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TECHNICAL PAPERS

Tuesday, February 27, 2024

SESSION T01: AC-DC Converters I

8:30 - 12:00

TRACK: AC-DC Converters

SESSION CHAIRS

Xin Zan, *University of Maryland*

John Lam, *York University*

- T01.1 **Grid Voltage Sensorless Control of 3.2kW Bridgeless Totem-Pole PFC Converter with Pre-estimation and Seamless Mode-Transition** 1
Inhwi Hwang, Jaekeun Lee, Shenghui Cui
Seoul National University, Korea
PRESENTATION **TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless**
- T01.2 **Decoupled Current Balancing of a Digitally Controlled Interleaved Totem-Pole PFC Converter with High Computational Efficiency** 6
Téo Robert, Romain Monthéard, Valentin Combet, Mathieu Gavelle
CEA, France
PRESENTATION **TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless**
- T01.3 **A Totem-Pole PFC with Re-rush Current Control, Accurate E-metering, Low iTHD and High Power Density** 14
Bosheng Sun¹, Sheng-Yang Yu¹, Ted Huh²
¹*Texas Instruments, United States*; ²*Texas Instruments, Korea*
PRESENTATION **TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless**
- T01.4 **Ultra Low-Profile Flying Capacitor 7-Level 3kW PFC with Optimized High Frequency Layout and Active Balancing Using 100V GaN** 22
Oscar Lorenz, Juan Sanchez
Infineon Technologies AG, Austria
PRESENTATION **TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless**
- T01.5 **A Multi-Level AC or DC-DC Converter Using Self-Bypassable Fixed Transfer Ratio Modules** 29
Ravisekhar Raju, Jesse Leonard
Fastwatt LLC, United States
PRESENTATION **TOPIC: Single-Phase & Three-Phase Input**

T01.6	Wide Output Range Soft-Switched Single-Stage Dual Active Bridge Type AC-DC Boost PFC Converter	34
	Himanshu Bhusan Sandhibigraha, Vishnu Mahadeva Iyer <i>Indian Institute of Science, India</i>	
	PRESENTATION	TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless
T01.7	Study of SEPIC and Ćuk Converters Working as Automatic Power Factor Corrector When Operating in Unusual Discontinuous Conduction Modes	42
	Duberney Murillo-Yarce, Juan Rodríguez, Felipe Loose, Marta Hernando, Javier Sebastian <i>Universidad de Oviedo, Spain</i>	
	PRESENTATION	TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless
T01.8	Miniaturization of AC-Adapter Realized by Primary Voltage-Clamper with Mid-Voltage (150V) AHB Converter	50
	Shuichiro Motoori ¹ , Toshiyuki Zaitso ¹ , Akihiro Kawano ¹ , Keita Tokumaru ² , Kimihiro Nishijima ² <i>¹ROHM Co., Ltd, Japan; ²Sojo University, Japan</i>	
	PRESENTATION	TOPIC: External AC-DC Adapters
T01.9	An Optimization Method for Planar Transformer Winding Losses in GaN Based Multi-Output Flyback Converter	56
	Teng Tian, Weijing Du, Bin Li, Xiucheng Huang, Jason Zhang <i>Navitas Semiconductor, United States</i>	
	PRESENTATION	TOPIC: Single-Phase & Three-Phase Input

SESSION T02: Resonant DC DC Converters

8:30 - 12:00

TRACK: DC-DC Converters

SESSION CHAIRS

Olivier Trescases, *University of Toronto*

Mladen Ivankovic, *Infineon*

T02.1	A 60 a Switched Tank Converter with Buck-Boost Sigma Regulation for 48 v Bus Down-Conversion	63
	Simone Zaffin ¹ , Alessandro Dago ¹ , Mauro Leoncini ¹ , Alessandro Gasparini ² , Osvaldo Zambetti ² , Salvatore Levantino ¹ , Massimo Ghioni ¹ <i>¹Politecnico di Milano, Italy; ²STMicroelectronics, Italy</i>	
	PRESENTATION	TOPIC: Resonant Converters
T02.2	A Novel High-Frequency Isolated Resonant Gate Driver for LLC-DCX	70
	Ziyan Zhou, Qiang Luo, Yuefei Sun, Yufan Wang, Qinsong Qian, Weifeng Sun <i>Southeast University, China</i>	
	PRESENTATION	TOPIC: Resonant Converters

T02.3	Design of a High Current, 1 MHz, 5 kW Partial Power Processing Converter with Hybrid Flex PCB for 80 C Ambient Automotive Conditions 75 Minh Ngo ¹ , Yuliang Cao, Dong Dong ¹ , Rolando Burgos ¹ , John Noon ² , Heath Kouns ² <i>¹Virginia Polytechnic Institute and State University, United States; ²Moog Inc., United States</i>	75
	<div style="border: 1px solid black; border-radius: 10px; padding: 2px 10px; display: inline-block; background-color: #e0f0ff;">PRESENTATION</div>	TOPIC: Resonant Converters
T02.4	A 260-A/48-V Bus Hybrid Resonant Converter with Large Conversion Ratio for Future Data Centers 83 Alessandro Dago ¹ , Mattia Balutto ² , Stefano Saggini ² , Mauro Leoncini ¹ , Salvatore Levantino ¹ , Massimo Ghioni ¹ <i>¹Politecnico di Milano, Italy; ²Università degli Studi di Udine, Italy</i>	83
	<div style="border: 1px solid black; border-radius: 10px; padding: 2px 10px; display: inline-block; background-color: #e0f0ff;">PRESENTATION</div>	TOPIC: Resonant Converters
T02.5	A 15x Matrix Autotransformer Switched-Capacitor DC-DC Converter for Datacenter Application 88 Maohang Qiu, Zhongshu Sun, Xiaoyan Liu, Haoran Meng, Vafa Marzang, Dong Cao <i>University of Dayton, United States</i>	88
	<div style="border: 1px solid black; border-radius: 10px; padding: 2px 10px; display: inline-block; background-color: #e0f0ff;">PRESENTATION</div>	TOPIC: Resonant Converters
T02.6	A High Density 400 W DC/DC Power Module with Integrated Planar Transformer and Half Bridge GaN IC 94 Bin Li, Xiucheng Huang, Jason Zhang <i>Navitas Semiconductor, United States</i>	94
	<div style="border: 1px solid black; border-radius: 10px; padding: 2px 10px; display: inline-block; background-color: #e0f0ff;">PRESENTATION</div>	TOPIC: Resonant Converters
T02.7	Design Method of Impedance Transformation Network for Robust Resonant Power Converters with Wide Load Impedance Variation 101 Junhyeong Lee ¹ , Sunghyuk Choi ¹ , Euihoon Chung ² , Jung-Ik Ha ¹ <i>¹Seoul National University, Korea; ²Myongji University, Korea</i>	101
	<div style="border: 1px solid black; border-radius: 10px; padding: 2px 10px; display: inline-block; background-color: #e0f0ff;">PRESENTATION</div>	TOPIC: Resonant Converters
T02.8	Thermal Balancing of Multiphase Resonant Converters Controlled by Phase Shift 107 Christian Branas ¹ , Rosario Casanueva ¹ , Alberto Pigazo ¹ , Francisco J. Azcondo ¹ , Francisco J. Díaz ¹ , Paula Lamo ² <i>¹Universidad de Cantabria, Spain; ²Universidad Internacional de la Rioja, Spain</i>	107
	<div style="border: 1px solid black; border-radius: 10px; padding: 2px 10px; display: inline-block; background-color: #e0f0ff;">PRESENTATION</div>	TOPIC: Resonant Converters
T02.9	Design and Implementation of Cascoded Dual-Half-Bridge Resonant Converter with GaN E-HEMT for High Input Voltage Applications 114 Cheng-Ying Ho, Tsong-Juu Liang, Kai-Hui Chen, Kuo-Fu Liao <i>National Cheng Kung University, Taiwan</i>	114
	<div style="border: 1px solid black; border-radius: 10px; padding: 2px 10px; display: inline-block; background-color: #e0f0ff;">PRESENTATION</div>	TOPIC: Resonant Converters

SESSION T03: Motor Drives

8:30 - 12:00

TRACK: Motor Drives & Inverters

SESSION CHAIRS

Ziaur Rahman, *Booz Allen Hamilton*

Rakib Islam, *American Axle and Manufacturing*

- T03.1 **Synchronous Overmodulation for Reduced Number of Switchings with Unit Voltage Gain including Six-Step Operation** 122
Cheolmin Hwang¹, Gyu Cheol Lim¹, Seongwon Lee¹, Jong-Joo Moon², Kyu-Sung Park², Jung-Ik Ha¹
¹*Seoul National University, Korea*; ²*Hyundai Transys Inc., Korea*
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- T03.2 **A Fast Approach for Full Electrical Parameters Identification in Auto-Tuned Induction Machines Drives Systems** 128
Mojataba Ayaz Khoshhava¹, Hamidreza Mosaddegh-Hesar¹, Mostafa Abarzadeh², Simon Caron², Kamal Al-Haddad¹
¹*École de Technologie Supérieure, Canada*; ²*Smartd Technologies Inc., Canada*
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- T03.3 **Investigation of Cable Length Influence on EMI Spectrum in a WBG-Based Drive System** 133
Yalda Azadeh, Abdul Basit Mirza, Fang Luo
State University of New York at Stony Brook, United States
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- 03.4 **A Smooth Pulse Number Transition Technique of Synchronized PWM for IPMSM Sensorless Control** 137
Do-Young Gil, Joon-Seok Kim, June-Seok Lee
Dankook University, Korea
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- T03.5 **Vector Control of AC Motor in Six-Step Operation Based on Variable DC-Link Voltage** 143
Jisun Ham, Hwigon Kim, Junyeol Maeng, Shenghui Cui
Seoul National University, Korea
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- T03.6 **Investigation of Motor Winding Overvoltages in Integrated WBG-Based Motor Drive Systems** 148
Yalda Azadeh, Abdul Basit Mirza, Fang Luo
State University of New York at Stony Brook, United States
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- T03.7 **A Dual-Buck-Structured Transformerless Inverter with a Common Ground** 153
Truong-Duy Duong¹, Minh-Khai Nguyen², Bang L.H. Nguyen³, Caisheng Wang¹
¹*Wayne State University, United States*; ²*General Motors, United States*;
³*Los Alamos National Laboratory, United States*
- PRESENTATION** **TOPIC: Single- & Multi-Phase Inverters**

T03.8 **Efficiency and EMI Analysis of WBG-Based Multilevel Inverters for 800 v Electric Vehicle Traction Systems** 157
Avinash Dornala, Kangbeen Lee, Mostafa Fereydoonian, Ali Halawa, Mikayla Benson, Woongkul Lee
Michigan State University, United States

PRESENTATION

TOPIC: AC, DC, BLDC Motor Drives

SESSION T04: Design Techniques for Wide Bandgap Power Modules

8:30 - 12:00

TRACK: Power Electronics Integration & Manufacturing

SESSION CHAIRS

Justin Henspeter, *IBM*

Lei Wang, *Lei Technical Consulting*

T04.1 **A 200V Monolithic GaN Dynamic Floating Voltage Level Shifter with Nanosecond Propagation Delays and Noise-Immune Slewing Control** 164
Fei Zhou, D. Brian Ma
The University of Texas at Dallas, United States

PRESENTATION

TOPIC: Power Modules / High Density Design

T04.2 **A 400W, 250kHz (2kW Peak) Integrated GaN Half Bridge Power Module in a Non-isolated Buck Converter** 168
Sourish S. Sinha, Pouria Zaghari, Jong E. Ryu, Douglas C. Hopkins
North Carolina State University, United States

PRESENTATION

TOPIC: Power Electronics Packaging

T04.3 **A Gallium Nitride Integrated Power Module with Ultra-Low Parasitic Inductances and Thermal Resistance** 175
Zezheng Dong¹, Jinxu Yang¹, Yinxiang Fan², Haidong Yan¹, Xinke Wu¹
¹Zhejiang University, China; ²Guilin University of Electronic Technology, China

PRESENTATION

TOPIC: Power Modules / High Density Design

T04.4 **Power Module Design with Chip-Level Series-Connected SiC MOSFETs** 181
Tobias Nieckula Ubostad, Dimosthenis Pefitsis
Norwegian University of Science and Technology, Norway

PRESENTATION

TOPIC: Power Modules / High Density Design

T04.5 **A Full SiC MOSFET DCDC Boost Power Module Using 2 kV SiC MOSFET for 1500V String Solar Inverter Applications** 188
Yusi Liu
onsemi, United States

PRESENTATION

TOPIC: Power Modules / High Density Design

T04.6 **A Novel Double-Sided Cooling 3L-ANPC SiC MOSFET Power Module with Interleaved Layout** 192
Tianjian Wang, Yongmei Gan, Haoyuan Jin, Laili Wang, Yuwei Wu, Yuchen Wang
Xi'an Jiaotong University, China

PRESENTATION

TOPIC: Power Electronics Packaging

T04.7 **GaN FET with Integrated Current Sense Without Supply** 197
Yinglai Xia, Luke Milner, Zhemin Zhang
Infineon Technologies Americas Corp., United States

PRESENTATION

TOPIC: Power Modules / High Density Design

T04.8 **Development of Pressure Contact Technology for Multi-Chip SiC Modules with Low Parasitics** 202
Lei Wang^{1,2}, Wenbo Wang¹, Gert Rietveld^{2,3}, Raymond J.E. Huetting²
¹*Yongjiang Laboratory, China*; ²*University of Twente, The Netherlands*;
³*VSL National Metrology Institute, The Netherlands*

PRESENTATION

TOPIC: Power Modules / High Density Design

T04.9 **SiC Engineered Substrate: Increasing SiC MOSFETs Current Density from Device to Module Level** 210
Eric Guiot¹, Frédéric Allibert¹, Jürgen Leib², Tom Becker², Alexis Drouin¹, Walter Schwarzenbach¹
¹*SOITEC, France*; ²*Fraunhofer IISB, Germany*

PRESENTATION

TOPIC: Power Modules / High Density Design

SESSION T05: Control of Power Electronic Converters I

8:30 - 12:00

TRACK: Control

SESSION CHAIRS

Xiaonan Lu, *Purdue University*

T05.1 **Optimized Switching States-Based Model Predictive Control for Grid-Connected Three-Level ANPC Inverter** 215
Euntaek Nam, Suyong Chae
Pohang University of Science and Technology, Korea

PRESENTATION

TOPIC: Control of Power Electronic Converters

T05.2 **Non-smooth H^∞ Impedance Shaping for DC Catenary Stability Enhancement in Railway Converter** 221
Francisco Huerta¹, Santiago Cóbreces¹, Emilio J. Bueno¹, José M. Del Toro²
¹*Universidad de Alcalá, Spain*; ²*Ingeniería Viesca, Spain*

PRESENTATION

TOPIC: Control of Power Electronic Converters

- T05.3 **Nonlinear Optimization-Based Power-Voltage Control of Grid-Connected Converter in Weak Grid** 228
 Gayoung Park, Jaeyeon Park, Shenghui Cui, Seung-Ki Sul
Seoul National University, Korea
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- T05.4 **Smooth Switching Dual-Mode Control Method Based on Kalman Filter for Grid-Connected Inverter** N/A
 Yanqi Cheng¹, Weimin Wu¹, Mohamed Orabi², Koutroulis Eftychios³, Henry Chung⁴, Frede Blaabjerg⁵
¹Shanghai Maritime University, China; ²Aswan University, Egypt; ³Technical University of Crete, Greece;
⁴City University of Hong Kong, China; ⁵Aalborg University, Denmark
- PRESENTATION** **TOPIC: Current-Mode & Voltage-Mode Control**
- T05.5 **A Novel Circulating Current Suppression Control Utilizing Negative Insertion in MMC** 238
 Swamy Jakkula, Nallamatti Poornachandra Rao, Anshuman Shukla
Indian Institute of Technology Bombay, India
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- T05.6 **Model Predictive Control Driven Transformer Coupled Parallel Hybrid Si IGBT/SiC MOSFET Converter** 244
 Ning Li, Stephen Finney, Paul D. Judge
The University of Edinburgh, United Kingdom
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- T05.7 **Enhanced Fault Ride-Through of Grid-Forming Converter with Extra Internal Voltage Source Rotation** 251
 Junyeol Maeng, Shenghui Cui
Seoul National University, Korea
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- T05.8 **Active Current Sharing and Source Management Methods on Fuel Cell/Battery Hybrid System for Drones with High Power Density** 256
 Dong Hwan Kim, Jong-Hun Lim, Je-Yeong Lim, Byoung Kuk Lee
Sungkyunkwan University, Korea
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**

SESSION T06: Wireless Power Transfer: Applications

8:30 - 12:00

TRACK: Wireless Power Transfer

SESSION CHAIRS

Reza Tavakoli, *Rivian*

Huber Jonas, *ETH, Zurich*

- T06.1 **Design and Development of Hybrid Current Sensors for Wide-Bandgap Power Electronics Applications** 260
Ali Parsa Sirat¹, Hossein Niakan², James Gafford², Babak Parkhideh²
¹East West Manufacturing, United States; ²University of North Carolina at Charlotte, United States
- PRESENTATION** **TOPIC: Non-Contact Sensors for Power Electronics**
- T06.2 **A Pulsed 6.78 MHz Inductive Wireless Power Transfer System for Quantum Cascade Lasers** 267
Shukai Wang, Richard Brun Jr., Claire Gmachl, Minjie Chen
Princeton University, United States
- PRESENTATION** **TOPIC: Wireless Charging**
- T06.4 **A High Frequency Inductive Power Transfer System for Low-Power Applications in Fresh Water** 273
Xianzao Li, Mayue Shi, Paul D. Mitcheson, Eric M. Yeatman
Imperial College London, United Kingdom
- PRESENTATION** **TOPIC: Power for IoT**
- T06.5 **A Novel Lightweight Wireless Charging System for UAV Applications** 279
Federico Iob¹, Giulia Segatti¹, Tryggvi Stefánsson², Friðfinnur Már Prastarson², Fabio Gelati³,
Gianmmaria Bernacchia³, Stefano Saggini¹
¹Università degli Studi di Udine, Italy; ²Svarmi ehf, Iceland; ³Luna Gerber Engineering S.R.L, Italy
- PRESENTATION** **TOPIC: Wireless Charging**
- T06.6 **A Novel Wireless Power Transfer System for Capsule Endoscopes** 284
Heng Zhang, Liangxi He, Chi-Kwan Lee
The University of Hong Kong, China
- PRESENTATION** **TOPIC: Wireless Charging**
- T06.7 **Design of a Rotational Misalignment Resistant Three-Phase Wireless Power Transfer Coil for AUVs** 289
Yuming Chen, Hamid A. Toliyat
Texas A&M University, United States
- PRESENTATION** **TOPIC: Wireless Charging**
- T06.8 **A Communication-Less Wireless Battery Charger Based on Variable Inductor** 296
Yihao Wu, Chenmin Deng, Soham Roy, Alex Hanson
The University of Texas at Austin, United States
- PRESENTATION** **TOPIC: Wireless Charging**

- T06.9 **Magnetic Characteristics Analysis and Compensation Network Design with Various Power Transfer Pads for Interoperable Wireless EV Charging** 302
 Hyeonu Jo, Ju-A Lee, Dong Hyeon Sim, Won-Jin Son, Byoung Kuk Lee
Sungkyunkwan University, Korea

PRESENTATION

TOPIC: Wireless Charging

SESSION T07: Power Electronics for Renewable Energy System Applications

8:30 - 12:00

TRACK: Renewable Energy Systems

SESSION CHAIRS

Xiwen Xu, *Tesla*

Kuldeep Singh, *University of Nottingham*

- T07.1 **A New Single-Active-Switch Non-isolated Dual-Output Step-Up Converter** 310
 Abdulaziz Alkhalidi, Ahmad Elkhateb, David Laverty
Queen's University, United Kingdom

PRESENTATION

TOPIC: Photovoltaic (PV) Inverters & Micro Inverters

- T07.2 **Bridge-Type Hybrid HVDC Circuit Breaker with Reduced Semiconductor Devices** 318
 Shinnosuke Hamajima¹, Yushi Koyama¹, Takahiro Ishiguro²
¹*Toshiba Infrastructure Systems & Solutions Corporation, Japan;*
²*Toshiba Energy Systems & Solutions Corporation, Japan*

PRESENTATION

TOPIC: Wind Energy Conversion Systems

- T07.3 **A Modified Middle Point Clamped (MMPC) DC-DC Converter for All-DC Wind Generation Systems** 325
 Awais Karni¹, Omid Beik², Mahdi Homaeinezhad²
¹*North Dakota State University, United States;* ²*Colorado School of Mines, United States*

PRESENTATION

TOPIC: Wind Energy Conversion Systems

- T07.4 **Cascaded H-bridge Converter Integrated with Split Batteries and with Multilevel AC Output for Household Applications** 333
 Madhat Alimawi¹, Reyhaneh Eskandari^{1,2}, Prasanth Venugopal¹, Thiago Batista Soeiro¹
¹*University of Twente, The Netherlands;* ²*University of Nottingham, United Kingdom*

PRESENTATION

TOPIC: Energy Storage Systems

- T07.5 **Design of a 15kW High-Efficiency and High Power Density Bidirectional TCM Buck/Boost Converter** 341
 Zhengming Hou¹, Dong Jiao¹, Bryan C. Gutierrez¹, Jih-Sheng Lai¹, Po-Li Chen²
¹*Virginia Polytechnic Institute and State University, United States;*
²*Industrial Technology Research Institute, Taiwan*

PRESENTATION

TOPIC: Bi-Directional Power Converters

- T07.6 **Single-Stage Bidirectional Inertia-Less Isolated DC/AC Converter** 348
 Satish Belkhode, Navami Prabhu, Joseph Benzaquen, Deepak Divan
Georgia Institute of Technology, United States
- PRESENTATION** **TOPIC: Bi-Directional Power Converters**
- T07.7 **Non Isolated Multi Port Inverter with Reduced Common Mode Leakage Current and Minimum Phase Property** 354
 Simanta Kumar Samal¹, Rajat Kumar Keshari², Rajeev Kumar Singh², Ranjit Mahanty²
¹National Institute of Technology Jamshedpur, India; ²Indian Institute of Technology (BHU) Varanasi, India
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**
- T07.8 **A Two-Stage Four-Switch Buck-Boost Integrated Dual-Active-Bridge Converter with Wide Range Soft-Switching and Minimized Backflow Power** 360
 Ruizhi Wei, Xuesong Wu, Li Ding, Yunwei Li
University of Alberta, Canada
- PRESENTATION** **TOPIC: Bi-Directional Power Converters**
- T07.9 **A New Dual-Purpose Flyback-Based DC–DC/AC Converter with Dynamic Voltage Gain** 366
 Maysam Abbasi¹, Naser Vosoughi Kurdkandi², Ehsan Abbasi³, Li Li¹,
 Ricardo P. Aguilera¹, Dylan Lu¹, Fei Wang⁴
¹University of Technology Sydney, Australia; ²San Diego State University, United States;
³University of Tabriz, Iran; ⁴Shanghai University, China
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**

SESSION T08: Magnetics Modeling & Simulation

8:30 - 12:00

TRACK: Magnetics

SESSION CHAIRS

George Slama, *Würth Elektronik*

Matt Wilkowski, *Enachip Inc.*

- T08.1 **Multi-Material Power Magnetics Modeling with a Modular and Scalable Machine Learning Framework** 370
 Edward Deleu¹, Haoran Li¹, Joe Li¹, Wonju Lee¹, Thomas Guillod², Charles R. Sullivan²,
 Shukai Wang¹, Minjie Chen¹
¹Princeton University, United States; ²Dartmouth College, United States
- PRESENTATION** **TOPIC: Magnetics Modeling & Simulations**
- T08.2 **Direct In-Situ Measurement of Magnetic Core Loss under Rectangular Voltage Excitation in Power Electronic Circuits** 378
 Lifang Yi, Jinyeong Moon
Florida State University, United States
- PRESENTATION** **TOPIC: Magnetics Modeling & Simulations**

