

**Tuesday, March 20, 10:00 - 10:10**

## **Introduction**

Room: Reithalle

**Tuesday, March 20, 10:10 - 11:50**

## **Clean switching, electromagnetic compatibility (EMC)**

Room: Reithalle

### **10:10 *Integration solutions for clean and safe switching of high speed devices***

Jean-Luc Schanen (Grenoble Electrical Engineering Laboratory, France); Pierre-Olivier Jeannin (Grenoble Université, France)

### **10:50 *Review of Parasitic Minimization Techniques for High Frequency Power Conversion***

David Reusch (Efficient Power Conversion (EPC), USA)

### **11:20 *A Fully-Isolated Robust Common-Mode Hybrid Filter***

Stefan Mollov (Mitsubishi Electric R&D Centre Europe, France)

**Tuesday, March 20, 11:50 - 13:20**

## **Lunch break**

Rooms: 2nd lecture hall, Reithalle

**Tuesday, March 20, 13:20 - 15:00**

## **EMC, Components to be integrated**

Room: Reithalle

### **13:20 *Electromagnetic noise induced by novel high voltage fast switching device***

Tsuyoshi Funaki (Osaka University, Japan)

### **14:00 *Future Requirements for PE - Silicon versus GaN versus SiC based power devices , comparison of key parameters with respect to use in power electronics***

Gerald Deboy (Infineon Technologies Austria AG, Austria)

### **14:30 *Frequency Optimum of Semiconductor Technologies and State-of-the-Art Magnetic Components in SMPS***

Tobias Reimann (Technische Universität Ilmenau, Germany)

**Tuesday, March 20, 15:00 - 15:30**

**Tea break**

Rooms: 2nd lecture hall, Reithalle

**Tuesday, March 20, 15:30 - 17:00**

**Reliability (1)**

Room: Reithalle

**15:30 Test Strategy in Industrial Product Development**

Lars Rimestad (Grundfos, Denmark)

**16:00 Automotive Qualification Routines for Power Electronics Components in Electrified Powertrains**

Martin Rittner (Robert Bosch GmbH, Germany); Markus Thoben (Infineon Technologies AG, Germany); Kai Kriegel (Siemens AG, Germany)

**16:30 Condition and Health Monitoring in Power Electronics**

Stefan Mollov (Mitsubishi Electric R&D Centre Europe, France); Frede Blaabjerg (Aalborg University, Denmark)

**Tuesday, March 20, 17:00 - 17:20**

**Break**

Rooms: 2nd lecture hall, Reithalle

**Tuesday, March 20, 17:20 - 18:30**

**Reliability (2)**

Room: Reithalle

**17:20 Analytics for Power Electronic Components - Methods to figure out root causes of failures**

Sandy Klengel (Fraunhofer Institute for Microstructure of Materials and System, Germany); Bianca Boettge (Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Germany); Matthias Petzold (Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Germany)

**17:50 Limitation of Power Module Lifetime Derived from Active Power Cycling Tests**

Uwe Scheuermann and Marion Junghänel (Semikron Elektronik GmbH & Co. KG, Germany)

**Tuesday, March 20, 19:00 - 22:00**

## **Get Together + Poster Session**

Rooms: 2nd lecture hall, Reithalle

### ***A mitigation solution for bifurcations in a low-power 4-Switch Buck-Boost converter (4SBB)***

Amokrane Malou (University of Lyon & ON Semiconductor, France); Bruno Allard, Xuefang Lin-Shi and Alaa Hijazi (INSA Lyon, France); Berengere Le Men (ON Semiconductor, France)

### ***Identifying the Stray Elements of the Experimental Setup Used in the Semiconductor Datasheets***

Mylene Delhommais, Jean-Luc Schanen, Yvan Avenas and Frédéric Wurtz (Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, F-38000 Grenoble, France); Cecile Rigaud and Sylvain Chardon (Tronico, France)

### ***A Novel Gate Driving Approach to Balance the Transient Current of Parallel-Connected GaN-HEMTs***

Jonathan Hackel, Michael Ebli and Martin Pfof (TU Dortmund, Germany)

### ***A co-planar power bus interconnect prototype for low inductance switching***

Xi Lin (University of Nottingham, United Kingdom (Great Britain)); Jianfeng Li (The University of Nottingham, United Kingdom (Great Britain)); C Mark Johnson (University of Nottingham, United Kingdom (Great Britain))

### ***A correlative approach to observing the thermomechanically driven microstructural evolution of ultrasonically bonded copper wires***

Bassem Mouawad, Pearl A Agyakwa, Martin Corfield and C Mark Johnson (University of Nottingham, United Kingdom (Great Britain))

### ***Novel specimen design to test engineering plastics for power electronic applications***

Bianca Boettge and Rico Bernhardt (Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Germany); Sandy Klengel (Fraunhofer Institute for Microstructure of Materials and Systems IMWS); Sebastian Wels and Albert Claudi (University of Kassel, Germany)

