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IEEE ENERGY CONVERSION CONGRESS & EXPOSITION®

ECCE 2011

PROGRAM

Energy Conversion Innovation for a Clean Energy Future

SEPTEMBER 17-22, 2011 • HYATT REGENCY PHOENIX & PHOENIX CONVENTION CENTER • PHOENIX, ARIZONA

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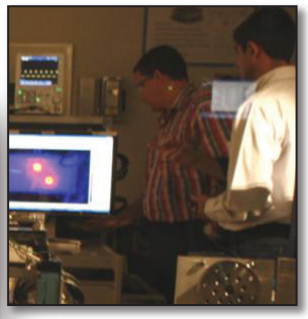


UTRC

United Technologies Research Center

United Technologies Research Center (UTRC) develops the world's most advanced technologies and processes to help ensure the products delivered to market by the UTC businesses are the best available.

The challenges undertaken at UTRC require the best minds working together to generate ideas, test theories, challenge assumptions and ultimately deliver solutions.

UTRC has approximately 500 employees and more than 96% of our technical staff hold advanced degrees.

Founded in 1929, UTRC is located in East Hartford, Connecticut (U.S.), and also operates research and development centers in Berkeley, California, Shanghai, China, and Cork, Ireland.

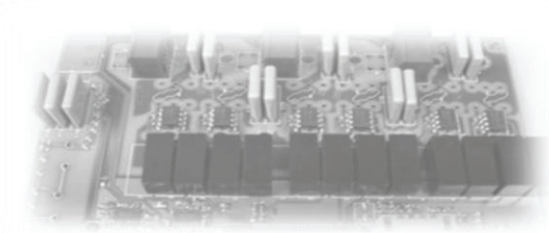
The **Systems Department at UTRC** develops innovative technology solutions and concepts in the area of complex adaptive systems to provide growth and competitive advantage to UTC's businesses.

We focus on solving problems related to designing, controlling and managing systems that are characterized by complex interactions between a large number of independent and heterogeneous components (and sub-systems).

The Department's core strengths and expertise are articulated along the following disciplines:

- Systems Dynamics & Optimization
- Controls Systems
- Power Electronics Systems
- Embedded Systems & Networks
- Decision Support & Machine Intelligence

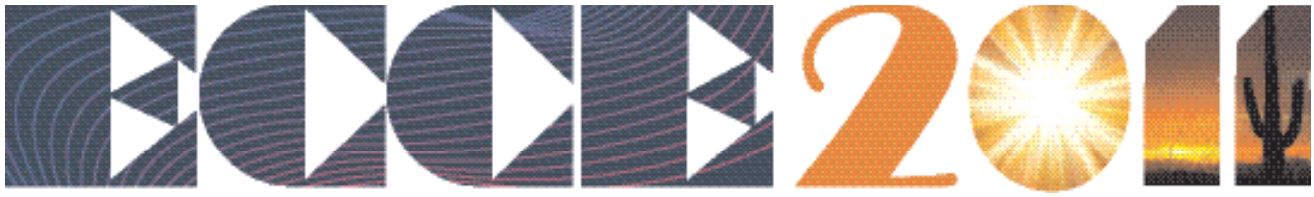
Clipper Wind Turbines



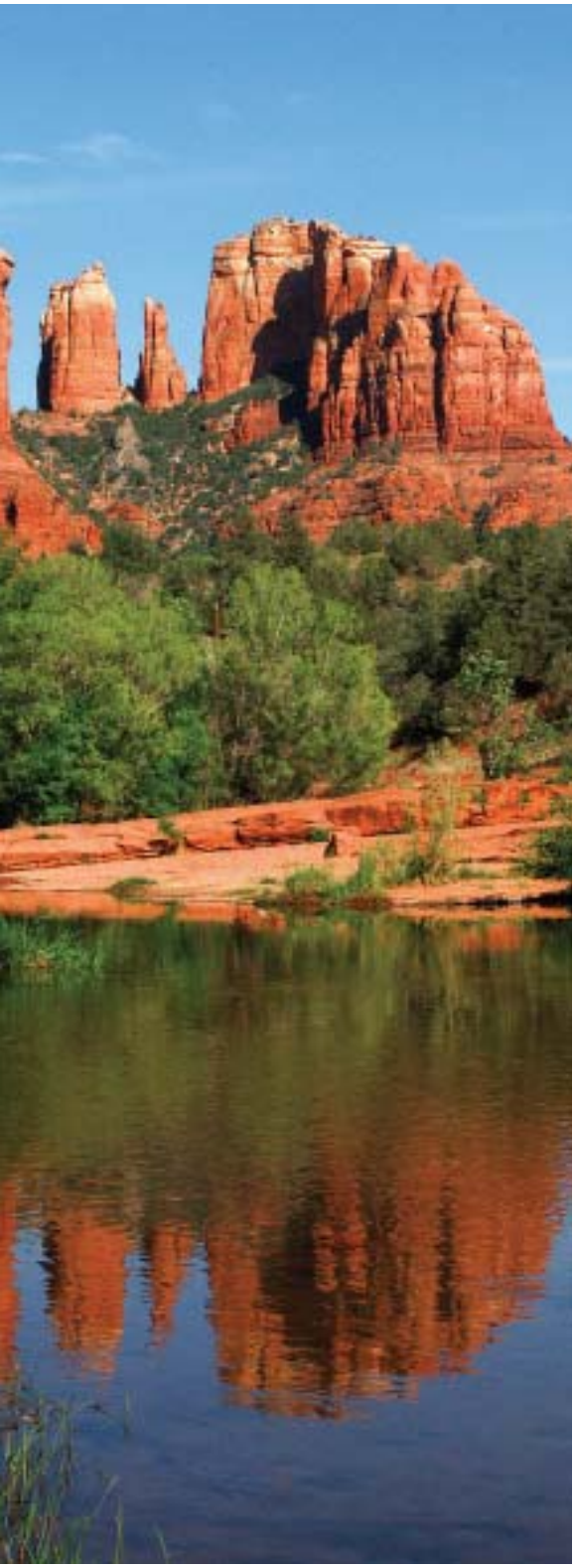
High Frequency Inverter

The **Power Electronics Systems group** conducts research in the fields of heterogeneous components in power electronics, motors and drives and intelligent energy management of distributed and decentralized systems and its application to micro grid and smart grid.

Core activities are: high density converters, converter topologies, high temperature and high frequency devices, local and global control of electric systems, and high fidelity modeling and control.



Welcome Letter



It gives us great pleasure to be able to welcome you to Phoenix for the 3rd Annual IEEE Energy Conversion Congress & Exposition®. This conference is the merging of the PELS Power Electronics Specialist Conference and the Industrial Power Conversion Systems Department sessions of the IAS Annual Meetings. ECCE 2011 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 2011 is replete with distinguished plenary speakers, tutorials given by experts from industry and academia, panels of experts in rap session, and ample opportunity to network and make new acquaintances in the energy conversion field. The approximately 600 high-quality technical papers to be presented in oral and poster sessions will take you into the practical and theoretical underpinnings of all aspects of energy conversion technology.

We hope you will take away a deeper appreciation for emerging systems and applications having electric power processing at their core, efficiency and sustainability as their goal, and mandate to tackle energy sustainability head-on through conservation, overall carbon emissions reductions, and with environmental and policy changes to anchor to. 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. It won't be all work and no play at ECCE 2011 ☺.

We would also like to welcome everyone to America's sunniest metropolis, Phoenix, Arizona. Phoenix is the gateway to the Grand Canyon, and its history is a testament to the spirit of puebloans, ranchers, miners and visionaries. High tech, aerospace and service industries make up the major portion of the economic base of Phoenix. Phoenix is recognized as a preferred location for high-tech institutes. Projected against the rich backdrop is a panorama of urban sophistication: resorts and spas that drop jaws, stadiums and arenas worthy of the world's biggest sports spectacles, restaurants with inspired cuisine, and golf courses that beckon players the year round. We hope you enjoy your time here in Phoenix.

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 Opal-RT Technologies Inc., General Atomics Electromagnetics, Power-One, United Technologies Research, GE Global Research and Nexteer Automotive for their support of ECCE 2011. We hope that you enjoy this important technical meeting in a most timely and exciting field!

John M. Miller
2011 General Chair

Uday Deshpande
2011 Co-General Chair

ECCE 2011 would like to express our gratitude for the generous support received from the following:

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AC-AC Converters

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Rafal Wrobel, University of Bristol, UK

Electric Drives

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Yen-Shin Lai (Vice Chair), National Taipei Institute of Technology, Taiwan
Timothy Alt, Rolls Royce, USA
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Tony O'Gorman, PESC Inc., USA
Guiseppe Scarcella, University of Catania, Italy
Jul-Ki Seok, YeungNam University, Republic of Korea
Gui-Jia Su, Oak Ridge National Laboratories, USA

Components, Materials, Packaging, and Other Enabling Technologies

Alex Huang (Vice Chair), North Carolina State University, USA
Jian Sun (Vice Chair), Rensselaer Polytechnic Institute, USA
J. Braham Ferreira, Delft University of Technology, Netherlands
Jean-Luc Schanen, G2E Lab, France
Adam Skorek, University of Quebec, Canada
Charlie Sullivan, Dartmouth College, USA

Other Energy Conversion Related Topics

Subhashish Bhattacharya (Vice Chair), North Carolina State University, USA
Avoki Omekanda (Vice Chair), General Motors, USA
Jian Sun (Vice Chair), Rensselaer Polytechnic Institute, USA

SATURDAY, SEPTEMBER 17, 2011

3:00 pm – 5:00 pm	**Registration Open**	*Atrium Lobby*

SUNDAY, SEPTEMBER 18, 2011

7:00 am – 7:00 pm	**Registration Open**	*Atrium Lobby*

Tutorials Group 1 • 8:30 am – 12:00 pm

Russell	Ellis West	Cowboy Artists	Ellis East	Cassidy	Curtis
T1-1 Practical Aspects in Modern Design Process of Electric Motors	T1-2 Understanding of Electrical Concepts in Wind Turbines and Photovoltaic Arrays	T1-3 Carrier Based PWM Methods For AC-DC-AC and AC-AC Power Conversion Systems	T1-4 Reliability of IGBT Modules in Energy Conversion	T1-5 Ultra-Capacitors in Power Conversion: Analysis, Modeling and Design in Theory and Practice	T1-6 Inductive Wireless Power Transmission

