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**ECCE 2012**  
**PROGRAM**  
IEEE ENERGY CONVERSION CONGRESS & EXPOSITION

**Raleigh, NC**

**September 15-20, 2012**

Raleigh Convention Center, Raleigh, NC  
500 Salisbury Street, Raleigh, NC 27601

[www.ecce2012.org](http://www.ecce2012.org)



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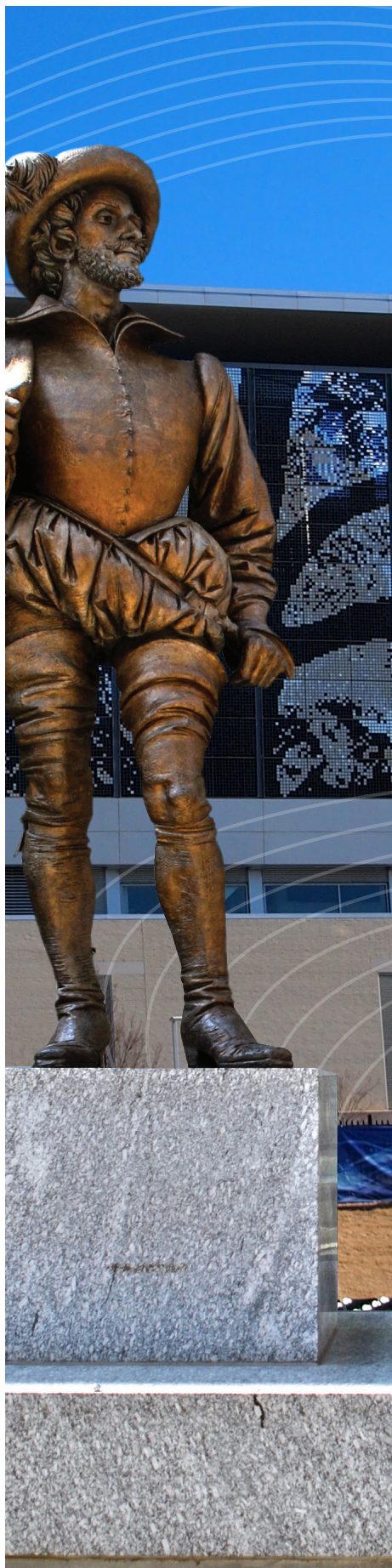
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It gives us great pleasure to welcome you to Raleigh, North Carolina for the 4th Annual IEEE Energy Conversion Conference and Exposition. ECCE 2012 continues to integrate the successful IEEE Energy 2030 conference that was initiated to foster energy conversion technology, policy and economic framework directed at the creation of a sustainable, global, energy infrastructure by 2030.

ECCE 2012 is replete with distinguished plenary speakers, tutorials given by professionals from industry and academia, panels of experts in rap session, and ample opportunity to network and make new acquaintances in the energy conversion field. Technical sessions fall into two major categories of Energy Conversion Systems and Components and Subsystems with a host of topical areas, ranging from alternative and renewable energy to grid ancillary services, power electronic enabled applications, lighting, electrified transportation systems, smart grid, energy efficiency, energy storage and more.

It is our hope that we can all be proud of ECCE, as it strives to be the preeminent conference in energy conversion technologies. ECCE is also the place to renew old acquaintances and make new ones, network with colleagues and enjoy the good company of your colleagues from around the world.

We would also like to welcome everyone to Raleigh. Long known as one of the nicest places in America, is a charming, unexpectedly fun place to visit. Raleigh and the nearby Research Triangle Park area, is also the home to many leading companies focused on power conversion, smart grid, alternative energy and advanced transportation technologies. Companies such as ABB, Cree, Eaton, and many others call this area home. North Carolina's Capital city and surrounding areas are overflowing with fun things to do. World-class museums, best of Broadway shows, live concerts, historic sites, professional and amateur sports and a shopping mecca of nine major retail spots. There is so much to do and so little stress. You will be pleasantly surprised.

Finally, we would like to thank all the members of the organizing committee, the program chairs and vice chairs, the program committee, and the authors for their efforts in putting together this event. We would also like to thank ABB, Eaton Corporation, GE Global Research, General Atomics and OPAL RT for their support of ECCE 2012. We hope that you enjoy this important technical meeting in a most timely and exciting field!



*Alex Huang*

Alex Huang  
2012 General Chair



*Iqbal Husain*

Iqbal Husain  
2012 General Co-Chair





*City Of Raleigh*  
*North Carolina*

**Nancy McFarlane**  
Mayor

**Welcome to Raleigh!**

On behalf of the members of the Raleigh City Council and the more than 404,000 residents of our city, I would like to welcome the IEEE Energy Conversion Congress & Exposition 2012 to Raleigh! We are glad to be your host city.

It will be an honor to have you here and we believe that Raleigh is the perfect location for ECCE 2012. With your organization's longstanding reputation of being on the forefront of energy conversion and related research, it is appropriate to meet in Raleigh where energy-related research, technology and education are definite mainstays of our local economy. We are proud of our reputation and that of nearby Research Triangle Park and know your attendees will feel at home while they are here.

You are also going to love our convention center! The Raleigh Convention Center is proudly Silver-LEED Certified and has a proven track record of being not only a state-of-the-art venue, but a strong, global partner with its sustainable practices. ECCE attendees and exhibitors alike will enjoy 500,000 square-feet of meeting, event and exhibit space, complete with the latest in technology. The best of lighting and sound, fiber-optic data network, and high speed wireless and wired capabilities all contribute to a superb meeting environment. Even more, a great staff awaits your arrival!

While you are here we hope that you will explore and experience our great city. Raleigh is known for its hospitality and we invite you to see all that it has to offer. Great cultural attractions, fine restaurants and world class entertainment are just a few steps away from the Raleigh Convention Center. Our complimentary R-LINE connector service makes it easy to get around when you want to venture further away. The Official Visitor Information Center inside the Raleigh Marriott City Center, tourism ambassadors and downtown ambassadors are all close by and available to help you find your way.

Again, thank you for choosing Raleigh, welcome to the City and we wish you a successful conference!

Sincerely,

A handwritten signature in black ink that reads "Nancy McFarlane".

Nancy McFarlane  
Mayor

## Organizational Committee

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North Carolina State University, USA

### General Co-Chair

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North Carolina State University, USA

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Dan Ionel (Vice Chair), Vestas Wind Turbines R&D, USA

Pedro Rodriguez (Vice Chair), Abengoa Research, Spain

Dehong Xu (Vice Chair), Zhejiang University, China

Vassilios Agelidis, University of New South Wales, Australia

Robert Balog, Texas A and M University, USA

Jensen, Bogi, Technical University of Denmark, Denmark

Francisco Canales, ABB Corporate Research, Switzerland

David Dorrell, University of Technology Sydney, Australia

Yao Duan, VESTAS Global Research, USA

Madhav Manjrekar, VESTAS Global Research, USA

Behrooz Mirafzal, Kansas State University, USA

Adel Nasiri, University of Wisconsin-Milwaukee, USA

Pragasen Pillay, Concordia University, Canada

Maryam Saeedifard, Purdue University, USA

Miaosen Shen, United Technologies Research Center, USA

Yilmaz Sozer, University of Akron, USA

### Smart Grid and Utility Applications

Marta Molinas (Vice Chair), Norwegian University of Science and Technology, Norway

Kathleen O'Brien (Vice Chair), GE Global Research Center, USA

Massimo Bongiorno, Chalmers University of Technology, Sweden

Nilanjan Chaudhuri, GE Global Research Center, USA

Harjeet Johal, GE Global Research Center, USA

Pukar Mahat, Aalborg University, Denmark

Jon Are Suul, Sintef Energy Research, Norway

Elisabetta Tedeschi, Tecnalia Research and Innovation, Spain

### Energy Efficiency and Industrial Applications

Henry Chung (Vice Chair), City University of Hong Kong, China

Brad Lehman (Vice Chair), Northeastern University, USA

Francisco Azcondo, Universidad de Cantabria, Spain

Xu Chu, GE Global Research Centre, China

Trishan Efram, Pacific Northwest National Laboratory, USA

Carl Ho, ABB Corporate Research, Switzerland

Peng Li, Northeastern University, USA

Tsong-Juu (Peter) Liang, National Cheng Kung University, Taiwan

Jaber Abu Qahouq, University of Alabama, USA

### Computer and Telecommunication Applications

Jaber Abu Qahouq (Vice Chair), University of Alabama, USA

### Transportation Applications

Ayman El-Refaie (Vice Chair), GE Global Research Center, USA

Burak Ozpineci (Vice Chair), Oak Ridge National Lab, USA

Fernando Briz, Universidad de Oviedo, Spain

Fabio Capponi, Sapienza Universita di Roma, Italy

Srdjan Lukic, North Carolina State University, USA

Chris Mi, University of Michigan-Dearborn, USA

Khwaja Rahman, General Motors, USA

### Power Converter Topologies

Dragan Maksimovic (Vice Chair), University of Colorado Boulder, USA  
 Yasuyuki Nishida (Vice Chair), Chiba Institute of Technology, Japan  
 William Peterson (Vice Chair), E&M Power, USA  
 Aleksandar Prodic (Vice Chair), University of Toronto, Canada  
 Pierluigi Tenca (Vice Chair), ABB Corporate Research, Sweden  
 Lixiang Wei (Vice Chair), Rockwell Automation, USA  
 Pat Wheeler (Vice Chair), University of Nottingham, UK  
 Pericle Zanchetta (Vice Chair), University of Nottingham, UK  
 Vassilios Agelidis, University of New South Wales, Australia  
 Stefano Bifaretti, Università di Roma Tor Vergata, Italy  
 Luca Corradini, Università di Padova, Italy  
 Keith Corzine, Missouri University of Science and Technology, USA  
 Bob Guenther, NWL, USA  
 Axel Mertens, Leibniz Universität Hannover, Germany  
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 Miguel Rodriguez, University of Colorado Boulder, USA  
 Maryam Saeedifard, Purdue University, USA  
 Olivier Trescases, University of Toronto, Canada  
 Keiji Wada, Tokyo Metropolitan University, Japan  
 Masayoshi Yamamoto, Shimane National University, Japan  
 Luca Zarri, Università de Bologna, Italy

### Converter Modeling, Control and EMI

Paolo Mattavelli (Vice Chair), Virginia Tech, USA  
 Antonello Monti (Vice Chair), RWTH Aachen University, Germany  
 Juergen Biela, Swiss Federal Institute of Technology (ETH), Switzerland  
 Oscar Garcia, Universidad Politecnica de Madrid, Spain  
 Herb Ginn, University of South Carolina, USA  
 Bin Lu, Eaton Corporation, USA  
 Aleksandar Prodic, University of Toronto, Canada  
 Pat Wheeler, University of Nottingham, UK  
 Pericle Zanchetta, University of Nottingham, UK

### Electrical Machines

Aldo Boglietti (Vice Chair), Politecnico di Torino, Italy  
 Andy Knight (Vice Chair), University of Alberta, Canada  
 Mircea Popescu (Vice Chair), Motor Design Ltd., UK  
 Emmanuel Agamloh, Advanced Energy, USA  
 Jonathan Bird, University of North Carolina at Charlotte, USA  
 Andrea Cavagnino, Politecnico di Torino, Italy  
 Akira Chiba, Tokyo Institute of Technology, Japan  
 Francesco Cupertino, Politecnico di Bari, Italy  
 Uday Deshpande, General Atomics, USA  
 Yao Duan, VESTAS, USA  
 Sang Bin Lee, Korea University, Korea  
 Gianmario Pellegrino, Politecnico di Torino, Italy  
 Marcello Pucci, ISSIA-CNR, Italy  
 Giuseppe Scarcella, Università di Catania, Italy  
 Jagadeesh Tangudu, United Technologies Research Center, USA

### Electrical Drives

Fernando Briz (Vice Chair), Universidad de Oviedo, Spain  
 Alfio Consoli (Vice Chair), Università de Catania, Italy  
 Michael Harke (Vice Chair), Danfoss Power Electronics, USA  
 J. Timothy Alt, Rolls-Royce, USA  
 Zhi “George” Gao, Schneider Electric, USA  
 Pablo Garcia, Universidad de Oviedo, Spain  
 Bin Lu, Eaton Corporation, USA  
 David Reigosa, Universidad de Oviedo, Spain  
 Jul-Ki Seok, YeungNam University, Korea  
 Gui-Jia Su, Oak Ridge National Laboratory, USA

### Components, Packaging and Other Enabling Technologies

Filippo Chimento (Vice Chair), ABB Corporate Research, Sweden  
 David Perreault (Vice Chair), Massachusetts Institute of Technology, USA  
 Craig Winterhalter (Vice Chair), Rockwell Automation, USA  
 Angus Bryant, GE Energy Power Conversion, USA  
 Braham Ferreira, Delft University of Technology, Netherlands  
 Yehui Han, University of Wisconsin-Madison, USA  
 Robert Pilawa-Podgurski, University of Illinois at Urbana-Champaign, USA  
 Juan Rivas, University of Michigan, USA  
 Jean-Lu Schanen, University of Grenoble, France  
 Adam Skorek, University of Quebec at Trois-Rivieres, Canada  
 Charles Sullivan, Dartmouth, USA

### Other Energy Conversion Related Topics & Education

Aldo Boglietti (Vice Chair), Politecnico di Torino, Italy  
 Iustin Radu Bojoi, Politecnico di Torino, Italy  
 Zhi “George” Gao, Schneider Electric, USA  
 Paolo Mattavelli, Virginia Tech, USA  
 Thomas Wu, University of Central Florida, USA

#### **ECCE 2012 Leadership would like to recognize the late Prof. Alfio Consoli.**

Prof. Consoli made such an impact on the committee and his valuable insights and contribution will be missed. Our thoughts are with his family.



**SATURDAY, SEPTEMBER 15TH, 2012**

3:00 pm - 5:00 pm Registration Open..... Main Lobby

**SUNDAY, SEPTEMBER 16TH, 2012**

**Tutorials Group 1 - 8:30 am - 12:00 pm**

7:00 am - 7:00 pm Registration Open..... Main Lobby

301A

302A

303

304

T1-1 Wind Power Generation in a High Penetration Scenario

T1-2 Controlling the Smart Grid: From Challenges to Opportunities

T1-3 Advanced Bus Bar System Design

T1-4 Switchmode Power Magnetics Design

12:00 pm - 1:30 pm Lunch on own

**Tutorials Group 2 - 1:00 pm - 5:00 pm**

301A

302A

303

304

T2-1 Battery Management Systems for Electric and Plug-In Hybrid Electric Vehicles

T2-2 Advanced Control Architectures for Intelligent MicroGrids

T2-3 Power Module Packaging: A Multidisciplinary Integration Approach

T2-4 Practical Design and Thermal Challenges of High Power DC-DC Converters in Hybrid Electric Vehicles (HEVs)

5:00 pm - 7:00 pm Opening Reception..... Ballroom A

**MONDAY, SEPTEMBER 17TH, 2012**

7:00 am - 7:00 pm Registration Open..... Main Lobby

8:00 am - 10:00 am Plenary Session..... Ballroom C

10:00 am - 10:20 am AM Break..... Main Lobby

**Breakout Session - 10:20 am - 12:00 pm**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B	402
S1: Non-Isolated DC-DC Converter Topologies	S2: Energy Efficient Applications	S3: Control of Grid Connected Inverters	S4: Thermal Management	S5: Predictive Control in Drives	S6: Induction Machines	S7: Control of Converter for Grid Application	S8: Harmonics in Smart Grid	S9: Power Converters for Wind Applications	S10: Contactless Power Transfer for EV Applications	S11: AC-DC Converters	S12: Multilevel Converters I: General Topologies	S13: Renewable Energy and New Grid Infrastructure

12:00 pm - 1:30 pm Lunch on own

**Breakout Session - 1:30 pm - 3:35 pm**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B
S13: Control of Non-Isolated DC-DC Converters	S14: Energy Harvesting for Low Power Electronic Applications	S15: Control of DC-DC Converters	S16: Power Modules and Packaging I	S17: Current Measurement & Control in Drives	S18: Concentrated Winding PM Machines	S19: Grid Connected Inverters with LCL Filters	S20: Smart Grid Devices	S21: EMI Modeling and Filter Design	S22: Energy Storage I	S23: Higher Power and Aerospace Applications	S24: Multilevel Converters II: Applications

4:00 pm - 10:00 pm Exhibit Hall Open..... Exhibit Hall B

4:00 pm - 6:00 pm Expo Reception Supported by OPAL RT..... Exhibit Hall B

4:00 pm - 6:00 pm Student Demonstrations..... Exhibit Hall B

7:00 pm - 10:00 pm Industry Student Dinner Supported by GE Global Research and Eaton (ticketed function)..... Exhibit Hall B

**TUESDAY, SEPTEMBER 18TH, 2012**

7:00 am - 6:00 pm Registration Open..... Main Lobby

**Breakout Session - 8:00 am - 9:40 am**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B	402
S25: Non-Isolated DC-DC Converters General	S26: Double-Fed Induction Generators for Wind Turbines	S27: Overmodulation in Drives	S28: Switched Reluctance Machines	S29: FEA & Modeling in Electric Machines	S30: Electrical Machines in Transportation	S31: Grid Parameter Identification	S32: Ocean and Wave Energy I	S33: Control of Smart Grid and Microgrid	S34: Power Converters Stability	S35: AC-AC Converter Topologies with Reduced Device Count	S36: AC-DC Converters: Design and Control	S37: Monitoring and Diagnostics

9:00 am - 6:00 pm Exhibit Hall Open..... Exhibit Hall B

9:00 am - 6:00 pm Student Demonstrations..... Exhibit Hall B

9:40 am - 10:00 am AM Break..... Exhibit Hall B

10:00 am - 11:30 am Poster Session I..... Exhibit Hall B

11:30 am - 12:00 pm Cree Industrial Seminar..... Exhibit Hall B

12:00 pm - 1:20 pm Lunch in Exhibit Hall..... Exhibit Hall B

12:30 pm - 1:00 pm General Atomics Industrial Seminar..... Exhibit Hall B

1:00 pm - 1:30 pm OPAL RT Industrial Seminar..... Exhibit Hall B

1:30 pm - 2:00 pm Eaton Industrial Seminar..... Exhibit Hall B

2:00 pm - 3:15 pm Poster Session II..... Exhibit Hall B

3:15 pm - 3:45 pm PM Break..... Exhibit Hall B

3:30 pm - 4:00 pm GE Global Research Industrial Seminar..... Exhibit Hall B

4:00 pm - 4:30 pm Ford Motor Company Industrial Seminar..... Exhibit Hall B

4:30 pm - 5:00 pm JSR Micro Inc./JM Energy Corp Industrial Seminar..... Exhibit Hall B

5:00 pm - 5:30 pm S & C Electric Company Industrial Seminar..... Exhibit Hall B

5:30 pm - 6:00 pm JFE Steel Industrial Seminar..... Exhibit Hall B

**Rap Session - 7:30 pm - 9:00 pm**

301A

302A

R1: The Role of Power Electronics in Smart Grid and Microgrids

R2: Wide Band Gap Power Device Market Trends and Prospects

**WEDNESDAY, SEPTEMBER 19TH, 2012**

7:00 am - 7:00 pm Registration Open ..... Main Lobby

**Breakout Session - 8:00 am - 9:40 am**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B
S37: Resonant DC-DC Converters	S38: Circuit Modeling and Control Applications	S39: Wide Bandgap Semiconductors I	S40: Sensorless Drives I	S41: Special Machines I	S42: PM Machines I	S43: Microgrid Operation and Control I	S44: Low-Voltage Ride Through for Wind Power Converters	S45: Solar Energy PV Converters I	S46: Distributed Power Systems	S47: Contactless Power Transfer I	S48: Multilevel Converters III: Design and Modulation of AC/DC Topologies

9:40 am - 10:00 am AM Break ..... Main Lobby

**Breakout Session - 10:00 am - 11:40 am**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B	402
S49: Control of Isolated DC-DC Converters	S50: Motor Drives for Energy Efficiency	S51: Advanced Silicon Devices and ICs	S52: Sensorless Drives II	S53: Linear Machines	S54: Losses & Thermal in Electric Machines	S55: Microgrid Operations and Control II	S56: Smart Grid Devices and Controls	S57: Control of Wind Power Converters	S58: Ocean and Wave Energy II	S59: Power Converters in Transportation I	S60: AC/DC Converters: PWM Techniques	S61: HVDC for Offshore Wind

11:40 am - 1:30 pm Lunch on own

**Breakout Session - 1:30 pm - 3:10 pm**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B
S61: Single Phase PFC	S62: Power Electronic Devices Applications	S63: Converter-Level Packaging and Integration I	S64: Inverter Issues in Drives	S65: Induction Machine Diagnostics	S66: PM Machines II	S67: Charging of EV I	S68: Renewable Energy System Analysis and Control	S69: Solar Energy PV Converters II	S70: Wind Power Applications	S71: Energy Storage I	S72: Multilevel Converters IV: Modeling

3:10 pm - 3:30 pm PM Break ..... Main Lobby

**Breakout Session - 3:30 pm - 5:10 pm**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B
S73: Single Phase Inverters	S74: LED Drivers and Control I	S75: Magnetic Materials and Design	S76: Common Mode & EMI in Drives	S77: Magnetic Gears in Electric Machines	S78: Losses in Concentrated Winding Machines	S79: Charging of EV II	S80: Circuit and Control Techniques for EMI Reduction	S81: Solar Energy PV Converters III	S82: Energy Storage II	S83: Multilevel Converters IV: Control	

7:00 pm - 9:00 pm ECCE Banquet ..... Ballroom AB

**THURSDAY, SEPTEMBER 20TH, 2012**

7:00 am - 3:00 pm Registration Open ..... Main Lobby

**Breakout Session - 8:00 am - 9:40 am**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B
S84: Resonant DC-DC Converters II	S85: LED Drivers and Control II	S86: Wide Bandgap Semiconductors II	S87: Fault Operation in Drives	S88: Special Machines II	S89: IPM Machines I	S90: Grid Connected Converters	S91: Hybrid Energy System	S92: Operation of Wind Power Systems	S93: Circuits and Control for Distributed Power System	S94: Contactless Power Transfer II	S95: Technologies for High Power AC-AC Converters

9:40 am - 10:00 am AM Break ..... Main Lobby

**Breakout Session - 10:00 am - 11:40 am**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B
S96: Isolated DC-DC Converters	S97: Power Quality and Active Filters	S98: Converter-Level Packaging and Integration II	S99: Control of DC-DC Converters II	S100: DTC in Drives	S101: PM Machine Diagnostics	S102: Power Quality in Smart Grid	S103: Power Flow Control	S104: Operational Issues of Power Converters	S105: Solar Energy - PV System Control	S106: Power Converters in Transportation II	S107: Multilevel Converters V: Design

11:40 am - 1:40 pm Awards Luncheon ..... Ballroom B

**Breakout Session - 1:40 pm - 3:20 pm**

301A	306C	306B	306A	305B	305A	304	303	302C	302B	302A	301B
S108: Single Phase PFC Energy Storage	S109: LED Lighting Technologies	S110: Power Modules and Packaging II	S111: Circuit Modeling and Simulation: DC-DC Converters	S112: Reluctance Drives	S113: IPM Machines II	S114: Fault Detection and Fault Tolerant Schemes	S115: Circuit Modeling and Simulation: Losses and Converter Behavior	S116: DC Transmission and DC Circuit Breakers	S117: Fuel Cells	S118: Energy Storage II	S119: Multilevel Converters VI: Performance Improvement

3:20 pm - 3:40 pm PM Break ..... Main Lobby

**Breakout Session - 3:30 pm - 5:10 pm**

301A	306C	306B	306A	305A	304	303	302C	302B	302A	301B
S120: General Inverter Technologies	S121: AC/DC Power Converters	S122: Passive Components for High Frequency Power Conversion	S123: Circuit Modeling and Simulation: Grid Connected Converters	S124: High Speed Machines	S125: Converter Control Under Abnormal Grid Conditions	S126: Inverter Control Techniques	S127: New Applications and Topologies for FACTS	S128: Advanced Control Strategies	S129: Solar Energy - PV Power Tracking	S130: Multilevel Converter VII: Control

**SATURDAY, SEPTEMBER 15TH, 2012**

3:00 pm - 5:00 pm Registration Open.....Main Lobby  
 7:00 am - 7:00 pm Registration Open.....Main Lobby

**Tutorials Group 1 - 8:30 am - 12:00 pm**

301A	T1-1 Wind Power Generation in a High Penetration Scenario	302A	T1-2 Controlling the Smart Grid: From Challenges to Opportunities	303	T1-3 Advanced Bus Bar System Design	304	T1-4 Switchmode Power Magnetics Design
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12:00 pm - 1:30 pm Lunch on own

**Tutorials Group 2 - 1:00 pm - 5:00 pm**

301A	T2-1 Battery Management Systems for Electric and Plug-In Hybrid Electric Vehicles	302A	T2-2 Advanced Control Architectures for Intelligent MicroGrids	303	T2-3 Power Module Packaging: A Multidisciplinary Integration Approach	304	T2-4 Practical Design and Thermal Challenges of High Power DC-DC Converters in Hybrid Electric Vehicles (HEVs)
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5:00 pm - 7:00 pm Opening Reception.....Ballroom A

**MONDAY, SEPTEMBER 17TH, 2012**

7:00 am - 7:00 pm Registration Open.....Main Lobby  
 8:00 am - 10:00 am Plenary Session.....Ballroom C  
 10:00 am - 10:20 am AM Break.....Main Lobby

**Breakout Session 10:20 am - 12:00 pm**

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	SS1							
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305B	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B	Room: 402							
10:20 am	Non-Isolated DC-DC Converter Topologies	Envelope Amplifier Based On a Hybrid Series Converter with the Slow-Envelope Technique	Modulation Scheme Analysis for High Efficiency Three-phase Buck Rectifier Considering Different-Device Combinations	Control of Grid-Connected Inverters	Regions of Active Damping Control for LCL Filters	Numerical Study of a Liquid Metal Heat Spreader for Power Semiconductor Devices	Thermal Management	Predictive Control in Drives	Induction Machines	Control of Converter for Grid Application	Harmonics in Smart Grid	Power Converters for Wind Applications	Contactless Power Transfer for EV Applications	AC-DC Converters	Multilevel Converters I: General Topologies	Single Stage Buck-Boost DC-AC Neutral Point Clamped Inverter	Optimal Zero-Vector Configuration for Space Vector Modulated AC-DC Matrix Converter	Variable Sampling Slope (VSS) and No-Deadtime Pump Generator (NDRG) Techniques for Closed-Loop Interleaving Power Factor Correction (PFC) Design with Suppression of Current Mismatch	Nested Multilevel Configurations	Experimental Power Grid Center-A Flexible Research Platform for Low Voltage Grids
10:45 am	Buck/Boost DC-DC Converter with Simple Auxiliary Snubber and Complete Soft Switching in Whole Operating Region	Improved RTGC System with Voltage Compensation Converter to Reduce Fuel Consumption	Precise Modeling and Analysis of DQ-Frame Current Controller for High Power Converters with Low Pulse Ratio	Junction Temperature Measurement of IGBTs Using Short Circuit Current	Deadlock Avoidance in Model Predictive Direct Torque Control	The Incremental Design Improvement of Commercially Manufactured Induction Motors	High Gain High Efficiency Front End Resonant DC-DC Boost Converter for PV Microinverter	Autonomous Control of Inverter-Interfaced Distributed Generation Units for Harmonic Current Filtering and Resonance Damping in an Islanded Microgrid	A Three-Phase to Three-Phase Quasi-Z-Source Matrix Converter for Residential Wind Energy Systems	A Large Air Gap 3kW Wireless Power Transfer System for Electric Vehicles	A 90 Percent Efficient 5kW Inductive Charging System for EV's	Measurement-Based Analytical Model of Conduction and Switching Losses of Three-Phase AC-DC Matrix Rectifier	Development of High Power Density Flying Capacitor Multi-level Converters with Balanced Capacitor Voltage	Addressing the Needs of an Emerging Fleet of Hybrid and Electric Vehicles	Comparison Study of 12kV n-type SiC IGBT with 10kV SiC MOSFET and 6.5kV Si IGBT based on 3L-NPC VSC applications	Single-Phase Semi-Bridge Five-Level Flying-Capacitor Rectifier	FreEM Systems: The Energy Internet			
11:10 am	High-Voltage Tapped-Inductor Buck Converter Auxiliary Power Supply for Cascaded Converter Submodules	Dynamic Modeling of Losses in Electrical Machines for Active Loss Control	Improved Discrete Current Controller for Grid-Connected Voltage Source Converters in Distorted Grids	Time-Dependent Finite Volume Model of a Thermoelectric Device	Predictive Current Control of a Six-Phase Asynchronous Drive System Based on Parallel Connected Back-to-Back Converters	Design and Tests on a Fractional-Slot Induction Machine	Grid Synchronization of Three-Phase Converters Using Cascaded Complex Vector Filter PLL	Non-Intrusive Active Power Clamp Filter on PLC Channels for Smart Grid Applications	A Transformerless Generator-Converter Concept making feasible a 100 kW Light Offshore Wind Turbine Part I - The Generator	A Transformerless Generator-Converter Concept Making Feasible a 100 kW Light Weight Offshore Wind Turbine Part I - The Generator	A Practical Directional Third Harmonic Hybrid Active Filter for Medium Voltage Utility Applications	Black Start Control of a Solid State Transformer for Emergency Power Restoration	Grid Synchronization of Three-Phase Converters Using Cascaded Complex Vector Filter PLL	Design and Tests on a Fractional-Slot Induction Machine	Predictive Current Control of a Six-Phase Asynchronous Drive System Based on Parallel Connected Back-to-Back Converters	Time-Dependent Finite Volume Model of a Thermoelectric Device	Improved Discrete Current Controller for Grid-Connected Voltage Source Converters in Distorted Grids	Dynamic Modeling of Losses in Electrical Machines for Active Loss Control		
11:35 am	High-Voltage Tapped-Inductor Buck Converter Auxiliary Power Supply for Cascaded Converter Submodules	Dynamic Modeling of Losses in Electrical Machines for Active Loss Control	Improved Discrete Current Controller for Grid-Connected Voltage Source Converters in Distorted Grids	Time-Dependent Finite Volume Model of a Thermoelectric Device	Predictive Current Control of a Six-Phase Asynchronous Drive System Based on Parallel Connected Back-to-Back Converters	Design and Tests on a Fractional-Slot Induction Machine	Grid Synchronization of Three-Phase Converters Using Cascaded Complex Vector Filter PLL	Non-Intrusive Active Power Clamp Filter on PLC Channels for Smart Grid Applications	A Transformerless Generator-Converter Concept making feasible a 100 kW Light Offshore Wind Turbine Part I - The Generator	A Transformerless Generator-Converter Concept Making Feasible a 100 kW Light Weight Offshore Wind Turbine Part I - The Generator	A Practical Directional Third Harmonic Hybrid Active Filter for Medium Voltage Utility Applications	Black Start Control of a Solid State Transformer for Emergency Power Restoration	Grid Synchronization of Three-Phase Converters Using Cascaded Complex Vector Filter PLL	Design and Tests on a Fractional-Slot Induction Machine	Predictive Current Control of a Six-Phase Asynchronous Drive System Based on Parallel Connected Back-to-Back Converters	Time-Dependent Finite Volume Model of a Thermoelectric Device	Improved Discrete Current Controller for Grid-Connected Voltage Source Converters in Distorted Grids	Dynamic Modeling of Losses in Electrical Machines for Active Loss Control		



MONDAY, SEPTEMBER 17TH, 2012 continued

12:00 pm - 1:30 pm Lunch on own

Breakout Session 1:30 pm - 3:35 pm

	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305B	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B
1:30 pm	Control of Non-Isolated DC-DC Converters	Energy Harvesting for Low Power Electronics Applications	Adaptive Voltage Tracking Control of Zeta Buck-Boost Converters	Planar Bond All: A New Packaging Technology for Advanced Automotive Power Modules	Current Measurement & Control in Drives	Concentrated Winding PM Machines	Grid-Connected Inverters with LCL Filters	Smart Grid Devices	EMI Modeling and Filter Design	Energy Storage I	Higher Power and Aerospace Applications	Multilevel Converters II: Applications
1:55 pm	One Novel Remote Sensing method for on-board Voltage Regulator in Computing System	Reducing Detent Force While Harvesting Energy from Center of Gravity: an 11-poles, 12-slots Generator Design	A Novel Predictive Phase Shift Controller for Bidirectional Isolated DC to DC Converter for High Power Applications	A 6.5kV, Wire-Bondless, Double-Sided Cooling Power Electronics Module	Six-Step Operation of PMSM with Instantaneous Current Control	Scalability Characteristics of Magnetic Circuit Model for Fractional-Slot Concentrated Winding IPM Machines	Synthesis of Active Damping for Grid-Connected Inverters with an LCL filter	Design and Evaluation of a Universal Power Router for Residential Applications	EMI study of a 70 kW Interleaved Three-Phase Inverter for Aircraft Application	LCL Filter Utilized in Battery Charging Applications to Achieve Compact Size and Low Ripple Charging	Optimal Design and Experimental Validation of a Medium-Frequency 400kVA Power Transformer for Railway Traction Applications	Startup and Low-Speed Operation of an Adjustable-Speed Motor Driven by a Modular Multilevel Cascade Inverter (MMCI)
2:20 pm	Linearized Sensory Adaptive Voltage Positioning Controller for DC-DC Boost Power Converter	The Effect of Reflections on the Performance of an Acoustic Energy Transfer System	Optimum Design of Magnetic Inductive Energy Harvester and its AC-DC Converter	Characterization of 4.5kV - 5.5 kA IGBTs within a Medium Voltage 3L-ANPC Phase Leg	Compensation of Current Measurement Error for Current-Controlled PMSM Drives	Effect of Stator Shifting on Harmonic Cancellation and Flux Weakening Performance of Interior PM Machines Equipped with Fractional-Slot Concentrated Windings for Hybrid Traction Applications	Design of LCL Filters in Consideration of Parameter Variations for Grid-Connected Converters	Design Considerations in Development of Active Mobile Substations	Modeling and Reduction of Conducted EMI in SiC JFET Motor Drives with Insulated Metal Substrate	Dynamic Control of Energy Storage System for Stable Operation of Wind Power Plant	Linearizing Control of Shipboard Multi-Machine MWDC Power Systems feeding Constant Power Loads	Investigation on IGBT-Based NPC/H-Bridge Large Power Converter
2:45 pm	Boundary Control of Buck-Boost Converters: Normalized Transistors and the Natural Switching Surface	Investigating the Scope for Electroplated Magnetic Alloys in Shielding of PCBs	Small-Signal Modeling of the Interleaved Boost with Voltage Multiplier	Reduction of the Stray Inductance in a Switching Cell using the Power Chip-On-Chip 3D Integration Concept	Maximum-Torque-per-Ampere Control of High-Torque Density Multiphase Drives Based on Induction Motors	Design and Analysis of PM Fractional Slot Machine Considering the Fault Operation	Magnetic Integration of an LCL Filter for the Single-Phase Grid-Connected Inverter	Ultra Fast Protection of Radial and Looped Electric Power Grid Using a Novel Solid State Protection Device	Modeling and Design of Common-mode Inductor for Conductive EMI Noise Suppression in Dc-fed Motor Drive System	An Axial Flux Flywheel Motor/Generator for Pulsed Power Application	A Novel Three-Phase Four-Wire Active Power Filter Applicable to Aircraft Power System	Modular Multilevel Converter AC Motor Drives with Constant Torque from Zero to Nominal Speed
3:10 pm	Current-Balancing Controller Requirements of Automotive Multi-Phase Converters with Coupled Inductors	Ocean Energy Power Take-Off using Oscillating Paddle	Optimum Design of a Three Phase Dual Active Bridge Based on Reactive Power Flow	Compact High Temperature Package with Smart Size-Optimized Gate Drive Unit for assembly of the Dual-IGT	A DSP-Based Resolver-to-Digital Conversion Using Pulse Excitation	Integrated Generator for More Electric Engine: Design and Testing of a Scaled Size Prototype	Design of Injected Grid Current Regulator and Capacitor-Current-Feedback Active-Damping for LCL-type Grid-Connected Inverter	State of Art of Power Electronics in Circuit Breaker Technology	A Novel Dithering Algorithm to Reduce the Electro-Magnetic Interference (EMI) in Single Phase DC/AC Inverters	Level-Shifted PWM for a Multilevel Traction Converter Using a State Composer	Level-Shifted PWM for a Multilevel Traction Converter Using a State Composer	A Battery Energy Storage System With a Modular Push-Pull PWM Converter

Exhibit Hall Open.....Exhibit Hall B  
 Expo Reception Supported by OPAL RT.....Exhibit Hall B  
 Student Demonstrations.....Exhibit Hall B  
 Industry Student Dinner Supported by GE Global Research and Eaton (ticketed function).....Exhibit Hall B

4:00 pm - 10:00 pm  
 4:00 pm - 6:00 pm  
 4:00 pm - 6:00 pm  
 7:00 pm - 10:00 pm



TUESDAY, SEPTEMBER 18TH, 2012 continued

Rep Session - 7:30 pm - 9:00 pm

301A

R1: The Role of Power Electronics in Smart Grid and Microgrids

302A

R2: Wide Band Gap Power Device Market Trends and Prospects

WEDNESDAY, SEPTEMBER 19TH, 2012

7:00 am - 7:00 pm

Registration Open.....

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..... Main Lobby

Breakout Session 8:00 am - 9:40 am

	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305B	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B
	Resonant DC-DC Converters I	Circuit Modeling and Control Applications	Wide Bandgap Semi-Conductors I	Sensorless Drives I	Special Machines I	PM Machines I	Microgrid Operation and Control I	Low-Voltage Ride Through for Wind Power Converters	Solar Energy - PV Converters I	Distributed Power Systems	Contactless Power Transfer I	Multilevel Converters III: Design and Modulation of AC-DC Topologies
8:00 am	Performance Analysis of Secondary Phase Shift ZVS DC-DC Converter for High Voltage Application	Variable Sampling Time Finite Control-Set Model Predictive Current Control for Voltage Source Inverters	Reliability of 4H-SiC SBD/BS Diodes under Repetitive Surge Current Stress	Sensorless Control of Doubly-Fed Induction Generators Based on Rotor High Frequency Signal Injection	Alternative Excitation Strategies for a Wound Rotor Synchronous Machine Drive	Report on IEEE Standard Working Group P1812 on Guide for testing Permanent Magnet Machines	Transient Characteristics for Load Changes of a Doubly-Fed Induction Generator Applied to Gas Engine Cogeneration System in Stand-alone Operation	A Novel Topology for Enhancing the Low Voltage Ride through Capability for Grid Connected Wind Turbine Generators	From H4, H5 to H6 --Standardization of Full-Bridge Single Phase Photovoltaic Inverter Topologies without Ground Leakage Current Issue	Optimal Mix and Placement of Energy Storage Systems in Power Distribution Networks for Reduced Outage Costs	Heat Distribution Control using Current Amplitude and Phase Angle in Zone-Control Induction Heating Systems	Optimized LCL Filter Design Methodology Applied to MV grid-connected Multimegawatt VSC
8:25 am	A ZVS PWM Full Bridge Converter with Self-Regulating Auxiliary Current	Small Signal Modeling and Controller Design of a Bidirectional Quasi-Z-Source Inverter for Electric Vehicle Applications	Advanced Silicon Carbide Gate Turn-Off Thyristor for Energy Conversion and Power Grid Applications	Robust Initial Rotor Position Estimation of Permanent Magnet Brushless AC Machines with Carrier Signal Injection-Based Sensorless Control	Brushless Doubly Fed Reluctance Machine Rotor Design	Non-Linear Scaling Rules for Brushless PM Synchronous Machines Based on Optimal Design Studies for a Wide Range of Power Ratings	Improved Power Control Bandwidth of Grid-Forming Sources in a CERTS Microgrid	Control Algorithm for a Doubly Fed Induction Generator in Medium Voltage Wind Power System under Fault Ride Through and Unbalanced Grid Conditions	Design and Implementation of Grid Connected Photovoltaic Micro Inverter	A Modified Boost Topology with Simultaneous AC and DC Load	Novel Control Approach to Achieving Efficient Wireless Battery Charging for Portable Electronic Devices	Design and control of high performance modular hybrid asymmetrical cascade multilevel inverters with active voltage balance and low losses
8:50 am	Optimization of a Series Resonant DC/DC Converter for Traction Applications	A Novel Pulse Width Modulation Technique with Active DC voltage Balancing and Device Voltage Falls Compensation for High-Power Cascaded Multilevel Active Rectifiers	Characterization of a new 6.5 kV 1000 A SiC diode module for medium voltage converters	Signal-Injection-Based Sensorless IPM Traction Drive for Wide-Torque Range Operation at Low Speed	Integrated AC and DC Excitation Method for Brushless Synchronous Machine	Optimum Design and Technology Evaluation of Slip Permanent Magnet Generators for Wind Energy Applications	Inverter-Based Microgrid Control and Stable Islanding Transition	A Series Reactor Based Converter Protection Scheme of Doubly Fed Induction Generator for Low Voltage Ride Through	Multi-Mode Control for Photovoltaic Grid-connected Interleaved Flyback Micro-inverters to Achieve High Efficiency in Wide Load Range	Regenerative Power Converters Representation of Grid Control and Actuation Emulator	Omi-directional Inductive Power Transfer System for Mobile Robots Using Evenly Displaced Multiple Pick-ups	Space Vector and Carrier-Based PWM Modulation Schemes for Maximum Utilization of Voltage Sources of a Nine-Switch Converter
9:15 am	A hybrid ZVS full-bridge Converter with Transformer Winding Series-parallel Auto Regulated Current Doubler Rectifier	Analysis and Design of Average Current Mode Control Using Describing Function-Based Equivalent Circuit Model	Comparison of 6.5 kV Silicon and SiC Diodes	Compensation of Inverter Non-linearity Based on Trapezoidal Voltage	Reducing Conduction Losses in Permanent Magnet Synchronous Motor by Multiple Power Supplies	Low Cost Axial Flux PM Generator for Small Wind Turbines	Quantitative Analysis of System Parameters Asymmetry on Droop-Controlled Converters	Operation and Thermal Loading of Three-level Neutral-Point-Clamped Wind Power Converter under Various Grid Faults	A Novel Active Power Decoupling Method for Single-Phase Photovoltaic or Energy Storage Applications	An Improved Design of Virtual Output Impedance Loop for Droop-Controlled Parallel Three-Phase Voltage Source Inverters	Analysis, design and control of a Double-Input Contactless Resonant Converter	A New Modulation Method for a 13 Levels Asymmetric Inverter that operates with minimum THD

9:40 am - 10:00 am

AM Break.....