### ***Investigations on the evolution of dynamic Ron of GaN power transistors during switching cycles***

Malika Elharizi (IFSTTAR); Richard Lallemand, Zoubir Khatir and Jean-Pierre Ousten (IFSTTAR, France)

### ***FEM based enhancement of system lifetime by improvement of the die top connection of power electronic semiconductors***

Andreas Klein (Heraeus Deutschland GmbH & Co. KG, Germany); Martin Becker (Danfoss Silicon Power GmbH, Germany); Anton Miric, Benjamin Fabian, Andreas Hinrich and Marko Kalajica (Heraeus Deutschland GmbH & Co. KG, Germany); Wolfgang Schmitt (Heraeus Materials Technology GmbH & Co. KG, Germany)

### ***Vibrational resistance investigation of an IGBT gate driver utilizing frequency response analysis and highly accelerated life test (HALT)***

Thomas Schriefer (University of Erlangen-Nuremberg & Chair of Electron Devices, Germany); Maximilian Hofmann (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany); Martin März (FhG Erlangen, Germany)

### ***Analysis of Transient Thermal-Mechanical Stresses in Power Devices Using Test Chips and Optical Techniques***

Markus Feisst (Universität Freiburg - IMTEK, Germany); Eike Möller (Albert-Ludwigs-Universität Freiburg & Institut für Mikrosystemtechnik-IMTEK, Germany); Jürgen Wilde (Universität Freiburg - IMTEK, Germany)

### ***Lifetime Testing Method for Ceramic Capacitors for Power Electronics Applications***

Fabian Dresel, Nils Tham and Tobias Erlbacher (Fraunhofer IISB, Germany); Andreas Schletz (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany)

### ***An Investigation of Frequency Response Analysis Method for Junction Temperature Estimation of SiCs Power Device***

Xiang Lu and Cuili Chen (Newcastle University, United Kingdom (Great Britain)); Maher Al-Greer (Teesside University, United Kingdom (Great Britain)); Volker Pickert and Charalampos C. Tsimenidis (Newcastle University, United Kingdom (Great Britain))

### ***Solder layer degradation measurement for SiC-MOSFET Modules during thermal cycling tests***

Haoze Luo (Aalborg University, Denmark); Francesco Iannuzzo (Università di Cassino e del Lazio Meridionale, Italy); Frede Blaabjerg (Aalborg University, Denmark)

### ***In-situ condition monitoring system to study the ageing of power semi-conductor devices in photovoltaic inverters***

Mouhannad Dbeiss (CEA-INES, France); Yvan Avenas (Grenoble Université, France); Henri Zara (CEA-INES, France); Laurent Dupont (IFSTTAR, France)

### ***Pressure less sintering of large dies by infrared radiation***

Wolfgang Schmitt (Heraeus Materials Technology GmbH & Co. KG, Germany); Ly May Chew (Heraeus Deutschland GmbH & Co. KG, Germany); Robert Miller (Hochschule Aschaffenburg, University of Applied Sciences, Germany)

### ***Integrated LED Driver based on 800V Si L-IGBTs***

Attahir Murtala Aliyu (University of Nottingham, United Kingdom (Great Britain)); Alwyn Elliott (Imperial College, United Kingdom (Great Britain)); Vasantha Pathirana and Nishad Udugampola (University of Cambridge, United Kingdom (Great Britain)); Pushparajah Rajaguru (University of Greenwich, United Kingdom (Great Britain)); Alberto Castellazzi (University of Nottingham & Power Electronics, Machines and Control Group, United Kingdom (Great Britain)); Paul Mitcheson (Imperial College London, United Kingdom (Great Britain)); Tanya Trajkovic (Camutronics, United Kingdom (Great Britain)); Florin Udrea (University Of Cambridge, United Kingdom (Great Britain)); Christopher Bailey (University of Greenwich, United Kingdom (Great Britain))

### ***Electrochemical Corrosion on Ceramic Substrates for Power Electronics - Causes, Phenomenological Description, and Outlook***

Christoph Friedrich Bayer and Antonia Diepgen (Fraunhofer Institute for Integrated Systems and Device Technology, Germany); Thomas Filippi (Fraunhofer IISB, Germany); Carmen Fuchs, Sophie Wüstefeld, Simon Kellner and Uwe Waltrich (Fraunhofer Institute for Integrated Systems and Device Technology, Germany); Andreas Schletz (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany)

### ***Parasitic Extraction Procedures for SiC Power Modules***

Ivana Kovacevic-Badstuebner and Roger Stark (Advanced Power Semiconductor Laboratory, ETH Zurich, Switzerland); Mattia Guacci (Power Electronic Systems Laboratory, ETH Zurich, Switzerland); Johann. W. Kolar (ETH Zurich, Switzerland); Ulrike Grossner (Advanced Power Semiconductor Laboratory, ETH Zurich, Switzerland)