12:00 pm – 1:00 pm	**Lunch on Own**	

Tutorials Group 2 • 1:00 pm – 5:00 pm

Russell	Ellis West	Cowboy Artists	Ellis East	Cassidy	Curtis
T2-1 Design and Modeling of Dual Fed Asynchronous Generators: Application to Wind Power Generation	T2-2 Design Considerations for Photovoltaic Systems Installed on Curved Surfaces	T2-3 Artificial Intelligence Techniques in Power Electronics and Motor Drives	T2-4 Practical Design and Challenges of Traction Inverter for Electrified Vehicles	T2-5 Designing with Lithium-Ion Batteries: An Engineering Perspective	T2-6 Multilevel Converters: Recent Development of Topologies and PWM Control Methods

4:30 pm – 5:00 pm	**New to ECCE/PELS/IAS Reception** *(for those new to the organizations)*	*Atrium*
5:00 pm – 7:00 pm	**Opening Reception**	*Atrium*

MONDAY, SEPTEMBER 19, 2011

7:00 am – 7:00 pm	**Registration Open**	*Atrium Lobby*
8:00 am – 10:00 am	**Plenary Session**	*Regency ABCD*
10:00 am – 10:20 am	**AM Break**	*Atrium Lobby*

Breakout Sessions • 10:20 am – 12:00 pm

Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Phoenix	Regency ABCD
S1: Solar PV Technology	S2: Power Semiconductors: Thermal Management	S3: Model-Based Sensorless Control	S4: Distributed Utility Voltage Regulation	S5: DC-DC Converters: Topologies I	S6: Induction Machines	S7: Multilevel Converters I	S8: MPPT Algorithms for Solar PV Systems	S9: Indirect AC-AC Converters I	S10: Transportation Applications: General	SP1: Wind Energy Conversion

12:00 pm – 1:20 pm	**Lunch on Own**	

Breakout Sessions • 1:20 pm - 3:00 pm

Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency CD	Regency AB
S11: Wind Energy: Generators and Drives	S12: Power Semiconductors: Packaging	S13: Direct Torque Control	S14: Distributed Grid Controls	S15: DC-DC Converters: Controls I	S16: Thermal Analysis and Losses I	S17: Voltage Source Inverters	S18: DC-DC Converters for Solar PV Systems I	S19: Indirect AC-AC Converters II	S20: Transportation Applications: Voltage Converters	SP2: Power Supply on Chip

3:00 pm – 3:20 pm	**PM Break**	*Atrium Lobby*

Breakout Sessions • 3:20 pm - 5:00 pm

Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency CD	Regency AB
S21: Wind Energy: Power Electronic Converters	S22: Magnetic Component Design & Applications	S23: Sensorless Control Issues	S24: Microgrid Controls	S25: DC-DC Converters: Modeling	S26: Thermal Analysis and Losses II	S27: Inverter Control Techniques	S28: DC-DC Converters for Solar PV Systems II	S29: Modeling and Control of AC-AC Converters	S30: Transportation Applications: Infrastructures	SP3: PEV Infrastruture and Technologies

5:00 pm – 7:00 pm	**Expo Open/Expo Reception** *Supported in part by Opal-RT Technologies, Inc.*	*Phoenix Convention Center, West Hall 1*
5:00 pm – 10:00 pm	**Student Demonstrations**	*Phoenix Convention Center, West Hall 1*
8:00 pm – 10:00 pm	**Industry Student Dinner** *Supported by GE Global Research and Nexteer Automotive (ticketed function)*	*Phoenix Convention Center, West Hall 1*

TUESDAY, SEPTEMBER 20, 2011

7:00 am – 6:00 pm	**Registration Open**	*Phoenix Convention Center, West Hall Prefunction*
9:00 am – 6:00 pm	**Exhibit Hall Open**	*Phoenix Convention Center, West Hall 1*
9:00 am – 6:00 pm	**Student Demonstrations**	*Phoenix Convention Center, West Hall 1*
9:20 am – 9:40 am	**AM Break**	*Phoenix Convention Center, West Hall 1*
9:30 am – 10:00 am	**GE Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
10:00 am – 10:30 am	**Ford Motor Company Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
10:30 am – 12:00 pm	**Poster Session I**	*Phoenix Convention Center, West Hall 1*
12:00 pm – 1:20 pm	**Lunch in the Exhibit Hall**	*Phoenix Convention Center, West Hall 1*
1:30 pm – 2:00 pm	**Magnetics Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
2:00 pm – 2:30 pm	**Opal-RT Technologies Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
2:30 pm - 3:00 pm	**Freescale Semiconductors Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
3:00 pm – 3:30 pm	**PM Break**	*Phoenix Convention Center, West Hall 1*
3:30 pm – 5:00 pm	**Poster Session II**	*Phoenix Convention Center, West Hall 1*
5:00 pm – 6:00 pm	**JMAG Industrial Seminar and Cocktail Reception** *Supported in part by JSOL Corporation and Powersys, Inc.*	*Phoenix Convention Center, West Hall 1*

TUESDAY, SEPTEMBER 20, 2011 *(Continued)*

Rap Sessions • 7:30 pm – 9:00 pm

Remington	Russell	Borein
R1 Mission Impossible? A 100% Renewable Energy Society, organized by Dan M. Ionel	**R2 Vehicle Electrification Technologies, Today and Tomorrow,** organized by Chris Mi	**R3 Plug-in Electric Vehicles and the Electric Power Grid: Colliding Industries,** organized by Jin Wang

WEDNESDAY, SEPTEMBER 21, 2011

7:00 am – 7:00 pm **Registration Open** ..... *Atrium Lobby*

Breakout Sessions • 8:00 am - 9:40 am

Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency AB
S31: Wind Energy: Grid Connection and System Integration	S32: Magnetics	S33: Drive Issues I	S34: Transient Behavior in Grid Connected and Stand Alone Systems	S35: Resonant DC-DC Converters I	S36: Fractional Slot Machines	S37: Z-Source Inverters	S38: LED Drivers I	S39: AC-DC Rectifiers: Design and Analysis	S40: Transporation Applications: Electric Drivetrain	SP4: Power Magnetics for Smart Grid Applications

9:40 am – 10:00 am **AM Break** ..... *Atrium Lobby*

Breakout Sessions • 10:00 am - 11:40 am

Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency AB
S41: Wind Energy: Generators and Controls	S42: Power Semiconductors: High Temperature Devices	S43: PM Machine Controls	S44: Grid Interactive Solar PV Systems I	S45: DC-DC Converters: Topologies II	S46: Faults and Diagnostics	S47: Modeling and Control of Single-Phase Inverters	S48: LED Drivers II	S49: High Performance Power Factor Correction	S50: Transportation Applications: Battery Modeling and Charging	SP5: Super-Conducting Machines

11:40 am – 1:30 pm **Lunch on Own**

Breakout Sessions • 1:30 pm - 3:10 pm

Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency A
S51: Wind Energy: Control Techniques	S52: Power Semiconductors: Wide Bandgap Devices	S53: Sensorless Control I	S54: Grid Interactive Solar PV Systems II	S55: Resonant DC-DC Converters II	S56: Electric Traction Machines	S57: Modeling and Control of Three-Phase Inverters	S58: Lighting Applications	S59: AC-DC Rectifier Control I	S60: Transportation Applications: Batteries, Ultracapacitors, and Fuel Cells	S61: DC-DC Converters: Digital Control

3:10 pm – 3:30 pm **PM Break** ..... *Atrium Lobby*

Breakout Sessions • 3:30 pm - 5:10 pm

Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency A
S62: Energy Storage I	S63: Power Devices: Parallel and Series Operation	S64: Sensorless Control II	S65: Impact of Renewable Energy Systems on Utility Grid	S66: Resonant DC-DC Converters III	S67: Advanced Electric Machine Design I	S68: High Power Inverters	S69: Uninterruptible Power Supplies	S70: Single Phase AC-DC Rectifier: Control and Analysis	S71: Rail, Aerospace, and Marine	S72: Integrated DC-DC Converters

7:00 pm – 9:30 pm **ECCE Banquet** ..... *Phoenix Convention Center, North 120 B-D*

THURSDAY, SEPTEMBER 22, 2011

7:00 am – 3:00 pm **Registration Open** ..... *Atrium Lobby*

Breakout Sessions • 8:00 am - 9:40 am

Ellis West	Curtis A	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Curtis B	Phoenix
S73: Energy Storage II	S74: Electric Machine Modeling	S75: Modulation Techniques	S76: DC-DC Converters for Renewable Energy Systems	S77: DC-DC Converter Controls II	S78: Advanced Electric Machine Design II	S79: Multilevel Converters II	S80: Medium Voltage Industrial Drives	S81: Single Phase AC-DC Rectifier: Topology	S82: Contactless Power Transfer	S83: Inverter Applications

9:40 am – 10:00 am **AM Break** ..... *Atrium Lobby*

Breakout Sessions • 10:00 am - 11:40 am

Ellis West	Curtis A	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Curtis B	Phoenix
S84: Energy Storage: Bateries	S85: Switched Reluctance Machines	S86: Drive Control	S87: Solar PV System Design and Architecture	S88: DC-DC Converter Controls III	S89: Permanent Magnet Machine Optimization	S90: Inverter PWM Techniques	S91: STATCOM Controls	S92: AC-DC Rectifier Control II	S93: DC-DC Converters: Passive Components	S94: General Inverter Technologies

11:45 am – 1:40 pm **Awards Luncheon** ..... *Regency ABCD*

Breakout Sessions • 1:40 pm - 3:20 pm

Ellis West	Curtis A	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Phoenix
S95: Ocean and Wave Energy Harvesting I	S96: Power Devices: Measurement and Characterisation	S97: Drive Issues II	S98: Grid Interactive Renewable Energy Systems	S99: DC-DC Converters: Topologies III	S100: Special Application Machines	S101: Modular Multilevel Converters	S102: Active Filters Applications	S103: Three-Phase AC-DC Rectifiers	S104: Soft-Switching Inverters

3:20 pm – 3:40 pm **PM Break** ..... *Atrium Lobby*

Breakout Sessions • 3:40 pm - 5:00 pm

Ellis West	Curtis A	Ellis East	Remington	Cowboy Artists	Russell	Sundance
S105: Ocean and Wave Energy Harvesting II	S106: IGBT Modules	S107: DC Microgrids	S108: Multiphase DC-DC Converters	S109: Synchornous Reluctance Machines	S110: Boost Inverters	S111: Utility Applications

