45 AM – 11:30 PM

SYSTEMS & CIRCUITS

Wednesday, April 24, 1:00 PM — 3:05 PM

Session Chairs: Jin Wang (Ohio State Univ.), Rolando Burgos (Virginia Tech.)

1:00 PM	**Accelerating commercialization of WBG power electronics: PowerAmerica Systems and Circuits impact [Invited]** Victor Veliadis (PowerAmerica, North Carolina State University)
1:25 PM	**Module level and system level integrations of WBG devices for high power applications [Invited]** Jin Wang (Ohio State University)
1:50 PM	**Technology Challenges in SiC-based Medium Voltage Power Conversion [Invited]** Rolando Burgos (Virginia Tech University)
2:15 PM	**Metrology Considerations for Accurate Characterization of High-Bandwidth Power Electronics Components & Applications [Invited]** Andy Lemmon (University of Alabama)
2:40 PM	**Evaluation of the PCB-Embedding Technology for a 3 kW Converter** Remy Caillaud, Johan Le Leslé, Cyril Buttay (Univ. Lyon), Florent Morel, Roberto Mrad, Nicolas Degrenne, Stefan Mollov

POWER MODULES

Wednesday, April 24, 3:30 PM—5:35 PM

Session Chair: Ty McNutt (Wolfspeed)

3:30 PM	**A New Packaging Concept for Highly Reliable Power Modules [Invited]** Shiori Idaka (Mitsubishi Electric)
3:55 PM	**ABB LinPak: smart design for efficient converters [Invited]** Fabian Fischer (ABB)
4:20 PM	**The Development of 1200 V SiC Hybrid Switched Power Modules** Puqi Ning (Chinese Academy of Sciences), Tianshu Yuan, Han Cao, Lei Li, Yuhui Kang
4:45 PM	**Stacked DBC Cavitied Substrate for a 15-kV Half-Bridge Power Module** Amol Deshpande (University of Arkansas), Fang Luo, Ange Iradukunda, David Huitink, Lauren Boteler
5:10 PM	**A Study of Dielectric Breakdown of a Half-Bridge Switching Cell with Substrate Integrated 650 V GaN Dies** Eduard Dechant (Technical University of Applied Sciences, Rosenheim), Norbert Seliger, Ralph Kennel

PACKAGING & INTERCONNECTS

Thursday, April 25, 1:00 PM — 3:05 PM

Session Chairs: Puqi Ning (Chinese Academy of Sciences), Brian Narveson (PSMA)

1:00 PM	**Silver Sintering Die Attach – Myths & Physics [Invited]** Gyan Dutt (Alpha)
1:25 PM	**Advanced SiC Power Module Packaging: Layout, Material System and Integration [Invited]** Fang Luo (U. of Arkansas), Amol Deshpande, Cai Chen
1:50 PM	**Rate controlled sintering: A novel approach to improve quality and yield of die-attach interconnects** Merkert Simon, Aaron Hutzler, Thomas Krebs (Pink)
2:15 PM	**Aerosol Jet Printing Process for Semi-Embedded Power Assembly** Stephane Azzopardi, (Safran Tech), Jérôme Lelièvre, Toni Youssef, Denis Labrousse, Elodie Pereira, Philippe Lasserre
2:40 PM	**A PCB based Package and 3D Assembly for High Power Density Converters** Roberto Mrad, Julien Morand, Rémi Perrin Mitsubishi Electric), Stefan Mollov

MODELING & RELIABILITY

Thursday, April 25, 3:30 PM—5:10 PM

Session Chairs: Patrick McCluskey (Univ. of Maryland), David Huitink (Univ. of Arkansas)

3:30 PM	**Reliability for Mission- and Safety-Critical Systems in Aerospace Applications [Invited]** Zak Sorchini (UTC), Steve Savulak
3:55 PM	**3D-FE electro-thermo-magnetic modeling of automotive power electronic modules - Wire-bonding and Copper clip technologies comparison,** Abdoulahad Thiam (LAPLACE, CNRS, University of Toulouse), Emmanuel Sarraute, William Sanfins, Frédéric Richardeau, Maël Durand
4:20 PM	**Prognostics and Reliability Assessment of Insulated Gate Bipolar Transistor Power Electronic Modules,** Erick Gutierrez (University of Maryland), Kevin Lin, Patrick McCluskey
4:45 PM	**Comparison of Silicon Carbide Packages with Different Solder Attach Materials under High Temperature, Fast Power Cycling Conditions,** Lauren E. Kegley (Wolfspeed), Tim Foster, Sayan Seal, Robert Shaw, Brice McPherson, Brandon Passmore, Marcelo Schupbach, Ty McNutt

DIELECTRICS & INSULATION

Friday, April 26, 8:00 AM — 10:05 AM

Session Chairs: Mona Ghassemi (Virginia Tech), Davide Fabiani (Univ. of Bologna)