### ***Fabrication of PCB embedded 1200V/50A power module and benchmarking with commercial DBC based package***

Ankit Bhushan Sharma, Johann Schnur, Niko Haag, Thomas Kuwan, Armin Stogel and Till Huesgen (Hochschule Kempten - University of Applied Science, Germany)

***Influence of Dielectric Constant on Partial Discharge Inception Voltage of Ceramic Insulating Substrate under High Temperature***

Tsuyoshi Abe, Michiya Suenaga and Akihiro Imakiire (Kyushu Institute of Technology, Japan); Masahiro Kozako and Masayuki Hikita (Kyusyu Institute of Technology, Japan); Takashi Nishimura, Hiroki Shiota and Hirotaka Muto (Mitsubishi Electric Corporation, Japan)

***On the reliability of stacked metallized ceramic substrates under thermal cycling***

Bassem Mouawad (University of Nottingham, United Kingdom (Great Britain)); Jianfeng Li (The University of Nottingham, United Kingdom (Great Britain)); Alberto Castellazzi (University of Nottingham & Power Electronics, Machines and Control Group, United Kingdom (Great Britain)); C Mark Johnson (University of Nottingham, United Kingdom (Great Britain))

***Novel PD Location Algorithm for Next Generation Power Module using Small Loop Sensors***

Jyunya Maki and Yuya Akinaga (Kyushu Institute of Technology, Japan); Masahiro Kozako and Masayuki Hikita (Kyusyu Institute of Technology, Japan); Yoko NAKamura, Yoshinari Ikeda, Katsumi Taniguchi and Kenji Okamoto (Fuji Electric Co., Ltd, Japan)

***Vias in DBC Substrates for Embedded Power Modules***

Hoang Linh Bach, Zechun Yu and Sebastian Letz (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany); Christoph Friedrich Bayer and Uwe Waltrich (Fraunhofer Institute for Integrated Systems and Device Technology, Germany); Andreas Schletz (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany); Martin März (FhG Erlangen, Germany)

***Thermal Characteristic Evaluation and Transient Thermal Analysis of Next-generation SiC Power Module in 250°C High Temperature***

Akihiro Imakiire (Kyushu Institute of Technology, Japan); Masahiro Kozako and Masayuki Hikita (Kyusyu Institute of Technology, Japan)

***Simulation of the Thermal Transient Behaviour of Silicon Carbide Modules Using Liquid Convection Cooling***

Ulf Mütter (Helmut Schmidt University, Germany); Jens Radvan (Philips Medical Systems, Germany); Stefan Richter (Philips Medical Systems, United Kingdom (Great Britain)); Klaus Hoffmann (Helmut-Schmidt-Universität, Germany)

***A SiC MOSFET power module with integrated gate drive for 2.5 MHz Class E resonant converters***

Asger Jørgensen (Aalborg University, Denmark); Unnikrishnan Nair (Universitat Politecnica de Catalunya, Denmark); Stig Munk-Nielsen and Christian Uhrenfeldt (Aalborg University, Denmark)

***A High Performance 1200V/120A SiC Power Module Based On a Novel Multi-DBCs Hybrid Packaging Structure***

Yuxiong Li, Cai Chen, Zhizhao Huang and Lichuan Chen (Huazhong University of Science and Technology, P.R. China); Kaifeng Zou (Naval Aeronautical Engineering University Qingdao Branch, P.R. China); Yong Kang (Huazhong University of Science and Technology, P.R. China); Fang Luo (University of Arkansas, P.R. China); Sichao Li (Huazhong University of Science and Technology, P.R. China)

***Direct Copper Bonding (DCB) alumina substrates with pre-applied solder pads for simplified die soldering and improved manufacturing yield***

Hans-Jürgen Richter, Pan Liu and Michael Schaefer (Heraeus Electronics, Germany); Dieter Watzal (Heraeus Deutschland, Germany); Sebastian Fritzsche (Heraeus Materials Technology GmbH & Co. KG, Germany); Christophe Féry (Heraeus Electronics, Germany)

***Reliability Design of Dual Sided Cooled Power Semiconductor Module for Hybrid and Electric Vehicles***

Yangang Wang (Dynex Semiconductor Ltd, United Kingdom (Great Britain))

***A Novel Double Sided Cooled Leadframe Power Module for Automotive Application based on ceramic-free Substrates***

Bao Ngoc An (Karlsruhe Institute of Technology, Germany); Johannes Kolb (SHARE at KIT, Germany); Thomas Blank, Benjamin Leyrer and Marc Weber (Karlsruhe Institute of Technology, Germany); Dorit Nötzel (Karlsruher Institut für Technologie (KIT), Germany); Thomas Hanemann (Karlsruhe Institute of Technology (KIT), Germany); Horst Demattio (Karlsruhe Institute of Technology, Germany); Peter Kästner (Karlsruhe Institute of Technology (KIT), Germany); Michael Meisser, Torsten Scherer and Matthias Mail (Karlsruhe Institute of Technology, Germany)