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..... Main Lobby

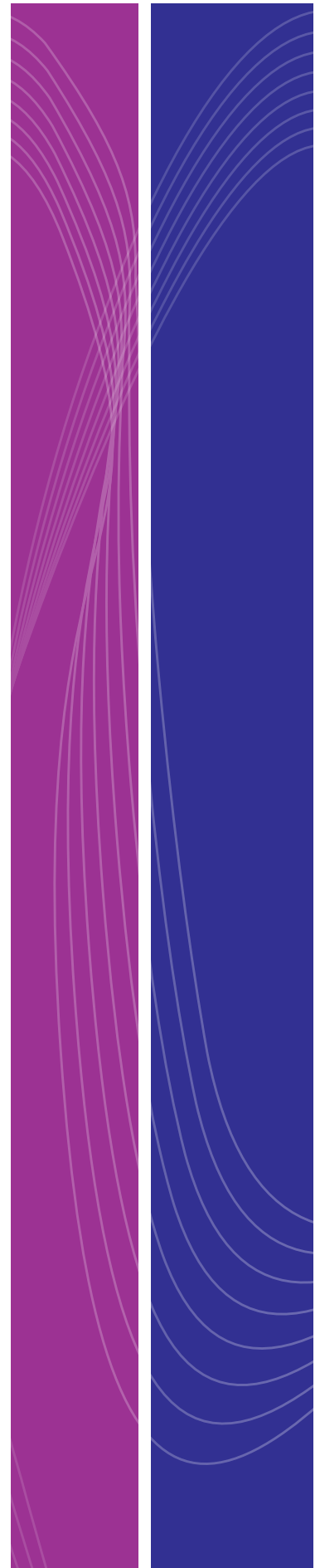


WEDNESDAY, SEPTEMBER 19TH, 2012 *continued*

Breakout Session 10:00 am - 11:40 am

	S49	S50	S51	S52	S53	S54	S55	S56	S57	S58	S59	S60	S63
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305B	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B	Room: 402
	Control of Isolated DC-DC Converters	Motor Drives for Energy Efficiency	Advanced Silicon Devices and ICs	Sensorless Vector Drives II	Linear Machines	Losses & Thermal in Electric Machines	Microgrid Operation and Control II	Smart Grid Devices and Controls	Control of Wind Power Converters	Ocean and Wave Energy II	Power Converters in Transportation I	AC-DC Converters: PWM techniques	HVDC for Offshore Wind
10:00 am	Two Novel Control Methods Expanding Input-output Operating Range for a Bi-Directional Isolated DC-DC Converter with Active Clamp Circuit	Time Optimal and Loss Minimizing Deadbeat Direct Torque and Flux Control for Interior Permanent Magnet Synchronous Machines	Dual-GCT Design Criteria and Voltage Scaling	Sensorless Vector Control of Doubly Fed Induction Machine Using a Reduced Order Observer Estimating Rotor Speed and Stator Variables	State Space-Vector Model of Linear Induction Motors	Core Loss Prediction in Electrical Machine Laminations Considering Skin Effect and Minor Hysteresis Loops	Anti-Islanding Protection in Multiple-Phase Converters Using Grid Synchronization Small-Signal Stability	Efficient Energy Extraction of Wind Power Networks in Urban Environment	Advanced structures for grid synchronization of power converters in distributed generation applications	Effect of Energy Storage on a Combined Wind and Wave Energy Farm	An Interleaved ZVS Full-Bridge DC-DC Converter with Capacitive Output Filter for a PHEV Charger	Unified Pulse Width Modulated Three-Phase Four-Leg Inverter Based on Dual-Buck Power Cell	State-of-the-Art VSC HVDC for Wind
10:25 am	A Zero Voltage and Zero Current Soft Switching PWM DC-DC Converter with Secondary-side Phase-Shifting Active Rectifier	Optimal Motion Trajectories Minimizing Loss of Induction Motor Under Amplitude Limits	A Novel High Speed and High Current FET Driver with Floating Ground and Integrated Charge Pump	Estimated-Speed-Aided Stabilizers for Sensorless Control of Interior Permanent Magnet Synchronous Machines	Torque Decomposition and Control in an Iron Core Linear Permanent Magnet Motor	Thermal Model and Analysis of Wound Rotor Induction Machine	Active Islanding Detection for Multiple Parallel-Connected Inverter-Based Distributed Generators Using High-Frequency Signal Injection	Distributed Model Predictive Control of Multi-Functional Power Conditioner System for Building Energy Efficiency	Simple, Fast and Accurate Maximum Power Point Tracking Converter for Thermoelectric Generators	DSP-Based Marine Current Turbine Emulator Using a 3-Phase Inverter	Theoretical Analysis of DC Link Capacitor Current Ripple Reduction in the HEV DC-DC Converter and Inverter System Using a Carrier Modulation Method	Three-Phase Multi-Module VSIs Using SHE-PWM with Reduced Zero-Sequence Circulating Current	Multi-Terminal DC Power System to Enable Grid Integration of Distributed Generation
10:50 am	Fast Transient Boundary Control of the Dual Active Bridge Converter Using the Natural Switching Surface	Efficiency Improvement of Permanent-Split-Capacitor Motors in HVAC Applications Using a Two-Phase Asymmetrical Inverter	Substrate Switching Noise Analysis and Layout/Circuit Considerations in Monolithic Power Converters	Current Regulated Pulse Width Modulation Controller Impact on Low Speed Performances of Industrial Sensorless Adjustable Speed Drives Under Sliding Mode Variable Structures	Parameter Identification of Linear Induction Motor Model in Extended Range of Operation by Means of Input-Output Data	The Impact of Rotating Field on Core Loss Estimation in Electrical Machine Laminations	An Adaptive Sliding Mode Controller for Enhanced Q-V Droop in a Microgrid	An Energy Management System for a Community Energy Storage System	Modeling and Analysis of Brushless Generator Based Biomechanical Energy Harvesting System	Optimal Control of Generators for Water Current Energy Harvesting	Dual Voltage Source Inverter Topology Extending Machine Operating Range	Soft-Switched Hybrid Modulation Scheme for Pulsating-DC-Link Converters	Wind Power Plant Control for the Connection to Multiterminal HVDC Links
11:15 am	A New Configuration of Bi-Directional Isolated DC-DC Converter Using Dual Half-Bridge Controlled Bridge with Pulse Current Link Concept	Peak Power Shaving of an Electric Injection Molding Machine with Supercapacitors	A Modified Model for MOSFET and Parameter Optimization Using Excel-Based Genetic Algorithm	Sinusoidal Current Shaping in Variable-Speed Distributed Generating Units with Low-Resolution Position Sensors	Double-Sided Flux-Switching Linear Synchronous Machine with Yokeless Translator	Innovative Thermal Model for the Estimation of Permanent Magnet and Stator Winding Temperatures	Transient Load Sharing Between Inverters and Synchronous Generators in Islanded Microgrids	Cooperative Control for Active Power Compensators Allocated in Distributed Network	Design and Evaluation of Interior Permanent Magnet Compressor Motors for Commercial Transcritical CO2 (R-744) Heat Pump Water Heaters	Investigation of the Electrical System Design Concept and Grid Connection of Ocean Energy Devices to an Offshore Storage System	A Segmented Traction Drive System with a Small DC Bus Capacitor	Options for Ground Fault Clearance in HVDC Offshore Networks	

11:40 am - 1:30 pm  
Lunch on own



**WEDNESDAY, SEPTEMBER 19TH, 2012** *continued*

**Breakout Session 1:30 pm - 3:10 pm**

	S61	S62	S63	S64	S65	S66	S67	S68	S69	S70	S71	S72
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305B	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B
	Single Phase PFC	Power Electronic Devices Applications	Converter-Level Packaging and Integration I	Inverter Issues in Drives	Induction Machine Diagnostics	PM Machines II	Charging of EV I	Renewable Energy System Analysis and Control	Solar Energy - PV Converters II	Wind Power Applications	Energy Storage I	Multilevel Converters IV: Modeling
1:30 pm	A High Performance Single-Phase AC-DC PFC Boost Converter with Passive Snubber Circuit	Optimization of a High Density Gallium Nitride Based Non-Isolated Point of Load Module	Design of a Flexible, Very Low Profile, High Step-Up PV Module Integrated Converter	PV/AM Boost Converter-Inverter System for EV Engine Starter/Alternator	Monitoring of Air-Gap Eccentricity for Inverter-Fed Induction Motors Based on the Differential Inductance	Design of Experiments to Address Manufacturing Tolerances and Process Variations Influencing Cogging Torque and Back EMF in the Mass Production of Permanent Magnet Synchronous Motors	Power Flow Steering for Electric Vehicle Fast Charging Station	Methods for Stability Analysis of Unbalanced Three-Phase Systems	Modeling and Controller Design of Quasi-Z-Source Inverter with Battery Based Photovoltaic Power System	Solid State Transformer Interfaced Wind Energy Systems with Integrated Active Power Transfer, Reactive Power Compensation and Voltage-Conversion Functions	Black-Box Model and Identification Methodology for PEM Fuel Cell with Overshooted Transient Response	Modeling and Analysis of the Cascaded H-Bridge Multilevel Inverter Using RMS Feedback Control
1:55 pm	A Three-Level Integrated AC-DC Converter	1200V SiC MOS-FETs for high voltage power conversion	Three-Level Driving Method for GaN Power Transistor in Synchronous Buck Converter	Advantages of High-Frequency PWM in AC Motor Drive Applications	Small-Signal Transient Analysis of Induction Machines with Stator Inter-Turn Faults using Dynamic Phasors	Harmonic Contents in Induced EMF and Electromagnetic Torque in Mass Produced Sinusoidal PM Brushless Machines	Charging Rate Optimization for Plug-In Hybrid Electric Vehicles in Smart Grid	Active and Reactive Power Management of Photovoltaic-Based Interline Dynamic Voltage Restorer in Low Voltage Distribution Networks	A New Class of PV Inverters: Series Partial Resonant Converters	A Robust Real-Time Maximum Power Point Tracking (MPPT) Method for Wind Power Systems	Forecasting the State-of-Charge of Li-Ion Batteries using Fuzzy Inference System and Fuzzy Identification	Active DC Link Voltage Ripple Reduction in DC-AC Power Cells Based Topologies
2:20 pm	A Low Common Mode Noise Bridgeless Boost-Buck-Boost Power Factor Correction Rectifier	Design and Performance of an All-SiC Three-Phase Buck Rectifier for High Efficiency Data Center Power Supplies	A Novel High Efficiency Gate Drive Circuit for Normally Off Type GaN-FET	Control of Three Phase Inverter for AC Motor Drive with Small DC-Link Capacitor Fed by Single Phase AC Source	Evaluation of the Influence of Rotor Axial Air Duct Design on Condition Monitoring of Induction Motors	Comparison of a Conventional and Modified Spoke-type Ferrite Magnet Motor for traction Drives of Low-speed Electric Vehicles	Smart Charger for Electric Vehicles with Power Quality Compensator on Single-Phase Three-Wire Distribution Feeders	Reactive Power Control Methods for Improved Reliability of Wind Power Inverters Under Wind Speed Variations	Fabrication Processes and Experimental Validation of a Planar PV Power System with Monolithically Embedded Power Converters	Wind Plant Power Prediction by Using Neural Network Methods	Automatic Power Monitor (APM) in Switching Charger with Smooth Transition Loop Selector (STLS) for High-energy Throughput System	Output Impedance Modeling of a Multilevel Modular Switched-Capacitor Converter to Achieve Continuously Variable Conversion Ratio
2:45 pm	Optimal Control for Sub-Unity Power Factor Correction	High Frequency GaN Devices enabled Cubesat EPS with Real-Time Scheduling	High-Speed Resonant Gate Driver with Controlled Peak Gate Voltage for Silicon Carbide MOSFETs	Control Method of Calculating Optimum DC Bus Voltage to Improve Drive System Efficiency in Variable DC Bus Drive System	Discriminating Rotor Cage Faults and Mechanical Load Oscillations in Three-Phase Induction Motors by The Stator Instantaneous Complex Apparent Impedance	Modeling and Analysis of Effects of Skew on Torque Ripple and Stator Tooth Forces in Permanent Magnet Machines	Review of Benefits and Challenges of Vehicle-to-Grid Technology	Control of Offshore Wind Farms Based on HVDC	Combined Active/Reactive Power Control for Flicker Mitigation in Distributed Wind Power (DWT)	Discrimination and Screening Method for a Li-Ion Cell based on Discrete Wavelet Transform		

3:10 pm - 3:30 pm

PM Break

Main Lobby

WEDNESDAY, SEPTEMBER 19TH, 2012 *continued*

Breakout Session 3:30 pm - 5:10 pm

S73 Room: 301A	S74 Room: 306C	S75 Room: 306B	S76 Room: 306A	S77 Room: 305B	S78 Room: 305A	S79 Room: 304	S80 Room: 302C	S81 Room: 302B	S82 Room: 302A	S83 Room: 301B
Single Phase Inverters	LED Drivers and Control I	Magnetic Materials and Design	Common Mode & EMI in Drives	Magnetic Gears in Electric Machines	Losses in Concentrated Winding Machines	Charging of EV II	Circuit and Control Techniques for EMI Reduction	Solar Energy -PV converters III	Energy Storage II	Multilevel Converters IV: Control
1MHz Variable Multi Sampling Digital Control of Single Phase PWM Inverter Using FPGA Based Hardware Controller	Improving the Design of the Asymmetrical Half-Bridge Converter without Electrolytic Capacitor for Low-Voltage Output-Voltage ac-dc LED Drivers	Iron Loss Calculation of AC Filter Inductor for Three Phase PWM Inverter	Common-Mode Voltage Reduction for Regenerative AC Drives	Improved Motor Integrated Permanent Magnet Gear for Traction Applications	Calculation of Magnet Losses in Concentrated-Winding Permanent Magnet Synchronous Machines Using a Computational Efficient - Finite Element Method	Bi-directional Power Flow Rapid Charging System Using Coupled Inductor for Electric Vehicle	Topology and PWM Method Dependency of High Frequency Leakage Current Characteristics of Inverter Driven AC Motor Drives	Transformer-Less Photovoltaic (PV) Inverters: A Critical Comparison	A New Medium Voltage Energy Storage Converter Topology With Medium Frequency Transformer Isolation	Predictive Control of a Three-Phase DC-AC Modular Multilevel Converter
3:30 pm										
A New Quasi-Resonant DC Link for Single Phase Micro Inverter	A Primary Side Control Scheme for Triac Dimmable LED Driver Based on Indirect Output Current Sensing	A Novel Integrated Magnetic Structure Suitable for Transformer-Linked Interleaved Boost Chopper Circuit	Reduction of Shaft Voltages and Bearing Currents in Five-Phase Induction Motors	Analysis and Design of a Trans-Rotary Magnetic gear	Analytical Model of Magnet Eddy-Current Volume Losses in Multi-Phase PM Machines with Concentrated Winding	Modeling of a Grid-Connected, Multifunctional Electric Vehicle Charging Station in Active Filter Mode with DQ Theory	Non-Ideal Smoothing Transformer as Effective Differential Mode Filter	A Single-Switch Isolated DC-DC Converter for Photovoltaic Systems	Optimal Energy Management of an Improved Inverter with Energy Storage Capacity Based on Dynamic Programming	Control of the Modular Multilevel Cascade Converter Based on Triple-Star Bridge-Cells (MMCC-TSBC) for Motor Drives
3:55 pm										
Design of Variable-Resistance Class E Inverters for Load Modulation	A Simple Precise Capacitive Current Balancing Method for the Multi-Output LED Drivers	Design of Multi-Permeability distributed Air-Gap Inductors	A Chirp PWM Scheme for Brushless DC Motor Drives	Performance of a Magnetic Gear Using Ferrite Magnets for Low Speed Ocean Power Generation	Finite Element Analysis and Preisch-Hyster-Toroid Compared to Measurements	Integrated Electric Motor Drive and Power Electronics for Bidirectional Power Flow between Electric Vehicle and DC or AC Grid	An Optimal Minimum-Component Input Filter Design and its Stability Analysis for a Transformer-Coupled Zero Voltage Switching Buck-Boost DC-DC Converter	A Survey and Extension of High Efficiency Grid Connected Transformerless Solar Inverters with Focus on Leakage Current Characteristics	The Effect of Low Frequency Current Ripple on the Performance of a Lithium Iron Phosphate (LFP) Battery Energy Storage System	Multi-Objective Optimization PWM Control for a Back-to-Back Five-Level ANPC Converter
4:20 pm										
Implementation and Control of a Bidirectional High-Gain Transformerless Standalone Inverter	A Loss-Adaptive Self-Oscillating Buck Converter for LED Driving	Modeling and Measured Verification of Stored Energy and Loss in MEMS Toroidal Inductors	Design-Oriented Analysis and Performance Evaluations of AC Inductors and Unique DC-Link Choke Configurations in Industrial Adjustable Speed Drives	An Electric Machine Integrated with Trans-Rotary Magnetic Gear	Small Signal Modeling and Networked Control of a PHEV Charging Facility			A High-Frequency-Link Photovoltaic Inverter	DC Distribution System Architecture and Controls for Wind Power Applications	Simplified Dynamics and Control of a Modular Multilevel Converter Based on a Terminal Behavioral Model
4:45 pm										
7:00 pm - 9:00 pm	ECCE Banquet..... Ballroom AB									

7:00 pm - 9:00 pm

ECCE Banquet.....

Ballroom AB



THURSDAY, SEPTEMBER 20TH, 2012

Registration Open..... Main Lobby

7:00 am - 3:00 pm

Breakout Session 8:00 am - 9:40 am

	S84	S85	S86	S87	S88	S89	S90	S91	S92	S93	S94	S95
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305B	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B
	Resonant DC-DC Converters II	LED Drivers and Control II	Wide Bandgap Semi-conductors II	Fault Operation in Drives	Special Machines II	IPM Machines I	Grid Connected Converters	Hybrid Energy System	Operation of Wind Power Systems	Circuits and Control for Distributed Power System	Contactless Power Transfer II	Technologies for High Power AC-AC Converters
8:00 am	Study on the Start-Up Schemes for the Three-Stage Solid State Transformer Applications	An Integrated Lighting Unit with Regulated Pulse Current Driving Technique	High Temperature Ultrafast Isolated Converter to Turn-Off Normally-On SiC JFETs	Identifying Ground Fault Location in High Resistance Grounded System for Adjustable Speed Drive at Low Speed	Axial-Flux Hybrid-Excitation Synchronous Machine: Analysis, Design and Experimental Evaluation	Design and Evaluation of a Variable-Flux Inverter-Based Interior Permanent Magnet Machine	Multi-Objective Operation of Cascade Inverter-Based Voltage Quality Disturbance Generator	Modeling and Control System Design for an Integrated Solar Generation and Energy Storage System with a Ride-Through Capability	Sensorless Small-Scale Variable Speed Wind Energy Conversion System Incorporating DTC-SVM of Direct-Drive PMSG with RLC Filter	Current Sensorless Control for Bidirectional Full-Bridge Converter in DC Distributed System	Recent Progress in Mid-Range Wireless Power Transfer	Loss Comparison between SiC Hybrid Si/SiC and Si Devices in Direct AC/AC Converters
8:25 am	An LLC Resonant Full-Bridge Inverter-Link DC-DC Converter with an Anti-Resonant Circuit for Practical Voltage Step-Up/Down Regulation	Variants of Current-Mirror Circuits for Reducing Current Imbalance in Parallel LED Strings	The Modeling and Characterization of Silicon Carbide Gate Turn Off Thyristors	Fast Fault Detection, Isolation and Reconfiguration in Fault-Tolerant Permanent Magnet Synchronous Motor Drives	Design of a Blood Pump for a Wearable Artificial Kidney Device	Design Considerations of a Brushless Open-Slot Radial-Flux PM Hub-Motor	Control and Modulation Scheme for a Cascaded H-Bridge Multi-Level Converter in Large Scale Photovoltaic Systems	Evaluation of Impact of Energy Storage on Effective Load Carrying Capability of Wind Energy	Optimum Control of Grid Connected Interior Permanent Magnet Wind Turbine Generator	Tuning of the Load Adaptive Controller for DC-AC Converter in LVDC Power Distribution	Magnetic Link Optimization for Wireless Power Transfer Applications: Modeling and Experimental Validation for Resonant Tubular Copper Coils	Experimental Validation of Active Snubber Circuit for Direct AC-AC Converters
8:50 am	An Interleaved LLC Resonant Converter Operating at Constant Switching Frequency	Capacitor Clamped Current Sharing Circuits for Multi-String LEDs	Static and Dynamic Characterization of 6.5kV, 100A SiC Bipolar PIN Diode Modules	A New Method for Modeling and Vector Control of Unbalanced Induction Motors	Comparison of Alternate Mechanically Adjusted Variable Flux Switched Flux Permanent Magnet Machines	A Svr and IPM Machine Design Methodology Assisted by Optimization Algorithms	Control of Cascaded H-Bridge Multilevel Inverter with Individual MPPT for Grid-Connected Photovoltaic Generators	An Isolated Multiport DC-DC Converter for Simultaneous Power Management of Multiple Renewable Energy Sources	Integrated Risk Management for Renewable Energy Investment over Life Cycle	Approach for Highly Efficient and Ultra Compact Converters in Next Generation 380 V DC Distribution System	Equivalent Complex Permeability and Conductivity of Litz Wire in Wireless Power Transfer Systems	Efficiency Comparison of AC-Link and TIPS (SST) Topologies Based on Accurate Device Models
9:15 am	Inductorless Forward-Flyback Soft-Switching Converter with Dual Constant On-Time Modulation for Photovoltaic Applications	A New Primary Side Controlled High Power Factor Single-Stage Flyback LED Driver	High Performance, Ultra High Voltage 4H-SiC IGBTs	Power Failure Ride-Through in Multi-Machine Drives	Performance Investigation of a Centrifugal Pump with a Consequent-Pole Bearingless Motor	A Novel Rotor Design of Interior Permanent Magnet Synchronous Motors to Cope with Both Maximum Torque and Core Loss Reduction	DC Islanding Detection Algorithm Using Injection Current Perturbation Technique for Photovoltaic Converters in DC Distribution	PV Balancers: Concept, Architecture, and Realization	Current-Based Diagnosis for Gear Tooth Breaks in Wind Turbine Gear Boxes	Implementation and Control of Switched Boost Inverter for DC Nanogrid Applications	Resonant Network Design Considerations for Variable Coupling Lumped Coil Systems	Half Bridge Topologies for Electronic Transformers

9:40 am - 10:00 am

AM Break..... Main Lobby



THURSDAY, SEPTEMBER 20TH, 2012 *continued*

Breakout Session 10:00 am - 11:40 am

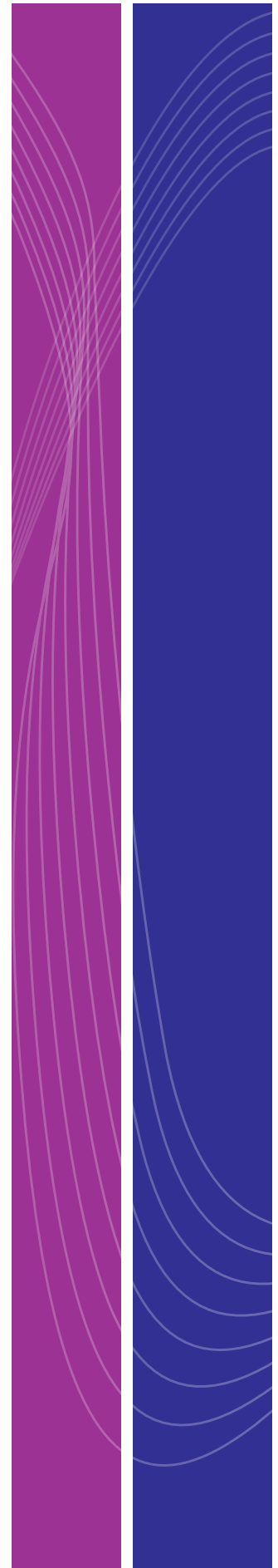
	S96	S97	S98	S99	S100	S101	S102	S103	S104	S105	S106	S107
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305B	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B
	Isolated DC-DC Converters	Power Quality and Active Filters	Converter-Level Packaging and Integration II	Control of DC-DC Converters II	DTC in Drives	PM Machine Diagnostics	Power Quality in Smart Grid	Power Flow Control	Operational Issues of Power Converters	Solar Energy-PV System Control	Power Converters in Transportation II	Multilevel Converters V: Design
10:00 am	Efficiency Analysis of an Isolated High Voltage Gain Converter Operating in Resonant and Non-Resonant Mode	Evaluation of Low Frequency Input Current Ripple in a Non-Isolated Single Phase Photovoltaic Grid-Connected Inverter with Back Current-Gain Model	Evaluation of SIC Power Devices for a High Power Density Matrix Converter	Instantaneous Current Control for the Three-Phase Dual-Active Bridge DC-DC Converter	An Emotional Learning Intelligent Direct Torque and Flux Controller Design for Induction Motor Drives	Detection of Partially Failed Magnetic Slot Wedges in Inverter Fed AC Machines Under Various Load Conditions	Improving the Voltage Quality of an inverter Via By-Passing the Harmonic Current Components	Power Flow Control with a Fractionally Rated BTB Converter	Auto Tuning of Digital Deadbeat Controllers for High Performance AC Voltage Sources Using Wide Bandwidth Impedance Identification	Increasing Energy-Efficiency in Solar Radiation Trackers for Photovoltaic Arrays	A Hybrid Switch Based Soft-Switching Inverter for Ultrahigh Efficiency Traction Motor Drives	Submodule Capacitor Dimensioning for Modular Multilevel Converters
10:25 am	Dead Time Optimization through Loss Analysis of an Active-Clamp Flyback Converter Utilizing GaN Devices	Damping of Input LC Filter Resonance Based on a Virtual Resistor for Matrix Converter	Sinusoidal Current Operation or Delay Time Compensation for Parallel-Connected IGBTs	A Sensorless Continuous and Discontinuous Conduction Mode Detection Method for a Synchronous Converter Using PWM Pulse Skipping	Wide-Speed Direct Torque and Flux Control of Torque-Controlled IPMSM Drives	Investigation of the Rotor Demagnetization Characteristics of Interior PM Synchronous Machines During Fault Conditions	A 12-Pulse Diode Rectifier with Energy Storage Integration and High Power Quality on Both AC and DC Side	Hybrid Distribution Transformer Transmitter Concept Development and Field Demonstration	Mitigation of Inrush Current in Dynamic Voltage Restorer Injection Transformers	Power Flow Control and Optimization of a Three-Port Converter for Photovoltaic-Storage Hybrid System	Design and Performance of Electrical Propulsion System of Extended Range Electric Vehicle (EREV), Chevrolet Volt	A Novel Start-Up Scheme for Modular Multilevel Converter
10:50 am	A Resonant Bi-Directional DC-DC Converter	Comprehensive Review of Stability Criteria for DC Distribution Systems	Analysis on the Switching Speed Limitation of Wide Band-Gap Devices in the Phase-Leg Configuration	New Thermal Balance Control Techniques of Phase-Shift Full-Bridge Converter	Dynamic Loss Minimization Using Improved Deadbeat-Direct Torque and Flux Control for Interior Permanent Magnet Synchronous Machines	Load Torque Signature Analysis: An Alternative to MCSA to Detect Faults in Motor Driven Loads	Elimination of Zero-Crossing Distortion in a Power Factor Correction Circuit	Flexible Distribution of Energy and Storage Resources	Equipment Sensitivity Evaluation to Voltage Sags Using Maximum Hybrid Entropy Interval Probability	Design and Evaluation of a Modular Resonant Switched Capacitors Equalizer for PV Panels	Development of the 120KW Bidirectional DC DC Converter for the Green Bus	Detection Method of an Open-Switch Fault and Fault-Tolerant Strategy for a Grid-Connected Type Three-Level Inverter System
11:15 am	High Frequency Isolated Bus Converter with Gallium Nitride Transistors and Integrated Transformer	Experimental Verification of the Generalized Nyquist Stability Criterion for Balanced Three-Phase AC Systems in the Presence of Constant Power Loads	Design and Performance Evaluation of SIC Based DC-DC Converters for PV Applications	Boundary Control for Isolated Topologies - The Natural Switching Surface for Full-Bridge ZVS	Performance Evaluation of Interior Permanent Magnet Synchronous Machines Using Deadbeat-Direct Torque Flux Control in an Indirect Matrix Converter with a Reactor Free Boost Converter	Load Torque Signature Analysis: An Alternative to MCSA to Detect Faults in Motor Driven Loads	Elimination of Zero-Crossing Distortion in a Power Factor Correction Circuit	Review of Solid State Transformer in the Distribution System: From Components to Field Application	Capacitor Voltage Regulation and Pre-Charge Routine for a Flying Capacitor Active Rectifier	Parallel Power Processing Topology for Solar PV Applications	Using the Traction Drive as the Sensor to Evaluate and Track Deterioration in Electrified Vehicle Gearboxes	Experimental Verification of a Modular Multilevel Cascade Inverter Based on Double-Star Bridge-Cells (MMCI-DSBC)

11:40 am - 1:40 pm

Awards Luncheon

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Ballroom B



**THURSDAY, SEPTEMBER 20TH, 2012** *continued*

**Breakout Session 1:40 pm - 3:20 pm**

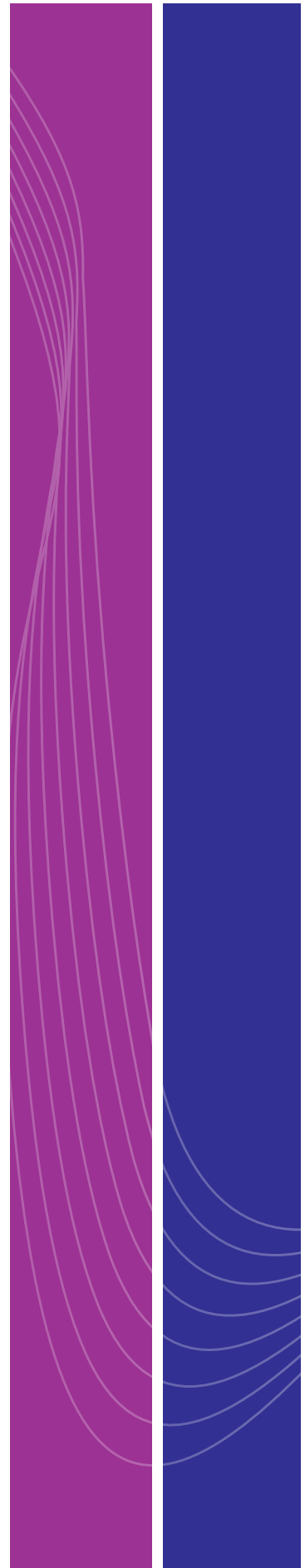
	S108	S109	S110	S111	S112	S113	S114	S115	S116	S117	S118	S119	
	Room: 301A	Room: 306C	Room: 306B	Room: 303	Room: 305B	Room: 305A	Room: 304	Room: 306A	Room: 302C	Room: 302B	Room: 302A	Room: 301B	
	Single Phase PFC Energy Storage	LED Lighting Technologies	Power Modules and Packaging II	Circuit Modeling and Simulation: DC-DC Converters	Reluctance Drives	IPM Machines II	Fault Detection and Fault Tolerant Schemes	Circuit Modeling and Simulation: Losses and Converter Behavior	DC Transmission and DC Circuit Breakers	Fuel Cells	Energy Storage II	Multilevel Converters VI: Performance Improvement	
1:40 pm	Class-E Zero-Voltage-Switching Rectifier Using Common-Ground-Step Controlled-Shunt Capacitor	A Direct-AC LED Driver with High Power Factor without the Use of Passive Components	Integrated Half-Bridge Switch Using 70um Thin Devices and Hollow Interconnects	Validation of Generalized Continuous Equivalent Model on a DC-DC Ladder Multilevel Converter	Maximum Torque Per Ampere Control of Switched Reluctance Machines	Structural Analysis of the Interior PM Rotor Considering Both Static and Fatigue Loading	Benchmarking of Grid Fault Modes in Single-Phase Grid-Connected Photovoltaic Systems	Optimization and Comparison of Two Three-Phase Inverter Topologies using Analytic Behavioural and Loss Models	A Surge-Less Solid-State DC Circuit Breaker for Voltage Source Converter Based HVDC Transmission Systems	Emulation of High Temperature PEM Fuel Cell Electrical Dynamics and Operational Phenomena	Modeling and Analysis of Battery Hysteresis Effects	A Novel Inner Current Suppressing Method for Modular Multilevel Converters	
2:05 pm	Enhanced Bipolar Stacked Switched Capacitor Energy Buffers	Contactless Electronic Ballast for High Brightness LED Lamps with Positionally Dimmed Method	A Nano-Composite Polyamide Imide Passivation for 10 kV Power Electronics Modules	Hybrid Behavioral-Analytical Loss Model for a High Frequency and Low Load DC-DC Buck Converter	Torque Control of a Switched Reluctance Motor by Using Torque Estimation and Excitation Angle Control	Rare Earth Reduction Using A Novel Variable Magnetomotive Force, Flux Intensified IPM Machine	A New Passive Islanding Detection Scheme for Distributed Generation Systems Based on Wavelets	General ZVS Half Bridge Model Regarding Nonlinear Capacitances and Application to LLC Design	Effect of VSC-HVDC on Load Frequency Control in Multi-Area Power System	Waveform Control of Fuel-Cell Inverter Systems	Comprehensive Design of an Isolated AC-DC Converter to Emulate On-road Current of Electrical Scooter for Testing Lithium Battery	A Novel Method to Improve Output Voltage Quality of Grid-Connected Cascaded H-Bridge Multilevel Converter with Phase-Shifted PWM and Serial Bus Communication	
2:30 pm	An Electrolytic Capacitor-Less and Single-Stage Controlled Three-Phase Isolated Battery Charger with Wide-Range Output Voltage for EV Applications	Modeling of Junction Temperature and Forward Voltage of LED Devices with Externally Measurable Variables	High Frequency High Power Density 3D Integrated Gallium Nitride Based Point of Load Module	Common-Mode and Differential-Mode Loop Gains of Parallel Buck Converters	Switched Reluctance Generator Control for Optimal Power Generation with Current Regulation	Drive Motor Designs for Electric Motorcycles	Design of Virtual Droop-Controlled Inverter with Seamless Transition Between Islanded and Grid-Connected Operations	Impact of SiC Components on the EMC Behaviour of a Power Electronics Converter	A Modular Stacked DC Transmission and Distribution System for Long Distance Subsea Applications	Fuel Cell Emulator Based on Interleaved Synchronous Buck Converter	On-Line Optimal Ion Conductivity Control of Li-Ion Battery	On-Line Optimal Ion Conductivity Control of Li-Ion Battery	Fault Detection and Tolerant Control of 3-Phase NPC Active Rectifier
2:55 pm	A Novel Single-Phase Buck PFC AC-DC Converter Using an Active Buffer	Failsafe Smart LED Module with Thermal Management, String Current Balancing and Communication for Lifetime Extension		Control Strategy to Achieve Minimum Zero Input Current Ripple for the Interleaved Boost Converter in Photovoltaic's Fuel Cell Power Conditioning System	A Fast and Precise Simulation Method for Performance Screening for High Power Converter Designs	Design of Saliency-Based Sensorless Drive IPM Motors for Hybrid Electric Vehicles	Fault Tolerant Control of Small Distributed Generation Systems	A Fast and Precise Simulation Method for Performance Screening for High Power Converter Designs	A 4 kV Silicon Carbide Solid State Fault Current Limiter	Power Management of Photovoltaic and Fuel Cell Hybrid System for a Constant-Power-Demand DC Supply Bus Using Complementary Energy Dispatch	Real-Time SOC and SOH Estimation for EV Li-Ion Cell Using Online Parameters Identification	Real-Time SOC and SOH Estimation for EV Li-Ion Cell Using Online Parameters Identification	Eliminating Common Mode Winding Voltages for a 3-Limb Coupled Inductor Used in Voltage Source Inverters

3:20 pm - 3:40 pm PM Break ..... Main Lobby

THURSDAY, SEPTEMBER 20TH, 2012 *continued*

Breakout Session 3:40 pm - 5:20 pm

	S120	S121	S122	S123	S124	S125	S126	S127	S128	S129	S130
	Room: 301A	Room: 306C	Room: 306B	Room: 306A	Room: 305A	Room: 304	Room: 303	Room: 302C	Room: 302B	Room: 302A	Room: 301B
	General Inverter Technologies	AC-DC Power Converters	Passive Components for High Frequency Power Conversion	Circuit Modeling and Simulation: Grid Connected Converters	High Speed Machines	Converter Control Under Abnormal Grid Conditions	Inverter Control Techniques	New Applications and Topologies for FACTS	Advanced Control Strategies	Solar Energy - PV Power Tracking	Multilevel Converter VII: Control
3:40 pm	A High Efficiency Two-Phase Interleaved Inverter for Wide Range Output Waveform Generation	Power Density and Efficiency of System Compatible, Sine-Wave Input/Output Drives	A DC Bus Capacitor Design Method for Various Inverter Applications	Comparison of Latch-Based and Switch-Based, Sampled-Data, Three-Phase, PWM, Voltage-Source Inverter Models for Dynamic Analysis	Design, Modelling and Testing of a High Speed Induction Machine Drive	Control Strategies of Current-Source Inverters for Distributed Generation Under Unbalanced Grid Conditions	Hybrid Control of BCM Soft-switching Three-Phase Micro-Inverter	A Novel D-FACTS Device: Magnetic Flux Controlled Distributed Active Inductor	A Grid Fundamental and Harmonic Components Detection Method for Single-Phase Systems	A Global Maximum Power Point Tracking Method for Photovoltaic Module Integrated Converters	Energy Storage and Circulating Currents in the Modular Multi-Level Converter
4:05 pm	Compound Synchronous Reference Frame PLL and Unbalance Control Strategy for Power Converter System in Weak Grids	An Improved Control Scheme for Buck PFC Converter for High Efficiency Adapter Application	Integration of Both EMI Filter and Boost Inductor for 1 kW PFC Converter	Dynamic Model of the Three-Phase Single-Stage Boost Inverter for Grid-Connected Applications	Optimal Traces Arrangement in Planar Magnetic Based Slotless PMSM	Decoupled Double Synchronous Reference Frame Current Controller for Unbalanced Grid Voltage Conditions	Unified Space Vector PWM Control for Current Source Inverter	Performance Comparison of Conventional STATCOM and STATCOM with Energy Storage in a Low Voltage Induction Motor Application	Research on Fast Transient and 6nH <sup>-1</sup> Harmonics Compensating Repetitive Control Scheme for Three-Phase Systems	Global MPPT Method for Partially Shaded Photovoltaic Modules	Three Phase Common-Mode Winding Voltage Elimination in a Three-Limb Five-Level Coupled Inductor Inverter
4:30 pm	Magnetically Coupled Impedance-Source Inverters	Novel Random Switching PWM with Constant Sampling Frequency and Constant Inductor Average Current for Digital-Controlled Power Factor Corrector	Planar, Double-Layer Magnetic Inductors for Low Power, High Frequency DC-DC Converters	Grid Connected VSI with LCL Filter - Models and Comparison	Novel Signal Injection Methods for High-Speed Self-Sensing Electrical Drives	Novel Harmonic and Phase Estimator for Grid-Connected Renewable Energy Systems	Control of High-Frequency-Link Inverter Using Optimal Switching Sequence	Performance Evaluation of Two High Precision Distributed Series Compensator Control	Closed-Loop IGBT Gate Drive Featuring Highly Dynamic $di/dt$ and $dv/dt$ Control	Sub-Module Integrated Distributed Maximum Power Point Tracking for Solar Photovoltaic Applications	Neutral Point Potential Balancing Using Synchronous Optimal Pulsewidth Modulation of Multilevel Inverters in Medium Voltage High Power AC Drives
4:55 pm	A Novel Digital-Controlled Single-Phase Transformer-Based Inverter for Non-Linear Load Applications	Integrated Low-Voltage Converter Architecture with AC Power Delivery	EMI Filter Design Considering In-Circuit Impedance Mismatching	The Time-Domain Analysis for Constant On-Time Critical Mode Boost-Type PFC Converters				An Approach to Regulating Dual Series Static Compensator (DSSC)		Advanced MPPT Algorithm for PV Systems	







## Registration Services

Saturday through Thursday  
Main Lobby, Street Level

On-site registration will be open during the following hours:

Saturday, September 15.....	3:00 pm–5:00 pm
Sunday, September 16.....	7:00 am–7:00 pm
Monday, September 17.....	7:00 am–7:00 pm
Tuesday, September 18.....	7:00 am–6:00 pm
Wednesday, September 19.....	7:00 am–7:00 pm
Thursday, September 20.....	7:00 am–3:00 pm

## Full Conference Registration

Full Conference Registration admits one entrance into all technical sessions, plenary sessions, rap sessions, access to the exhibition and all social functions. Additional guest tickets for receptions can be purchased at the Registration Desk.

### Full-Conference Registration

IEEE Member.....	\$715.00
Student IEEE Member.....	\$265.00
Society Member.....	\$665.00
Life Member.....	\$340.00
Non-Member.....	\$940.00

## One-Day Registration

One-Day Registration admits one entrance into that day's technical sessions, the plenary sessions\*, rap sessions\*, industrial seminars\*, and access to the exhibition.

### One-Day Registration

Society Member.....	\$375.00
IEEE Member.....	\$425.00
Non-Member.....	\$475.00

## Certificate of Attendance

Certificates of Attendance will not be provided for ECCE 2012.

## Tutorial Registration\*

Tutorials will take place on Sunday, September 16, 2012. You may select one morning session and one afternoon session. The rates are outlined below. The registration rate is the same if you choose to attend either one or two tutorials. The registration fee includes materials for all 8 tutorials

Society Member.....	\$365.00
IEEE Member.....	\$390.00
Non-Member.....	\$415.00

\*Access to specified sessions is permitted only if applicable for that day's activities.

## Expo Only

Expo Only Registration allows access to the Expo Hall only, on Tuesday, September 18. Complimentary access to the Expo hall is available after 1:30 pm on September 18th. Registration fee is \$25 for Expo Only access 9:00 am – 1:30 pm, and includes lunch. Expo Only Registrations may be purchased at the Registration Desk located just outside the Exhibit Hall.

## Guest Tickets

Guests may purchase a registration for \$175, which includes admission to the opening reception, awards luncheon and conference banquet. A limited number of awards luncheon and conference banquet tickets will be sold onsite. You can still include your guests' name on the registration form, even if he or she does not want to attend the social functions. You may also purchase individual event tickets per the rates below.

Opening Reception Ticket.....	\$60.00
Industry Student Dinner.....	\$250.00
Lunch Ticket.....	\$30.00
ECCE Banquet Ticket.....	\$75.00
Awards Luncheon Ticket.....	\$60.00

## Receipts

All who register online will receive a receipt/confirmation via email. All registrants will also receive a receipt attached to their badge, which can be obtained upon check-in. If you need additional paperwork, please contact the customer service staff, located in the Registration Desk.

## Badges

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

## Message and Information Center

Saturday through Thursday

Main Lobby, Street Level

If you need to reach a fellow attendee, messages and notices may be placed on the Message Board. Please plan to check these boards regularly in case other attendees are trying to reach you. Outside of registration hours it is recommended that messages be left at the attendee's hotel. Attendees will not be paged.

**Accessibility for Registrants with Disabilities**

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

**Business Center**

The Raleigh Convention Center does not have a Business Center. However, the ECCE 2012 headquarters hotel, Raleigh Marriott City Center, has a Business Center which is located on the lobby level of the hotel and is open every day, 24hrs a day. Services include copies, faxing, scanning and internet.

**Cameras and Recording Devices**

The use of cameras and/or recorders is strictly prohibited during the oral and poster sessions. Limited use is allowed for Exhibitors in their own booth area. Personal photography is allowed at social functions

**+ First Aid**

If you are in need of emergency services or hospital care, the nearest hospitals are as follows:

**WakeMed Health & Hospital**

3000 New Bern Avenue  
Raleigh, NC 27610  
919-350-8000  
4 miles from convention center

**Duke Raleigh Hospital**

3400 Wake Forest Road  
Raleigh, NC 27609  
919-954-3000  
5-6 miles from convention center

**Rex Healthcare**

4420 Lake Boone Trail  
Raleigh, NC 27607  
919-784-3100  
6-7 miles from convention center

**Hotels**

The ECCE 2012 headquarters hotel is the Raleigh Marriott City Center.

**Raleigh Marriott City Center**

500 Fayetteville Street · Raleigh, North Carolina 27601 USA  
Phone: 919-833-1120  
Fax: 919-833-8912

**Internet Access**

ECCE is offering a free internet hot spot in the ECCE Registration area of the Raleigh Convention Center. Log on to IEEE ECCE and enter the password: ecce2012.

For Internet at the Raleigh Marriott City Center, the cost is \$9.95 per day for wireless internet in the lobby, guestrooms and throughout the hotel.

**Local Transportation**

ECCE is pleased to offer a private shuttle service to all attendees during peak arrival and departure dates of the conference from the airport to the Raleigh Marriott City Center. Look for the ECCE official transportation provider signs in the Terminal 2 baggage claim area when you arrive. The cost is \$22.00 one-way or \$38.00 roundtrip. Tickets can be purchased with cash or credit onsite upon arrival in Raleigh or attendees can call (919) 439-2024 for more information or make a reservation. A taxi fare will run about \$45.00 one way and taxis are readily available 24hrs a day both at the airport and outside the Raleigh Marriott City Center.

**Lost & Found**

Lost and found is located at the event registration desk on the main lobby at the Raleigh Convention Center.

**Parking**

Daily Convention Center Parking: Public Parking garages on Lenoir Street between Salisbury and McDowell Street; one on McDowell Street between Cabarrus and Davie Street; One on Salisbury Street between Cabarrus and Davie Street. Parking is \$7.00 per day. Accessible parking is available on the 1st level of each garage

Hotel Parking: Self-parking is available for \$12.00 per day or valet parking at \$18.00 per day.

**Meals & Refreshments**

Full conference registration includes all meals, refreshments and social functions (except the Industry Student Dinner) provided by ECCE 2012.

**Morning Refreshments**

Monday, Wednesday and Thursday – *Main Lobby, Street Level*  
Tuesday – *Exhibit Hall B*

Monday, September 17.....	10:00 am – 10:20 am
Tuesday, September 18.....	9:40 am – 10:00 am
Wednesday, September 19.....	9:40 am – 10:00 am
Thursday, September 20.....	9:40 am – 10:00 am

**Lunch**

Tuesday – *Exhibit Hall B*

Tuesday, September 18.....	12:00 pm – 1:20 pm
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**Awards Luncheon**

Thursday – *Ballroom B*

Thursday, September 20.....	11:45 am – 1:40 pm
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**Afternoon Refreshments**

Monday, Wednesday and Thursday – *Main Lobby, Street Level*  
Tuesday – *Exhibit Hall B*

Monday, September 17.....	3:00 pm – 3:20 pm
Tuesday, September 18.....	3:15 pm – 3:45 pm
Wednesday, September 19.....	3:10 pm – 3:30 pm
Thursday, September 20.....	3:20 pm – 3:40 pm

**Meet and Greet the Fellows Reception***Ballroom A*

Sunday, 5:00 pm – 7:00 pm

Join us for a Meet and Greet the Fellows Reception within the Sunday evening Opening Reception of ECCE 2012. A chance to chat, take photos and congratulate the 2012 IEEE Power Electronics Society Class of Fellows that have chosen to receive their award at ECCE.