- T08.3 **Characterization and Impact of Large-Signal Dielectric Properties in MnZn Ferrites** 384
 Thomas Guillod, William V.R. Roberts, Charles R. Sullivan
¹Dartmouth College, United States; ²Princeton University, United States
PRESENTATION **TOPIC: Magnetics Modeling & Simulations**
- T08.4 **Investigating the Mutual Impact of Waveform, Temperature, and DC-Bias on Magnetic Core Loss Using Neural Network Models** 391
 Joe Li, Edward Deleu, Wonju Lee, Haoran Li, Minjie Chen, Shukai Wang
 Princeton University, United States
PRESENTATION **TOPIC: Magnetics Modeling & Simulations**
- T08.5 **A Physics-Based Circuit Model for Nonlinear Magnetic Material Characteristics** 396
 Saurav Dulal, Sadia Binte Sohid, Han Cui, Gong Gu, Daniel J. Costinett, Leon M. Tolbert
 The University of Tennessee-Knoxville, United States
PRESENTATION **TOPIC: Magnetics Modeling & Simulations**
- T08.6 **A Simple Power Loss Evaluation Method for High-Frequency Transformers Based on Surface Temperature Measurement within Wide Operation Range** 402
 Zheyuan Yi, Zengyang Liu, Kai Sun, Bowen Su
 Tsinghua University, China
PRESENTATION **TOPIC: High-Frequency Magnetics**
- T08.7 **Integrating Equation-Based Methods with Random Forest Regression for Improved Accuracy of Magnetic Core Loss Modeling** 410
 Bailey Sauter¹, Skye Reese¹, Shivangi Sinha¹, John Haddon², Thomas Byrd², Dragan Maksimović¹
¹University of Colorado Boulder, United States; ²Lockheed Martin, United States
PRESENTATION **TOPIC: Magnetics Modeling & Simulations**
- T08.8 **Emulation of Plasma Load Reactances by Saturation Control of Low-Permeability Inductors** 416
 Darshan Tagare¹, Sanghyeon Park², Mike K. Ranjram¹
¹Arizona State University, United States; ²Lam Research, United States
PRESENTATION **TOPIC: Magnetics Applications**
- T08.9 **High-Performance High-Power Inductor Design for High-Frequency Applications** 424
 Mansi V. Joisher¹, Roderick S. Bayliss III², Mike K. Ranjram³, Rachel S. Yang¹,
 Alexander Jurkov⁴, David J. Perreault¹
¹Massachusetts Institute of Technology, United States; ²University of California-Berkeley, United States;
³Arizona State University, United States; ⁴MKS Instruments Inc., United States
PRESENTATION **TOPIC: High-Frequency Magnetics**

Wednesday, February 28, 2024

SESSION T09: Bi-Directional DC DC Converter

8:30 - 12:00

TRACK: DC-DC Converters

SESSION CHAIRS

Khurram Afridi, *Cornell University*

Enver Candan, *IBM*

- T09.1 **Resonant Commutation Technique for Scalable Electronic-Embedded Transformer DCX with Bidirectional Switch** 432
Yuliang Cao, Khai Ngo, Dong Dong
Virginia Polytechnic Institute and State University, United States
PRESENTATION **TOPIC: Bidirectional DC/DC Converters**
- T09.2 **Generalized Instantaneous Dual Flux Control for Three-Phase Dual-Active Bridge Converter** 440
Jonghun Yun, Shenghui Cui, Seung-Ki Sul
Seoul National University, Korea
PRESENTATION **TOPIC: Bidirectional DC/DC Converters**
- T09.3 **Enhanced Triple Phase Shift Modulation Strategy for ANPC-DAB Converter to Extend Soft Switching Range** 445
Hui Cao, Nan Lin, Peyman Darvish, Yushi Yang, Zhenqi Wang, Yue Zhao
University of Arkansas, United States
PRESENTATION **TOPIC: Bidirectional DC/DC Converters**
- T09.4 **Enhancing Resilience of DAB Converters with Fault-Tolerant Approach** 453
Piyali Pal¹, Majid Poshtan², Abdul R. Beig³, Ranjan Kumar Behera¹,
Khalifa Al Hosani³, Utkal Ranjan Muduli³
¹*Indian Institute of Technology Patna, India*; ²*California Polytechnic State University, United States*;
³*Khalifa University, U.A.E.*
PRESENTATION **TOPIC: Bidirectional DC/DC Converters**
- T09.5 **Localization of Open-Circuit Faults in GaN-Based Three-Phase Dual Active Bridge Converters with Reduced Sensing Requirements** 461
Satyam Sa, Yi Han, Seyed Amir Assadi, Mohammad Shawkat Zaman, Olivier Trescases
University of Toronto, Canada
PRESENTATION **TOPIC: Bidirectional DC/DC Converters**
- T09.6 **A Variable Frequency Modulation Strategy for Current-Fed Dual-Active-Bridge Converter to Expand ZVS Range** 468
Cong Li¹, Xipei Yu², Yunfei Li¹, Hengkai Dang¹, Jinjun Liu¹, Sixing Du¹
¹*Xi'an Jiaotong University, China*; ²*Virginia Polytechnic Institute and State University, United States*
PRESENTATION **TOPIC: Bidirectional DC/DC Converters**

T09.7 **Circulating Power and Winding Current Minimization in a Triple Active Bridge DC-DC Converter with Optimized Leakage Inductance Design** 474
Md Didarul Alam, Mohammad Mahinur Rahman, Iqbal Husain, Srdjan Lukic
North Carolina State University, United States

PRESENTATION

TOPIC: Bidirectional DC/DC Converters

T09.8 **A Partial-Power-Processed CLLC-DAB DC/DC Transformer with Voltage Self-Balancing Capability for Bipolar LVDC Distribution Systems** 481
Ruizhi Wei, Rui Liu, Li Ding, Yunwei Li
University of Alberta, Canada

PRESENTATION

TOPIC: Resonant Converters

T09.9 **Three-Phase Interleaved Bidirectional LLC Resonant Converter with Vertically Integrated Magnetics** 486
Junyang Bao, Yong Li, Shanxu Duan, Bangyin Liu
State Key Laboratory of Advanced Electromagnetic Engineering and Technology, Huazhong University of Science and Technology, China

PRESENTATION

TOPIC: Resonant Converters

SESSION T10: Solid-State Transformers

8:30 - 12:00

TRACK: Power Electronics for Utility Interface

SESSION CHAIRS

Sudip Mazumder, *University of Illinois-Chicago*

Jonathan Kimball, *Missouri University of Science and Technology*

T10.1 **A Single Stage Dual Active Half-Bridge Single Phase Solid-State Transformer with Wide Input-Range** 493
Burkhard Ulrich, Fabian Ohler, Fabian Schenzle, Tobias Walter
Hochschule Reutlingen, Germany

PRESENTATION

TOPIC: Solid-State Transformers

T10.2 **Single-Stage Isolated Three-Port AC-DC-DC Converter with Asymmetrical Modulation** 501
Tengfei Sun¹, Ziheng Xiao¹, Zhou He², Yi Tang¹
¹Nanyang Technological University, Singapore; ²Huazhong University of Science and Technology, China

PRESENTATION

TOPIC: Bidirectional Grid Interface Converters

T10.3 **Isolated Three-Phase AC-AC Converter with Phase Shift Modulation** 506
Jacob A. Mueller, Jack Flicker, Andrew Dow, Luciano Garcia Rodríguez, Felipe Palacios
Sandia National Laboratories, United States

PRESENTATION

TOPIC: Solid-State Transformers

- T10.4 **Design of Asynchronous Microgrid Power Conditioning System with Gen-3 10 kV SiC MOSFETs for MV Grid Interconnection** 514
Nithin Kolli, Sanket Parashar, Raj Kumar Kokkonda, Subhashish Bhattacharya, Victor Veliadis
North Carolina State University, United States

PRESENTATION

TOPIC: Bidirectional Grid Interface Converters

- T10.5 **A Five-Level AC/DC Converter for MV Solid-State Transformer** 522
Yipeng Ren, Haoyuan Weng, Xin Wu, Dehong Xu
Zhejiang University, China

PRESENTATION

TOPIC: Solid-State Transformers

- T10.6 **AC Solid-State Transformer Using DC-DC Converters and without Added Rectifier and Inverter Stages** 528
Ravisekhar Raju, Jesse Leonard
Fastwatt LLC, United States

PRESENTATION

TOPIC: Solid-State Transformers

- T10.7 **Optimization of DC-Link Capacitance for Single-Phase ISOP SST considering the Second Harmonic Pulsating Power in LLC Converter** 533
Tianyu Wei, Andrea Cervone, Drazen Dujic
École Polytechnique Fédérale de Lausanne, Switzerland

PRESENTATION

TOPIC: Solid-State Transformers

- T10.8 **A 100 kW, 405 kHz HFT for Power Electronic Building Blocks (PEBBs) with a Compact MV Electrical Insulation Design** 539
Sharifa Sharfeldden, Taha Moaz, Narayanan Rajagopal, Marie Lawson, Christina DiMarino
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Solid-State Transformers

SESSION T11: Inverters

8:30 - 12:00

TRACK: Motor Drives & Inverters

SESSION CHAIRS

Matt Woongkul Lee, *Michigan State University*

Ali Safayet, *Halla Mechatronics*

- T11.1 **Comparative Experimental Evaluation of a Three-Phase ARCP Inverter with a Single Shared Inductor Using SiC MOSFETs and Si IGBTs** 547
Thomas Lehmeier, Adrian Amler, Yan Zhou, Martin März
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

PRESENTATION

TOPIC: Single- & Multi-Phase Inverters

- T11.2 **PCB-Integrated Pickup-Coil for Overcurrent Detection in High-Current, Paralleled GaN HEMTs** 555
 Dominik Koch, Tobias Fink, Jeremy Nuzzo, Kevin Muñoz Barón, Ingmar Kallfass
Universität Stuttgart, Germany
PRESENTATION **TOPIC: Sensor Integration**
- T11.3 **A 7-Level Interleaved Hybrid Active Neutral Point Clamped Converter for High-Frequency Low-Inductance Motors** 561
 Arjit Bali, Xiaolong Zhang, Anubhav Bose, Kiruba S. Haran, Andrew Stillwell
University of Illinois Urbana-Champaign, United States
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- T11.4 **Soft Switching ARCP Inverter Using Series Connected SiC MOSFETs for Medium Voltage Motor Drive Applications** 567
 Raj Kumar Kokkonda, Subhashish Bhattacharya
North Carolina State University, United States
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- T11.5 **Zero Sequence and Ground Current Analysis of Dual Source Open-End Winding PMSM Drive System** 575
 Gyu Cheol Lim, Junhyuk Yang, Cheolmin Hwang, Jung-Ik Ha
Seoul National University, Korea
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- T11.6 **Overshoot Dynamics in Parallel Connectivity Enabled Multilevel Converters: Generalized Analytic Expression and Impact Analysis** 581
 Jinshui Zhang, Majed Al Munefi, Angel V. Peterchev, Stefan M. Goetz
Duke University, United States
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- T11.7 **Analysis and Mitigation of Voltage Overshoot in Auxiliary Switches of a Si-IGBT ARCP Inverter** 587
 Weiqiang Chen¹, Eddy Aeloiza¹, Veli-Matti Leppanen², Tero Viitanen²
¹ABB Corporate Research Center, United States; ²ABB Oy, Finland
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- T11.8 **1 kW 6.78 MHz Push-Pull Φ_2 Amplifier for Induction Heating** 595
 Calvin H. Lin, Zhechi Ye, Eric Stolt, Juan Rivas-Davila
Stanford University, United States
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- T11.9 **Two Switches Common Grounded Transformerless Step-Up and Step-Down Inverter** 600
 Ion Leandro Dos Santos, Telles Brunelli Lazzarin
Federal University of Santa Catarina, Brazil
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**

SESSION T12: Converter & Components Modeling & Simulation

8:30 - 12:00

TRACK: Modeling & Simulation

SESSION CHAIRS

Kasunaidu Vechalapu, *Infineon Technologies Americas Corp.*

Bridget O'Gorman, *PESC Inc.*

T12.1 Derivation and Analysis of New Small-Signal Model for Active Clamp Forward Converter 606

Dongheon Lee¹, Yonghan Kang², Byungcho Choi¹, Honnyong Cha¹
¹Kyungpook National University, Korea; ²Cisco Systems, Inc., United States

PRESENTATION

TOPIC: Circuits & Systems

T12.2 Accurate Data-Driven Losses Modeling for SiC-Based Converters 612

Francesco Porpora¹, Daniele Marciano², Franco Pio Caruso², Mauro Di Monaco¹, Giuseppe Tomasso^{1,3}
¹University of Cassino and Southern Lazio, Italy; ²E-Lectra s.r.l., Italy; ³IRIS LAB Research Consortium, Italy

PRESENTATION

TOPIC: Circuits & Systems

T12.3 High-Frequency Equivalent Circuit of a Ferrite Common Mode Choke considering DC Superimposition Characteristics 619

Katsuya Nomura¹, Shuhei Chizuwa², Takashi Masuzawa²
¹Kwansei Gakuin University, Japan; ²Mitsubishi Heavy Industries, Japan

PRESENTATION

TOPIC: Device & Component Modeling

T12.4 Optimizing DC Inductor Design with Air Gap for Triangular Excitation: A Reinforcement Learning Approach 627

Fanghao Tian, Hans Wouters, Xiaobing Shen, Wilmar Martinez
KU Leuven - EnergyVille, Belgium

PRESENTATION

TOPIC: Rapid Prototyping

T12.5 Small-Signal Modeling of Multi-Phase Trans-inductor Voltage Regulator Modules in Datacenter Applications 633

Chenxi Li, Liang Wang, Minfan Fu, Haoyu Wang
ShanghaiTech University, China

PRESENTATION

TOPIC: Circuits & Systems

T12.6 Investigation of Parasitic Capacitance Models for Planar Transformers: Accuracy and Impedance Prediction 639

Quang-Huy Nguyen^{1,2}, Minh-Quang Ngo^{1,2}, Duy-Dinh Nguyen², Nhat-Truong Phan³, Tat-Thang Le⁴
¹EVSELab Co.Ltd., Vietnam; ²Hanoi University of Science and Technology, Vietnam;
³National Taiwan University of Science and Technology, Taiwan; ⁴FPT Software, Vietnam

PRESENTATION

TOPIC: Parasitics

T12.7 Modelling the Effect of the DC Link Decoupling Capacitor of a Commutation Power Loop Using a Thevenin-Based Frequency Domain Approach 645

Ayooluwa Ajiboye, Ayodhya Somiruwam Gamwari, Rakesh Resalayyan, Alireza Khaligh
University of Maryland, United States

PRESENTATION

TOPIC: Device & Component Modeling

- T12.8 **Aging Modeling and Simulation of the Gate Switching Instability Degradation in SiC MOSFETs** 653
Juan R. García-Meré¹, Alexis A. Gómez¹, Jaume Roig-Guitart², Juan Rodríguez¹, Alberto Rodríguez¹
¹Universidad de Oviedo, Spain; ²onsemi, Belgium

PRESENTATION

TOPIC: Device & Component Modeling

SESSION T13: Control of Power Electronic Converters II

8:30 - 12:00

TRACK: Control

SESSION CHAIRS

Jaber Abu Qahouq, *The University of Alabama (UA)*

Seungdeog Choi, *Mississippi State University*

- T13.1 **Fast Transient DC-Bus Dynamics in GaN-Based PFCs: Dual-Loop Geometric Control** 659
Rahil Samani, Ignacio Galiano Zurbriggen, Matteo Sposito, Ignacio Santana
University of Calgary, Canada

PRESENTATION

TOPIC: Control of Power Electronic Converters

- T13.2 **Experimental Validation of a Control Strategy Enhancing the Dynamic Performance of Current-Fed Triple-Active-Bridge DC-DC Converters** 666
Paul Kowalewski, Adrian Tissen, André Thönnessen, Niklas Fritz, Rik W. De Doncker
RWTH Aachen University, Germany

PRESENTATION

TOPIC: Control of Power Electronic Converters

- T13.3 **Dual Active Bridge Simultaneous Input Admittance Passivity Shaping and Reference Tracking Using Low Order H-infinity Control** 673
Juan José Pérez¹, Daniel Santamargarita¹, David Molinero¹, Francisco Huerta¹, Daniel Pizarro¹, Santiago Cobreces¹, Robert Griñó²
¹Universidad de Alcalá, Spain; ²Universitat Politècnica de Catalunya, Spain

PRESENTATION

TOPIC: Control of Power Electronic Converters

- T13.4 **A Power Supply and High-Voltage Blocking Sensing Circuit for High Voltage Synchronous Rectifier** 679
Song Ding, Chunyan Nie, Minggang Chen, Ziyang Zhou, Lanxin Gu, Qinsong Qian
Southeast University, China

PRESENTATION

TOPIC: Sensor & Sensor-Less Control

- T13.5 **Small-Signal Modeling of Multiphase V² Constant On-Time Control with Phase Overlapping** 683
Sundaramoorthy Sridhar, Qiang Li
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Current-Mode & Voltage-Mode Control

- T13.6 **Simple and Robust Carrier-Based PWM Technique for Single-Stage Three-Phase Rectifier Indirect Matrix Converter** 691
Mikayla Benson, Avinash Dornala, Marya Andleeb, Kangbeen Lee, Woongkul Lee
Michigan State University, United States

PRESENTATION

TOPIC: Control of Power Electronic Converters

- T13.7 **High-Bandwidth Control of a 21 kW Unfolding-Based AC-DC Converter Using Extra Element Theorem and Current Emulation Technique** 698
Aditya Zade¹, Shubhangi Gurudiwan¹, Mahmoud Mansour¹, Bryce Hesterman¹,
Dragan Maksimović², Regan Zane¹
¹Utah State University, United States; ²University of Colorado Boulder, United States

PRESENTATION

TOPIC: Control of Power Electronic Converters

- T13.8 **Optimal Trajectory Control for a Fully Soft Switching Single-Stage Isolated Three Phase AC to DC Series Resonant Converter** 706
Yusuf Kosesoy, Jan M. Schellekens, Henk Huisman
Eindhoven University of Technology, The Netherlands

PRESENTATION

TOPIC: Control of Power Electronic Converters

- T13.9 **Cumulative Charge Balanced Single-Inductor Dual-Output Converter for Improved Transient and Cross Regulation** 712
Hareesh A V¹, Pradipta Patra¹, Manish Parmar², Nelson Chen²
¹Samsung Semiconductor India Research, India; ²DSA, Samsung Electronics, United States

PRESENTATION

TOPIC: Control of Power Electronic Converters

SESSION T14: GaN Devices

8:30 - 12:00

TRACK: Devices & Components

SESSION CHAIRS

Jason Neely, *Sandia*

Gregory Pickrell, *Sandia*

- T14.1 **Applications of Power Supply for RF Discharge in Low-Temperature Plasma Sterilization** 719
Tsai-Fu Wu, Xi-Ming Duan, Chi-Pin Wu, Wei-Che Hsu
National Tsing Hua University, Taiwan

PRESENTATION

TOPIC: GaN HEMTs

- T14.2 **A Gate Driver with a Low-Voltage GaN HEMT for False Turn-On Suppression and Gate Reliability Enhancement of SiC MOSFETs** 724
Ji Shu, Jiahui Sun, Zheyang Zheng, Kevin J. Chen
The Hong Kong University of Science and Technology, China

PRESENTATION

TOPIC: GaN HEMTs

- T14.3 **Evaluation of GaN HEMT Dv/Dt Immunity and Dv/Dt Induced False Turn-On Energy Loss** 729
 Nirmana Perera, Kaspars Ledins, Sheung Wai Fung, Loizos Efthymiou,
 Kalparupa Mukherjee, John Findlay, Peter Comiskey
Cambridge GaN Devices Ltd., United Kingdom
- PRESENTATION** **TOPIC: GaN HEMTs**
- T14.4 **Vertical GaN Transistor with Quasi-monolithically Integrated HEMT Gate Driver and Sense-CAVET for Current Monitoring** 737
 Michael Basler¹, Philipp Döring¹, Stefan Mönch¹, Richard Reiner¹, Rachid Driad¹,
 Michael Mikulla¹, Rüdiger Quay^{1,2}
¹Fraunhofer Institute for Applied Solid State Physics IAF, Germany; ²University of Freiburg, Germany
- PRESENTATION** **TOPIC: GaN HEMTs**
- T14.5 **Fast Overcurrent Protection for Direct Drive Cascode GaN HEMT Semiconductors Based on Industrial Gate Drivers** 742
 Enrico Vico, Fausto Stella, Simone Giuffrida, Radu Bojoi
Politecnico di Torino, Italy
- PRESENTATION** **TOPIC: GaN HEMTs**
- T14.6 **Unclamped-Inductive-Switching Based Output Capacitance Loss Characterization with Extended Test Capability** 749
 Qihao Song, Qiang Li, Yuhao Zhang
Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: GaN HEMTs**
- T14.7 **Experimental Characterization of Dynamic C_{oss} Losses in 600V GaN HEMTs Based on a Novel and Simple Calorimetric Method** 754
 Stefano de Filippis¹, Matthias J. Kasper¹, Alex Pacini¹, José Miguel Sanz-Alcaine², Gerald Deboy¹
¹Infineon Technologies AG, Austria; ²I3A, Universidad de Zaragoza, Spain
- PRESENTATION** **TOPIC: GaN HEMTs**
- T14.8 **Exceptional Gate Overvoltage Robustness in P-gate GaN HEMT with Integrated Circuit Interface** 761
 Bixuan Wang¹, Qihao Song¹, Kalparupa Mukherjee², Loizos Efthymiou², Daniel Popa²,
 Giorgia Longobardi², Florin Udrea², Yuhao Zhang¹
¹Virginia Polytechnic Institute and State University, United States;
²Cambridge GaN Devices Ltd., United Kingdom
- PRESENTATION** **TOPIC: GaN HEMTs**
- T14.9 **Evaluation of Monolithic AC GaN Switch in a Vienna Rectifier for UPS** 767
 Qinghong Yu¹, Damir Klikic¹, Vincent Aulagnier¹, Eric Persson², John Cerce¹
¹Schneider Electric, United States; ²Infineon Technologies Americas Corp., United States
- PRESENTATION** **TOPIC: GaN HEMTs**

SESSION T15: Power Electronics for Hybrid & Electric Cars

8:30 - 12:00

TRACK: Transportation Power Electronics

SESSION CHAIRS

Rasoul Hosseini, *General Motors*

Zhengda Zhang, *TESLA*

- T15.1 **High Fidelity Modeling Based High Power Density Three Phase Coupled Inductor Design for EV Applications** 774
Shahid Aziz Khan, Mengqi Wang, Shivam Chaturvedi, DucDung Le
University of Michigan-Dearborn, United States
- PRESENTATION** **TOPIC: Power Electronics for Hybrid & Electric Cars**
- T15.2 **Experimental Evaluation of Submodule Losses in Battery-Integrated MMCs with NLM and PSPWM** 779
Arvind Balachandran¹, Tomas Jonsson^{1,2}, Lars Eriksson¹
¹*Linköping University, Sweden*; ²*Scania CV AB, Sweden*
- PRESENTATION** **TOPIC: Power Electronics for Hybrid & Electric Cars**
- T15.3 **Discharge Profile-Based On-State Voltage Acquisition for Power Semiconductors in EV Traction Inverters** 787
Xing Wei¹, Zhaoxin Wang¹, Bo Yao¹, Jiahong Liu¹, Yingzhou Peng², Huai Wang¹
¹*Aalborg University, Denmark*; ²*Hunan University, China*
- PRESENTATION** **TOPIC: Power Electronics for Hybrid & Electric Cars**
- T15.4 **Synchronous Rectification for a Two-Transformer Active-Clamp Forward-Flyback Converter to Remove Voltage Spikes** 793
Seokwon Kim¹, Hanhim Sung¹, Dae-Woo Lee², Tae-Jong Ha², Jun-Young Lee², Jong-Won Shin¹
¹*Chung-Ang University, Korea*; ²*Hyundai Motor Company, Korea*
- PRESENTATION** **TOPIC: Power Electronics for Hybrid & Electric Cars**
- T15.5 **Two-Phase Interleaved DC Charging Method of Integrated Charger for Efficiency Enhancement** 801
Junhyuk Yang, Gyu Cheol Lim, Cheolmin Hwang, Jung-Ik Ha
Seoul National University, Korea
- PRESENTATION** **TOPIC: Power Electronics for Hybrid & Electric Cars**
- T15.6 **Digital Closed Loop Control of a Three Port Series Resonant Converter for Electric Vehicles** 807
Kyle Kozielski¹, Guvanathi Abeyasinghe Mudiyansele¹, Rachit Pradhan¹, Giorgio Pietrini¹, Ashish Solanki², Parthasarathy Nayak², Mehdi Narimani¹, Ali Emadi¹
¹*McMaster University, Canada*; ²*Eaton Corp., United States*
- PRESENTATION** **TOPIC: Power Electronics for Hybrid & Electric Cars**