8:00 AM	**Ceramic Substrates and Liquids: Origin of Partial Discharges, and High Temperature Properties [Invited],** Olivier Lesaint (Univ. Grenoble Alpes, CNRS, Grenoble INP), Joko Muslim, Rachelle Hanna
8:25 AM	**Electrical Polymeric Insulation for Power Electronics: Physical Limits and New Tailored Composite Design Concepts [Invited],** Sombel Diaham (LAPLACE, CNRS, University of Toulouse)
8:50 AM	**Ceramic substrates for high voltage power electronics: past, present and future,** Zarel Valdez-Nava (LAPLACE, CNRS, University of Toulouse), Driss Kenfaui, Marie-Laure Locatelli, Lionel Laudebat, Sophie Guillemet- Fritsch
9:15 AM	**Drastic Change in Non-Linear Resistive Materials I(V) Characteristics** Guillaume Belijar (IRT Saint Exupéry), Loïc Hermette, Masahiro Kozako, Masayuki Hikita
9:40 AM	**Effect of Film Thickness and Electrode Material on Space Charge Formation and Conductivity in Polyimide Films ,** Flora Carrasco (University of Toulouse), Laurent Berquez, Kunihiko Tajiri, Hirotaka Muto, Didier Marty-Dessus, Marie-Laure Locatelli, Sombel Diaham, Virginie Griseri, Thierry Lebey, Gilbert Teyssedre

EMI & PARASITIC IMPLICATIONS

Friday, April 26, 10:15 AM — 12:20 PM

Session Chairs: Aaron Brovont (Univ. of Alabama), Nicolas Degrenne (MERCE)

10:15 AM	**Robust On-line Junction Temperature Estimation of IGBT Power Modules Based on V_{ON} during PWM Power Cycling [Invited]**, Nicholas Degrenne (Mitsubishi Electric Research Center Europe), Stefan Mollov
10:40 AM	**Packaging and integration of passive components to reduce board space with optimized thermal and electrical performance [Invited],** John Bultitude (KEMET), Tony Burk, Allen Templeton, Nathan Reed, Galen Miller, John McConnell, Javaid Qazi, Abhijit Gurav, Lonnie Jones, Jim Magee, Manuel Ortiz, Mark Laps, Reggie Phillips, Kunihiro Kusano, Kenichi Chatani, Yoshihiro Saito
11:05 AM	**Study of the impedance of the bypassing network of a switching cell – influence of the positioning of the decoupling capacitors,** Yoann Pascal (Lab. SATIE and CNAM, France), Mickaël Petit, Denis Labrousse, François Costa
11:30 AM	**Bus Snubber Optimization for Multi-Chip Power Modules** Brian T. DeBoi (University of Alabama), Andrew N. Lemmon
11:55 AM	**PEEC Method and Hierarchical Approach Towards 3D Multichip Power Module (MCPM) Layout Optimization,** Quang Le (University of Arkansas), Tristan Evans, Yarui Peng, Alan Mantooth

THERMAL CHALLENGES

Friday, April 26, 1:00 PM — 2:40 PM

Session Chairs: Lauren Boteler (Army Research Lab), Ercan Dede (Toyota

1:00 PM	**Advanced Thermal Ground Planes for Power Electronics [Invited]** Ryan McGlen (Aavid, Boyd Corp)
1:25 PM	**Thermal simulations of SiC MOSFETs under short-circuit conditions: influence of various simulation parameters,** Yoann Pascal (Lab. SATIE and CNAM, France), Mickaël Petit, Denis Labrousse, François Costa
1:50 PM	**Measurement of Space Charge Distribution Accumulated in Super Engineering Plastics at High Temperature Under High DC Electric Field ,** Maimi Mima (Tokyo City University), Yuuki Narita, Tokihiro Narita, Hiroaki Miyake, Yasuhiro Tanaka
2:15 PM	**Thermal Management and Reliability of Power Electronics and Electric Machines [Invited]** Sreekant Narumanchi (National Renewable Energy Laboratory)

POSTER SESSION

Wednesday, April 24, and Thursday, April 25, 11:30 AM — 1:00 PM
Session Chair: Patrick McCluskey (Univ. of Maryland)

1. **Development and evaluation of SiC inverter using Ni micro plating bonding power module**
   Akihiro Kawagoe (Kyushu Institute of Technology), Tomoya Itose , Akihiro Imakiire, Masahiro Kozako, Masayuki Hikita, Kohei Tatsumi, Tomonori Iizuka, Isamu Morisako, Nobuaki Sato, Koji Shimizu, Kazutoshi Ueda, Kazuhiko Sugiura, Kazuhiro Tsuruta, Keiji Toda
2. **Evaluation of Electric Charge Accumulation in Insulation Layer of Power Module using Direct Current Integrated Charge Measurement**
   Daiki Hanazawa (Tokyo City University), Maimi Mima, Kimio Hijikata, Hiroaki Miyake, Yasuhiro Tanaka, Tatsuo Takada
3. **An Auxiliary Resonant Switching Arm for a Buck-Boost Converter**
   José-Alejandro Pichardo-Iniesta (Instituto Politécnico Nacional), Ismael Araujo-Vargas
4. **Measurement of Space Charge Distribution in Epoxy Resin Package at High Temperature under High DC Stress**
   Kosuke Sato (Tokyo City University), Soichiro Konishi, Hiroaki Miyake, Yasuhiro Tanaka
5. **High reliable silver sintered joint on copper lead frame by pressure sintering process**
   Ly May Chew (Heraeus Electronics), Wolfgang Schmitt
6. **Electric Field Control by Nonlinear Field Dependent Conductivity Dielectrics Characterization for High Voltage Power Module Packaging**
   Maryam Mesgarpour Tousi (Virginia Tech) and Mona Ghassemi
7. **New approach for faster thermal modeling of PCBs based on power module applications**
   Michael Hofer (Würth Elektronik)
8. **Silver sinter paste for SiC bonding with improved mechanical properties**
   Wolfgang Schmitt (Heraeus Electronics), Ly May Chew, and David Stenzel