***Cause and effects of different working frequencies on the joint formation in copper wire bonding***

Reinhard Schemmel (University of Paderborn, Germany); Simon Althoff (Universität Paderborn, Germany); Michael Brökelmann, Andreas Unger and Matthias Hunstig (Hesse GmbH, Germany); Walter Sextro (Universität Paderborn, Germany)

***Comparison of thermal and reliability performance between a SiC MOSFET module with embedded decoupling capacitors and commercial Si IGBT power modules***

Li Yang, Pearl A Agyakwa, Martin Corfield and C Mark Johnson (University of Nottingham, United Kingdom (Great Britain)); Anne Harris and Matthew Packwood (Dynex Semiconductor Ltd, United Kingdom (Great Britain)); Krzysztof Paciura (Cummins Inc, United Kingdom (Great Britain))

***Innovative Reliable Nitride based Power Devices and Applications – The EU Public Funded Project 'InRel-NPower'***

Martin Rittner and Ulrich Kessler (Robert Bosch GmbH, Germany); Joerg Naundorf, Kai Kriegel and Martin Schulz (Siemens AG, Germany); Gaudenzio Meneghesso (University of Padova, Italy)

***Benchmarks of the gate driver supplies' architectures for the power devices in series connection***

Van Sang Nguyen (Grenoble Institute of Technology & G2ELab, France); Pierre Lefranc (University of Grenoble Alpes, France); Jean-Christophe Crebier (Grenoble Université, France)

***SMPS electromagnetic noise in System-on-Chip: Resonant frequency and amplitude dependencies***

Eric Feltrin (Ecole Centrale de Lyon & STMicroelectronics, France); David Chesneau (STMicroelectronics, France); Christian Vollaire (Ampere Lab, France); Bruno Allard (INSA Lyon, France)

***Optimizing integrated common and differential mode chokes with the PermeabilityLink method***

Jörn Schlieuwe, Matthias Koeppen, August Gauss, Detlef Lange and Stefan Weber (EPCOS AG, Germany)

***Thermistor Die for Power Module Applications***

Sophie Schuurman, Erik Mattens and Bruno Van Beneden (Vishay Resistors Belgium, Belgium); Emilio Mattiuzzo and Marcello Turnaturi (Vishay Semiconductor Italiana, Italy)

***C-V Characterization Technique for Four-Terminal GaN-on-Si HEMTs Based on 3-Port S-Parameter Measurements***

Cristino Salcines (University of Stuttgart); Stefan Moench (Institute of Robust Power Semiconductor Systems, University of Stuttgart, Germany); Ingmar Kallfass (University of Stuttgart, Germany); Boris Spudic (Institute of Robust Power Semiconductor Systems (ILH), University of Stuttgart, Germany)

***Die-bonding performance of micron Ag particle paste for high power devices***

Tetsu Takemasa (Osaka University, Japan); Minoru Ueshima (Senju Metal Industry, Japan); Jiu Jinting and Junko Seino (Senju Metal Industry Co., Ltd., Japan); Katsuaki Suganuma (Osaka University, Japan)

***Power Loss Analysis of 60 V Trench Field-Plate MOSFETs utilizing Structure Based Capacitance Model for Automotive Application***

Kenya Kobayashi and Masaki Sudo (Kyushu Institute of Technology); Ichiro Omura (Kyushu Institute of Technology, Japan)

### ***Surge Current Capability of IGBTs Used in Low Voltage DC/AC Hybrid Circuit Breaker***

Kenan Askan and Michael Bartonek (Eaton Industries GmbH, Austria); Klaus Sobe (Infineon Technologies Austria AG, Austria)

### ***A High Efficiency and Power Density, High Step-Up, Non-isolated DC-DC Converter Based on Multicell Approach***

André Andreta (Universite Grenoble Alpes, France); Yves Lembeye (Grenoble Electrical Engineering Laboratory, France); Lyubomir Kerachev (Universite Grenoble Alpes, France); Farshid Sarrafin (University of Grenoble (des Alpes) & G2Elab, France); Luiz Fernando Villa (Universite de Toulouse, France); Jean Christophe Crebier (Université Grenoble Alpes, France)

### ***How asymmetric busbar design causes symmetric switching behavior of paralleled IGBT modules***

Matthias Wissen (Infineon Technologies AG, Germany); Daniel Domes (Infineon Technologies AG & Warstein, Germany); Waleri Brekel and Koray Yilmaz (Infineon Technologies AG, Germany)

### ***Ferrite embedding for Power SiPs - a packaging view***

Tina Thomas (Technische Universität Berlin, Germany); Stefan Hoffmann, Karl-Friedrich Becker, Hans Walter, Volker Bader and Tanja Braun (Fraunhofer IZM, Germany); Eckart Hoene (Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration IZM, Germany); Martin Schneider-Ramelow (Fraunhofer IZM & TU Berlin, Germany)