- T15.7 **Effects of Regenerative Braking on Hybrid Battery Balancing** 815
 Alvin Huynh, Akash Samanta, Sheldon Williamson
University of Ontario Institute of Technology, Canada
PRESENTATION **TOPIC: Vehicular Power Electronic Circuits & Systems**
- T15.8 **Comparative Evaluation of SiC/GaN/Si-Based Drive-Train Inverters for Light Electric-Vehicles** 822
 Jaydeep Saha, Sai Srinivas Manohar, Prasanth Sundararajan, Sanjib Kumar Panda
National University of Singapore, Singapore
PRESENTATION **TOPIC: Power Electronics for Hybrid & Electric Cars**
- T15.9 **Experimental Verification of 500kW Resonant Switched-Capacitor Converter for Electric Trucks and Electric Aircraft Application** 830
 Xiaoyan Liu, Maohang Qiu, Kevin Hobbs, Ahmed Dahneem, Haoran Meng, Dong Cao
University of Dayton, United States
PRESENTATION **TOPIC: Power Electronics for Aerospace**

SESSION T16: Magnetic Applications I

8:30 - 12:00

TRACK: Magnetics

SESSION CHAIRS

George Slama, *Würth Elektronik*

Matt Wilkowski, *Enachip Inc.*

- T16.1 **Low-Profile Fractional Planar Transformer Based on a Novel Infinite-Shape PCB Winding for 5kW Dual Active Bridge Converter** 838
 Amin KhakparvarYazdi, S. Ali Khajehoddin
University of Alberta, Canada
PRESENTATION **TOPIC: High-Frequency Magnetics**
- T16.2 **Evaluation and Comparison of Discrete Magnetics and Integrated Magnetics for High Power LLC Converters** 846
 Feng Jin, Zheqing Li, Tianlong Yuan, Chunyang Zhao, Qiang Li
Virginia Polytechnic Institute and State University, United States
PRESENTATION **TOPIC: Magnetics Applications**
- T16.3 **Analysis and Design Trade-Offs of a Multi-Winding High-Frequency Transformer for a Battery Charger** 854
 Neha Rajput, Himanshu Bhusan Sandhibigraha, Vishnu Mahadeva Iyer
Indian Institute of Science, India
PRESENTATION **TOPIC: High-Frequency Magnetics**

- T16.4 **Design and Performance Comparison of Multi-Frequency Inductors for Megahertz Wireless Power Transfer** 861
 Rachel S. Yang¹, Ioannis Nikiforidis^{2,3}, Nunzio Pucci², Mansi V. Joisher¹, Prateek Wagle², Paul D. Mitcheson^{1,2}, David J. Perreault¹
¹Massachusetts Institute of Technology, United States; ²Imperial College London, United Kingdom; ³Bumblebee Power, United Kingdom
- PRESENTATION** **TOPIC: High-Frequency Magnetics**
- T16.5 **A 10kW/200kHz PCB-Winding Transformer with High Insulation Voltage for Solid-State Transformer Applications** 869
 Chen Chen, Zhicheng Guo, Alex Q. Huang
 The University of Texas at Austin, United States
- PRESENTATION** **TOPIC: Magnetics Applications**
- T16.6 **All-in-One Magnetic Structure for PSFB Converter with Current Doubler Rectifier** 875
 HUU-Phuc Kieu, Dinh Bao-Hung Nguyen, Donghyuk Lee, Sewan Choi
 Seoul National University of Science and Technology, Korea
- PRESENTATION** **TOPIC: High-Frequency Magnetics**
- T16.7 **Embedded Gate Driver Transformer for Use with Medium Voltage SIC MOSFETS** 881
 Jim Quilici¹, Ping Lu²
¹Shennan Circuits Corp. America, United States; ²Shennan Circuits Corp., China
- PRESENTATION** **TOPIC: Magnetics Applications**
- T16.8 **Double Sided Conduction in N:1 Transformers** 884
 Alyssa Brown, Michael Solomentsev, Champers Fu, Odinaka Okeke, Alex J. Hanson
 The University of Texas at Austin, United States
- PRESENTATION** **TOPIC: High-Frequency Magnetics**

SESSION T17: POL & Multiphase DC DC Converters

13:30 - 17:00

TRACK: DC-DC Converters

SESSION CHAIRS

Sombuddha Chakraborty, Texas Instruments

Olivier Trescases, University of Toronto

- T17.1 **A 1500-A/48-V-to-1-V Switching Bus Converter for Next-Generation Ultra-High-Power Microprocessors** 890
 Yicheng Zhu, Jiarui Zou, Robert C.N. Pilawa-Podgurski
 University of California-Berkeley, United States
- PRESENTATION** **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**

- T17.2 **Analysis of Parasitic Stored Energy Loss and PCB Layout Optimization for 48V-to-1V Series-Capacitor Buck** 898
 Xinmiao Xu, Qiang Li
Virginia Polytechnic Institute and State University, United States
PRESENTATION **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- T17.3 **Vertical Power Delivery for 1000 Amps Machine Learning ASICs** 906
 Houle Gan, Shuai Jiang, Sue Teng, Shin Yamamoto, Venkata Chivukula, Bill Edwards,
 Chee Chung, Jason Chen, Mushafik Mohideen, Gregory Sizikov, Xin Li
Google LLC, United States
PRESENTATION **TOPIC: Voltage Regulator Modules (VRM)**
- T17.4 **A 2400 w/In³ 1.8 v Bus Converter Enabling Vertical Power Delivery for Next-Generation Processors** 910
 Pranav Raj Prakash¹, Ahmed Nabih¹, Yan Liang¹, Sudhir Kudva², Mostafa Mosa²,
 C. Thomas Gray², Qiang Li¹
¹Virginia Polytechnic Institute and State University, United States; ²NVIDIA Corporation, United States
PRESENTATION **TOPIC: Voltage Regulator Modules (VRM)**
- T17.5 **Ultra-Low-Profile Twisted Core Inductor for Vertical Power Delivery Voltage Regulator** 918
 Adhistira M. Naradhipa, Feiyang Zhu, Qiang Li
Virginia Polytechnic Institute and State University, United States
PRESENTATION **TOPIC: Voltage Regulator Modules (VRM)**
- T17.6 **500A Stacked Direct Power Converter with Standard PCB Transformer** 925
 José A. Cobos, Pablo Mazariegos, Alejandro Figueroa, Alejandro Castro, Álvaro Cobos
Differential Power S.L., Spain
PRESENTATION **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- T17.7 **Efficiency Impact of Phase Firing Order in Dual-Sided Power Entry with Trans-inductor Voltage Regulators (TLVR)** 931
 Pavan Kumar, Justin Tippetts, Satya Sai Deepak Naidu, Paul Brusco
Intel Corporation, United States
PRESENTATION **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- T17.8 **A Novel Concept of Injected Coupled Inductors** 939
 Alexandr Ikriannikov, Laszlo Lipcsei
Analog Devices, Inc., United States
PRESENTATION **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- T17.9 **A 97% Peak Efficiency 12V to 1V 500A Multi-Phase Direct Power Converter for High Current Applications** 947
 Alejandro Castro, Pablo Mazariegos, Alejandro Figueroa, Álvaro Cobos, José A. Cobos
Differential Power S.L., Spain
PRESENTATION **TOPIC: Resonant Converters**

SESSION T18: Protection & Control for Utility Interface & UPS

13:30 - 17:00

TRACK: Power Electronics for Utility Interface

SESSION CHAIRS

Ravisekhar Raju, *FastWatt LLC*

Jacob Mueller, *Sandia National Laboratories*

- T18.1 **Machine Learning Based Inter-turn Short Circuit Detection for Three-Phase Power Transformers with Primary Side Currents** 953
Yujia Cui¹, Kadir Liano¹, Zhijun Liu¹, Zhuo Liu², Hao Yang², Haihui Lu², Zhongyuan Cheng³,
Navid Zargari³, Jiangang Hu¹, Ranga Tallam¹, Bijan SayyarRodsari¹
¹Rockwell Automation, United States; ²Rockwell Automation, China; ³Rockwell Automation, Canada
- PRESENTATION** **TOPIC: Power Generation, Transmission & Distribution**
- T18.2 **Open-Circuit Switch Fault Diagnosis in Single-Phase CHMC with Switching Duty Ratio-Based Estimated Grid Current** 959
Hyeon-Woo Oh, Dongho Choi, Jeong-Yul Bang, June-Seok Lee
Dankook University, Korea
- PRESENTATION** **TOPIC: Solid-State Transformers**
- T18.3 **Modeling and Experiments of a Nonlinear Inductor-Based Fault Current Commutation Strategy for a Hybrid DC Circuit Breaker** 965
Qichen Yang¹, Michael Steurer¹, Sihun Song¹, Matthew Pickles¹, John Hauer¹, Matthew Bosworth¹,
Nash Bonaventura¹, Yuchen He¹, Michael Coleman¹, Karl Schoder¹, Yanjun Shi², Lukas Graber³
¹Florida State University, United States; ²Tesla, United States; ³Georgia Institute of Technology, United States
- PRESENTATION** **TOPIC: Power Generation, Transmission & Distribution**
- T18.4 **Mixed Duty-Ratio and Frequency Modulation Control for a Soft-Switched Inversion Stage of a High-Power-Density Online Uninterruptible Power Supply (UPS)** 971
Maida Farooq, Khurram K. Afridi
Cornell University, United States
- PRESENTATION** **TOPIC: Power Quality, UPS, Filters**
- T18.5 **Optimal Design of Supercapacitor Stacks for Size-Critical Applications** 977
Arkadeb Sengupta¹, Thiago Pereira^{1,2}, Marco Liserre^{1,2}
¹Christian-Albrechts-Universität zu Kiel, Germany; ²Fraunhofer Institute for Silicon Technology, Germany
- PRESENTATION** **TOPIC: UPS**
- T18.6 **Stability Analysis of MMC considering Internal Dynamics Based on Equivalent Impedance Model** 984
Hongyi Chen, Heya Yang, Zhizhan Tang, Rujing Zhang, Xin Xiang, Wuhua Li
Zhejiang University, China
- PRESENTATION** **TOPIC: Power Generation, Transmission & Distribution**
- T18.7 **A Practical and Unique Control Technique to Enhance Efficiency of Dual-Stage DC-AC Power Inverter** 989
Akshat Jain, Ranajay Mallik
STMicroelectronics, India
- PRESENTATION** **TOPIC: UPS**

T18.8 **13.8 kV, 1MW Resonant Direct AC Medium Voltage Single Stage Solar PV Inverter** 995
Parthkumar Bhuvella, Hooman Taghavi, Adel Nasiri
University of South Carolina, United States

PRESENTATION

TOPIC: Distributed Energy Systems

T18.9 **Three-Phase Single-Stage Bidirectional Isolated AC-AC Converter with Reduced Count of Switches** 1003

Asad Hameed, Gerry Moschopoulos
Western University, Canada

PRESENTATION

TOPIC: Solid-State Transformers

SESSION T19: High Performance Drives

13:30 - 17:00

TRACK: Motor Drives & Inverters

SESSION CHAIRS

Ali Safayet, Halla Mechatronics

T19.1 **A 14-Level FCML Inverter for Electric Vehicles with Optimal Capacitors Achieving 175 kW/Kg and 380 kW/L Power Density** 1009

Logan Horowitz, Robert C.N. Pilawa-Podgurski
University of California-Berkeley, United States

PRESENTATION

TOPIC: High Performance Drives

T19.2 **Common-Mode EMI Noise Analysis of Neutral-Point-Less (NPL) Multilevel X-type Inverter** 1014

Kangbeen Lee¹, Mikayla Benson¹, Xiaofeng Dong², Jinyeong Moon², Woongkul Lee¹
¹*Michigan State University, United States*; ²*Florida State University, United States*

PRESENTATION

TOPIC: High Performance Drives

T19.3 **Comprehensive Comparative Analysis: VSI-Based vs. CSI-Based Motor Drive Systems with Sinusoidal Output Voltage** 1021

Feida Chen, Sangwhae Lee, Thomas M. Jahns, Bulent Sarlioglu
University of Wisconsin-Madison, United States

PRESENTATION

TOPIC: High Performance Drives

T19.4 **Direct Flux-and-Torque Vector Control with Active Torque Ripple Minimization** 1028

Andrei Bojoi, Paolo Pescetto, Fausto Stella, Simone Ferrari, Gianmario Pellegrino
Politecnico di Torino, Italy

PRESENTATION

TOPIC: High Performance Drives

T19.5 **Virtual Reduced-Order Plant-Based Speed Sensorless Control for AC Motor Drives with Output LC Filter** 1035

Cheng Xue, Xuesong Wu, Yunwei Li
University of Alberta, Canada

PRESENTATION

TOPIC: High Performance Drives

T19.6 **Multi-Rate Finite Control Set Model Predictive Control with Reduced Circulating Currents for Parallel Dual-Converter-Fed PMSM Drive** 1041
Xuesong Wu, Cheng Xue, Yunwei Li
University of Alberta, Canada

PRESENTATION

TOPIC: High Performance Drives

T19.7 **Design and Implementation of a Dv/Dt Filter for Motor Overvoltage Mitigation in SiC-Based Adjustable Speed Drives** 1046
Wenzhi Zhou¹, Zhaobo Zhang¹, Xibo Yuan^{1,2}, Mohamed Diab³
¹*University of Bristol, United Kingdom*; ²*China University of Mining and Technology, China*;
³*Loughborough University, United Kingdom*

PRESENTATION

TOPIC: High Performance Drives

T19.8 **Enhancing Low-Speed Torque Profile in a Self-Commutated 12-Pulse CSI Fed Multi-Phase Induction Machine Using a Novel PWM Scheme** 1054
Pratyush Pandey, Hari Krishnan P, Kamalesh Hatua
Indian Institute of Technology Madras, India

PRESENTATION

TOPIC: High Performance Drives

T19.9 **Semiconductor Power Losses Reduction Using Tandem Diodes Concepts for Motor Drives Applications** 1062
Tiago Kommers Jappe, Matthias Tauer, Zoltán Major
Vincotech GmbH, Germany

PRESENTATION

TOPIC: High Performance Drives

SESSION T20: SiC Devices

13:30 - 17:00

TRACK: Devices & Components

SESSION CHAIRS

Lee Gill, *Sandia*

Riya Paul, *University of Arkansas*

T20.1 **Deep Investigation on SiC MOSFET Degradation under Gate Switching Stress and Application Switching Stress** 1067
Alexis A. Gómez¹, Juan R. García-Meré¹, Alberto Rodríguez¹, Juan Rodríguez¹,
Carlos Jimenez², Jaime Roig-Guitart²
¹*Universidad de Oviedo, Spain*; ²*onsemi, Belgium*

PRESENTATION

TOPIC: SiC MOSFETs & BJTs

T20.2 **Current Balancing of Parallel High Current SiC Half Bridge Modules Using Delay Based Active Gate Driving with Inter-device Inductances** 1073
Mason Parker¹, Sebastian Neira¹, Philip Waite², Edward L. Horsley², Stephen Finney¹, Paul D. Judge¹
¹*The University of Edinburgh, United Kingdom*; ²*Siemens Gamesa Renewable Energy, United Kingdom*

PRESENTATION

TOPIC: SiC MOSFETs & BJTs

- T20.3 **Surge Current Handling Capability of SiC Fets** 1081
 Xueqing Li, Pete Losee, Anup Bhalla
Qorvo, Inc., United States
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- T20.4 **Design of 10 kV SiC MOSFET Power Module Based MW-Level Modular Multilevel Converter Phase-Leg** 1087
 Ruirui Chen¹, Dingrui Li¹, Min Lin¹, Mohamed Al Sager¹, Zihan Gao¹, Fred Wang^{1,2}, Hua Bai¹, Leon M. Tolbert¹
¹The University of Tennessee-Knoxville, United States; ²Oak Ridge National Laboratory, United States
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- T20.5 **Electro-Thermal Trade-Off for AC-Current Injection and Series-Clamping-Diodes Based Rds-On Estimation Circuit** 1095
 Furkan Karakaya¹, Anuj Maheshwari¹, Arijit Banerjee¹, John S. Donna²
¹University of Illinois Urbana-Champaign, United States; ²United States Naval Academy, United States
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- T20.6 **Gate-Source-Dependent Soft- and Hard-Switching Losses of 1200V SiC MOSFETs Utilizing Heatsinkless Calorimetric Measurements Based on Optical Sensors** 1100
 Ruben Schnitzler, Dominik Koch, Mathias C.J. Weiser, Julian Weimer, Ingmar Kallfass
Universität Stuttgart, Germany
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- T20.7 **Online Monitoring Method for SiC MOSFET Gate Oxide Degradation Based on Gate Voltage Filtering** 1108
 Jiahong Liu, Bo Yao, Xing Wei, Yichi Zhang, Huai Wang
Aalborg University, Denmark
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- T20.8 **Energy-Based Method to Estimate the Partial Hard Turn-On Loss of Complementary SiC MOSFET from Experiment** 1114
 Manish Mandal, Bharath Kumar M, Malingu G, Shamibrota K. Roy, Kaushik Basu
Indian Institute of Science, India
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- T20.9 **Measurement of Circuit Parasitics of a 200kW SiC Based Stack** 1120
 Surjakanta Mazumder, Manish Mandal, Bharath Kumar M, Malingu G, Shamibrota Kishore Roy, Kaushik Basu
Indian Institute of Science, India
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**

SESSION T21: Gate Drive Circuits

13:30 - 17:00

TRACK: Control

SESSION CHAIRS

Kang Wei, *Texas Instruments*

Seungdeog Choi, *Mississippi State University*

- T21.1 **Variable Gate Current Range Digital Gate Driver IC Always Providing 6-Bit Controllability in Various IGBTs** 1125
Haoxi Zhou, Toshiaki Inuma, Dibo Zhang, Katsuhiko Hata, Makoto Takamiya
The University of Tokyo, Japan
PRESENTATION **TOPIC: Gate Drive Circuits**
- T21.2 **A Digital Gate Driver IC with a Digitally Adjustable DESAT and Parameter Adjustment Method for False Detection Prevention and Short-Circuit Protection of 1200V 180A SiC Module** 1130
Koutaro Miyazaki, Shusuke Kawai, Takeshi Ueno, Hiroaki Ishihara
Toshiba Research & Development Center, Japan
PRESENTATION **TOPIC: Gate Drive Circuits**
- T21.3 **Closed Loop Digital Design of Active Gate Driver Based Power Converter** 1135
Manish Kumar^{1,2}, Zhengyang Feng², Sheng Wang¹, Magnus Sandell², Wenlong Ming¹
¹*Cardiff University, United Kingdom;* ²*Toshiba Europe Limited, United Kingdom*
PRESENTATION **TOPIC: Gate Drive Circuits**
- T21.4 **A Quad-Slope 70V GaN Gate Driver with Integrated Three-Mode Level Shifter for Enhanced Negative Voltage Tolerance, dV/Dt Detection and Double-Edge Self-Triggered Delay Compensation** 1141
Tianqi Liu¹, Qiang Gao², Rui P. Martins¹, Yan Lu¹
¹*University of Macau, Macau;* ²*Light Semibucks Company Limited, China*
PRESENTATION **TOPIC: Gate Drive Circuits**
- T21.5 **5-MHz Operation of a DC 565-V SiC-MOSFET Half-Bridge Inverter by Reducing Thermal Resistance of General-Purpose Gate Drivers** 1146
Koji Orikawa¹, Sota Asano¹, Satoshi Ogasawara²
¹*Hokkaido University, Japan;* ²*Nagoya University, Japan*
PRESENTATION **TOPIC: Gate Drive Circuits**
- T21.6 **Application of a Short-Circuit Protection by Using Gate Charge Characteristic to Three Parallel Connected IGBT Modules** 1153
Takeshi Horiguchi¹, Kosuke Horino¹, Yasushige Mukunoki¹, Kenji Oda², Masahiro Kinoshita², Masahiko Tsukakoshi²
¹*Mitsubishi Electric Corporation, Japan;* ²*Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan*
PRESENTATION **TOPIC: Gate Drive Circuits**

- T21.7 **Impact of Operational Parameters on $dVDS/dt$ of SiC MOSFET and a Scheme for Gate Driver Resistance Selection to Limit $dVDS/dt$** 1159
Aditya Aman¹, Abhishek Chanekar¹, Sandeep Anand¹, Anant Agarwal²
¹Indian Institute of Technology Bombay, India; ²The Ohio State University, United States

PRESENTATION

TOPIC: Gate Drive Circuits

SESSION T22: Wireless Power Transfer: Topology

13:30 - 17:00

TRACK: Wireless Power Transfer

SESSION CHAIRS

Jungwon Choi, *University of Washington*

Regan Zane, *Utah State University*

- T22.1 **Drone Charging Stations on Telecom Towers with Series-Stacked Capacitive Differential Wireless Power Transfer** 1166
Mian Liao¹, Tanuj Sen¹, Youssef Elasser¹, Hashim Al Hassan², Andrew Pigney², Edward Knapp², Minjie Chen¹
¹Princeton University, United States; ²American Tower Inc., United States

PRESENTATION

TOPIC: Wireless Charging

- T22.2 **Accurate Switch-Current Reading by Utilizing PCB-Embedded Differential Rogowski Coils** 1174
Ali Parsa Sirat, Jiale Zhou, Hossein Niakan, Babak Parkhideh
University of North Carolina at Charlotte, United States

PRESENTATION

TOPIC: Non-Contact Sensors for Power Electronics

- T22.3 **A Single-Stage Reconfigurable Wireless Charger for 400-V and 800-V Electric Vehicle Battery Voltages** 1181
Guru Prasad Reddy Vaddemani, Harish Karneddi, Deepak Ronanki
Indian Institute of Technology Madras, India

PRESENTATION

TOPIC: Wireless Charging

- T22.4 **A High-Power-Density Reduced-Fringing-Field Multi-MHz Capacitive Wireless Power Transfer System** 1187
Syed Saeed Rashid, Dheeraj Etta, Matteo Ciabattoni, Sounak Maji, Francesco Monticone, Khurram K. Afridi
Cornell University, United States

PRESENTATION

TOPIC: Wireless Charging

- T22.5 **A Family of Balance Circuits for Inductive Power Transfer Systems to Reduce Common Mode Noise** 1195
Guoao Li¹, Ying Mei¹, Wanying Weng¹, Yizhen Lin², Jiande Wu¹, Xiangning He¹
¹Zhejiang University, China; ²China Tobacco Zhejiang Industrial Co., Ltd., China

PRESENTATION

TOPIC: Wireless Charging

T22.6 **A Novel Hybrid Magnetic Core Design Method for Weight Reduction of Wireless Power Transfer Systems** 1202
Yaohua Li¹, Sicheng Wang¹, Yue Wu², Yongbin Jiang¹, Xuhui Zhu¹, Ziheng Xiao¹, Zhou He³, Yi Tang¹
¹Nanyang Technological University, Singapore; ²Xi'an Jiaotong University, China;
³Huazhong University of Science and Technology, China

PRESENTATION

TOPIC: Wireless Charging

T22.7 **A Variable Compensation Rectifier with Enhanced Compensation Capability for Coupling Variations in Wireless Power Transfer Systems** 1207
Asif Mushtaq Bhat, Sreyam Sinha
Indian Institute of Technology Delhi, India

PRESENTATION

TOPIC: Wireless Charging

T22.8 **Comparative Evaluation of Voltage- and Current-Immersed Inductive Power Transfer to Multiple Stainless-Steel-Enclosed Moving Receivers** 1213
Junzhong Xu¹, Spasoje Mirić², Markus Blickenstorfer³, Marco Hitz³, Johann W. Kolar¹, Jonas Huber¹
¹ETH Zürich, Switzerland; ²University of Innsbruck, Austria; ³NTI AG, Switzerland