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RELIABILITY AND SYSTEM LEVEL DESIGN CONSIDERATIONS FOR SIC POWER MODULES

WEDNESDAY, APRIL 24, 2019 | 8:15 AM—9:35 AM

Dr. Ty McNutt

Director of Business Development, Wolfspeed, a Cree Company

This tutorial will cover SiC devices, packaging, and optimization of power electronic systems through design. For each topic, the current status of the technology will be covered, as well as touch on future technologies currently being developed. In addition, the tutorial will cover qualification and reliability aspects of the device and packaging technologies, from industrial to automotive requirements.

Dr. Ty McNutt currently serves as Director of Business Development for the Fayetteville, Arkansas location of Wolfspeed, a Cree Company. He manages various technical projects, and works closely with customers and their applications teams to integrate advanced silicon carbide device and packaging technologies into next generation systems. He is an inventor on seven issued patents on silicon carbide materials, devices, packaging, and applications, as well as authored or co-authored over 70 publications on wide bandgap devices. Dr. McNutt has been working in the field of silicon carbide for over 18 years and received his Ph.D. in Electrical Engineering from the University of Arkansas in the field of silicon carbide semiconductor device physics.

CONDUCTED ELECTROMAGNETIC INTERFERENCE IN POWER ELECTRONICS SYSTEMS

THURSDAY, APRIL 25, 2019 | 8:15 AM—9:35 AM

Dr. Aaron Brovont

Assistant Professor, The University of Alabama

This tutorial provides an introductory to intermediate-level treatment of techniques for modeling and analysis of conducted EMI in power electronic systems. Emphasis is placed on understanding common-mode behavior and mode conversion directly resulting from power module parasitics. Specifically, a systematic approach to modeling conducted emissions in power electronic systems is derived, and the approach is demonstrated on an example EMI qualification testbed. Predicted and experimental results are compared. The demonstration includes the identification of critical parasitic elements, decomposition of common-mode (CM) and differential-mode (DM) operation, and analytical estimation of induced CM voltages. Finally, the decomposed DM/CM model is employed to quantitatively analyze and mitigate the impact of power module parasitics on EMI compliance.

Aaron D. Brovont received the B.S. in electrical engineering, the M.S. in electrical and computer engineering, and the Ph.D. degrees from Purdue University in West Lafayette, IN, in 2011, 2013, and 2016, respectively. He is currently an Assistant Professor of Electrical and Computer Engineering at the University of Alabama, Tuscaloosa. His research interests include modeling and design of power electronic systems for optimal EMI mitigation, utilization of common-mode behavior for power system monitoring and control, and numerical methods for use with population-based design of power system components.

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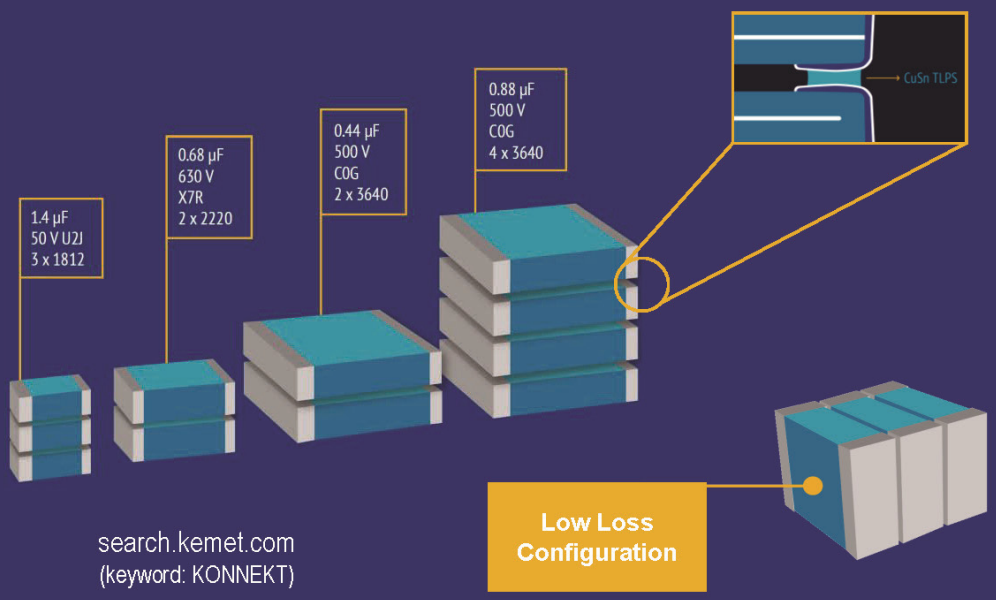