SATURDAY, SEPTEMBER 17, 2011

3:00 pm – 5:00 pm	Registration Open ..... *Atrium Lobby*

SUNDAY, SEPTEMBER 18, 2011

7:00 am – 7:00 pm	Registration Open ..... *Atrium Lobby*

Tutorials Group 1 • 8:30 am – 12:00 pm

Russell	Ellis West	Cowboy Artists	Ellis East	Cassidy	Curtis
T1-1 Practical Aspects in Modern Design Process of Electric Motors	T1-2 Understanding of Electrical Concepts in Wind Turbines and Photovoltaic Arrays	T1-3 Carrier Based PWM Methods For AC-DC-AC and AC-AC Power Conversion Systems	T1-4 Reliability of IGBT Modules in Energy Conversion	T1-5 Ultra-Capacitors in Power Conversion: Analysis, Modeling, and Design in Theory and Practice	T1-6 Inductive Wireless Power Transmission

12:00 pm – 1:00 pm	Lunch on Own

Tutorials Group 2 • 1:00 pm – 5:00 pm

Russell	Ellis West	Cowboy Artists	Ellis East	Cassidy	Curtis
T2-1 Design and Modeling of Dual Fed Asynchronous Generators: Application to Wind Power Generation	T2-2 Design Considerations for Photovoltaic Systems Installed on Curved Surfaces	T2-3 Artificial Intelligence Techniques in Power Electronics and Motor Drives	T2-4 Practical Design and Challenges of Traction Inverter for Electrified Vehicles	T2-5 Designing with Lithium-Ion Batteries: An Engineering Perspective	T2-6 Multilevel Converters: Recent Development of Topologies and PWM Control Methods

4:30 pm – 5:00 pm	New to ECCE/PELS/IAS Reception *(for those new to the organizations)* ..... *Atrium*
5:00 pm – 7:00 pm	Opening Reception ..... *Atrium*

MONDAY, SEPTEMBER 19, 2011

7:00 am – 7:00 pm	Registration Open ..... *Atrium Lobby*
8:00 am – 10:00 am	Plenary Session ..... *Regency ABCD*
10:00 am – 10:20 am	AM Break ..... *Atrium Lobby*

Breakout Sessions • 10:20 am – 12:00 pm

	Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Phoenix	Regency ABCD
	S1: Solar PV Technology	S2: Power Semi-conductors: Thermal Management	S3: Model-Based Sensorless Control	S4: Distributed Utility Voltage Regulation	S5: DC-DC Converters: Topologies I	S6: Induction Machines	S7: Multilevel Converters I	S8: MPPT Algorithms for Solar PV Systems	S9: Indirect AC-AC Converters I	S10: Transportation Applications: General	SP1: Wind Energy Conversion
10:20 am – 10:45 am	Novel Non-flat Photovoltaic Module Geometries and Implications to Power Conversion	Study and Realization of a High Power Density Electronics Device Cooling Loop Using a Liquid Metal Coolant	Sensorless Multiphase Induction Motor Drive Based on a Speed Observer Operating with Third-Order Field Harmonics	A Full-Feedforward Scheme of Grid Voltages for a Three-Phase Grid-Connected Inverter With an LCL Filter	Design and Analysis for ZVS Forward-Flyback DC-DC Converter	Stray Losses in the Stator and Rotor of Induction Machines with Sinusoidal Supplies	Virtual-Vector-Based Space Vector Pulse Width Modulation of the DC-AC Multilevel-Clamped Multilevel Converter (MLC2)	Integrated CMOS DC-DC Converter with Digital Maximum Power Point Tracking for a Portable Thermo-photovoltaic Power Generator	Modulation of Indirect Matrix Converter Under Unbalanced Source Voltage Condition	Development of a Drive Cycle Based Evaluation Method for Variable Voltage Converter in Vehicle Electrification Applications	Power Electronics Converters for Wind Turbine Systems
10:45 am – 11:10 am	A Test Bench for Accelerated Thermal Ageing of III-V Concentration Solar Cells Using Forward Bias Injection	Drift Region Integrated Microchannel Structure for Direct Cooling of Power Electronics	Square Root Unscented Kalman Filters for State Estimation of Induction Motor Drives	Optimal Size and Location of Distributed Generation Unit for Voltage Stability Enhancement	Interleaved Power Converter with Current Ripple Cancelation at a Selectable Duty Cycle	Harmonic Loss and Torque Analysis of High Speed Induction Motors	A New Voltage-Balancing Controller in Cascaded Multilevel Converters	Study and Evaluation of Load Current Based MPPT Control for PV Solar Systems	An Investigation of High Efficiency Operation Conditions for a Three-Port Energy Source System Using an Indirect Matrix Converter	Small-Size Light-Weight Transformer with New Core Structure for Contactless Electric Vehicle Power Transfer System	A Commercial Perspective on Wind Technology Development Needs

MONDAY, SEPTEMBER 19, 2011 *(Continued)*

Breakout Sessions • 10:20 am – 12:00 pm *(Continued)*

	Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Phoenix	Regency ABCD
	S1: Solar PV Technology	S2: Power Semi-conductors: Thermal Management	S3: Model-Based Sensorless Control	S4: Distributed Utility Voltage Regulation	S5: DC-DC Converters: Topologies I	S6: Induction Machines	S7: Multilevel Converters I	S8: MPPT Algorithms for Solar PV Systems	S9: Indirect AC-AC Converters I	S10: Transportation Applications: General	SP1: Wind Energy Conversion
11:10 am – 11:35 am	Challenges to Overcurrent Protection Devices under Line-Line Faults in Solar Photovoltaic Arrays	Thermal Management of Compact SMT Multilayer Power Converters	The Opportunities of Two-Phase Hybrid Stepping Motor Back EMF Sampling	A Time-Coordination Approach for Compensating Pulse-Load using Flywheel	Comparison of Bi-Directional Isolated Full-Bridge Converters with Combinations of Active and Passive Snubbers	Analysis and Modeling of Rotor Slot Enclosure Effects in High Speed Induction Motors	Multilevel Cascade H-Bridge Inverter DC Voltage Estimation Through Output Voltage Sensing	Improved MPPT Short-Circuit Current Method by a Fuzzy Short-Circuit Current Estimator	A Compact Versatile Matrix Converter to Integrate Various Energy Resources to Utility Network	Fault-Tolerant Control of Induction Motor Drive for Automotive Belt-Alternator-Starter Application	Short Term Energy Storage in Wind Power Generation
11:35 am – 12:00 pm	Analysis and Mitigation of Common Mode Voltages in Photovoltaic Power Systems	Development and Electrical Characterization of a Vertical Electrical and Thermal Test Chip (VTTC)	Analysis and Design of a Position Observer with Resistance Adaptation for Synchronous Reluctance Motor Drives		Study and Implementation of a Novel Bi-Directional DC-DC Converter with High Conversion Ratio	Measurement Proven Analytical and Numerical Models for Calculation of the Teeth Flux Pulsations and Harmonic Torques of Skewed Squirrel Cage Standard Induction Machines	Experimental Verification of Loss Reduction in Diode-Clamped Mutilevel Inverters	An Optimal Control Method for Grid-Connected Photovoltaic Micro-Inverter to Improve the Efficiency at Light-Load Condition	Hybrid PWM Control for Z-Source Matrix Converter	Energy Efficiency in Plug-in Hybrid Electric Vehicle Chargers: Evaluation and Comparison of Front End AC-DC Topologies	Wind Power Plant Grid Connection – Challenges, Opportunities and Solutions Ahead
12:00 pm – 1:20 pm	**Lunch on Own**										

Breakout Sessions • 1:20 pm - 3:00 pm

	Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency CD	Regency AB
	S11: Wind Energy: Generators and Drives	S12: Power Semiconductors: Packaging	S13: Direct Torque Control	S14: Distributed Grid Controls	S15: DC-DC Converter Controls I	S16: Thermal Analysis and Losses I	S17: Voltage Source Inverters	S18: DC-DC Converters for Solar PV Systems I	S19: Indirect AC-AC Converters II	S20: Transportation Applications: Voltage Converters	SP2: Power Supply on Chip
1:20 pm – 1:45 pm	Quasi-Z Source Inverter Based PMSG Wind Power Generation System	Thermo-Mechanical Reliability Investigation of Large Temperature Excursions in Power Electronics Packages	Sensorless Direct Flux and Torque Control for Direct Drive Washing Machine Applications	Optimized Pole and Zero Placement with State Observer for LCL-Type Grid-Connected Inverter	A Practical Control Strategy to Improve Unloading Transient Response Performance for Buck Converters	Thermal Analysis of a Balanced Calorimeter for Testing Electrical Machines	Inter-Phase Interleaving for Three Phase Voltage Source Converter Operated with Low Non-Triple Carrier Ratio	Current-Fed Quadratic Full-Bridge Buck Converter for PV Systems Interfacing: Dynamic Characterization	Active AC Snubber for Direct AC-AC Power Converters	Optimal Design of Multilevel Modular Switched-Capacitor DC-DC Converter	Single Chip Power Converters: Products and Manufacturing Considerations
1:45 pm – 2:10 pm	Supercapacitor Energy Storage for Wind Energy Integration	Design of Power Converters on 3D-MIDs for Driving Three-Dimensional LED-Lamps	Model Predictive Direct Torque Control: Derivation and Analysis of the Explicit Control Law	Smart-Grid Technologies and Progress in Europe and the United States	A Small Signal Model for Average Current Mode Control Based On Describing Function Approach	Design of a Novel Test Fixture to Measure Rotational Core Losses in Machine Laminations	Model Predictive-Based Voltage Regulation of an Islanded Distributed Generation Unit	Photovoltaic Microinverter Using Single-Stage Isolated High-Frequency link Series Resonant Topology	Comparison of Boost Chopper and Active Buffer as Single to Three Phase Converter	A Double-Wing Multilevel Modular Capacitor-Clamped DC-DC Converter with Reduced Capacitor Voltage Stress	Developing Single-Chip Offline LED Drivers

