

Strong Turnout For Workshop On Power Electronics Packaging

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The [2019 International Workshop on Integrated Power Packaging \(IWIPP\)](#) was held at the LAPLACE CNRS in Toulouse, France, April 24-26, 2019. Thierry Lebey the director and general chair of the workshop welcomed us to Toulouse on the first day. Attendance was up 30% compared to 2017 (94 registered attendees in 2019 vs. 72 in 2017). This increase in interest probably reflects the importance of improved power electronics packaging for more efficient power through many industries. There was significant international representation; approximately 50% of attendees came from Europe, 35% from the U.S., and 15% from Asia.

The technical program this year was very strong with positive feedback from audience members that indicated that the program exceeded expectations for content quality. Since Toulouse is the center of the European aerospace industry it is not surprising that many of the presentations were related to the Electrification Challenges in Aeronautics. These were reviewed in a plenary by Christophe Lochot of Airbus.



Although this gave us an insight into these issues, one of the core characteristics of IWIPP is that it has always been a multi-disciplinary workshop and this year was no exception. Power packaging design requires expertise from a range of engineering disciplines; including electrical, thermal, mechanical, and materials. Attendees were exposed to all aspects of power electronics packaging over a wide range of interdisciplinary research.



The use of wide-bandgap semiconductors and the challenges these present for packaging were discussed by many presenters. Ty McNutt of Wolfspeed gave a tutorial on System Level Reliability for SiC Power Modules and Ahmed Elasser of GE Global Research reviewed the history and future prospects for SiC. The critical packaging design aspects associated with higher switching frequencies and temperatures were reviewed in depth.

Aaron Brovont of the University of Alabama gave a tutorial on assessing EMI in power electronics and novel approaches to thermal management were reviewed by Ercan Dede of Toyota. As power packaging becomes more critical to aerospace and automotive industries, understanding reliability is extremely important and the origins of these limits were described by Laurent Dupont IFSTAR-SATIE in his plenary presentation.

Many of the oral presentations described various approaches to enhancing performance through improved packaging materials and better circuit designs. Several different developments were described in detail including the use of aluminum metallized silicon nitride substrates as well as the increasing use of sintered metal and transient liquid metal interconnects. The performance of coatings for very high voltage insulation was reviewed in detail. Packaging passive components to achieve higher power densities whilst reducing parasitic inductance and resistance was reviewed in some of the presentations.



In addition to presentations by leaders from academia and industry, students also presented their work in oral and poster presentations. To encourage student participation to present their research findings and cultivate interest in packaging technologies among the next generation of engineers IWIPP 2019 offers a Student Travel Grant Award. In 2019 this was won by Brian T. DeBoi of the University of Alabama who presented work on Bus Snubber Optimization for Multi-Chip Power Modules supervised by Andrew N. Lemmon.

Brian's research focuses on improving frequency-domain characterization and behavioral die modeling methods of silicon carbide utilizing devices and their surrounding packaging. These improved models and parasitic estimations can be leveraged in simulation to better understand what parameters are most impactful on device behavior, and to devise techniques to improve performance of real-world systems.

There were plenty of networking opportunities at the poster session at the several benchtops exhibits and during the tours of the Power Electronics & Integration, Smart Grid & Emulation and Actuation & Electroactive Morphing Laboratories. Discussions continued through the banquet dinner sponsored by Wolfspeed (Diamond Level Sponsorship). The high-quality food and wine provided during the banquet and meetings probably set a new benchmark for the workshop.

Additional sponsorship was provided by Littelfuse and KEMET (both at Platinum Level) and Heraeus (Gold Level Partner). This workshop was endorsed and sponsored by the IEEE Power Electronics Society (PELS), IEEE Electronics Packaging Society (EPS), IEEE Dielectrics and Insulation Society (DEIS), Power Sources Manufacturers Association (PSMA) and European Center for Power Electronics (ECPE).

This broad participation of academia and industry resulted in a multi-disciplinary event to present and discuss innovative solutions to address the challenges of power packaging in many applications. Planning will begin soon for IWIPP 2021 that will expand this commitment to the power packages of tomorrow. Those interested in helping to organize for 2021 can reach out to Andrew Lemmon at lemmon@eng.ua.edu.