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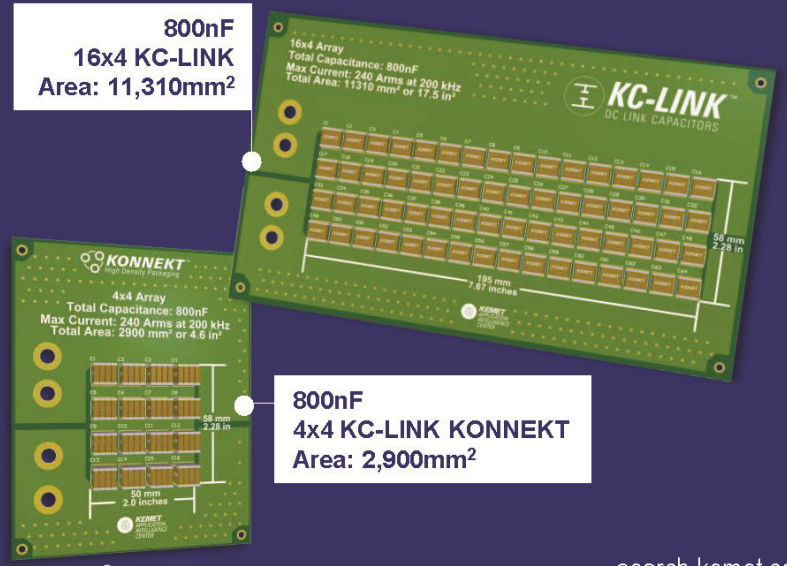

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Littelfuse offers the broadest selection of discrete SiC MOSFETs and Schottky Diodes in industry standard and innovative packages. SiC MOSFETs exhibit extremely fast dynamic characteristics and ultralow on resistances which make them appealing design alternatives to traditional Si MOSFETs or IGBTs. SiC Schottky diodes demonstrate extremely fast, temperature independent switching speeds and negligible reverse recovery losses also making them lucrative options in converter designs in which efficiency and power density are key.

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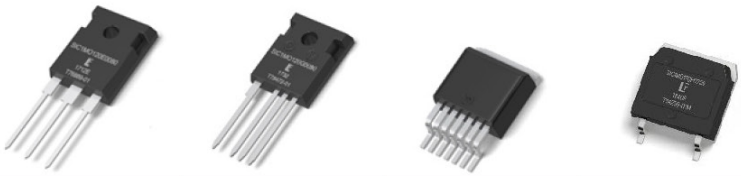

	$R_{DS,ON}$ (mΩ)	TO-247-3L	TO-247-4L	TO-263-7L (D2PAK)	TO-268-2L (D3PAK)
1200 V	160	LSIC1MO120E0160	LSIC1MO120G0160	LSIC1MO120T0160	
	120	LSIC1MO120E0120	LSIC1MO120G0120	LSIC1MO120T0120	
	80	LSIC1MO120E0080	LSIC1MO120G0080	LSIC1MO120T0080	
	40	LSIC1MO120E0040	LSIC1MO120G0040		
	25	LSIC1MO120E0025	LSIC1MO120G0025		
1700 V	750	LSIC1MO170E1000		LSIC1MO170T0750	LSIC1MO170H0750

- TO-247-3L: Most common
- TO-247-4L: With Kelvin connection
- TO-263-7L: Surface mount with Kelvin connection
- TO-268-2L: High creepage
- Bare die available upon request
- Competitive performance and price with best-in-class delivery in market
- Samples available for evaluation
- In Qual./Dev. part numbers to be released in 2019

SiC Schottky Diode Portfolio

In Production
In Qual./Dev.

	I_F	TO-252-2L (DPAK)	TO-263-2L (D2PAK)	TO-220-2L	TO-247-3L
650 V	6 A	LSIC2SD065C06A	LSIC2SD065D06A	LSIC2SD065A06A	
	8 A	LSIC2SD065C08A	LSIC2SD065D08A	LSIC2SD065A08A	
	10 A	LSIC2SD065C10A	LSIC2SD065D10A	LSIC2SD065A10A	LSIC2SD065E10CCA
	12 A				LSIC2SD065E12CCA
	16 A	LSIC2SD065C16A	LSIC2SD065D16A	LSIC2SD065A16A	LSIC2SD065E16CCA
	20 A	LSIC2SD065C20A	LSIC2SD065D20A	LSIC2SD065A20A	LSIC2SD065E20CCA
	32 A				LSIC2SD065E32CCA
	40 A				LSIC2SD065E40CCA
1200 V	5 A	LSIC2SD120C05		LSIC2SD120A05	
	8 A	LSIC2SD120C08		LSIC2SD120A08	
	10 A	LSIC2SD120C10	LSIC2SD120D10	LSIC2SD120A10	LSIC2SD120E10CC
	15 A		LSIC2SD120D15	LSIC2SD120A15	LSIC2SD120E15CC
	20 A		LSIC2SD120D20	LSIC2SD120A20	LSIC2SD120E20CC
	30 A				LSIC2SD120E30CC
	40 A				LSIC2SD120E40CC

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ECPE, the Industry-driven Power Electronics Research Network in Europe with more than 170 member organizations is promoting research, expert workshops and advanced training as well as public relations in power electronics. The ECPE Network covering the value chain from the materials and components to the systems and applications strengthens the cooperation between Power Electronics industry and university & research institutes on a European level. As a European Technology and Innovation Platform ECPE is driving precompetitive joint research and sets up research & technology roadmaps for a strategic research agenda with future research directions according to the demands of European power electronics industry.