MONDAY, SEPTEMBER 19, 2011 *(Continued)*

Breakout Sessions • 1:20 pm - 3:00 pm *(Continued)*

	Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency CD	Regency AB
	S11: Wind Energy: Generators and Drives	**S12: Power Semiconductors: Packaging**	**S13: Direct Torque Control**	**S14: Distributed Grid Controls**	**S15: DC-DC Converters: Controls I**	**S16: Thermal Analysis and Losses I**	**S17: Voltage Source Inverters**	**S18: DC-DC Converters for Solar PV Systems I**	**S19: Indirect AC-AC Converters II**	**S20: Transportation Applications: Voltage Converters**	**SP2: Power Supply on Chip**
2:10 pm – 2:35 pm	Mechanical Stress Reduction in Variable Speed Wind Turbine Drivetrains	A Novel Hybrid Packaging Structure for High-Temperature SiC Power Modules	Model Predictive Direct Torque Control of a Five-Level ANPC Converter Drive System	Enhanced Power Calculator for Droop Control in Single-Phase Systems	A Novel Control Method for Light-Loaded Multiphase Boost Converter with Voltage Multiplier Used as a Front-End of a Grid-Connected Fuel-Cell Generation	A Simple Method to Account for PWM Eddy Current Iron Losses in Finite Element Analysis	Reduction of Voltage Harmonics for Parallel-Operated Inverters	Three-Port Flyback-Type Micro-Inverter with an Active Power Decoupling Circuit	Control of Single-Phase to Three-Phase Matrix Converters for PM Synchronous Motor Drive	Review of High Power Isolated Bi-Directional DC-DC Converters for PHEV/EV DC Charging Infrastructure	Nanostructured Scalable Thick-Film Magnetics
2:35 pm – 3:00 pm	Bearing Fault Detection for Direct-Drive Wind Turbines via Stator Current Spectrum Analysis	In-Situ Measurement of Wirebond Strain in Electrically Active Power Semiconductors	Deadbeat-Direct Torque and Flux Control for Interior PM Synchronous Motors Operating at Voltage and Current Limits		Asymmetrical Bridge Double-Input DC-DC Converters Adopting Pulsating Voltage Source Cells	Online Surge Testing Applied to an Induction Machine with Emulated Insulation Breakdown	Generalized Closed-Loop Control (GCC) Schemes with Embedded Virtual Impedances for Voltage Source Converters		Improvement in the Control Range of Matrix Converters		Voltage Scalable Switched Capacitor DC-DC Converters for On-Chip Applications

3:00 pm – 3:20 pm **PM Break** ..... *Atrium Lobby*

Breakout Sessions • 3:20 pm - 5:00 pm

	Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency CD	Regency AB
	S21: Wind Energy: Power Electronic Converters	**S22: Magnetic Component Design and Application**	**S23: Sensorless Control Issues**	**S24: Microgrid Controls**	**S25: DC-DC Converters: Modeling**	**S26: Thermal Analysis and Losses II**	**S27: Inverter Control Techniques**	**S28: DC-DC Converters for Solar PV Systems II**	**S29: Modeling and Control of AC-AC Converters**	**S30: Transportation Applications: Infrastructure**	**SP3: PEV Infrastruture and Technologies**
3:20 pm – 3:45 pm	Three-Level Boost Converter based Medium Voltage Megawatt PMSG Wind Energy Conversion Systems	Resonant Converter Transformer Design and Optimization	Secondary Resistive Losses with High-frequency Injection-based Self-sensing in IPM Machines	Autonomous Control of Interlinking Converters in Hybrid AC-DC Microgrids with Energy Storages	A New STS Model DC-DC Converter	Advanced Testing and Modeling of Magnetic Materials Including a New Method of Core Loss Separation for Electrical Machines	Stability Analysis of Droop Control for Inverter Using Dynamic Phasors Method	DC-DC Converter Topology Assessment for Large Scale Distributed Photovoltaic Plant Architectures	Un-Terminated, Low-Frequency Terminal-Behavioral d-q Model of Three-Phase Converters	A Study of Sectional Tracks in Roadway Inductive Power Transfer System	The EV Project and EV Charging Infrastructure Challenges
3:45 pm – 4:10 pm	Electro-Thermal Modeling for Junction Temperature Cycling-Based Lifetime Prediction of a Press-Pack IGBT 3L-NPC-VSC Applied to Large Wind Turbines	Novel CCTT Core Integrated Magnetic for High- Power DC-DC Converters	Analysis of Iron and Magnet Losses in Surface Permanent Magnet Machines Resulting from Injection-Based Self-Sensing Position Estimation	Comparison of PV Inverter Controller Configurations for CERTS Microgrid Applications	Dynamic Modeling of a ZETA Converter in DCM Applied to Low Power Renewable Sources	A Nonintrusive Thermal Monitoring Method for Closed-Loop Drive-Fed	A Grid Synchronization Method for Droop Controlled Distributed Energy Resources Converters	Research on Output Current of Interleaved-Flyback in Boundary Conduction Mode for Photovoltaic AC Module Application	A Four Legs Matrix Converter Based Ground Power Unit with Selective Harmonic Control	Cost Benefits and Vehicle-to-Grid Regulation Services of Unidirectional Charging of Electric Vehicles	Technologies for Bi-Directional EV Battery Charging

MONDAY, SEPTEMBER 19, 2011 *(Continued)*

Breakout Sessions • 3:20 pm - 5:00 pm *(Continued)*

	Ellis West	Curtis	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency CD	Regency AB
	S21: Wind Energy: Power Electronic Converters	**S22: Magnetic Component Design & Application**	**S23: Sensorless Control Issues**	**S24: Microgrid Controls**	**S25: DC-DC Converters: Modeling**	**S26: Thermal Analysis and Losses II**	**S27: Inverter Control Techniques**	**S28: DC-DC Converters for Solar PV Systems II**	**S29: Modeling and Control of AC-AC Converters**	**S30: Transportation Applications: Infrastructure**	**SP3: PEV Infrastruture and Technologies**
4:10 pm – 4:35 pm	Power Density Investigation on the Press-Pack IGBT 3L-HB-VSCs Applied to Large Wind Turbines	Iron Loss Evaluation of Filter Inductor Used in PWM Inverters	The Influence of Magnetic Hysteresis on HF Injection Based Inductance Calculation	Phase Locked Loop Control of Inverters in a Microgrid	Simple Large-Signal Model Based on Gyrator for System Level Analysis	Loss Measurement of a 40 kW High-Speed Bearingless PM Synchronous Motor	High Performance AC Current Regulation for Low Pulse Ratio Inverters	Power Control in Three-Phase Grid-Connected Current-Source Boost Inverter	Study of the Bi-Directional Power Flow in Back-to-Back Converters by using Linear and Nonlinear Control Strategies	Mitigating Distribution Transformer Lifetime Degradation Caused by Grid-Enabled Vehicle (GEV) Charging	Current Sensor and Metrology Technologies for EV Charging Sub-Meter Applications
4:35 pm – 5:00 pm	A Comparison of Medium Voltage High Power DC-DC Converters with High Step-Up Conversion Ratio for Offshore Wind Energy Systems	Development and Evaluation of Single Sided Flux Couplers for Contactless Electric Vehicle Charging	Saliency Based Sensorless Control of Induction Machines at Frequency Overlap of Signal Components	Enabling High Droop Gain for Improvement of Reactive Power Sharing Accuracy in an Electronically-Interfaced Autonomous Microgrid	Modeling of Multiple-Input DC-DC Converters Considering Input-Coupling Effects	Induction Motor Rotor Temperature Estimation Using Superheterodyne Receivers	Swinging Bus Inverters: New Requirements in Renewable Power and the Natural Switching Surface	A Novel Primary-Side-Assisted Soft-Switching and Fault-Tolerance of A High-Frequency-Link Inverter for Renewable-Energy Systems	An Integrated Filter and Controller Design for Direct Matrix Converter	A Study on Receiver Circuit Topology of a Cordless Battery Charger for Electric Vehicles	EV Charging Standards

5:00 pm – 7:00 pm	**Expo Open/Expo Reception** *Supported in part by Opal-RT Technologies, Inc.*	*Phoenix Convention Center, West Hall 1*
5:00 pm – 10:00 pm	**Student Demonstrations**	*Phoenix Convention Center, West Hall 1*
8:00 pm – 10:00 pm	**Industry Student Dinner** *Supported by GE Global Research and Nexteer Automotive (ticketed function)*	*Phoenix Convention Center, West Hall 1*

TUESDAY, SEPTEMBER 20, 2011

7:00 am – 6:00 pm	**Registration Open**	*Phoenix Convention Center, West Hall Prefunction*
9:00 am – 6:00 pm	**Exhibit Hall Open**	*Phoenix Convention Center, West Hall 1*
9:00 am – 6:00 pm	**Student Demonstrations**	*Phoenix Convention Center, West Hall 1*
9:20 am – 9:40 am	**AM Break**	*Phoenix Convention Center, West Hall 1*
9:30 am – 10:00 am	**GE Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
10:00 am – 10:30 am	**Ford Motor Company Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
10:30 am – 12:00 pm	**Poster Session I**	*Phoenix Convention Center, West Hall 1*
12:00 pm – 1:20 pm	**Lunch in the Exhibit Hall**	*Phoenix Convention Center, West Hall 1*
1:30 pm – 2:00 pm	**Magnetics Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
2:00 pm – 2:30 pm	**Opal-RT Technologies Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
2:30 pm - 3:00 pm	**Freescale Semiconductors Industrial Seminar**	*Phoenix Convention Center, West Hall 1*
3:00 pm – 3:30 pm	**PM Break**	*Phoenix Convention Center, West Hall 1*
3:30 pm – 5:00 pm	**Poster Session II**	*Phoenix Convention Center, West Hall 1*
5:00 pm – 6:00 pm	**JMAG Industrial Seminar and Cocktail Reception** *Supported in part by JSOL Corporation and Powersys, Inc.*	*Phoenix Convention Center, West Hall 1*

Rap Sessions • 7:30 pm – 9:00 pm

Remington	Russell	Borein
R1 Mission Impossible? A 100% Renewable Energy Society, organized by Dan M. Ionel	**R2 Vehicle Electrification Technologies, Today and Tomorrow,** organized by Chris Mi	**R3 Plug-in Electric Vehicles and the Electric Power Grid: Colliding Industries,** organized by Jin Wang