PRESENTATION

TOPIC: Wireless Charging

T22.9 **Electric Vehicle Battery Charger Based on a Three-Phase to Single-Phase Matrix Converter for Inductive Power Transfer** 1223
Nikola Mirković, Đjordje Stojić², Alberto Delgado Exposito¹, Pedro Alou Cervera¹, Miroslav Vasić¹
¹Universidad Politécnica de Madrid, Spain; ²Electrical Engineering Institute Nikola Tesla, Serbia

PRESENTATION

TOPIC: Wireless Charging

SESSION T23: Renewable Energy Technologies

13:30 - 17:00

TRACK: Renewable Energy Systems

SESSION CHAIRS

Weiqliang Chen, ABB

Chunui Liu, Rivian

T23.1 **A Transferable Deep Learning Network for IGBT Open-Circuit Fault Diagnosis in Three-Phase Inverters** 1229
Yongjie Liu, Ariya Sangwongwanich, Yi Zhang, Shuyu Ou, Huai Wang
Aalborg University, Denmark

PRESENTATION

TOPIC: Photovoltaic (PV) Inverters & Micro Inverters

T23.2 **Experimental Study Based Switching Sequence for Reduction of Peak Voltage Transients in GaN-Based 3L-ANPC Inverter** 1235
Subhransu Satpathy, Partha Pratim Das, Subhashish Bhattacharya, Victor Veliadis
North Carolina State University, United States

PRESENTATION

TOPIC: Photovoltaic (PV) Inverters & Micro Inverters

- T23.3 **A $L_n C_{2n-2}$ Network-Based Paralleled Dual Buck-Boost Non-isolated Multi-Output Hybrid Converter with Reduced Leakage Current** 1242
 Rajat Kumar Keshari¹, Prakhar Nema¹, Simanta Kumar Samal², Rajeev Kumar Singh¹
¹Indian Institute of Technology (BHU) Varanasi, India; ²National Institute of Technology Jamshedpur, India
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**
- T23.4 **Control-Sync: A Method for Grid-Forming Inverters** 1248
 Fahmid Sadeque, Mehmetcan GURSOY, Fariba Fateh, Behrooz Mirafzal
 Kansas State University, United States
- PRESENTATION** **TOPIC: Microgrid Systems**
- T23.5 **An Active Voltage Quadrupler Rectifier Based Multidirectional Three-Port Converter in 800V Micro-Grids** 1255
 Yuchong Peng, Bo Xue, Liang Wang, Haoyu Wang
 ShanghaiTech University, China
- PRESENTATION** **TOPIC: Bi-Directional Power Converters**
- T23.6 **Simplified Fixed Frequency Phase Shift Modulation for a Novel Single-Stage Single Phase Series-Resonant AC-DC Converter** 1261
 Huanghao Zou, Mafu Zhang, Saleh Farzamkia, Alex Q. Huang
 The University of Texas at Austin, United States
- PRESENTATION** **TOPIC: Bi-Directional Power Converters**
- T23.7 **Carrier-Based Modulation Scheme plus Neutral-Point Current Control for Balancing Neutral-Point Voltage of Three-Phase Four-Leg Three-Level Inverter over Entire Power Factor** 1269
 Yuhao Wang, Li Zhang, Tianxiang Yin, Lei Lin, Xiaojie Shi
 Huazhong University of Science and Technology, China
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**
- T23.8 **An Electrolytic Capacitor Less Non-isolated Microinverter with Integrated Battery Storage System for Residential Applications** 1275
 Fahad M. Alhuwaisheh¹, Prasad Enjeti²
¹College of Technological Studies, Kuwait; ²Texas A&M University, United States
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**
- T23.9 **Cyber-Secure and Safe Operation of Solar Photovoltaic Power Distribution Systems** 1280
 Jaewon Kim¹, Hasan Ibrahim², Shaozhe Wang², Akshay Mete², Le Xie², Prasad Enjeti², P.R. Kumar²
¹Massachusetts Institute of Technology, United States; ²Texas A&M University, United States
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**

SESSION T24: Charging Systems

13:30 - 17:00

TRACK: Transportation Power Electronics

SESSION CHAIRS

Harish Krishnamoorthy, *University of Houston*

Sheldon Williamson, *Ontario Tech University*

- T24.1 **A Single-Phase Integrated Onboard Charger with a Wide Voltage Range for Plug-In Electric Vehicles** 1288
Harish Karneddi, Deepak Ronanki
Indian Institute of Technology Madras, India
PRESENTATION **TOPIC: Charging Systems**
- T24.2 **Design and Control of a New Single-Stage Wireless Charger with Interoperable Power Level Capability** 1294
Guru Prasad Reddy Vaddemani¹, Deepak Ronanki¹, Apparao Dekka², Abdul R. Beig³
¹*Indian Institute of Technology Madras, India*; ²*Lakehead University, Canada*; ³*Khalifa University, U.A.E.*
PRESENTATION **TOPIC: Charging Systems**
- T24.3 **A 22-kW On-Board Charger (OBC) with an Integrated Planar Inductor and Transformer** 1300
Tianlong Yuan, Feng Jin, Qiang Li
Virginia Polytechnic Institute and State University, United States
PRESENTATION **TOPIC: Charging Systems**
- T24.4 **Optimized EV On-Board Charging Power Converter Using Hybrid DCX-DAB Topology** 1305
Héctor Sarnago, Óscar Lucía
I3A, Universidad de Zaragoza, Spain
PRESENTATION **TOPIC: Charging Systems**
- T24.5 **A Gray-Box Stability Analysis Mechanism for Power Electronic Converters** 1310
Rui Kong, Subham Sahoo, Yubo Song, Frede Blaabjerg
Aalborg University, Denmark
PRESENTATION **TOPIC: Vehicular Power Electronic Circuits & Systems**
- T24.6 **Common-Mode Current Prediction in a Non-Isolated Onboard EV Fast Charger** 1316
Amirhossein Nazeri, Chatumal Perera, Peter W. Lehn
University of Toronto, Canada
PRESENTATION **TOPIC: Charging Systems**
- T24.7 **An Improved Dual-Mode Fast Charger for Supercapacitors** 1324
Yang Chen, Hengzhao Yang
ShanghaiTech University, China
PRESENTATION **TOPIC: Charging Systems**

T24.8 **Rapid Parameterization of Lithium-Ion Batteries Using Frequency Window Identification Technique for On-Board Charge Control and Battery Management** 1330
Latha Anekal, Akash Samanta, Sheldon Williamson
University of Ontario Institute of Technology, Canada

PRESENTATION

TOPIC: Vehicular Power Electronic Circuits & Systems

T24.9 **A Novel Electric Vehicle Charging Station Based on Parallel Hybrid Converter and DAB with Ability to Simultaneously Work in STATCOM Mode** 1338
Nikhil Suresh Patil, Ibhan Chand Rath, Anshuman Shukla
Indian Institute of Technology Bombay, India

PRESENTATION

TOPIC: Charging Systems

Thursday, February 29, 2024

SESSION T25: Hybrid Switched Capacitor DC DC

8:30 - 11:10

TRACK: DC-DC Converters

SESSION CHAIRS

Cahit Gezgin, *Infineon*

Luke Jenkins, *IBM*

T25.1 **A 94.7% Efficiency Direct-Step-Down Switched-Tank-Based 48V to 1V-3.3V Hybrid Converter with Constant-Resonant-Time Closed-Loop Control** 1344
Si Yuan Sim¹, Xin Zhang², Junmin Jiang³, Kang Wei⁴, Cheng Huang¹
¹*Iowa State University, United States*; ²*IBM T.J. Watson Research Center, United States*;
³*Southern University of Science and Technology, China*; ⁴*Texas Instruments, United States*

PRESENTATION

TOPIC: Point-of-Load (PoL) & Multi-Phase Converters

T25.2 **A Six-Level Multi-Inductor Hybrid Converter with the Hexagonal Layout to Improve the Current Balancing** 1351
Qi Liu¹, Jingyuan Liang¹, Sherman Tang¹, Shao Chen², Jiange Han², Qinsong Qian², Wai Tung Ng¹
¹*University of Toronto, Canada*; ²*Southeast University, China*

PRESENTATION

TOPIC: Point-of-Load (PoL) & Multi-Phase Converters

T25.3 **Current-Sourced Hybrid Switched-Capacitor Converter for Data Center Power Delivery** 1357
Aria K. Delmar, Andrew Stillwell
University of Illinois Urbana-Champaign, United States

PRESENTATION

TOPIC: Point-of-Load (PoL) & Multi-Phase Converters

T25.4 **Multilevel Series-Capacitor Buck Converter** 1363
Gianluca Roberts, Aleksandar Prodić
University of Toronto, Canada

PRESENTATION

TOPIC: Point-of-Load (PoL) & Multi-Phase Converters

T25.5 **Always-Dual-Path Hybrid DC-DC Converter with Soft Charging for High Efficiency with Reduced Passive Components** 1371
Katsuhiro Hata¹, Shinsaku Tanaka², Toru Ashikaga², Yasuhiro Rikiishi²
¹The University of Tokyo, Japan; ²Sanken Electric Co., Ltd., Japan

PRESENTATION

TOPIC: Voltage Regulator Modules (VRM)

T25.6 **Hybrid-Switched-Capacitor VRM with Zero-Voltage-Switching Intermediate Voltage Rails** .. 1377
Shuyu Zhang^{1,2}, Huaqiao Liu^{1,3}, Yenan Chen^{1,3}
¹Stanford University, United States; ²ZJU-Hangzhou Global Scientific and Technological Innovation Center, China; ³Zhejiang University, China

PRESENTATION

TOPIC: Voltage Regulator Modules (VRM)

T25.7 **A Gallium Nitride-Based 48V-to-1V Point-of-Load (PoL) Converter for Aerospace Telecommunications and Computing Applications** 1384
Nathan M. Ellis, Yicheng Zhu, Robert C.N. Pilawa-Podgurski
University of California-Berkeley, United States

PRESENTATION

TOPIC: Point-of-Load (PoL) & Multi-Phase Converters

SESSION T26: DC DC Converter Applications

8:30 - 11:10

TRACK: DC-DC Converters

SESSION CHAIRS

Wai Tung Ng, *University of Toronto*

Zobair Roohani, *Infineon*

T26.1 **Coupled Inductor Design Methodology for Optimization of Boost Extending Topology** 1389
Vikas Kumar Rathore, Michael Evzelman, Mor Mordechai Peretz
Ben-Gurion University of the Negev, Israel

PRESENTATION

TOPIC: Hard- & Soft-Switched

T26.2 **High Step-Up Ratio Interleaved Boost L-LLC Resonant Converter with PWM and PFM Control for Wide Input and Output Voltage Range** 1396
Yu Zuo, Diego Bernal Cobaleda, Xiaobing Shen, Wilmar Martinez
KU Leuven - EnergyVille, Belgium

PRESENTATION

TOPIC: Resonant Converters

T26.3 **Modular Soft-Switched PV Converter with an Efficiency Optimization Scheme for High Frequency Linking Power Balancers** 1403
Kajanan Kanathipan, John Lam
York University, Canada

PRESENTATION

TOPIC: Resonant Converters

T26.4 **High Power/High Temperature Fluid Water Induction Heating System Based on SiC-MOSFET High Frequency Single-Ended Resonant Inverter** N/A
Taku Nakamoto¹, Tomokazu Mishima¹, Hideki Omori¹, Shuhei Otani², Kyouhei Ogawa²
¹Kobe University, Japan; ²Noritz Corporation, Japan

PRESENTATION

TOPIC: Resonant Converters

T26.5 **A Practical Auxiliary Circuit for Voltage Fluctuation Reduction in Multi-Core CPU Power Supplies** 1417
Yijie Qian, Shen Xu, Xinru Wang, Weifeng Sun
Southeast University, China

PRESENTATION

TOPIC: Voltage Regulator Modules (VRM)

SESSION T27: Topologies & Passives for Utility Interface

8:30 - 11:10

TRACK: Power Electronics for Utility Interface

SESSION CHAIRS

Khurram Afridi, *Cornell University*

Javad Khodabakhsh, *Qualcomm*

T27.1 **Influence of Voltage Dependency of Capacitors on a 3-Phase Common Mode Feedforward Current Sense Current Injection Active EMI Filter** 1423
Stefan Haensel¹, Stephan Frei²
¹Siemens AG, Germany; ²Technische Universität Dortmund, Germany

PRESENTATION

TOPIC: Power Quality, UPS, Filters

T27.2 **Analysis and Mitigation of Background Harmonics Effect on Small-AC-Signal Injection Based Decentralized Secondary Voltage Control for Parallel Inverters in Islanded Microgrids** 1428
Yidong Shi, Zeng Liu, Xiaochen Wu, Jiazhi Wang, Jinjun Liu
Xi'an Jiaotong University, China

PRESENTATION

TOPIC: Distributed Energy Systems

T27.3 **Balancing Control of Cluster Energy in Star-Connected Multilevel Power Conversion System Using Zigzag Transformer** 1434
Yeongung Kim¹, Shenghui Cui², Jae-Jung Jung¹
¹Kyungpook National University, Korea; ²Seoul National University, Korea

PRESENTATION

TOPIC: Power Quality, UPS, Filters

T27.4 **Transformer-Less Split-Phase Neutral Grounded Inverter** 1441
Snehal Bagawade, Luis Zubieta
Block Energy Labs, Canada

PRESENTATION

TOPIC: Distributed Energy Systems

T27.5 **On-Board AC Charging Topology Integrated with Electric Vehicle Motor Drive System** 1448
Md Khalid Mahmud Bin Azam¹, Aquib Ahmed¹, Mohammad Muntasir Islam¹, Afsana Dristy¹,
Ashraf Siddiquee¹, Yilmaz Sozer¹, Mithat John Kisacikoglu²
¹The University of Akron, United States; ²National Renewable Energy Laboratory, United States

PRESENTATION

TOPIC: Bidirectional Grid Interface Converters

T27.6 **Design and Optimization with Litz Wire Version of PCB in Solid-State Transformer** 1453
Zheqing Li, Feng Jin, Xin Lou, Yi-Hsun Hsieh, Qiang Li, Fred C. Lee
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Solid-State Transformers

T27.7 **Passive Filter for 3-Level Three-Phase AC-AC Converter with Unshielded Motor Cable** 1460
Gopal Mondal, Sebastian Nielebock
Siemens AG, Germany

WITHDRAWN

PRESENTATION

227_1092p

TOPIC: Power Quality, UPS, Filters

SESSION T28: Design Techniques for Noise & EMI Reduction

8:30 - 11:10

TRACK: Power Electronics Integration & Manufacturing

SESSION CHAIRS

Veda Galigekere, Oak Ridge National Laboratory

Abey Mathew, IBM

T28.1 **Investigation on Noise Caused by Gate Driver IC and Near Field Coupling within Gate Drivers PCBs for Medium Voltage SiC-Based Converters** 1465
He Song, Dushan Boroyevich
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Thermal & EMC Management

T28.2 **SiC Power Module Design with a Low-Permittivity Material to Reduce Common-Mode Noise** 1472
Sihoon Choi¹, Jiyeon Choi¹, Jong-Won Shin², Yonezawa Yu¹, Jun Imaoka¹, Masayoshi Yamamoto¹
¹Nagoya University, Japan; ²Chung-Ang University, Korea

PRESENTATION

TOPIC: Power Modules / High Density Design

T28.3 **Common-Mode Noise Reduction for Bridgeless Flyback PFC Rectifier with Balance Technique** 1478
Sihoon Choi¹, Yikun Yin², Jong-Won Shin³, Jun Imaoka¹, Masayoshi Yamamoto¹
¹Nagoya University, Japan; ²United Automotive Electronic Systems, China; ³Chung-Ang University, Korea

PRESENTATION

TOPIC: Thermal & EMC Management

T28.4 **A Survey of CM EMI Modeling and Reduction Technique of Transformer for Isolated Converters** 1484
Qinghui Huang, Yirui Yang, Yanwen Lai, Zhedong Ma, Shuo Wang
University of Florida, United States

PRESENTATION

TOPIC: Thermal & EMC Management

T28.5 **Gate Driver CM Noise Minimization by Impedance Balancing with Integrated Rogowski Sensor** 1491
He Song, Vladimir Mitrovic, Dushan Boroyevich
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Thermal & EMC Management

T28.6 **A Novel Technique to Measure Parasitic Capacitances Affecting CM Noise Emissions** 1498
Tyler McGrew, Shuo Wang, Qiang Li
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Thermal & EMC Management

T28.7 **Reducing EMI Filter Size and Losses with a Novel Piezoelectric Interference-Suppression Component** 1506
Florian Hubert¹, Manfred Wich¹, Thomas Duerbaum², Stefan J. Rupitsch¹
¹*Albert-Ludwigs-Universität Freiburg, Germany;*
²*Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany*

PRESENTATION

TOPIC: Thermal & EMC Management

SESSION T29: Practical Design Considerations for Power Modules

8:30 - 11:10

TRACK: Power Electronics Integration & Manufacturing

SESSION CHAIRS

Yusi Liu, *On Semiconductor*

Vidhi Patel, *ABB*

T29.1 **New Snap-Off Free 1200 v Diode Technology with Active Rear-Side Structure for Enhanced System Performance** 1512
Christian R. Müller, Alexander Philippou, Benedikt Stoib, Javier Acuna, Yizheng Zhou
Infineon Technologies AG, Germany

PRESENTATION

TOPIC: Power Modules / High Density Design

T29.2 **Designing of a >1kV Medium-Voltage Line Impedance Stabilization Network** 1518
Tahmid Ibne Mannan¹, Ashik Amin¹, Seungdeog Choi¹, Mostak Mohammad²
¹*Mississippi State University, United States;* ²*Oak Ridge National Laboratory, United States*

PRESENTATION

TOPIC: Thermal & EMC Management

T29.3 **Volume Minimization of Current Type ACC with Rogowski Coil** 1526
Atsutoshi Okura, Rintaro Kusui, Kodai Nishikawa, Masamichi Yamaguchi, Hiroki Watanabe, Jun-Ichi Itoh
Nagaoka University of Technology, Japan

PRESENTATION

TOPIC: Thermal & EMC Management

- T29.4 **Flip-Chip Low Inductive and EMC Optimized PCB Power Module** 1534
 Fatme Abed Ali, Pierre-Olivier Jeannin, Yvan Avenas, Pierre Lefranc
G2Elab, Université Grenoble Alpes, France
- PRESENTATION** **TOPIC: Power Modules / High Density Design**
- T29.5 **Modeling and Analysis of Multi-Layer High-Voltage Power Modules Design Using Generalized Multiport Network** 1539
 Yu Chen, Narayanan Rajagopal, Christina Dimarino
Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: Power Electronics Packaging**
- T29.6 **Breaking Barriers: Unleashing the Potential of High-Efficiency 500 W 4-to-1 IBC through Innovative 3D-PCB Design and Power Inlay Semiconductor Technology** 1545
 Eslam Abdelhamid, Christian Rainer, Juan Sanchez
Infineon Technologies AG, Austria
- PRESENTATION** **TOPIC: Power Modules / High Density Design**
- T29.7 **A Novel Fast-Acting Solid-State DC Circuit Breaker Using Low Requirement IGBT** 1552
 Taihang He, Qinshu Lu, Huiyao Mi, Shanxu Duan
State Key Laboratory of Advanced Electromagnetic Engineering and Technology, Huazhong University of Science and Technology, China
- PRESENTATION** **TOPIC: Quality & System Reliability**

SESSION T30: Device Modeling & Simulation

8:30 - 11:10

TRACK: Modeling & Simulation

SESSION CHAIRS

Bing Lu, *Texas Instruments*

- T30.1 **Nonlinear Losses and Material Limits of Piezoelectric Resonators for DC-DC Converters** ... 1560
 Clarissa Daniel¹, Eric Stolt¹, Weston Braun¹, Ruochoen Lu², Juan Rivas-Davila¹
¹Stanford University, United States; ²The University of Texas at Austin, United States
- PRESENTATION** **TOPIC: Device & Component Modeling**
- T30.2 **Multi-Step Least Squares Algorithm for Thermal Characterization Based on Mission Profile** .. 1566
 Martin Votava¹, Karthik Debbadi¹, Yoann Pascal¹, Marco Liserre^{1,2}
¹Fraunhofer Institute for Silicon Technology ISIT, Germany; ²Kiel University, Germany
- PRESENTATION** **TOPIC: Device & Component Modeling**
- T30.3 **Embedding-Encoded Artificial Neural Network Model for MOSFET Preselection: Integrating Analytic Loss Models with Dynamic Characteristics from Datasheets** 1574
 Fanghao Tian, Shirong Li, Xiaobo Ning, Diego Bernal Cobaleda, Wilmar Martinez
KU Leuven - EnergyVille, Belgium
- PRESENTATION** **TOPIC: Device & Component Modeling**

T30.4 **PCB-Embedded Helical Coils' Return Path Utilization for Bidirectional Switch-Current Sensing** 1581
Ali Parsa Sirat, Jiale Zhou, Hossein Niakan, Babak Parkhideh
University of North Carolina at Charlotte, United States

PRESENTATION

TOPIC: Parasitics

T30.5 **A Passive Balancing Method for Dynamic Current Sharing of Paralleled SiC MOSFETs with Kelvin-Source Connection** 1589
Che-Wei Chang¹, Matthias Spieler¹, Rolando Burgos¹, Ayman El-Refaie², Dong Dong¹
¹*Virginia Polytechnic Institute and State University, United States*; ²*Marquette University, United States*

PRESENTATION

TOPIC: Circuits & Systems

T30.6 **A Compact Three-Phase Multi-Stage EMI Filter with Compensated Parasitic-Component Effects** 1596
Shin-Yu Chen¹, Ripun Phukan², Tonglei Wang³, Rolando Burgos³, Dong Dong³,
Gopal Mondal⁴, Henrik Krupp⁴, Sebastian Nielebock⁴
¹*Texas Instruments, United States*; ²*Delta Electronics, United States*; ³*Virginia Polytechnic Institute and State University, United States*; ⁴*Siemens AG, Germany*

PRESENTATION

TOPIC: Parasitics

T30.7 **Frequency-Tuning Matching Network for Load-Varying Applications** 1604
Zhechi Ye, Kawin Surakitbovorn, Calvin Lin, Juan Rivas-Davila
Stanford University, United States

PRESENTATION

TOPIC: Circuits & Systems

SESSION T31: Renewable Energy System Control

8:30 - 11:10

TRACK: Renewable Energy Systems

SESSION CHAIRS

Tao Yang, *University of Nottingham*

Yangfeng Wang, *Monolithic Power Systems*

T31.1 **Constant Current and Constant Voltage Hybrid Bidirectional String-to-Cell Equalizer Based on C2L3 Resonant Topology** 1608
Yilin Wang, Yiqing Lu, Haoyu Wang
ShanghaiTech University, China

PRESENTATION

TOPIC: Energy Storage Systems

T31.2 **Distributed Fixed-Time Secondary Control for DC Microgrids** 1614
Junwei Chai, Minghao Wang, Zhao Xu
The Hong Kong Polytechnic University, China

PRESENTATION

TOPIC: Microgrid Systems

- T31.3 **Impedance Reshaping of GFM Converters with Selective Resistive Behaviour for Small-Signal Stability Enhancement** 1619
 Chirag Ramgopal Shah¹, Marta Molinas¹, Roy Nilsen¹, Mohmmad Amin²
¹Norwegian University of Science and Technology, Norway; ²Enchanted Rock LLC, United States
- PRESENTATION** **TOPIC: Grid-Tied Systems**
- T31.4 **Impedance Profile Prediction for Grid-Connected VSCs Based on Feature Extraction** 1627
 Yang Wu¹, Heng Wu¹, Li Cheng², Jianyu Zhou², Zichao Zhou², Minjie Chen³, Xiongfei Wang^{1,2}
¹Aalborg University, Denmark; ²KTH Royal Institute of Technology, Sweden;
³Princeton University, United States
- PRESENTATION** **TOPIC: Grid-Tied Systems**
- T31.5 **A Leader-Follower Control for Negative-Sequence Current Sharing among Grid-Forming Sources in Islanded Microgrids** 1633
 Dingrui Li^{1,2}, Chengwen Zhang², Yu Su², Fred Wang^{2,3}, Leon M. Tolbert²
¹ABB Corporate Research Center, United States; ²The University of Tennessee-Knoxville, United States;
³Oak Ridge National Laboratory, United States
- PRESENTATION** **TOPIC: Microgrid Systems**
- T31.6 **Optimal Control of Flexible Transfer Converter for Synchronization of Microgrid with Utility Grid** 1639
 Ronghui An¹, Zhaoqi Song¹, Jinjun Liu¹, Zeng Liu¹, Ziwen Zhao¹, Zhiheng Huang¹, Cao Zhan²
¹Xi'an Jiaotong University, China; ²Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: Microgrid Systems**
- T31.7 **Instant Startup and Grid Synchronization of Inverter Based Resources** 1647
 Yuchen He, Yuan Li, Bokang Zhou, Jinli Zhu, Ahmad Fares Abdelhadi, Hector Akuta, Fang Peng
 Florida State University, United States
- PRESENTATION** **TOPIC: Grid-Tied Systems**