**PELS Fellows**

**Francis Kub** SSC, ED, PEL  
Naval Research Laboratory

Honored for leadership in the development of wide bandgap semiconductor power electronics



**Joel Spira** PE, IA, IE, PC, PEL  
Lutron Electronics Co., Inc.

Honored for leadership in developing and commercializing light control technologies



**Remus Teodorescu** PE, IE, IA, PEL  
Aalborg University

Department of Energy Technology  
Honored for contributions to grid-connected renewable energy converter

**IAS Fellows**

**Suresh Gopalakrishnan**, IAS, PELS  
General Motors

Honored for contributions to electronic drives and remote control for automotive systems.

**Opening Reception***Ballroom A*

Sunday, 5:00 pm – 7:00 pm

Catch up with your industry partners and friends! Grab a drink and relax before the week ahead.

**Guest Breakfast***Room 402*

Monday, 9:00 am – 10:00 am

ECCE guest ticket holders are invited to attend the ECCE Guest Breakfast. A representative from Visit Raleigh will join you to discuss things to do while you are in Raleigh and to answer any specific questions about the city.

**Expo Reception***Exhibit Hall B*

Monday, 4:00 pm – 6:00 pm  
(Supported by OPAL RT)



Enjoy a drink and light snacks while you mingle with industry partners and friends and explore the latest advances in products and services to meet the needs of current and future challenges facing the energy conversion industry.





imagination at work

**Industry Student Dinner**

*Exhibit Hall B*

Monday, 7:00 pm – 10:00 pm  
(Supported by GE Global Research and Eaton)

The Industry Student Career Fair and Dinner will bring together students and industry for a career networking fair. This will be a fantastic opportunity that will bring together students and industry for an information exchange session and career discussions. Leading industry representatives will present information on the latest technologies and products they are developing and provide an opportunity for the student community to see how their learning experiences are applied in the industry.

All ECCE 2012 student registrants can attend this event for free. Exhibitors will receive free tickets to the dinner and may purchase additional tickets for \$50. Tickets will be available for \$250 for industry engineers, with full conference registrations, who would like the opportunity to network with the students during the event. Tickets can be purchased during online registration or onsite at the ECCE Registration Desk. This is a great opportunity for ECCE exhibitors to network with students and provide information relating to their companies.

We look forward to you joining us for a productive evening!

**ECCE Banquet**

*Ballroom AB*

Wednesday, 7:00 pm – 9:00 pm

Join your colleagues for great food, drinks, entertainment and networking.

**Industry Tours**

*Marriott Lobby*

Friday, 8:00 am – 1:00 pm

Join your colleagues for an exciting tour of ABB, Advanced Energy and the FREEDM Center at NC State. The tour will depart the Raleigh Marriott City Center at 8:00 am. Please note this tour is limited to the first 20 people who sign up and the cost for the tour is \$25 per person. Please inquire at the registration desk for more information.

**Tour Schedule**

8:00 am	Depart Raleigh Marriott City Center
8:15 - 9:30 am	Tour ABB
9:45 - 11:00 am	Tour Advanced Energy
11:15 am - 12:30 pm	FREEDM Center

**Mobile Web App**



The IEEE ECCE 2012 Conference is offering all attendees the opportunity to download the “ECCE Mobile Web App” for this year’s conference. The mobile web app is available for iPhone, Android and Blackberry smartphones and includes event information, schedules and a complete directory of exhibitors.

[blot.io/f5oj](http://blot.io/f5oj)

To download the app, either scan the QR code here OR load the accompanying short URL into your mobile web browser.

If you choose, you can download and install the app to your smartphone so you can have a handy reference of all the exhibitors for the future. If you need a QR code scanner visit <http://m.linkblots.com> on your smartphone for direct links to download and install FREE barcode readers for your specific mobile device.





## Oral Presenters

Speaker Ready Room *Room 307*  
Saturday through Thursday

**ALL Oral Presenters** must check in at the Speaker Ready Room at least 4 hours prior to their scheduled session. Even if you have submitted your presentation in advance and have no changes, you must check and confirm that the presentation is correct.

The hours of operation of the Speaker Ready Room are as follows:

Saturday, September 15.....	3:00 pm – 5:00 pm
Sunday, September 16.....	7:00 am – 7:00 pm
Monday, September 17.....	7:00 am – 7:00 pm
Tuesday, September 18.....	7:00 am – 6:00 pm
Wednesday, September 19.....	7:00 am – 7:00 pm
Thursday, September 20.....	7:00 am – 3:00 pm

You may also edit your presentation at this time. When you are finished reviewing your presentation and verify it is ready, the AV personnel will upload your presentation onto the laptop in your scheduled session room.

### Presenters' Orientation and Breakfast

A Presenters' orientation will be held for all presenters and session chairs from 7:00 am – 8:00 am, Monday through Thursday in Room 402 at the Raleigh Convention Center. Oral presenters should meet with their respective session chairs to review the format and timing of their session and alert conference management of any changes. Oral Presenters should attend the orientation each day that they are scheduled to provide an oral presentation (or chair a session); you may only attend breakfast on days on which you are scheduled to speak.

Poster Presenters should attend the breakfast the morning of Tuesday, September 18, 2012.

## Poster Presenters

Poster Presentation Schedule *Exhibit Hall B*  
Tuesday

Poster Session I.....	10:00 am – 11:30 am
Poster Session II.....	2:00 pm – 3:15 pm

300 posters will be on display on Tuesday in Exhibit Hall B at the Raleigh Convention Center. The poster presenters should be available for questions at their display boards during their scheduled poster presentation time. If you are unsure in which session your poster should be presented, please review the complete Technical Session schedule starting on page 33.

### Poster Session I Setup

Presenters will have access to the exhibit hall (Exhibit Hall B - Raleigh Convention Center), starting at 9:00 am. Presenters for Poster Session I must have their posters set-up no later than 9:30 am. Poster presenters must then take their posters down promptly at 11:30 am. Any posters that remain on the poster boards at 12:30 pm, and do not belong in Poster Session II will be removed and kept at the Registration Desk.

### Poster Session II Setup

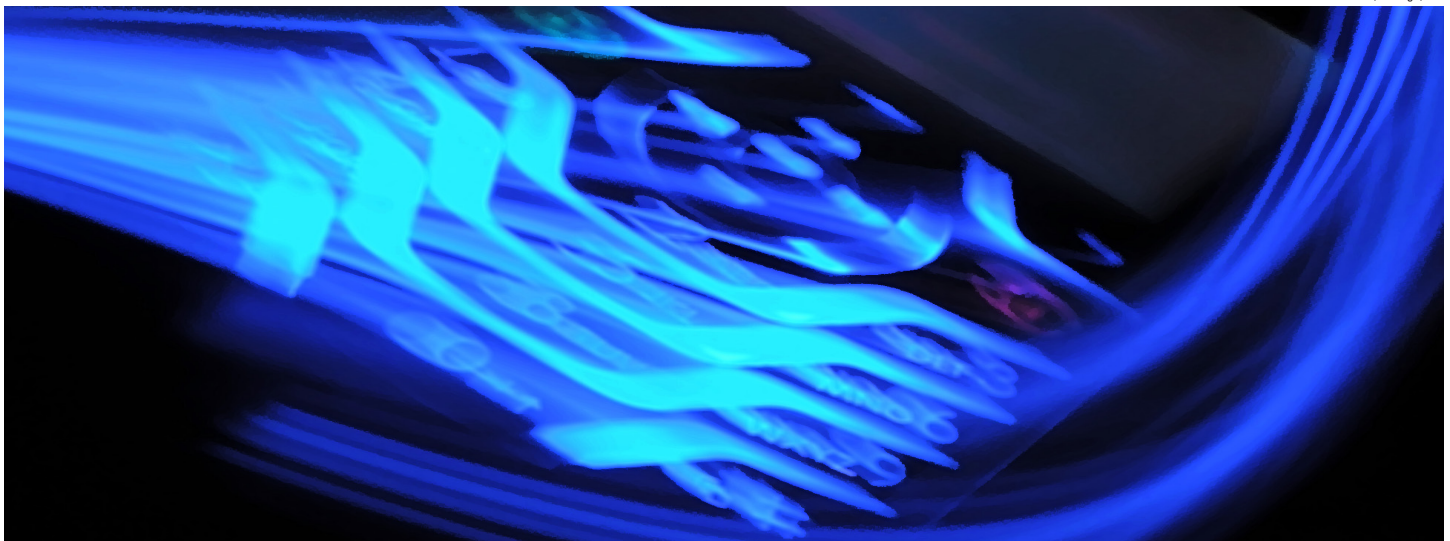
Presenters for Poster Session II will have from 12:30 pm – 1:30 pm to set-up their posters. Posters for Poster Session II must be set up no later than 1:30 pm and must be removed no later than 5:30 pm.

Do not leave your presentation on the poster board. Posters remaining after 6:00 pm on Tuesday, September 18th will be removed and kept at the Registration Desk. Uncollected posters will be discarded.

### Poster Boards & Push-Pins

4'x8' poster boards will be provided, so please keep these dimensions in mind when printing your posters. Push pins will be provided for all poster presenters.

Museum Park NCMA, Raleigh, NC



*All of the following meetings will be held at the Raleigh Convention Center.*

### IAS and IAS/PELS Joint Committee Meetings

**IEEE Working Group 1812: PM Machine Testing Standardization Meeting**  
Sunday, September 16  
1:00 pm – 5:00 pm  
Room: Glass Board Room, Main Lobby

**Industrial Power Conversion Systems Department**  
Sunday, September 16  
7:00 pm – 8:00 pm  
Room: 402

**Industrial Drives Committee**  
Monday, September 17  
6:00 pm – 7:00 pm  
Room: 305A

**PEDCC**  
Monday, September 17  
6:00 pm – 7:00 pm  
Room: 306B

**IAS Transportation Systems Committee and PELS Technical Committee on Vehicle and Transportation Systems**  
Monday, September 17  
7:00 pm - 8:00 pm  
Room: 303

**IAS Industrial Power Converter Committee**  
Tuesday, September 18  
6:00 pm – 7:30 pm  
Room: 305 A

**Electric Machines Committee**  
Tuesday, September 18  
6:00 pm – 7:00 pm  
Room: 305 B

**Renewable Energy Systems Committee**  
Wednesday, September 19  
5:15 pm - 6:15 pm  
Room: 306A

### ECCE Committee Meetings

**2013 ECCE Organizing Committee**  
Tuesday, September 18  
5:00 pm – 6:00 pm  
Room: 402

**ECCE Steering Committee**  
Wednesday, September 19  
11:00 am - 12:30 pm  
Room: Glass Board Room, Main Lobby

**2014 ECCE Organizing Committee**  
Wednesday, September 19  
4:00 pm - 5:00 pm  
Room: Glass Board Room, Main Lobby

### PELS Committee Meetings

**Bylaws Committee Meeting**  
Sunday, September 16  
10:00 am - 3:00 pm  
Room: 402

**PELS Electronic Transformers Technical Thrust Committee Meeting**  
Tuesday, September 18  
8:30 am - 4:00 pm  
Room: Glass Board Room, Main Lobby

**PELS Nominations Committee Meeting (Committee Members)**  
Tuesday, September 18  
12:00 pm – 1:00 pm  
Room: 303

**PELS TC Meeting on High Performance and Emerging Technologies**  
Tuesday, September 18  
12:00 pm - 1:30 pm  
Room: 304

**PELS TC on Power and Control Core Technologies**  
Tuesday, September 18  
12:00 pm - 2:00 pm  
Room: 305A

**TC on Communication Energy Systems (INTELEC)**  
Tuesday, September 18  
4:00 pm – 5:00 pm  
Room: 303

**PELS Sustainable Energy Technical Committee**  
Tuesday, September 18  
5:00 pm – 7:00 pm  
Room: 304

**PELS Standards Committee Meeting**  
Tuesday, September 18  
7:00 pm – 9:00 pm  
Room: 303

**PELS Fincom (Committee Members)**  
Wednesday, September 19  
9:00 am – 10:00 am  
Room: Glass Board Room, Main Lobby

**PELS/ECCE Global Partnership Meeting (Committee Members)**  
Wednesday, September 19  
10:00 am – 11:00 am  
Room: 205

**PELS Membership Committee: Students/ Liaisons & Chapter Chairs**  
Wednesday, September 19  
12:30 pm - 2:30 pm  
Room: 402

**PELS Meetings Committee**  
Wednesday, September 19  
12:30 pm - 5:30 pm  
Room: 205

**Editorial Meeting IEEE Trans. On Power Electronics**  
Wednesday, September 19  
3:00 pm - 4:30 pm  
Room: 402

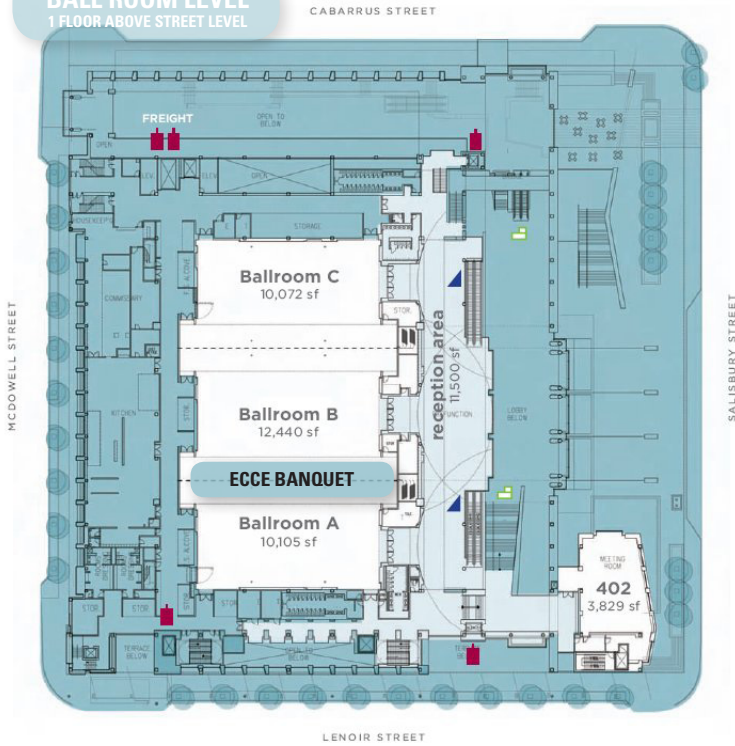
**PELS Power Conversion Systems and Components**  
Wednesday, September 19  
5:15 pm - 6:15 pm  
Room: 402

**Awards Committee including Nominations**  
Wednesday, September 19  
6:00 pm – 7:00 pm  
Room: Glass Board Room, Main Lobby

**PELS Operations & Products Committee**  
Thursday, September 20  
2:00 pm – 6:00 pm  
Room: 402

**PELS Administrative Committee Meeting**  
Friday, September 21  
8:00 am – 5:00 pm  
Room: **University Ballroom, Raleigh Marriott**

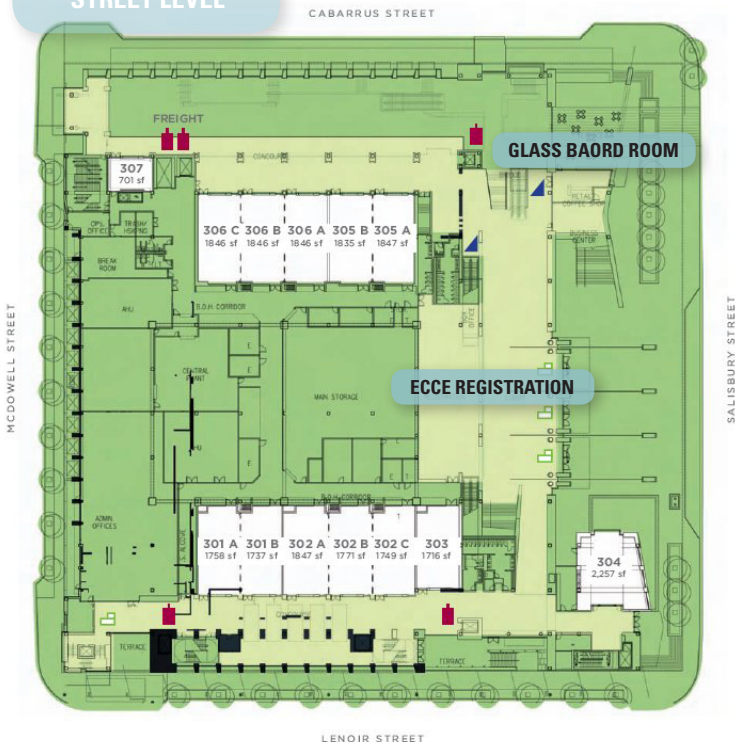
**BALL ROOM LEVEL**  
1 FLOOR ABOVE STREET LEVEL



**EXHIBIT LEVEL**  
2 FLOORS BELOW STREET LEVEL



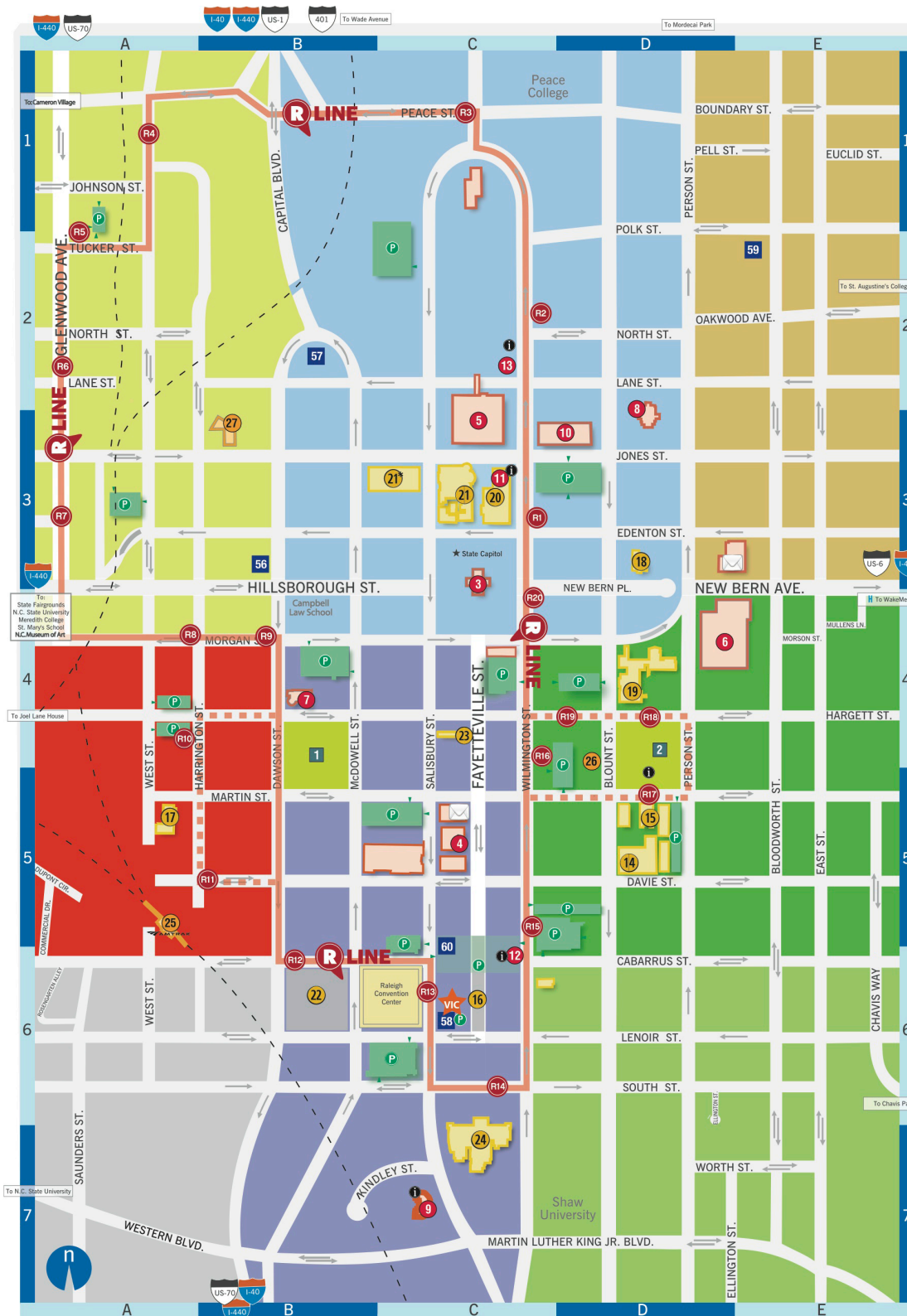
**STREET LEVEL**



**Raleigh Convention Center**

Session/Event	Location	Date
Tutorials	301A, 302A, 303, 304	September 16
ECCE Opening Reception	Ballroom A	September 16
Breakout Sessions	301A, 306C, 306B, 306A, 305B, 305A, 304, 303, 302C, 302B, 302A, 301B, 402	September 17-19
Plenary Session	Ballroom C	September 17
Rap Sessions	301AB, 302ABC	September 18
ECCE Banquet	Ballroom AB	September 19
Awards Luncheon	Ballroom B	September 20
<b>Exhibit Hall (Exhibit Hall B)</b>		
ECCE Expo		September 17
Expo Reception		September 17
Industry Student Dinner (Supported by GE Global Research)		September 17
Student Demonstrations		September 17
ECCE Expo		September 18
Student Demonstrations		September 18
Poster Sessions		September 18
Industrial Seminars		September 18





**Parks**

- 1 Nash Square (B, 4)
- 2 Moore Square (D, 4)

**Civic/Government**

- 3 N.C. State Capitol (C, 3) [V]
- 4 Wake County Courthouse (C, 5)
- 5 N.C. State Legislative Building (C, 3) [V]
- 6 Federal Government Complex (D, 4)
- 7 City of Raleigh Municipal Complex/ Police Department (B, 4)
- 8 N.C. Executive Mansion (D, 3) [V]
- 9 Greater Raleigh Chamber of Commerce (C, 7)
- 10 N.C. State Archives (D, 3)
- 11 Capital Area Visitor Information (C, 3)
- 12 Greater Raleigh Convention and Visitors Bureau (C, 6)
- 13 N.C. Division of Tourism, Film & Sports Development (C, 2)

**Attractions**

- 14 Artspace (D, 5)
- 15 City Market (D, 5)
- 16 City Plaza (C, 6) [V]
- 17 Contemporary Art Museum
- 18 Haywood Hall (D, 3) [V]
- 19 Marbles Kids Museum/Wachovia IMAX® Theatre (D, 4) [V]
- 20 N.C. Museum of History (C, 3) [V]
- 21 N.C. Museum of Natural Sciences (C, 3) [V]
- 22 Raleigh Amphitheater and Festival Site (B, 6) [V]
- 23 Raleigh City Museum (C, 4) [V]

**Greater Raleigh Visitor Information Center!** [V]

- 24 Progress Energy Center for the Performing Arts (C, 7) [V]
  - Memorial Auditorium
  - Fletcher Opera Theater
  - Meymandi Concert Hall
  - Kennedy Theatre

**Transit**

- 25 Amtrak Rail Station (A, 5)
- 26 City Bus Terminal (D, 4)
- 27 Greyhound Bus Terminal (B, 3)
- R-Line Stops [V]
  - .....R-LINE after 6:30pm route

**Hotels**

- 56 Clarion State Capital (B, 3)
- 57 Days Inn Downtown (B, 2)
- 58 Raleigh Marriott City Center (C, 6)
- 59 Oakwood Inn B&B (E, 2) [V]
- 60 Sheraton Raleigh Hotel (C, 5)

**Symbols**

- P Parking
- Parking entryway indicator
- Flow of traffic
- i Information
- Railroad tracks
- ☐ Post offices

[V] = Find a video about this point of interest at [video.visitRaleigh.com](http://video.visitRaleigh.com)

**Districts** [V]

- Glenwood South
- Capital District
- Historic Oakwood
- Warehouse District
- Fayetteville Street
- Moore Square
- East Raleigh/South Park

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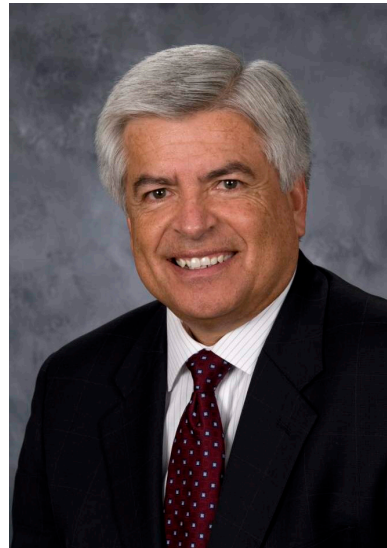
Monday, September 17th, 8:00 am - 10:00 am

Chairs: **Le Tang**, ABB, USA

*Ballroom C*

Rogelio Sullivan, North Carolina  
State University, USA

ECCE's plenary speakers will draw from their diverse industry perspectives and experiences to set the stage for the week's technical program. The overarching session theme will be their perspectives on the major engineering, industry, and societal trends that are shaping the future of energy conversion and utilization. This thought provoking and informative plenary is essential for engineers of all disciplines. The organizing committee is extremely proud to be able to share the vision of these luminaries with conference attendees from all disciplines. The following are brief bios of the confirmed Plenary.



Dr. Dan Arvizu  
Director, DOE National  
Renewable Energy  
Laboratory

Dr. Dan Arvizu has been the Director and Chief Executive of the U.S. Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) since January 15, 2005. NREL, in Golden, Colorado, began operations in 1977 and is the DOE's primary laboratory for energy efficiency and renewable energy research and development. After more than three decades of professional engagement in the clean energy field, Dr. Arvizu has become one of the world's leading experts on renewable energy and sustainable energy. Prior to joining NREL, Dr. Arvizu was the chief technology officer with CH2M HILL Companies, Ltd. Before joining CH2M, he was an executive with Sandia National Laboratories in Albuquerque, New Mexico. He started his career and spent four years at the AT&T Bell Telephone Laboratories.



James E. Rogers  
Chairman, President  
and CEO, Duke Energy

Rogers became chairman, president and CEO of Duke Energy in 2007, having served as chairman and CEO of Cinergy since 1994 and PSI Energy since 1988. He is chair of the Institute for Electric Efficiency, past co-chair of the National Action Plan for Energy Efficiency and a board member of the Alliance to Save Energy. He is a director of Cigna Corp. and Applied Materials Inc. He is a board member of the Institute of Nuclear Power Operations and Business Roundtable. He is lifetime member of the Council on Foreign Relations and a member of the Honorary Committee of the Joint U.S.-China Collaboration on Clean Energy. Newsweek named Rogers to The Global Elite list, "The 50 Most Powerful People in the World in 2008.



Panu Virolainen  
Group Vice President,  
Head of Research and  
Development in Discrete  
Automation and Motion  
Division, ABB Group

Panu Virolainen is currently Group Vice president and Head of Research & Development in Discrete Automation and Motion division at ABB. This division has within ABB Group responsibility for electric motors and generators, electric drives, wind turbine converters, solar inverters and other LV/MV power electronics as well as robotics and PLCs. Virolainen joined ABB in year 1995 and has since then held various positions within the company in the areas of research and development, design and project management, product engineering and general management. Prior to his current assignment he was leading the global business of ABB's component, general machinery and standard drives within business unit LV Drives and functioning as technology manager of this same business unit. Virolainen holds Master's of Science degree in Electrical Engineering from Helsinki University of Technology.

Tuesday, September 18th, 7:30 pm - 9:00 pm

**R1: The Role of Power Electronics in Smart Grid and Microgrids**

*Room: 301 A*

Discuss Smart Grid enabled power electronics applications for grid modernization; increased penetration and value proposition of renewable generators; electric vehicles used as grid storage; and microgrid consumer facing-benefits of resiliency and power quality.

Moderator: Leo Casey, *CTO, Satcon*

Presenters: Leo Casey, *CTO, Satcon*  
Wanda Reder, *VP Power Systems Services, S & C Electric Company*  
Heart Akerson, *CEO, Heart Transverter*  
Glenn Skutt, *President, PowerHub*  
Leon Tolbert, *Professor, University of Tennessee*

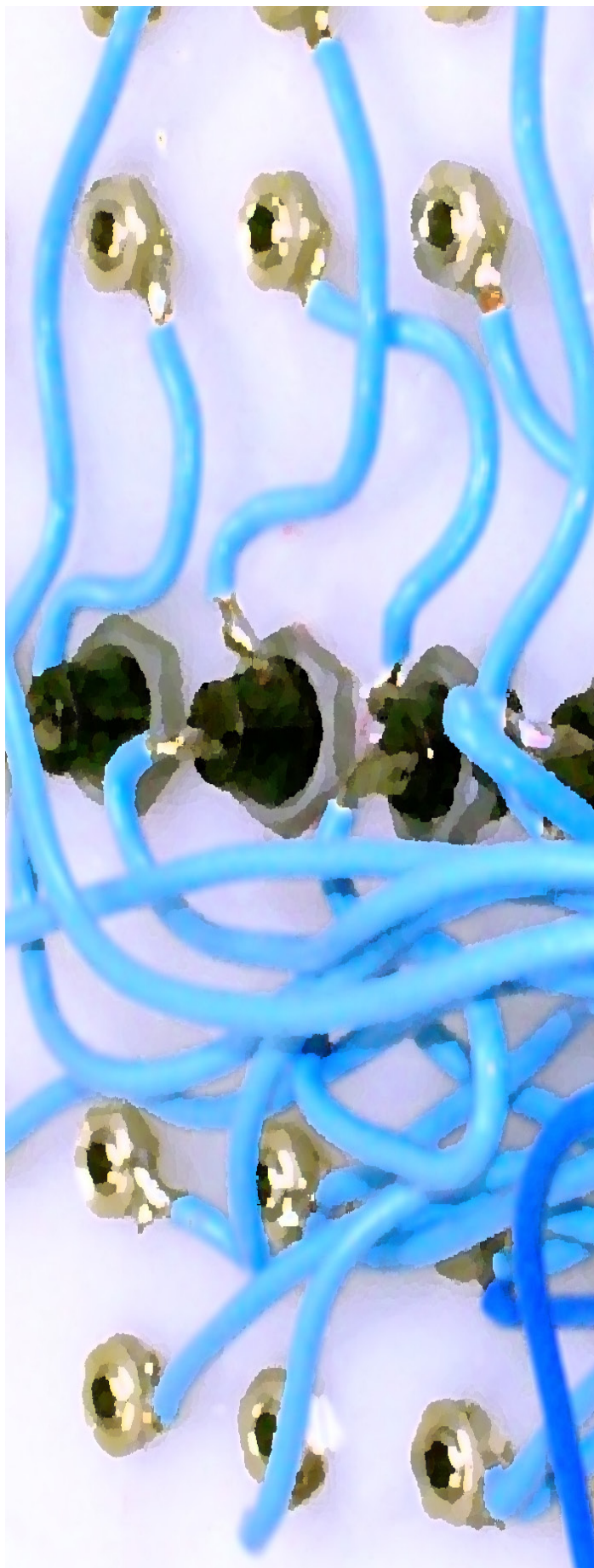
**R2: Wide Band Gap Power Device Market Trends and Prospects**

*Room: 302 A*

Discuss the latest wide bandgap power device performance; advantages of the devices in existing applications; future applications enabled by the new technology; and system drivers and market penetration timeline for different device/application types.

Moderator: John Palmour, *Co-founder and CTO, Power & RF, Cree*

Presenters: John Palmour, *Co-founder and CTO, Power & RF*  
Cree Paul Chow, *Professor, Rensselaer Polytechnic Institute*  
Jeffrey Casady, *President/CTO, SemiSouth Laboratories*



Sunday, September 16th, 8:30 am - 12:00 pm

Morning Sessions

*Note: All tutorials are held on September 16, 2012. Pre-registration for each tutorial is required. Please visit the Registration Desk for space availability.*

### T1-1 Wind Power Generation in a High Penetration Scenario

Room: 301A

Instructors:

Eduard Muljadi – NREL

Longya Xu – Ohio State University

Vahan Gevorgian – NREL

Mohit Singh – NREL

Based on DOE studies, wind power generation may reach 330GW by 2030 at the level of penetration of 20% of the total energy production. This large amount of variable generation into the grid will bring issues into power system operation, dynamic and steady state stability of our power system, and, at the same time it is an opportunity to solve these issues using the latest state of the art technology developed in the area control systems, power electronics, electric machines, and, energy storage. From this amount of wind power, 54GW of wind power will be generated at offshore WPPs. The deployment of offshore WPP requires power transmission from the plant to the load center inland. Since this power transmission requires submarine cables, there is a need to use High Voltage Direct Current (HVDC) transmission for some cases requiring longer than 50 kilometers of submarine cable. Otherwise, if the power is transmitted via alternating current, the reactive power generated by the cable capacitance may cause an excessive over-voltage in the middle of the transmission distance which requires unnecessary and costly oversize cable voltage breakdown capability.

This tutorial will cover the challenges in high penetration wind power generation including the system integration issues (low voltage ride through, real and reactive power control), wind turbine control, wind power plant aggregation, short circuit contribution of a wind plant, power system stability (steady state and dynamic), energy storage, offshore wind power plant, and smart grid application. Both the onshore and offshore wind power generation will be presented. Several wind turbine manufacturers will be invited to participate as instructors.

### T1-2 Controlling the Smart Grid: from Challenges to Opportunities

Room: 302A

Instructor:

Mo-Yuen Chow – North Carolina State University

The smart grid technology provides a promising solution to the increasing demands of power quality, reliability, safety, availability, security, resilience, and environmental friendliness that legacy power systems have difficulties in fulfilling. In this tutorial, we will first provide an overview of smart grids, and the benefits of using distributed control strategies for smart grid operations. We will then focus on two smart grid control topics:

The first topic, “Time-sensitive Distributed Controls on Smart Grid Economic Dispatch”, we will discuss the design and development of high performance distributed control to achieve real-time optimal power allocation in the FREEDM system, which is a prototype smart grid at NCSU. By using the distributed consensus framework, the Incremental Cost Consensus (ICC) algorithm is able to solve the centralized economic dispatch problem in a distributed fashion. The convergence rate of the algorithm will be discussed.

The second topic, “Performance optimization of PHEV Municipal Parking Deck in a Smart Grid Environment”, we will discuss the design, and development of optimal charging/discharging strategies for large-scale PHEV (Plug-in Hybrid Electric Vehicles) Parking Deck. We will discuss the relevant optimization algorithms, such as Particle Swarm Optimization (PSO) and Estimation of Distribution Algorithm (EDA), and their applications on the project.

We will conclude the tutorial with discussions on some future Smart Grid control challenges and directions.

### T1-3 Advanced Bus Bar System Design

Room: 303

Instructors:

Douglas Hopkins – North Carolina State University

Charles R. Mosling – PCES Contract Services, LLC

Are you pushing copper or aluminum to their thermal limits be they on a printed circuit board, extending out a power supply box, routing current to the drives, bolted in a cabinet, or running between floors in a telecom station? This seminar dives deep into second-order effects of high-current densities in heavy metal interconnects, and high electric fields across the insulating glue. Bus bars are not just for bulk electrical routing. They can provide the metal carrier for components, have water-cooling, provide high frequency gateways to low impedance energy storage, and offer novel functional integration. The seminar unravels pertinent standards as a base-line, then delves deeply with simulations and case studies to show effects of high fault currents in ac and dc systems, provides an understanding of the three drivers in contact resistance for clamped and sliding interfaces, and addresses the copper versus aluminum trade-off. When finished, the attendee should have an in-depth understanding of the scalable second-order electrical, thermal and corrosion effects impacting bus bar design. The course is intended to be comprehensive.

The design landscape is continually moving to higher power densities. Some move is in voltage, but the vast change is in current. More importantly, power delivery is speeding up with faster delivery to point of load from lower and lower source impedances. Together, the trend continues to be much higher currents at much higher densities. Cabling has a place, but flat bar conductors is preferred, particularly for increased functionality, as the bars become primary thermal conduits besides mechanical carriers. This trend is not just in heavy busing, as in cabinets, but is applied inside power supplies and slowly onto circuit boards. The “bus bar” concept is completely scalable, and this seminar focuses on scalability to purposely aid the designers in expanding their innovative approaches to their circuit or system designs.



When finished the designer will:

- ➔ Understand and be moderately versed in relevant standards.
- ➔ Have gained an intuitive insight through 3-D modeling examples to the problems of current crowding in bus bars due to high frequencies and ultra fast perturbations, particularly from faults.
- ➔ Sufficiently understand the differences and similarities in application of AC and DC bus bar designs to estimate DC bus bar performance.
- ➔ Understand the critical issues in application of Aluminum for Copper in bus bar designs
- ➔ Have a conceptual approach to functional integration of electrical, mechanical and thermal design of bus bar systems based on numerous 3-D simulations and examples of existing bus bar configurations produced by leading manufacturers.
- ➔ Fully understand scalability and, through examples, feel competent to apply bus bar designs to different applications in a wide range of power levels.

#### T1-4 Switchmode Power Magnetics Design

*Room: 304*

Instructor:

Weyman Lundquist – *West Coast Magnetics*

This tutorial will cover the fundamentals of SMPS power magnetics design, with a focus on problems related to high power applications. The demands on switch mode power supply (SMPS) power transformers and inductors are increasing rapidly. High frequency power electronic equipment is being designed for power levels that are moving into the medium to high kilowatt range. Exciting new applications driving this trend to high power levels include hybrid vehicle power trains, large scale solar converters, and power grid level energy conversion including wind energy. This trend to higher power levels is leading to some unique challenges in the design of the magnetic components and this session will address these challenges in the context of basic instruction on SMPS magnetics design.

This tutorial could be a 4 hour session or an 8 hour session and it covers the following topics:

- ➔ Magnetism basics
- ➔ Choice of core material
- ➔ Winding losses: solid wire, litz wire, and foil
- ➔ Power transformer design
- ➔ Boost inductor design
- ➔ Current sense transformer design

The target audience for this tutorial consists of analog design engineers looking for more experience and knowledge of SMPS magnetics, especially as this topic relates to design in the kilowatt range. The intention is to enable the attendee to be capable of basic design work after completion of the class. Drawing from work that the instructor has done in conjunction with Professor

Charles Sullivan at the Thayer School of Engineering at Dartmouth, this tutorial combines practical hands on advice with the results of more fundamental research on topics such as design of inductors and transformers for low AC winding resistance, and prediction of inductance roll off with DC current.

Sunday, September 16th, 1:00 pm - 5:00 pm

Afternoon Sessions

#### T2-1 Battery Management Systems for Electric and Plug-In Hybrid Electric Vehicles

*Room: 301A*

Instructor:

Chris Mi – *University of Michigan-Dearborn*

Electric vehicles (EV) and plug-in hybrid electric vehicles (PHEV) have attracted worldwide attentions because their capabilities to displace petroleum usage and improve energy and environment sustainability. One of the key constraints for mass market penetration of EV and PHEV is the high cost of the battery system. Power electronics are widely used in EV and PHEV battery systems, such as battery charger, battery control units (DC-DC converter), battery cell balancing circuits, and battery protection circuits. These power electronics units must address the unique characteristics of different batteries and assure safe operation of the battery system, and effectively work with the battery management system (BMS). Proper design of these circuits can help optimize the system efficiency and reduce cost while extend the life expectance of the battery system. Understanding the battery system in an EV, HEV, and PHEV are foundation for a power electronic engineer to design and develop effective and efficient power electronic units to work with the battery system and maintain system safety. This course covers four main topics: (1). Energy storage system basics for power electronic engineers with focus on lithium ion batteries; (2). Battery management systems; (3). The application of power electronics in the battery system of an EV and PHEV, including on board and off board battery charger, DC-DC converter, battery monitoring, control, balancing, and protection circuits. (4). Battery safety basics. The seminar will focus on the unique aspects of these power electronic circuits in EV and PHEV applications. Conductive, inductive, and wireless chargers will be discussed. Vehicle to grid (V2G) concepts will be illustrated.

#### T2-2 Advanced Control Architectures for Intelligent MicroGrids

*Room: 302A*

Instructors:

Josep Guerrero – *Aalborg University*

Tzung-Lin Lee – *Sun Yat-Sen University*

Mukul Chandorkar – *Indian Institute of Technology Bombay*

This tutorial presents a review of advanced control techniques for MicroGrids. It is organized in two closely related parts. The first part of the tutorial covers decentralized, distributed, and hierarchical control of grid connected and islanded operation MicroGrids. At first, decentralized control techniques for microgrids are reviewed.



Then, the recent developments in the stability analysis of decentralized controlled MicroGrids are discussed. Hierarchical control strategies for power electronics based MicroGrids that mimic the behavior of the mains grid are reviewed. The use of the GPS timing signal is expected to play an important role in decentralized MicroGrid measurement and control. The tutorial will present the possibilities for the use of the timing information in MicroGrid primary and secondary control. As complexity grows, an important aspect of decentralized MicroGrid control is controller testing. The tutorial will also present the possibilities for the in-position, simultaneous, hardware-in-loop (HIL) testing of the primary and secondary loops of decentralized MicroGrid controllers.

The second part is devoted to the main problems and solutions of power quality in MicroGrids, distributed energy storage systems, and AC/DC hybrid Microgrids. Power quality enhancement of grid-interactive MicroGrids is presented. Then, cooperative control to mitigate voltage harmonics and unbalances in MicroGrids is reviewed. Following this, the use of static synchronous compensator (STATCOM) in grid-connected MicroGrids is presented in order to improve voltage sags/swells and unbalances. Finally, the coordinated control of distributed storage systems and AC/DC hybrid microgrids is presented. Future trends and new technologies of MicroGrid Control are discussed and the Tutorial is summarized and concluded.

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### **T2-3 Power Module Packaging: A Multidisciplinary Integration Approach**

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*Room: 303*

Instructor:

Zhenxian Liang – *Oak Ridge National Laboratory (ORNL)*

The intent of this seminar is to introduce an integrated approach for advancing power electronics module packaging technology. The tutorial will begin with an overview of the major criteria to appraise a power module and a comprehensive evaluation program, including comparison of WBG module to Si ones. This will be followed by discussion on an integrated design of packaging structure, packaging materials and packaging processing technology for improving power module's cost, efficiency, reliability, functionality, and power density, etc. Then it will be addressed to characterize power module in a group of technical performance parameters of electrical, thermal, mechanical and thermomechanical properties. These parameters include thermal impedance, operation temperature, power and thermal cycling capability, vibration, stress strength, weight, volume, and parasitic electric resistance and inductance, etc. The topics will be covered by using examples that are advanced in the field. The workshop is intended to be of interest to those who design, manufacture, use, apply, or specify power electronics modules.

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### **T2-4 Practical Design and Thermal Challenges of High Power DC-DC Converters in Hybrid Electric Vehicles (HEVs)**

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*Room: 304*

Instructors:

Behzad Vafakhah, Chingchi Chen,

Lihua Chen – *Ford Motor Company*

many sustainable and renewable energy applications such as hybrid electric vehicles and PV system power conditioners to step up the voltage of battery or solar cells. It is desirable that the power conversion be made with low losses in these converters. As one of the critical passive components of DC-DC converters, power inductors (reactors) often limit total energy flow and significantly contribute to converters losses, while transfer the energy from battery packs (or PV String) at a lower DC voltage to a higher boosted DC voltage. In HEV applications, specifications provided by automakers for designing the high power density DC-DC converters can leave suppliers with many questions regarding power delivery, sizing strategy, and thermal performance and management.

The requirements for the DC-DC converters in automotive application include steady-state and transient power delivery, reliability and durability, thermal capability, Noise, Vibration, Harshness (NVH), weight, package size, and cost, etc. However, regular power converter design standards would not be adequate to enable the design of a fully functional DC-DC converter for harsh vehicle operating environment with critical vehicle operating points. Additionally, the rising temperature of the power inductor challenges reliability due to the restricted thermal environment. Therefore, the stringent requirements of power converter under transient and worst case scenarios usually are not fully understood by designers until converters are failed due to hot spot temperature rise of the inductor and as a result, overheating the inductor in a vehicle test.

This seminar highlights the practical design challenges of DC-DC power converters for electrified vehicle applications. Power converter design specifications derived from vehicle applications will be explained. The seminar will provide a comprehensive overview of the latest trends in magnetic core technology for higher power densities and higher efficiency power inductors. The seminar will not be focused only on power inductor as an isolated component but as part of the power converter design. The characteristics of different core material are compared and power inductor core selection and sizing will be intensively discussed. Vehicle operation related extreme conditions and worst case scenarios which usually drive the power converter design will also be explained. This course is designed to provide participants with an overview of the thermal analysis of inductor based on inductor loss components. The seminar highlights the necessary thermal performance improvements obtained through improved packaging and better electrical design.

The attendee should leave the seminar with improved knowledge of particular requirements of power converter design and practical challenges. This seminar is designed to provide participants with an overview of better understanding of high power DC-DC converter (including power inductor) design constraints to meet automotive application requirements. It should also be of interest to engineers who work on DC-DC power conversion applications related to PV system power conditioners and middle-scale wind generation systems.