WEDNESDAY, SEPTEMBER 21, 2011

7:00 am – 7:00 pm — **Registration Open** ..... *Atrium Lobby*

Breakout Sessions • 8:00 am - 9:40 am

	Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency AB
	S31: Wind Energy: Grid Connection and System Integration	**S32: Magnetics**	**S33: Drive Issues I**	**S34: Transient Behavior in Grid Connected and Stand Alone Systems**	**S35: Resonant DC-DC Converters I**	**S36: Fractional Slot Machines**	**S37: Z-Source Inverters**	**S38: LED Drivers I**	**S39: AC-DC Rectifiers: Design and Analysis**	**S40: Transporation Applications: Electric Drivetrain**	**SP4: Power Magnetics For Smart Grid Applications**
8:00 am – 8:25 am	Modeling and Mitigation of Harmonic Resonance Between Wind Turbines and the Grid	Magnetic Characterization of Low Temperature Co-Fired Ceramic (LTCC) Ferrite Materials for High Frequency Power Converters	Influence of High-Frequency Leakage Current on Motor Position Control in PWM Inverter-Fed Servo Drives	Active Islanding Detection Using High Frequency Signal Injection	A New DC-DC Converter with Wide-Range ZVS and Zero Circulating Current	Design, Analysis and Loss Minimization of a Fractional-Slot Concentrated Winding Interior Permanent Magnet Machine for Traction Applications	Single-Phase Z-Source Inverter: Analysis and Low-Frequency Harmonics Elimination Pulse Width Modulation	A Universal-Input High-Power-Factor PFC Pre-Regulator without Electrolytic Capacitor for PWM Dimming LED Lighting Application	A Flicker-Free Electrolytic Capacitor-Less AC-DC LED Driver	Design and Analysis of a 55-kW Air Cooled Automotive Traction Drive Inverter	Magnetic Components for High Voltage DC Transmission Converters and Static Var Compensators
8:25 am – 8:50 am	Thermal Analysis of Multilevel Grid Side Converters for 10 MW Wind Turbines Under Low Voltage Ride Through	Predicting Inductance Roll-Off with DC Excitations	A Review of Mitigation Methods for Overvoltage in Long-Cable-Fed PWM AC Drives	Safe Transient Operation of Microgrids Based on Master-Slave Configuration	Zero Voltage Switching Technique for Bi-Directional DC-DC Converters	Influence of Alternate Slot Openings on Torque-Speed Characteristics and Cogging Torque of Fractional Slot IPM Brushless AC Machines	Stability Analysis of Reduced Leakage Current Modulation Techniques for Z-Source Inverters in Transformerless Photovoltaic Applications	A Novel High Efficiency and Low-Cost Current Balancing Method for Multi-LED Driver	An AC-DC Single-Stage Full-Bridge Converter with Buck-Boost Input Section	Back to Back Z-Source Inverter Topology for the Series Hybrid Electric Bus	Magnetic Components in Electric Circuits — Understanding Thermal Behaviour and Stress
8:50 am – 9:15 am	Power Capacity Specification for Energy Storage in Wind Application Using Probability-Based Method	High Frequency Inductor Design and Comparison for High Efficiency High Density POLs with GaN Device	Investigation of Voltage Stresses Inside Adjustable Speed Drives	Droop-Controlled Inverters with Seamless Transition Between Islanding and Grid-Connected Operations	Soft Switching Chopper with Tail Loss Cancel Circuit	Comparison of Interior and Surface PM Machines Equipped with Fractional-Slot Concentrated-Windings for Hybrid Traction Applications	High Step-Up Continuous Input Current LCCT-Z-Source Inverters for Fuel Cells	Off-Line LED Driver with Bi-Directional Second Stage for Reducing Energy Storage	Class E Rectifier Using Switch-Controlled Capacitor	A Novel Current Angle Control of a Current Source Inverter Fed Permanent Magnet Synchronous Motor Drive for Automotive Applications	Transformer Construction and Its Affect on Transformer Stability
9:15 am – 9:40 am			Identifying Ground Fault Location in High Resistance Grounded Systems using Adjustable Speed Drive	Engine Generator Efficiency and Transient Characteristics Improvement Using a Series Compensator Named MERS	The Resonant LLC vs. LCC Converter — Comparing Two Optimized Prototypes		Transient Modeling Of Current-Fed Quasi-Z-Source Inverter	A Novel SEPIC-Derived PFC Pre-Regulator without Electrolytic Capacitor for PWM Dimming LED Lighting Application Based on Valley Fill Circuit	MHz Power Factor Correction with Adaptive Current Source Drivers		Design, Development, and Testing of a 1 MVA, 13.8 kV/465 V Solid-State Transformer with 10 kV Silicon Carbide Switches

9:40 am – 10:00 am — **AM Break** ..... *Atrium Lobby*

WEDNESDAY, SEPTEMBER 21, 2011 *(Continued)*

Breakout Sessions • 10:00 am - 11:40 am

	Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency AB
	S41: Wind Energy: Generators and Controls	**S42: Power Semiconductors: High Temperature Devices**	**S43: PM Machine Controls**	**S44: Grid Interactive Solar PV Systems I**	**S45: DC-DC Converters: Topologies II**	**S46: Faults and Diagnostics**	**S47: Modeling and Control of Single-Phase Inverters**	**S48: LED Drivers II**	**S49: High Performance Power Factor Correction**	**S50: Transportation Applications: Battery Modeling and Charging**	**SP5: Superconducting Machines**
10:00 am – 10:25 am	Vector Control of Mulpitle-Module Transverse Flux PM Generator for Large-Scale Direct-Drive Wind Turbines	Investigation of Si IGBT Operation at 200 Degree Centigrade for Traction Application	Magnet Temperature Estimation in Surface PM Machines During Six-Step Operation	Leakage Current Analysis of Grid Connected Transformerless Solar Inverters with Zero Vector Isolation	Serial or Parallel Linear-Assisted Switching Converter as Envelope Amplifier: Optimization and Comparison	Detection and Classification of Rotor Demagnetization and Eccentricity Faults for PM Synchronous Motors	Fast Current-Tracking Control for Grid-Connected Inverter with an LCL Filter by Sinusoidal Compensation	Multi-Channel Constant Current (MC3) LLC Resonant LED Driver	Boundary Control of Boost-Derived PFCs Using the Natural Switching Surface: Derivation and Enhanced Properties	Battery Modeling Based on the Coupling of Electrical Circuit and Computational Fluid Dynamics	Towards Commercial Application of HTS Rotating Machines
10:25 am – 10:50 am	Direct Grid Connection of a Slip-Permanent Magnet Wind Turbine Generator	Characterization of a High Temperature Multichip SiC JFET-Based Module	Adaptive Flux-Weakening Controller for IPMSM Drives	Towards Next Generation Photovoltaic Inverters	A Large DC-Gain Highly Efficient Hybrid Switched-Capacitor-Boost Converter for Renewable Energy Systems	Detection of Inter-Coil Short Circuits in the Stator Winding of a PM Machine by Using Saliency Tracking Schemes	Wide Bandwidth System Identification of AC System Impedances by Applying Perturbations to an Existing Converter	An Energy Conservation Based High-Efficiency Dimmable Multi-Channel LED Driver	Digital Primary-Side Sensing and PFC Control of a Flyback Converter	Improved Nonlinear Model for Electrode Voltage-Current Relationship for More Consistent Online Battery System Identification	Fault Current Limiting HTS Power Transformer
10:50 am – 11:15 am	Predictive Direct Control of Doubly Fed Induction Generator for Grid Synchronization in Wind Power Generation	Development of a 10 kW High Temperature High Power Density Three-Phase AC-DC-AC SiC Converter	Voltage Disturbance State-Filter Design for Precise Torque-Controlled Interior PM Synchronous Motors	Single-Stage Grid-Connected Forward Microinverter with Boundary Mode Control	A Gallium-Nitride Switched-Capacitor Circuit Using Synchronous Rectification	Bearing Fault Detection Capability of Frequency Response Measurement in Speed-Sensorless Operated Two-Mass-Systems	A Frequency Adaptive Resonant Controller for Fixed Point Digital Implementation at High Sampling Frequency	Analysis of the Asymmetrical Half-Bridge for Street LED-Lighting Applications	A Snubber Cell for Single-Stage PFC with a Boost Type Input Current Shaper and Isolated DC-DC Converter	A Transient-Based Approach for Estimating the Parameters of a Lithium-Ion Battery Model	Overview on the Development of High-Temperature Superconducting (HTS) Machines at Siemens
11:15 am – 11:40 am	Feed-Forward Transient Compensation Control for DFIG Wind Generators During Both Balanced and Unbalanced Grid Disturbances	Design Comparison of High Power Medium-Voltage Converters Based on 6.5kV Si-IGBT/Si-PiN Diode, 6.5kV Si-IGBT/SiC-JBS Diode, and 10kV SiC MOSFET/SiC-JBS Diode	Torque Ripple Control for Synchronous Motors Using Instantaneous Torque Estimation	Research on a Non-Complementary Active Clamp Flyback Converter with Unfolding DC-AC Inverter for Decentralized Grid-Connected PV Systems	A Novel Push-Pull Forward Converter for High Reliability and High Input Voltage Applications	A Low Conductivity Composite Rotor for Fractional Pitch Concentrated Winding Machines	Current Mode with RMS Voltage and Offset Control Loops for a Single-Phase Aircraft Inverter Suitable for Parallel and Three-Phase Operation Modes	Single Switch Three-Level Boost Converter for PWM Dimming LED Lighting	The Input EMI Filter Design of Interleaved Critical Conduction Mode Boost PFC Converter with Coupled Inductor	A Three-Phase High Frequency Semi-Controlled Battery Charging Power Converter for Plug-In Hybrid Electric Vehicles	Design Considerations for Large Direct Drive Wind Turbine Generators with Superconductor Field Windings
11:40 am – 1:30 pm	**Lunch on Own**										