SESSION T32: Power Applications, Heating, AC

8:30 - 11:10

TRACK: Power Electronics Applications

SESSION CHAIRS

Jeff Nilles, Alpha & Omega Semiconductor

Juan Rodriguez, Universidad de Oviedo

- T32.1 **Effective Audible Noise Reduction Scheme Using Sideband Harmonic Suppression for Domestic Induction Heating Cooktops** 1654
 Man Jae Kwon, Seung Hyun Kang, Yun Seong Hwang, Hyeon Soo Kim, Byoung Kuk Lee
 Sungkyunkwan University, Korea

PRESENTATION

TOPIC: AC-DC-AC Applications & Matrix Converters

- T32.2 **Single-Ended Direct AC-AC Converter for Domestic Induction Heating Based on a Bidirectional GaN-FET** 1659
 Pablo Guillén, Héctor Sarnago, José Miguel Burdío, Óscar Lucía
I3A, Universidad de Zaragoza, Spain
- PRESENTATION** **TOPIC: AC-DC-AC Applications & Matrix Converters**
- T32.3 **A Versatile Arbitrary Waveform Generator for Large-Signal Induction Heating Load Characterization** 1664
 Ignacio Álvarez-Gariburo, Héctor Sarnago, Óscar Lucía
I3A, Universidad de Zaragoza, Spain
- PRESENTATION** **TOPIC: AC-DC-AC Applications & Matrix Converters**
- T32.4 **Dynamic DC-Bus Voltage Control of Induction Hardening System under Load Temperatures from Ambient to beyond Curie Point** 1669
 Amaïur Mendi-Altube¹, Irma Villar¹, Claudio Carretero², Jesús Acero²
¹IKERLAN, Spain; ²Universidad de Zaragoza, Spain
- PRESENTATION** **TOPIC: AC-DC-AC Applications & Matrix Converters**
- T32.5 **ZVS Modulation Strategy for Constant High Frequency Four-Switch Buck-Boost Converters Used in Envelope Tracking Power Supplies** 1675
 Juan R. García-Meré, Juan Rodríguez, Javier Sebastian
Universidad de Oviedo, Spain
- PRESENTATION** **TOPIC: Network & Telecommunication Power Electronics**
- T32.6 **Surge Voltage Stress and Modulation Techniques in Variable Frequency Drives: A Comparative Study of Matrix Converter and Two-Level VSI Topologies** 1682
 Luca Rovere¹, Liliana de Lillo², Lee Empringham²
¹Thinking Pod Innovations, United Kingdom; ²University of Nottingham, United Kingdom
- PRESENTATION** **TOPIC: AC-DC-AC Applications & Matrix Converters**
- T32.7 **A Linear Irradiance Control Power Supply for Dielectric Barrier Discharge Excimer Ultraviolet Lamps** 1689
 Zhuoning Ding¹, Chunguang Ren¹, Ming Xu², Julu Sun², Juanjuan Sun², Weilong Yang², Xinqi Li¹
¹Taiyuan University of Technology, China; ²Powerland Technology Inc., China
- PRESENTATION** **TOPIC: Lamp Ballasts & LED Lighting**

SESSION T33: AC-DC Battery Charger Converters

13:30 - 15:10

TRACK: AC-DC Converters

SESSION CHAIRS

Jin Moon, *Florida State University*

- T33.1 **Wide Operating Range Single-Stage Bidirectional Impedance Control Network-Based Onboard Electric Vehicle Charger** 1694
Firehiwot Gurara, Dheeraj Etta, Khurram K. Afridi
Cornell University, United States
PRESENTATION **TOPIC: Bidirectional AC/DC Converters**
- T33.2 **A New Bridge-Less AC-DC Stacked-Switches Structured Bi-directional On-Board High Voltage EV Charger with Minimal Storage Capacitances** 1700
Siamak Derakhshan, John Lam
York University, Canada
PRESENTATION **TOPIC: Bidirectional AC/DC Converters**
- T33.3 **Dual Transformer-Based Single-Stage Converter for EV Fast Charger with Flat Efficiency Characteristics** 1706
Million Gerado Geda, Huigyeong Song, Phu Do Ba, Bumsoo Cho, Sunju Kim, Sewan Choi
Seoul National University of Science and Technology University, Korea
PRESENTATION **TOPIC: Bidirectional AC/DC Converters**
- T33.4 **T-type Converter with Zero Common-Mode Voltage Modulation for Potential Transformer-Less EV Charger Application** 1712
Regis Nibaruta¹, Sohaib Qazi^{1,2}, Anand Krishnamurthy Iyer¹, Prasanth Venugopal¹, Volodymyr Havryliuk³, Thiago Batista Soeiro¹
¹*University of Twente, The Netherlands;* ²*University of Nottingham, United Kingdom;* ³*Ukrainian State University of Science and Technologies, Ukraine*
PRESENTATION **TOPIC: Single-Phase & Three-Phase Input**
- T33.5 **Isolated Active Front-End with Integrated Bidirectional GaN Switches for Battery Chargers** ... 1719
Matteo Vazzoler, Tommaso Caldognetto, Davide Biadene, Andrea Petucco, Paolo Mattavelli
Università di Padova, Italy
PRESENTATION **TOPIC: Single-Phase & Three-Phase Input**

SESSION T34: Soft Switching DC DC Converters

13:30 - 15:10

TRACK: DC-DC Converters

SESSION CHAIRS

Xin Zhang, *IBM*

Bing Lu, *Texas Instruments*

- T34.1 **Rotation Control of Synchronize Rectifier to Improve Thermal Performance of LLC Converter under Boost Mode Operation** 1727
Feng Jin, Chunyang Zhao, Tianlong Yuan, Qiang Li
Virginia Polytechnic Institute and State University, United States
PRESENTATION **TOPIC: Resonant Converters**
- T34.2 **Practical Design Methodology for a High Efficiency LLC Converter** 1734
Brent McDonald, Sheng-Yang Yu, Carlos A. Rodriguez
Texas Instruments, United States
PRESENTATION **TOPIC: Resonant Converters**
- T34.3 **A Simple and Efficient Sigma DC-DC Converter and Its Optimal Design** 1740
Shan Zhao¹, Chunguang Ren¹, Ming Xu², Julu Sun², Juanjuan Sun², Jukui Wei², Xinqi Li¹
¹Taiyuan University of Technology, China; ²Powerland Technology Inc., China
PRESENTATION **TOPIC: Hard- & Soft-Switched**
- T34.4 **Integrated Planar Magnetics Optimization for Δ - Δ LLC Converter with Wide Output Voltage Range** 1746
Abdulsamed Lordoglu¹, Mehmet Onur Gulbahce¹, Serkan Dusmez²
¹Istanbul Technical University, Turkey; ²WAT Motor Sanayi ve Ticaret A.Ş., Turkey
PRESENTATION **TOPIC: Resonant Converters**
- T34.5 **High Voltage DC-DC Converters with High Power Density Using Single ZVT Soft Switching Cell in Electric Vehicle Application** 1754
Seung Hyun Kang, Yun Seong Hwang, Man Jae Kwon, Hyeon Soo Kim, Byoung Kuk Lee
Sungkyunkwan University, Korea
PRESENTATION **TOPIC: Hard- & Soft-Switched**

SESSION T35: Si Devices

13:30 - 15:10

TRACK: Devices & Components

SESSION CHAIRS

Yuhao Zhang, *Virginia Tech*

Helen Cui, *UTK*

- T35.1 **System Design of a HV/LV DC-DC Converter with the Evaluation of GaN and Si Chip-Embedding** 1759
Ahmed Eldistawy¹, Marcelo Lobo Heldwein², Mark Nils Muenzer¹, Peter Weiss¹, Sam Chan¹, Giampiero Ciammetti¹
¹*Infiniteon Technologies AG, Germany*; ²*Technische Universität München, Germany*
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**
- T35.2 **Next Step in Power MOSFET Evolution Boosts Application Efficiency** 1767
Ralf Siemieniec¹, Simone Mazzer¹, Elvir Kahrimanovic¹, David Laforet¹, Michael Hutzler¹, Elias Pree¹, Laszlo Juhasz¹, Alessandro Ferrara¹, Kapil Kelkar²
¹*Infiniteon Technologies AG, Austria*; ²*Infiniteon Technologies Americas Corp., United States*
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**
- T35.3 **Evaluation of Current, Delay, and Temperature Influence and Diode Selection on the Switching Behavior of a SiC/Si Hybrid Switch** 1775
Adrian Amler¹, Thomas Heckel², Daniel Ruppert³, Cornelius Rettner⁴, Martin März¹
¹*Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany*; ²*Fraunhofer IISB, Germany*; ³*Audi AG, Germany*; ⁴*Volkswagen AG, Germany*
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**
- T35.4 **A New Calorimetric Method for Switching Loss Measurement of Power Devices** 1783
Leopoldo Rossetto, Davide Biadene, Paolo Mattavelli, Nicola Zanatta, Giorgio Spiazzi
Università di Padova, Italy
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**
- T35.5 **Comparison of GaN and Si Devices in a 50 MHz Class Φ_2 Converter** 1790
Zhechi Ye, Calvin Lin, Juan Rivas-Davila
Stanford University, United States
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**

SESSION T36: Energy Storage Management

13:30 - 15:10

TRACK: Renewable Energy Systems

SESSION CHAIRS

Marium Rasheed, *Ford Motor Company*

Rakesh Ramachandran, *Grundfos*

- T36.1 **State of Health Estimation and Remaining Useful Lifetime Prediction of Battery Based on the Real Dynamic Forklift Profile** 1794
Xingjun Li, Dan Yu, Søren Byg Vilsen, Daniel-loan Store
Aalborg University, Denmark
- PRESENTATION** **TOPIC: Energy Storage Systems**
- T36.2 **State of Charge Estimation Based on Thermal Modeling Compensation considering Capacity Variation by Internal Temperature Effects of LiFePO₄ Battery** 1800
Jong-Hun Lim¹, Go Woon Heo¹, Je-Yeong Lim¹, Dong Hwan Kim¹, Bumsu Jun², Byoung Kuk Lee¹
¹*Sungkyunkwan University, Korea*; ²*Solu-m, Korea*
- PRESENTATION** **TOPIC: Energy Storage Systems**
- T36.3 **A Novel Balancing Algorithm for Lithium Battery Strings Using Bidirectional Charge Circulation** 1805
Nguyen-Anh Nguyen, Phuong-Ha La, Sung-Jin Choi
University of Ulsan, Korea
- PRESENTATION** **TOPIC: Energy Storage Systems**
- T36.4 **Accurate Co-estimation Methods for Second-Life Battery Management Systems (BMS-2): Integrating State and Parameter Estimations** N/A
Xiaofan Cui¹, Zexiang Liu²
¹*University of California-Los Angeles, United States*; ²*University of Michigan-Ann Arbor, United States*
- PRESENTATION** **TOPIC: Energy Storage Systems**
- T36.5 **Soft Switched Hybrid Energy Storage Module for Power and Energy Management of a DC Bus** 1818
Ilya Zeltser¹, Michael Evzelman², Daniel Beniaminson², Mor M. Peretz²
¹*Rafael Advanced Defense Systems Ltd., Israel*; ²*Ben-Gurion University of the Negev, Israel*
- PRESENTATION** **TOPIC: Energy Storage Systems**

SESSION T37: Power Electronics for Aerospace

13:30 - 15:10

TRACK: Transportation Power Electronics

SESSION CHAIRS

Dong Cao, *University of Dayton*

Tao Yang, *University of Nottingham*

- T37.1 **Carrier-Based Space-Vector Coordinate-Shifted DPWM Strategy for Three-Level T-type NPC Inverters in Electric Aircraft Propulsion Applications** 1826
Feng Guo^{1,2}, Zhuxuan Ma¹, Fei Diao¹, Hui Cao¹, Yue Zhao¹
¹*University of Arkansas, United States*; ²*University of Wisconsin-Milwaukee, United States*

PRESENTATION

TOPIC: Power Electronics for Aerospace

- T37.2 **Tape Wound Magnesil vs. Air Core Magnetics: High Temperature DC-DC Power Conversion** .. 1831
Nitish Jolly¹, Ayan Mallik¹, Chris Darmody², Akin Akturk²
¹*Arizona State University, United States*; ²*CoolCAD Electronics LLC, United States*

PRESENTATION

TOPIC: Power Electronics for Aerospace

- T37.3 **GaN Based Active Clamp Flyback Auxiliary Power Supply for Cryogenic Power Electronics Conversion** 1838
Samuel Defaz, Mustafeez Hassan, Fang Luo
State University of New York at Stony Brook, United States

PRESENTATION

TOPIC: Power Electronics for Aerospace

- T37.4 **Small Signal Modelling of Hybrid Frequency and Phase-Shift Control Full-Bridge LLC Converter Using Extended Describing Function Method** 1843
Naveed Ishraq, Ayan Mallik, Saikat Dey
Arizona State University, United States

PRESENTATION

TOPIC: Power Electronics for Aerospace

SESSION T38: Reliability & Thermal Performance of Power Modules & Components

13:30 - 15:10

TRACK: Power Electronics Integration & Manufacturing

SESSION CHAIRS

Kasunaidu Vechalapu, *Infineon Technologies Americas Corp.*

Lee Gill, *Sandia*

- T38.1 **Design of a Cylindrical Jet Impingement Cooling System for High-Power Common-Mode Choke in Aerospace Applications** 1849
Sam Hemming¹, Di Wang¹, Mohamed Hefny¹, Sreejith Chakkalakkal¹, Giorgio Pietrini¹, Armen Baronian², Piranavan Suntharalingam², Mikhail Goykhman², Ali Emadi¹
¹*McMaster University, Canada*; ²*Eaton Corp., United States*

PRESENTATION

TOPIC: Thermal & EMC Management

- T38.2 **A Compact Vertically Stacked Converter Module with Thermal Balancing and High-Power Dissipation Capability** 1855
 Jingyuan Liang¹, Qi Liu², Tiantian Liu³, Wai Tung Ng¹
¹University of Toronto, Canada; ²Southeast University, China; ³Chinese Academy of Sciences, China
PRESENTATION **TOPIC: Power Modules / High Density Design**
- T38.3 **Thermal Modeling of E-mode GaN HEMTs under Wide-Range Thermal Cycling Tests** 1861
 Hussain Sayed, Harish S. Krishnamoorthy
 University of Houston, United States
PRESENTATION **TOPIC: Thermal & EMC Management**
- T38.4 **SymCool™ B-TRAN™ Power Module Design Considerations and Characterization** 1867
 Mouzhi Dong, Mudit Khanna, Ruiyang Yu, Yifan Jiang, Joseph Templeton,
 Jiankang Bu, Jeffrey Knapp, Daniel Brdar
 Ideal Power Inc., United States
PRESENTATION **TOPIC: Power Modules / High Density Design**
- T38.5 **Low Temperature Pb-Free Solder Preform Technology for Molded Power Module Package Attach Designed for Improved Thermomechanical Performance** 1872
 Joseph Hertline, Ryan W. Mayberry, James McCoy
 Indium Corporation, United States
PRESENTATION **TOPIC: Thermal & EMC Management**

SESSION T39: Digital Controllers & Control ICs

13:30 - 15:10

TRACK: Control

SESSION CHAIRS

Dorin Neacsu, *Technical University of Iasi*

Mohamed Orabi, *Aswan University*

- T39.1 **A Wide Input Voltage Range Buck Converter with Constant-Charge PFM Control** 1876
 Paolo Melillo¹, Lorenzo Cremonesi², Mauro Leoncini¹, Alessandro Gasparini²,
 Salvatore Levantino¹, Massimo Ghioni¹
¹Politecnico di Milano, Italy; ²STMicroelectronics, Italy
PRESENTATION **TOPIC: Control ICs**
- T39.2 **Online Digital PID Control Tuning In Voltage-Mode Boost Converters for Shaping the Output Impedance** 1882
 Dipayan Chatterjee¹, Santanu Kapat¹, Indra Narayan Kar²
¹Indian Institute of Technology Kharagpur, India; ²Indian Institute of Technology Delhi, India
PRESENTATION **TOPIC: Digital Control**

T39.3 **Performance Comparison of Direct Digital Control and DQ-Based Control for a Three-Phase Three-Wire Inverter with LCL Filter considering Inductance Attenuation** 1888
Tsai-Fu Wu, Chien-Chih Hung, Anumeha Kumari, Jui-Yang Chiu, Li-Xin Chen
National Tsing Hua University, Taiwan

PRESENTATION

TOPIC: Control of Power Electronic Converters

T39.4 **Sensorless Current Balancing Control for Interleaved Boost 3X Converter** 1893
Hung-Chi Chen¹, Yu-Te Lin¹, Chien-Hsu Chen¹, Chung-Yi Li²
¹National Yang Ming Chiao Tung University, Taiwan; ²Chang Gung University, Taiwan

PRESENTATION

TOPIC: Sensor & Sensor-Less Control

T39.5 **A Master-Slave Distributed Power Management Architecture for Dynamic Voltage and Frequency Scaling (DVFS) for Low Power Microprocessor** 1900
Yen-Ming Chen, Ching-Jan Chen, Yu-Lin Chao
National Taiwan University, Taiwan

PRESENTATION

TOPIC: Control ICs

SESSION T40: Wireless Power Transfer: Modeling & Control

13:30 - 15:10

TRACK: Wireless Power Transfer

SESSION CHAIRS

Khurram Afridi, *Cornell University*

Praveen Kumar, *Oak Ridge National Laboratory*

T40.1 **Power Loss Investigation of Pavement Materials in Roadway Inductive Charging System** 1905
Zilong Zheng¹, Yao Wang¹, Xiao Chen², Shuyan Zhao¹, Shervin Salehi Rad¹,
Hua Zhang³, Hao Wang², Fei Lu¹
¹Drexel University, United States; ²Rutgers University, United States; ³Rowan University, United States

PRESENTATION

TOPIC: Wireless Charging

T40.2 **Misalignment Estimation in a Three-Phase Transverse-Pole DWPT System** 1909
Vatan Mehar, Aaron D. Brovont, Steven D. Pekarek, Dionysios Aliprantis
Purdue University, United States

PRESENTATION

TOPIC: Wireless Charging

T40.3 **Loss Modeling and System Optimization of Smartwatch Wireless Charging Application** 1914
Qi Tian, Liang Jia, Gordon Liao, Tressa Scott, Srikanth Lakshminathan
Google LLC, United States

PRESENTATION

TOPIC: Wireless Charging

T40.4 **Dual-PWM Control of Inductive Power Transfer Systems for High Efficiency Over Wide Load Ranges** 1920
Yihao Wu, Chenmin Deng, Mafu Zhang, Soham Roy, Alex J. Hanson
The University of Texas at Austin, United States

PRESENTATION

TOPIC: Wireless Charging

- T40.5 **Thermal Analysis of a 100 kW Polyphase Wireless Power Transfer System** 1927
Emrullah Aydin^{1,2}, Himel Barua², Ahmet Aktas^{2,3}, Mostak Mohammad², Omar C. Onar², Burak Ozpineci²
¹Malatya Turgut Ozal University; ²Oak Ridge National Laboratory, United States; ³Gazi University, Turkey

PRESENTATION

TOPIC: Wireless Charging

SESSION D01: AC-DC Converters II

11:30 - 13:30

TRACK: AC-DC Converters

SESSION CHAIRS

Xiaofan Cui, *UCLA*

Xin Zan, *University of Maryland*

- D01.1 **Performance Analysis of SEPIC Bridgeless with Simplified Control Strategy in AC-DC Conversion System for More Electric Aircraft** 1932

Thiago G. Neves, Vítor F. Barbosa, Antônio O.C. Neto, Gustavo B. Lima,
Danillo B. Rodrigues, Luiz C.G. Freitas
Universidade Federal de Uberlândia, Brazil

PRESENTATION

TOPIC: Embedded AC-DC Power Supplies

- D01.2 **Cycle-by-Cycle Reverse Current Limiting in Actively Clamped Flyback Converters with Noncomplementary Control** 1940

Claudio Adragna, Emanuele De Bartolomeo, Francesco Ferrazza
STMicroelectronics, Italy

PRESENTATION

TOPIC: External AC-DC Adapters

- D01.3 **Three-Phase Single-Stage Multiport Bidirectional AC-DC Converter with Reduced Power Conversion Stages** 1946

Asad Hameed, Gerry Moschopoulos
Western University, Canada

PRESENTATION

TOPIC: Bidirectional AC/DC Converters

- D01.4 **A 3700 W Ultra Low Profile Single-Phase Multi-Level Totem-Pole PFC** 1954

Enis Baris Bulut¹, Serkan Dusmez²
¹Trakya University, Turkey; ²WAT Motor Sanayi ve Ticaret A.Ş., Turkey

PRESENTATION

TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

- D01.5 **New Single-Stage Single-Phase Isolated Bidirectional AC-DC PFC Converter** 1962

Mafu Zhang, Huanghao Zou, Saleh Farzamkia, Zibo Chen, Alex Q. Huang
The University of Texas at Austin, United States

PRESENTATION

TOPIC: Bidirectional AC/DC Converters

- D01.6 **A GaN Based Totem Pole Bridgeless Power Factor Correction Circuit** 1968

Harsha Ademane, Rosario Attanasio, Gianni Vitale
STMicroelectronics, United States

PRESENTATION

TOPIC: Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

- D01.7 **Three-Level Flying-Capacitor-Based 100 W USB-C PD GaN Charger in Aircraft Applications** 1973
Tianyu Zhao¹, Jiewen Hu¹, Rolando Burgos¹, Bo Wen¹, Andrew McLean², Rodrigo Fernández Mattos²
¹Virginia Polytechnic Institute and State University, United States; ²Collins Aerospace, United Kingdom

PRESENTATION

TOPIC: External AC-DC Adapters

- D01.8 **A Modulation Method to Realize Soft Switching for Three-Phase Matrix AC-DC Converter** 1977
Zhicheng Zhu¹, Yu Zhang², Rui Li¹
¹Shanghai Jiao Tong University, China;
²CEPRI, State Grid Shanghai Municipal Electric Power Company, China

PRESENTATION

TOPIC: Bidirectional AC/DC Converters

- D01.9 **Optimal Zero-Current Distortion Compensation Method for Vienna Rectifier to Improve Dynamic Characteristic at Driving Start-Point** 1981
Juyeon Lee, June-Seok Lee
Dankook University, Korea

PRESENTATION

TOPIC: Bidirectional AC/DC Converters

- D01.10 **Circulating Current Suppression in Parallel Connected ANPC Converters Using Advanced PWM Switching Patterns** 1987
Wael Telmesani^{1,2}, Saeed Wdaan¹, John Salmon¹
¹University of Alberta, Canada; ²Umm Al-Qura University, Saudi Arabia

PRESENTATION

TOPIC: Bidirectional AC/DC Converters

SESSION D02: High-Power DC-DC Converters

11:30 - 13:30

TRACK: DC-DC Converters

SESSION CHAIRS

Justin Henspeter, IBM

Jiangang Hu, Rockwell Automation

- D02.1 **Characterization of Cycling Current in Pumpback Test for Loss Assessment of DAB Converter** 1995
Xiaobo Dong¹, Haoyuan Jin¹, Ang Li¹, Shanzhe Li¹, Yilong Yao¹, Laili Wang¹, Kai Gao²
¹Xi'an Jiaotong University, China; ²State Grid Shanghai Electric Power Research Institute, China