## **Wednesday, March 21, 08:30 - 10:10**

### **S4: Mechatronic systems and their applications**

Room: 2nd lecture hall

#### **08:30 SiC MOSFET based Automotive Traction Inverter performance**

Masaharu Nakanishi (Semiconductor Company & ROHM Semiconductor, Germany)

#### **08:50 Integration Concept for a Traction Inverter with 3D-Printed Embedded Cooling Technology realizing Highest Power Density**

Jasper Schnack, Ulf Schümann and Dominik Hilper (Fachhochschule Kiel, Germany); Ronald Eisele (FH Kiel, Germany); Thomas Ebel (FTCAP GmbH, Germany); Frank Osterwald and Holger Beer (Danfoss Silicon Power GmbH, Germany)

#### **09:10 Applying magnetoresistive current sensors in difficult operating environments**

Rolf Slatter and Matthias Brusius (Sensitec GmbH, Germany); Claudia Glenske (Sensitec GmbH)

#### **09:30 Grid-Connected Three-Phase H-Bridge Inverter with Level Doubling Network Controlled by Staircase Modulation Techniques**

Milan Srndovic, Aleksandr Viatkin and Gabriele Grandi (University of Bologna, Italy)

#### **09:50 Comparison of the Surge Current Ruggedness between the Body Diode of SiC MOSFETs and Si Diodes for IGBT**

Patrick Hofstetter and Mark Bakran (University of Bayreuth, Germany)

## S2.1: General aspects of packaging (1/2)

to be continued

Room: Reithalle

### **08:30 Thermo-mechanical stress and deformation behaviour of joined semiconductor devices using different die attach technologies**

Falk Naumann, Bianca Boettge, Georg Lorenz and Michael Bernasch (Fraunhofer Institute for Microstructure of Materials and Systems IMWS, Germany); Christina Ebensperger and Stefan Oehling (SEMIKRON Elektronik GmbH & Co. KG, Germany)

### **08:50 Silver sinter paste optimized for pressure sintering under air atmosphere on precious and non-precious metal surfaces with high reliable sintered joints**

Ly May Chew (Heraeus Deutschland GmbH & Co. KG, Germany); Wolfgang Schmitt (Heraeus Materials Technology GmbH & Co. KG, Germany); Jens Nachreiner and Stefan Gunst (Heraeus Deutschland GmbH & Co. KG, Germany)

### **09:10 Improvement of power module system solders by directional solidification**

Aaron Hutzler, Christoph Oetzel and Emil Friker (PINK GmbH Thermosysteme, Germany)

### **09:30 Power Chip Interconnections Based on TLP, Sintering and CTE-Matched Conductors**

Markus Feisst, Philip Schaetzle and Jürgen Wilde (Universität Freiburg - IMTEK, Germany)

### **09:50 Additive manufacturing of thick copper structures on alumina through selective laser melting for power electronic applications**

Thomas Stoll (Friedrich-Alexander-Universität Erlangen-Nürnberg & Lehrstuhl für Fertigungsautomatisierung und Produktionssystematik (FAPS), Germany)

## Wednesday, March 21, 10:10 - 10:40

### Tea break

Rooms: 2nd lecture hall, Reithalle

## Wednesday, March 21, 10:40 - 12:20

## S5.1: Condition Monitoring (Reliability (1/2))

Room: 2nd lecture hall

### **10:40 Signal Sweeping Technique to Decouple the Influence of Junction Temperature and Bond Wire Lift-off in Condition Monitoring for Multichip IGBT Modules**

Cuili Chen and Volker Pickert (Newcastle University, United Kingdom (Great Britain)); Maher Al-Greer (Teesside University, United Kingdom (Great Britain)); Charalampos C. Tsimenidis (Newcastle University, United Kingdom (Great Britain)); Thillainathan Logenthiran (Newcastle University, Singapore); Xiang Lu (Newcastle University, United Kingdom (Great Britain)); Ng Chong and Chunjiang Jia (ORE Catapult, United Kingdom (Great Britain))

### **11:00 Real-time condition monitoring of IGBT modules in PV inverter systems**

Uimin Choi and Frede Blaabjerg (Aalborg University, Denmark)

**11:20 Investigation of the usage of a chip integrated sensor to determine junction temperature during power cycling tests**

Carsten Kempiaak (Otto-von-Guericke-Universität Magdeburg, Germany); Andreas Lindemann (Otto-von-Guericke-Universität Magdeburg); Eckhard Thal and Shiori Idaka (Mitsubishi Electric Europe B. V., Germany)

**11:40 On-line Virtual Junction Temperature Measurement via DC Gate Current Injection**

Julio Brandelero (Mitsubishi Electric R&D Centre Europe, France); Jeffrey Ewanchuk and Stefan Mollov (Mitsubishi Electric R&D Centre Europe)