WEDNESDAY, SEPTEMBER 21, 2011 *(Continued)*

Breakout Sessions • 1:30 pm - 3:10 pm

	Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency A
	S51: Wind Energy: Control Techniques	S52: Power Semiconductors: Wide Bandgap Devices	S53: Sensorless Control I	S54: Grid Interactive Solar PV Systems II	S55: Resonant DC-DC Converters II	S56: Electric Traction Machines	S57: Modeling and Control of Three-Phase Inverters	S58: Lighting Applications	S59: AC-DC Rectifiers: Control I	S60: Transportation Applications: Batteries, Ultracapacitors and Fuel Cells	S61: DC-DC Converters: Digital Control
1:30 pm – 1:55 pm	Control of Power Converters in Distributed Generation Applications Under Grid Fault Conditions	Switching Characteristics of Diamond-Based m-i-p+ Diodes in Power Electronic Applications	Comparison of Resistance-Based and Inductance-Based Self-Sensing Control for Surface Permanent Magnet Machine Using High Frequency Signal Injection	Single-Phase Cascaded H-Bridge Multilevel Inverter with Nonactive Power Compensation for Grid-Connected Photovoltaic Generators	Small Signal Phasor Modeling of Dual Active Bridge Series Resonant DC-DC Converters with Multi-Angle Phase Shift Modulation	Influence of Winding Design on Losses in Brushless AC IPM Propulsion Motors	Power Synchronization Control for Capacitor Minimization in Solid State Transformers (SST)	A Series Tuned High Power IPT Stage Lighting Controller	An Optimal Lyapunov-Based Control Strategy for Digitally Controlled Single-Phase Power Factor Correction AC-DC Converters	Sizing Considerations for Ultra-capacitors in Hybrid Energy Storage Systems	Digital Control Implementation to Reduce the Cost and Improve the Performance of the Control Stage of an Industrial Switch-Mode Power Supply
1:55 pm – 2:20 pm	The Steady-State Interaction of a Grid-Connected Doubly-Fed Induction Generator and The Wind Turbine	Evaluation of the Switching Characteristics of a Gallium-Nitride Transistor	Sensorless Control of Surface Permanent Magnet Synchronous Machines Using the High Frequency Resistance	1 MHz Cascaded Z-Source Inverters for Scalable Grid-Interactive Photovoltaic (PV) Applications Using GaN Device	Research on Key Application Issues of Smart Synchronous Rectifier Driver IC in LLC Resonant Converter	Design of a Ferrite Magnet Vernier Machine for an In-Wheel Machine	Low THD, Fast Transient, and Cost-Effective Synchronous-Frame Repetitive Controller for Three-Phase UPS Inverters	A Multi-Functional Digital Controller for a High Power Factor Electronic Ballast Dimmable with Standard Phase-Cut Dimmers	Bridgeless Isolated PFC Rectifier Using Bi-Directional Switch and Dual Output Windings	A Modular Balancing Bridge for Series Connected Li-Ion Batteries	Novel Random Switching PWM Technique with Constant Sampling Frequency and Constant Inductor Average Current for Digital-Controlled Converter
2:20 pm – 2:45 pm	An Adaptive Approximation Method for Maximum Power Point Tracking (MPPT) in Wind Energy Systems	10 kV, 120 A SiC Half H-Bridge Power MOSFET Modules Suitable for High Frequency, Medium Voltage Applications	High-Resolution Sensorless Position Estimation Using Delta-Sigma-Modulated Current Measurement	Low Frequency Current Reduction Using a Quasi-Notch Filter operated in Two-Stage DC-DC-AC Grid-Connected Systems	Analysis and Design Considerations of LLCC Resonant DC-DC converter with Precise Current Sharing for Two-Channel LED Driver	Feasibility and Electromagnetic Design of Direct Drive Wheel Actuator for Green Taxiing	Control and Elimination of Sinusoidal Harmonics in Power Electronics Equipment: A System Approach	Collective Dimming of Discharge Lamps with Improved Input Power Factor Using MERS-PFC Converter	Forward-Based AC-DC Converter with Quasi-Active Input Current Shaping Technique	Optimal Power Flow for Hybrid Ultracapacitor Systems in Light Electric Vehicles	Small-Signal Model Analysis and Design of Constant On-Time V2 Control for Low-ESR Caps with External Ramp Compensation
2:45 pm – 3:10 pm	Design of a Novel Simulation Platform for the EMS-MG Based on MAS	Optimal Stray Magnetic Couplings for EMC Filters	High Frequency Injection Assisted "Active Flux" Based Sensorless Vector Control of Reluctance Synchronous Motors, with Experiments from Zero Speed	Multi-String Single-Stage Grid-Connected Inverter for PV System	A Novel Two-stage Electronic Ballast for MH Lamp with Frequency Modulation Control	Fundamental Characteristics of a Ferrite Permanent Magnet Axial gap Motor with Segmented Rotor Structure for the Hybrid Electric Vehicle	Active Filter Under Constant-Frequency Hysteresis Control Based on a Synchronous Reference Frame	Proposing Meaures of Flicker in the Low Frequencies for Lighting Applications	Dynamic Behavior of Current Controllers for Selective Harmonic Compensation in Three-Phase Active Power Filters	A Parallel Energy-Sharing Control for a Fuel Cell-Battery-Ultracapacitor Hybrid Vehicles	Dynamic Response Improvement of Power Converter Using An Adaptive Frequency Control Law
3:10 pm – 3:30 pm	**PM Break** ..... *Atrium Lobby*										

WEDNESDAY, SEPTEMBER 21, 2011 *(Continued)*

Breakout Sessions • 3:30 pm - 5:10 pm

	Ellis West	Regency C	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Regency D	Regency A
	S62: Energy Storage I	S63: Power Devices: Parallel and Series Operation	S64: Sensorless Control II	S65: Impact of Renewable Energy Systems on Utility Grid	S66: Resonant DC-DC Converters III	S67: Advanced Electric Machine Design I	S68: High Power Inverters	S69: Uninterruptible Power Supplies	S70: Single Phase AC-DC Rectifier: Control and Analysis	S71: Rail, Aerospace, and Marine	S72: Integrated DC-DC Converters
3:30 pm – 3:55 pm	Testing and Modeling of Lithium-Ion Ultracapacitors	Series Connection of Power Switches in High Input Voltage with Wide Range Power Supply for Gate Driving Application	Encoderless Servo Drive with Adequately Designed IPMSM for Pulse Voltage Injection based Position Detection	A Review on Fundamental Grid-Voltage Detection Methods Under Highly Distorted Conditions in Distributed Power-Generation Networks	A Resonant Bi-Directional DC-DC Converter for Aerospace Applications	Induction Motor Design Methodology Based on Rotor Diameter Progressive Growth	Common-Mode Voltage Reduction Methods for Medium-Voltage Current Source Inverter-Fed Drives	A Cascaded Online Uninterruptible Power Supply Using Reduced Semiconductor	Digital Control Strategy for Multi-Phase Interleaved Boundary Mode and DCM Boost PFC Converters	Diode Rectification of Multiphase Synchronous Generators for Aircraft Applications	A Single-Inductor Bipolar-Output Converter with 5 mV Positive Voltage Ripple for Active Matrix OLED
3:55 pm – 4:20 pm	An Analysis on the Possibility of Using Flying Capacitors of a Three-Level Capacitor Clamped Inverter as Power Smoothing Elements for Wind Power Systems	Digital Adaptive Driving Strategies for High-Voltage IGBTs	PWM Switching Frequency Signal Injection Sensorless Method in IPMSM	Two Methods for Addressing DC Component in Phase-Locked Loop (PLL) Systems	Hybrid Half- and Full-Bridge Converter with High Efficiency and Full Soft-Switching Range	Theory and Design of Fractional-Slot Multilayer Winding	Implementation of a Fully Integrated High Density 50 kW Inverter Using a SiC JFET Based Six-Pack Power Module	Comparisons of Different Control Strategies for 20kVA Solid State Transformer	The Effect of Ripple Steering on Control Loop Stability for a CCM PFC Boost Converter	Self Healing for a DC Zonal Distribution Architecture Using Active Impedance Estimation	A 1.65W Fully Integrated 90nm Bulk CMOS Intrinsic Charge Recycling Capacitive DC-DC Converter
4:20 pm – 4:45 pm	A Modular Hybrid Fuel Cell System with Energy Storage	A New Delay Time Compensation Principle for Parallel Connected IGBTs	Position Self-Sensing Evaluation of a FI-IPMSM based on High Frequency Signal Injection Methods	Monte Carlo Analysis of the Impacts of High Renewable Power Penetration	Practical Performance Evaluations of a Soft Switching PWM Boost DC-DC Converter with High Efficiency and High Scalability Edge Resonant Switched Capacitor Modular	Integer-Slot vs Fractional-Slot Concentrated-Winding Axial-Flux Permanent Magnet Machines: Comparative Design, FEA and Experimental Tests	A Transformerless D-Statcom Based on a Multi-Voltage Cascade Converter Requiring No DC Sources	On Single-Phase UPS Topologies	Model Predictive-based Control Method for Cascaded H-Bridge Multilevel Active Rectifiers	An Algorithm and Implementation System for Measuring Impedance in the D-Q Domain	Non-Isolated Flyback Switching Capacitor Voltage Regulator
4:45 pm – 5:10 pm	Power Oscillation Damping Controller by Static Synchronous Compensator with Energy Storage	The Voltage Sharing of Commercial IGBTS in Series with Passive Components	Sensorless Rotor Position Detection Capability of a Dual Three-Phase Fractional-Slot IPM Machine	Online Grid-Adaptive Control and Active-Filter Functionality of PWM-Converters to Mitigate Voltage-Unbalances and Voltage-Harmonics - A Control Concept Based on Grid-Impedance Measurement	Optimal Design Considerations for a Modified LLC Converter with Wide Input Voltage Range Capability Suitable for PV Applications	Design and Analysis of Brushless Doubly Fed Reluctance Machines	Optimisation of Switching Losses and Harmonic Performance Using Model Predictive Control of a Cascaded H-bridge Multi-level StatCom				
7:00 pm – 9:30 pm	**ECCE Banquet** ..... *Phoenix Convention Center, North 120 B-D*										