High power DC-DC power converters have been increasingly used in

Monday, September 17th, 10:20 am - 12:00 pm

**S1 Non-Isolated DC-DC Converter Topologies**

Room: 301A

Chairs: Javier Sebastian, Stefano Saggini

**10:20 am Envelope Amplifier based on a Hybrid Series Converter with the Slow-Envelope Technique**

*P.M. Cheng, O. García, M. Vasi, P. Alou, J.A. Oliver, G. Montoro, J.A. Cobos, Universidad Politecnica de Madrid, Spain; Universitat Politecnica de Catalunya, Spain*

**10:45 am Performance Analysis of Interleaved Boost Converter with Voltage Gain Extension Cell**

*Yi Zhao, Yuan Yao, Xin Xiang, Hongbin Yu, Wuhua Li, Xiangning He, Zhejiang University, China*

**11:10 am Buck/Boost DC-DC Converter with Simple Auxiliary Snubber and Complete Soft Switching in Whole Operating Region**

*M. Pavlovsky, A. Kawamura, G. Guidi, Yokohama National University, Japan; Norwegian University of Science and Technology, Japan*

**11:35 am High-Voltage Tapped-Inductor Buck Converter Auxiliary Power Supply for Cascaded Converter Submodules**

*Tomas Modeer, Staffan Norrga, Hans-Peter Nee, KTH Royal Institute of Technology, Sweden*

**S2 Energy Efficiency Applications**

Room: 306C

Chairs: Brad Lehman, Yaow-ming Chen

**10:20 am Modulation Scheme Analysis for High Efficiency Three-Phase Buck Rectifier Considering Different Device Combinations**

*Ben Guo, Fred Wang, Rolando Burgos, University of Tennessee-Knoxville, United States; ABB Research Center, United States*

**10:45 am Improved RTGC System with Voltage Compensation Converter to Reduce Fuel Consumption**

*Bayasgalan Dugarjav, J.S. Ryu, Y.M. Choi, S.H. Lee, D.H. Han, Y.J. Lee, H.R. Choi, G.H. Choe, Seoho Electric Co., Ltd., Mongolia; Seoho Electric Co., Ltd., Korea (South); Konkuk University, Korea (South)*

**11:10 am Small Power Step-Up Converter for Driving Flapping Wings of the Micro Robotic Insects**

*Yuan-Ping Liu, Dejan Vasic, Lab. SATIE, France; SATIE, University of Cergy-Pontoise, France*

**11:35 am Dynamic Modeling of Losses in Electrical Machines for Active Loss Control**

*Francesco Quattrone, Robert D. Lorenz, Leibniz Universitaet Hannover, Germany; University of Wisconsin - Madison, United States*

**S3 Control of Grid-Connected Inverters**

Room: 306B

Chairs: Jian Sun, Zhe Chen

**10:20 am Regions of Active Damping Control for LCL Filters**

*S.G. Parker, B.P. McGrath, D.G. Holmes, RMIT University, Australia*

**10:45 am Precise Modeling and Analysis of DQ-Frame Current Controller for High Power Converters with Low Pulse Ratio**

*Jie Shen, Stefan Schröder, Hanno Stagge, Rik W. De Doncker, GE Global Research Europe, Germany; E.ON ERC, RWTH Aachen University, Germany*

**11:10 am Observer-Based Grid Voltage Disturbance Rejection for Grid Connected Voltage Source PWM Converters with Line Side LCL Filters**

*Nils Hoffmann, Michael Hempel, Michael C. Harke, Friedrich W. Fuchs, Christian-Albrechts-University of Kiel, Germany; Danfoss Power Electronics, United States*

**11:35 am Improved Discrete Current Controller for Grid-Connected Voltage Source Converters in Distorted Grids**

*Mebtu Beza, Massimo Bongiorno, Chalmers University of Technology, Sweden*

**S4 Thermal Management**

Room: 306A

Chairs: Juan Rivas, Fred Wang

**10:20 am Numerical Study of a Liquid Metal Heat Spreader for Power Semiconductor Devices**

*Mansour Tawk, Yvan Avenas, Eric Vagnon, Aline Msaed, Dr., France; Dr., Lebanon*

**10:45 am Junction Temperature Measurement of IGBTs using Short Circuit Current**

*Zhuxian Xu, Fred Wang, Puqi Ning, University of Tennessee-Knoxville, United States*

**11:10 am Power Electronics Loss Measurement using New Heat Flux Sensor based on Thermoelectric Device with Active Control**

*Yichao Zhang, T.M. Jahns, University of Wisconsin-Madison, United States*

**11:35 am Time Dependent Finite Volume Model of a Thermoelectric Device**

*David Yan, F.P. Dawson, M.C. Pugh, A. El-Deib, University of Toronto, Canada*

**S5 Predictive Control in Drives**

Room: 305B

Chairs: Bin Lu, Stefan Schröder

**10:20 am Torque Ripple Reduction Strategy of Model based Predictive Torque Control for Doubly Salient Permanent Magnet Synchronous Machines**

*Wenwu Yang, Wei Xu, Xianyong Xiao, Sichuan University, China; RMIT University, Australia*

**10:45 am Deadlock Avoidance in Model Predictive Direct Torque Control**

*Thomas Burtscher, Tobias Geyer, ABB, Switzerland; ABB Corporate Research, Switzerland*

**11:10 am Model Predictive Pulse Pattern Control for the Five-Level Active Neutral Point Clamped Inverter**

*Nikolaos Oikonomou, Christof Gutscher, Petros Karamanakos, Frederick Kieferndorf, Tobias Geyer, ABB Switzerland LTD., Corporate Research, Switzerland; ABB Switzerland LTD., Medium Voltage Drives, Switzerland; National Technical University of Athens, Greece; The University of Auckland, New Zealand*

**11:35 am Predictive Current Control of a Six-Phase Asymmetrical Drive System based on Parallel-Connected Back-to-Back Converters**

*Jaya Deepti Dasika, Jiangchao Qin, Maryam Saeedifard, Steve D. Pekarek, Purdue University, United States*

**S6 Induction Machines**

Room: 305A

Chairs: Emmanuel Agamloh, Andrea Cavagnino

**10:20 am Computation of Equivalent Circuit Parameters of Nine-Phase Induction Motor in Different Operating Modes**

*Amrit Gautam, Olorunfemi Ojo, Mehdi Ramezani, Omonowo Momoh, Tennessee Technological University, United States; Purdue University, United States*

**10:45 am ▪ The Incremental Design Efficiency Improvement of Commercially Manufactured Induction Motors**

*Emmanuel Agamloh, Aldo Boglietti, Andrea Cavagnino, Advanced Energy, United States; Politecnico di Torino, Italy*

**11:10 am ▪ 2/4 POLES Split Phase Capacitor Motor for Compressors: A Comprehensive Characterization**

*F. Kalluf, A. Espíndola, L. Tutelea, I. Boldea, Whirlpool/Embraco, Brazil; UPT, Romania*

**11:35 am ▪ Design and Tests on a Fractional-Slot Induction Machine**

*Luigi Alberti, Nicola Bianchi, University of Padova, Italy*

**S7 Control of Converter for Grid Application**

*Room: 304*

*Chairs: Stefan Schroeder, Jih-Sheng Lai*

**10:20 am ▪ Closed-Loop Control of DC-DC Dual Active Bridge Converters Driving Single-Phase Inverters**

*Hengsi Qin, Jonathan W. Kimball, SolarBridge Technologies, Inc., United States; Missouri University of Science and Technology, United States*

**10:20 am ▪ High Gain High Efficiency Front End Resonant DC-DC Boost Converter for PV Microinverter**

*Shiladri Chakraborty, Parthasarathi Sensarma, Indian Institute Of Technology, Kanpur, India*

**11:10 am ▪ Black Start Control of a Solid State Transformer for Emergency Power Restoration**

*Nicholas Parks, Sumit Dutta, Vivek Ramachandram, Kamallesh, Hatua Subhashish, Bhattacharya, North Carolina State University, United States*

**11:35 am ▪ Grid Synchronization of Three-Phase Converters using Cascaded Complex Vector Filter PLL**

*Cristian Blanco, David Reigosa, Fernando Briz, Juan M. Guerrero, Pablo García, University of Oviedo, Spain, Spain*

**S8 Harmonics in Smart Grid**

*Room: 303*

*Chairs: Salvatore D'Arco, Marta Molinas*

**10:20 am ▪ A Selected Harmonics Compensation Method with Distributed Energy Resources**

*Damoun Ahmadi, Jin Wang, The Ohio State University, United States*

**10:45 am ▪ Autonomous Control of Inverter-Interfaced Distributed Generation Units for Harmonic Current Filtering and Resonance Damping in an Islanded Microgrid**

*Xiongfei Wang, Frede Blaabjerg, Zhe Chen, Aalborg University, Denmark*

**11:00 am ▪ A Practical Directional Third Harmonic Hybrid Active Filter for Medium Voltage Utility Applications**

*Jorge E. Hernandez, Rajendra P. Kandula, Frank Lambert, Deepak Divan, Georgia Institute of Technology, United States*

**11:35 am ▪ Non-Intrusive Active Power Clamp Filter on PLC Channels for Smart Grid Applications**

*Amir Mehdi Pasdar, Yilmaz Sozer, Iqbal Husain, University of Akron, United States; North Carolina State University, United States*

**S9 Power Converters for Wind Applications**

*Room: 302C*

*Chairs: Bogi Bech Jensen, Tzung-lin Lee*

**10:20 am ▪ A High Efficiency High Power Step-Up Resonant Switched-Capacitor Converter for Offshore Wind Energy Systems**

*Wu Chen, Alex Huang, Chushan Li, Gangyao Wang, Southeast University, China; North Carolina State University, United States; Zhejiang University, China*

**10:45 am ▪ A 3- $\phi$  to 3- $\phi$  Quasi Z-Source Matrix Converter for Residential Wind Energy Systems**

*Ekrem Karaman, Mehdi Farasat, Andrzej M. Trzynadlowski, University of Nevada, Reno, United States*

**11:00 am ▪ A Transformerless Generator-Converter Concept Making Feasible a 100 kV Light Weight Offshore Wind Turbine: Part I – The Generator**

*Paal Keim Olsen, Sverre Gjerde, Robert M. Nilssen, Jorunn Hoelto, Sverre Hvidsten, SmartMotor AS, IEEE Member, Norway; NTNU, Norway; SINTEF Energy Research, Norway*

**11:35 am ▪ A Transformerless Generator-Converter Concept making Feasible a 100 kV Low Weight Offshore Wind Turbine Part II – The Converter**

*Sverre S. Gjerde, Paal Keim Olsen, Tore M. Undeland, Norwegian University of Science and Technology, Norway; SmartMotor, Norway*

**S10 Contactless Power Transfer for EV Applications**

*Room: 302B*

*Chairs: John Miller, Laura Marlino*

**10:20 am ▪ Grid Side Regulation of Wireless Power Charging of Plug-In Electric Vehicles**

*John M. Miller, Clifford P. White, Omer C. Onar, Phillip M. Ryan, Oak Ridge National Laboratory, United States*

**10:45 am ▪ A Large Air Gap 3kW Wireless Power Transfer System for Electric Vehicles**

*Hiroya Takanashi, Yukiya Sato, Yasuyoshi Kaneko, Shigeru Abe, Tomio Yasuda, Saitama University, Japan; Technova Inc, Japan*

**11:00 am ▪ A 90 Percent Efficient 5kW Inductive Charger for Evs**

*Hunter H. Wu, Aaron Gilchrist, Ky Sealy, Daniel Bronson, Energy Dynamics Laboratory, United States*

**11:35 am ▪ A Bipolar Receiver Pad in a Lumped IPT System for Electric Vehicle Charging Applications**

*Adeel Zaheer, Dariusz Kacprzak, Grant A. Covic, University of Auckland, New Zealand*

**S11 AC-DC Converters**

*Room: 302A*

*Chairs: Sung Yeul Park, Jun Li*

**10:20 am ▪ Optimal Zero-Vector Configuration for Space Vector Modulated AC-DC Matrix Converter**

*Bo Feng, Hua Lin, Xingwei Wang, Xing An, Bangyin Liu, Huazhong university of Science and Technology, China; Huazhong University of Science and Technology, China*

**10:45 am ▪ Variable Sampling Slope (VSS) and No-Deadtime Ramp Generator (NDRG) Techniques for Closed-Loop Interleaving Power Factor Correction (PFC) Design with Suppression of Current Mismatch**

*Chun-Yen Chen, Ruei Hong Peng, Jen-Chieh Tsai, Yu-Chi Kang, Chia-Lung Ni, Yi-Ting Chen, Ke-Horng Chen, Shih-Ming Wang, Ming-Wei Lee, Hsin-yu Luo, National Chiao Tung University, Taiwan*

**11:00 am ▪ Measurement-Based Analytical Model of Conduction and Switching Losses of Three-Phase AC-DC Matrix Rectifier**

*K. You, D. Xiao, M.F. Rahman, Toshiba International Pty Ltd., Australia; University of New South Wales Australia, Australia*

**11:35 am ▪ Comparison Study of 12kV n-Type SiC IGBT with 10kV SiC MOSFET and 6.5kV Si IGBT based on 3L-NPC VSC Applications**

*Sachin Madhusoodhanan, Kamallesh Hatua, Subhashish Bhattacharya, Scott Leslie, Sei-Hyung Ryu, Mrinal Das, Anant Agarwal, David Grider, North Carolina State University, United States; Powerex, United States; Cree, United States*



**S12 Multilevel Converters I: General Topologies**

Room: 301B

Chairs: Pierluigi Tenca, Bingseng Wang

**10:20 am** ▪ **Single Stage Buck-Boost DC-AC Neutral Point Clamped Inverter**  
 Mo Wei, Poh Chiang Loh, Frede Blaabjerg, Nanyang Technological University, Singapore; Aalborg University, Denmark

**10:45 am** ▪ **Nested Multilevel Configurations**  
 Euzeli C. dos Santos Jr., Joao H.G. Muniz, Edison R.C. da Silva, Cursino B. Jacobina, IUPUI, Brazil; UFCG, Brazil

**11:10 am** ▪ **Development of High Power Density Flying Capacitor Multi-Level Converters with Balanced Capacitor Voltage**  
 Hidemine Obara, Yukihiko Sato, Chiba University, Japan

**11:35 am** ▪ **Single-Phase Semi-Bridge Five-Level Flying-Capacitor Rectifier**  
 C.A. Teixeira, D.G. Holmes, B.P. McGrath, RMIT University, Australia

**SS1 Renewable Energy and New Grid Infrastructure**

Room: 402

Chairs: Dan Ionel, Karim Younsi

**10:20 am** ▪ **Large-Scale Solar Plants: A Reality in Both Photovoltaics and Thermal Solar Technologies**  
 Pedro Rodriguez, Abengoa, Spain

**10:45 am** ▪ **Experimental Power Grid Center: A Flexible Research Platform for Low Voltage Grids**  
 Ashwin M. Khambadkone, Inam Nutkani, Yu Xiaoxiao, Experimental Power Grid Center, Singapore

**11:10 am** ▪ **Addressing the Needs of an Emerging Fleet of Hybrid and Electric Vehicles**  
 John M. Miller, Burak Ozpineci, Oak Ridge National Labs (ORNL), United States

**11:35 am** ▪ **FREEDM Systems: The Energy Internet**  
 Alex Huang, North Carolina State University, United States

Monday, September 17th, 1:30 pm - 3:35 pm

**S13 Control of Non-Isolated DC-DC Converters**

Room: 301A

Chairs: Yan-Fei Liu, Luca Corradini

**1:30 pm** ▪ **One Novel Remote Sensing Method for On-Board Voltage Regulator in Computing System**

Xiaoguo Liang, Meng Wang, Gang Ji, Naveen Gg, Intel Asia-Pacific Research and Development Ltd., China; Intel Corporation US, United States; Intel Technology India Pvt. Ltd., India

**1:55 pm** ▪ **Linearized Sensorless Adaptive Voltage Positioning Controller for DC-DC Boost Power Converter**

Wangxin Huang, Jaber A. Abu Qahouq, Shehab Ahmed, The University of Alabama, United States

**2:20 pm** ▪ **Boundary Control of Buck-Boost Converters: Normalized Trajectories and the Natural Switching Surface**

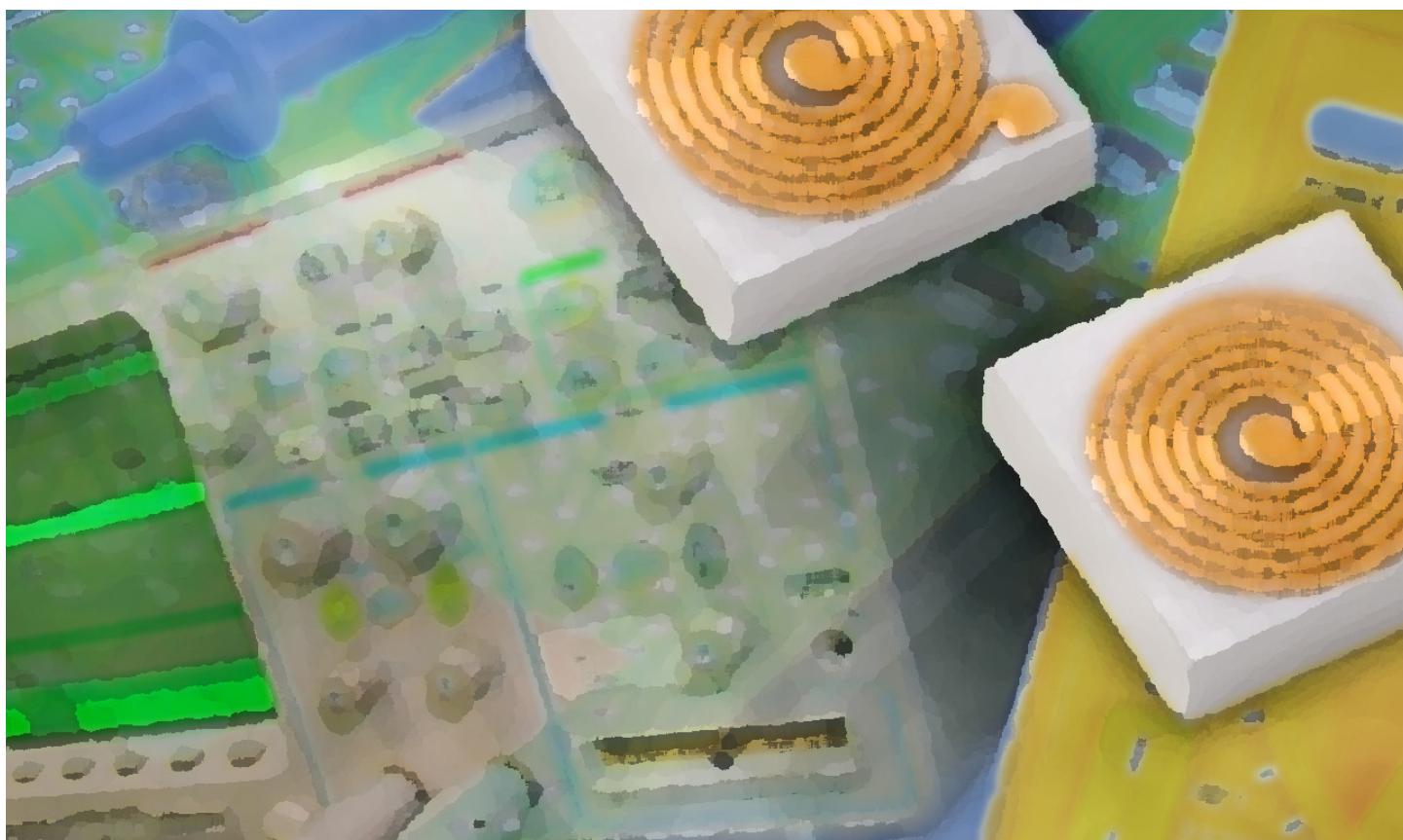
Juan M. Galvez, Martin Ordóñez, Tuan T. Nguyen, Federico Luchino, Simon Fraser University, Canada; Eindhoven University of Technology, Netherlands

**2:45 pm** ▪ **A Novel Carrier Generation based Fully Digital Hysteretic Modulator for Point-of-Load Converters**

R.K. Singh, Santanu Mishra, Indian Institute of Technology Kanpur, India

**3:10 pm** ▪ **Current-Balancing Controller Requirements of Automotive Multi-Phase Converters with Coupled Inductors**

Sebastian Utz, Johannes Pforr, University of Applied Sciences Ingolstadt, Germany





**S14 Energy Harvesting for Low Power Electronics Applications**

Room: 306C

Chairs: Jaber Abu Qahouq, Toshihisa Shimizu

**1:30 pm ■ Reducing Detent Force While Harvesting Energy from Center of Gravity: An 11-Poles, 12-Slots Generator Design**

Zhi Yang, Yichao Tang, Peng Zeng, Alireza Khaligh, IIT, United States; University of Maryland, United States; VIA Telecom Inc., United States

**1:55 pm ■ The Effect of Reflections on the Performance of an Acoustic Energy Transfer System**

M.G.L. Roes, M.A.M. Hendrix, J.L. Duarte, Eindhoven University of Technology, Netherlands

**2:20 pm ■ Optimum Design of Magnetic Inductive Energy Harvester and Its AC-DC Converter**

Qian Sun, Sumeet Patil, Stephen Stoute, Nian-Xiang Sun, Brad Lehman, Northeastern University, United States

**2:45 pm ■ Investigating the Scope for Electroplated Magnetic Alloys in Shielding of PCBs**

Maeve Duffy, Santosh Kulkarni, Saibal Roy, Wai Man Ng, Ron Hui, National University of Ireland Galway, Ireland; Tyndall National Institute, Ireland; The University of Hong Kong, Hong Kong

**3:10 pm ■ Ocean Energy Power Take-Off using Oscillating Paddle**

Samir Hazra, Subhashish Bhattacharya, Krishna Kiran Uppalapati, Jonathan Bird, North Carolina State University, United States; University of North Carolina at Charlotte, United States

**S15 Control of DC-DC Converters**

Chairs: 306B

Chairs: Byungcho Choi, Francisco Javier Azcondo

**1:30 pm ■ Adaptive Voltage Tracking Control of Zeta Buck-Boost Converters**

Afshin Izadian, Pardis Khayyer, Heng Yang, Purdue School of Engineering and Technology, United States; Ohio State University, United States

**1:55 pm ■ A Novel Predictive Phase Shift Controller for Bidirectional Isolated DC to DC Converter for High Power Applications**

Sumit Dutta, Subhashish Bhattacharya, Mukul Chandorkar, North Carolina State University, United States; Indian Institute of Technology, Bombay, India

**2:20 pm ■ Design Considerations of a Three Phase Dual Active Bridge based on Reactive Power Flow**

David Boillat, Sudhin Roy, Awneesh Tripathi, Subhashish Bhattacharya, ETH Zurich, Switzerland; NC State University, United States

**2:45 pm ■ Small-Signal Modeling of the Interleaved Boost with Voltage Multiplier**

G. Spiazzi, S. Buso, F. Sichirollo, L. Corradini, University of Padova, Italy

**S16 Power Modules and Packaging I**

Room: 306A

Chairs: Jean-Luc Schanen, Steffen Bernet

**1:30 pm ■ Planar Bond All: A New Packaging Technology for Advanced Automotive Power Modules**

Zhenxian Liang, Puqi Ning, Fred Wang, Laura Marlino, Oak Ridge National Laboratory, United States; University of Tennessee, United States

**1:55 pm ■ A 6.5kV, Wire-Bondless, Double-Sided Cooling Power Electronics Module**

H. Zhang, S.S. Ang, A. Mantooh, J.C. Balda, The University of Arkansas, United States

**2:20 pm ■ Characterization of 4.5 kV - 5.5 kA IGBTs within a Medium Voltage 3L-ANPC Phase Leg**

Daniel Andler, Rodrigo Álvarez, Steffen Bernet, José Rodriguez, Tech-

nische Universitaet Dresden, Germany; Universidad Tecnica Federico Santa Maria, Chile

**2:45 pm ■ Reduction of the Stray Inductance in a Switching Cell using the Power Chip-on-Chip 3D Integration Concept**

Jean-Louis Marchesini, Yvan Avenas, Pierre-Olivier Jeannin, Salim Boulahrouz, G2Elab, France; Skikda University, Algeria

**3:10 pm ■ Compact High Temperature Package with Smart Size Optimized Gate Drive Unit for Assembling the Dual-IGT**

Thomas Butschen, Zhan Wang, Murat Kaymak, Rik W. De Doncker, RWTH Aachen University, Germany; Florida State University, United States

**S17 Current Measurement and Control in Drives**

Room: 305B

Chairs: Radu Bojoi, Tobias Geyer

**1:30 pm ■ Transient Response Evaluation of Resonant Controllers for AC Drives**

Alejandro G. Yepes, Ana Vidal, Francisco D. Freijedo, Jano Malvar, Óscar López, Jesús Doval-Gandoy, University of Vigo, Spain; Gamesa Innovation and Technology, Spain

**1:55 pm ■ Six-Step Operation of PMSM with Instantaneous Current Control**

Yong-Cheol Kwon, Sungmin Kim, Seung-Ki Sul, Seoul National University, Korea (South)

**2:20 pm ■ Compensation of Current Measurement Error for Current-Controlled PMSM Drives**

Myoungho Kim, Seung-Ki Sul, Junggi Lee, Seoul National University, Korea (South); LG Electronics Inc., Korea (South)

**2:45 pm ■ Maximum-Torque-per-Ampere Control of High Torque-Density Multiphase Drives based on Induction Motors**

L. Zarrì, M. Mengoni, A. Tani, G. Serra, D. Casadei, University of Bologna, Italy

**3:10 pm ■ A DSP-Based Resolver-to-Digital Conversion using Pulse Excitation**

Chung-Chuan Hou, Chung Hua University, Taiwan

**S18 Concentrated Winding PM Machines**

Room: 305A

Chairs: Ayman El-Refaie, Nicola Bianchi

**1:30 pm ■ Design of a Low Torque Ripple Fractional-Slot Interior Permanent Magnet Motor**

Luigi Alberti, Massimo Barcaro, Nicola Bianchi, University of Padova, Italy; University of Bozen - Bolzano, Italy

**1:55 pm ■ Scalability Characteristics of Magnetic Circuit Model for Fractional-Slot Concentrated Winding IPM Machines**

Jagadeesh K. Tangudu, T.M. Jahns, University of Wisconsin - Madison, United States

**2:20 pm ■ Effect of Stator Shifting on Harmonic Cancellation and Flux Weakening Performance of Interior PM Machines Equipped with Fractional-Slot Concentrated Windings for Hybrid Traction Applications**

Patel Bhageerath Reddy, Kum-Kang Huh, Ayman EL-Refaie, GE Global research, United States; GE Global Research, United States

**2:45 pm ■ Design and Analysis of PM Fractional Slot Machine Considering the Fault Operation**

Lei Hao, Isaac Du, Hejie Lin, Chandra Namuduri, General Motors, United States

**3:10 pm ■ Integrated Generator for more Electric Engine: Design and Testing of a Scaled Size Prototype**

A. Cavagnino, Zijian Li, A. Tenconi, S. Vaschetto, Politecnico di Torino, Italy

**S19 Grid-Connected Inverters with LCL Filters**

Room: 304

Chairs: Rajib Datta, Yunwei Li

**1:30 pm ▪ Synthesis of Active Damping for Grid-Connected Inverters with an LCL Filter**

Huafeng Xiao, Xiaohui Qu, Shaojun Xie, Jinming Xu, School of Electrical Engineering, Southeast Univ, China; College of Automation Engineering, Nanjing Unive, China

**1:55 pm ▪ Design of LCL Filters in Consideration of Parameter Variations for Grid-Connected Converters**

Robert Meyer, Axel Mertens, Leibniz University Hanover, IAL, Germany

**2:20 pm ▪ Cost-Effective Deadbeat Current Control for Wind-Energy Inverter Application with LCL Filter**

Katsumi Nishida, Tarek Ahmed, Mutsuo Nakaoka, Ube National College of Technology, Japan; Assiut University, Egypt; Kyoungham University, Japan

**2:45 pm ▪ Magnetic Integration of an LCL Filter for the Single-Phase Grid-Connected Inverter**

Donghua Pan, Xinbo Ruan, Xuehua Wang, Chenlei Bao, Weiwei Li, Huazhong University of Science and Technology, China

**3:10 pm ▪ Design of Injected Grid Current Regulator and Capacitor-Current-Feedback Active-Damping for LCL-Type Grid-Connected Inverter**

Chenlei Bao, Xinbo Ruan, Xuehua Wang, Weiwei Li, Donghua Pan, Kailei Weng, Huazhong University of Science and Technology, China

**S20 Smart Grid Devices**

Room: 303

Chairs: Subhashish Bhattacharya, Marta Molinas

**1:30 pm ▪ Design and Evaluation of a Universal Power Router for Residential Applications**

Brian P. Stalling, Tavis Clemmer, H. Alan Mantooth, Robert Motte, Hang Xu, Tyler Price, Roger Dougal, University of Arkansas, United States; University of South Carolina, United States

**1:55 pm ▪ Design Considerations in Development of Active Mobile Substations**

Babak Parkhideh, Nima Yousefpour, Saman Babaei, Subhashish Bhattacharya, North Carolina State University, United States

**2:20 pm ▪ Design Issues in a Medium-Voltage DC Amplifier with a Multi-Pulse Thyristor Bridge Front-End**

Hesam Mirzaee, Subhashish Bhattacharya, Sandeep Bala, North Carolina State University, United States; ABB US Corporate Research Center, United States

**2:45 pm ▪ Ultra Fast Protection of Radial and Looped Electric Power Grid using a Novel Solid-State Protection Device**

Mohammad Ali Rezaei, Alex Huang, North Carolina State University, United States

**3:10 pm ▪ State of Art of Power Electronics in Circuit Breaker Technology**

Rudraksh Kapoor, Anshuman Shukla, Georgios Demetriades, Indian Institute of Technology Bombay, India; ABB AB, Corporate Research, Sweden

**S21 EMI Modeling and Filter Design**

Room: 302C

Chairs: Jian Sun, Michael Zagami

**1:30 pm ▪ EMI Study of a 70kW Interleaved Three-Phase Inverter for Aircraft Application**

B. Toure, J.L. Schanen, L. Gerbaud, Y. Avenas, R. Ruelland, R. De Maglie, T. Meynard, Liebherr Aerospace Toulouse/G2Elab, France; G2Elab, France; Liebherr Aerospace Toulouse, France; Liebherr Elektronik GmbH, Germany; Laplace, France

**1:55 pm ▪ Modeling and Reduction of Conducted EMI in SiC JFET Motor Drives with Insulated Metal Substrate**

Xun Gong, J.A. Ferreira, Delft University of Technology, Netherlands

**2:20 pm ▪ Optimal Design of AC EMI Filters with Damping Networks and Effect on the System Power Factor**

Nico Hensgens, Marcelo Silva, Jesus A. Oliver, José A. Cobos, Stanislav Skibin, Andreas Ecklebe, Universidad Politecnica de Madrid, Spain; ABB Corporate Research, Switzerland

**2:45 pm ▪ Modeling and Design of Common-mode Inductor for Conductive EMI Noise Suppression in DC-Fed Motor Drive System**

Jing Xue, Fred Wang, University of Tennessee-Knoxville, United States

**3:10 pm ▪ A Novel Dithering Algorithm to Reduce the Electro-Magnetic Interference (EMI) in Single Phase DC/AC Inverters**

A. Elrayah, K. Namburi, Y. Sozer, I. Husain, University of Akron, United States; North Carolina State University, United States

**S22 Energy Storage I**

Room: 302B

Chairs: Adel Nasiri, Chung-chuan Hou

**1:30 pm ▪ LCL Filter Utilized in Battery Charging Applications to Achieve Compact Size and Low Ripple Charging**

Xiaohu Zhou, Xunwei Yu, Srdjan Lukic, Alex Huang, FREEDM Systems Center, North Carolina State University, United States

**1:55 pm ▪ Dynamic Control of Energy Storage System for Stable Operation of Wind Power Plant**

Duong Tran, Ashwin M. Khambadkone, National University of Singapore, Singapore

**2:20 pm ▪ Cell Voltage Equalizer using Series Resonant Inverter and Voltage Multiplier for Series-Connected Supercapacitors**

Masatoshi Uno, Akio Kukita, Japan Aerospace Exploration Agency, Japan

**2:45 pm ▪ An Axial Flux Flywheel Motor/Generator for Pulsed Power Application**

Jianning Dong, Yunkai Huang, Peiyong Shen, Long Jin, Baoyun Ge, Southeast University, China

**S23 Higher Power and Aerospace Applications**

Room: 302A

Chairs: Srdjan Lukic, Pierluigi Tenca

**1:30 pm ▪ Optimal Design and Experimental Validation of a Medium-Frequency 400kVA Power Transformer for Railway Traction Applications**

Irma Villar, Luis Mir, Ion Etxeberria-Otadui, Javier Colmenero, Xabier Agirre, Txomin Nieva, IK4-IKERLAN Technological Research Centre, Spain; CAF Power and Automation, Spain; CAF Power and Automation, Spain

**1:55 pm ▪ Linearizing Control of Shipboard Multi-Machine MVDC Power Systems Feeding Constant Power Loads**

Giorgio Sulligoi, Daniele Bosich, Lin Zhu, Marco Cupelli, Antonello Monti, DI3 - University of Trieste, Italy; E.ON Energy Research Center RWTH Aachen University, Germany

**2:20 pm ▪ A Review and Implementation of Matrix-Converter for Aerospace Application**

K. Kobravi, R. Iravani, H.A. Kojori, University of Toronto, Canada; Honeywell-Aerospace, Canada

**2:45 pm ▪ A Novel Three-Phase Four-Wire Active Power Filter Applicable to Aircraft Power System**

Zhong Chen, Miao Chen, Changyou Wang, Nanjing University of Aeronautics and Astronautics, China

**3:10 pm** ▪ **Level-Shifted PWM for a Multilevel Traction Converter using a State Composer**  
Roberto Aceiton, Jens Weber, Steffen Bernet, Technische Universität Dresden, Germany

**S24** **Multilevel Converters II: Applications**

*Room: 301B*

*Chairs: Yongsug Suh, Stefano Bifaretti*

**1:30 pm** ▪ **Startup and Low-Speed Operation of an Adjustable-Speed Motor Driven by a Modular Multilevel Cascade Inverter (MMCI)**

*Makoto Hagiwara, Isamu Hasegawa, Hirofumi Akagi, Tokyo Institute of Technology, Japan; Tokyo Institute of Technology, Japan; Tokyo Institute of Technology, Japan*

**1:55 pm** ▪ **Investigation on IGBT-Based NPC/H-Bridge Large Power Converter**

*Zhiming Lan, Yaohua Li, Chongjian Li, Chunyi Zhu, Chengsheng Wang, Institute of Electrical Engineering, Chinese Ac, China; Automation Research and Design Institute of Meta, China*

**2:20 pm** ▪ **Power Density Investigations for the Large Wind Turbines' Grid-Side Press-Pack IGBT 3L-NPC-VSCs**

*Osman S. Senturk, Lars Helle, Stig Munk-Nielsen, Remus Teodorescu, Pedro Rodriguez, ABB Switzerland Ltd., Switzerland; Vestas Wind Systems, Denmark; Aalborg University, Denmark; Technical University of Catalonia, Spain*

**2:45 pm** ▪ **Modular Multilevel Converter AC Motor Drives with Constant Torque from Zero to Nominal Speed**

*Antonios Antonopoulos, Lennart Ängquist, Staffan Norrga, Kalle Ilves, Hans-Peter Nee, KTH - Royal Institute of Technology, Sweden*

**3:10 pm** ▪ **A Battery Energy Storage System with a Modular Push-Pull PWM Converter**

*Makoto Hagiwara, Hirofumi Akagi, Tokyo Institute of Technology, Japan*

**Tuesday, September 18th, 8:00 am - 9:40 am**

**S25** **Non-Isolated DC-DC Converters General**

*Room: 301A*

*Chairs: David Anderson, Regan Zane*

**8:00 am** ▪ **Reduction of Equivalent Series Inductor Effect in Delay-Ripple Reshaped Constant On-Time Control for Buck Converter with Multi-Layer Ceramic Capacitors**

*Wei-Chung Chen, Yu-Chi Kang, Chia-Ching Lin, Ke-Horng Chen, Shih-Ming Wang, Ming-Wei Lee, Hsin-yu Luo, National Chiao Tung University, Taiwan*

**8:25 am** ▪ **Detailed Characterization of Coupled Inductors in Interleaved Converters Regarding the Demand for Additional Filtering**

*Jens C. Schroeder, Friedrich W. Fuchs, University of Kiel, Germany*

**8:50 am** ▪ **General Derivation Law of Single-Switch Integrated Converter for Dual-Output, Dual-Input and Single-Stage Applications**

*Yu Chen, Cai Chen, Xinchun Lin, Yong Kang, Huazhong University of Science and Technology, China*

**9:15 am** ▪ **Unified Algebraic Synthesis of Generalized Fibonacci Switched Capacitor Converters**

*Alexander Kushnerov, Sam Ben-Yaakov, Ben-Gurion University of the Negev, Israel*





**S26** **Doubly-Fed Induction Generators for Wind Turbines**

Room: 306C

Chairs: Yao Duan, Ojo Olorunfemi

**8:00 am** ▪ **Doubly Fed Induction Generator in an Offshore Wind Power Plant Operated at Rated V/Hz**

*E. Muljadi, M. Singh, V. Gevorgian, National Renewable Energy Laboratory, United States*

**8:25 am** ▪ **Direct Power Control of Doubly-Fed-Induction-Generator-Based Wind Turbines under Asymmetrical Grid Voltage Dips**

*Hongwei Ma, Lie Xu, Yongdong Li, Zedong Zheng, Ling Peng, School of Electrical Engineering, Tsinghua University, China; China Ship Development Design Center, China*

**8:50 am** ▪ **A Novel Three-Vectors-Based Predictive Direct Power Control of Doubly Fed Induction Generator for Wind Energy Applications**

*Yongchang Zhang, Zhengxi Li, Zhengguo Piao, Wei Xie, Xianglong Wei, Wei Xu, North China University of Technology, China; RMIT University, Australia*

**9:15 am** ▪ **Decoupled Control of Natural and Power Variables of Doubly-Fed Induction Generator using Feedback Linearization**

*Adeola Balogun, Olorunfemi Ojo, Frank Okafor, University of Lagos, Nigeria; Tennessee Technological University, United States*

**S27** **Overmodulation in Drives**

Room: 306B

Chairs: Tim Alt, Gianmario Pellegrino

**8:00 am** ▪ **Maximum Voltage Utilization of IPMSMs using Modulating Voltage Scalability for Wide Flux Weakening Applications**

*SeHwan Kim, YoungSun Lee, Won-Kyoung Choi, Mu-Shin Kwak, Young-Kook Lee, Jul-Ki Seok, YeungNam Univ., Korea, Republic of; Hyundai-Kia Motors, Korea, Republic of*

**8:25 am** ▪ **Dynamic Overmodulation in the Synchronous Reference Frame for IPMSMs**

*Junwoo Kim, Sungyoon Jung, Kwanghee Nam, POSTECH, Korea (South)*

**8:50 am** ▪ **Extension of the Operating Region of an IPM Motor Utilizing Series Compensation**

*Di Pan, Feng Liang, Yang Wang, Thomas A. Lipo, University of Wisconsin-Madison, United States; Ford Motor Company, United States; United Technologies Research Center, United States*

**9:15 am** ▪ **Control of Wide Speed Range PMSM Drives with Large DC-Link Variations without Regenerative Unit utilizing PWM-VSI Overmodulation**

*Nicola-Valeriu Olarescu, Martin Weinmann, Stefan Zeh, Sorin Musuroi, Ciprian Sorandaru, Diehl AKO Stiftung Co. KG, Germany; University "Politehnica" of Timisoara, Romania*

**S28** **Switched Reluctance Machines**

Room: 306A

Chairs: Avoki Omekanda, Peter Wung

**8:00 am** ▪ **Four-Quadrant Torque Ripple Minimization of Switched Reluctance Machine through Current Profiling with Mitigation of Rotor Eccentricity Problem and Sensor Errors**

*Rajib Mikail, Iqbal Husain, Yilmaz Sozer, Mohammad Islam, Tomy Sebastian, North Carolina State University, United States; The University of Akron, United States; Nexteer Automotive, United States*

**8:25 am** ▪ **A Fixed Switching Frequency Predictive Current Control Method for Switched Reluctance Machines**

*Rajib Mikail, Iqbal Husain, Yilmaz Sozer, Mohammad Islam, Tomy Sebastian, North Carolina State University, United States; The University of Akron, United States; Nexteer Automotive, United States*

**8:50 am** ▪ **Torque Ripple Mitigation of Double Stator Switched Reluctance Motor (DSSRM) using a Novel Rotor Shape Optimization**

*Mohammad Ali Tavakkoli, Mehdi Moallem, Isfahan University of Technology, Iran*

**9:15 am** ▪ **Comparison of Energy Consumption of SRM and IPMSM in Automotive Driving Schedules**

*Kyohei Kiyota, Hiroya Sugimoto, Akira Chiba, Tokyo Institute of Technology, Japan*

**S29** **FEA and Modeling in Electric Machines**

Room: 305B

Chairs: Eric Lin, Rajeev Vyas

**8:00 am** ▪ **Finite-Element Analysis of Electrical Machines for Sensorless Drives with Signal Injection**

*Luigi Alberti, Nicola Bianchi, Mattia Morandini, Johan Gyselinck, University of Padova, Italy; Universite' libre de Bruxelles, Belgium*

**8:25 am** ▪ **Machine Design Optimization based on Finite Element Analysis in a High-Throughput Computing Environment**

*Wenyang Jiang, T.M. Jahns, T.A. Lipo, William Taylor, Yusaku Suzuki, University of Wisconsin - Madison, United States; JSOL Corp., Japan*

**8:50 am** ▪ **Steady-State Finite Element Analysis of Magnetic Devices using a Shooting-Newton-GMRES Algorithm with Runge-Kutta Integration**

*Jason Pries, Heath Hofmann, University of Michigan, United States*

**9:15 am** ▪ **Loss and Efficiency Evaluations of SynRM According to Windings Type by Coupled Preisach Models and FEM and Experiment**

*Jung-Ho Lee, Han-Sang Song, Hanbat National University, Korea, Republic of*

**S30** **Electrical Machines in Transportation**

Room: 305A

Chairs: Fabio Capponi, Rajeev Vyas

**8:00 am** ▪ **In-Wheel Motor for a Small Hybrid Electric Vehicle: Design, Realization and Experimental Characterization**

*Christophe Espanet, Frédéric Dubas, Hoan Minh Mai, Didier Chamagne, Robert Bernard, Pascal Bigot, University of Franche-Comte, France; Novelte Systeme, France*

**8:25 am** ▪ **Development and Experimental Characterization of a Multiple Isolated Flux Path Reluctance Machine**

*Tim Burress, Curt Ayers, Oak Ridge National Laboratory/Univ. of Tennessee, United States*

**8:50 am** ▪ **Electric Machine Design for General Motors e-Assist Light Electrification Technology**

*Sinisa Jurkovic, John C. Morgante, Khwaja M. Rahman, Peter J. Savagian, General Motors, United States*

**S31** **Grid Parameter Identification**

Room: 304

Chairs: Vladimir Blasko, Yongdong Li

**8:00 am** ▪ **Online Grid Impedance Identification for Adaptive Control of Grid-Connected Inverters**

*Mauricio Céspedes, Jian Sun, Rensselaer Polytechnic Institute, United States*

**8:25 am** ▪ **Online Grid Impedance Estimation for the Control of Grid Connected Converters in Inductive-Resistive Distributed Power-Networks using Extended Kalman-Filter**

*Nils Hoffmann, Friedrich W. Fuchs, Christian-Albrechts-University of Kiel, Germany*

**8:50 am** ▪ **Estimation of Power Systems Amplitudes, Frequencies, and Phase Characteristics using Energy Operators**

*David A. Kaiser, James F. Kaiser, Enphase Energy, United States; Duke University, United States*



**S32 Ocean and Wave Energy I**

Room: 303

Chairs: David Dorrell, Ted Brekken

**8:00 am ■ Modeling and Control of a Slack-Moored Two-Body Wave Energy Converter with Finite Element Analysis***Timothy M. Lewis, Annette von Jouanne, Ted K.A. Brekken, Oregon State University, United States***8:25 am ■ Design and Operation of Very Slow-Speed Generators for a Bristol Cylinder Sea Wave Generating Device***Sze Song Ngu, David G. Dorrell, C. Cossar, Universiti Malaysia Sarawak, Malaysia; University of Technology Sydney, Australia; University of Glasgow, United Kingdom***8:50 am ■ All-Electric Wave Energy Converter Array with Energy Storage and Reactive Power Compensation for Improved Power Quality***Jonas Sjolte, Gaute Tjensvoll, Marta Molinas, Fred Olsen, Norway; NTNU, Norway***S33 Control of Smart Grid and Microgrid**