**12:00 Current filament monitoring under unclamped inductive switching conditions on real IGBT interconnection**

Masanori Tsukuda (Green Electronics Research Institute, Kitakyushu, Japan); Takaaki Arimoto and Ichiro Omura (Kyushu Institute of Technology, Japan)

## **S2.2: General aspects of packaging (2/2)**

Room: Reithalle

**10:40 Full SiC Integrated Power Converter Module with Replaceable Building Blocks**

Attahir Murtala Aliyu (University of Nottingham, United Kingdom (Great Britain)); Alberto Castellazzi (University of Nottingham & Power Electronics, Machines and Control Group, United Kingdom (Great Britain)); Philippe Lasserre (Primes Association, France); Nicola Delmonte (Università di Parma, Italy); Paolo Cova (University of Parma, Italy)

**11:00 Making Thermal Grease Obsolete: Fully Isolated Discrete Power Package with High Thermal and Electrical Performance**

Thomas Basler, Christian Kasztelan and Daniel Pedone (Infineon Technologies AG, Germany); Edward Fürgut (Infineon Technologies AG, Germany); Matthias Schmidt (Infineon Technologies AG, Germany)

**11:20 Transfer molding for power semiconductor modules**

Jürgen Schuderer and Viktor Lindström (ABB Corporate Research, Switzerland); Chunlei Liu (ABB Switzerland Ltd. Corporate Research, Switzerland); Fabian Mohn (ABB Corporate Research, Switzerland)

**11:40 Thermal and thermo-mechanical design of an integrated substrate and heat sink for planar power module**

Jianfeng Li (The University of Nottingham, United Kingdom (Great Britain)); Xi Lin, Jingru Dai, Bassem Mouawad and C Mark Johnson (University of Nottingham, United Kingdom (Great Britain))

**12:00 Design and Fabrication of PCB Embedded Power Module with Integrated Heat Exchanger for Dielectric Coolant**

Johann Schnur, Ankit Bhushan Sharma, Niko Haag and Thomas Kuwan (Hochschule Kempten - University of Applied Science, Germany); Armin Stogel (Hochschule Kempten, Germany); Till Huesgen (Hochschule Kempten - University of Applied Science)

## **Wednesday, March 21, 12:20 - 13:50**

### **Lunch break**

Rooms: 2nd lecture hall, Reithalle

**Wednesday, March 21, 13:50 - 15:30**

## **S5.2: Degradation of Interconnects (Reliability (2/2))**

Room: 2nd lecture hall

### **13:50 On-time Dependency on the Power Cycling Capability of Al Bond Wires Measured by Shear Test**

Nan Jiang (Chemnitz University of Technology, Germany); Marko Kalajica (Heraeus Deutschland GmbH & Co. KG, Germany); Josef Lutz (Chemnitz University of Technology, Germany)

### **14:10 Power cycling reliability of time-reduced sintering for attaching SiC diodes using nanosilver film**

Jingru Dai and Jianfeng Li (University of Nottingham, United Kingdom (Great Britain)); Pearl Agyakwa (Nottingham University, United Kingdom (Great Britain)); Christopher Johnson (University of Nottingham, United Kingdom (Great Britain))

### **14:30 Experimentally-Validated Models of On-State Voltage for Remaining Useful Life Estimation and Design for Reliability of Power Modules**

Nicolas Degrenne and Stefan Mollov (Mitsubishi Electric R&D Centre Europe, France)

### **14:50 Interpretation of Power Cycling data derived from transient cooling curves**

Martin Bayer and Samuel Hartmann (ABB Switzerland Ltd., Switzerland)

### **15:10 Trends in SiC MOSFET Threshold Voltage and ON-Resistance Measurements from Thermal Cycling and Electrical Switching Stresses**

Joseph Kozak (Virginia Tech, USA); Douglas DeVoto and Joshua Major (National Renewable Energy Laboratory, USA); Khai D.T. Ngo (Virginia Tech, USA)

## **S1.1: Components to be integrated (1/2)**

to be continued

Room: Reithalle

### **13:50 Direct Pressed Die (DPD) Technology - a Novel Packaging Solution for Power Modules**

Christian Goebel (Semikron Elektronik GmbH, Germany)

### **14:10 PCB-Embedding for GaN-on-Si Power Devices and ICs**

Richard Reiner (IAF Fraunhofer, Germany); Beatrix Weiss, Dirk Meder and Patrick Waltereit (Fraunhofer IAF, Germany); Christian Vockenberger (AT&S Austria Technologie & Systemtechnik, Austria); Thomas Gerrer and Rüdiger Quay (Fraunhofer IAF, Germany); Oliver Ambacher (Fraunhofer IAF & IMTEK, University Freiburg, Germany)

### **14:30 The M-Shunt Structure Applied to Printed Circuit Boards**

Christian Bödeker, Melanie Adelmund and Nando Kaminski (University of Bremen, Germany)