PRESENTATION

TOPIC: Bidirectional DC/DC Converters

- D02.2 **Design Methodology of Bidirectional LLC Resonant Converter** 2000
Cheol-Hee Jo¹, Guangyao Li¹, Junchen Xie¹, Jung-Hoon Ahn², Dong-Hee Kim¹
¹Chonnam National University, Korea; ²Korea Electronics Technology Institute, Korea

PRESENTATION

TOPIC: Resonant Converters

- D02.3 **Optimized Dual Transformer Wiring Method for High Efficiency Operation of a 25kW LLC Converter** 2006
 Dong Hyeon Sim, Chae-Lyn Kim, Hyeonu Jo, Ju-A Lee, Byoung Kuk Lee
Sungkyunkwan University, Korea
- PRESENTATION** **TOPIC: Resonant Converters**
- D02.4 **A Resonant Tank Design for LLC Resonant Converter considering Leakage Inductance of Current Doubler Rectifier** 2011
 Koki Mori, Akito Tabata, Haruki Kanto, Yoichi Ishizuka
Nagasaki University, Japan
- PRESENTATION** **TOPIC: Resonant Converters**
- D02.5 **Compact Hardware Implementation of Power Factor Control for LLC Converter with Event-Driven-Timer Based Digital Controller** 2015
 Toshiyuki Zaitso¹, Yuto Yoshimura², Kazuhiro Umetani², Masataka Ishihara², Eiji Hiraki², Kazuhiro Horii¹
¹ROHM Co., Ltd, Japan; ²Okayama University, Japan
- PRESENTATION** **TOPIC: Resonant Converters**
- D02.6 **Optimal Modulation of Three-Phase Dual Active Bridge Using Multidimensional Ripple Correlation and Artificial Neural Networks** 2021
 David Molinero¹, Daniel Santamargarita¹, Juan José Pérez¹, Emilio José Bueno¹, Miroslav Vasić²
¹Universidad de Alcalá, Spain; ²Universidad Politécnica de Madrid, Spain
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D02.8 **Two-Phase LLC Converter with Common LC Branch for Inherent Current-Sharing and Phase-Shedding Ability** 2026
 Ubaid Ahmad, Roberto Giral, Carlos Olalla
Universitat Rovira i Virgili, Spain
- PRESENTATION** **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- D02.9 **DC-Bias Elimination in High-Frequency Dual Active Bridge DC/DC Converters through Single-Sided Measurements** 2034
 Patrick Lenzen, Martin Pfof
Technische Universität Dortmund, Germany
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D02.10 **Modeling of Secondary LLC Resonant Converter Based on Full Frequency Range Extended Describing Function Method** 2040
 Honglin Lu, Debin Zhang, Chengzhi Qu, Jiaqi Li, Chenhao Wu, Guangrui Zhou
Shanghai Institute of Space Power-Sources, China
- PRESENTATION** **TOPIC: Resonant Converters**
- D02.11 **Capacitive Based Isolated Resonant Switched Capacitor Solid State DC Transformer** 2047
 Catalin Muntean, Miguel Astudillo Martínez, Diego Serrano, Miroslav Vasić
Universidad Politécnica de Madrid, Spain
- PRESENTATION** **TOPIC: Resonant Converters**

- D02.12 **Practical Current Derivation Method for a Highly Accurate Variable Switching Frequency ZVS Regulation in TCM Operated Bidirectional Buck/Boost Converters** 2054
 Bryan Gutierrez, Zhengming Hou, Dong Jiao, Jih-Sheng Lai
Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D02.13 **A ZVS Implementation Method of a Current-Fed Dual Active Bridge Converter within the Full Load Range** 2059
 Qing Gu¹, Baochang Xie¹, Rui Li¹, Zhicheng Zhu¹, Yu Zhang²
¹Shanghai Jiao Tong University, China; ²CEPRI, State Grid Shanghai Municipal Electric Power Company, China
- PRESENTATION** **TOPIC: Hard- & Soft-Switched**
- D02.15 **Current Stress Optimization of HNPC-DAB Converter with a Novel Modulation Scheme Using Four Control Degrees of Freedom** 2063
 Nikhil Suresh Patil, Anshuman Shukla
Indian Institute of Technology Bombay, India
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D02.16 **Identifying Suitable PSFB Topology for HVLV Auxiliary Power Supply (APS) Application in EVs** 2069
 Veera Bharath Gandluru, Komal Autkar, Yuequan Hu
Wolfspeed, United States
- PRESENTATION** **TOPIC: Hard- & Soft-Switched**
- D02.17 **Design Optimization of a Wide Voltage Range LLC Resonant Converter with Topology Morphing** 2077
 Guvanthi Abeysinghe Mudiyansele, Kyle Kozielski, Ali Emadi
McMaster University, Canada
- PRESENTATION** **TOPIC: Resonant Converters**
- D02.18 **A Novel Open Circuit Fault Detection and Diagnosis Method for Dual-Active Bridges under Parasitic Coupling** 2085
 Muhammed Ali Gultekin, Uiliam Kutrolli, Ali Bazzi
University of Connecticut, United States
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D02.19 **Highly Power Dense MVDC to LVDC Conversion for Fast EV Charging Applications Based on N-Switch-Leg MAB Converter** 2090
 Ankam Karthik, Suman Mandal, Anshuman Shukla
Indian Institute of Technology Bombay, India
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**

D02.20 **ZVS Boundary Assessment for T-Type-Based Dual Active Bridge Series Resonant Converters Using State-Plane Analysis** 2098
Shubhangi Gurudiwan, Aditya Zade, Rees Hatch, Hongjie Wang, Regan Zane
Utah State University, United States

PRESENTATION

TOPIC: Resonant Converters

D02.21 **Cost-Effective Piggyback Forward Based DC-DC Converter** 2106
Oleksandr Matiushkin^{1,2}, Oleksandr Husev¹, Hossein Afshari¹, Dmitri Vinnikov¹, Ryszard Strzelecki³
¹Tallinn University of Technology, Estonia; ²University of Extremadura, Spain;
³Gdansk University of Technology, Poland

PRESENTATION

TOPIC: Hard- & Soft-Switched

D02.22 **DC Short Circuit Fault Analysis of a Triple Active Bridge Converter for Fault Ride-Through Capability** 2112
Shubham Dhiman, Shrivatsal Sharma, Osamah Aljumah, Subhashish Bhattacharya
North Carolina State University, United States

PRESENTATION

TOPIC: Bidirectional DC/DC Converters

SESSION D03: Low-Power DC-DC Converters

11:30 - 13:30

TRACK: DC-DC Converters

SESSION CHAIRS

Abhiman A. Hande, *RTX*

D03.1 **A Conduction-Loss-Conscious 4-Level Power Converter with Tri-path Synchronous Rectification for High Step-Down DC-DC Conversion** 2119
Jin Woong Kwak, D. Brian Ma
The University of Texas at Dallas, United States

PRESENTATION

TOPIC: Point-of-Load (PoL) & Multi-Phase Converters

D03.3 **An Improved High-Frequency Single-Stage AC LED Driver with Soft Switching Operation and No Input Electrolytic Capacitor** 2124
Ramin Rahimzadeh Khorasani, Nilanjan Ray Chaudhuri
Pennsylvania State University, United States

PRESENTATION

TOPIC: Hard- & Soft-Switched

D03.4 **A Merged Backside Series/Parallel Hybrid Piezoelectric-Resonator-Based DC-DC Converter** 2130
Wen-Chin B. Liu, Patrick P. Mercier
University of California-San Diego, United States

PRESENTATION

TOPIC: Resonant Converters

- D03.5 **Power Amplifiers with Reactance Steering Network for Efficient Driving of Variable Impedance Inductively Coupled Plasma Coils** 2136
 Tanuj Sen, Mian Liao, Youssef Elasser, Minjie Chen
Princeton University, United States
PRESENTATION **TOPIC: Resonant Converters**
- D03.6 **A Ramp Integrating Capacitor Current Constant On-Time (RICCCOT) Controlled Buck Converter with High Noise Immunity in DCM** 2144
 Yu-Lin Chao, Chieh-Ju Tsai, Yen-Ming Chen, Ching-Jan Chen
National Taiwan University, Taiwan
PRESENTATION **TOPIC: Voltage Regulator Modules (VRM)**
- D03.7 **SRC-Based Two-Cell Li-Ion Battery Buck Converter for De-ripple Power Operation** 2148
 Zixuan Xu¹, Minghao Wang², Zhao Xu¹
¹The Hong Kong Polytechnic University, China; ²University of Macau, Macau
PRESENTATION **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- D03.8 **A Novel Technique for Real-Time Optimal Efficiency Tracking in Integrated DC-DC Converters** 2153
 Federico Iob¹, Stefano Saggini¹, Carmelo A. Santagati², Simone Scaduto², Agatino A. Alessandro²
¹Università degli Studi di Udine, Italy; ²STMicroelectronics, Italy
PRESENTATION **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- D03.9 **Power Electronics Building Block with Distributed TCM Modulator** 2156
 Jörg Haarer, Luis Koppenhöfer, Philipp Marx, Philipp Ziegler, Jörg Roth-Stielow
Universität Stuttgart, Germany
PRESENTATION **TOPIC: Resonant Converters**
- D03.10 **Power and Signal Dual Modulation with QR-ZVS DC/DC Converters Using GaN-HEMTs** 2164
 Abdelmoumin Allioua, Gerd Griepentrog
Technische Universität Darmstadt, Germany
PRESENTATION **TOPIC: Resonant Converters**
- D03.11 **Low-Profile Direct Power Converter: 350A/48V-1V with Planar Matrix Transformer Using Standard PCB and Commercial Cores** 2172
 Alejandro Figueroa, Pablo Mazariegos, Javier Goicoechea, Alejandro Castro, José A. Cobos
Differential Power S.L., Spain
PRESENTATION **TOPIC: Point-of-Load (PoL) & Multi-Phase Converters**
- D03.12 **Isolated and Regulated Ultra-Flat DC-DC Power Converter for Extremely Wide Input Voltage Range (15V-150V) and High Gain** 2178
 Pablo Mazariegos, Cristina Martos, Javier Goicoechea, José Francisco Jiménez, José A. Cobos
Differential Power S.L., Spain
PRESENTATION **TOPIC: Voltage Regulator Modules (VRM)**

- D03.14 **An Accurate Temperature-Based Method for Fast Switching Loss Extraction of WBG Device** 2183
 Qiuzhe Yang, Feng Jin, Qiang Li
Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: Hard- & Soft-Switched**
- D03.15 **A Relook at the ZVS of Power MOSFETs and an Improved Modeling Approach for ZVS Analysis in Power Converters** 2188
 Aabid Ahmad Dar, Vishnu Mahadeva Iyer
Indian Institute of Science, India
- PRESENTATION** **TOPIC: Hard- & Soft-Switched**
- D03.16 **Overview of High-Power Density Voltage Regulator Solutions for XPU Applications** 2194
 Behzad Vafakhah, Peter T. Li, Olga Skyberg, Michael J. Keller
Intel Corporation, United States
- PRESENTATION** **TOPIC: Voltage Regulator Modules (VRM)**
- D03.17 **Wide-Input Voltage Range Two-Stages Auxiliary Power Supply for Medium Voltage Applications** 2202
 Marcio L. Magri Kimpara, Rajendra Prasad Kandula, Jonathan Harter, Christian Boone
Oak Ridge National Laboratory, United States
- PRESENTATION** **TOPIC: Resonant Converters**
- D03.18 **PCB Layout Design Impact on Three Level Buck Converters for USB3.1 PD Application** 2208
 Abhishek Bhandari, Hui Ye
Alpha and Omega Semiconductor, United States
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D03.20 **Design of a Digitally Controlled Four-Switch Buck-Boost Converter with Smooth Mode Transition** 2216
 Burak Çaykenarı¹, Bünyamin Tamyürek²
¹ASELSAN, Turkey; ²Gazi University, Turkey
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D03.21 **Parasitic Inductance Impact of a High-Turn-Ratio Half Bridge Active Clamped Converter for More-Electric Aircraft Applications** 2226
 Yiren Zhu, Yang Tao, Zhenyu Wang, Xingyu Yan, Serhiy Bozhko, Patrick Wheeler
University of Nottingham, United Kingdom
- PRESENTATION** **TOPIC: Bidirectional DC/DC Converters**
- D03.22 **LLC Type Resonant Converter Adopting Peak Current Shaving with Third Harmonics Injection for Wide Output Voltage Range Application** 2232
 Dong Jiao, Zhengming Hou, Jih-Sheng Lai
Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: Resonant Converters**

SESSION D04: Utility-Interface Converters

11:30 - 13:30

TRACK: Power Electronics for Utility Interface

SESSION CHAIRS

Drazen Dujic, *École Polytechnique Fédérale de Lausanne*

Maja Harfman Todorovic, *Menlo Microsystems*

- D04.1 **Optimal Design of Distributed Network Based on Power Quality to Minimize the Flicker of Wind Turbines** 2239
Abolfazl Ghaffari¹, Alireza Askarzadeh¹, Roohollah Fadaeinedjad¹, Gerry Moschopoulos²
¹Graduate University of Advanced Technology, Iran; ²Western University, Canada
- PRESENTATION** **TOPIC: Distributed Energy Systems**
- D04.2 **An Asymmetric Perturbation Signal for Enhanced Perturbation Injection Capabilities of a Grid-Connected Converter** 2244
Jules Mace, Andrea Cervone, Drazen Dujic
École Polytechnique Fédérale de Lausanne, Switzerland
- PRESENTATION** **TOPIC: Bidirectional Grid Interface Converters**
- D04.3 **Adaptive Virtual Impedance for Reactive Current Control during Fault Conditions in Grid-Forming Inverters** 2251
Mohammad Bani Shamseh, Li Haiqing
Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan
- PRESENTATION** **TOPIC: Distributed Energy Systems**
- D04.4 **Stability Analysis of Second-Order Harmonic Active Filters for Input-Series/Output-Parallel Solid State Transformers** 2258
Andrea Cervone, Tianyu Wei, Drazen Dujic
École Polytechnique Fédérale de Lausanne, Switzerland
- PRESENTATION** **TOPIC: Solid-State Transformers**
- D04.5 **Harmonic Current Compensation for LCL Filtered Shunt Active Power Filter** 2266
Deokyong Woo, Sungmin Kim
Hanyang University, Korea
- PRESENTATION** **TOPIC: Power Quality, UPS, Filters**
- D04.6 **A Simplified Control Technique for High Power Factor Corrected Line-Interactive UPS with Tri-port Transformer** 2272
Kazuhide Domoto¹, Toshiro Hirose¹, Takuma Endo², Yoichi Ishizuka²
¹Nishimu Electronics Industries Co.,Ltd., Japan; ²Nagasaki University, Japan
- PRESENTATION** **TOPIC: UPS**
- D04.7 **Capacitor Voltage-Balancing Method of Three-Phase Four-Wire T-type Inverter Based Active Power Filter** 2277
Lei Zhang, Haoxin Yang, Ziheng Xiao, Zhigang Yao, Fei Deng, Tengfei Sun, Yi Tang
Nanyang Technological University, Singapore
- PRESENTATION** **TOPIC: Power Quality, UPS, Filters**

D04.8 **Design of a Modular Multilevel DC/DC Converter to Solid-State Transformer in a Green Hydrogen System** 2282
Samuel S. Queiroz, Levy F. Costa
Eindhoven University of Technology, The Netherlands

PRESENTATION

TOPIC: Solid-State Transformers

D04.10 **Effect of Grid Current QSG on Harmonic Current Content in Single-Phase Grid-Connected Inverter** 2289
Somenath Banerjee, Sonam Acharya, Santanu Kumar Mishra
Indian Institute of Technology Delhi, India

PRESENTATION

TOPIC: Power Quality, UPS, Filters

D04.11 **Cyber Resiliency of a Solid-State Power Substation** 2293
Shantanu Gupta¹, Mateo D. Roig Greidanus¹, Silvanus A. D'Silva¹, S. Bhattacharya²,
Sudip K. Mazumder¹, M. Shadmand¹, M. Govindarasu², Taesic Kim³, Juan C. Balda⁴,
Xiaoqing Song⁴, Rambabu Adapa⁵, Mohammad Shahidehpour⁶
¹University of Illinois Chicago, United States; ²Iowa State University, United States;
³Texas A&M University-Kingsville, United States; ⁴University of Arkansas, United States;
⁵Electric Power Research Institute, United States; ⁶Illinois Instit

PRESENTATION

TOPIC: Solid-State Transformers

D04.12 **Protection Circuit for DC Short Fault and Soft-Reclosing Operation for Protective Coordination Algorithm** 2301
Junhee Yoon, Sungmin Kim
Hanyang University, Korea

PRESENTATION

TOPIC: Power Generation, Transmission & Distribution

SESSION D05: Motor Drives & Inverters

11:30 - 13:30

TRACK: Motor Drives & Inverters

SESSION CHAIRS

Jin Moon, *Florida State University*

Matt Woongkul Lee, *Michigan State University*

D05.1 **Robust Online Diagnosis of Inverter Open-Circuit Switching Faults for Robotic Joints with BLDC Motors** 2308
Mohamed Y. Metwly, Landon Clark, Biyun Xie, JiangBiao He
University of Kentucky, United States

PRESENTATION

TOPIC: AC, DC, BLDC Motor Drives

D05.2 **Hybrid Modulation Method for Single Phase Full Bridge CRM Inverter to Improve Reactive Power Capability** 2314
Xingyu Chen, Qiang Li
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Single- & Multi-Phase Inverters

- D05.3 **Online CEMF Estimation for Permanent Magnet Synchronous Motor** 2320
 Bing Li, Jiangan Hu
Rockwell Automation, United States
PRESENTATION **TOPIC: AC, DC, BLDC Motor Drives**
- D05.4 **Regenerative Active Front End Based Motor-Drive Systems for Servo Press Applications** 2324
 Ahmed Sayed-Ahmed, Emmanuel Arthur
Rockwell Automation, United States
PRESENTATION **TOPIC: AC, DC, BLDC Motor Drives**
- D05.5 **Fast-Response FCS-MPC for Coordinated Control of Permanent Magnet Direct-Drive Motors in Humanoid Robotic Arm Shoulders** 2332
 Chao Gong¹, Brian Seibel¹, Cheng Xue¹, Xiaodong Zhang², Yaoifei Han³, Yunwei Li¹
¹University of Alberta, Canada; ²Shenzhen in Drive Amperex Company Ltd, China;
³Tongji University, China; ¹Rockwell Automation, United States;
PRESENTATION **TOPIC: Actuators**
- D05.6 **Frequency-Dependent Impedance Variation in Multilevel Converters with Parallel Connectivity** 2337
 Jinshui Zhang, Angel V. Peterchev, Stefan M. Goetz
Duke University, United States
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- D05.7 **Low THD Current Control of Nonlinear Load Characteristics Using a Single Phase Dual ZETA Inverter** 2342
 Kai Franck, Benjamin H. Zacher, Simon Holzmann, Max Wagner, Christian Schumann
Kaiserslautern University of Applied Sciences, Germany
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**
- D05.8 **Multisampling Model Predictive Control for PMSM Drives with Improved Tracking Performance and High Bandwidth** 2348
 Cheng Xue, Xuesong Wu, Yunwei Li
University of Alberta, Canada
PRESENTATION **TOPIC: High Performance Drives**
- D05.9 **Speed-Increasing Type Reluctance Vernier Machine** 2353
 Kimio Hijikata, Jin Kushida, Riku Horikawa
Tokyo City University, Japan
PRESENTATION **TOPIC: AC, DC, BLDC Motor Drives**
- D05.10 **Efficiency Enhancement and Current Stress Reduction in ARCP Inverter through Switching Sequence Dependent Control Strategy** 2361
 Mingi Oh, Iqbal Husain
North Carolina State University, United States
PRESENTATION **TOPIC: Single- & Multi-Phase Inverters**

- D05.11 **Broken Rotor Bar Detection in AC Induction Motors Using Cascaded Flux-Current State Observer** 2368
 Jin A. Choi¹, Jae Suk Lee¹, Yeonwoo Kim², Sehwan Kim², Woongkul Lee³
¹Jeonbuk National University, Korea; ²Korea Institute of Machinery and Materials, Korea;
³Michigan State University, United States
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- D05.12 **MPC-Based Fault-Tolerant Control of Asymmetrical Six-Phase PMSM Motor with Robust Voltage Vector Calibration** 2373
 Yixiao Luo¹, Kai Yang¹, Jincheng Yu², Li Zhang¹, Xinhong Zou¹
¹Huazhong University of Science and Technology, China; ²Harbin Institute of Technology, China
- PRESENTATION** **TOPIC: High Performance Drives**
- D05.13 **Regenerative dV/Dt Filter Topology for Motor Drives** 2377
 Md Ehsanul Haque, Yilmaz Sozer, Ashraf Siddiquee
 The University of Akron, United States
- PRESENTATION** **TOPIC: High Performance Drives**
- D05.14 **Mitigation of Uneven Overvoltage Distribution in Motor Windings Fed by SiC-Based Drives Using a GaN-Based Adaptive Surge Impedance Method** 2385
 Milad Sadoughi¹, Arya Sadasivan¹, Fariba Fateh¹, Jiangbiao He², Behrooz Mirafzal¹
¹Kansas State University, United States; ²University of Kentucky, United States
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- D05.15 **A Rotor Flux Observer for SPMSM Sensorless Drive Based on Linear Regression Model** ... 2392
 Jongwon Choi¹, Taeyeon Lee², Yoonjae Kim³
¹Hannam University, Korea; ²WiPowerOne, Korea; ³Hoseo University, Korea
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**
- D05.16 **A TMR-Based Integrated Current Sensing Solution for WBG Power Modules** 2398
 Sama Salehi Vala, Abdul Basit Mirza, Fang Luo
 State University of New York at Stony Brook, United States
- PRESENTATION** **TOPIC: Sensor Integration**
- D05.17 **Comparison of Flux-Weakening Control Methods for Wound Field Synchronous Motor** 2403
 Han-Vit Kim, Do-Hyeon Kim, June-Seok Lee
 Dankook University, Korea
- PRESENTATION** **TOPIC: AC, DC, BLDC Motor Drives**

SESSION D06: Devices & Components

11:30 - 13:30

TRACK: Devices & Components

SESSION CHAIRS

Hengzhao Yang, *ShanghaiTech University*

Dong Dong, *Virginia Tech*

- D06.2 **Overshoot Prevention in Monolithic GaN by Ultra-Low ESL Gate Loop Design Using Chip-Scale Capacitors and Gate Driver Pull-Up Path Tuning Technique** 2409
Niklas Deneke, Bernhard Wicht
Leibniz Universität Hannover, Germany
PRESENTATION **TOPIC: GaN HEMTs**
- D06.3 **Triangular and Rectangular Power Pulses in Automotive MOSFETs Applications for Thermally Unstable Linear Mode** 2415
Christian Radici, VijayaKrishna Satyamsetti, Philip Ellis, Peter Vines, Wayne Lawson
Nexperia, United Kingdom
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**
- D06.4 **Modeling the Effect of Gate-Drain Parasitic Capacitance of a SiC MOSFET in a Half-Bridge during the Soft Turn-Off and Hard Turn-On Transition** 2419
Ayodhya Somiruan Gamwari, Ayooluwa Ajiboye, Rakesh Resalayan, Alireza Khaligh
University of Maryland, United States
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- D06.5 **Gan and SiC Based 500kHz Resonant Bidirectional DC/DC Design for 800V OBCM Application** 2425
Minli Jia, Hao Sun, Jingxian Cai, Haisong Zhang, Zhen Zhou, Jinlong Chen
Navitas Semiconductor, China
PRESENTATION **TOPIC: GaN HEMTs**
- D06.7 **Design and Implementation of GaN-HEMT-Based Inverter-Coil Integrated Module for Free Zone Induction Heating System** 2433
Sang Min Park¹, Hyung-Kyu Yang¹, Byoung Jo Hyon¹, Joon Sung Park¹,
Jin-Hong Kim¹, Byoung Kuk Lee²
¹*Korea Electronics Technology Institute, Korea*; ²*Sungkyunkwan University, Korea*
PRESENTATION **TOPIC: GaN HEMTs**
- D06.10 **Remaining Useful Life Prediction of Aluminum Electrolytic Capacitor with a Strain-Based Health Indicator** 2438
Bo Yao¹, Xing Wei¹, Yichi Zhang¹, Zhihao Lin¹, Haoran Wang², Huai Wang¹
¹*Aalborg University, Denmark*; ²*China Three Gorges Corporation, China*
PRESENTATION **TOPIC: Capacitors, Supercapacitors**