Room: 302C

Chairs: Jon Are Suul, Zhe Chen

**8:00 am ■ Load Sharing using Droop Control for Parallel Operation of Matrix Converters as Distributed Generator Interfaces in Isolated Mode***Xiong Liu, Poh Chiang Loh, Frede Blaabjerg, Peng Wang, School of EEE, Nanyang Technological University, Singapore; Institute of Energy, Aalborg University, Denmark***8:25 am ■ A Seamless Transfer Strategy of Islanded and Grid-Connected Mode Switching for Microgrid based on Droop Control***Cheng Jin, Mingzhi Gao, Xiaofeng Lv, Min Chen, Zhejiang University, China***8:50 am ■ Distributed Control of Orthogonal Current Components among Converters in an Autonomous Microgrid***Gholamreza Dehnavi, Herbert L. Ginn III, University of South Carolina, United States***9:15 am ■ A Grid Voltage Sensor-Less Operational Approach of Interconnecting Distributed Generating Source based Inverter to an Un-Balanced Generalized Three-Phase Grid Together with Local Load at PCC***S. Dasgupta, S.N. Mohan, S.K. Sahoo, S.K. Panda, National University of Singapore, Singapore; National University of Singapore, Singapore***S34 Power Converters Stability**

Room: 302B

Chairs: Pericle Zanchetta, Brad Lehman

**8:00 am ■ Equivalent of SVM and Carrier-Based PWM in Three Phase/Wire/Level Vienna Rectifier for Unbalanced Load***Bin Li, Lijun Hang, Leon M. Tolbert, Zhengju Lu, EECS, University of Tennessee-Knoxville, United States; Zhejiang University, China; EECS, University of Tennessee-Knoxville, United States***8:25 am ■ Interleaved Buck Cell based Full-Bridge Shunt Active Power Filter***Zhong Chen, Miao Chen, Nanjing University of Aeronautics and Astronautics, China***8:50 am ■ A Source Current Detected APF Control Scheme based on Novel Resonant Regulator***Hao Yi, Yanjun Zhang, Fang Zhuo, Jinjun Liu, Wenjie Chen, Xi'an Jiaotong University, China***9:15 am ■ Field Programmable Analog Array (FPAA) based Shunt Active Filter Controller***Misha Kumar, Eric Green, Ankan De, Sudhin Roy, Subhashish Bhattacharya, North Carolina State University, United States***S35 AC-AC Converter Topologies with Reduced Device Count**

Room: 302A

Chairs: Lixiang Wei, Pat Wheeler

**8:00 am ■ Reduced Switch Count Three-Phase AC-to-AC Converters with Input Power Factor Control***Antônio L. de Lacerda, Edison R.C. da Silva, Euzeli C. Dos Santos Jr., Cursino B. Jacobina, Federal University of Campina Grande, Brazil***8:25 am ■ Bi-Directional Partial Resonant Converters with Reduced Number of Switches***Mahshid Amirabadi, Hussain Hussain, Hamid A. Toliyat, Texas A and M University, United States***8:50 am ■ New Configurations of Single-Phase Universal Active Power Filters with Reduced Number of Electric Power Switches***W.R.N. Santos, E.R.C. da Silva, C.B. Jacobina, A.C. Oliveira, P.M. Santos, Federal University of Piaui, Brazil; Federal University of Campina Grande, Brazil; Federal University of Maranhao, Brazil***9:15 am ■ A Soft-Switching Three-Phase AC-AC Converter with a High-Frequency AC Link***Hamidreza Keyhani, Hamid A. Toliyat, Texas A and M University, College Station, United States***S36 AC-DC Converters: Design and Control**

Room: 301B

Chairs: Rolando Burgos, Yasuyuki Nishida

**8:00 am ■ Virtual Impedance based Selective Harmonic Compensation (VI-SHC) PWM for Current Source Rectifiers***Ruoshui Ni, Yun Wei Li, Zhongyuan Cheng, Navid R. Zargari, University of Alberta, Canada; Rockwell Automation, Canada***8:25 am ■ Application of the One-Cycle Control Technique to a Three-Phase Three-Level NPC Rectifier***Aluisio A.M. Bento, Paula K.P. Vieira, Edison R.C. da Silva, Federal University of Rio Grande do Norte, Brazil; Federal University of Campina Grande, Brazil***8:50 am ■ Introducing the Natural Switching Surface for Reference Frame Systems: Three-Phase Boost PFCs***Juan M. Galvez, Martin Ordóñez, Simon Fraser University, Canada***9:15 am ■ An Investigation of Minimum DC-Link Capacitance in PWM Rectifier-Inverter Systems Considering Control Methods***Jin Xu, Yukihiko Sato, Chiba University, Japan***SS2 Monitoring and Diagnostics**

Room: 402

Chairs: Dan Ionel, Karim Younsi

**8:00 am ■ Electrical Asset Health Monitoring in the Electric Utility Industry***Claude Hudon, IREQ, Hydro Quebec, Canada***8:25 am ■ Monitoring and Diagnostics Technologies for Industrial Motors***Dave Whitefield, General Electric, United States***8:50 am ■ Industrial Motor Health Monitoring***Sangbin Lee, University of South Korea, Korea (South)***9:15 am ■ Prognostic Algorithms for Shipboard Machinery***George Vachtsevanos; Electrical and Computer Engineering, Georgia Technology, United States*



## Poster Session I Exhibit Hall B

Tuesday, September 18th, 10:00 am - 11:30 am

## PS01 DC-DC Converters – I

**P101** ▪ A Multimode, Switching-Surface Controlled DC-DC Converter with Improved Light-Load Efficiency*Takeshi Ueno, Tetsuro Itakura, Toshiba, Japan***P102** ▪ Optimal Stability Control Method for Transformer-Linked Three-Phase Boost Chopper Circuit*Kenshiro Katsura, Masayoshi Ymamoto, IEEJ student member, Japan; IEEJ Member, IEEE Member, Japan***P103** ▪ 28V Bus Solar Array Regulator based on Converters with Transformer and Self-Driven Synchronous Rectification*A. Fernández, H. Carbonnier, O. Mourra, F. Tonicello, European Space Agency, Netherlands***P104** ▪ Hold-Up Time Analysis of a DC-Link Module with a Series Voltage Compensator*Huai Wang, Wenchao Liu, Henry Chung, City University of Hong Kong, Aalborg University, Denmark; City University of Hong Kong, Hong Kong*

## PS02 Single Phase Power Converters

**P301** ▪ A Family of Full-Bridge Single-Stage PFCs Topologies: Identification of Technical Operating Problems*Hugo Ribeiro, Beatriz Borges, Carlos Ferreira, Instituto de Telecomunicacoes - IST, Portugal; Instituto Politecnico de Tomar - IPT, Portugal***P302** ▪ Improving the Low Power Operation of Full-Bridge Single-Stage Power Factor Correctors*Hugo Ribeiro, Beatriz Borges, Instituto de Telecomunicacoes - IST, Portugal***P303** ▪ Ripple-Port Module-Integrated Inverter for Grid-Connected PV Applications*Souhib Harb, Mehran Mirjafari, Robert S. Balog, Texas A and M University, United States***P304** ▪ Compensation of DC-Link Oscillation in Single-Phase to Single-Phase VSC/CSC and Power Density Comparison*Montie A. Vitorino, Ruxi Wang, Mauricio B.R. Correa, Dushan Boroyevich, Federal University of Campina Grande, Brazil; Virginia Polytechnic Inst. and St. University, United States***P305** ▪ Single-Phase to Three-Phase DC-Link Converters with Reduced Controlled Switch Count*Cursino B. Jacobina, Nustenil Segundo, Euzeli C. dos Santos Jr., Nady Rocha, DEE - UFCG, Brazil; DEE - UFPB, Brazil*

## PS03 Multilevel Converters I

**P501** ▪ Multilevel Dodecagonal Voltage Space Vector Generation using Flying Capacitor Topology for Induction Motor Drives*Jaison Mathew, Rajeevan Puthenpurayil, Mathew Kallarackel, Najath Abdul Azeez, Gopakumar Kumarukuttan Nair, CEDT, Indian Institute of Science, Bangalore, India***P502** ▪ A Novel Hybrid Modular Multilevel Converter (HMMC)*Xiaofeng Yang, Zhiqin Lin, Tao Xiong, Trillion Q. Zheng, Beijing Jiaotong University, China***P503** ▪ A Nine-Level Grid-Connected Photovoltaic Inverter based on Cascaded Full-Bridge with Flying Capacitor*Giampaolo Buticchi, Carlo Concar, Giovanni Franceschini, Emilio Lorenzani, Pericle Zanchetta, DII - University of Parma, Italy; DISMI - University of Modena and Reggio Emilia, Italy; PEMC - University of Nottingham, United Kingdom*

**P504** ▪ **Direct Dead-Time Control – A Novel DC-Link Neutral-Point Balancing Method for the Three-Level Neutral-Point-Clamped Voltage Source Inverter**  
*Michael Sprenger, Rodrigo Alvarez, Steffen Bernet, Technische Universität Dresden, Germany*

#### PS04 Transportation Applications I

**P701** ▪ **Robust Switch-Mode Charger with Bootstrap Detector (BSD) and Soft-Start Embedded in Type-III Compensation (SSEC) Technique**

*Ruei-Hong Peng, Yi-Ping Su, Tsu-wei Tsai, Ya-Ping Chen, Ke-Horng Chen, Ming-Jhe Du, Shih-Hsien Cheng, National Chiao Tung University, Taiwan*

**P702** ▪ **Design and Simulation of a DC Electric Vehicle Charging Station Connected to a MVDC Infrastructure**

*Adam R. Sparacino, Brandon M. Grainger, Robert J. Kerestes, Gregory F. Reed, University of Pittsburgh, United States; University of Pittsburgh, United States*

**P703** ▪ **Black-Box Model and Identification Methodology for PEM Fuel Cell with Overdamped Transient Response**

*C. Raga, A. Barrado, A. Lázaro, I. Quesada, D. López del Moral, V. Valdivia, Universidad Carlos III de Madrid, Spain*

**P704** ▪ **A Loop Cancellation based Active Damping Solution for Constant Power Instability in Vehicular Power Systems**

*X.N. Zhang, D.M. Vilathgamuwa, King Jet Tseng, B.S. Bhangu, Gajananayake Chandana, Nanyang Technological University, Singapore; Advanced Technology Centre Rolls-Royce Singapore, Singapore*

#### PS05 Lighting Applications and Smart Infrastructures

**P901** ▪ **A High Efficiency and High Power Factor Offline Converter for Solid State Street Lighting Applications**

*Francesco Sichirollo, Simone Buso, Giorgio Spiazzi, University of Padova, Italy*

**P902** ▪ **Universal Retrofit LED Lamp for Fluorescent Lighting Fixture with Start-Up Process Emulator**

*Nan Chen, Henry Shu-hung Chung, City University of Hong Kong, Hong Kong*

**P903** ▪ **A New Double Frequency Dimmer for Lighting Device**

*Wu Chen, Jie Yu, Jianhua Wang, Southeast University, China*

**P904** ▪ **An Adaptive Control Strategy for Automotive HID Lamps based on Lamp Temperature**

*Xiaofeng Lv, Zirui Jia, Cheng Jin, Min Chen, Zhaoming Qian, ZheJiang University, China*

**P905** ▪ **A Constant Power Single-Switch Electronic Ballast with Power Factor Correction**

*John Lam, Praveen K. Jain, Queen's University, Canada*

**P906** ▪ **Intelligent IEC 61850/61499 Logical Nodes for Smart Metering**

*Valeriy Vyatkin, Gulnara Zhabelova, Chen-Wei Yang, Don McComas, Julien Chouinard, The University of Auckland, New Zealand; Eaton Corporation, New Zealand; ICS Triplex ISaGRAF Inc, Canada*

**P907** ▪ **Electronic Circuit Survey for Office Load Monitoring and Identification**

*Dawei He, Liang Du, Ronald Harley, Thomas Habetler, Yi Yang, Georgia Institute of Technology, United States; Eaton, United States*

#### PS06 Drive Control

**P1101** ▪ **Maximum Torque per Volt Operation and Stability Improvement of PMSM in Deep Flux-Weakening Region**

*Dakai Hu, Lei Zhu, Longya Xu, The Ohio State University, United States; Institute of Electrical Engineering, CAS, China*

**P1102** ▪ **Improved Control of Load Commutated Inverter Fed Salient Pole Wound Field Synchronous Motor using Field Oriented Technique**

*Amit Kumar Jain, V.T. Ranganathan, GE Global Research Center, Bangalore, India; EE Department, Indian Institute of Science, India*

**P1103** ▪ **Speed Control of Two-Mass Mechanical Loads in Electric Drives**

*Seppo E. Saarakkala, Marko Hinkkanen, Kai Zenger, Aalto University School of Electrical Engineering, Finland*

#### PS07 Electrical Machine Diagnostics

**P1301** ▪ **Inter-Turn Fault Detection in PM Synchronous Machine by Physics-Based EMF Estimation**

*Ali Sarikhani, Osama A. Mohammed, Florida International University, United States*

**P1302** ▪ **Comparison of the Fault Characteristics of IPM-Type and SPM-Type BLDC Motors under Inter-Turn Faults Conditions using Winding Function Theory**

*Kyung-Tae Kim, Jun-Kyu Park, Byeong-Woo Kim, Jin Hur, University of Ulsan, Korea, Republic of*

**P1303** ▪ **Phase Current Estimation of BLDC Motor Drive System by using Source Side Current of DC-Link**

*Jong-Joo Moon, Je-Wook Park, Jang-Mok Kim, Seon-Hwan Hwang, Deok-Je Bang, Pusan National University, Korea, Republic of; Kyungnam University, Korea, Republic of; Korea Electrotechnology Research Institute, Korea, Republic of*

**P1304** ▪ **Modeling for the Design of Fractional Slot PM Machines with Concentrated Windings Protected from Demagnetization during Three-Phase Short Circuit**

*Hung Vu Xuan, Henk Polinder, Domenico Lahaye, Jan A. Ferreira, Delft University of Technology, Netherlands*

**P1305** ▪ **Advanced Diagnosis of Outer Cage Damage in Double Squirrel Cage Induction Motors Under Time-Varying Condition based on Wavelet Analysis**

*Yasser Gritli, Sang Bin Lee, Fiorenzo Filippetti, Luca Zarri, University of Bologna, Italy; Korea University, Korea (South)*

**P1306** ▪ **Inter Winding Short Circuit Faults in Permanent Magnet Synchronous Motors used for High Performance Applications**

*Rakib Islam, Mohammad Islam, Joanne Tersigni, Tomy Sebastian, Nexteer Automotive, United States*

**P1307** ▪ **Dynamic Modeling of Double Cage Induction Machines for Diagnosis of Rotor Faults**

*E. Lorenzani, A. Salati, C. Bianchini, F. Immovilli, A. Bellini, S.B. Lee, J. Yoo, C. Kwon, DISMI, University of Modena and Reggio Emilia, Italy; Department of Electrical Engineering, Korea Univ, Korea (South)*

#### PS08 Machine-Drive Integration

**P1501** ▪ **Application of Output Space Mapping Method for Fast Optimization using Multi-Physical Modeling**

*R. Khliassa, S. Vivier, L.A. Ospina Vargas, G. Friedrich, Université de Compiègne, France*

**P1502** ▪ **Application of Linear-Phase Filters in Induction Motor Speed Detection**

*Zhi Gao, Larry Turner, Roy S. Colby, Schneider Electric, United States*

**P1503** ▪ **Supply Frequency Tracking in Resistance-Based Induction Motor Rotor Temperature Estimation**

*Zhi Gao, Roy S. Colby, Larry Turner, Schneider Electric, United States*

**P1504** ▪ **Design and Online Winding Reconfigurations Method of MATRIX Motor**

*Hiroki Hijikata, Kan Akatsu, Shibaura Institute of Technology, Japan*



**PS09 Advanced Devices, Packaging, and Thermal Management****P1701 Thermal Resistance of Snap-In Type Aluminum Electrolytic Capacitor Attached to Heat Sink***Till Huesgen, ABB Corporate Research, Switzerland***P1702 An Analytical Model for Bottom Semi-Superjunction Power Devices***Haimeng Huang, Xingbi Chen, University of Electronic Science and Technology, China***P1703 A New Level-Shifting Circuit with an Integrated Low Voltage Power Supply and Active Resistances***Mou-fu Kong, Xing-bi Chen, University of Electronic Science and Technology, China***P1704 Plug-and-Play AC/AC Power Electronics Building Blocks (AC-PEBBs) for Grid Control***Amrit Iyer, Rohit Moghe, Rajendra Kandula, Jorge Hernandez, Deepak Divan, Georgia Institute of Technology, United States; Georgia Institute of Technology, India; Georgia Institute of Technology, Panama***P1705 Evaluation and Comparison of Silicon and Gallium Nitride Power Transistors in LLC Resonant Converter***Weimin Zhang, Yu Long, Zheyu Zhang, Fred Wang, Leon M. Tolbert, Benjamin J. Blalock, Stephan Henning, Chris Wilson, Robert Dean, University of Tennessee-Knoxville, United States; Auburn University, United States***P1706 Impact of the Source-Path Parasitic Inductance on the MOSFET Commutations***Antonino Gaito, Rosario Scollo, Giuseppe Panebianco, Angelo Raciti, Stmicroelectronics, Italy; University of Catania, Italy***P1707 Megawatt Scale Energy Recovery in the Rankine Cycle***Jonathan Siviter, Andrew Knox, James Buckle, Andrea Montecucco, Euan McCulloch, University of Glasgow, United Kingdom; Previously Doosan Power Systems, United Kingdom***PS10 Converter, Modeling, and Control****P1901 Modeling and Optimization of High Power Inverter Three-Layer Laminated Busbar***Cai Chen, Xuejun Pei, Yunhao Shi, Xinchun Lin, Xinming Liu, Yong Kang, Huazhong University of Science and Technology, China***P1902 Small-Signal Laplace-Domain Model for Digital Predictive Current Mode Controls***Yingyi Yan, Fred C. Lee, Paolo Mattavelli, Shuilin Tian, Virginia Tech, United States***P1903 Current Feedback Based Hybrid Common-Mode EMI Filter for Grid-Tied Inverter Application***Ming Li, Miaosen Shen, Lei Xing, Waleed Said, United Technologies Research Center, United States***P1904 Common Mode Choke Optimization for Three-Phase Motor Drive Systems***Lei Xing, Miaosen Shen, Ming Li, Waleed Said, United Technologies Research Center, United States***P1905 Irreversible Instability in Three-Phase Voltage-Source Converter Connected to Non-Ideal Power Grid with Interacting Load***Cheng Wan, Meng Huang, Chi K. Tse, Siu-Chung Wong, Xinbo Ruan, Huazhong University of Science and Technology, China; The Hong-Kong Polytechnic University, Hong Kong***P1906 Integral-Resonant Voltage Control for Three-Phase Four-Leg Voltage Source Inverters***A. Lidozzi, G. Lo Calzo, L. Solero, F. Crescimbin, University ROMA TRE, Italy***PS11 Solid State Transformers****P2101 Comparisons of Different Three-Stage Three-Phase Cascaded Modular Topologies for Power Electronic Transformer***Xinyu Wang, Jinjun Liu, Taotao Xu, Xiaojian Wang, Xi'an Jiaotong University, China***P2102 Auxiliary Power Supply for Solid State Transformers***Arun Kadavelugu, Gangyao Wang, Subhashish Bhattacharya, Alex Huang, North Carolina State University, United States***P2103 Parallel Operation of Solid State Transformers***Fei Wang, Xu She, Gangyao Wang, Alex Huang, Rolando Burgos, FREEDM Systems Center, North Carolina State University, United States***P2104 Accurate Equivalent Circuit Modeling of a Medium-Voltage and High-Frequency Coaxial Winding DC-Link Transformer for Solid State Transformer Applications***Seunghun Samuel Baek, Bernardo Cougo, Subhashish Bhattacharya, Gabriel Ortiz, North Carolina State University, United States; Laplace, University of Toulouse, France; Power Electronic Systems Laboratory, ETH Zurich, Switzerland***P2105 Simplified Solid State Transformer Modeling for Real Time Digital Simulator (RTDS)***Youyuan Jiang, Lloyd Breazeale, Raja Ayyanar, Xiaolin Mao, Arizona State University, United States***PS12 Power Flow Control in Smart Grids****P2301 Optimal Power Flow of VSC-Based Multi-Terminal DC Networks using Genetic Algorithm Optimization***S. Rodrigues, R. Teixeira Pinto, P. Bauer, E. Wiggelinkhuizen, J. Pierik, Delft University of Technology, Netherlands; Energy Research Centre of the Netherlands, Netherlands***P2302 Demand Response as a Strategy to Support Grid Operation in Different Time Scales***Harjeet Johal, Krishna Anaparthi, Jason Black, GE Global Research, United States; Battelle, United States***P2303 Optimization of Power System Stabilizer Parameters using Population-Based Incremental Learning***Komla A. Folly, Ganesh K. Venayagamoorthy, University of Cape Town, South Africa; Clemson University, United States***P2304 Optimal PMU Placement with Binary PSO***J. Peppanen, T. Alquthami, D. Molina, R. Harley, Georgia Institute of Technology, United States***P2305 Basic Model and Governing Equation of Solar Cells used in Power and Control Applications***Afshin Izadian, Arash Pourtaherian, Sarasadat Motahari, Purdue School of Engineering and Technology, United States***PS13 Wide Bandgap Semiconductors****P2501 Effects of Parasitic Capacitances on Gallium Nitride Heterostructure Power Transistors***Raghav Khanna, William Stanchina, Gregory Reed, University of Pittsburgh, United States; University of Pittsburgh, United States***P2502 An Accurate Prediction of Two-Dimensional Carrier Density Profile in IGBT and its Significances on Steady-State and Transient Analysis***Meng-Chia Lee, Xing Huang, Alex Q. Huang, North Carolina State University, United States***P2503 Impact of Gate Driver Signal on Static Losses for a SiC Switch Built with Normally-Off JFETs and a Schottky Diode***Xavier Fonteneau, Florent Morel, Hervé Morel, Philippe Lahaye, Eliana Rondon-Pinilla, Laboratoire Ampere UMR CNRS 5005, ECA-EN, France; Laboratoire Ampere UMR CNRS 5005, France; ECA-EN, France*



- P2504** ▪ **4.5kV-400A Modules using SiC-PiN Diodes and Si-IEGTs Hybrid Pair for High Power Medium-Voltage Power Converters**  
*Kazuto Takao, Keiji Wada, Kyungmin Sung, Yuji Mastuoka, Yasunori Tanaka, Shinichi Nishizawa, Chiharu Ota, Takeo Kanai, Takashi Shinohe, Hiromichi Ohashi, TOSHIBA, Japan; AIST, Japan; Ibaraki National College of Tech., Japan; Tokyo Metropolitan Univ., Japan; TMEIC, Japan*
- P2505** ▪ **Static and Switching Characteristics of 6500 V Silicon Carbide Anode Switched Thyristor Modules**  
*Siddarth Sundaresan, Aye-Mya Soe, Ranbir Singh, GeneSiC Semiconductor, United States*

#### PS14 Converters for Micro Grid Applications

- P2701** ▪ **A New Nonisolated Three-Port DC-DC Converter with High Step-Up/Down Ratio**  
*Yen-Mo Chen, Xunwei Yu, Alex Q. Huang, North Carolina State University, United States; North Carolina State University, United States*
- P2702** ▪ **A Novel 3-D Space Vector Modulation Scheme for Three-Level Three-Leg NPC Converter in Three-Phase Four-Wire APF System**  
*Lianghe Zhu, Yunpin Zou, Xudong Zou, Sheng Chao, Jian Tang, Xu She, Zheyu Zhang, Electric Power Research Institute of Guangdong, China; Huazhong University of Science and Technology, China; Research Center of Dongfang Electric Company, China; North Carolina State University, United States; University of Tennessee-Knoxville, United States*
- P2703** ▪ **ZVS Range Extension of 10A 15kV SiC MOSFET based 20kW Dual Active Half Bridge (DHB) DC-DC Converter**  
*Gangyao Wang, Alex Huang, Chushan Li, North Carolina State University, United States; Zhejiang University, China*
- P2704** ▪ **Hybrid Single-Phase Multilevel Inverters as Renewable Energy Interfaces Considering THD, Modularity and Capacitor Recharging**  
*B. Diong, L. Dofflemyer, B. Xiao, L.M. Tolbert, F. Filho, Southern Polytechnic State University, United States; University of Tennessee-Knoxville, United States*
- P2705** ▪ **LCL Filter Design for Grid-Connected Voltage-Source Converters in High Power Systems**  
*Byung-Geuk Cho, Seung-Ki Sul, Seoul National University, Korea (South)*
- P2706** ▪ **Analysis and Control of Multi-Level Dual Active Bridge DC-DC Converter**  
*M.A. Moonem, H. Krishnaswami, University of Texas at San Antonio, United States*

#### PS15 Design-Oriented Modeling and Analysis

- P2901** ▪ **Acceleration Harmonics Reduction for Electrodynamics Shaker Fed by Cascaded H-Bridge Inverter**  
*Hung-Chi Chen, Jhen-Yu Liao, National Chiao Tung University, Taiwan*
- P2902** ▪ **Static and Dynamic Analyses of Three-Phase Rectifier with LC Input Filter by Laplace Phasor Transformation**  
*Changbyung Park, Sungwoo Lee, Gyu-Hyeong Cho, Chun-Taek Rim, KAIST, Korea (South)*
- P2903** ▪ **Discrete Modeling of Resonant Converters – Steady State and Small Signal Description**  
*Juergen Stahl, Helene Steuer, Thomas Duerbaum, University of Erlangen, Germany*
- P2904** ▪ **Large Signal Model with Dynamic CCM-DCM Detection**  
*A. Fernández, H. Carbonnier, O. Mourra, F. Tonicello, European Space Agency, Netherlands*
- P2905** ▪ **Modeling and Analysis of Hybrid Converters**  
*Michael Evzelman, Shmuel Ben-Yaakov, Ben-Gurion University of the Negev, Israel*
- P2906** ▪ **A New Platform and Methodology for System-Level Design of Next-Generation FPGA-Based Digital SMPS**  
*Brian MacCleery, Olivier Trescases, Muris Mujagic, Damon M. Bohls, Oleg Stepanov, Garret Fick, National Instruments, United States; University of Toronto, Canada; National Instruments, Canada*

#### PS16 Solar PV Converters

- P3101** ▪ **Current-Sensorless MPPT with DC-DC Boost Converter for Photovoltaic Battery Chargers**  
*Gamal M. Dousoky, Emad M. Ahmed, Masahito Shoyama, Minia University, Egypt; Kyushu University, Japan*
- P3102** ▪ **High Efficiency Cascaded Quasi-Z-Source Photovoltaic Inverter Module using eGaN FETs**  
*Yan Zhou, Liming Liu, Hui Li, Florida State University, United States*
- P3103** ▪ **A Simple Circuit to Improve the Power Yield of PV Array during Partial Shading**  
*Z. Salam, M.Z. Ramli, Universiti Teknologi Malaysia, Malaysia; Universiti Teknikal Malaysia, Melaka, Malaysia*
- P3104** ▪ **Reliability, Efficiency, and Cost Comparisons of MW-Scale Photovoltaic Inverters**  
*Yaosuo Xue, Baoming Ge, Fang Zheng Peng, Siemens Corporate Research, United States; Michigan State University, United States*
- P3105** ▪ **Commercial-Scale Transformerless Solar Inverter Technology Review**  
*Tiefu Zhao, Vijay Bhavaraju, Prasanna Nirantare, Jun Xu, Eaton Corporation Innovation Center, United States; Eaton Corporation Innovation Center, India; Eaton Corporation Innovation Center, China*

#### PS17 Converter and System Control for Energy Storage

- P3301** ▪ **A Linear Parameter-Varying Model for HEV/EV Battery Thermal Modeling**  
*Xiao Hu, Saeed Asgari, Shaohua Lin, Scott Stanton, Wenyu Lian, Ansys Inc., United States; General Motors Company, United States*
- P3302** ▪ **Renewable Energy Variability Impact Study using Midterm Dynamic Simulation**  
*Chaoyang Jing, Antonio Velarde, Patricia Arons, TDBU, United States; SCE, United States*
- P3303** ▪ **Design of the PI Regulator and Feedback Coefficient of Capacitor Current for Grid-Connected Inverter with an LCL Filter in Discrete-Time Domain**  
*Xuehua Wang, Xinbo Ruan, Chenlei Bao, Lin Xu, Huazhong University of Science and Technology, China*
- P3304** ▪ **Modeling and Controller Design for a Four-Switch Buck-Boost Converter in Distributed Maximum Power Point Tracking PV System Applications**  
*Cheng-Wei Chen, Kun-Hung Chen, Yaow-Ming Chen, Senior Member, IEEE, Professor, Taiwan; Student, Taiwan*



Poster Session II Exhibit Hall B

Tuesday, September 18th, 2:00 pm - 3:15 pm

**PS18 Model-Based Controls**
**P3501 An Improved DC-Link Voltage Fast Control Scheme for a PWM Rectifier-Inverter System**

Lu Yin, Zhengming Zhao, Ting Lu, Sheng Yang, Gaoyu Zou, Tsinghua University, China

**P3502 Model Predictive Control of the Internal Voltages of a Five-Level Active Neutral Point Clamped Converter**

Frederick Kieferndorf, Petros Karamanakos, Philipp Bader, Nikolaos Oikonomou, Tobias Geyer, ABB Switzerland LTD., Corporate Research, Switzerland; National Technical University of Athens, Greece; ABB Switzerland LTD., Medium Voltage Drives, Switzerland; ABB Switzerland LTD., Corporate Research, New Zealand

**P3503 A High Resolution Digital Phase-Shift Modulation Scheme for Ultra-High Frequency Dual Active Bridge Converters**

Yu Du, Alex Q. Huang, ABB Corporate Research, United States; FREEDM Systems Center, North Carolina State Univ, United States

**P3504 Multisampled Model Predictive Control of Inverter Systems: A Solution to Obtain High Dynamic Performance and Low Distortion**

Sébastien Mariéthoz, Manfred Morari, ETH Zurich, Switzerland

**PS19 DC-DC Converters II**
**P3701 A New Digital Peak Current Mode DC-DC Converter using FPGA Delay Circuit and Simple A-D Converter**

Fujio Kurokawa, Kazuhiro Kajiwara, Yuichiro Shibata, Yoshihiko Yamabe, Toru Tanaka, Keiichi Hirose, Nagasaki University, Japan; NTT Facilities, Japan

**P3702 A Thermal Management Approach to Fault-Resilient Design of Three-Level IGCT-Based NPC Converters**

Anderson V. Rocha, Hélder De Paula, Manoel E. dos Santos, Braz J. Cardoso Filho, Federal University of Minas Gerais, Brazil; GERDAU ACOMINAS S/A, Brazil

**P3703 Multiple-Input Soft-Switching Converters in Renewable Energy Applications**

Sheng-Yang Yu, Alexis Kwasinski, The University of Texas at Austin, United States

**P3704 A Comparative Study of Three-Phase Dual Active Bridge Topologies and Their Suitability for D-Q Mode Control**

Awneesh K. Tripathi, Kamalesh Hatua, Subhashish Bhattacharya, North Carolina State University, United States

**PS20 Three Phase Power Converters**
**P3901 Analysis, Design and Control of 1MW, High Power Factor and High Current Rectifier System**

Jitendra Solanki, Norbert Fröhleke, Joachim Böcker, Peter Wallmeier, LEA, University of Paderborn, Germany; AEG Power Solutions GmbH, Germany

**P3902 Fault Tolerant 24 KVA Interleaved Inverter**

Pierre-Olivier Jeannin, David Frey, Yvan Avenas, Kevin Guepratte, Hervé Stephan, Thales group, France; G2elab, France; G2elab, France

**P3903 Matrix Transformers for Renewable Energy Integration**

Jiyao Wang, Yehui Han, University of Wisconsin-Madison, United States

**P3904 Pulse Width Modulation for Reduction of Power Losses in Three-Phase Neutral Point Clamped Inverters**

Abinadabe S. Andrade, Luciano M. Barros, Edison R.C. da Silva, Cursino Jacobina, Federal University of Campina Grande, Brazil

**P3905 Pulse Density Modulation Control using Space Vector Modulation for a Single-Phase to Three-Phase Indirect Matrix Converter**

Yuki Nakata, Jun-ichi Itoh, Nagaoka University of Technology, Japan

**PS21 Multilevel Converters – II**
**P4101 Independent Control of Series Connected Utility Scale Multi-level Photovoltaic Inverters**

S. Essakiappan, H.S. Krishnamoorthy, P. Enjeti, R.S. Balog, S. Ahmed, Texas A and M University, College Station, United States; Texas A and M University, Doha, Qatar

**P4102 A Carrier-Based Approach for Overmodulation of Three-Level Neutral-Point Clamped Inverter with Zero Neutral-Point Current**

RamKrishan Maheshwari, Stig Munk-Nielsen, Sergio Busquets-Monge, Aalborg University, Denmark; Technical University of Catalonia, Spain

**P4103 Thermal and Efficiency Analysis of Five-Level Multi-Level Clamped Multilevel Converter Considering Grid Codes**

K. Ma, R.S. Muñoz-Aguilar, P. Rodríguez, F. Blaabjerg, Aalborg University, Denmark; Universitat Politècnica de Catalunya, Spain

**P4104** ▪ **Control of Cascaded Multi-Level STATCOM using Line Voltage Total Harmonic Distortion Minimization Technique**

*Nima Yousefpoor, Babak Parkhideh, Saman Babaei, Subhashish Bhattacharya, North Carolina State University, United States*

**PS22** **Transportation Applications II****P4301** ▪ **Sensorless Control for IPMSMs based on a Multilayer Discrete-Time Sliding-Mode Observer**

*Yue Zhao, Wei Qiao, Long Wu, University of Nebraska-Lincoln, United States; John Deere Electronic Solutions, United States*

**P4302** ▪ **A Contactless Slipping System by means of Axially Travelling Magnetic Field**

*Ali Abdolkhani, Aiguo Patrick Hu, The University Of Auckland, New Zealand*

**P4303** ▪ **Wireless Power Transfer: A Survey of EV Battery Charging Technologies**

*Fariborz Musavi, Murray Edington, Wilson Eberle, Delta-Q Technologies Corp., Canada; The University of British Columbia, Canada*

**P4304** ▪ **Auction-Based Energy Management System of a Large-Scale PHEV Municipal Parking Deck**

*Habiballah Rahimi Eichi, Mo-Yuen Chow, North Carolina State University, United States*

**P4305** ▪ **Implementation of Online Battery State-of-Power and State-of-Function Estimation in Electric Vehicle Applications**

*Larry W. Juang, Phillip J. Kollmeyer, T.M. Jahns, R.D. Lorenz, University of Wisconsin-Madison, United States*

**PS23** **PWM Controllers****P4501** ▪ **Optimizing Low Side Gate Resistance for Damping Phase Node Ringing of Synchronous Buck Converter**

*Zhiyang Chen, Isauro Amaro, ON Semiconductor, United States*

**P4502** ▪ **Digital V2 Control with Fast-Acting Capacitor Current Estimator**

*Pei-Hsin Liu, Yingyi Yan, Paolo Mattavelli, Fred C. Lee, Virginia Tech, United States*

**P4503** ▪ **Enhancements of the Multiple Input Buck Converter used for Envelope Tracking Applications by Improved Output Filter Design and Multiphase Operation**

*Pablo F. Miaja, Alberto Rodríguez, Javier Sebastián, Miguel Rodríguez, University of Oviedo, Spain; University of Colorado, United States*

**P4504** ▪ **Monolithic CMOS Synchronous Buck Converter with a Fast and Low-Cost Current Sensing Scheme**

*Yu Du, Qiaoqiao Liu, Alex Q. Huang, ABB Corporate Research, United States; ECE Department, North Carolina State University, United States; FREEDM Systems Center, North Carolina State Univ, United States*

**PS24** **Sensorless Control****P4701** ▪ **Simple On-Line Dead-Time Compensation Scheme based on Disturbance Voltage Observer**

*Beomseok Lee, Jaehong Kim, Kwanghee Nam, LG Electronics Company, Korea (South); Chosun University, Korea (South); POSTECH, Korea (South)*

**P4702** ▪ **Neural Sensorless Control of Linear Induction Motors by a Full-Order Luenberger Observer Considering the End-Effects**

*Angelo Accetta, Maurizio Cirrincione, Marcello Pucci, Gianpaolo Vitale, ISSIA-CNR, Italy; UTBM, France*

**P4703** ▪ **Research on SVM-DTC of Speed Sensorless PMSG for the Direct-Drive Wind Generation System with CSC**

*Meiqin Mao, Bin Liu, Kai Shen, Bin Xu, Liuchen Chang, Hefei University of Technology, China; University of New Brunswick, Canada*

**PS25** **Machines for Aerospace and Transportation****P4901** ▪ **Design and Modeling of a Five-Phase Aircraft Synchronous Generator with High Power Density**

*Tony Camarano, Thomas Wu, Samuel Rodriguez, Jon Zumberge, Mitch Wolff, University of Central Florida, United States; Air Force Research Lab, Wright Patterson, United States*

**P4902** ▪ **Development of Electrical Drive System for the UTS PHEV**

*Wei Xu, Gang Lei, Yongchang Zhang, Tianshi Wang, Jianguo Zhu, Platform Technologies Research Institute, RMIT, Australia; University of Technology Sydney, Australia; North China University of Technology, China*

**P4903** ▪ **Design Considerations for Dual Winding Permanent Magnet Synchronous Machines**

*E. Mese, M. Tezcan, M. Ayaz, Y. Yasa, K. Yilmaz, Yildiz Technical University, Turkey; Kocaeli University, Turkey*

**P4904** ▪ **Converter Temperature Regulation with Dual Mode Control of Fault-Tolerant Permanent Magnet Motors**

*W.U.N. Fernando, L. Papini, C. Gerada, University of Nottingham, United Kingdom*

**P4905** ▪ **A New Electric Accessory Drive System for Hybrid Electric Vehicles**

*E. Mese, Y. Yasa, H. Akca, M.G. Aydeniz, M. Garip, Yildiz Technical University, Turkey*

**PS26** **Novel Machine Design****P5101** ▪ **A Wind Turbine Architecture Employing a New Three Port Magnetic Gear Box**

*A.S. Abdel-Khalik, A. Elserougi, S. Ahmed, A. Massoud, Alexandria University, Egypt; Texas A and M University at Qatar, Qatar; Alexandria university, Egypt; Qatar university, Qatar*

**P5102** ▪ **Optimal Split Ratio for Switched Flux Permanent Magnet Machines**

*Dawei Li, Ronghai Qu, Xiaolong Zhang, Yang Liu, State Key Laboratory of Advanced Electromagnetic, China*

**P5103** ▪ **Aerodynamic Fluid Bearings for Capacitive Power Transfer and Rotating Machinery**

*Daniel C. Ludois, Justin Reed, Micah Erickson, C-Motive Technologies, United States*

**P5104** ▪ **Stability Consideration of Magnetic Suspension in Two-Axis Actively Positioned Bearingless Motor with Collocation Problem**

*Hiroya Sugimoto, Akira Chiba, Tokyo Institute of Technology, Japan*

**PS27** **Power Quality in Micro Grids****P5301** ▪ **Mitigation of Harmonics of DFIGs in DC-Microgrids**

*Feng Wei, D. Mahinda Vilathgamuwa, S.S. Choi, Nanyang Technological University, Singapore*

**P5302** ▪ **Distributed Control of Hybrid AC Microgrids with Dynamic Active and Reactive Power Capacity Tuning**

*Inam Ullah Nutkani, Poh Chiang Loh, Frede Blaabjerg, School of EEE, Nanyang Technological University, Singapore; Department of Energy Technology, Aalborg University, Denmark*

**P5303** ▪ **Selective Harmonic Virtual Impedance for Voltage Source Inverters with LCL filter in Microgrids**

*Mehdi Savaghebi, Juan C. Vasquez, Alireza Jalilian, Josep M. Guerrero, Tzung-Lin Lee, Iran Univ. of Sci. and Tech. (IUST), Iran; Aalborg University, Denmark; Sun Yat-Sen University, Taiwan*

**P5304** ▪ **Design Considerations for Microgrids with Energy Storage**

*Andrew D. Paquette, Deepak M. Divan, Georgia Institute of Technology, United States*

**P5305** ▪ **Research Laboratory for Grid Integration of Distributed Renewable Energy Resources – Design and Realization**

*F.W. Fuchs, F. Gebhardt, N. Hoffmann, A. Knop, R. Lohde, J. Reese, C. Wessels, Christian-Albrechts-University of Kiel, Germany*



**P5306** ▪ **Voltage Harmonic Control of Weak Utility Grid through Distributed Energy Systems**

*S. Palle, N. Arafat, Y. Sozer, I. Husain, University of Akron, United States; North Carolina State University, United States*

**PS28** **Control and Protection in Micro Grids**

**P5501** ▪ **A Multi-Agent Approach to Radial Feeder Voltage Control of PEBB-Based Converter: A Real Time Simulation Test**

*Flavien Berthold, Mauro Carpita, Antonello Monti, Ferdinanda Ponci, HES-SO, Master thesis at the RWTH, ACS Institute, Switzerland; RWTH, director of ACS Institute, Germany; RWTH, ACS Institute, Germany; HES-SO, Switzerland*

**P5502** ▪ **Voltage Transient Propagation in AC and DC Datacenter Distribution Architectures**

*Emmanuel Taylor, Matthew Korytowski, Gregory Reed, University of Pittsburgh, United States; University of Pittsburgh, United States*

**P5503** ▪ **A Fast Acting DC Solid State Fault Isolation Device (FID) with Si and SiC Devices for MVDC Distribution System**

*Swanand Juvekar, Bobby Compton, Subhashish Bhattacharya, Eaton Corporation, NC State University, United States; NC State University, United States; Eaton Corporation, United States*

**P5504** ▪ **Evaluating APLCs Placement in a Power System based on Real-Time Simulation**

*Camila S. Gerhke, Antonio M.N. Lima, Alexandre C. Oliveira, UFCG, Brazil*

**P5505** ▪ **Self-Power Emitter Turn-Off Thyristor (SPETO) based Circuit Breaker for Power Distributed System**

*Qian Chen, Kai Tan, Alex Q. Huang, North carolina state university, United States; North Carolina State University, United States*

**P5506** ▪ **The Uncertainty Assessment of Sensitive Equipment Voltage Sags Ride-Through Ability based on Maximum Hybrid Entropy**

*Da Yang, Ying Wang, Xianyong Xiao, Wei Xu, School of Electrical Engineering and Informat, China; Platform Technologies Research Institute, RMIT U, Australia*

**PS29** **Power System Compensators**

**P5701** ▪ **Control of Thyristor-Based Commutation Cells**

*Stefan P. Engel, Rik W. De Doncker, PGS, E.ON Energy Research Center, RWTH Aachen, Germany*

**P5702** ▪ **Improving Power Flow in Transformers using a BTB Converter to Balance Low Voltage Feeders**

*J. Alcalá, V. Cárdenas, J. Pérez-Ramírez, R.J. Betancourt, H. Miranda, Universidad de Colima, Mexico; Universidad Autonoma de San Luis Potosí, Mexico*

**P5703** ▪ **Control and Design Principle of SVC-MERS – A New Reactive Power Compensator with Line Frequency Switching and Small Capacitor**

*Daisuke Shiojima, Miao-miao Cheng, Takanori Isobe, Ryuichi Shimada, Tokyo institute of technology, Japan*

**P5704** ▪ **New Synthetic Test Circuit for Testing Thyristor Valve in HVDC Converter**

*Hyun-Jun Kim, Do-Hyun Kim, Byung-Moon Han, Jae-Hun Jung, Eui-Cheol Nho, Myongji University, Korea (South); Pukyung National University, Korea (South)*

**PS30** **Wind Power Systems**

**P5901** ▪ **SCR-Based Wind Turbine Control for a DC Distributed Wind Farm**

*Ravi Nanayakkara, Adel Nasiri, Rockwell Automation, United States; UW-Milwaukee, United States*

**P5902** ▪ **Harmonic Resonance Damping in Wind Power Plant**

*K.N. Md Hasan, Kalle Rauma, Alvaro Luna, Ignacio Candela, P. Rodriguez, Technical University of Catalonia, Spain; Aalto University, Finland*

**P5903** ▪ **A New Hybrid PLL for Interconnecting Renewable Energy Systems to the Grid**

*Lenos Hadjidemetriou, Elias Kyriakides, Frede Blaabjerg, University of Cyprus, Cyprus; Aalborg University, Denmark*

**P5904** ▪ **A New Approach for Current Sensor Fault Diagnosis in PMSG Drives for Wind Energy Conversion Systems**

*Nuno M.A. Freire, Jorge O. Estima, A.J. Marques Cardoso, University of Coimbra / IT, Portugal; University of Beira Interior / IT, Portugal*

**P5905** ▪ **Comprehensive Modeling and Analysis of Permanent Magnet Synchronous Generator-Wind Turbine System with Enhanced Low Voltage Ride Through Capability**

*Ziping Wu, Wenzhong Gao, Daye Yang, Yan Shi, University of Denver, United States; China Electric Power Research Institute, China; Xinjiang Electric Power Company, China*

**PS31** **Ocean and Wave Energy, Energy Storage**

**P6101** ▪ **Wave Energy Converter Modeling in the Frequency Domain: A Design Guide**

*Bret Bosma, Zhe Zhang, Ted K.A. Brekken, H. Tuba Özkan-Haller, Cameron McNatt, Solomon C. Yim, Oregon State University, United States*