IEEE Electronics Packaging Society (EPS)

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The IEEE Electronics Packaging Society is the leading international forum for scientists and engineers engaged in the research, design and development of revolutionary advances in microsystems packaging and manufacturing. Its objectives are scientific, literary, and educational in character. The Society strives for the advancement of the theory and practice of electrical and electronics engineering and of the allied arts and sciences, and the maintenance of a high professional standing among its members and others and with special attention of such aims within the field of interest of the Society.

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DEIS' interests lie in materials, measurements, numerical modelling, components, applications and systems pertinent to dielectrics and electrical insulation. These include solids, liquids and gases; small-scale systems such as nano-dielectrics and bio-dielectrics; high-voltage and high-field phenomena; and large-scale systems such as high-power insulation applied to electricity generation, transmission, and distribution. DEIS supports the basic science of dielectrics and electrical insulation through practical applications and the development of relevant standards.

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Contact: Braham Ferreira
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The Power Electronics Society is one of the fastest growing technical societies of IEEE. For over 20 years, PELS has facilitated and guided the development and innovation in power electronics technology. This technology encompasses the effective use of electronic components, the application of circuit theory and design techniques, and the development of analytical tools toward efficient conversion, control and condition of electric power. The Power Electronics Society's goal is to keep members current and competitive in the workplace, and provide them with the tools necessary to help them grow both personally and professionally.

ISP System

ZI la Herray BP 10047
65501 VIC EN BIGORRE
FRANCE
www.isp-system.fr
+33 (0) 5 62 33 44 44
contact@isp-system.fr

Contact: Jean-Yves Bécel
jean-yves.becel@isp-system.fr

ISP System is a leading manufacturer of fully automated high precision mechatronics systems. We can provide you with a wide range of die attach systems based on leading-edge technology. The offering includes adhesive bonding, laser selective soldering, laser selective sintering, and together with our partners we have developed an innovative sintering process allowing high thermal conductivity assembly for power packaging.

Heraeus Electronics

Heraeus Holding GmbH
Postfach 1561
D-63405 Hanau, Germany
www.heraeus-electronics.com
+49618135-5466
electronics.emea@heraeus.com

Contact: Anette Dressler
anette.dressler@heraeus.com

We are one of the leading manufacturers of materials for the assembly and packaging of devices in the electronics industry. We develop sophisticated materials solutions for consumer electronics and computing, automotive, LED, power electronics and communications. Our core competences include bonding wires, assembly materials, thick film pastes as well as roll clad strips and substrates, and their integration into perfectly matched systems.

PINK GmbH Thermosysteme

Am Kessler 6
97877 Wertheim
Germany
http://www.pink.de/en/
+49 (0) 93 42-919 0
info@pink.de

Contact: Thomas Krebs
tkrebs@pink.de

PINK GmbH Thermosysteme is located in Wertheim/Germany and produces systems for vacuum-supported soldering, low-pressure plasma systems, sintering systems as well as systems for drying and processing technology. PINK is a worldwide supplier for innovative and reliable customized systems and delivers products to well-known technology companies of e.g. automotive industry and their suppliers, semiconductor industry, electronics industry as well as chemical and pharmaceutical industry.

Power Sources Manufacturers Association (PSMA)

P.O. Box 418
Mendham, NJ 07945-0418
https://www.psma.com/
+1-973-543-9660
power@PSMA.com

Contact: Joe Horzepa
joe@psma.com

The purpose of PSMA is to enhance the stature and reputation of its members and their products, improve their knowledge of technological and other developments related to power sources, and educate the entire electronics industry, plus academia, as well as government and industry agencies as to the importance of, and relevant applications for, all types of power sources and conversion devices.

REGISTRATION & HELP DESK

Full conference registration admits one individual to all technical sessions including the tutorials, plenary sessions, and the exhibition atrium, in addition to all social / networking functions. Food & beverage registrations may be purchased at the registration desk for exclusive access to the social and networking events. The food and beverage registration, which is available for €350, includes all conference social and networking events but does not include the technical content of the workshop.

Tutorials will take place on Wednesday and Thursday morning, and registered conference attendees will receive the material for each of these tutorials.

Throughout the duration of the conference, the registration desk will remain staffed for the convenience of the participants. Any conference or program questions may be directed to this help desk; when the conference is not in session, please contact a member of the organizing committee with questions.

REGISTRATION RATES

	Early Reg.*	Late / On-Site Reg.*
IEEE / PSMA Member	€460	€530
Non-IEEE / PSMA Member	€500	€570
Student	€260	€350
Food & Beverage	€260	€350

*Excludes 20% VAT + Processing Fees

BADGES

Badges should be worn at all official functions of the meeting. Badge checkers will be stationed throughout the meeting areas. Only those with technical registrations will be allowed into sessions. If you forget or lose your badge, you may obtain a second badge at the registration desk with proof of registration.