### **14:50 An Investigation of the Parasitic Impedance on the DC-Link Capacitor of EV Drive Inverters**

Stefan Piepenbreier (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany); Albert Käß (Chair of Electrical Engineering, University of Erlangen-Nuremberg, Germany); Martin März (FhG Erlangen, Germany)

### **15:10 Volumetric Evaluation of Passive Components in Multilevel Three-Phase Active Front-End AC-DC Converters**

Friedrich Schultheiß (BMW Group, Germany); Martin März (FhG Erlangen, Germany)

**Wednesday, March 21, 15:30 - 16:00**

**Tea break**

Rooms: 2nd lecture hall, Reithalle

**Wednesday, March 21, 16:00 - 17:00**

**S6.1: EMI (Clean switching, electromagnetic compatibility (1/2))**

Room: 2nd lecture hall

**16:00 Characterization of ferrite properties for FM-band filtering in automotive applications**

Sven Bönisch (Brandenburg University of Technology, Germany); Stefan Hoffmann (Fraunhofer IZM, Germany); Eckart Hoene (Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration IZM, Germany); Michael Schmidhuber (Sumida Components GmbH, Germany)

**16:20 Suppression of Electromagnetic Interference using Multi-Stage Inte-grated Filtering with Screening and Partitioning**

Zhe Zhang (University of Nottingham & Power Electronics, Machines and Control Group, United Kingdom (Great Britain)); C Mark Johnson (University of Nottingham, United Kingdom (Great Britain))

**16:40 Improving 9-150 kHz EMI Performance of Single-Phase PFC Rectifier**

Pooya Davari (Aalborg University, Denmark); Eckart Hoene (Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration IZM, Germany); Firuz Zare (University of Queensland, Australia); Frede Blaabjerg (Aalborg University, Denmark)

**17:00 Advantages of Gallium Nitride over Silicon transistors in soft-switched resonant switched capacitor converters**

Diego Serrano, Miroslav Vasic, Pedro Alou and Jesus Oliver (Universidad Politecnica de Madrid, Spain); Jose A. Cobos (Universidad Politécnica de Madrid (UPM), Spain)

**Wednesday, March 21, 16:00 - 16:20**

**S.1.2: Components to be integrated (2/2)**

Room: Reithalle

**16:00 Double chips low side - high side configurable full gate driver circuits for a high speed inverter leg**

Van Sang Nguyen (Grenoble Institute of Technology & G2ELab, France); Pierre Lefranc (University of Grenoble Alpes, France); Jean-Christophe Crebier (Grenoble Université, France)

**Wednesday, March 21, 16:20 - 17:20**

**S3.1: Power packages and modules (1/2)**

to be continued

Room: Reithalle

**16:20 Fabrication and Characterization of a High-Power-Density, Planar 10 kV SiC MOSFET Power Module**

Christina DiMarino (Virginia Tech & Center for Power Electronics Systems (CPES), USA); Christopher Johnson, Bassem Mouawad, Jianfeng Li and Robert Skuriat (University of Nottingham, United Kingdom (Great Britain)); Meiyu Wang and Yansong Tan (Tianjin University, P.R. China); Guo-Quan Lu (Virginia Tech & NBE Technologies, LLC, USA); Dushan Boroyevich and Rolando Burgos (Virginia Tech, USA)

**16:40 A 3.3 kV SiC MOSFET Half-Bridge Power Module**

Bassem Mouawad and Abdallah Hussein (University of Nottingham, United Kingdom (Great Britain)); Alberto Castellazzi (University of Nottingham & Power Electronics, Machines and Control Group, United Kingdom (Great Britain))

**17:00 Towards Wafer Level 3D Power Integration**

Dominique Bergogne (CEA Leti University of Grenoble, France); Jean Charbonnier and Venceslass Rat (CEA Leti, France)

**Wednesday, March 21, 17:20 - 17:40**

**Break**

Rooms: 2nd lecture hall, Reithalle

**Wednesday, March 21, 17:40 - 19:00**

**S6.2: Clean switching, electromagnetic compatibility (2/2)**

to be continued

Room: 2nd lecture hall

**17:40 Design of a low inductive switching cell dedicated to SiC based CSI converter**

Guillaume Lefèvre (CEA - INES)

**18:00 Novel SiC module design - optimised for low switching losses, efficient cooling path and low inductance**

Thomas Huber and Alexander Kleimaier (University of Applied Sciences Landshut, Germany)

**18:20 Switching characteristics of low inductance SiC module with integrated capacitors for aircraft applications**

Bernardo Cougo, Hans Sathler and Raphael Riva (IRT Saint-Exupery, France)

**18:40 Benefits of new CoolSiC™ MOSFET in HybridPACK™ Drive package for electrical drive train applications**

Waldemar Jakobi and Andre Uhlemann (Infineon Technologies AG, Germany)