THURSDAY, SEPTEMBER 22, 2011

7:00 am – 3:00 pm — **Registration Open** ..... *Atrium Lobby*

Breakout Sessions • 8:00 am - 9:40 am

	Ellis West	Curtis A	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Curtis B	Phoenix
	S73: Energy Storage II	S74: Electric Machine Modeling	S75: Modulation Techniques	S76: DC-DC Converters for Renewable Energy Systems	S77: DC-DC Converters: Controls II	S78: Advanced Electric Machine Design II	S79: Multilevel Converters II	S80: Medium Voltage Industrial Drives	S81: Single Phase AC-DC Rectifier: Topology	S82: Contactless Power Transfer	S83: Inverter Applications
8:00 am – 8:25 am	Interleaved Smart Burp PV Charger for Lead Acid Batteries with Incremental Conductance MPPT	Modeling and Effects of In-Situ Magnetization of Isotropic Ferrite Magnet Motors	PWM Scheme to Reduce the Common-Mode Current Generated by an AC Drive at Low Modulation Index	Bi-Directional Converter with Low Input/Output Current Ripple for Renewable Energy Applications	Analysis and Implementation of Output Voltage Regulation in Multi-Phase Switched Capacitor Converters	Design Study for Exterior Rotor Bearingless Permanent Magnet Machines	Optimal Pulsewidth Modulation of a Dual Three-Level Inverter System Operated from a Single DC Link	Transformerless Multi-Level Converter Based Medium Voltage Drives	A Transformerless Single-Stage AC-DC Converter with Low Output Voltage	Free Positioning for Inductive Wireless Power System	High Performance Gradient Driver for Magnetic Resonance Imaging System
8:25 am – 8:50 am	Design and Implementation of a Bi-Directional Isolated DAB-Based DC-DC Converter in Home Area Networks	A Basic Study of MATRIX Motor	Model Predictive Pulse Pattern Control	Swinging Bus Technique for Ripple Current Elimination in Fuel Cell Power Conversion	Flyback Transformer Based Transient Suppression Method for Digitally Controlled Buck Converters	A Novel Technique for Minimizing Torque Ripple in Axial Flux Segmented Rotor SRM	Fault-Tolerance Capacity of the Multilevel Active Clamped Topology	Quantitative System Compatibility and Characteristics Analysis of Two-level and Three-Level Low Voltage Industrial Drives	Novel Bi-Directional AC-DC MOSFET Converter for Energy Storage System Applications	A Contactless Power Transfer System with Capacitively Coupled Matrix Pad	High Performance Pulsed Power Resonant Converter for Radio Frequency Applications
8:50 am – 9:15 am	Power Control Strategy of a CSC Based Wind Energy Conversion System with Superconducting Magnetic Energy Storage System in DC Side	Influence of Slot and Pole Number Combinations on Unbalanced Magnetic Force in Permanent Magnet Machines	Quantitative Power Quality and Characteristic Analysis of Multilevel Pulse Width Modulation Methods in Medium Voltage High Power Industrial AC Drives	Characteristic Analysis and Modeling on PEMFC Degradation Associated with Low Frequency Ripple Current Effects	Improvements in Boundary Control of Boost Converters Using the Natural Switching Surface	Core Axial Lengthening as Effective Solution to Improve the Induction Motor Efficiency Classes	A Neutral Point Balancing Controller for Three-Level Inverter with Full Power-Factor Range and Low Distortions	Regenerative Energy Saving in Multi-Axis Servo-Motor-Drives	Dynamic Behavior of Single-Phase Full-Wave Rectifiers with Instantaneous Constant-Power Loads	A New Tri-State-Boost-Based Pickup Topology for Inductive Power Transfer Applications	H5TM Inverter with Constant-Frequency Asynchronous Sigma-Delta Modulation
9:15 am – 9:40 am	Lithium-based Energy Storage Management for DC Distributed Renewable Energy System			A Three-Port Half-Bridge Converter with Synchronous Rectification for Renewable Energy Application	A Family of Switching Capacitor Regulators	Characterization of Noise and Vibration in Permanent Magnet Synchronous Motors Using Electromagnetic and Structural Analyses	Equalization of DC Bus Voltage in Three-Level NPC-HB Inverters for PV Applications by Even Harmonics Injection or Fundamental Phase Modulation			A Design Methodology for Multi-kW, Large Airgap, MHz Frequency, Wireless Power Transfer Systems	Variable Sampling Frequency in Iterative Learning Current Control for Shunt Active Filter in Aircraft Power Systems

9:40 am – 10:00 am — **AM Break** ..... *Atrium Lobby*

THURSDAY, SEPTEMBER 22, 2011 *(Continued)*

Breakout Sessions • 10:00 am - 11:40 am

	Ellis West	Curtis A	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Curtis B	Phoenix
	S84: Energy Storage: Batteries	S85: Switched Reluctance Machines	S86: Drive Control	S87: Solar PV System Design and Architecture	S88: DC-DC Converters: Controls III	S89: Permanent Magnet Machine Optimization	S90: Inverter PWM Techniques	S91: STATCOM Controls	S92: AC-DC Rectifiers: Control II	S93: DC-DC Converters: Passive Components	S94: General Inverter Technologies
10:00 am – 10:25 am	Battery Ripple Current Reduction in a Three-Phase Interleaved DC-DC Converter for 5kW Battery Charger	Design of Switched Reluctance Motor Competitive to 60 kW IPMSM in Third Generation Hybrid Electric Vehicle	Control of Induction Machine with Extended Range of Maximum Torque Capability for Traction Drives	Development of an Autonomous Distributed Maximum Power Point Tracking PV System	Seamless Boost Converter Control in Critical Boundary Condition for Fuel Cell Power Conditioning System	Automated Bi-Objective Design Optimization of Multi-MW Direct-Drive PM Machines Using CE-FEA and Differential Evolution	A Novel Switching Loss Minimized PWM Method for a High Switching Frequency Three-Level Inverter with a SiC Clamp Diode	Negative-Sequence Reactive-Power Control by a PWM STATCOM Based on a Modular Multilevel Cascade Converter (MMCC-SDBC)	AC Stability of High Power Factor Multi-Pulse Rectifiers	A Novel Winding Layout Strategy for Planar Transformer Applicable to High Frequency High Power DC-DC Converters	An Improved Virtual Resistance Damping Method for Grid-Connected Inverters with LCL Filters
10:25 am – 10:50 am	Empirical Battery Model Characterizing a Utility-Scale Carbon-Enhanced VRLA Battery	Torque Ripple Minimization of Switched Reluctance Machines through Current Profiling	Application of One-Cycle Control to Stator Field-Oriented Control	Progressive Smooth Transition for Four-Switch Buck-Boost Converter in Photovoltaic Applications	Enhanced Load Step Response for a Bi-Directional DC-DC Converter	Fast Optimization of an IPMSM with Space Mapping technique	SDRE Control of Single Phase PWM Inverter Using FPGA Based Hardware Controller	A Unified Modular Transformer Converter (MTC) System with Advanced Angle Control Structure	Multiloop Interleaved Control for Two-Switch Two-Capacitor Three-level SMR without Capacitor Voltage Balancing Loop	Proposal and Validation of a Medium-Frequency Power Transformer Design Methodology	Modeling and Digital Control of LCLC Resonant Inverter with Varying Load
10:50 am – 11:15 am	Self-Reconfigurable Multicell Batteries	Switched Reluctance Generator Controls for Optimal Power Generation and Battery Charging	Zero-Speed Operation of CSI-Fed Induction Motor Drive	Photovoltaic-Wind Hybrid System with Battery Back-up Optimized for Apartment Complexes and other Community Living Environments	A Switching Strategy for Multiple-Input Converters	Minimization of Cogging Torque in a Small Axial-Flux PMSG with a Parallel-Teeth Stator	Introducing the Elliptical Carrier for PWM Inverters: Derivation and Properties for Phase-Shift Compensation	A DSTATCOM with ADALINE Algorithm for Current Compensation in Distributed Generation Systems	HF Voltage Generation in a Multi-State Switching Cells-Based Single-Phase Multilevel PFC Rectifierer	Novel Concepts for High Frequency High Efficiency Transformer Design	Analysis and Characterization of DC Bus Ripple Current of Two-Level Inverters Using the Equivalent Centered Harmonic Approach
11:15 am – 11:40 am	Evaluating the Application of Energy Storage and Day-Ahead Solar Forecasting to Firm the Output of a Photovoltaic Plant	Characteristics of Axial type Switched Reluctance Motor	Input Power Factor Compensation for PWM-CSC Based High-Power Synchronous Motor Drives	Flexible Electrical Power System Controller Design and Battery Integration for 1U to 12U CubeSats	Sliding-Mode Control of Quasi-Z-Source Inverter with Battery for Renewable Energy System	A Review of Recent Developments in Electrical Machine Design Optimization Methods with a Permanent Magnet Synchronous Motor Benchmark Study	A New Three-Phase Hybrid Five-Level Inverter with Reduced Number of High-Frequency Switching Devices	Instantaneous Phase-Locked Loop for Performance Improvement of System with STATCOM under Single-Line to Ground Fault	Low-Frequency Leakage Current Reduction using Active Control of Single-Phase PWM Rectifier	A Novel Integrated Multi-Elements Resonant Converter	Model Predictive Control of Z-Source Neutral Point Clamped Inverter
11:45 am – 1:40 pm	**Awards Luncheon** ..... *Regency ABCD*										

THURSDAY, SEPTEMBER 22, 2011 *(Continued)*

Breakout Sessions • 1:40 pm - 3:20 pm

	Ellis West	Curtis A	Cassidy	Ellis East	Remington	Cowboy Artists	Russell	Sundance	Borein	Phoenix
	S95: Ocean and Wave Energy Harvesting I	S96: Power Devices: Measurement and Characterisation	S97: Drive Issues II	S98: Grid Interactive Renewable Energy Systems	S99: DC-DC Converters: Topologies III	S100: Special Application Machines	S101: Modular Multilevel Converters	S102: Active Filters Applications	S103: Three-Phase AC-DC Rectifiers	S104: Soft-Switching Inverters
1:40 pm – 2:05 pm	Wave Energy Converter with Wideband Power Absorption	Automatic Measurement of the Reverse Recovery Behavior of Ultra-Fast Diodes	Control of PWM Voltage Source Inverter in the Pulse Dropping Region to Reduce Reflected Wave Motor Over-Voltage	Utility Grid Impact with High Penetration PV Micro-Inverters Operating Under Burst Mode Using Simplified Simulation Model	Canonical Small-Signal Model of Double-Input Converters Based on H-Bridge Cells	Damper Windings for the Magnetic Gear	A New Three-Phase AC-AC Modular Multilevel Converter with Six Hexagonally Arranged Branches	Design and Testing of a Medium Voltage Controllable Network Transformer Prototype with an Integrated Hybrid Active Filter	Selective Harmonic Compensation (SHC) PWM for Grid-Interfacing High-Power Converters	Dynamic Analysis and Control of a Zone-Control Induction Heating System
2:05 pm – 2:30 pm	Efficient Energy Harvester for Microbial Fuel Cells Using DC-DC Converters	Can Power Devices' Sensitivity to Mechanical Stresses Be Used as a Sensor for Power Assembly Health Monitoring?	Embedded-Friendly Online Dead-Time Compensation Using PWM Timer	Energy Capture Improvement of a Solar PV System with a Multilevel Inverter	A Novel Half-Bridge Converter with Current Ripple Reduction	Experimental Evaluation of a Motor Integrated Permanent Magnet Gear	Complex Phasor Modeling and Control of Modular Multilevel Inverters	A High Power Medium-Voltage DC Amplifier System	Development of an All SiC High Power Density Three-Phase Rectifier with Interleaving	1/3 Weight Core of a Capacitor-Less ARCP Method Three-Phase Voltage Source Soft-Switching Inverter suitable for EV
2:30 pm – 2:55 pm	Universal Power Management IC for Small-Scale Energy Harvesting with Adaptive Impedance Matching	High-Bandwidth, High-Fidelity In-Circuit Measurement of Power Electronic Switching Waveforms for EMI Generation Analysis	Feedforward Control for SPMSM with Final State Control Based on Voltage Limit Circle with Transient Term	A DC-Link Voltage Control Scheme for Single-Phase Grid-Connected PV Inverters	Design Considerations of a Multiple-Input Isolated Single Ended Primary Inductor Converter (SEPIC) for Distributed Generation Sources	A Line-Fed Permanent Magnet Motor Solution for Drum-Motor and Conveyor-Roller Applications	Continuous Model of Modular Multilevel Converter and Experimental Verification	Study of a New Technique to Reduce the DC-Link Capacitor in a Power Electronic System by Using a Series Voltage Compensator	A Multi-Carrier PWM for Parallel Three-Phase Active Front-End Converters	Switching Control Strategy to Extend the ZVS Operating Range of a Dual Active Bridge AC-DC Converter
2:55 pm – 3:20 pm	Design and Experiments of Linear Tubular Generators for the Inertial Sea Wave Energy Converter	Experimental Study of Power Module with SiC Devices	On-Line Condition Monitoring for MOSFET and IGBT Switches in Digitally Controlled Drives		A Variable Frequency Soft Switching Controlled Boost-Flyback Converter for High Step-Up Applications	Design Study of a Three-Phase Brushless Exciter for Aircraft Starter/Generator	Capacitor Voltage Balancing Control Based on CPS-PWM of Modular Multilevel Converter	Directional Triplen Hybrid Active Filter for Radial Systems	New Considerations in the Input Filter Design of a Three-Phase Buck-Type PWM Rectifier for Aircraft Applications	
3:20 pm – 3:40 pm	**PM Break** ..... *Atrium Lobby*									