**P6102** ▪ **Current Sharing Control for Cascaded H-Bridge Applied to Secondary use Batteries in Community Energy Storage Systems**

*Mark Lomaskin, Sanzhong Bai, Srdjan Lukic, NC State University, United States*

**P6103** ▪ **Characterizing Battery Behavior for Time Dependent Currents**

*Thuwaragan Sritharan, David Yan, Francis Dawson, Keryn Lian, University of Toronto, Canada*

**P6104** ▪ **Control of Bidirectional DC/AC Converter for Redox Flow Battery Energy Storage System**

*Yongcan Lyu, Hua Lin, Xingwei Wang, Huacheng Yang, Yong Luo, Huazhong university of Science and Technology, China; Huazhong University of Science and Technology, China*

**P6105** ▪ **Control Strategy of AC-DC Matrix Converter in Battery Energy Storage System**

*Bo Feng, Hua Lin, Sanying Hu, Xing An, Xingwei Wang, Huazhong university of Science and Technology, China*

**PS32** **Component Modeling and Diagnosis**

**P6301** ▪ **Fault Diagnoses for the DC Filters of Power Electronic Converters**

*Tamer Kamel, Chris Diduch, Yevgen Biletskiy, Liuchen Chang, University of New Brunswick, Canada*

**P6302** ▪ **Characterization of Aging Process in Power Converters using Spread Spectrum Time Domain Reflectometry**

*M. Sultana Nasrin, Faisal H. Khan, University of Utah, United States*

**P6303** ▪ **Modelling and Compensation of Thermal Effects on an Ironless Inductive Position Sensor**

*Alessandro Danisi, Alessandro Masi, Roberto Losito, Yves Perriard, CERN - EPFL, Switzerland; CERN, Switzerland; EPFL, Switzerland*

**P6304** ▪ **Calorimeter Evaluation of Inverter Grade Metalized Film Capacitor ESR**

*John M. Miller, Curtis W. Ayers, Larry E. Seiber, D. Barton Smith, Oak Ridge National Laboratory, United States*

**P6305** ▪ **Application of Recursive Least Square (RLS) Algorithm with Variable Forgetting Factor for Frequency Components Estimation in a Generic Input Signal**

*Mebtu Beza, Massimo Bongiorno, Chalmers University of Technology, Sweden*

**P6306** ▪ **Thermal Loading and Reliability of 10 MW Multilevel Wind Power Converter at Different Wind Roughness Classes**

*Andrea Isidori, Fabio Mario Rossi, Frede Blaabjerg, Aalborg University, Denmark*

**P6307** ▪ **Thermal Design Considerations for 12kV SiC n-IGBT based 3L NPC Converter**

*Giti Karimi-Moghaddam, Richard D. Gould, Sachin Madhusoodhanan, Kamallesh Hatua, Subhashish Bhattacharya, Scott Leslie, Sei-Hyung Ryu, Mrinal Das, Anant Agarwal, David Grider, NCSU, United States; Powerex, United States; Cree, United States*

Wednesday, September 19th, 8:00 am - 9:40 am

**S37 Resonant DC-DC Converters I**

Room: 301A

Chairs: Johann Kolar, George Hwang

**8:00 am ▪ Performance Analysis of Secondary Phase Shift ZVS DC-DC Converter for High Voltage Application**

Sheng Zong, Wuhua Li, Xiangning He, Fangrui Liu, David Xu, Bin Wu, Zhejiang University, China; Ryerson University, Canada

**8:25 am ▪ A ZVS PWM Full Bridge Converter with Self-Regulating Auxiliary Current**

Zhong Chen, Liangchen Shi, Feng Ji, Shasha Liu, Nanjing University of Aeronautics and Astronautics, China

**8:50 am ▪ Optimization of a Series Resonant DC/DC Converter for Traction Applications**

Lars Lindenmüller, Rodrigo Alvarez, Steffen Bernet, TU Dresden, Germany

**9:15 am ▪ A Hybrid ZVS Full-Bridge Converter with Transformer Winding Series-Parallel Auto Regulated Current Doubler Rectifier**

Hui Chen, Xinke Wu, Chen Hu, Min Chen, Fang Z. Peng, Zhejiang University, China; Michigan State University, United States

**S38 Circuit Modeling and Control Applications**

Room: 306C

Chairs: Regan Zane, Yan-Fei Liu

**8:00 am ▪ Variable Sampling Time Finite Control-Set Model Predictive Current Control for Voltage Source Inverters**

Nils Hoffmann, Markus Andresen, Friedrich W. Fuchs, Lucian Asiminoaei, Paul B. Thøgersen, Christian-Albrechts-University of Kiel, Germany; Danfoss Solar Inverters A/S, Denmark; KK-Electronic A/S, Denmark

**8:25 am ▪ Small Signal Modeling and Controller Design of a Bidirectional Quasi-Z-Source Inverter for Electric Vehicle Applications**

Feng Guo, Lixing Fu, Chien-Hui Lin, Cong Li, Jin Wang, The Ohio State University, United States

**8:50 am ▪ A Novel Pulse Width Modulation Technique with Active DC Voltage Balancing and Device Voltage Falls Compensation for High-Power Cascaded Multilevel Active Rectifiers**

L. Tarisciotti, A.J. Watson, P. Zanchetta, J.C. Clare, P. Wheeler, S. Bifaretti, University of Nottingham, United Kingdom; University of Rome "Tor Vergata", Italy

**9:15 am ▪ Analysis and Design of Average Current Mode Control using Describing Function-Based Equivalent Circuit Model**

Yingyi Yan, Fred C. Lee, Paolo Mattavelli, Virginia Tech, United States

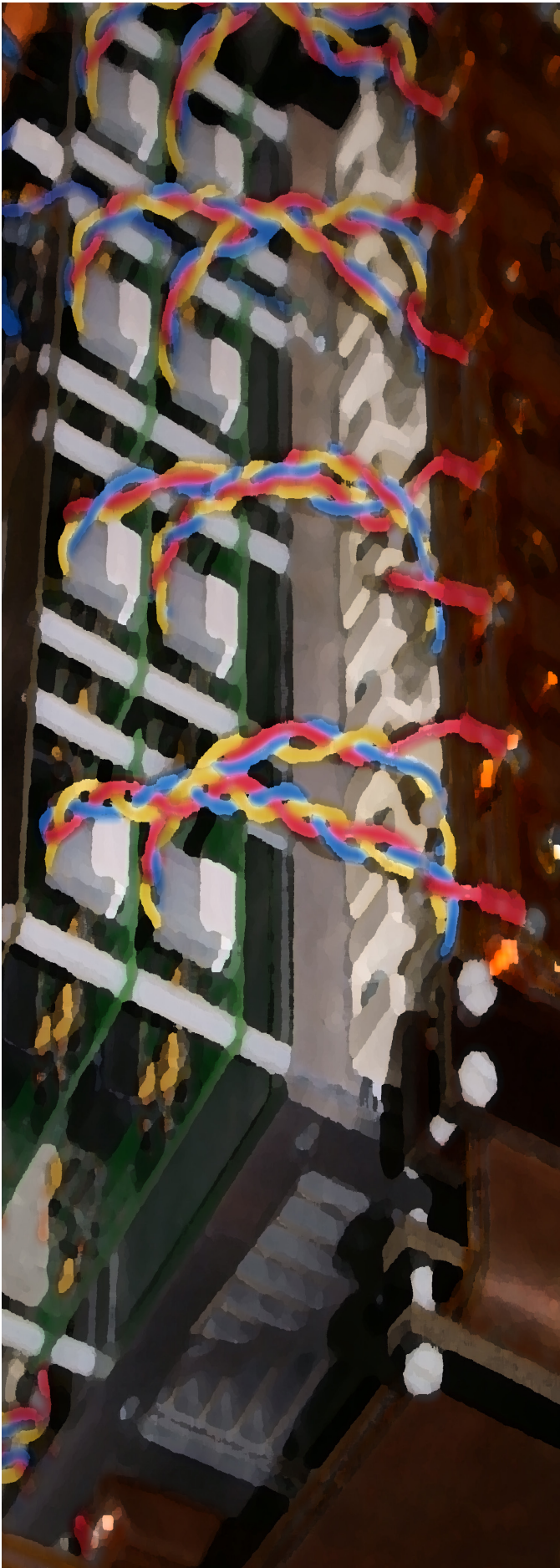
**S39 Wide Bandgap Semiconductors I**

Room: 306B

Chair: Angus Bryant

**8:00 am ▪ Reliability of 4H-SiC SBD/JBS Diodes under Repetitive Surge Current Stress**

Xing Huang, Gangyao Wang, Meng-Chia Lee, Alex Q. Huang, FREEDM System Center, NCSU, United States





**8:25 am** ▪ **Advanced Silicon Carbide Gate Turn-Off Thyristor for Energy Conversion and Power Grid Applications**

*Lin Cheng, Anant Agarwal, Michael O'Loughlin, Craig Capell, Al Burk, John Palmour, Aderinto Ogunniyi, Heather O'Brien, Charles Scozzie, Cree, Inc., United States; U.S. Army Research Laboratory, United States*

**8:50 am** ▪ **Characterization of a New 6.5 kV 1000A SiC Diode for Medium Voltage Converters**

*Felipe Filsecker, Rodrigo Alvarez, Steffen Bernet, TU Dresden, Germany*

**9:15 am** ▪ **Comparison of 6.5 kV Silicon and SiC Diodes**

*Felipe Filsecker, Rodrigo Alvarez, Steffen Bernet, TU Dresden, Germany*

**S40** **Sensorless Drives I**

*Room: 306A*

*Chairs: Jul-Ki Seok, Zhi "George" Gao*

**8:00 am** ▪ **Sensorless Control of Doubly-Fed Induction Generators based on Rotor High Frequency Signal Injection**

*David Reigosa, Fernando Briz, Cristian Blanco, Antonio Di Gioia, Pablo Garcia, Juan Manuel Guerrero, University of Oviedo, Spain; University of Rome, "la Sapienza", Italy*

**8:25 am** ▪ **Robust Initial Rotor Position Estimation of Permanent Magnet Brushless AC Machines with Carrier Signal Injection-Based Sensorless Control**

*L.M. Gong, Z.Q. Zhu, University of Sheffield, United Kingdom*

**8:50 am** ▪ **Signal-Injection-Based Sensorless IPM Traction Drive for Wide-Torque Range Operation at Low Speed**

*Yoshiaki Kano, Takashi Kosaka, Nobuyuki Matsui, Tomoya Takahashi, Masami Fujitsuna, Toyota National College of Technology, Japan; Nagoya Institute of Technology, Japan; DENSO Corporation, Japan; DENSO Corporation, Japan*

**9:15 am** ▪ **Compensation of Inverter Nonlinearity based on Trapezoidal Voltage**

*Yongsoon Park, Seung-Ki Sul, Seoul National University, Korea, Republic of*

**S41** **Special Machines I**

*Room: 305B*

*Chairs: Dave Dorrell, Mircea Popescu*

**8:00 am** ▪ **Alternative Excitation Strategies for a Wound Rotor Synchronous Machine Drive**

*Ron Wang, Steve Pekarek, Michelle Bash, Purdue University, United States; PC Krause and Associates, United States*

**8:25 am** ▪ **Brushless Doubly-Fed Reluctance Machine Rotor Design**

*Andrew M. Knight, Robert E. Betz, William K. Song, David G. Dorrell, University of Alberta, Canada; University of Newcastle, Australia; University of Technology, Sydney, Australia*

**8:50 am** ▪ **Integrated AC and DC Excitation Method for Brushless Synchronous Machine**

*Jiadan Wei, Qingqing Zheng, Yiwei Yang, NUAU, China*

**9:15 am** ▪ **Reducing Conductor Usage in Superconducting Machines by Multiple Power**

*Bogi Bech Jensen, Nenad Mijatovic, Asger Bech Abrahamsen, Technical University of Denmark, Denmark*

**S42** **PM Machines I**

*Room: 305A*

*Chairs: Haran Karmaker, Yao Duan*

**8:00 am** ▪ **Report on IEEE Standard Working Group P1812 on Guide for Testing Permanent Magnet Machines**

*Haran Karmaker, TECO-Westinghouse Motor Company, United States*

**8:25 am** ▪ **Non-Linear Scaling Rules for Brushless PM Synchronous Machines based on Optimal Design Studies for a Wide Range of Power Ratings**

*Yao Duan, Dan M. Ionel, Vestas, United States*

**8:50 am** ▪ **Optimum Design and Technology Evaluation of Slip Permanent Magnet Generators for Wind Energy Applications**

*Johannes H.J. Potgieter, Maarten J. Kamper, University of Stellenbosch, South Africa*

**9:15 am** ▪ **Low Cost Axial Flux PM Generator for Small Wind Turbines**

*Samuel O. Ani, Henk Polinder, Jan A. Ferreira, Delft University of Technology, Netherlands*

**S43** **Microgrid Operation and Control I**

*Room: 304*

*Chairs: Toshifumi Ise, Luis Arnedo*

**8:00 am** ▪ **Transient Characteristics for Load Changes of a Doubly-Fed Induction Generator Applied to Gas Engine Cogeneration System in Stand-Alone Operation**

*Tetsuji Daido, Yushi Miura, Toshifumi Ise, Yuki Sato, Osaka University, Japan; Osaka Gas Co., Ltd., Japan*

**8:25 am** ▪ **Improved Power Control Bandwidth of Grid-Forming Sources in a CERTS Microgrid**

*Micah J. Erickson, T.M. Jahns, R.H. Lasseter, University of Wisconsin-Madison, United States*

**8:50 am** ▪ **Inverter-Based Microgrid Control and Stable Islanding Transition**

*Yan Xu, Huijuan Li, Leon M. Tolbert, Oak Ridge National Laboratory, United States; University of Tennessee, United States*

**9:15 am** ▪ **Quantitative Analysis of System Parameters Asymmetry on Droop-Controlled Converters**

*Chia-Tse Lee, Chia-chi Chu, Po-Tai Cheng, National Tsing Hua University, Taiwan*

**S44** **Low-Voltage Ride Through for Wind Power Converters**

*Room: 303*

*Chairs: Pragasen Pillay, Yongsug Suh*

**8:00 am** ▪ **A Novel Topology for Enhancing the Low Voltage Ride through Capability for Grid Connected Wind Turbine Generators**

*R.A. Ibrahim, M.S. Hamad, Y.G. Dessouky, B.W. Williams, Arab Academy for Science and Technology, Egypt; Strathclyde University, United Kingdom*

**8:25 am** ▪ **Control Algorithm for a Doubly Fed Induction Generator in Medium Voltage Wind Power System under Fault Ride Through and Unbalanced Grid Conditions**

*Yongsug Suh, Yonggyun Park, Yuran Go, Chonbuk National University, Korea (South); ILJIN Company, Korea (South)*

**8:50 am** ▪ **A Series Reactor based Converter Protection Scheme of Doubly Fed Induction Generator for Low Voltage Ride Through**

*Linyuan Zhou, Jinjun Liu, Yangque Zhu, Sizhan Zhou, Xian Jiaotong University, China*

**9:15 am** ▪ **Operation and Thermal Loading of Three-Level Neutral-Point-Clamped Wind Power Converter under Various Grid Faults**

*K. Ma, F. Blaabjerg, M. Liserre, Aalborg University, Denmark*

**S45** **Solar Energy – PV Converters I**

*Room: 302C*

*Chairs: Robert Balog, Yaow-ming Chen*

**8:00 am** ▪ **From H4, H5 to H6 – Standardization of Full-Bridge Single Phase Photovoltaic Inverter Topologies without Ground Leakage Current Issue**

*Jianhua Wang, Baojian Ji, Jianfeng Zhao, Jie Yu, Southeast University, China; Nanjing University of Technology, China*



**8:25 am** ■ Design and Implementation of Grid Connection Photovoltaic Micro Inverter  
Wei-Fu Lai, Shih-Ming Chen, Tsorng-Juu Liang, Kuan-Wen Lee, Adrian Ioinovici,  
National Cheng-Kung University, Taiwan; Sun Yat-sen University, China

**8:50 am** ■ Multi-Mode Control for Photovoltaic Grid-Connected Interleaved  
Flyback Micro-Inverters to Achieve High Efficiency in Wide Load Range  
Zhiliang Zhang, Xiao-Fei He, Xiaoyong Ren, Xin Li, Yan-Fei Liu, Nanjing Univer-  
sity of Aeronautics and Astronautics, China; Queen's University, Canada

**9:15 am** ■ A Novel Active Power Decoupling Method for Single-  
Phase Photovoltaic or Energy Storage Applications  
Shengfang Fan, Yaosuo Xue, Kai Zhang, Huazhong University of Science  
and Technology, China; Siemens Corporate Research, United States

#### S46 Distributed Power Systems

Room: 302B

Chairs: Leon Tolbert, Yunwei Li

**8:00 am** ■ Optimal Mix and Placement of Energy Storage Systems in  
Power Distribution Networks for Reduced Outage Costs  
Jesse M. Gantz, S. Massoud Amin, Anthony M. Giacomoni, University of  
Minnesota - Twin Cities, United States

**8:25 am** ■ A Modified Boost Topology with Simultaneous AC and DC Load  
Olive Ray, Santanu Mishra, Indian Institute of Technology, Kanpur, India

**8:50 am** ■ Regenerative Power Converters Representation of Grid  
Control and Actuation Emulator

Jing Wang, Liu Yang, Yiwei Ma, Xiaojie Shi, Xiaohu Zhang, Lijun Hang, Keman Lin, Leon M.  
Tolbert, Fred Wang, Kevin Tomsovic, University of Tennessee-Knoxville, United States

**9:15 am** ■ An Improved Design of Virtual Output Impedance Loop for  
Droop-Controlled Parallel Three-Phase Voltage Source Inverters  
Xiongfeng Wang, Frede Blaabjerg, Zhe Chen, Aalborg University, Denmark

#### S47 Contactless Power Transfer I

Room: 302A

Chairs: Robert Lorenz, Suresh Gopalakrishnan

**8:00 am** ■ Heat Distribution Control using Current Amplitude and  
Phase Angle in Zone-Control Induction Heating Systems  
Ha Ngoc Pham, Hideaki Fujita, Naoki Uchida, Kazuhiro Ozaki, Tokyo Institute of  
Technology, Japan; Mitsui Engineering and Shipbuilder Co., LTD., Japan

**8:25 am** ■ Novel Control Approach to Achieving Efficient Wireless  
Battery Charging for Portable Electronic Devices

Isaac Nam, Roger Dougal, Enrico Santi, University of South Carolina, United States

**8:50 am** ■ Omni-Directional Inductive Power Transfer System for  
Mobile Robots using Evenly Displaced Multiple Pick-Ups

Changbyung Park, Sungwoo Lee, Gyu-Hyeong Cho, Su-Yong Choi, Chun-  
Taek Rim, KAIST, Korea, Republic of

**9:15 am** ■ Analysis, Design and Control of a Double-Input Contactless Resonant Converter  
Hao Wu, Qianhong Chen, Xiaoyong Ren, Xinbo Ruan, Siu Chung Wong, Chi K. Tse, Nanjing Univer-  
sity of Aeronautics and Astronautics, China; Hong Kong Polytechnic University, Hong Kong

#### S48 Multilevel Converters III: Design and Modulation of AC/DC Topologies

Room: 301B

Chairs: Pericle Zanchetta, Sandeep Bala

**8:00 am** ■ Optimized LCL Filter Design Methodology Applied to MV  
Grid-Connected Multimegawatt VSC

Jon San-Sebastian, Ion Etxeberria-Otadui, Alejandro Rujas, Jon Andoni Barrena, Pedro  
Rodriguez, IKERLAN-IK4 Technological Research Centre, Spain; Univ. of Mondragon, Spain;  
Department of Electrical Engineering, Technical, Spain

**8:25 am** ■ Design and Control of High Performance Modular Hybrid  
Asymmetrical Cascade Multilevel Inverters with Active Voltage Bal-  
ance and Low Losses

Sébastien Mariéthoz, ETH Zurich, Switzerland

**8:50 am** ■ Space Vector and Carrier-Based PWM Modulation  
Schemes for Maximum Utilization of Voltage Sources of a Nine-  
Switch Converter

Kennedy Aganah, Sosthenes Karugaba, Olorunfemi Ojo, Tennessee  
Technological University, United States

**9:15 am** ■ A New Modulation Method for a 13-Level Asymmetric  
Inverter that Operates with Minimum THD

Eduardo Espinosa, José Espinoza, Felipe Villarroel, Pedro Melin,  
Jaime Rohten, Javier Muñoz, Concepcion University, Chile

Wednesday, September 19th, 10:00 am - 11:40 am

#### S49 Control of Isolated DC-DC Converters

Room: 301A

Chairs: Jaber Abu-Qahouq, Vahid Yousefzadeh

**10:00 am** ■ Two Novel Control Methods Expanding Input-Output  
Operating Range for a Bi-Directional Isolated DC-DC Converter with  
Active Clamp Circuit

Takae Shimada, Hiroyuki Shoji, Kimiaki Taniguchi, Hitachi, Ltd., Japan;  
Hitachi Computer Peripherals Co., Ltd., Japan

**10:25 am** ■ A Zero Voltage and Zero Current Soft Switching PWM  
DC-DC Converter with Secondary-Side Phase-Shifting Active Rectifier  
Tomokazu Mishima, Kouhei Akamatsu, Mutsuo Nakaoka, Kobe Univer-  
sity, Japan; Professor Emeritus of Yamaguchi University, Japan

**10:50 am** ■ Fast Transient Boundary Control of the Dual Active  
Bridge Converter using the Natural Switching Surface

Germán G. Oggier, Martin Ordóñez, Juan M. Galvez, Federico Luchino,  
Simon Fraser University, Canada

**11:15 am** ■ A New Configuration of Bi-Directional Isolated DC/DC Con-  
verter using Dual Half-Controlled Bridge with Pulse Current Link Concept  
Takanori Isobe, Ryuichi Shimada, Kyohei Kato, Naoto Kojima, Tokyo  
Institute of Technology, Japan; MERSTech, Japan

#### S50 Motor Drives for Energy Efficiency

Room: 306C

Chairs: Avoki Omekanda, Andy Knight

**10:00 am** ■ Time Optimal and Loss Minimizing Deadbeat-Direct Torque  
and Flux Control for Interior Permanent Magnet Synchronous Machines

Jae Suk Lee, Robert D. Lorenz, M. Anibal Valenzuela, University of  
Wisconsin-Madison, United States; University of Concepcion, Chile

**10:25 am** ■ Optimal Motion Trajectories Minimizing Loss of Induc-  
tion Motor under Amplitude Limits

Kaoru Inoue, Keito Kotera, Toshiji Kato, Doshisha University, Japan

**10:50 am** ■ Efficiency Improvement of Permanent-Split Capacitor Mo-  
tors in HVAC Applications using a Two-Phase Asymmetrical Inverter

Korwin Anderson, Giri Venkataramanan, Thomas Lipo, University of Wisconsin-  
Madison, Trane, United States; University of Wisconsin-Madison, United States

**11:15 am** ■ Peak Power Shaving of an Electric Injection Molding  
Machine with Supercapacitors

Hirofumi Akiyoshi, Eiji Hiraki, Toshihiko Tanaka, Masayuki Okamoto, Ta-  
dayoshi Matsuo, Kiyoshi Ochi, Yamaguchi University, Japan; Ube National  
College of Technology, Japan; The Japan Steel Works, LTD., Japan

**S51 Advanced Silicon Devices and ICs**

Room: 306B  
Chair: Filippo Chimento

- 10:00 am** ▪ **Dual-GCT Design Criteria and Voltage Scaling**  
*Edward Van Brunt, Alex Q. Huang, Thomas Butschen, Rik W. De Doncker, North Carolina State University, United States; RWTH Aachen, Germany*
- 10:25 am** ▪ **A Novel High Speed and High Current FET Driver with Floating Ground and Integrated Charge Pump**  
*Xiaojun Xu, Lin Sheng, Xianhui Dong, Texas Instruments, China; Texas Instruments, United States*
- 10:50 am** ▪ **Substrate Switching Noise Analysis and Layout/Circuit Considerations in Monolithic Power Converters**  
*Jiwei Fan, Todd Harrison, Texas Instruments, United States*
- 11:15 am** ▪ **A Modified MODPEX Model for MOSFET and Parameter Optimization using Excel-Based Genetic Algorithm**  
*Zhiyang Chen, Richard Lindeman, ON Semiconductor, United States*

**S52 Sensorless Drives II**

Room: 306A  
Chairs: David Reigosa, Giuseppe Scarcella

- 10:00 am** ▪ **Sensorless Vector Control of Doubly Fed Induction Machine using a Reduced Order Observer Estimating Rotor Speed and Stator Variables**  
*Yongsu Han, Sungmin Kim, Jung-Ik Ha, Seoul National University, Korea (South)*
- 10:25 am** ▪ **Estimated-Speed-Aided Stabilizers for Sensorless Control of Interior Permanent Magnet Synchronous Machines**  
*Yue Zhao, Wei Qiao, Long Wu, University of Nebraska-Lincoln, United States; John Deere Electronic Solutions, United States*
- 10:50 am** ▪ **Current Regulated Pulse Width Modulation Controller Impact on Low Speed Performances of Industrial Encoderless Adjustable Speed Drives under Sliding Mode Variable Structures**  
*Kevin Lee, Wenxi Yao, Wenbin Lu, Zhengyu Lu, Eaton, United States; Zhejiang University, China*
- 11:15 am** ▪ **Sinusoidal Current Shaping in Variable-Speed Distributed Generating Units with Low-Resolution Position Sensors**  
*Alessandro Lidozzi, Giovanni Lo Calzo, Luca Solero, Fabio Crescimbeni, University ROMA TRE, Italy*

**S53 Linear Machines**

Room: 305B  
Chairs: Leila Parsa, Marcello Pucci

- 10:00 am** ▪ **State Space-Vector Model of Linear Induction Motors**  
*Marcello Pucci, ISSIA-CNR, Italy*
- 10:25 am** ▪ **Torque Decomposition and Control in an Iron Core Linear Permanent Magnet Motor**  
*T.T. Overboom, J.P.C. Smeets, J.M. Stassen, J.W. Jansen, E. Lomonova, Eindhoven University of Technology, Netherlands*
- 10:50 am** ▪ **Parameter Identification of Linear Induction Motor Model in Extended Range of Operation by Means of Input-Output Data**  
*F. Alonge, M. Cirrincione, F. D'Ippolito, M. Pucci, A. Sferlazza, DIAS - University of Palermo, Italy; UTBM, France; ISSIA-CNR, Italy*
- 11:15 am** ▪ **Double-Sided Flux-Switching Linear Synchronous Machine with Yokeless Translator**  
*Arun Gandhi, Leila Parsa, Rensselaer Polytechnic Institute, United States*

**S54 Losses and Thermal in Electric Machines**

Room: 305A  
Chairs: Sinisa Jurkovic, Mircea Popescu

- 10:00 am** ▪ **Core Loss Prediction in Electrical Machine Laminations Considering Skin Effect and Minor Hysteresis Loops**  
*Maged Ibrahim, Pragasen Pillay, Concordia University, Canada*
- 10:25 am** ▪ **Thermal Model and Analysis of Wound Rotor Induction Machine**  
*Aldo Boglietti, Andrea Cavagnino, Mircea Popescu, David Staton, Politecnico di Torino, Italy; Motor Design Ltd., United Kingdom*
- 10:50 am** ▪ **The Impact of Rotating Field on Core Loss Estimation in Electrical Machine Laminations**  
*Natheer Alatawneh, Pragasen Pillay, Concordia University, Canada*
- 11:15 am** ▪ **Innovative Thermal Model for the Estimation of Permanent Magnet and Stator Winding Temperatures**  
*Christian Kral, Anton Haumer, Sang Bin Lee, AIT Austrian Institute of Technology GmbH, Austria; Korea University, Korea (South)*

**S55 Microgrid Operation and Control II**

Room: 304  
Chairs: Paolo Mattavelli, Po-Tai Cheng

- 10:00 am** ▪ **Anti-Islanding Protection in Three-Phase Converters using Grid Synchronization Small-Signal Stability**  
*Dong Dong, Dushan Boroyevich, Paolo Mattavelli, Bo Wen, Yaosuo Xue, Virginia Tech, United States; Siemens Corporate Research, United States*
- 10:25 am** ▪ **Active Islanding Detection for Multiple Parallel-Connected Inverter-Based Distributed Generators using High Frequency Signal Injection**  
*David Reigosa, Fernando Briz, Cristian Blanco, Pablo Garcia, Juan Manuel Guerrero, University of Oviedo, Spain*
- 10:50 am** ▪ **An Adaptive Sliding Mode Controller for Enhanced Q'-V Droop in a Microgrid**  
*Christopher N. Rowe, Terrence J. Summers, Robert E. Betz, Timothy G. Moore, University of Newcastle, Australia; CSIRO, Australia*
- 11:15 am** ▪ **Transient Load Sharing Between Inverters and Synchronous Generators in Islanded Microgrids**  
*Andrew D. Paquette, Matthew J. Reno, Ronald G. Harley, Deepak M. Divan, Georgia Institute of Technology, United States*

**S56 Smart Grid Devices and Controls**

Room: 303  
Chairs: Harjeet Johal, Faisal Khan

- 10:00 am** ▪ **Efficient Energy Extraction of Wind Power Networks in Urban Environment**  
*Alfio Consoli, Giuseppe Scarcella, Giacomo Scelba, DIEEI - University of Catania, Italy*
- 10:25 am** ▪ **Distributed Model Predictive Control of Multi-Functional Power Conditioning System for Building Energy Efficiency**  
*Tai-Sik Hwang, Sung-Yeul Park, Shalabh Gupta, University of Connecticut, United States*
- 10:50 am** ▪ **An Energy Management System for a Community Energy Storage System**  
*Kazi M. Moyeenull Huq, M.E. Baran, Srdjan Lukic, Otsebele E Nare, North Carolina State University, United States; Hampton University, United States*
- 11:15 am** ▪ **Cooperative Control for Active Power Compensators Allocated in Distributed Network**  
*Camila S. Gehrke, Antonio M.N. Lima, Alexandre C. Oliveira, UFCG, Brazil*

**S57 Control of Wind Power Converters**

Room: 302C

Chairs: Francisco Canales, Junichi Itoh

**10:00 am ▪ Advanced Structures for Grid Synchronization of Power Converters in Distributed Generation Applications***Alvaro Luna, Joan Rocabert, Ignacio Candela, Pedro Rodriguez, Remus Teodorescu, Frede Blaabjerg, Technical University of Catalonia, Spain; Aalborg University, Denmark***10:25 am ▪ Simple, Fast and Accurate Maximum Power Point Tracking Converter for Thermoelectric Generators***Andrea Montecucco, Jonathan Siviter, Andrew R. Knox, University of Glasgow, United Kingdom***10:50 am ▪ Modeling and Analysis of Brushless Generator based Biomechanical Energy Harvesting System***Ze'ev Rubinshtein, Raziell Riemer, Shmuel Ben-Yaakov, Ben-Gurion University of the Negev, Israel***11:15 am ▪ Design and Evaluation of Interior Permanent Magnet Compressor Motors for Commercial Transcritical CO<sub>2</sub> (R-744) Heat Pump Water Heaters***Ian P. Brown, Matthew W. Critchley, Jiamin Yin, Stephen B. Memory, Stefan W. Elbel, Chad D. Bowers, Michael Petersen, Predrag S. Hrnjak, Gennadi Y. Sizov, A.O. Smith Corporate Technology Center, United States; Marquette University, United States; Creative Thermal Solutions, United States***S58 Ocean and Wave Energy II**

Room: 302B

Chairs: Pedro Rodriguez, Toshihisa Shimizu

**10:00 am ▪ Effect of Energy Storage on a Combined Wind and Wave Energy Farm***Elisabetta Tedeschi, Eider Robles, Maider Santos, Olivier Duperray, Fernando Salcedo, Tecnalia Research and Innovation, Spain***10:25 am ▪ DSP-Based Marine Current Turbine Emulator using a 3-Phase Inverter***Lucas Sinopoli, Martin Ordonez, John Quaicoe, Simon Fraser University, Canada; Memorial University, Canada***10:50 am ▪ Optimal Control of Generators for Water Current Energy Harvesting***Steven P. Bastien, Raymond B. Sepe Jr., Electro Standards Laboratories, United States***11:15 am ▪ Investigation of the Electrical System Design Concept and Grid Connection of Ocean Energy Devices to an Offshore Compressed Energy Storage System***Emmanuel B. Agamloh, Iqbal Husain, Ali Safayet, North Carolina State University, United States***S59 Power Converters in Transportation I**

Room: 302A

Chairs: Khwaja Rahman, Kum-Kang Huh

**11:00 am ▪ An Interleaved ZVS Full-Bridge DC-DC Converter with Capacitive Output Filter for a PHEV Charger***Deepak Gautam, Fariborz Musavi, Murray Edington, Wilson Eberle, William G. Dunford, Delta-Q Technologies Corp., Canada; The University of British Columbia, Canada***10:00 am ▪ Theoretical Analysis of DC Link Capacitor Current Ripple Reduction in the HEV DC-DC Converter and Inverter System using a Carrier Modulation Method***Xi Lu, Fang Zheng Peng, Michigan State University, United States***10:50 am ▪ Dual Voltage Source Inverter Topology Extending Machine Operating Range***T. Gerrits, C.G.E. Wijnands, J.J.H. Paulides, J.L. Duarte, Eindhoven University of Technology, Netherlands***11:15 am ▪ A Segmented Traction Drive System with a Small DC Bus Capacitor***Gui-Jia Su, Lixin Tang, Oak Ridge National Laboratory, United States***S60 AC/DC Converters: PWM techniques**

Room: 301B

Chairs: Luca Zarri, Radu Bojoi

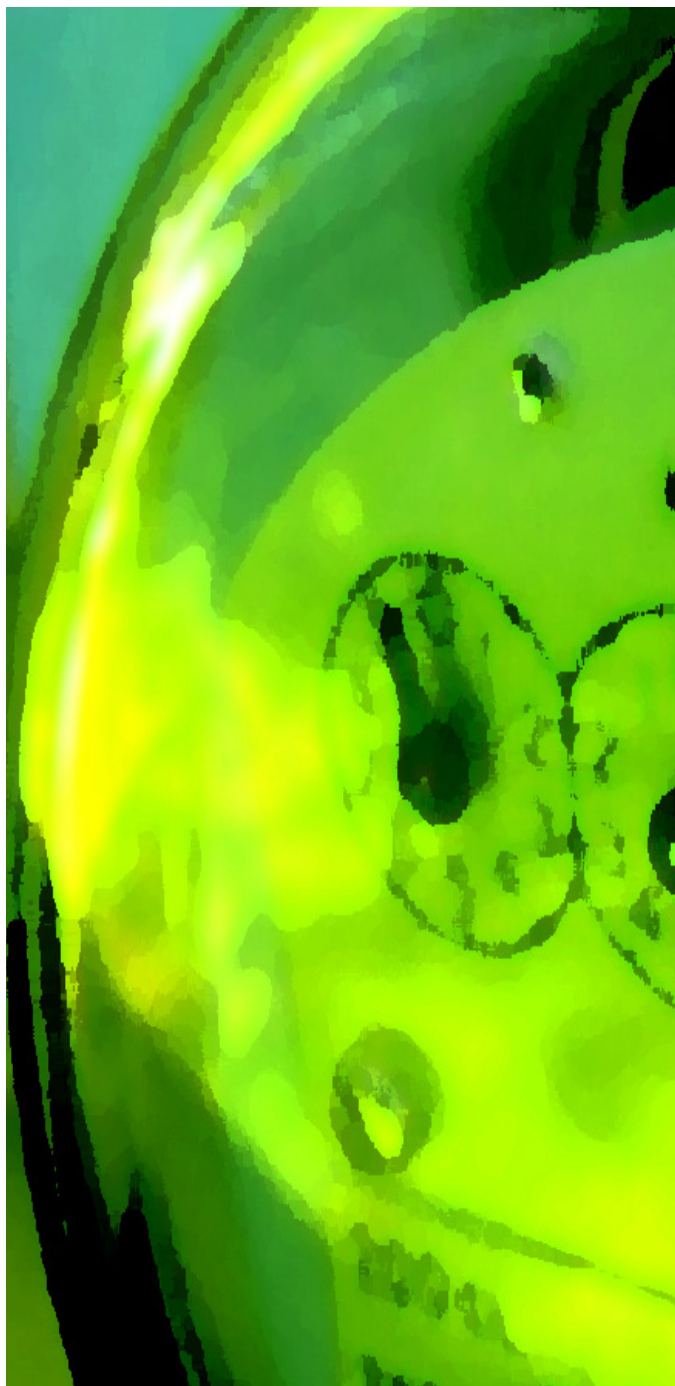
**10:00 am ▪ Unified Pulse Width Modulated Three-Phase Four-Leg Inverter based on Dual-Buck Power Cell***Pengwei Sun, Chien-Liang Chen, Jih-Sheng Lai, Chuang Liu, Virginia Tech, United States; Harbin Institute of Technology, China***10:25 am ▪ Three-Phase Multi-Module VSIs using SHE-PWM with Reduced Zero-Sequence Circulating Current***Mehdi Narimani, Gerry Moschopoulos, University of Western Ontario, Canada***10:50 am ▪ Soft-Switched Hybrid Modulation Scheme for Pulsating-DC-Link Converters***Arash Rahnamaee, Sudip K. Mazumder, University of Illinois, Chicago, United States***SS3 HVDC for Offshore Wind**

Room: 402

Chairs: Frans Dijkhuizen, Jian Sun

**10:00 am ▪ State-of-the-Art VSC HVDC for Wind***Franz Dijkhuizen, ABB Corporate Research, Sweden***10:25 am ▪ Multi-Terminal DC Power System to Enable Grid Integration of Distributed Generation***Ranjan Gupta, Ravisekhar Raju, Rajib Datta, Jian Sun, Subhashish Bhattacharya, GE Global Research, Rensselaer Polytechnic Institute, North Carolina State University, United States***10:50 am ▪ Wind Power Plant Control for the Connection to Multi-terminal HVdc Links***S. Bernal-Perez, S. Añó-Villalba, R. Blasco-Gimenez, N. Aparicio, Universidad Politécnica de Valencia, Spain***11:15 am ▪ Options for Ground Fault Clearance in HVDC Offshore Networks***M.K. Bucher, M.M. Walter, M. Pfeiffer, C.M. Franck, ETH Zurich, Switzerland*





Wednesday, September 19th, 1:30 pm - 3:10 pm

**S61**     **Single Phase PFC**  
 Room: 301A  
 Chairs: Bill Peterson, Tony O’Gorman

- 1:30 pm** ▪ **A High Performance Single-Phase AC-DC PFC Boost Converter with Passive Snubber Circuit**  
*M. Mahesh, A.K. Panda, PES Institute of Technology, India; National Institute of Technology, India*
- 1:55 pm** ▪ **A Three-Level Integrated AC-DC Converter**  
*Mehdi Narimani, Gerry Moschopoulos, University of Western Ontario, Canada*

- 2:20 pm** ▪ **A Low Common Mode Noise Bridgeless Boost-Buck-Boost Power Factor Correction Rectifier**  
*Jong-Won Shin, Gab-Su Seo, Jung-Ik Ha, Bo-Hyung Cho, Seoul National Univeristy, Korea (South)*
- 2:45 pm** ▪ **Optimal Control for Sub-Unity Power Factor Correction**  
*Zekeriya Dereli, Wayne W. Weaver, Michigan Technological University, United States*

**S62**     **Power Electronic Devices Applications**  
 Room: 306C  
 Chairs: Po-Tai Cheng, Craig Winterhalter

- 1:30 pm** ▪ **Optimization of a High Density Gallium Nitride based Non-Isolated Point of Load Module**  
*David Reusch, Fred C. Lee, David Gilham, Yipeng Su, Virginia Tech, United States*
- 1:55 pm** ▪ **1200V SiC MOSFETs for High Voltage Power Conversion**  
*Tao Wu, Jifeng Chen, Saijun Mao, Michael J. Schutten, GE Global Research Center, ETS China, China; GE Global Research Center, ETS China, United States*
- 2:20 pm** ▪ **Design and Performance of an All-SiC Three-Phase Buck Rectifier for High Efficiency Data Center Power Supplies**  
*Fan Xu, Ben Guo, Leon M. Tolbert, Fred Wang, Benjamin J. Blalock, University of Tennessee-Knoxville, United States*
- 2:45 pm** ▪ **High Frequency GaN Device-Enabled Cubesat EPS with Real-Time Scheduling**  
*Mihir Shah, Avik Juneja, Subhashish Bhattacharya, Alexander G. Dean, North Carolina State University, United States*

**S63**     **Converter-Level Packaging and Integration I**  
 Room: 306B  
 Chair: Bram Ferreira

- 1:30 pm** ▪ **Design of a Flexible Very Low Profile High Step-Up PV Module Integrated Converter**  
*Milos Acanski, Jelena Popovic-Gerber, Braham Ferreira, Delft University of Technology, Netherlands*
- 1:55 pm** ▪ **Three-Level Driving Method for GaN Power Transistor in Synchronous Buck Converter**  
*Xiaoyong Ren, David Reusch, Shu Ji, Zhiliang Zhang, Mingkai Mu, Fred C. Lee, Nanjing University of Aeronautics and Astronautics, China; Virginia Polytechnic Institute and State University, United States*
- 2:20 pm** ▪ **A Novel High Efficiency Gate Drive Circuit for Normally Off Type GaN-FET**  
*Hirokatsu Umegami, Yu Nozaki, Masayoshi Yamamoto, Osamu Machida, Student Member, Japan; Non Member, Japan; Member, Japan*
- 2:45 pm** ▪ **High-Speed Resonant Gate Driver with Controlled Peak Gate Voltage for Silicon Carbide MOSFETs**  
*Philip Anthony, Neville McNeill, Derrick Holliday, University of Bristol, United Kingdom; University of Strathclyde, United Kingdom*

**S64**     **Inverter Issues in Drives**  
 Room: 306A  
 Chairs: Gui-Jia Su, Chandra Namuduri

- 1:30 pm** ▪ **PWAM Boost-Converter-Inverter System for EV Engine Starter/Alternator**  
*Qin Lei, Fang Z. Peng, Michigan state university, United States*
- 1:55 pm** ▪ **Advantages of High Frequency PWM in AC Motor Drive Applications**  
*Kohei Shirabe, Mahesh Swamy, Jun-Koo Kang, Masaki Hisatsune, Yifeng Wu, Don Kebort, Jim Honea, Yaskawa America, Inc., United States; Transphorm Inc., United States*

**2:20 pm** ■ **Control of Three Phase Inverter for AC Motor Drive with Small DC-Link Capacitor Fed by Single Phase AC Source**

*Hyun-Sam Jung, Seung-Jun Chee, Seung-Ki Sul, Young-Jae Park, Hyun-Soo Park, Woo-Kyu Kim, Samsung Heavy Industries Co., Ltd., Korea (South); Seoul National University, Korea (South); Samsung Electronics, Korea (South)*

**2:45 pm** ■ **Control Method of Calculating Optimum DC Bus Voltage to Improve Drive System Efficiency in Variable DC Bus Drive System**

*Chen-Yen Yu, Jun Tamura, Robert D. Lorenz, UW-Madison, United States; Nissan co., Japan*

**S65** ■ **Induction Machine Diagnostics**

*Room: 305B*

*Chairs: Sang Bin Lee, Bulent Sarlioglu*

**1:30 pm** ■ **Monitoring of Airgap Eccentricity for Inverter-Fed Induction Motors based on the Differential Inductance**

*Jongman Hong, Doosoo Hyun, Sang Bin Lee, Christian Kral, Korea University, Korea (South); Austrian Institute of Technology, Austria*

**1:55 pm** ■ **Small-Signal Transient Analysis of Induction Machines with Stator Inter-Turn Faults using Dynamic Phasors**

*Dhaval C. Patel, M.C. Chandorkar, Indian Institute of Technology Bombay, Mumbai, India*

**2:20 pm** ■ **Evaluation of the Influence of Rotor Axial Air Duct Design on Condition Monitoring of Induction Motors**

*Sungho Lee, Jongman Hong, Sang Bin Lee, Ernesto Wiedenbrug, Mike Teska, Heedong Kim, Korea University, Korea (South); Baker Instrument Company, United States; Korea Electric Power Research Institute, Korea (South)*

**2:45 pm** ■ **Discriminating Rotor Cage Faults and Mechanical Load Oscillations in Three-Phase Induction Motors by the Stator Instantaneous Complex Apparent Impedance**

*M'hamed Drif, Jorge O. Estima, A.J. Marques Cardoso, University of Coimbra/IT, Portugal; University of Coimbra, FCTUC/IT, Portugal; University of Beira Interior/IT, Portugal*

**S66** ■ **PM Machines 2**

*Room: 305A*

*Chairs: Uday Deshpande, Jonathan Bird*

**1:30 pm** ■ **Design of Experiments to Address Manufacturing Tolerances and Process Variations Influencing Cogging Torque and Back EMF in the Mass Production of the Permanent Magnet Synchronous Motors**

*Mehnaz Akhter Khan, Iqbal Husain, Rakib Islam, Jeff Klass, North Carolina State University, United States; Nexteer Automotive, United States*