RECEIPTS

All participants who register online will receive a receipt/confirmation via email. If you need additional paperwork, please contact the event staff, located at the registration desk.

CONSENT TO USE OF IMAGES

Registration and attendance / participation in IWIPP constitutes an agreement by the registrant for IWIPP's use and distribution (both now and in the future) of the registrant or attendee's image or voice in photographs, videotapes, electronic reproductions and audiotapes of such events and activities. The use of cameras and/or recorders is strictly prohibited during the oral and poster sessions. Limited use is allowed for Exhibitors in their own booth area. Personal photography is allowed at social functions.

LOST & FOUND

Any lost & found items should be turned into the registration desk, and will be left with the hosting institution staff if unclaimed at the end of the event.

INTERNET ACCESS

Complimentary WiFi is available throughout the conference facilities. The network is called wifinp and a personal login + password will be provided when you will register. Please notify the front desk if there are any internet issues.

LOCAL TRANSPORTATION

Taxis and public transportation is available in Toulouse. The main conference location is located only a few minutes walking distance from the following metro stations and bus stops:

line B: "François Verdier" Station

line A: "Jean Jaurès" Station

Bus N°14 - 29, "Saint Georges" Stop

Bus N°16 - 22, "Place Dupuy " Stop

Bus N° 27, "Guilheméry"Stop

Bus N° 29 - 38, "François Verdier"Stop

PARKING

There is no parking available in ENSEEIHT. The closest parking locations are indicated in the map on page 30 of this program. The cost for parking a vehicle for one full day is around 15€.

ACCESSIBILITY FOR REGISTRANTS

The meeting staff will work with attendees to provide reasonable accommodations for those who require special needs. To request assistance on-site, please check in at the Registration & Help Desk.

DISTRIBUTING COMMERCIAL MATERIAL

Distribution of commercial material in the IWIPP meeting and exhibition spaces by people or organizations not sanctioned as a Partner, Sponsor, or Exhibitor is prohibited. IWIPP reserves the right to remove without notice any materials not in compliance with this policy.

LOCATIONS

The IWIPP 2019 headquarters & technical content will be held at the following location:

ENSEEIHT (N7)

2, Rue Charles Camichel

31000 Toulouse

France

+33 (0)5 34 32 20 00

The Wolfspeed Conference Banquet will be held on Thursday, April 25, at the following location:

Espaces Vanel

1 Allée Chaban Delmas

31500 Toulouse

For local recommendations and additional transportation instructions, please refer to the Conference Location & Local Accommodations pages on the conference website at www.iwipp.org.

INVITED PRESENTATIONS

In order to provide direct access to the wisdom and knowledge of distinguished packaging industry leaders, plenary sessions are offered to kick-off the technical content each full day of the conference.

ORAL TECHNICAL SESSIONS

The Technical Program Committee organized a rigorous peer review process and has carefully picked the papers making up the 7 focused Oral Sessions. The various technical tracks are designed to enhance the knowledge-base for practicing packaging and power electronics professionals. **All authors are expected to deliver their final technical presentations to the session chair prior to the start of session. For morning presenters, this should be done before the start of the day's program. For afternoon presenters, this should be done before the end of the lunch period. Technical presentations may be provided via USB or email.**

POSTER TECHNICAL SESSIONS

This year, the poster session will be held during lunch on Wednesday and Thursday. All poster presenters are asked to setup their posters during the morning break on Wednesday, April 24. Poster presenters should be available for questions at their display during the scheduled poster session time. Poster board backing material for the specified conference poster size and push pins will be provided. Please keep the dimensions provided to you in mind when designing and printing final content.