- D06.11 **Impact of Bond Wire Degradation on Thermal Estimation and Temperature Coefficient of IGBT Modules in Power Cycling Test** 2443
 Yichi Zhang, Yi Zhang, Bo Yao, Huai Wang
Aalborg University, Denmark
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**
- D06.12 **A Multi-Metrics In Situ Aging Detector for SiC Power MOSFET Modules with Full Driver-Integration Capability** 2448
 Shuofeng Zhao, Faisal Khan
National Renewable Energy Laboratory, United States
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- D06.13 **An Experimental Technique for Detecting False Turn-On of SiC MOSFETs** 2456
 Manish Mandal, Shamibrota K. Roy, Kaushik Basu
Indian Institute of Science, India
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- D06.14 **Single Event Upset in Depletion-Mode Gallium Oxide MOSFETs at the Breakdown Region** 2461
 Abu Shahir Md Khalid Hasan, Md Maksudul Hossain, Pedram Chavoshpour Heris, H. Alan Mantooth
University of Arkansas, United States
PRESENTATION **TOPIC: Power Silicon MOSFETs, BJTs, IGBTs**
- D06.15 **Switching Cell Design for Medium Voltage Flying Capacitor Converter with 10 kV SiC MOSFET** 2468
 Ruirui Chen¹, Dingrui Li¹, Min Lin¹, Mohamed Al Sager¹, Zihan Gao¹, Fred Wang^{1,2},
 Hua Bai¹, Leon M. Tolbert¹
¹The University of Tennessee-Knoxville, United States; ²Oak Ridge National Laboratory, United States
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**
- D06.16 **FET Junction Temperature Monitoring Using Novel On-Chip Solution** 2475
 Ramandeep Narwal, Aditi Agarwal, Tzu-Hsuan Cheng, B. Jayant Baliga,
 Subhashish Bhattacharya, Douglas C. Hopkins
North Carolina State University, United States
PRESENTATION **TOPIC: SiC MOSFETs & BJTs**

SESSION D07: Power Converter Design, Packaging & Integration

11:30 - 13:30

TRACK: Power Electronics Integration & Manufacturing

SESSION CHAIRS

Adam Skorek, *University of Québec at Trois-Rivières*

- D07.1 **Power Control and Sensing Method of kW Range Class E Power Amplifier** 2483
Kyungmin Lee, Seogyong Jeong, Ji Hoon Kim, Young Ho Ryu
Samsung Electronics, Korea
PRESENTATION **TOPIC: Quality & System Reliability**
- D07.2 **Low Inductance Package with Multi-Layer PCB Wiring for Double-Sided Direct Oil-Cooling Inverter** 2488
Kyota Asai, Takeshi Tokuyama, Takahiro Araki, Akihiro Namba, Ti Chen, Shintaro Tanaka
Hitachi, Ltd., Japan
PRESENTATION **TOPIC: Power Modules / High Density Design**
- D07.3 **A Screening Method for Improving Transient Current Sharing of Paralleled SiC MOSFETs Based on Spectral Clustering** 2494
Junhui Yang¹, Yongmei Gan¹, Hongchang Cui¹, Yan Nie¹, Wenbo Fan¹, Laili Wang¹, Kai Gao²
¹Xi'an Jiaotong University, China; ²State Grid Shanghai Electric Power Research Institute, China
PRESENTATION **TOPIC: Power Electronics Packaging**
- D07.4 **Operation Point Based Optimization of Switching Losses with Current-Source Gate Driver for SiC-Based Power Modules** 2502
Muhammad Muneeb Alam, Saad Khalid, Ngoc Ho Tran
Robert Bosch GmbH, Germany
PRESENTATION **TOPIC: Power Modules / High Density Design**
- D07.5 **Design of Zero Overvoltage Switching Tailored Power Electronics** 2510
Nico Schmied, Stefan Matlok, Martin März
Fraunhofer IISB, Germany
PRESENTATION **TOPIC: Power Modules / High Density Design**
- D07.6 **A ΔI_{in} Self-Canceled SEPIC Power Converter for EMI CISPR 25 Compliance** 2518
Zhenda Fu, Lixiong Du, Jin Woong Kwak, Fei Zhou, D. Brian Ma
The University of Texas at Dallas, United States
PRESENTATION **TOPIC: Thermal & EMC Management**
- D07.7 **Common-Mode Noise Reduction in Full-Bridge LLC Resonant Converter with Split Primary Winding Transformer** 2522
Binghui He, Yang Chen, Xiang Yu, Yan-Fei Liu
Queen's University, Canada
PRESENTATION **TOPIC: Thermal & EMC Management**

- D07.8 **Parasitic Inductance Network Modeling Method for Power Module Inner Wirings Based on Inductance Matrix Measurement** 2530
 Kotaro Kobashi¹, Kazuhiro Umetani¹, Masataka Ishihara¹, Hiroto Sakai²,
 Yuta Okawauchi², Takuto Hayashi¹, Eiji Hiraki¹
¹Okayama University, Japan; ²ROHM Co., Ltd, Japan
PRESENTATION **TOPIC: Power Modules / High Density Design**
- D07.9 **Difference in Differential and Common Mode Currents of Output and Input Cables in Three-Phase Variable Speed Drive System for Evaluating Radiated EMI** 2537
 Tuvshinbayar Bandi¹, Fumiya Odera^{1,2}, Shinya Ohtsuka¹
¹Kyushu Institute of Technology, Japan; ²Yaskawa Electric Corporation, Japan
PRESENTATION **TOPIC: Thermal & EMC Management**
- D07.10 **Simultaneous Measurement System of Differential Mode and Common Mode Currents without Influence for Radiated EMI in Three-Phase Variable Speed Drive System** 2543
 Fumiya Odera^{1,2}, Tuvshinbayar Bandi², Shinya Ohtsuka²
¹Yaskawa Electric Corporation, Japan; ²Kyushu Institute of Technology, Japan
PRESENTATION **TOPIC: Thermal & EMC Management**
- D07.11 **A High-Reliability SiC-Based Power Module with High-Temperature Co-fired Ceramic Interposer for High-Temperature Applications** 2551
 Baihan Liu¹, Jianwei Lv¹, Yiyang Yan¹, Mengyao Du¹, Yifan Zhang¹, Cai Chen¹,
 Jiaxin Liu¹, Yong Kang¹, Chenjiang Yu², Min Wang²
¹Huazhong University of Science and Technology, China; ²Intelligent Power Semiconductor Co., LTD., China
PRESENTATION **TOPIC: Power Modules / High Density Design**
- D07.13 **A Comprehensive Study on Electric Field Coupling Effects of Medium-Voltage SiC Power Module and Optimization Design** 2556
 Peiyuan Sun¹, Laili Wang¹, Tianshu Yuan¹, Dingkun Ma¹, Liangjun Ma¹, Lei Li¹,
 Jiacheng Guo¹, Xiaobo Dong¹, Kai Gao²
¹Xi'an Jiaotong University, China; ²State Grid Shanghai Electric Power Research Institute, China
PRESENTATION **TOPIC: Power Electronics Packaging**
- D07.14 **Cost Effective 3D Printed Heatsink for Fast Prototyping of WBG Power Converters** 2562
 Fausto Stella, Stefano Savio, Enrico Vico, Radu Bojoi, Eric Armando
 Politecnico di Torino, Italy
PRESENTATION **TOPIC: Thermal & EMC Management**
- D07.15 **Methods for Increasing the Partial Discharge Inception Voltage of Power Module Substrates Using Guard Ring Structures** 2568
 Yuan Gao, Christian Uhrenfeldt, Stig Munk-Nielsen, Thore Stig Aunsborg
 Aalborg University, Denmark
PRESENTATION **TOPIC: Power Electronics Packaging**

D07.16 **A Jet Impingement Cooling Method to Mitigate the Inherent Uneven Temperature of Multi-Chips in Power Modules** 2574
Hongchang Cui¹, Laili Wang¹, Haoyuan Jin¹, Hang Kong¹, Feng Wang¹,
Xiaobo Dong¹, Zizhen Cheng¹, Kai Gao²
¹*Xi'an Jiaotong University, China*; ²*State Grid Shanghai Electric Power Research Institute, China*

PRESENTATION

TOPIC: Thermal & EMC Management

D07.19 **A Compact Power Stage Design for 10-kV SiC Device-Based Converters with Heatsink Electric Field Shaping** 2580
Zihan Gao¹, Ruirui Chen¹, Hua Bai¹, Leon M. Tolbert¹, Fred Wang^{1,2}
¹*The University of Tennessee-Knoxville, United States*; ²*Oak Ridge National Laboratory, United States*

PRESENTATION

TOPIC: Power Modules / High Density Design

D07.20 **Common-Mode Voltage in Three-Level T-type Inverter: Modeling, Analysis, and Compensation** 2586
Vefa Karakaşlı, Adeel Jamal, Gerd Griepentrog, Omid Safdarzadeh
Technische Universität Darmstadt, Germany

PRESENTATION

TOPIC: Thermal & EMC Management

D07.21 **Machine Learning-Based Surrogate Models for Finned Heatsink Optimization** N/A
Ziheng Wang, Yi Zhang, Huai Wang
Aalborg University, Denmark

PRESENTATION

TOPIC: Thermal & EMC Management

D07.22 **An Improved Thermal Matrix Model of a Forced-Cooled Heat Sink considering Uneven Cooling Conditions** 2599
Linhao Ren¹, YiYang Yan¹, Jiaxin Liu¹, Suhang Wei¹, Cai Chen¹, Yong Kang¹, Chenjiang Yu², Min Wang²
¹*Huazhong University of Science and Technology, China*; ²*Intelligent Power Semiconductor Co., LTD., China*

PRESENTATION

TOPIC: Thermal & EMC Management

SESSION D08: Modeling & Simulation

11:30 - 13:30

TRACK: Modeling & Simulation

SESSION CHAIRS

Suman Debnath, ORNL

D08.1 **A Nested Deep Learning Framework for the Steady-State Modeling of Power Converters in Time Domain** 2604
Xinze Li¹, Fanfan Lin², Xin Zhang², Hao Ma²
¹*Nanyang Technological University, Singapore*; ²*Zhejiang University, China*

PRESENTATION

TOPIC: Circuits & Systems

- D08.2 **Modelling of a Planar Omnidirectional Wireless Power Transfer System** 2609
 Xipei Yu, Junjie Feng, Liyan Zhu, Qiang Li
Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: Circuits & Systems**
- D08.3 **Real-Time Electro-Thermal Simulations for Power Electronic Converters** 2616
 Kerry Sado, Jarrett Peskar, Sebastian Ionita, Jack Hannum, Austin Downey, Kristen Booth
University of South Carolina, United States
- PRESENTATION** **TOPIC: Circuits & Systems**
- D08.4 **Modeling of Complex Power Delivery Networks Driven by Non-linear Voltage Regulators** .. 2624
 Ian Wilkinson¹, Ernesto Neri², Jonathan Rosenfeld¹, Daniel Garcia Mora¹, Rishik Bazaz¹, Pavan Kumar¹
¹Intel Corporation, United States; ²Intel Corporation, Mexico
- PRESENTATION** **TOPIC: Circuits & Systems**
- D08.5 **Optimal Driving Strategies for GaN HEMT: A Numerical Non-linear Datasheet-Based Model** ... 2629
 Daniel Ríos Linares, Miguel Astudillo Martínez, Miroslav Vasić
Universidad Politécnica de Madrid, Spain
- PRESENTATION** **TOPIC: Device & Component Modeling**
- D08.6 **Large-Signal Characterization of Piezoelectric Resonators for Power Conversion** 2637
 Amanda K. Jackson, Jason W. Perreault, Jeffrey H. Lang, David J. Perreault
Massachusetts Institute of Technology, United States
- PRESENTATION** **TOPIC: Device & Component Modeling**
- D08.7 **Modeling and Analysis of Partial Power Concept for Data Center Application** 2644
 Di Wu, Pinhe Wang, Yanda Lyu, Asier Romero Arruti, Ziwei Ouyang, Michael Andreas Esbern Andersen
Technical University of Denmark, Denmark
- PRESENTATION** **TOPIC: Circuits & Systems**
- D08.8 **Symmetrical Termination Structure for Matrix Transformer in High Power Density Applications** 2651
 Kexin Zhao, Kangping Wang, Yuhang Xu, Suchen Dong, Changtao Chen
Xi'an Jiaotong University, China
- PRESENTATION** **TOPIC: Parasitics**
- D08.9 **Small Signal Analysis of High-Gain Transformer-Less Hybrid Boost Extender Converter Based on State-Space Modeling** 2656
 Daniel Beniaminson, Michael Evzelman, Alon Kuperman, Mor M. Peretz
Ben-Gurion University of the Negev, Israel
- PRESENTATION** **TOPIC: Circuits & Systems**

D08.10 **Modeling Framework to Compare High Voltage Vertical GaN PN and Merged PN-Schottky Diodes** 2663
Samuel K. Atwimah¹, Tolen Nelson¹, Prakash Pandey¹, Aidan P. Fox¹, Daniel G. Georgiev¹, Alan G. Jacobs², Andrew D. Koehler², Karl D. Hobart², Travis J. Anderson², Raghav Khanna¹
¹University of Toledo, United States; ²U.S. Naval Research Laboratory, United States

PRESENTATION

TOPIC: Device & Component Modeling

D08.11 **Analytical Determination of Unipolar Diode Losses in Power Switching and Perspective for Ultra-Wide Bandgap Semiconductors** 2670
Nolan S. Hendricks, Joshua J. Piel, Ahmad E. Islam, Andrew J. Green
Air Force Research Laboratory, United States

PRESENTATION

TOPIC: Device & Component Modeling

D08.12 **A Comprehensive Study of Machine Learning Algorithms for GPU Based Real-Time Monitoring and Lifetime Prediction of IGBTs** 2678
Md Moniruzzaman¹, Ahmed H. Okilly², Seungdeog Choi¹, Jeihoon Baek², Tahmid Ibne Mannan¹, Zeenat Islam¹
¹Mississippi State University, United States; ²Koreatech University, Korea

PRESENTATION

TOPIC: Device & Component Modeling

SESSION D09: Control I

11:30 - 13:30

TRACK: Control

SESSION CHAIRS

Dorin Neacsu, *Technical University of Iasi*

D09.1 **DC-Bias Current Detection and Mitigation for a Three-Phase Transformer-Connected Converter through DC-Link Measurement** 2685
Kaveh Pouresmaeil, Maurice Roes, Nico Baars, Korneel Wijnands
Eindhoven University of Technology, The Netherlands

PRESENTATION

TOPIC: Control of Power Electronic Converters

D09.2 **An Optimized Sensorless Synchronous Rectification Method for LLC Resonant Converter in Wide Output Voltage Range** 2691
Won-Yong Jang, Issac Kim, Jihyeon Yun, Jung-Wook Park
Yonsei University, Korea

PRESENTATION

TOPIC: Control of Power Electronic Converters

D09.3 **Enhancing Stability of Dual Active Bridge Converters with a Long Input Cable** 2697
Paolo Sbabo, Lazar Stojanović, Paolo Mattavelli, Giorgio Spiazzi
Università di Padova, Italy

PRESENTATION

TOPIC: Control of Power Electronic Converters

- D09.4 **A New Hybrid Control for Zero Voltage Switching Based on High Frequency Partial Power Buck-Boost Converter** 2705
 Di Wu, Yanda Lyu, Pinhe Wang, Asier Romero Arruti, Ziwei Ouyang, Michael Andreas Esbern Andersen
Technical University of Denmark, Denmark
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D09.5 **A Multi-Segment PWM Scheme for Enhanced Hybrid Active NPC H-bridge Converter** 2712
 Satish Belkhode¹, Anshuman Shukla², Suryanarayana Doolla²
¹Georgia Institute of Technology, United States; ²Indian Institute of Technology Bombay, India
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D09.6 **The Output Voltage Estimator for Primary-Side Regulated Active-Clamp Forward Converter** ... 2718
 Junho Shin, Jong-Won Shin
Chung-Ang University, Korea
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D09.7 **Harmonic Suppression Strategy of Grid-Connected Current Based on Energy-Shaping Control** 2724
 Jiahui Qiu¹, Bingyi Jin¹, Qiang Li², Wei Zhang¹, Hongpeng Liu¹
¹Northeast Electric Power University, China; ²State Grid Sichuan Electric Power Company, Mianyang Power Supply Company, China
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D09.8 **Dynamic Phasor Modeling and Analysis of Sequence Decomposed Grid-Forming Control under Unbalanced Faults** 2730
 Siye Cen, M.A. Awal, Iqbal Husain
North Carolina State University, United States
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D09.9 **A Variable Duty Cycle PFM Control Method for LLC Resonant Converter** 2737
 Tianhao Tan¹, Jingyi Zhou², Qinsong Qian¹
¹Southeast University, China; ²Southampton Ocean Engineering Joint Institute at HEU, Harbin Engineering University, China
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D09.11 **A Fault Tolerant Control Strategy for Three-Level T-type Inverter in LVRT/HVRT Operation** 2743
 Xianzhe Pang, Shumei Chi, Qicai Ren, Alian Chen
Shandong University, China
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D09.12 **Coordinate Control of NP Voltage Balance in Two-Stage Three-Level DC-AC Converters** 2749
 Zhou He¹, Hongfa Ding¹, Ziqi Zhang¹, Jiayang Wu², Dandi Zhang¹, Yingzhe Liu¹,
 Ziheng Xiao³, Zhigang Yao^{3,4}, Yi Tang³
¹Huazhong University of Science and Technology, China; ²The University of Hong Kong, China;
³Nanyang Technological University, Singapore; ⁴Southwest Jiaotong University, China
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**

D09.13 **Source Current Feedback Based Virtual Impedance Control for Three Phase Interleaved DC-DC Converter** 2756
Shivam Chaturvedi, Shahid Aziz Khan, Ducdung Le, Mengqi Wang
University of Michigan-Dearborn, United States

PRESENTATION

TOPIC: Control of Power Electronic Converters

D09.14 **Achieving Fast Dynamic Response in Hybrid PWM Inverters Using a Low-Computational State Trajectory Prediction Algorithm Incorporating with Reduced-Order Switching Surfaces** 2761
Jacky Chun-Tak Lai, Shun-Cheung Ryan Yeung, Henry Shu-Hung Chung
City University of Hong Kong, China

PRESENTATION

TOPIC: Control of Power Electronic Converters

SESSION D10: Control II

11:30 - 13:30

TRACK: Control

SESSION CHAIRS

Xiaonan Lu, *Purdue University*

D10.1 **A Non-isolated and Cost-Effective Hybrid Driving Solution for High Voltage GaN HEMTs** ... 2769
Antonello Laneve¹, Alex Rossi¹, Diogo Varajao²
¹*Infineon Technologies AG, Austria*; ²*Infineon Technologies AG, Germany*

PRESENTATION

TOPIC: Gate Drive Circuits

D10.2 **Innovative Solid-State Isolators with Overcurrent and Over-Temperature Protection for Solid-State Relays** 2778
Wolfgang Frank
Infineon Technologies AG, Germany

PRESENTATION

TOPIC: Control ICs

D10.3 **Improved I-F Start-Up Method for the Refrigerant Load of the E-compressor** 2783
Hyunwoo Lee¹, Youngeun Oh², Jongwon Choi²
¹*Hyundai-WIA, Korea*; ²*Hannam University, Korea*

PRESENTATION

TOPIC: Sensor & Sensor-Less Control

D10.4 **A Dynamic Sampling Method to Achieve Noise-Free Sampling for High-Frequency Converters** 2789
Zhou He¹, Hongfa Ding¹, Ziqi Zhang¹, Jiayang Wu², Dandi Zhang¹, Jiannan Shao¹,
Ziheng Xiao³, Zhigang Yao^{3,4}, Yi Tang³
¹*Huazhong University of Science and Technology, China*; ²*The University of Hong Kong, China*;
³*Nanyang Technological University, Singapore*; ⁴*Southwest Jiaotong University, China*

PRESENTATION

TOPIC: Digital Control

- D10.5 **A 3-Level Active Gate Driver Network for SiC MOSFETs to Minimize Overshoot and Switching Losses** 2794
 Vin Loong Choo, Martin Pfof
Technische Universität Dortmund, Germany
- PRESENTATION** **TOPIC: Gate Drive Circuits**
- D10.6 **Design and Optimization of High Performance Gate Driver for Medium-Voltage SiC Power Modules** 2800
 Lei Li¹, Yongmei Gan¹, Tianshu Yuan¹, Dingkun Ma¹, Yan Nie¹, Peiyuan Sun¹,
 Xiaobo Dong¹, Kai Gao², Laili Wang¹
¹*Xi'an Jiaotong University, China*; ²*State Grid Shanghai Electric Power Research Institute, China*
- PRESENTATION** **TOPIC: Gate Drive Circuits**
- D10.7 **MIMO Analysis of Port-Coupling Induced Destabilization of Interlinking DC-DC Converters** 2806
 Ruzica Cvetanovic¹, Ivan Petric², Paolo Mattavelli¹, Simone Buso¹
¹*Università di Padova, Italy*; ²*Hanwha Q Cells America Inc., United States*
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D10.8 **Feedback Modelling of Passively Balanced Flying Capacitor Multilevel Converters** 2814
 Daniel H. Zhou, Minjie Chen
Princeton University, United States
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D10.9 **On the Use of DualReLU ANN for Approximating Explicit Model Predictive Control for Buck Converters** 2822
 Yangxiao Xiang, Henry Shu-Hung Chung, Hongjian Lin
City University of Hong Kong, China
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D10.11 **Control Structure for Improving Performance of Interleaved Current-Fed Switched Inverter** ... 2828
 Sonam Acharya, Somenath Banerjee, Santanu Kumar Mishra
Indian Institute of Technology Delhi, India
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**
- D10.12 **Multi-Objective Design Optimization for High-Bandwidth Printed-Circuit-Board Shielded Rogowski Coils** 2833
 Xingyue Tian¹, Sadia Binte Sohid¹, Han Cui¹, Fred Wang¹, Jason Swaim², Michael Zimmermann²
¹*The University of Tennessee-Knoxville, United States*; ²*Keysight Technologies, United States*
- PRESENTATION** **TOPIC: Sensor & Sensor-Less Control**
- D10.13 **Stability-Oriented Prediction Horizons Design of Generalized Predictive Control for DC/DC Boost Converter** 2841
 Yuan Li¹, Subham Sahoo¹, Sergio Vazquez², Yichao Zhang¹, Tomislav Dragičević³, Frede Blaabjerg¹
¹*Aalborg University, Denmark*; ²*Universidad de Sevilla, Spain*; ³*Technical University of Denmark, Denmark*
- PRESENTATION** **TOPIC: Control of Power Electronic Converters**

D10.15 **A Digital Dithering Phase Shift Modulator for Enhanced Resolution** 2849
Burkhard Ulrich
Hochschule Reutlingen, Germany

PRESENTATION

TOPIC: Digital Control

SESSION D11: Wireless Power Transfer

11:30 - 13:30

TRACK: Wireless Power Transfer

SESSION CHAIRS

Sheldon Williamson, *Ontario Tech University*

D11.1 **Load Detection Circuit for Hybrid Induction Cooker of Inductive Heating and Wireless Power Transfer** 2855

Kyungmin Lee, Sangwook Lee, Young Ho Ryu
Samsung Electronics, Korea

PRESENTATION

TOPIC: Wireless Charging

D11.2 **Optimized Folded Coil Designs for Wireless Charging Chambers with Even Distribution of Magnetic Flux Density** 2859

Kaiyuan Wang¹, Rui Liang², Jinqiu Gao¹, Jiayang Wu³, Yi Tang¹, Yun Yang¹
¹*Nanyang Technological University, Singapore*; ²*The Hong Kong Polytechnic University, China*;
³*The University of Hong Kong, China*

PRESENTATION

TOPIC: Wireless Charging

D11.3 **Design of a 27.12MHz Ultra-Compact High-Performance Capacitive Wireless Power Transfer System Using Stacked Inverter Architecture** 2864