**1:55 pm** ■ **Harmonic Contents in Induced EMF and Electromagnetic Torque in Mass Produced Sinusoidal PM Brushless Machines**

*Mohammad Islam, Rakib Islam, Mazharul Chowdhury, Abraham Gebregergis, Tomy Sebastian, Nexteer Automotive, United States*

**2:20 pm** ■ **Characteristics Comparison of a Conventional and Modified Spoke-Type Ferrite Magnet Motor for Traction Drives of Low-Speed Electric Vehicles**

*Sung-Il Kim, Jinwoo Cho, Sunghyuk Park, Taesang Park, Seongtaek Lim, Samsung Advanced Institute of Technology, Korea, Republic of*

**2:45 pm** ■ **Modeling and Analysis of Effects of Skew on Torque Ripple and Stator Tooth Forces in Permanent Magnet AC Machines**

*G.Y. Sizov, P. Zhang, D.M. Ionel, N.A.O. Demerdash, I.P. Brown, M.G. Solveson, Marquette University, United States; A. O. Smith, United States; ANSYS, United States*

**S67** ■ **Charging of EV I**

*Room: 304*

*Chairs: Giuseppe Guidi, Joachim, Boecker*

**1:30 pm** ■ **Power Flow Steering for Electric Vehicle Fast Charging Station**

*Gierr Waltrich, Jorge L. Duarte, Marcel A.M. Hendrix, Eindhoven University of Technology, Netherlands*

**1:55 pm** ■ **Charging Rate Optimization for Plug-In Hybrid Electric Vehicles in Smart Grid**

*Zahra Darabi, Mehdi Ferdowsi, Missouri University of Science and Technology, United States*

**2:20 pm** ■ **Smart Charger for Electric Vehicles with Power Quality Compensator on Single-Phase Three-Wire Distribution Feeders**

*Toshihiko Tanaka, Tsukasa Sekiya, Hidenori Tanaka, Eiji Hiraki, Masayuki Okamoto, Yamaguchi University, Japan; Ube National College of Technology, Japan*

**2:45 pm** ■ **Review of Benefits and Challenges of Vehicle-to-Grid Technology**

*Murat Yilmaz, Philip T. Krein, University of Illinois at Urbana-Champaign, United States*

**S68** ■ **Renewable Energy System Analysis and Control**

*Room: 303*

*Chairs: Deepak Divan, Robert Cuzner*

**1:30 pm** ■ **Methods for Stability Analysis of Unbalanced Three-Phase Systems**

*Mauricio Céspedes, Jian Sun, Rensselaer Polytechnic Institute, United States*

**1:55 pm** ■ **Active and Reactive Power Management of Photovoltaic-Based Interline Dynamic Voltage Restorer in Low Voltage Distribution Networks**

*A. Elserougi, A.S. Abdel-Khalik, S. Ahmed, A. Massoud, Alexandria university, Egypt; Qatar University, Qatar; Alexandria University, Egypt; TAMU at Qatar, Qatar*

**2:20 pm** ■ **Reactive Power Control Methods for Improved Reliability of Wind Power Inverters under Wind Speed Variations**

*K. Ma, M. Liserre, F. Blaabjerg, Aalborg University, Denmark*

**2:45 pm** ■ **Control of Offshore Wind Farms Based on HVDC**

*Thanh Hai Nguyen, Dong-Choon Lee, Yeungnam University, Korea, Republic of*

**S69** ■ **Solar Energy – PV Converters II**

*Room: 302C*

*Chairs: Sudip Mazumder, Yen-shin Lai*

**1:30 pm** ■ **Modeling and Controller Design of Quasi-Z-Source Inverter with Battery based Photovoltaic Power System**

*Yushan Liu, Baoming Ge, Haitham Abu-Rub, Atif Iqbal, FangZheng Peng, Beijing Jiaotong University, Beijing, China; Michigan State University, East Lansing, MI 4882, United States; Texas A and M University at Qatar, Doha 23874, Qatar; Qatar University, Qatar*

**1:55 pm** ■ **A New Class of PV Inverters: Series Partial Resonant Converters**

*Mahshid Amirabadi, Hamid A. Toliyat, Texas A and M University, United States*

**2:20 pm** ■ **Fabrication Processes and Experimental Validation of a Planar PV Power System with Monolithically Embedded Power Converters**

*Abusaleh M. Imtiaz, Faisal H. Khan, University of Utah, United States*



**S70 Wind Power Applications**

Room: 302B

Chairs: Dehong Xu, Eduard Muljadi

**1:30 pm ▪ Solid State Transformer Interfaced Wind Energy System with Integrated Active Power Transfer, Reactive Power Compensation and Voltage Conversion Functions**

Xu She, Fei Wang, Rolando Burgos, Alex Q. Huang, North Carolina State University, United States, ABB Corporate Research, United States

**1:55 pm ▪ A Robust Real-Time Maximum Power Points Tracking (MPPT) Method for Wind Power Systems**

Yu Zou, Malik Elbuluk, Yilmaz Sozer, University of Akron, United States

**2:20 pm ▪ Wind Plant Power Prediction by using Neural Network Methods**

Ziqiao Liu, Wenzhong Gao, Yih-Huei Wan, Eduard Muljadi, University of Denver, United States; NREL, United States

**2:45 pm ▪ Combined Active/Reactive Power Control for Flicker Mitigation in Distributed Wind Power**

Moataz Ammar, Géza Joós, McGill University, Canada

**S71 Energy Storage I**

Room: 302A

Chairs: Thomas Jahns, Srdjan Lukic

**1:30 pm ▪ Black-Box Model and Identification Methodology for PEM Fuel Cell with Overshooted Transient Response**

C. Raga, A. Barrado, A. Lázaro, C. Fernández, V. Valdivia, I. Quesada, Universidad Carlos III de Madrid, Spain

**1:55 pm ▪ Forecasting the State-of-Charge of Li-Ion Batteries using Fuzzy Inference System and Fuzzy Identification**

Ho-Ta Lin, Tsorng-Juu Liang, Shih-Ming Chen, Kuan-Wen Li, National Cheng-Kung University, Taiwan

**2:20 pm ▪ Automatic Power Monitor (APM) in Switching Charger with Smooth Transition Loop Selector (STLS) for High-Energy Throughput System**

Tsu-wei Tsai, Ruei-Hong Peng, Yi-Ping Su, Ya-Ping Chen, Ke-Horng Chen, Shih-Ming Wang, Ming-Wei Lee, Hsin-yu Luo, National Chiao Tung University, Taiwan

**2:45 pm ▪ Discrimination and Screening Method for a Li-Ion Cell based on Discrete Wavelet Transform (DWT)**

Jonghoon Kim, Woojin Kim, Jungpil Park, Changyoon Chun, Bohyung Cho, Samsung SDI, Korea (South); Seoul National University, Korea (South)

**S72 Multilevel Converters IV: Modeling**

Room: 301B

Chairs: Axel Mertens, Zach Pan

**1:30 pm ▪ Modeling and Analysis of the Cascaded H-Bridge Multilevel Inverter using RMS Feedback Control**

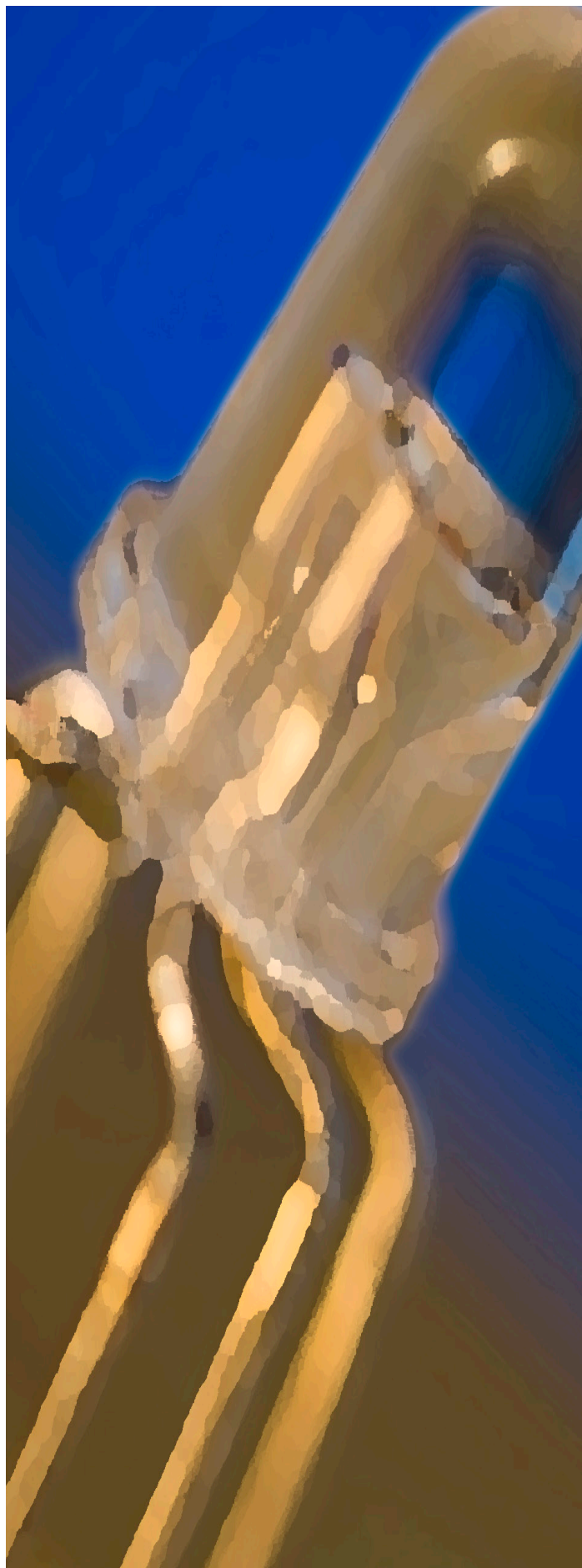
Yufei Li, Yue Wang, Yupeng Feng, Jinlong Wu, Jinjun Liu, Xi'an Jiaotong University, China; XJ Group Corporation, China

**1:55 pm ▪ Active DC Link Voltage Ripple Reduction in DC-AC Power Cells based Topologies**

Roberto Ramírez, José Espinoza, Felipe Villarroel, Eduardo Espinosa, Pedro Melin, Luis Morán, Daniel Sbárbaro, Concepcion University, Chile

**2:20 pm ▪ Output Impedance Modeling of a Multilevel Modular Switched-Capacitor Converter to Achieve Continuously Variable Conversion Ratio**

Mohammed Khorshed Alam, Faisal H. Khan, University of Utah, United States





Wednesday, September 19th, 3:30 pm - 5:10 pm

**S73 Single Phase Inverters**

Room: 301A

Chairs: Robert Gunther, Bill Peterson

**3:30 pm ■ 1MHz Variable Multi Sampling Digital Control of Single Phase PWM Inverter using FPGA based Hardware Controller**

Hiroki Uchida, Tomoki Yokoyama, Tokyo Denki University, Japan

**3:55 pm ■ A New Quasi Resonant DC Link for Single Phase Micro Inverter**

Anna Grishina, Haibing Hu, Dehua Zhang, Ahmadreza Amirahmadi, John Shen, Issa Batarseh, University of Central Florida, United States

**4:20 pm ■ Design of Variable-Resistance Class E Inverters for Load Modulation**

Lukasz Roslaniec, David J. Perreault, Warsaw University of Technology, Poland; Massachusetts Institute of Technology, United States

**4:45 pm ■ Implementation and Control of a Bidirectional High-Gain Transformer-Less Standalone Inverter**

Olive Ray, Santanu Mishra, Avinash Joshi, V. Pradeep, Arvind Tiwari, Indian Institute of Technology, Kanpur, India; GE Global Research, Bangalore, India

**S74 LED Drivers and Control I**

Room: 306C

Chairs: Toshiji Kato, David Perreault

**3:30 pm ■ Improving the Design of the Asymmetrical Half-Bridge Converter without Electrolytic Capacitor for Low-Output-Voltage AC-DC LED Drivers**

M. Arias, M. Fernández, D. González, J. Sebastián, D. Balocco, A. Diallo, University of Oviedo, Spain; AEG Power Solutions, France

**3:55 pm ■ A Primary Side Control Scheme for Triac Dimmable LED Driver based on Indirect Output Current Sensing**

Hulong Zeng, Ting Jiang, Junming Zhang, ZheJiang University, China

**4:20 pm ■ A Simple Precise Capacitive Current Balancing Method for the Multi-Output LED Drivers**

Chen Zhao, Xiaogao Xie, Shirong Liu, Hangzhou Dianzi University, China

**4:45 pm ■ A Loss-Adaptive Self-Oscillating Buck Converter for LED Driving**

Yi Chen, Yurong Nan, Qinggang Kong, Zhejiang University of Technology, China; Dalian Shinergy Science and Technology Development. Co., Ltd., China

**S75 Magnetic Materials and Design**

Room: 306B

Chairs: Yehui Han, Kan Akatsu

**3:30 pm ■ Iron Loss Calculation of AC Filter Inductor for Three Phase PWM Inverter**

Hiroaki Matsumori, Toshihisa Shimizu, Koushi Takano, Hitoshi Ishii, Tokyo Metropolitan University, Japan; Iwatsu test Instrument Corporation, Japan

**3:55 pm ■ A Novel Integrated Magnetic Structure Suitable for Transformer-Linked Interleaved Boost Chopper Circuit**

Jun Imaoka, Masayoshi Yamamoto, Shimane University, Japan

**4:20 pm ■ Design of Multi-Permeability Distributed Air-Gap Inductors**

Laili Wang, Zhiyuan Hu, Yan-Fei Liu, Yunqing Pei, Xu Yang, Queen's University, Canada; Xi'an Jiaotong University, China

**4:45 pm ■ Modeling and Measured Verification of Stored Energy and Loss in MEMS Toroidal Inductors**

Mohammad Aragchchini, Jeffrey H. Lang, Xuehong Yu, Min Soo Kim, Florian Herrault, Mark G. Allen, Jizheng Qiu, Charles R. Sullivan, Massachusetts Institute of Technology, United States; Georgia Institute of Technology, United States; Dartmouth University, United States

S76

**Common Mode and EMI in Drives**

Room: 306A

Chairs: Mahesh Swamy, Suresh Gopalakrishnan

**3:30 pm ■ Common-Mode Voltage Reduction for Regenerative AC Drives**

Rangarajan M. Tallam, Carlos D. Rodríguez Valdez, Russel J. Kerkman, Gary L. Skibinski, Richard A. Lukaszewski, Rockwell Automation, United States; Radyn, United States

**3:55 pm ■ Reduction of Shaft Voltages and Bearing Currents in Five-Phase Induction Motors**

Hussain A. Hussain, Hamid A. Toliyat, Texas A and M University, United States

**4:20 pm ■ A Chirp PWM Scheme for Brushless DC Motor Drives**

Wasi Uddin, Tausif Husain, Rakesh Mitra, Ernest Ofori, Yilmaz Sozer, Iqbal Husain, University of Akron, United States; North Carolina State University, United States

**4:45 pm ■ Design-Oriented Analysis and Performance Evaluations of AC Inductors and Unique DC-Link Choke Configurations in Industrial Adjustable Speed Drives**

Kevin Lee, Leo Sun, Wei Chen, Fang Xie, Gerald Zheng, Lei Zhang, Eaton, United States; Fuzhou University, China

S77

**Magnetic Gears in Electric Machines**

Room: 305B

Chairs: Akira Chiba, Thomas Wu

**3:30 pm ■ Improved Motor Integrated Permanent Magnet Gear for Traction Applications**

T.V. Frandsen, P.O. Rasmussen, K.K. Jensen, Aalborg University, Denmark; Grundfos Holding A/S, Denmark

**3:55 pm ■ Analysis and Design of the Trans-Rotary Magnetic Gear**

Siavash Pakdelian, Nicolas W. Frank, Hamid A. Toliyat, Dept of ECE, Texas A and M University, United States; Power Electronics group, ABB US CRC, United States

**4:20 pm ■ Performance of a Magnetic Gear using Ferrite Magnets for Low Speed Ocean Power Generation**

Krishna K. Uppalapati, Jonathan Z. Bird, Dan Jia, Joshua Garner, Aixi Zhou, University of North Carolina-Charlotte, United States

**4:45 pm ■ An Electric Machine Integrated with Trans-Rotary Magnetic Gear**

Siavash Pakdelian, Yateendra Deshpande, Hamid A. Toliyat, Dept of ECE, Texas A and M University, United States

S78

**Losses in Concentrated Winding Machines**

Room: 305A

Chairs: Jonathan Bird, Gianmario Pellegrino

**3:30 pm ■ Calculation of Magnet Losses in Concentrated-Winding Permanent Magnet Synchronous Machines using a Computationally Efficient – Finite Element Method**

Peng Zhang, Gennadi Y. Sizov, Jiangbiao He, Dan M. Ionel, Nabeel A.O. Demerdash, Marquette University, United States

**3:55 pm ■ Analytical Model of Magnet Eddy-Current Volume Losses in Multi-Phase PM Machines with Concentrated Winding**

Bassel Aslan, Eric Semail, Jerome Legranger, PARISTECH / L2ep/Centre de Lille, France; Valeo-EEM, France

**4:20 pm ■ Finite Element Analysis and Preisach Hysteresis Model of a Toroid Compared to Measurements**

N.H. Vrijssen, J.W. Jansen, E.A. Lomonova, Eindhoven University of Technology, Netherlands

**S79**     **Charging of EV II**  
 Room: 304  
 Chairs: Martin Pavlovski, Jin Wang

**3:30 pm** ▪ **Bi-directional Power Flow Rapid Charging System using Coupled Inductor for Electric Vehicle**

*Yongsug Suh, Taewon Kang, Hyeoncheol Park, Byungik Kang, Simon Kim, Chonbuk National University, Korea (South); Chonbuk National University, Korea (South); Iljin Electric. Co. Ltd., Korea (South)*

**3:55 pm** ▪ **Modeling of a Grid-Connected, Multifunctional Electric Vehicle Charging Station in Active Filter Mode with DQ Theory**

*Russell Crosier, Shuo Wang, Yongbin Chu, University of Texas-San Antonio, United States*

**4:20 pm** ▪ **Integrated Electric Motor Drive and Power Electronics for Bidirectional Power Flow between Electric Vehicle and DC or AC Grid**

*Mehnaz Akhter Khan, Iqbal Husain, Yilmaz Sozer, North Carolina State University, United States; University of Akron, United States*

**4:45 pm** ▪ **Small Signal Modeling and Networked Control of a PHEV Charging Facility**

*Luis Herrera, Ernesto Inoa, Feng Guo, Hanning Tang, Jin Wang, Ohio State University, United States*

**S80**     **Circuit and Control Techniques for EMI Reduction**

Room: 302C  
 Chairs: Lei Xing, Yilmaz Sozer

**3:30 pm** ▪ **Topology and PWM Method Dependency of High Frequency Leakage Current Characteristics of Voltage Source Inverter Driven AC Motor Drives**

*N. Onur Çetin, Ahmet M. Hava, Middle East Technical University, Turkey*

**3:55 pm** ▪ **Non-Ideal Smoothing Transformer as Effective Differential Mode Filter**

*Juergen Stahl, Rene Junghaenel, Manfred Albach, University of Erlangen, Germany*

**4:20 pm** ▪ **An Optimal Minimum-Component Input Filter Design and its Stability Analysis for a Transformer-Coupled Zero Voltage Switching Buck-Boost DC-DC Converter**

*Xiaoyan Yu, Maurizio Salato, Vicor Corporation, United States*

**S81**     **Solar Energy – PV Converters III**

Room: 302B  
 Chairs: Miaosen Shen, Ahmet Hava

**3:30 pm** ▪ **Transformer-Less Photovoltaic (PV) Inverters: A Critical Comparison**

*M.C. Poliseo, R.A. Mastromauro, M. Liserre, Politecnico di Bari, Italy*

**3:55 pm** ▪ **A Single-Switch Isolated DC-DC Converter for Photovoltaic Systems**

*Jianwu Zeng, Wei Qiao, Liyan Qu, University of Nebraska-Lincoln, United States*

**4:20 pm** ▪ **A Survey and Extension of High Efficiency Grid Connected Transformerless Solar Inverters with Focus on Leakage Current Characteristics**

*Ziya Özkan, Ahmet M. Hava, Middle East Technical University, Turkey*

**4:45 pm** ▪ **A High-Frequency-Link Photovoltaic Inverter**

*Priyadarshini T. Sivasubramanian, Sudip K. Mazumder, University of Illinois-Chicago, United States*

**S82**     **Energy Storage II**

Room: 302A  
 Chairs: Yilmaz Sozer, Tomoki Yokoyama

**3:30 pm** ▪ **A New Medium-Voltage Energy Storage Converter Topology with Medium-Frequency Transformer Isolation**

*Harish S. Krishnamoorthy, Pawan Garg, Prasad N. Enjeti, Texas A and M University, College Station, United States*

**3:55 pm** ▪ **Optimal Energy Management of an Improved Elevator with Energy Storage Capacity based on Dynamic Programming**

*Endika Bilbao, Philippe Barrade, Ion Etxeberria-Otadui, Alfred Rufer, Sergio Luri, Inigo Gil, STI-IEL-LEI EPFL, Switzerland; IKERLAN-IK4 Technology Research Centre, Spain; Orona EIC Elevator Innovation Centre, Spain*

**4:20 pm** ▪ **The Effect of Low Frequency Current Ripple on the Performance of a Lithium Iron Phosphate (LFP) Battery Energy Storage System**

*Sandeep Bala, Tomas Tengnér, Pablo Rosenfeld, François Delince, ABB Corporate Research, United States; ABB Corporate Research, Sweden; ABB Power Products, United States; ABB Power Products, Belgium*

**4:45 pm** ▪ **DC Distribution System Architecture and Controls for Wind Power Applications**

*Yogesh Patel, Adel Nasiri, Rockwell Automation, United States; UW-Milwaukee, United States*

**S83**     **Multilevel Converters IV: Control**

Room: 301B  
 Chairs: Grahame Holmes, Brendan McGrath

**3:30 pm** ▪ **Predictive Control of a Three-Phase DC-AC Modular Multilevel Converter**

*Jiangchao Qin, Maryam Saeedifard, Purdue University, United States*

**3:55 pm** ▪ **Control of the Modular Multilevel Cascade Converter based on Triple-Star Bridge-Cells (MMCC-TSBC) for Motor Drives**

*Wataru Kawamura, Hirofumi Akagi, Tokyo Institute of Technology, Japan*

**4:20 pm** ▪ **Multi-Objective Optimization PWM Control for a Back-to-Back Five-Level ANPC Converter**

*Kui Wang, Zedong Zheng, Yongdong Li, Lie Xu, Hongwei Ma, Tsinghua University, China*

**4:45 pm** ▪ **Simplified Dynamics and Control of a Modular Multilevel Converter based on a Terminal Behavioral Model**

*Daniel C. Ludois, Giri Venkataramanan, University of Wisconsin-Madison, United States*

**Thursday, September 20th, 8:00 am - 9:40 am**

**S84**     **Resonant DC-DC Converters II**

Room: 301A  
 Chairs: Pravin Jain, Mor Peretz

**8:00 am** ▪ **Study on the Start-Up Schemes for the Three-Stage Solid State Transformer Applications**

*Xiaohu Liu, Liming Liu, Hui Li, Keith Corzine, Tangtang Guo, Florida State University, United States; Missouri University of Science and Technology, United States; Zhejiang Univeristy, China*

**8:25 am** ▪ **An LLC Resonant Full-Bridge Inverter-link DC-DC Converter with an Anti-Resonant Circuit for Practical Voltage Step-Up/Down Regulation**

*Tomokazu Mishima, Hiroto Mizutani, Mutsuo Nakaoka, Kobe University, Japan; Professor Emeritus of Yamaguchi University, Japan*

**8:50 am** ▪ **An Interleaved LLC Resonant Converter Operating at Constant Switching Frequency**

*Zhiyuan Hu, Yajie Qiu, Laili Wang, Yan-Fei Liu, Queen's University, Canada*

**9:15 am** ▪ **Inductorless Forward-Flyback Soft-Switching Converter with Dual Constant On-Time Modulation for Photovoltaic Applications**

*Wensong Yu, Ben York, Jih-Sheng Lai, Virginia Tech, United States*

**S85 LED Drivers and Control II**

Room: 306C

Chairs: S.Y.(Ron) Hui, Brad Lehman

**8:00 am ■ An Integrated Lighting Unit with Regulated Pulse Current Driving Technique**

Ming-Shian Lin, Chern-Lin Chen, National Taiwan University, Taiwan

**8:25 am ■ Variants of Current-Mirror Circuits for Reducing Current Imbalance in Parallel LED Strings**

Sinan Li, S.Y. Hui, The University of Hong Kong, Hong Kong

**8:50 am ■ Capacitor Clamped Current Sharing Circuits for Multi-String LEDs**

Yijie Yu, Fanghua Zhang, Jianjun Ni, Nanjing University of Aeronautics and Astronautics, China

**9:15 am ■ A New Primary Side Controlled High Power Factor Single-Stage Flyback LED Driver**

Xiaogao Xie, Zhou Lan, Chen Zhao, Hangzhou Dianzi University, China

**S86 Wide Bandgap Semiconductors II**

Room: 306B

Chair: Shashank Krishnamurthy

**8:00 am ■ A High Temperature Ultrafast Isolated Converter to Turn-Off Normally-On SiC JFETs**

Fabien Dubois, Stéphane Sorel, Sonia Dhokkar, Régis Meuret, Dominique Bergogne, Christian Martin, Bruno Allard, Hervé Morel, Ruxi Wang, Université de Lyon, INSA Lyon, Ampere Laboratory, France; Université de Lyon, UCBL, Ampere Laboratory, France; Hispano Suiza, SAFRAN Group, France

**8:25 am ■ The Modeling and Characterization of Silicon Carbide Gate Turn Off Thyristors**

Osama S. Saadeh, H. Alan Mantooth, Juan C. Balda, University of Arkansas, United States

**8:50 am ■ Static and Dynamic Characterization of 6.5kV, 100A SiC Bipolar PiN Diode Modules**

Ahmed Elasser, Mohammed Agamy, Jeffrey Nasadoski, Alexander Bolotnikov, Zachary Stum, Ravi Raju, Ljubisa Stevanovic, Jorge Mari, Matthias Menzel, Peter Losee, Bastien Bertrand, GE Global Research Center, United States; GE Global Research Center, Germany; GE Global Research Center, United States; Semisouth, United States

**9:15 am ■ High Performance, Ultra High Voltage 4H-SiC IGBTs**

Sei-Hyung Ryu, Craig Capell, Lin Cheng, Charlotte Jonas, Anand Gupta, Matt Donofrio, Jack Clayton, Michael O'Loughlin, Al Burk, David Grider, Anant Agarwal, John Palmour, Allen Hefner, Subhashish Bhattacharya, Cree, Inc., United States; NIST, United States; Cree, Inc, United States; NCSU, United States

**S87 Fault Operation in Drives**

Room: 306A

Chairs: Suman Dwari, Fang Luo

**8:00 am ■ Identifying Ground Fault Location in High Resistance Grounded System for Adjustable Speed Drive at Low Speed**

Lixiang Wei, Zhijun Liu, Rockwell Automation, United States

**8:25 am ■ Fast Fault Detection, Isolation and Reconfiguration in Fault-Tolerant Permanent Magnet Synchronous Motor Drives**

Jorge O. Estima, A.J. Marques Cardoso, University of Coimbra/IT, Portugal; University of Beira Interior/IT, Portugal

**8:50 am ■ A New Method for Modeling and Vector Control of Unbalanced Induction Motors**

M. Jannati, N.R.N. Idris, Z. Salam, Universiti Teknologi Malaysia, Malaysia

**9:15 am ■ Power Failure Ride-Through in Multi-Machine Drives**

Bhakti M. Joshi, M.C. Chandorkar, Indian Institute of Technology Bombay, India

**S88 Special Machines 2**

Room: 305B

Chairs: Yves Perriard, Fabio Giulii Capponi

**8:00 am ■ Axial-Flux Hybrid-Excitation Synchronous Machine: Analysis, Design and Experimental Evaluation**

F. Giulii Capponi, G. De Donato, F. Caricchi, University of Roma "La Sapienza", Italy

**8:25 am ■ Design of a Blood Pump for a Wearable Artificial Kidney Device**

Miroslav Markovic, Michael Rapin, Marc Correvon, Yves Perriard, Research Assistant, Switzerland; Student, Switzerland; Team Leader, Switzerland; Professor, Switzerland

**8:50 am ■ Comparison of Alternate Mechanically Adjusted Variable Flux Switched Flux Permanent Magnet Machines**

Z.Q. Zhu, M.M.J. Al-Ani, X. Liu, M. Hasegawa, A. Pride, R. Deodhar, University of Sheffield, United Kingdom; IMRA Europe SAS, UK Research Center, United Kingdom

**9:15 am ■ Performance Investigation of a Centrifugal Pump with a Consequent-Pole Bearingless Motor**

Junichi Asama, Daisuke Kanehara, Takaaki Oiwa, Akira Chiba, Shizuoka University, Japan; Tokyo Institute of Technology, Japan

**S89 IPM Machines 1**

Room: 305A

Chairs: Tom Jahns, Nicola Bianchi

**8:00 am ■ Design and Evaluation of a Variable-Flux Flux-Intensifying Interior Permanent Magnet Machine**

Natee Limsuwan, Takashi Kato, Kan Akatsu, Robert D. Lorenz, WEM-PEC, University of Wisconsin - Madison, United States; Nissan Motor CO., LTD., Japan; Shibaura Institute of Technology, Japan

**8:25 am ■ Design Considerations of a Brushless Open-Slot Radial-Flux PM Hub-Motor**

Rafal Wrobel, James Goss, Adrian Mlot, Phil Mellor, University of Bristol, United Kingdom; Motor Design Ltd., United Kingdom

**8:50 am ■ A SyR and IPM Machine Design Methodology Assisted by Optimization Algorithms**

F. Cupertino, G.M. Pellegrino, E. Armando, C. Gerada, Politecnico di Bari, Italy; Politecnico di Torino, Italy; University of Nottingham, United Kingdom

**9:15 am ■ A Novel Rotor Design of Interior Permanent Magnet Synchronous Motors to Cope with Both Maximum Torque and Core Loss Reduction**

Katsumi Yamazaki, Masaki Kumagai, Takeshi Ikemi, Shinji Ohki, Chiba Institute of Technology, Japan; Nissan Motor Co., Ltd., Japan

**S90 Grid-Connected Converters**

Room: 304

Chairs: Axel Mertens, Mauricio Cespedes

**8:00 am ■ Multi Objective Operation of Cascade Inverter-Based Voltage Quality Disturbance Generator**

Zhongdong Yin, Renzhong Shan, Lingling Fan, Songwei Cao, North China Electric Power University, China; Tsinghua University, China; University of south Florida, United States

**8:25 am ■ Control and Modulation Scheme for a Cascaded H-Bridge Multi-Level Converter in Large Scale Photovoltaic Systems**

C.D. Townsend, T.J. Summers, R.E. Betz, University of Newcastle, Australia



**8:50 am** ■ **Control of Cascaded H-Bridge Multilevel Inverter with Individual MPPT for Grid-Connected Photovoltaic Generators**

*Bailu Xiao, Ke Shen, Jun Mei, Faete Filho, Leon M. Tolbert, The University of Tennessee, United States; Harbin Institute of Technology, China; Southeast University, China*

**9:15 am** ■ **DC Islanding Detection Algorithm using Injection Current Perturbation Technique for Photovoltaic Converters in DC Distribution**

*Gab-Su Seo, Bo-Hyung Cho, Kyu-Chan Lee, Seoul National University, Korea (South); Interpower Co., LTD., Korea (South)*

**S91** **Hybrid Energy System**

*Room: 303*

*Chairs: Maryam Saeedifard, Fujio Kurokawa*

**8:00 am** ■ **Modeling and Control System Design for an Integrated Solar Generation and Energy Storage System with a Ride-Through Capability**

*Xiaoyu Wang, Meng Yue, Eduard Muljadi, Brookhaven National Laboratory, United States; National Renewable Energy Laboratory, United States*

**8:25 am** ■ **Evaluation of Impact of Energy Storage on Effective Load Carrying Capability of Wind Energy**

*Ali Esmaili, Adel Nasiri, UW-Milwaukee, United States*

**8:50 am** ■ **An Isolated Multiport DC-DC Converter for Simultaneous Power Management of Multiple Renewable Energy Sources**

*Jianwu Zeng, Wei Qiao, Liyan Qu, University of Nebraska-Lincoln, United States*

**9:15 am** ■ **PV Balancers: Concept, Architectures, and Realization**

*Huimin Zhou, Junjian Zhao, Yehui Han, University of Wisconsin-Madison, United States*

**S92** **Operation of Wind Power Systems**

*Room: 302C*

*Chairs: Madhav Manjerkar, Hideaki Fujita*

**8:00 am** ■ **Sensorless Small-Scale Variable Speed Wind Energy Conversion System Incorporating DTC-SVM of Direct-Drive PMSG with RLC Filter**

*Pieter Bouwer, Maarten J. Kamper, Stellenbosch University, South Africa*

**8:25 am** ■ **Optimum Control of Grid Connected Interior Permanent Magnet Wind Turbine Generator**

*Hossein Karimi-Davijani, Olorunfemi Ojo, Tennessee Technological University, United States*

**8:50 am** ■ **Integrated Risk Management for Renewable Energy Investment over Life Cycle**

*Qin Sun, Santiago Grijalva, Georgia Institute of Technology, United States*

**9:15 am** ■ **Current-Based Diagnosis for Gear Tooth Breaks in Wind Turbine Gearboxes**

*Dingguo Lu, Xiang Gong, Wei Qiao, University of Nebraska-Lincoln, United States*

**S93** **Circuits and Control for Distributed Power System**

*Room: 302B*

*Chairs: Avinash Joshi, Edison da Silva*

**8:00 am** ■ **Current Sensorless Control for Bidirectional Full-Bridge Converter in DC Distributed System**

*Hung-Chi Chen, Jhen-Yu Liao, National Chiao Tung University, Taiwan*

**8:25 am** ■ **Tuning of the Load Adaptive Controller for DC/AC Converter in LVDC Power Distribution**

*Pasi Peltoniemi, Pasi Nuutinen, Juha Pyrhönen, Lappeenranta University of Technology, Finland*

**8:50 am** ■ **Approach for Highly Efficient and Ultra Compact Converters in Next Generation 380 V DC Distribution System**

*Yusuke Hayashi, NTT Facilities, Japan*

**9:15 am** ■ **Implementation and Control of Switched Boost Inverter for DC Nanogrid Applications**

*Ravindranath Adda, Olive Ray, Santanu Mishra, Avinash Joshi, Department of Electrical Engineering, IIT Kanpur, India*

**S94** **Contactless Power Transfer II**

*Room: 302A*

*Chairs: Chandra Namuduri, Pierluigi Tenca*

**8:00 am** ■ **Recent Progress in Mid-Range Wireless Power Transfer**

*C.K. Lee, W.X. Zhong, S.Y.R. Hui, The University of Hong Kong, Hong Kong; City University of Hong Kong, Hong Kong*

**8:25 am** ■ **Magnetic Link Optimization for Wireless Power Transfer Applications: Modeling and Experimental Validation for Resonant Tubular Coils**

*Zeljko Pantic, Benjamin Heacock, Srdjan Lukic, North Carolina State University, United States*

**8:50 am** ■ **Equivalent Complex Permeability and Conductivity of Litz Wire in Wireless Power Transfer Systems**

*Mohammad Etemadrezaei, Srdjan M. Lukic, North Carolina State University, United States*

**9:15 am** ■ **Resonant Network Design Considerations for Variable Coupling Lumped Coil Systems**

*Chang-Yu Huang, John T. Boys, Grant A. Covic, Dr., New Zealand; Prof., New Zealand*

**S95** **Technologies for High Power AC-AC Converters**

*Room: 301B*

*Chairs: Pat Wheeler, Lixiang Wei*

**8:00 am** ■ **Loss Comparison between SiC, Hybrid Si/SiC, and Si Devices in Direct AC/AC Converters**

*Rohit Moghe, Rajendra P. Kandula, Amrit Iyer, Deepak Divan, Georgia Institute of Technology, United States*

**8:25 am** ■ **Experimental Validation of Active Snubber Circuit for Direct AC/AC Converters**

*Amrit Iyer, Rohit Moghe, Rajendra Kandula, Anish Prasai, Deepak Divan, Georgia Institute of Technology, United States; Varentec, United States*

**8:50 am** ■ **Efficiency Comparison of AC-Link and TIPS (SST) Topologies based on Accurate Device Models**

*Ankan De, Sudhin Roy, Subhasish Bhattacharya, Ph.D. Student, United States; Associate Professor, United States; Post Doc, United States*

**9:15 am** ■ **Half Bridge Topologies for Electronic Transformers**

*Shashank Krishnamurthy, United Technologies Research Center, United States*



Thursday, September 20th, 10:00 am - 11:40 am

#### S96 Isolated DC-DC Converters

Room: 301A

Chairs: Victor Martin, Miroslav Vasic

**10:00 am** ▪ **Efficiency Analysis of an Isolated High Voltage Gain Converter Operating in Resonant and Non-Resonant Mode**  
 Giorgio Spiazzi, Francesco Sichirollo, Flávio A.S. Gonçalves, UNESP - Univ Estadual Paulista, Brazil; University of Padova - DEI, Italy

#### 10:25 am

▪ **Dead Time Optimization through Loss Analysis of an Active-Clamp Flyback Converter Utilizing GaN Devices**

Thomas LaBella, Ben York, Chris Hutchens, Jih-Sheng Lai, Virginia Tech Future Energy Electronics Center, United States

#### 10:50 am

▪ **A Resonant Bi-Directional DC-DC Converter**

Ross P. Twiname, Duleepa J. Thrimawithana, Udaya K. Madawala, Auckland University of Technology, New Zealand; Auckland University, New Zealand

#### 11:15 am

▪ **High Frequency Isolated Bus Converter with Gallium Nitride Transistors and Integrated Transformer**

David Reusch, Fred C. Lee, Virginia Tech (CPES), United States

#### S97

#### Power Quality and Active Filters

Room: 306C

Chairs: Radu Bojoi, Jin-Jun Liu

#### 10:00 am

▪ **Evaluation of Low Frequency Input Current Ripple in a Non-Isolated Single Phase Photovoltaic Grid-Connected Inverter with Back Current Gain Model**

Jianhua Wang, Baojian Ji, Jianfeng Zhao, Jie Yu, Southeast University, China; Nanjing University of Technology, China

#### 10:25 am

▪ **Damping of Input LC Filter Resonance based on Virtual Resistor for Matrix Converter**

Xingwei Wang, Hua Lin, Bo Feng, Yongcan Lyu, Huazhong university of Science and Technology, China

#### 10:50 am

▪ **Comprehensive Review of Stability Criteria for DC Distribution Systems**

Antonino Riccobono, Enrico Santi, University of South Carolina, United States

#### 11:15 am

▪ **Experimental Verification of the Generalized Nyquist Stability Criterion for Balanced Three-Phase AC Systems in the Presence of Constant Power Loads**

Bo Wen, Dushan Boroyevich, Paolo Mattavelli, Zhiyu Shen, Rolando Burgos, Virginia Tech, United States; ABB Corporate Research, United States

#### S98

#### Converter-Level Packaging and Integration II

Room: 306B

Chairs: Adam Skorek, Pat Wheeler

#### 10:00 am

▪ **Evaluation of SiC Power Devices for a High Power Density Matrix Converter**

Saeed Safari, Alberto Castellazzi, Pat Wheeler, University of Nottingham, United Kingdom

#### 10:25 am

▪ **Sinusoidal Current Operation of Delay Time Compensation for Parallel Connected IGBTs**

Rodrigo Alvarez, Steffen Bernet, Technical University of Dresden, Germany

#### 10:50 am

▪ **Analysis of the Switching Speed Limitation of Wide Band-Gap Devices in a Phase-Leg Configuration**

Zheyu Zhang, Weimin Zhang, Fred Wang, Leon M. Tolbert, Benjamin J. Blalock, University of Tennessee-Knoxville, United States

#### 11:15 am

▪ **Design and Performance Evaluation of SiC based DC-DC Converters for PV Applications**

Omid Mostaghimi, Nick Wright, Alton Horsfall, Newcastle University, United Kingdom

#### S99

#### Control of DC-DC Converters II

Room: 306A

Chairs: Paolo Mattavelli, Faisal Khan

#### 10:00 am

▪ **Instantaneous Current Control for the Three-Phase Dual-Active Bridge DC-DC Converter**

Stefan P. Engel, Nils Soltau, Rik W. De Doncker, RWTH Aachen, E.ON Energy Research Center, PGS, Germany

**10:25 am** ▪ **A Sensorless Continuous and Discontinuous Conduction Mode Detection Method for a Synchronous Converter using PWM Pulse Skipping**  
 Jongbok Baek, Woon Choi, Bohyung Cho, *Electrical Engineering, Seoul National Univ., Korea, Republic of*

**10:50 am** ▪ **New Thermal Balance Control Techniques of Phase-Shift Full-Bridge Converter**

Yen-Shin Lai, Zih-Jie Su, Ye-Then Chang, *National Taipei U. of Tech., Taiwan; Delta Electronics CO. Ltd., Taiwan*

**11:50 am** ▪ **Boundary Control for Isolated Topologies: The Natural Switching Surface for Full-Bridge ZVS**

Germán G. Oggier, Martin Ordóñez, *Simon Fraser University, Canada*

#### S100 DTC in Drives

Room: 305B

Chairs: Maurizio Cirrincione, Jagadeesh Tangudu

**10:00 am** ▪ **An Emotional Learning Intelligent Direct Torque and Flux Controller Design for Induction Motor Drives**

Saeed Jafarzadeh, M. Sami Fadali, Cristian Lascu, *University of Nevada Reno, United States; University Politehnica of Timisoara, Romania*

**10:25 am** ▪ **Wide-Speed Direct Torque and Flux Control of Torque-Controlled IPMSM Drives**

SeHwan Kim, Jul-Ki Seok, *YeungNam University, Korea, Republic of*

**10:50 am** ▪ **Dynamic Loss Minimization using Improved Deadbeat-Direct Torque and Flux Control for Interior Permanent Magnet Synchronous Machines**  
 Wei Xu, Robert D. Lorenz, *WEMPEC, University of Wisconsin Madison, United States*

**11:15 am** ▪ **Performance Evaluation of Interior Permanent Magnet Synchronous Machines using Deadbeat-Direct Torque Flux Control in an Indirect Matrix Converter with a Reactor Free Boost Converter**  
 Goh Teck Chiang, Jun-ichi Itoh, Jae Suk Lee, Robert D. Lorenz, *Nagaoka University of Technology, Japan; University of Wisconsin Madison, United States*

#### S101 PM Machine Diagnostics

Room: 305A

Chairs: Zhi Gao, Sang Bin Lee

**10:00 am** ▪ **Detection of Partially Fallen-Out Magnetic Slot Wedges in Inverter Fed AC Machines Under Various Load Conditions**

Goran Stojicic, Mario Vasak, Nedjeljko Peric, Gojko Joksimovic, Thomas M. Wolbank, *Vienna University of Technology, Austria; University of Zagreb, Croatia; University of Montenegro, Yugoslavia*

**10:25 am** ▪ **Investigation of the Rotor Demagnetization Characteristics of Interior PM Synchronous Machines during Fault Conditions**

James D. McFarland, T.M. Jahns, *University of Wisconsin - Madison, United States*

**10:50 am** ▪ **Load Torque Signature Analysis: An Alternative to MCSA to Detect Faults in Motor Driven Loads**

Marcelo Martins Stopa, Braz de Jesus Cardoso Filho, *Centro Federal de Educaçao Tecnologica de Minas, Brazil; Universidade Federal de Minas Gerais, Brazil*

#### S102 Power Quality in Smart Grid

Room: 304

Chairs: Massimo Bongiorno, Wenzhong Gao

**10:00 am** ▪ **Improving the Voltage Quality of an Inverter via By-Passing the Harmonic Current Components**

Qing-Chang Zhong, Frede Blaabjerg, Josep M. Guerrero, Tomas Hornik, *The University of Sheffield, United Kingdom; Aalborg University, Denmark; Turbo Power Systems, United Kingdom*

**10:25 am** ▪ **A 12-Pulse Diode Rectifier with Energy Storage Integration and High Power Quality on both AC and DC side**

Sanzhong Bai, Srdjan Lukic, *North Carolina State University, United States*

**10:50 am** ▪ **Elimination of Zero-Crossing Distortion in a Power Factor Correction Circuit**

Darren Paschedag, Mehdi Ferdowsi, *Missouri University of Science and Technology, United States*

#### S103 Power Flow Control

Room: 303

Chairs: Subhashish Bhattacharya, Mo-Yuen Chow

**10:00 am** ▪ **Power Flow Controller for Meshed Systems with a Fractionally Rated BTB Converter**

Rajendra P. Kandula, Amrit Iyer, Rohit Moghe, Jorge E. Hernandez, Deepak Divan, *Georgia Institute of Technology, United States*