NETWORKING BREAKS + LUNCH

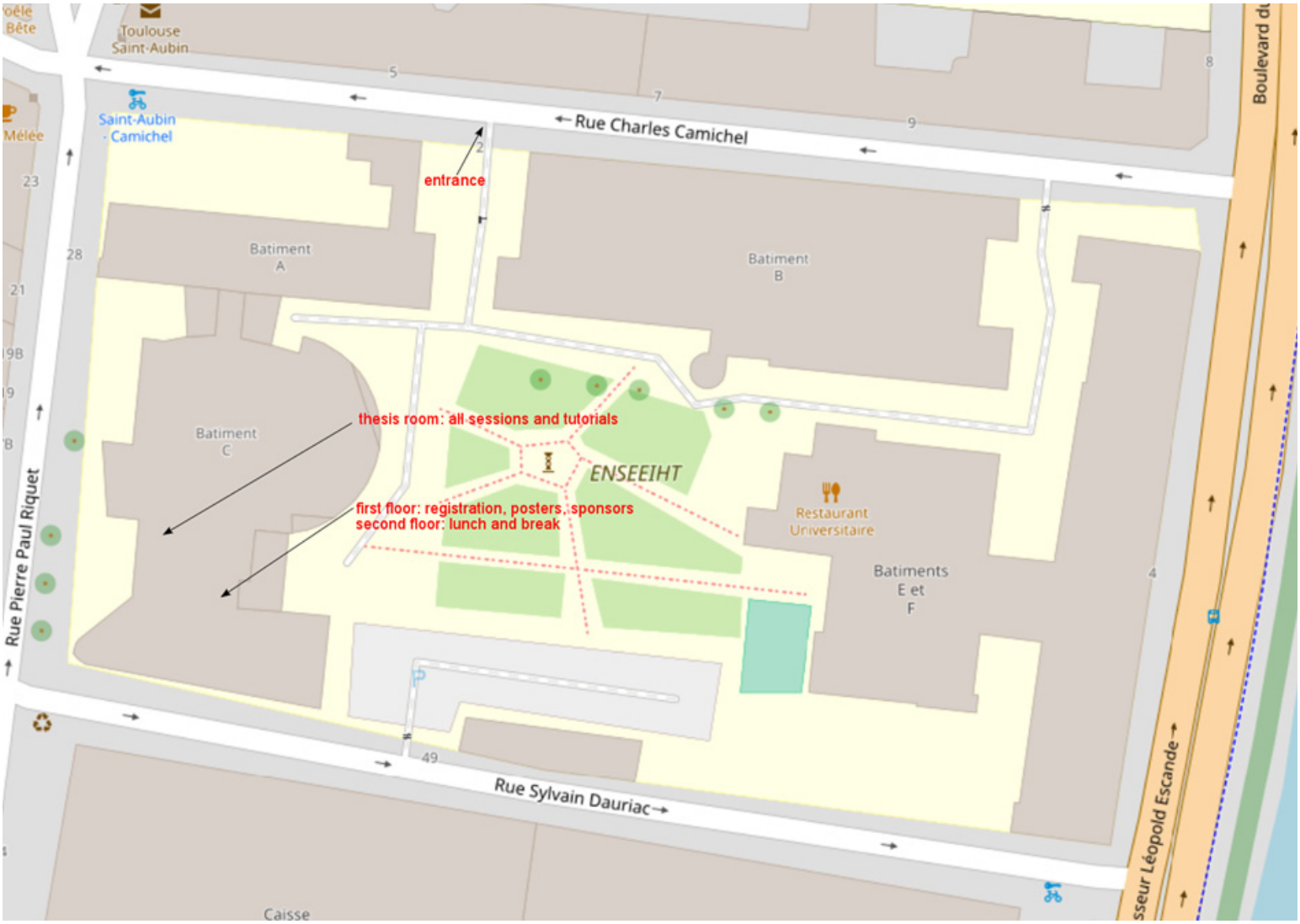
IWIPP's generous industry sponsors understand that coffee, tea, and snacks are necessary brain food to ensure each participant leaves IWIPP with as much knowledge as possible. As such, there will be beverage service and two snack breaks each day in the exhibition area. Each day of the conference, lunch is also provided.

KEMET-LITTELFUSE WELCOME RECEPTION

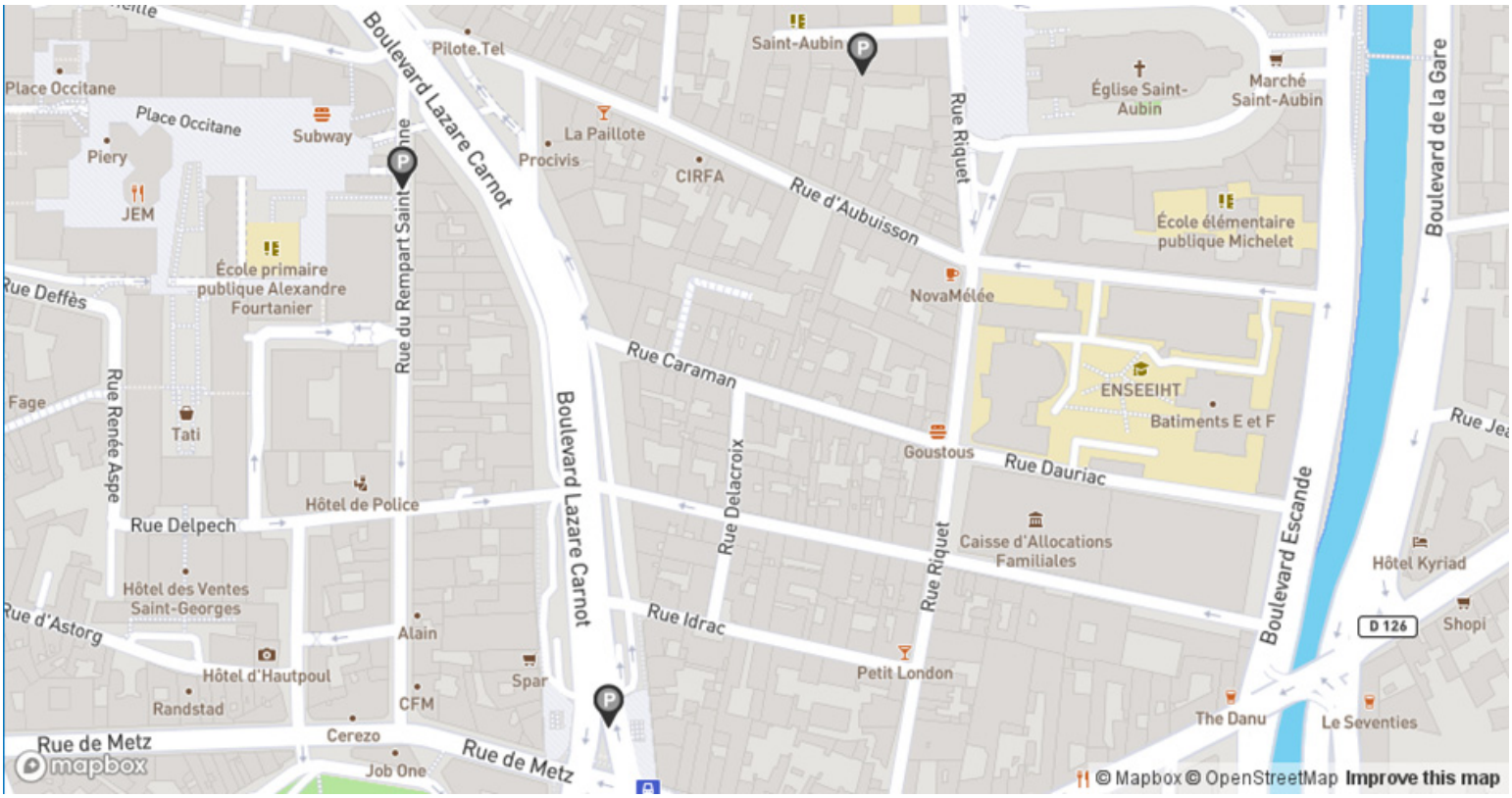
On Wednesday, April 24, Kemet, Littelfuse, and the IWIPP Leadership celebrate the start of this year's workshop with a networking event following the completion of the first day of the technical program. The event will have beverage service and hors d'oeuvres, while the conference attendees have the opportunity to network with IWIPP exhibitors.