## S3.2: Power packages and modules (2/2)

Room: Reithalle

### 17:40 *A transfer-molded high temperature SiC power module withstanding up to 250 °C*

Kazuhiro Mitamura (Advanced Industrial Science And Technology (AIST) & Renesas Electronics Corporation, Japan); Yui Ozaki (Sumitomo Bakelite Co., Ltd., Japan); Yoshinori Murakami (National Institute of Advanced Industrial Science and Technology, Japan); Hiroki Takahashi (FUJI ELECTRIC CO., LTD., Japan); Hidekazu Tanisawa, Kenichi Kouji, Fumiki Kato, Shinji Sato, Hiroshi Yamaguchi and Hiroshi Sato (National Institute of Advanced Industrial Science and Technology, Japan)

### 18:00 *High Reliable Power Modules by Pressureless Sintering*

Uwe Waltrich, Christoph Friedrich Bayer and Stephanie Zötl (Fraunhofer Institute for Integrated Systems and Device Technology, Germany); Sigrid Zischler (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany); Adam Tokarski (Fraunhofer Institute for Integrated Systems and Device Technology, Germany); Andreas Schletz (Fraunhofer Institute for Integrated Systems and Device Technology IISB, Germany); Martin März (FhG Erlangen, Germany)

### 18:20 *Pressureless Silver Nanopowder Sintered Bonds for Liquid Cooled IGBT Power Modules*

Namjee Kim and Rophina Li (University of Toronto, Canada); Meinrad Machler, John Bruggers and Sooky Winkler (Dana, Canada); Wai Tung Ng (University of Toronto, Canada)

### 18:40 *Low Temperature Silver Sinterprocesses on (EN)EPEAg Surfaces for High Temperature SiC Power Modules*

Thomas Blank, Bao Ngoc An, Benjamin Leyrer, Michael Bruns, Michael Meisser and Torsten Scherer (Karlsruhe Institute of Technology, Germany); Dai Isikawa (Karlsruhe Institute of Technology (KIT), Germany); Jessica Helber, Helge Wurst and Marc Weber (Karlsruhe Institute of Technology, Germany)

## Wednesday, March 21, 19:30 - 22:00

### Dinner

Rooms: 2nd lecture hall, Reithalle

## Thursday, March 22, 08:30 - 10:10

### Mechatronic systems and their applications

Room: Reithalle

#### 08:30 *Google Little Box Reloaded*

Johann. W. Kolar (ETH Zurich, Switzerland)

#### 09:10 *Little Box Winner Team*

Paul Bleus (CET Power, Belgium)

#### 09:40 *Power conversion needs for high tech systems*

Korneel Wijnands (Eindhoven University of Technology, The Netherlands)

**Thursday, March 22, 10:10 - 10:40**

**Tea break**

Rooms: 2nd lecture hall, Reithalle

**Thursday, March 22, 10:40 - 12:10**

**Packaging (1)**

Room: Reithalle

**10:40 GM-DOE SiC Traction Inverter Power Module Development for Electrified Vehicles**

Brian Peaslee (General Motors, Germany)

**11:10 10 kV SiC power module packaging**

C Mark Johnson (University of Nottingham, United Kingdom (Great Britain)); Christina DiMarino (Virginia Tech & Center for Power Electronics Systems (CPES), USA); Bassem Mouawad, Jianfeng Li and Robert Skuriat (University of Nottingham, United Kingdom (Great Britain)); Meiyu Wang and Yansong Tan (Tianjin University, P.R. China); Guo-Quan Lu (Virginia Tech & NBE Technologies, LLC, USA); Dushan Boroyevich and Rolando Burgos (Virginia Tech, USA)

**11:40 Power Electronic Integration and packaging for aeronautic application in harsh environment**

Regis Meuret (Safran Electrical & Power, France); Donatien Martineau and Toni Youssef (Safran, France); Christian Martin (Univ Lyon, UCB Lyon 1, CNRS, AMPERE, France); Ousseynou Yade (AMPERE, France)

**Thursday, March 22, 12:10 - 13:40**

**Lunch break**

Rooms: 2nd lecture hall, Reithalle

**Thursday, March 22, 13:40 - 14:20**

**Packaging (2)**

Room: Reithalle

**13:40 Advanced Joining by Metal-powder Sintering: the Science, Practice, and Recent Development**

Guo-Quan Lu (Virginia Tech & NBE Technologies, LLC, USA); Meiyu Wang, Yun-Hui Mei and Xin Li (Tianjin University, P.R. China)

**Thursday, March 22, 14:20 - 14:30**

**Closing remarks**

Room: Reithalle

**Thursday, March 22, 14:30 - 14:45**

**Ceremony: CIPS Young Engineer Award , CIPS Best Poster Award**

Room: Reithalle

**Thursday, March 22, 14:45 - 15:15**

**Ceremony: Semikron Innovation and Young Engineer Award**

Room: Reithalle