**10:25 am** ▪ **Hybrid Distribution Transformer: Concept Development and Field Demonstration**

Sandeep Bala, Debrup Das, Eddy Aeloiza, Arindam Maitra, Satish Rajagopalan, ABB Corporate Research, *United States; Electric Power Research Institute, United States*

**10:50 am** ▪ **Flexible Distribution of Energy and Storage Resources**

Mahesh S. Illindala, *Ohio State University, United States*

**11:15 am** ▪ **Review of Solid State Transformer in the Distribution System: From Components to Field Application**

Xu She, Rolando Burgos, Gangyao Wang, Fei Wang, Alex Q. Huang, *North Carolina State University, United States; ABB Corporate Research, United States*

#### S104 Operational Issues of Power Converters

Room: 302C

Chairs: Fang Z Peng, Rajib Datta

**10:00 am** ▪ **Auto Tuning of Digital Deadbeat Controllers for High Performance AC Voltage Sources using Wide Bandwidth Impedance Identification**  
 Daniel Martin, Enrico Santi, *University of South Carolina, United States*

**10:25 am** ▪ **Mitigation of Inrush Current in Dynamic Voltage Restorer Injection Transformers**

Shan Gao, Xinchun Lin, Yong Kang, Yuping Duan, Jun Qiu, *Huazhong University of Science and Technology, China; Wuhan Iron and Steel Group Corp., China*

**10:50 am** ▪ **Equipment Sensitivity Evaluation to Voltage Sags using Maximum Hybrid Entropy Interval Probability**

Hao Li, Ying Wang, Xianyong Xiao, Wei Xu, *Sichuan University, China; RMIT University, Australia*

**11:15 am** ▪ **Capacitor Voltage Regulation and Pre-Charge Routine for a Flying Capacitor Active Rectifier**

Hossein Sepahvand, Mostafa Khazraei, Mehdi Ferdowsi, Keith A. Corzine, *Missouri University of Science and Technology, United States*

#### S105 Solar Energy – PV System Control

Room: 302B

Chairs: M Khambadkone Ashwin, Masahito Shoyama

**10:00 am** ▪ **Increasing Energy-Efficiency in Solar Radiation Trackers for Photovoltaic Arrays**

Gamal M. Dousoky, Abou-Hashema M. El-Sayed, Masahito Shoyama, *Minia University, Egypt; Kyushu University, Japan*

**10:25 am** ▪ **Power Flow Control and Optimization of a Three-Port Converter for Photovoltaic-Storage Hybrid System**

Wen Cai, Bangyin Liu, Shanxu Duan, Ling Jiang, *Huazhong University of Science and Technology, China*



**10:50 am ▪ Design and Evaluation of a Modular Resonant Switched Capacitors Equalizer for PV Panels**

*Shmuel Ben-Yaakov, Alon Blumenfeld, Alon Cervera, Michael Evzelman, Ben-Gurion University of the Negev, Israel*

**11:15 am ▪ Parallel Power Processing Topology for Solar PV Applications**

*M. Badawi, A.S. Yilmaz, Y. Sozer, I. Husain, University of Akron, United States; North Carolina State University, United States*

**S106 Power Converters in Transportation II**

*Room: 302A*

*Chairs: Michael Harke, Fernando Briz*

**10:00 am ▪ A Hybrid Switch based Soft-Switching Inverter for Ultrahigh Efficiency Traction Motor Drives**

*Jih-Sheng Lai, Wensong Yu, Pengwei Sun, Scott Leslie, Beat Arnet, Chris Smith, Art Cogan, Virginia Tech, United States; Powerex, United States; Azure Dynamics, United States*

**10:25 am ▪ Design and Performance of Electrical Propulsion System of Extended Range Electric Vehicle (EREV) Chevrolet Volt**

*Khwaja Rahman, Sinisa Jurkovic, Constantin Stancu, John Morgante, Peter Savagian, General Motors, United States; General Motors, United States*

**10:50 am ▪ Development of the 120kW Bidirectional DC DC Converter for the Green Bus**

*Youjun Choi, Heeseok Moon, Youngwook Son, Korea Automotive Technology Institute Vehicle IT, Korea, Republic of*

**11:15 am ▪ Using the Traction Drive as the Sensor to Evaluate and Track Deterioration in Electrified Vehicle Gearboxes**

*Christopher M. Wolf, Kyle M. Hanson, Robert D. Lorenz, M. Anibal Valenzuela, Ford Motor Company, United States; University of Wisconsin-Madison, United States; University of Concepcion, Chile*

**S107 Multilevel Converters V: Design**

*Room: 301B*

*Chairs: Tiefu Zhao, Luca Zarri*

**10:00 am ▪ Submodule Capacitor Dimensioning for Modular Multilevel Converters**

*Hans Bärnklaue, Albrecht Gensior, Steffen Bernet, Dresden University of Technology, Germany*

**10:25 am ▪ A Novel Start-Up Scheme for Modular Multilevel Converter**

*Keyan Shi, Feifei Shen, Dong Lv, Ping Lin, Min Chen, DeHong Xu, Zhejiang University, China*

**10:50 am ▪ Detection Method of an Open-Switch Fault and Fault-Tolerant Strategy for a Grid-Connected T-Type Three-Level Inverter System**

*Ui-Min Choi, Kyo-Beum Lee, Ajou University, Korea (South)*

**11:15 am ▪ Experimental Verification of a Modular Multilevel Cascade Inverter based on Double-Star Bridge-Cells (MMCI-DSBC)**

*Nuntawat Thitichaiworakorn, Makoto Hagiwara, Hirofumi Akagi, Tokyo Institute of Technology, Japan; Tokyo Institute of Technology, Japan*



Thursday, September 20th, 1:40 pm - 3:20 pm

**S108 Single Phase PFC Energy Storage**

*Room: 301A*

*Chairs: Tony O'Gorman, Bill Peterson*

**1:40 pm ▪ A Class-E Zero-Voltage-Switching Rectifier using Common-Grounded Multi-Step Controlled-Shunt Capacitor**

Yohei Kamito, Kazuaki Fukui, Hirotaka Koizumi, Tokyo University of Science, Japan

**2:05 pm** ■ **Enhanced Bipolar Stacked Switched Capacitor Energy Buffers**  
 Khurram K. Afridi, Minjie Chen, David J. Perreault, Massachusetts Institute of Technology, United States

**2:30 pm** ■ **An Electrolytic Capacitor-Less and Single-Stage Controlled Three-Phase Isolated Battery Charger with Wide-Range Output Voltage for EV Applications**

Ming-Shi Huang, Yao-Zhu Hsieh, Po-Yi Yeh, Chien yang Li, National Taipei University of Technology, Taiwan; Chyng Hong Electronic Co. Ltd., Taiwan

**2:55 pm** ■ **A Novel Single-Phase Buck PFC AC-DC Converter using an Active Buffer**  
 Yoshiya Ohnuma, Jun-ichi Itoh, Nagaoka University of Technology, Japan

### S109 LED Lighting Technologies

Room: 306C

Chairs: Henry Chung, Praveen Jain

**1:40 pm** ■ **A Direct AC LED Driver with High Power Factor without the use of Passive Components**

Rohan Dayal, Kumar Modepalli, Leila Parsa, Rensselaer Polytechnic Institute, United States

**2:05 pm** ■ **Contactless Electronic Ballast for High Brightness LED Lamps with Positionally Dimmed Method**

Xiaohui Qu, Siu-Chung Wong, Chi K. Tse, Southeast University, China; Hong Kong Polytechnic University, Hong Kong

**2:30 pm** ■ **Modeling of Junction Temperature and Forward Voltage of LED Devices with Externally Measurable Variables**

Xuehui Tao, Huanting Chen, S.Y. Hui, City University of Hong Kong, Hong Kong; University of Hong Kong, Hong Kong

**2:55 pm** ■ **Failsafe Smart LED Module with Thermal Management, String Current Balancing and Commutation for Lifetime Extension**

Shuze Zhao, Ke Cao, Saleh Firwana, Anton Swaris, Ronald Content, Olivier Tréscases, University of Toronto, Canada; GO Lighting Technologies Inc., Canada

### S110 Power Modules and Packaging II

Room: 306B

Chairs: Craig Winterhalter

**1:40 pm** ■ **Integrated Half-Bridge Switch using 70µm Thin Devices and Hollow Interconnects**

Adane Kassa Solomon, Jianfeng Li, Alberto Castellazzi, Mark Johnson, Power Electronics, Machines and Control Group, U, United Kingdom

**2:05 pm** ■ **A Nano-Composite Polyamide Imide Passivation for 10 kW Power Electronics Modules**

Jinchang Zhou, Simon Ang, Alan Mantooh, Juan C. Balda, University of Arkansas, United States

**2:30 pm** ■ **High Frequency High Power Density 3D Integrated Gallium Nitride based Point of Load Module**

Shu Ji, David Reusch, Fred C. Lee, CPES, Virginia Tech, United States

**2:55 pm** ■ **Electro-Thermal Simulation and Design of a 60 A, 4.5 kV Half-Bridge Si IGBT/SiC JBS Hybrid Power Module**

Tam H. Duong, Allen R. Hefner, Karl D. Hobart, National Institute of Standards and Technology, United States; Naval Research Laboratory, United States

### S111 Circuit Modeling and Simulation: DC-DC Converters

Room: 306A

Chairs: Oscar Garcia, Yehui Han

**1:40 pm** ■ **Validation of Generalized Continuous Equivalent Model on a DC/DC Ladder Multilevel Converter**

Andres Lopez, Diego Patino, Rafael Diez, Pontificia Universidad Javeriana, Colombia

**2:05 pm** ■ **Hybrid Behavioral-Analytical Loss Model for a High Frequency and Low Load DC-DC Buck Converter**

D. Díaz, M. Vasi, O. García, J.A. Oliver, P. Alou, J.A. Cobos, Universidad Politecnica de Madrid, Spain

**2:30 pm** ■ **Common-Mode and Differential-Mode Loop Gains of Paralleled Buck Converters**

Ming Li, Chi Kong Tse, United Technologies Research Center, United States; Hong Kong Polytechnic University, Hong Kong

**2:55 pm** ■ **Control Strategy to Achieve Minimum/Zero Input Current Ripple for the Interleaved Boost Converter in Photovoltaics/Fuel Cell Power Conditioning System**

Saijun Zhang, Xiaoyan Yu, Power Electronics Group, United States

### S112 Reluctance Drives

Room: 305B

Chairs: Luigi Alberti, Bulent Sarlioglu

**1:40 pm** ■ **Maximum Torque per Ampere Control of Switched Reluctance Machines**  
 Wei Wang, Babak Fahimi, University of Texas-Dallas, United States

**2:05 pm** ■ **Torque Control of a Switched Reluctance Motor by using Torque Estimation and Excitation Angle Control**

Noriya Nakao, Kan Akatsu, Shibaura Institute of Technology, Japan

**2:30 pm** ■ **Switched Reluctance Generator Control for Optimal Power Generation with Current Regulation**

Chandan Sikder, Iqbal Husain, Yilmaz Sozer, North Carolina State University, United States; University of Akron, United States

**2:55 pm** ■ **Design and Performance of Compensated Reluctance Synchronous Machine Drive with Extended Constant Power Speed Range**

Maarten J. Kamper, Wikus T. Villet, Stellenbosch University, South Africa

### S113 IPM Machines 2

Room: 305A

Chairs: Francesco Cupertino, Jagadeesh Tangudu

**1:40 pm** ■ **Structural Analysis of the Interior PM Rotor Considering Both Static and Fatigue Loading**

Massimo Barcaro, Giovanni Meneghetti, Nicola Bianchi, University of Padova, Italy

**2:05 pm** ■ **Rare Earth Reduction using a Novel Variable Magneto-motive Force, Flux Intensified IPM Machine**

Takashi Kato, Natee Limsuwan, ChenYen Yu, Kan Akatsu, Robert D. Lorenz, NISSAN MOTOR CO., LTD., Japan; WEMPEC, University of Wisconsin, United States; Shibaura Institute of Technology, Japan

**2:30 pm** ■ **Drive Motor Designs for Electric Motorcycles**

David G. Dorrell, Mircea Popescu, University of Technology Sydney, Australia; Moter Design Ltd, United Kingdom

**2:55 pm** ■ **Design of Saliency-Based Sensorless Drive IPM Motors for Hybrid Electric Vehicles**

Yoshiaki Kano, Takashi Kosaka, Nobuyuki Matsui, Tomoya Takahashi, Masami Fujitsuna, Toyota National College of Technology, Japan; Nagoya Institute of Technology, Japan; DENSO Corporation, Japan

### S114 Fault Detection and Fault Tolerant Schemes

Room: 304

Chairs: Jovan Bebic, Keith Corzine

**1:40 pm** ■ **Benchmarking of Grid Fault Modes in Single-Phase Grid-Connected Photovoltaic Systems**

Yongheng Yang, Frede Blaabjerg, Zhixiang Zou, Aalborg University, Denmark; Southeast University, China

**2:05 pm** ■ **A New Passive Islanding Detection Scheme for Distributed Generation Systems based on Wavelets**

*A.S. Aljankawey, Ning Liu, C.P. Diduch, L. Chang, University of New Brunswick, Canada; Hefei University of Technology, China*

**2:30 pm** ■ **Design of Virtual Inductance for Droop-Controlled Inverter with Seamless Transition between Islanded and Grid-Connected Operations**

*Shang-Hung Hu, Chun-Yi Kuo, Tzung-Lin Lee, National Sun Yat-sen University, Taiwan*

**2:55 pm** ■ **Fault Tolerant Control of Small Distributed Generation Systems**

*Alfio Consoli, Mario Cacciato, Giuseppe Scarcella, Giacomo Scelba, University of Catania, Italy*

**S115** **Circuit Modeling and Simulation: Losses and Converter Behavior**

*Room: 303*

*Chairs: Antonello Monti, Herb Ginn*

**1:40 pm** ■ **Optimization and Comparison of Two Three-Phase Inverter Topologies using Analytic Behavioural and Loss Models**

*Julia Pinne, Artjom Gruber, Klaus Rigbers, Eugen Sawadski, Tomasz Napierala, SMA Solar Technology AG, Germany*

**2:05 pm** ■ **General ZVS Half Bridge Model Regarding Nonlinear Capacitances and Application to LLC Design**

*Reinhold Elferich, Philips Research, Netherlands*

**2:30 pm** ■ **Impact of SiC Components on the EMC Behaviour of a Power Electronics Converter**

*Eliana Rondon, Florent Morel, Christian Vollaire, Jean-Luc Schanen, Laboratoire Ampere, Universite de Lyon, France; G2ELab, Grenoble INP/UJF, Grenoble, France*

**2:55 pm** ■ **A Fast and Precise Simulation Method for Performance Screening for High Power Converter Designs**

*Jie Shen, Stefan Schröder, Hanno Stagge, Rik W. De Doncker, GE Global Research Europe, Germany; E.ON ERC, RWTH Aachen University, Germany*

**S116** **DC Transmission and DC Circuit Breakers**

*Room: 302C*

*Chairs: Rajib Datta, Steffen Bernet*

**1:40 pm** ■ **A Surge-Less Solid-State DC Circuit Breaker for Voltage Source Converter based HVDC Transmission Systems**

*Kenichiro Sano, Masahiro Takasaki, Central Research Inst. of Electric Power Ind., Japan*

**2:05 pm** ■ **Effect of VSC-HVDC on Load Frequency Control in Multi-Area Power System**

*E. Rakhshani, A. Luna, K. Rouzbehi, P. Rodriguez, I. Etxeberria-Otadui, Technical University of Catalonia, Spain; IKERLAN-IK4 Technological Center, Spain*

**2:30 pm** ■ **A Modular Stacked DC Transmission and Distribution System for Long Distance Subsea Applications**

*J. Song-Manguelle, R. Datta, M. Harfman Todorovic, R. Gupta, D. Zhang, S. Chi, L. Garcés, R. Lai, GE Global Research, United States*

**2:55 pm** ■ **A 4 kV Silicon Carbide Solid-State Fault Current Limiter**

*Osama S. Saadeh, Erik D. Johnson, Mahmood S. Saadeh, Andres Escobar Mejia, Christopher Schirmer, Brian Rowden, Alan Mantooth, Juan Balda, Simon Ang, University of Arkansas, United States*

**S117** **Fuel Cells**

*Room: 302B*

*Chairs: Vassilios Agelidis, Hung-chi Chen*

**1:40 pm** ■ **Emulation of High Temperature PEM Fuel Cell Electrical Dynamics and Operational Phenomena**

*Chris de Beer, Paul Barendse, Azeem Khan, University of Cape Town, South Africa*

**2:05 pm** ■ **Waveform Control of Fuel-Cell Inverter Systems**

*Guo-Rong Zhu, Siew-Chong Tan, Ke-Wei Wang, Chi K. Tse, Wuhan University of Technology, China; University of Hong Kong, Hong Kong; City University of Hong Kong, Hong Kong; Hong Kong Polytechnic University, Hong Kong*

**2:30 pm** ■ **Fuel Cell Emulator based on Interleaved Synchronous Buck Converter**

*V. Sanchez, F. Chan, Juan M. Ramirez, Julio C. Rosas-Caro, Quintana Roo University, Mexico; CINVESTAV-Guadalajara, Mexico; Instituto Tecnológico de Ciudad Madero, Mexico*

**2:55 pm** ■ **Power Management of Photovoltaic and Fuel Cell Hybrid System for a Constant-Power-Demand DC Supply Bus using Complementary Energy Dispatch**

*Guan-Chyun Hsieh, Cheng-Wen Su, Hung-I Hsieh, Chung Yuan Christian University, Taiwan; National Chiayi University, Taiwan*

**S118** **Energy Storage II**

*Room: 302A*

*Chairs: Chris Mi, Avoki Omekanda*

**1:40 pm** ■ **Modeling and Analysis of Battery Hysteresis Effects**

*Habiballah Rahimi Eichi, Mo-Yuen Chow, North Carolina State University, United States*

**2:05 pm** ■ **Comprehensive Design of an Isolated AC-DC Converter to Emulate On-Road Current of Electrical Scooter for Testing Lithium Battery**

*Ming-Shi Huang, Yu-Chan Chang, Po-Yi Yeh, Chien-Chuan Lu, National Taipei University of Technology, Taiwan*

**2:30 pm** ■ **On-Line Optimal Ion Conductivity Control of Li-Ion Battery**

*Yong-Duk Lee, Sung-Yeul Park, Soo-Bin Han, University of Connecticut, United States; Korea Institute of Energy Research (KIER), Korea (South); University of connecticut, United States*

**2:55 pm** ■ **Real-Time SOC and SOH Estimation for EV Li-Ion Cell using Online Parameters Identification**

*Akram Eddahech, Olivier Briat, Jean-Michel Vinassa, Univ. Bordeaux, IMS, UMR 5218, F-33400 Talence, France*

**S119** **Multilevel Converters VI: Performance Improvement**

*Room: 301B*

*Chairs: Pierluigi Tenca, Maryam Saeedifard*

**1:40 pm** ■ **A Novel Inner Current Suppressing Method for Modular Multilevel Converters**

*Zixin Li, Ping Wang, Zunfang Chu, Haibin Zhu, Yongjie Luo, Yaohua Li, Chinese Academy of Sciences, China*

**2:05 pm** ■ **A Novel Method to Improve Output Voltage Quality of Grid-Connected Cascaded H-Bridge Multilevel Converter with Phase-Shifted PWM and Serial Bus Communication**

*Seong-Yong Lee, Myung-Ho Woo, Jong-Kyu Kim, Seung-Pyo Ryu, Hyundai Heavy Industries Co., Ltd., Korea, Republic of*

**2:30 pm** ■ **Fault Detection and Tolerant Control of 3-Phase NPC Active Rectifier**

*Hyun-Keun Ku, Won-Sang Im, Jang-Mok Kim, Yong-Sug Suh, Pusan National University, Korea (South); Chonbuk National University, Korea (South)*

**2:55 pm** ■ **Eliminating Common Mode Winding Voltages for a 3-Limb Coupled Inductor used in 3/5-Level PWM Voltage Source Inverters**

*John Salmon, Jeff Ewanchuk, Reaz Ul Haque, University of Alberta, Canada*





Thursday, September 20th, 3:40 pm - 5:20 pm

**S120 General Inverter Technologies**

Room: 301A

Chairs: Stefano Bifaretti, Tiefu Zhao

**3:40 pm ▪ A High Efficiency Two-Phase Interleaved Inverter for Wide Range Output Waveform Generation**

Rixin Lai, Lei Wang, Juan Sabate, GE Global Research, United States

**4:05 pm ▪ Compound Synchronous Reference Frame PLL and Unbalance Control Strategy for Power Conditioning System in Weak Grids**

Baoqi Liu, Shanxu Duan, Bangyin Liu, Changsong Chen, Xiaolong Jiang, Huazhong University of Science and Technology, China

**4:30 pm ▪ Magnetically Coupled Impedance-Source Inverters**

Poh Chiang Loh, Frede Blaabjerg, Nanyang Technological University, Singapore; Aalborg University, Denmark

**4:55 pm ▪ A Novel Digital-Controlled Single-Phase Transformer-Based Inverter for Non-Linear Load Applications**

Ming-Shi Huang, Po-Yi Yeh, Yu-Ting Yeh, Meng-Gu Huang, National Taipei University of Technology, Taiwan

**S121 AC-DC Power Converters**

Room: 306C

Chairs: Rolando Burgos, Yasuyuki Nishida

**3:40 pm ▪ Power Density and Efficiency of System Compatible, Sine-Wave Input/Output Drives**

Robert Cuzner, Daniel Drews, Giri Venkataramanan, DRS Power and Control Technologies, United States; University of Wisconsin-Madison, United States

**4:05 pm ▪ An Improved Control Scheme for Buck PFC Converter for High Efficiency Adapter Application**

Hulong Zeng, Junming Zhang, ZheJiang University, China; Zhejiang University, China

**4:30 pm ▪ Novel Random Switching PWM with Constant Sampling Frequency and Constant Inductor Average Current for Digital-Controlled Power Factor Corrector**

Yen-Shin Lai, Kung-Min Ho, National Taipei University of Technology, Taiwan

**4:55 pm ▪ Integrated Low-Voltage Converter Architecture with AC Power Delivery**

Wei Li, Nathaniel Salazar, David J. Perreault, MIT, United States

**S122 Passive Components for High Frequency Power Conversion**

Room: 306B

Chair: Robert Pilawa

**3:40 pm ▪ A DC Bus Capacitor Design Method for Various Inverter Applications**

Ahmet M. Hava, Ufuk Ayhan, Vahap Volkan Aban, Middle East Technical University, Turkey; Meteksan Defense Industry Inc., Turkey

**4:05 pm ▪ Integration of Both EMI Filter and Boost Inductor for 1 kW PFC Converter**

Cheng Deng, Zhiwei Wen, Changsheng Hu, DeHong Xu, Zhejiang University, China

**4:30 pm ▪ Planar, Double-Layer Magnetic Inductors for Low Power, High Frequency DC-DC Converters**

Elias Haddad, Christian Martin, Charles Joubert, Bruno Allard, Cyril Buttay, Lyon 1 University, France; Insa Lyon, France

**4:55 pm ▪ EMI Filter Design Considering In-Circuit Impedance Mismatching**  
Fang Luo, Dushan Boroyevich, Paolo Mattavelli, Hemant Bishnoi, Cpes, virginia tech, United States**S123 Circuit Modeling and Simulation: Grid Connected Converters**

Room: 306A

Chairs: Osar Garcia, Antonello Monti

**3:40 pm ▪ Comparison of Latch-Based and Switch -Based, Sampled-Data, Three-Phase, PWM, Voltage-Source Inverter Models for Dynamic Analysis**

Jun Kikuchi, Chris Wolf, Michael Degner, Ford Motor Company, United States

**4:05 pm ▪ Dynamic Model of the Three-Phase Single-Stage Boost Inverter for Grid-Connected Applications**

Ali K. Kaviani, Behrooz Mirafzal, Florida International University, United States; Kansas State University, United States

**4:30 pm ▪ Grid Connected VSI with LCL Filter – Models and Comparison**

Bjarte Hoff, Waldemar Sulkowski, Narvik University College, Norway

**4:55 pm ▪ The Time-Domain Analysis for Constant On-Time Critical Mode Boost-Type PFC Converters**

Yang-Lin Chen, Yaow-Ming Chen, Cheng-Nan Wu, National Taiwan University, Department of Electrical Engineering, Taiwan

**S124 High Speed Machines**

Room: 305A

Chairs: Radu Bojoi, Chris Gerada

**3:40 pm ▪ Design, Modelling and Testing of a High Speed Induction Machine Drive**

David Gerada, Abdeslam Mebarki, Neil L. Brown, He Zhang, Chris Gerada, Cummins Generator Technologies, United Kingdom; University of Nottingham, United Kingdom

**4:05 pm ▪ Optimal Traces Arrangement in Planar Magnetic based Slotless PMSM**

F. Cupertino, S. Ettore, Politecnico di Bari - DEE, Italy

**4:30 pm ▪ Novel Signal Injection Methods for High Speed Self-Sensing Electrical Drives**

A. Tüysüz, M. Schöni, J.W. Kolar, ETH Zurich, Switzerland

**S125 Converter Control under Abnormal Grid Conditions**

Room: 304

Chairs: Robert Delmerico, Fred Wang

**3:40 pm ▪ Control Strategies of Current-Source Inverters for Distributed Generation Under Unbalanced Grid Conditions**

Zheng Wang, Shouting Fan, Zhixiang Zou, Yunkai Huang, Ming Cheng, School of EE, Southeast University, China

**4:05 pm ▪ Decoupled Double Synchronous Reference Frame Current Controller for Unbalanced Grid Voltage Conditions**

Manuel Reyes, Pedro Rodríguez, Sergio Vázquez, Alvaro Luna, Juan Manuel Carrasco, Remus Teodorescu, University of Seville, Spain; Technical University of Catalonia, Spain; Aalborg University, Denmark

**4:30 pm ▪ Novel Harmonic and Phase Estimator for Grid-Connected Renewable Energy Systems**

Ali Elreyyah, Ali Safayet, Yilmaz Sozer, Iqbal Husain, Malik Elbuluk, University of Akron, United States; North Carolina State University, United States

**S126 Inverter Control Techniques**

Room: 303

Chairs: Tobias Geyer, Yongdong Li

**3:40 pm ▪ Hybrid Control of BCM Soft-Switching Three Phase Micro-Inverter**

Ahmadreza Amirahmadi, Haibing Hu, Anna Grishina, Frank Chen, John Shen, Issa Batarseh, University of Central Florida, United States

**4:05 pm ▪ Unified Space Vector PWM Control for Current Source Inverter**

Qin Lei, Bingsen Wang, Fang Z. Peng, Michigan State University, United States

**4:30 pm ▪ Control of High-Frequency-Link Inverter using Optimal Switching Sequence**

Alireza Tajfar, Sudip K. Mazumder, University of Illinois-Chicago, United States

**S127 New Applications and Topologies for FACTS**

Room: 302C

Chairs: Deepak Divan, Steffen Bernet

**3:40 pm ▪ A Novel D-FACTS Device: Magnetic Flux Controlled Distributed Active Inductor**

Ming Li, Yue Wang, Weiwei Gu, Yufei Li, Xi'an Jiaotong University, China

**4:05 pm ▪ Performance Comparison of Conventional STATCOM and STATCOM with Energy Storage in a Low Voltage Induction Motor Application**

Antti Virtanen, Heikki Tuusa, Tampere University of Technology, Finland

**4:30 pm ▪ Performance Evaluation of Two High Precision Distributed Series Compensator Control**

Ming Li, Yue Wang, Xiong Fang, Zhaoan Wang, Yufei Li, Xi'an Jiaotong University, China

**4:55 pm ▪ An Approach to Regulating Dual Series Static Compensator (DSSC)**

Nima Yousefpoor, Babak Parkhideh, Subhashish Bhattacharya, North Carolina State University, United States

**S128 Advanced Control Strategies**

Room: 302B

Chairs: Brendan McGrath, Brad Lehman

**3:40 pm ▪ A Grid Fundamental and Harmonic Components Detection Method for Single-Phase Systems**

Yi Fei Wang, Yun Wei Li, ATCO Electric, Canadian Utilities Ltd., Edmonton, Canada; University of Alberta, Edmonton, AB, Canada

**4:05 pm** ■ **Research on Fast Transient and  $6n\pm 1$  Harmonics Compensating Repetitive Control Scheme for Three-Phase Systems**

*Dong Chen, Junming Zhang, Zhaoming Qian, Zhejiang University, China*

**4:30 pm** ■ **Closed-Loop IGBT Gate Drive Featuring Highly Dynamic  $di/dt$  and  $dv/dt$  Control**

*Yanick Lobsiger, Johann W. Kolar, Power Electronic Systems Laboratory, ETH Zurich, Switzerland*

**S129** **Solar Energy – PV Power Tracking**

*Room: 302A*

*Chairs: Behrooz Mirafzal, Hung-chi Chen*

**3:40 pm** ■ **A Global Maximum Power Point Tracking Method for PV Module Integrated Converters**

*Sairaj V. Dhople, Roy Bell, Jonathan Ehlmann, Ali Davoudi, Patrick L. Chapman, Alejandro Domínguez-García, University of Illinois Urbana-Champaign, United States; SolarBridge Technologies, United States; University of Texas-Arlington, United States*

**4:05 pm** ■ **Global MPPT Method for Partially Shaded Photovoltaic Modules**

*Stefano Bifaretti, Vincenzo Iacovone, Lucio Cinà, Emilio Buffone, University of Rome Tor Vergata, Italy*

**4:30 pm** ■ **Sub-Module Integrated Distributed Maximum Power Point Tracking for Solar Photovoltaic Applications**

*Robert C.N. Pilawa-Podgurski, David J. Perreault, University of Illinois Urbana-Champaign, United States; Massachusetts Institute of Technology, United States*

**4:55 pm** ■ **Advanced MPPT Algorithm for PV Systems**

*Ignacio Candela, Alvaro Luna, Joan Rocabert, Raul Munoz-Aguilar, Pedro Rodriguez, Technical University of Catalonia, Spain*

**S130** **Multilevel Converter VII: Control**

*Room: 301B*

*Chairs: Bingsen Wang, Aexl Mertens*

**3:40 pm** ■ **Energy Storage and Circulating Currents in the Modular Multilevel Converter**

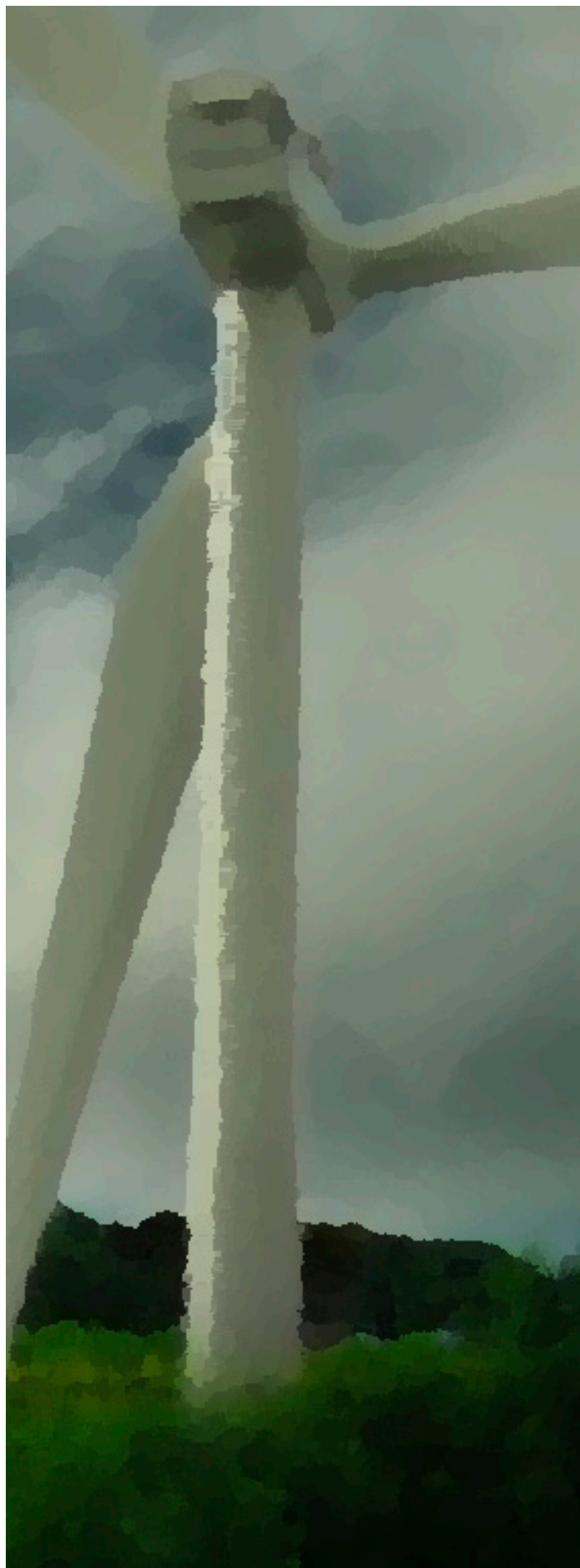
*Andrew The, Jan Böcker, Sibylle Dieckerhoff, Technical University of Berlin, Germany*

**4:05 pm** ■ **Three Phase Common-Mode Winding Voltage Elimination in a Three-Limb Five-Level Coupled Inductor Inverter**

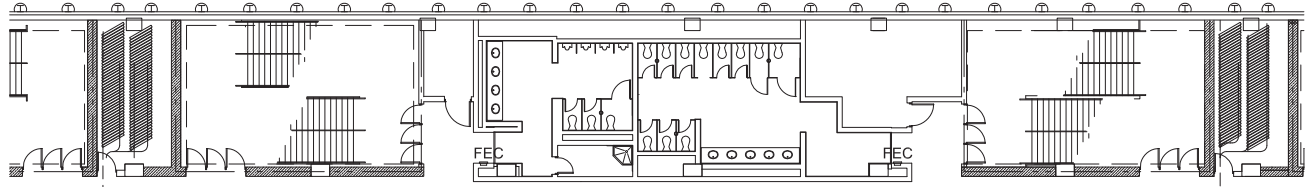
*Jeffrey Ewanchuk, Reaz Ul Haque, Andrew Knight, John Salmon, University of Alberta, Canada*

**4:30 pm** ■ **Neutral Point Potential Balancing using Synchronous Optimal Pulsewidth Modulation of Multilevel Inverters in Medium Voltage High Power AC Drives**

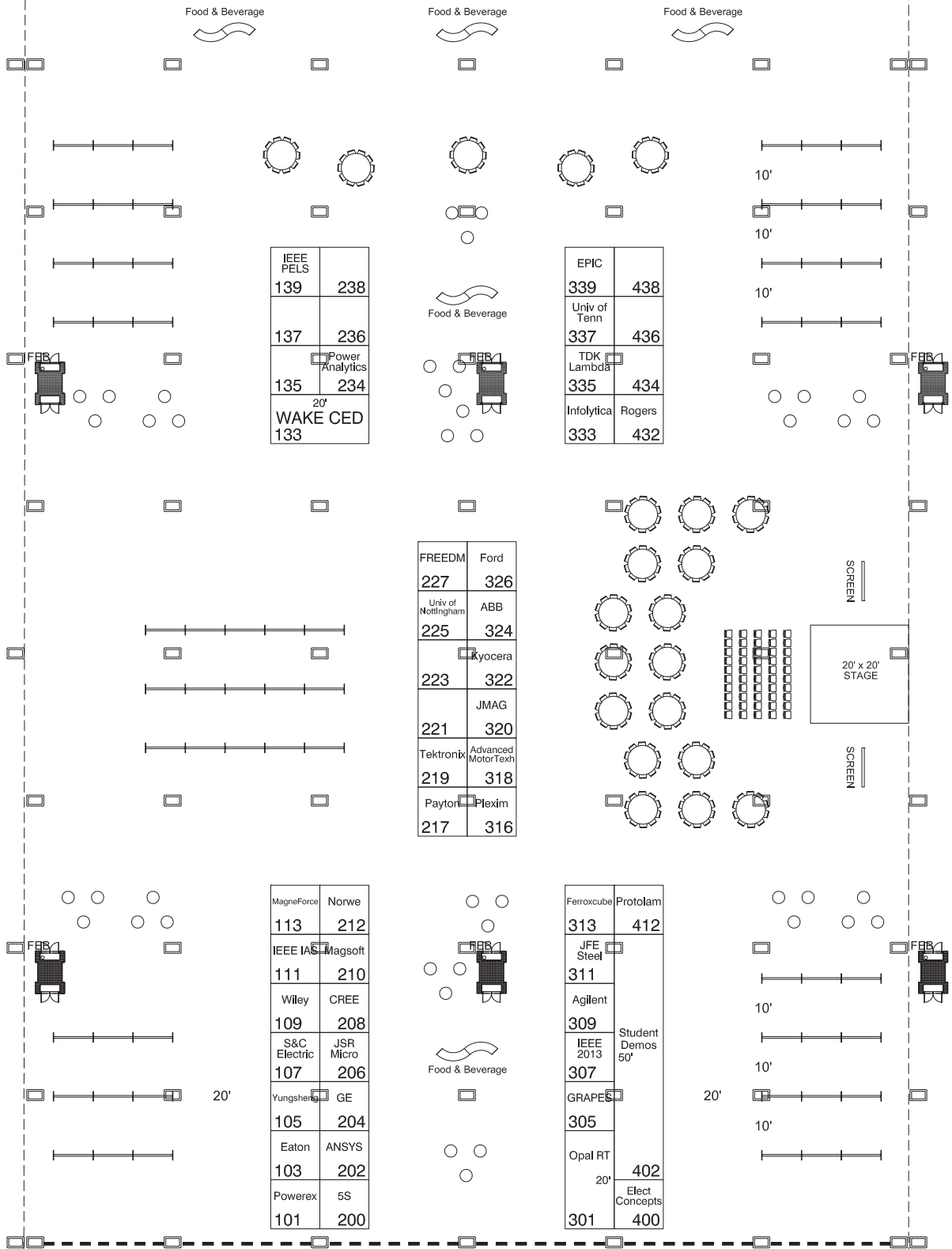
*Till Boller, Joachim Holtz, Akshay K. Rathore, University of Wuppertal, Germany; National University of Singapore, Singapore*







### HALL B



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Opal RT	402
20'	Elect Concepts
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**GRAPES**

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ECCE 2013 will celebrate the fifth edition of the Energy Conversion Congress and Exposition in Colorful Denver Colorado. ECCE has grown to become the foremost technical conference and exposition for people looking for energy conversion solutions: solutions that are timely, practical, customer focused, market sensitive, and cost effective. Be a part of the greatest annual assemblage of energy conversion professionals, consisting of both industry veterans and fresh startups. Be a part of the action, be present to network; establish and nurture relationships with your future customers while also renew and reinforce relationships with your present customers.

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The Industry Applications Society supports the advancement of the theory and practice of electrical and electronic engineering in the development, design, manufacture and application of electrical systems, apparatuses, devices and controls to the processes and equipment of industry and commerce; the promotion of safe, reliable and economical installations; industry leadership in energy conservation and environmental health and safety issues; the creation of voluntary engineering standards and recommended practices; and the professional development of its membership.

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CURENT is a NSF Engineering Research Center established at University of Tennessee in 2011 that is jointly supported by NSF and the DOE. The partner schools include RPI, Northeastern University and Tuskegee University. CURENT focusses on developing power systems and power electronics technologies for future transmission grids with high penetration of renewable energy sources.

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**Student Demonstrations**

Exhibit Hall B

In this event, 8 university student teams will demonstrate their hardware or video of hardware operations. The objective of this student demo program is to show the prototype built by the students to the industry participants and provide an opportunity for potential technology transfer from academic research to industry products.

The demos are listed below:

**Monday, September 17th, 2012****4:00 pm - 6:00 pm****GaN Based Power Supply**

Demonstrator: Thomas LaBella (student)

University: Virginia Tech, United States

Advisor: Dr. Jih-Sheng Lai, email: laijs@vt.edu

**An GaN/SiC based Isolated DC/DC Converter with Reduced Number of Switches and Voltage Stresses for Electric and Hybrid Electric Vehicles**

Demonstrator: Xuan Zhang (student)

University: Ohio State University, United States

Advisor: Dr. Jin Wang, email: wang@ece.osu.edu

**Ultra Fast Protection of Electric Distribution Systems**

Demonstrator: Mohammad Ali Rezaei (student)

University: North Carolina State University-FREEDM Systems Center, United States

Advisor: Dr. Alex Huang, email: aqhuang@ncsu.edu

**A PV Module Based on Cascaded Quasi-Z-Source Inverters (qZSI) using eGaN FETs**

Demonstrator: Yan Zhou (student)

University: Florida State University, United States

Faculty: Dr. Hui Li, email: hli@caps.fsu.edu

**Tuesday, September 18th, 2012****9:00 am - 6:00 pm****A Electric Scooter Drive System**

Demonstrator: Hyun-Keun Ku (student)

University: Pusan National University, Republic of Korea

Advisor: Dr. Jang-Mok Kim, email: jmok@pusan.ac.kr

**High Power Density Two-Stage Single-Phase Inverter or Aeronautic Application**

Demonstrator: Donghua Pan (student)

University: Huazhong University of Science and Technology, China

Advisor: Dr. Xinbo Ruan, email: ruanxb@mail.hust.edu.cn

**Remote Control of the Solid State Transformer**

Demonstrator: Gangyao Wang (student)

University: North Carolina State University-Raleigh, United States

Advisor: Dr. Alex Huang, email: aqhuang@ncsu.edu

**A Flux Focusing Ferrite Magnetic Gear**

Demonstrator: Krishna Kiran Uppalapati (student)

University: University of North Carolina at Charlotte, United States

Advisor: Dr. Jonathan Bird







# CALL FOR PAPERS

IEEE ENERGY CONVERSION CONGRESS & EXPO | DENVER, COLORADO, USA | SEPTEMBER 15-19, 2013

The Fifth Annual IEEE Energy Conversion Congress and Exposition (ECCE 2013) will be held in Denver, Colorado, on September 15-19, 2013. ECCE 2013 is the premiere international conference and exposition event you can't afford to miss. To be held in the Mile High City of Denver, ECCE 2013 will feature both industry-driven and application-oriented technical sessions, as well as industry expositions and seminars. ECCE 2013 will bring together practicing engineers, researchers and other professionals for interactive discussions on the latest advances in various areas related to energy conversion.

Technical papers are solicited on any subject pertaining to the scope of the conference that includes, but is not limited to, the following major topics:

## Energy Conversion Systems

- Renewable and alternative energy systems - solar, wind, wave, energy harvesting, and energy storage
- Smart grid and utility applications - renewable energy integration, distributed resources and micro-grids, HVDC, FACTS, V2G-G2V, and electronic transformers
- Energy efficiency and industrial applications - lighting, smart appliances, high efficiency motor drives, smart buildings, consumer electronics and others
- Computer and telecommunication applications - power supplies, UPS, energy storage, energy harvesting and system architectures
- Transportation applications - electric and hybrid vehicles, infrastructure, traction, marine and aerospace
- Power conversion systems stability and power quality

## Components and Subsystems for Energy Conversion

- Electric machines and actuators
- Electric motor drives
- Power converters
- Power semiconductor devices and packaging
- Magnetic materials and other passive components
- Converter-level packaging and integration
- Converter and components modeling, control and EMI, focused on circuits, advanced controls, measurement and sensing, reliability and thermal modeling
- Reliability, diagnostics and prognostics

**Paper Submission Guideline:** Prospective authors are requested to submit a digest no longer than five (5) pages, single column, single spaced, summarizing the proposed paper. The digest should include key equations, figures, tables and references as appropriate, but no author names or affiliations. The digests must clearly state the objectives

of the work, its significance in advancing engineering or science, and the methods and specific results in sufficient detail. The digests will be reviewed using a double-blind peer review process to ensure confidentiality and fair review. Refer to the conference web page for a detailed list of technical topics and the digest submission method.

### Important Dates

#### January 15, 2013

Digest of proposed papers due (to be submitted via ECCE 2013 website)

#### May 1, 2013

Notification to authors of acceptance/rejection of papers

#### July 1, 2013

Final papers with IEEE copyright forms due

Denver is the capital of Colorado and the vibrant center of the mountain west region. Nestled in the foothills of the Rocky Mountain West, Denver enjoys over 300 days of sunshine per year and is surrounded by the breathtaking vistas of the mountains and beyond. Over the years Denver has become the strategic center of renewable energy world. Major universities, research centers, and numerous renewable energy companies settle in the Rocky Mountain area because of the high energy, high achieving spirit of the American West. The conference will be held in the state of the art Colorado Convention Center, a premier sustainable green meeting facility. The center received LEED Existing Building: Operation and Maintenance, one of the largest convention centers in the country to have achieved this certification.

For more information, please visit <http://www.ecce2013.org> or contact the ECCE 2013 Technical Program Chairs at [ecce2013tpc@gmail.com](mailto:ecce2013tpc@gmail.com). For exhibiting at ECCE 2013, please contact conference Exhibition Chair at [mohammad.islam@nexteer.com](mailto:mohammad.islam@nexteer.com). For more about Denver and its surrounding areas, please visit <http://www.denver.org>.

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