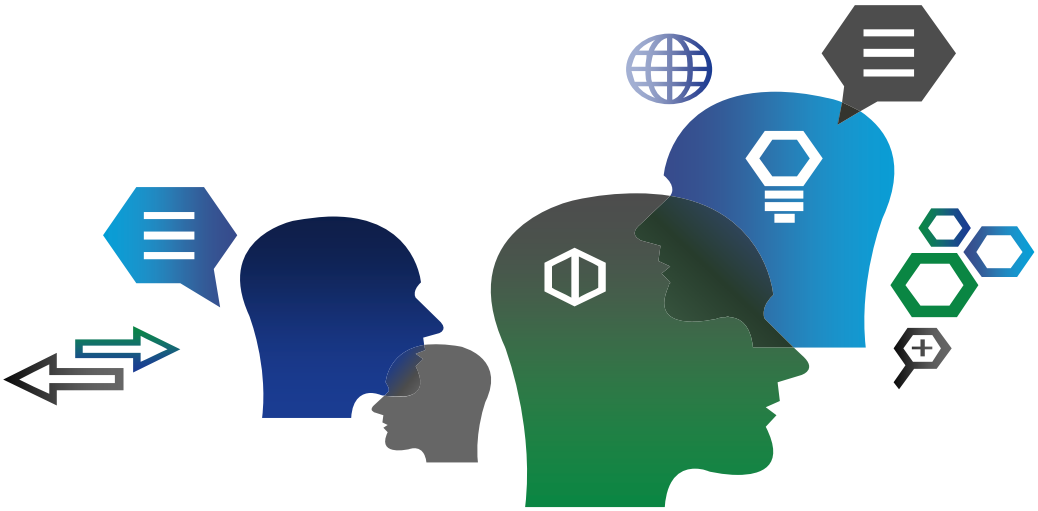
WOLFSPEED CONFERENCE BANQUET

On Thursday, April 25, Wolfspeed and the IWIPP Leadership invite you to participate in a Gala dinner at Espaces Vanel. The Gala dinner will have great food, networking opportunities, and exciting giveaway items from IWIPP's industry partners. The gala dinner location is within walking distance (10 min) of the conference location and around 10 min from downtown Toulouse. More details will be provided on Thursday afternoon (before the social event).


Toulouse Saint-Aubin
Saint-Aubin - Camichel
Rue Charles Camichel
entrance
Batiment A
Batiment B
Batiment C
thesis room: all sessions and tutorials
ENSEEIHT
first floor: registration, posters, sponsors
second floor: lunch and break
Restaurant Universitaire
Batiments E et F
Rue Pierre Paul Riquet
Rue Sylvain Dauriac
Caisse
Boulevard

IWIPP 2019 Public Parking Locations





THANK YOU FOR YOUR ATTENTION, PARTICIPATION, & INNOVATIVE THINKING

Without you, IWIPP wouldn't be a success. Not only are we grateful for your participation, we want to hear from you about how we can improve in the future!

If you need anything throughout the conference or after it has come to an end, please feel free to reach out to the IWIPP Organizing Committee.

We hope that you fully enjoyed your time in Toulouse, and that you left with great knowledge to take back to your organization!

Sincerely, the 2019 IWIPP Leadership

2019 IWIPP