Yuetao Hou, Khurram Afridi
Cornell University, United States

PRESENTATION

TOPIC: Wireless Charging

D11.4 **A Privacy Leakage Issue in Qi-Compatible Cellphone Wireless Charging by Stray Magnetic Field Sniffing** 2870

Yirui Yang, Zihao Zhan, Honggang Yu, Qinghui Huang, Shuo Wang
University of Florida, United States

PRESENTATION

TOPIC: Wireless Charging

D11.5 **Improving Magnetic Energy Harvesting via Desaturation with Reverse Voltage** 2877

Min Gao, Lifang Yi, Jinyeong Moon
Florida State University, United States

PRESENTATION

TOPIC: Energy Harvesting (PWT)

- D11.6 **A Simple and Reconfigurable IPT System for E-scooter Charging with High-Misalignment Tolerant and Constant Current/Voltage Output** 2883
 Guangyao Li, Cheol-Hee Jo, Junchen Xie, Dong-Hee Kim
Chonnam National University, Korea
- PRESENTATION** **TOPIC: Wireless Charging**
- D11.7 **A Compact Microwave Rectifier Circuit with Improved Harmonic Control Structure for Wireless Power Transmission** N/A
 Jianying Ding¹, Ke Jin¹, Xing Li¹, Weiyang Zhou¹, Yali Jing², Jiang Zhu¹
¹*Nanjing University of Aeronautics and Astronautics, China;*
²*State Grid Mingguang Power Supply Company, China*
- PRESENTATION** **TOPIC: Wireless Charging**
- D11.8 **Design of a 11kW Three-Phase Inductive Power Transfer System Based on DD²Q Coil Structure** 2893
 Nikola Mirković, Alberto Delgado Exposito, Pedro Alou Cervera, Miroslav Vasić
Universidad Politécnica de Madrid, Spain
- PRESENTATION** **TOPIC: Wireless Charging**
- D11.9 **Study on a Fully Integrated Coil Based on the LCCL-S Compensation Topology for Wireless Electric Vehicles Charging Systems** 2899
 Junchen Xie¹, Guangyao Li¹, Cheol-Hee Jo¹, Geun Wan Koo², Dong-Hee Kim¹
¹*Chonnam National University, Korea;* ²*Korea Automotive Technology Institute, Korea*
- PRESENTATION** **TOPIC: Wireless Charging**
- D11.10 **Optimal Design of a Harmonic Controlled Power Amplifier Based on Impedance Decoupling for WPT Application** N/A
 Jiang Zhu, Ke Jin, Chen Yang, Weiyang Zhou, Jing Gao, Jianying Ding
Nanjing University of Aeronautics and Astronautics, China
- PRESENTATION** **TOPIC: Wireless Charging**
- D11.11 **Modeling and Analysis of Duty Cycle Mode Voltage Ringings in Wireless Power Transfer Systems** 2909
 Haoquan Zhang, Liang Jia, Yanchao Li, Srikanth Lakshminathan
Google LLC, United States
- PRESENTATION** **TOPIC: Wireless Charging**
- D11.12 **Comprehensive Comparative Analysis of Circular, Rectangular, and Hexagonal Coils for Wireless Charging of E-mobility** 2915
 Jeonggi Son, Niranjana Shrestha, Sheldon Williamson
University of Ontario Institute of Technology, Canada
- PRESENTATION** **TOPIC: Wireless Charging**

- D11.13 **A Unified and Precise Mathematical Model for Combining Circular and Square Coils in Wireless Power Transfer Systems** 2922
Yue Wu¹, Yongbin Jiang², Yaohua Li², Sicheng Wang², Chang Wang³,
Huajia Wang⁴, Xiaohua Wang¹, Yi Tang²
¹*Xi'an Jiaotong University, China*; ²*Nanyang Technological University, Singapore*; ³*Technical University of Denmark, Denmark*; ⁴*State Grid Shandong Electric Power Research Institute State Grid Shandong, China*

PRESENTATION

TOPIC: Wireless Charging

- D11.14 **High-Performance Multi-MHz Capacitive Wireless Power Transfer System Utilizing Magnetic-Core Coupled Inductors** 2928
Dheeraj Etta, Rabail Makhdoom, Sounak Maji, Syed Saeed Rashid, Khurram K. Afridi
Cornell University, United States

PRESENTATION

TOPIC: Wireless Charging

- D11.15 **Parity-Time-Symmetry-Based WPT Systems with Homogenous Transmitter Coils for Drone Applications** 2933
Ziliang Wu, Jiasheng Huang, Pinhe Wang, Ziwei Ouyang, Michael A.E. Andersen
Technical University of Denmark, Denmark

PRESENTATION

TOPIC: Wireless Charging

SESSION D12: Renewable Energy Systems

11:30 - 13:30

TRACK: Renewable Energy Systems

SESSION CHAIRS

Haoyu Wang, *ShanghaiTech University*

Ruoyu Hou, *Power Integration*

- D12.2 **Demonstration of 5kV/150A Series-Type Hybrid Circuit Breaker (S-HCB) Using a High-Temperature Superconductor (HTS) Counter Voltage Injection Transformer** 2940
Triston Cooper, Mahmoud Alashi, Nikolai Shatalov, Zheng Shen, Ian Brown, Yuengfeng Zhou
Illinois Institute of Technology, United States

PRESENTATION

TOPIC: Microgrid Systems

- D12.4 **Addressing Reactive Power Sharing in Parallel Inverter Islanded Microgrid through Deep Reinforcement Learning** 2946
Oroghene Oboreh-Snapps, Sophia A. Strathman, Jonathan Saelens, Arnold Fernandes, Jonathan W. Kimball
Missouri University of Science and Technology, United States

PRESENTATION

TOPIC: Microgrid Systems

- D12.5 **Converter-Based Microgrid Platform Development for Inverter Based Resource Control Parameters Testing** 2954
Nattapat Praisuwanna, Jingxin Wang, Leon M. Tolbert, Buxin She, Fangxing Li
The University of Tennessee-Knoxville, United States

PRESENTATION

TOPIC: Microgrid Systems

- D12.6 **Converter Design and Control Strategy for PEM Water Electrolyzer to Increase Hydrogen Generation Using Hardware-in-the-Loop Simulation** 2960
 Kiryong Kim, Jae-Hoon Kim, Jong-Pil Lee, Tae-Jin Kim, Chang-Yeol Oh
Korea Electrotechnology Research Institute, Korea
- PRESENTATION** **TOPIC: Fuel Cells**
- D12.7 **Supercapacitor-Buffered DC-Operable Refrigerators for DC Homes** 2965
 Nirashi Polwaththa Gallage¹, Don Charles Themiya Sirimanne¹, Nihal Kularatna¹,
 Alistair Steyn-Ross¹, Dulsha Kularatna-Abeywardana²
¹University of Waikato, New Zealand; ²University of Auckland, New Zealand
- PRESENTATION** **TOPIC: Energy Storage Systems**
- D12.8 **Equivalent Circuit Model Analysis for Data-Driven Oriented Diagnosis of High-Level CO in HT-PEMFC with EIS** 2972
 Dan Yu¹, Xingjun Li¹, Samuel Simon Araya², Simon Lennart Sahlin¹, Vincenzo Liso¹
¹Aalborg University, Denmark; ²Luxembourg Institute of Science and Technology, Luxembourg
- PRESENTATION** **TOPIC: Fuel Cells**
- D12.9 **Energy-Storage-Device-Enabled Adaptable Fast/Slow Synchronization Control Structure for Dual-Port Grid-Forming Voltage-Source Converters** 2979
 Shuo Zhang, Wei Qiao, Jun Wang, Liyan Qu
University of Nebraska-Lincoln, United States
- PRESENTATION** **TOPIC: Microgrid Systems**
- D12.11 **Preliminary Experiments Quantifying the Arcing Process in a DC Circuit Breaker Development Project** 2986
 Chamara Dassanayake¹, Nihal Kularatna¹, Alistair Steyn-Ross¹, Nicoloy Gurusinghe², Kosala Gunawardane³
¹University of Waikato, New Zealand; ²Sri Lanka Technological Campus, Sri Lanka;
³University of Technology Sydney, Australia
- PRESENTATION** **TOPIC: Microgrid Systems**
- D12.12 **Multi-Objective Minimization of Life-Cycle Environmental Impacts of Three-Phase AC-DC Converter Building Blocks** 2994
 Luc Imperiali, David Menzi, Johann W. Kolar, Jonas Huber
ETH Zürich, Switzerland
- PRESENTATION** **TOPIC: Bi-Directional Power Converters**
- D12.13 **Optimal Design and Operation of Long-Distance Deep-Water HVAC Transmission for Offshore WECS Integration with FPSO Unit** 3005
 Lenon Schmitz¹, Francisco José Viglus², Jéssika Melo de Andrade¹, Matheus Schramm Dall Asta¹,
 Marcelo Lobo Heldwein², Telles Brunelli Lazzarin¹
¹Federal University of Santa Catarina, Brazil; ²Federal University of Technology-Paraná, Brazil;
³Technische Universität München, Germany
- PRESENTATION** **TOPIC: Wind Energy Conversion Systems**

- D12.14 **High Step-Up Three-Port Converter with Coupled-Inductor and Voltage Lift for Sustainable Energy Systems** 3012
 Kuo-Fu Liao¹, Tsong-Juu Liang¹, Kai-Hui Chen¹, Jih-Sheng Lai²
¹National Cheng Kung University, Taiwan; ²Virginia Polytechnic Institute and State University, United States
- PRESENTATION** **TOPIC: Energy Storage Systems**
- D12.15 **A Supercapacitor Assisted Technique for Reducing Losses in the Input Loop of an Inverter System for Solar PV Applications** 3020
 Chamila Anuradha Naligama, Nihal Kularatna, Alistair Steyn-Ross
University of Waikato, New Zealand
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**
- D12.16 **High-Conversion Ratio Modular Series-Capacitor Boost for PV Systems with MPPT Control** ... 3027
 Eli Hamo, Martin Mellincovsky, Mor Mordechai Peretz
Ben-Gurion University of the Negev, Israel
- PRESENTATION** **TOPIC: Photovoltaic (PV) Inverters & Micro Inverters**
- D12.17 **Novel Battery Model Employing Variable Capacitor for Effective Description of SOC Behavior** 3035
 Ngoc-Thao Pham¹, Jonghoon Kim², Sung-Jin Choi¹
¹University of Ulsan, Korea; ²Chungnam National University, Korea
- PRESENTATION** **TOPIC: Energy Storage Systems**
- D12.19 **Design of a Cooling System in a Medium Voltage MMC** 3041
 Min Lin¹, Ruirui Chen¹, Dingrui Li¹, Leon M. Tolbert¹, Fred Wang^{1,2}, Hua Bai¹
¹The University of Tennessee-Knoxville, United States; ²Oak Ridge National Laboratory, United States
- PRESENTATION** **TOPIC: Grid-Tied Systems**
- D12.20 **A Hybrid Technique for Minimizing Ripple in DC Nanogrids** 3047
 Sam Fowler, Sally Sajadian
Lafayette College, United States
- PRESENTATION** **TOPIC: Microgrid Systems**
- D12.21 **Dual-Loop Geometric Control of Stator Flux for Improved LVRT Response in DFIG-Based Wind Turbine Systems** 3053
 Jacqueline Dubreuil, Ignacio Galiano Zurbriggen, Jeff Pieper
University of Calgary, Canada
- PRESENTATION** **TOPIC: Wind Energy Conversion Systems**
- D12.22 **Direct Power Control of Back to Back Modular Multilevel Converter with Advanced Grid Support Functions for Grid Forming Application** 3061
 Vikram Roy Chowdhury, Barry Mather
National Renewable Energy Laboratory, United States
- PRESENTATION** **TOPIC: Microgrid Systems**

D12.23 **Operation of Grid Forming Converters as Self Excited Induction Generators under Non-ideal Loading Conditions** 3066
Vikram Roy Chowdhury, Barry Mather
National Renewable Energy Laboratory, United States

PRESENTATION

TOPIC: Photovoltaic (PV) Inverters & Micro Inverters

D12.24 **An Asymmetric Nine-Level Single-Phase Current Source Inverter Topology** N/A
Mias Fakher Aldin, Kfir Jack Dagan
Ariel University, Israel

PRESENTATION

TOPIC: Photovoltaic (PV) Inverters & Micro Inverters

SESSION D13: Transportation Power Electronics

11:30 - 13:30

TRACK: Transportation Power Electronics

SESSION CHAIRS

Dong Cao, *University of Dayton*

Rasoul Hosseini, *General Motors*

D13.1 **Inrush Current Load Regulation for Small Mobility Application** 3076
Shahid Aziz Khan, Mengqi Wang, Shivam Chaturvedi, DucDung Le
University of Michigan-Dearborn, United States

PRESENTATION

TOPIC: Vehicular Power Electronic Circuits & Systems

D13.2 **A Bidirectional 400–12 v DC-DC Converter with Improved Dynamics and Integrated Transformer for EV Applications** 3081
Héctor Sarnago, Óscar Lucía
I3A, Universidad de Zaragoza, Spain

PRESENTATION

TOPIC: Power Electronics for Hybrid & Electric Cars

D13.3 **Coordination of RB-IGCT-Based Solid-State Circuit Breakers for High-Di/Dt Faults in DC EV Microgrids** 3086
Govind Chavan, Chunmeng Xu, Abhinav Patni, Steven Englebretson, Pietro Cairoli
ABB Corporate Research Center, United States

PRESENTATION

TOPIC: Vehicular Power Electronic Circuits & Systems

D13.4 **A Reconfigurable Topology for Integration of Removable Batteries in an Electric Powertrain with 400 V and 800 v Compatibility** 3092
Duberney Murillo-Yarce, Gabriel D. Colvero, Diego G. Lamar, Alberto Rodríguez, Aitor Vazquez
Universidad de Oviedo, Spain

PRESENTATION

TOPIC: Power Electronics for Hybrid & Electric Cars

D13.5 **Solid-State Circuit Breaker for Aircraft High Voltage DC Network** 3100
Thanh Long Le¹, Toni Youssef¹, Stéphane Azzopardi¹, Thierry Lebey¹,
Philippe Lasserre², Arnaud Bruder³, Bruno Lefebvre³
¹Safran Tech, France; ²DEEP Concept, France; ³SuperGrid Institute, France

PRESENTATION

TOPIC: Power Electronics for Aerospace

- D13.7 **Towards System-Friendly Solid-State Circuit Breaker for Electrified Aircraft Propulsion** 3108
 Dehao Qin¹, Zheyu Zhang², Shimul K. Dam³, Ching-Hsiang Yang³,
 Zhou Dong⁴, Cheng Wan¹, Hua Bai³, Fred Wang^{3,5}
¹Clemson University, United States; ²Rensselaer Polytechnic Institute, United States;
³The University of Tennessee-Knoxville, United States; ⁴ABB Corporate Research Center, United States;
⁵Oak Ridge National Laboratory, United States
- PRESENTATION** **TOPIC: Power Electronics for Aerospace**
- D13.8 **Optimizing a Full-Bridge Capacitor-Clamped LLC Resonant Converter for EV Charging considering the Effect of Leakage Inductance of the Auxiliary Transformer** 3115
 Jiayang Wu¹, Sinan Li², Junming Zeng³, Siew-Chong Tan¹, Shu-Yuen Ron Hui¹
¹The University of Hong Kong, China; ²University of Sydney, Australia;
³Nanyang Technological University, Singapore
- PRESENTATION** **TOPIC: Charging Systems**
- D13.9 **Resonant MIMO Converter for Future High-Voltage DC Grids in More Electric Aircraft Applications** 3121
 Diego Bernal Cobaleda, Fanghao Tian, Yu Zuo, Wilmar Martinez
 KU Leuven - EnergyVille, Belgium
- PRESENTATION** **TOPIC: Power Electronics for Aerospace**
- D13.10 **Zero-Leakage-Current Zero-Common-Mode Modulation for Neutral-Point Connected Three-Phase Non-isolated On-Board Chargers** 3128
 Alessandro Pevere¹, Matthias J. Kasper¹, Alex Pacini¹, Gerald Deboy¹, Roberto Petrella², Narendar Rao³
¹Infineon Technologies AG, Austria; ²Università degli Studi di Udine, Italy; ³Volvo Cars, Sweden
- PRESENTATION** **TOPIC: Power Electronics for Hybrid & Electric Cars**
- D13.11 **Design and Analysis of a High Current GaN Based PCB for Dual Active Bridge Converter for Electric Aircraft Applications** 3135
 Abdul Muneeb, Mustafeez Ul Hassan, Ali Anwar, Fang Luo
 State University of New York at Stony Brook, United States
- PRESENTATION** **TOPIC: Power Electronics for Aerospace**
- D13.12 **Characterizations and Converter Design Using the Latest 6.5 kV Silicon Carbide MOSFETs** ... 3140
 Xinyuan Du, Zhuxuan Ma, Mengxuan Jiang, Ahmed Ismail, Yue Zhao
 University of Arkansas, United States
- PRESENTATION** **TOPIC: Power Electronics for Aerospace**
- D13.13 **Modeling of Rail Transit Earth Current Distribution at Neutral Point of AC Grounding Transformer** 3145
 Jinli Zhu, Yuchen He, Bokang Zhou, Yuan Li
 Florida State University, United States
- PRESENTATION** **TOPIC: Vehicular Power Electronic Circuits & Systems**
- D13.15 **Magnetic Integrated High Frequency Transformer Based Dual Active Bridge for Multifunctional Onboard EV Charger** 3151
 Nagamalleswararao Kamarajugadda, Amarkumar A. Kushwaha, Baylon G. Fernandes, Kishore Chatterjee
 Indian Institute of Technology Bombay, India
- PRESENTATION** **TOPIC: Vehicular Power Electronic Circuits & Systems**

- D13.16 **A Hybrid Si-SiC Flyback Converter for Auxiliary Power Supplies in DC Ship Grids** 3157
Sohaib Qazi^{1,2}, Lucas de Oliveira Baumann³, Ki-Bum Park⁴, Francisco Canales⁵, Thiago Batista Soeiro¹
¹University of Twente, The Netherlands; ²University of Nottingham, United Kingdom;
³ETH Zürich, Switzerland; ⁴Korea Advanced Institute of Science and Technology, Korea;
⁵ABB Corporate Research Center, Switzerland

PRESENTATION

TOPIC: Vehicular Power Electronic Circuits & Systems

SESSION D14: Harvest, AC & HF Power Applications, & Power Quality

11:30 - 13:30

TRACK: Power Electronics Applications

SESSION CHAIRS

Ali Safayet, *Halla Mechatronics*

Jeff Nilles, *Alpha & Omega Semiconductor*

- D14.1 **Low-Power Solid-State Transformers to Replace Line-Frequency Class 2 Transformers** 3163
Allen T. Nguyen, Charles R. Sullivan
Dartmouth College, United States

PRESENTATION

TOPIC: AC-DC-AC Applications & Matrix Converters

- D14.2 **Power Quality Impact of Residential LED Lighting Systems with Integrated TRIAC-Based Dimmer** 3171
Jeet Panchal, Lakshmi Ravi, Boran Fan, Dong Dong, Rolando Burgos
Virginia Polytechnic Institute and State University, United States

PRESENTATION

TOPIC: Lamp Ballasts & LED Lighting

- D14.3 **High-Voltage Nanosecond Pulse Generator Using Series-Stacked Enhancement-Mode GaN Transistors** 3179
P. Briz, H. Sarnago, J.M. Burdío, Ó. Lucía
I3A, Universidad de Zaragoza, Spain

PRESENTATION

TOPIC: Network & Telecommunication Power Electronics

- D14.4 **High Power Factor Soft Switched Synchronous Buck with GaN SiP and Advanced HPF QR Controller** 3184
Jai Aditya Chaudhary, Rosario Attanasio, Gianni Vitale
STMicroelectronics, United States

PRESENTATION

TOPIC: Lamp Ballasts & LED Lighting

- D14.5 **Building Fabric Power Converters for Wearable Energy Harvesting Applications** 3192
F. Selin Bagci, Katherine A. Kim
National Taiwan University, Taiwan

PRESENTATION

TOPIC: Energy Harvesting (PEA)

SESSION D15: High Frequency Magnetics

11:30 - 13:30

TRACK: Magnetics

SESSION CHAIRS

George Slama, Würth Elektronik

Matt Wilkowski, Enachip Inc.

- D15.1 **PCB-Based Inductor Design for 1-kW, 1-MHz Buck Converter** 3199
Aqarib Hussain, Daniel Perez, Dejana Cucak, Kristen Booth
University of South Carolina, United States
PRESENTATION **TOPIC: High-Frequency Magnetics**
- D15.2 **Splitting Conductors of Coils on PCB for AC-Resistance Reduction** 3204
Shunsaku Nomoto¹, Shinjiro Shimura¹, Keisuke Kusaka¹, Takashi Takada²
¹Nagaoka University of Technology, Japan; ²AGC Inc., Japan
PRESENTATION **TOPIC: High-Frequency Magnetics**
- D15.3 **Decreasing Parasitic Capacitances of Planar Transformers in High-Frequency Operation** 3210
Sujeong Lee, Jong-Won Shin
Chung-Ang University, Korea
PRESENTATION **TOPIC: High-Frequency Magnetics**
- D15.4 **Interleaved PCB Winding Planar Transformer for Electric Vehicle Charging CLLC Converters** 3216
Hans Wouters, Hassan Pervaiz, Tim Geboers, Yu Zuo, Wei-Ren Lin, Wilmar Martinez
KU Leuven - EnergyVille, Belgium
PRESENTATION **TOPIC: Magnetics Applications**

SESSION D16: Magnetic Design & Optimization

11:30 - 13:30

TRACK: Magnetics

SESSION CHAIRS

George Slama, Würth Elektronik

Edward Herbert, PSMA

- D16.3 **Research on Vibration and Acoustic Noise Emission of Nanocrystalline Inductors Based on Multi-Physics Coupling Analysis** 3224
Mengyao Du¹, Baihan Liu¹, JiaJia Guan¹, Wenzhe Xu¹, ShuangXi Zhu¹, Cai Chen¹, Jiaxin Liu¹, Yong Kang¹, Min Wang², Chenjiang Yu²
¹Huazhong University of Science and Technology, China; ²Intelligent Power Semiconductor Co., LTD., China
PRESENTATION **TOPIC: Magnetics Applications**
- D16.4 **A Multilevel Converter Testbench for High-Frequency Power Magnetics Characterization** 3229
Neha Rajput, Vishnu Mahadeva Iyer
Indian Institute of Science, India
PRESENTATION **TOPIC: High-Frequency Magnetics**

SESSION D17: Magnetic Applications II

11:30 - 13:30

TRACK: Magnetism

SESSION CHAIRS

Matt Wilkowski, *Enachip Inc.*

Edward Herbert, *PSMA*

D17.1 **Integrated Magnetic Design for High Power Density Converter** 3235

Pinhe Wang¹, Asier Arruti², Jiasheng Huang¹, Tiberiu Gabriel Zsurzsan¹,
Michael A.E. Andersen¹, Ziwei Ouyang¹

¹Technical University of Denmark, Denmark; ²Mondragon Unibertsitatea, Spain

PRESENTATION

TOPIC: Magnetism Applications

D17.2 **Enhanced Area Product Method for High-Frequency Inductors and Transformers** 3242

Reanna Orzechowski, Matthew Jahnes, Matthias Preindl

Columbia University, United States

PRESENTATION

TOPIC: High-Frequency Magnetism

D17.3 **Analysis of Eddy Currents and Thermal Modeling of Planar Magnetic Components with Metal Housing** 3247

Atsushi Hasenuma¹, Jun Imaoka¹, Masayoshi Yamamoto¹, Tatsuya Miyazaki², Yuta Okawauchi²,
Akihiro Kawano²

¹Nagoya University, Japan; ²ROHM Co., Ltd, Japan

PRESENTATION

TOPIC: Magnetism Applications

D17.4 **Derivation of an Optimal Winding Configuration for Minimizing the Effect of Winding Capacitances in a Two-Winding High-Frequency Transformer** 3255

Annoy Kumar Das, Baylon G. Fernandes

Indian Institute of Technology Bombay, India

PRESENTATION

TOPIC: High-Frequency Magnetism