THURSDAY, SEPTEMBER 22, 2011 *(Continued)*

	Breakout Sessions • 3:40 pm - 5:00 pm						
	Ellis West	**Curtis A**	**Ellis East**	**Remington**	**Cowboy Artists**	**Russell**	**Sundance**
	S105: Ocean and Wave Energy Harvesting II	**S106: IGBT Modules**	**S107: DC Microgrids**	**S108: Multiphase DC-DC Converters**	**S109: Synchornous Reluctance Machines**	**S110: Boost Inverters**	**S111: Utility Applications**
3:40 pm – 4:05 pm	Experimental Evaluation of a Doubly-Fed Linear Generator for Ocean Wave Energy Applications	Diagnostic Characterization of High-Power IGBTs with Field Instrumentation: Pitfalls in Using Curve Tracers Only and Improvements by Oscilloscopes	Game Theoretic Bus Selection in DC Power Systems	Impact of Input and Output Voltage Perturbation on the Behavior of Automotive Multi-Phase Converters with Coupled Inductors	Rotor Structure for Reducing Demagnetization of Magnet in a PMASynRM with Ferrite Permanent Magnet and its Characteristics	Switched-Boost Inverter Based on Inverse Watkins-Johnson Topology	Transformer-Less Intelligent Power Substation Design with 15kV SiC IGBT for Grid Interconnection
4:05 pm – 4:30 pm	Per-Unit Wave Energy Converter System Analysis	Characterization of a 6.5 kV / 500 A IGBT Module in a Series Resonant Converter	Control of Parallel-Connected Bi-Directional AC-DC Converters in Stationary Frame for Microgrid Application	H2-Optimal Thermal Management for Multi-Phase Current Mode Buck Converters	Performance Evaluation of a High Power Density PMASynRM with Ferrite Magnets	High Voltage Gain Boost Converter Topology for Grid Connected Systems	A Half-Bridge Inverter Based Current Balancer with the Reduced DC Capacitors in Single-Phase Three-Wire Distribution Feeders
4:30 pm – 4:55 pm		Turn-On Loss vs. Free-Wheel Diode Recovery DV/DT in IGBT Modules	DC-Bus Voltage Regulation and Power Compensation with Bi-Directional Inverter in DC-Microgrid Applications	Design and Characterization of a Three-Phase Dual Active Bridge DC-DC Converter in Wye-Delta Connection for a High Frequency and High Power Applications	Magnet Minimization in IPM-PMASR Motor Design for Wide Speed Range Application	High Step-Up Single-Stage Boost Inverter	Design Aspects of a Square-Wave Series Voltage Compensator
4:55 pm – 5:00 pm							Series Connected IGCT Based Three-Level Neutral Point Clamped Voltage Source Inverter Pole for High Power Converters

Registration Booth

Saturday through Thursday
Atrium (Hyatt Regency Phoenix)

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

Saturday, September 17	3:00 pm – 5:00 pm
Sunday, September 18	7:00 am – 7:00 pm
Monday, September 19	7:00 am – 7:00 pm
*Tuesday, September 20	7:00 am – 6:00 pm
Wednesday, September 21	7:00 am – 7:00 pm
Thursday, September 22	7:00 am – 3:00 pm

**On Tuesday, the registration booth will be located in West Hall Prefunction at the Phoenix Convention Center.*

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 (except the Industry Student Dinner). Additional guest tickets for receptions can be purchased at the Registration Desk.

Full Conference Registration Rates

IEEE Member	$675.00
Student IEEE Member	$225.00
Society Member	$625.00
Life Member	$300.00
Non-Member	$900.00

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 (Monday only).

One-Day Registration Rates

Society Member	$325.00
IEEE Member	$375.00
Non-Member	$425.00

Certificate of Attendance

Certificates of Attendance will not be provided for ECCE 2011.

Tutorial Registration**

Tutorials will take place on Sunday, September 18, 2011. 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 12 tutorials.

Society Member	$325.00
IEEE Member	$350.00
Non-Member	$375.00

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

Expo Only

Expo Only Registration gives admission to the Exposition, only, on Tuesday, September 20. Admission is $25 for those entering between 9:00 am – 1:30 pm, free to those entering after 1:30 pm. Registration is required. You may purchase an Expo Only Registration at the Registration Desk located just outside the Exhibit Hall on Tuesday.

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
ECCE Banquet Ticket	$75.00
Awards Luncheon Ticket	$60.00
Lunch Ticket	$30.00
Industry Student Dinner	$100.00

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 at 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
Atrium (Hyatt Regency Phoenix)

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

Thy Hyatt Regency Phoenix Business Center is located on the first floor, lobby level and is open every day, Sunday through Saturday from 9:00 am – 5:00 pm. Services include copies, faxing, 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

The Security Department at the Hyatt Regency Phoenix is equipped with basic first aid supplies. If you are in need of emergency services or hospital care, the nearest hospitals are as follows:

Good Samaritan Medical Center
1111 E McDowell
Phoenix, AZ 85006
602-239-2000
1.9 miles from hotel

St Luke Medical Center
1800 E Van Buren
Phoenix, AZ 85006
602-251-8100
1.9 miles from hotel

Hotels

The ECCE 2011 headquarters hotel is the Hyatt Regency Phoenix:

Hyatt Regency Phoenix
122 North 2nd Street
Phoenix, Arizona, USA 85004
Tel: (602) 252-1234 Fax: (602) 254-9472

Internet Access

Complimentary wireless internet access will be available for ECCE 2011 attendees in the designated hot spot area of the Expo Hall (West Hall 1) at the Phoenix Convention Center on Tuesday and in the Atrium at the Hyatt Regency Phoenix on Monday through Thursday.

Local Transportation

The Phoenix Sky Harbor International Airport is located 6.5 miles from the hotel, or about a 15 minute drive. A taxi fare will run about $18.00, one way and Taxis are readily available 24hrs a day both at the airport and outside the Hyatt Regency Phoenix. For private pickups, AAA Sedans is the preferred vendor and they can be reached at 1-480-888-8888 to schedule a pickup.

You may also choose to take the Valley Metro Light rail from the Airport to and from the Hyatt Regency Phoenix. To get to the Hyatt on the light rail you will need to take the Free PHX airport shuttle to the **44th & Washington** Metrorail stop and take the train to stop #14 — **3rd & Washington**. Once off the train, exit left (West) off the train towards 2nd Street. Head right (North) on 2nd Street and the Hyatt will be one block North on your left-hand side. For more information and rates for the light rail, please visit www.valleymetro.org.

Lost & Found

Lost and found is located at the event registration desk in the Atrium at the Hyatt Regency Phoenix.

Parking

Self-parking at the Hyatt Regency Phoenix is available in the city run and owned garage at the corner of 2nd Street and Adams Street. Per day pricing is currently $19.00 and is subject to change without notification. Self-parking is on a first come, first serve basis. Valet parking is also available at the hotels front drive, current valet parking price is $27.00 per day. Self and valet parking can be posted to guest rooms. Please inquire at the front desk for this service.

Meals & Refreshments

Full conference registration includes all meals, refreshments and social functions (except the Industry Student Dinner) provided by ECCE 2011.

Morning Refreshments

Monday, Wednesday and Thursday – *Atrium (Hyatt Regency Phoenix)*, Tuesday – *West Hall 1 (Phoenix Convention Center)*

Monday, September 19 ..... 10:00 am – 10:20 am
Tuesday, September 20 ..... 9:20 am – 9:40 am
Wednesday, September 21 ..... 9:40 am – 10:00 am
Thursday, September 22 ..... 9:40 am – 10:00 am

Lunch

Tuesday – *West Hall 1 (Phoenix Convention Center)*

Tuesday, September 20 ..... 12:00 pm – 1:20 pm

Awards Lunch

Thursday – *Regency ABCD (Hyatt Regency Phoenix)*

Thursday, September 22 ..... 11:45 am – 1:40 pm

Afternoon Refreshments

Monday, Wednesday and Thursday – *Atrium (Hyatt Regency Phoenix)*, Tuesday – *West Hall 1 (Phoenix Convention Center)*

Monday, September 19 ..... 3:00 pm – 3:20 pm
Tuesday, September 20 ..... 3:00 pm – 3:30 pm
Wednesday, September 21 ..... 3:10 pm – 3:30 pm
Thursday, September 22 ..... 3:20 pm – 3:40 pm

Special Events

Meet and Greet the Fellows Reception

Sunday, 5:00 pm – 7:00 pm
Atrium (Hyatt Regency Phoenix)

Join us for a Meet and Greet the Fellows Reception within the Sunday evening Opening Reception of ECCE 2011. A chance to chat, take photos and congratulate the 2011 IEEE Power Electronics Society Class of Fellows that have chosen to receive their award at ECCE.

PELS Fellows

Ivo Barbi PEL, IE
Federal University of Santa Catarina Department of Electrical Engineering

Honored for contributions to soft switching converter technology.

Bo Cho PEL, IA, AES, IE
Seoul National University School of EE and Computer Science

Honored for contributions to large-scale distributed power electronics systems.

Fujio Kurokawa PEL, IA, IE
Nagasaki University

Honored for contributions to switching power converter control.

Zheng Shen PEL
University of Central Florida

Honored for contributions to the development of lateral power metal-oxide semiconductor field-effect transistors.

Vatche Vorperian PEL
Jet Propulsion Laboratory California Institute of Technology

Honored for contributions to pulse width modulated and resonant converters.

IAS Fellows

Ram Bhatia PEL, IA
ABB Group

Honored for leadership in management of large motor projects.

Joseph Ojo PEL, PE, IA, IE
Tennessee Tech University

Honored for contributions to dual stator winding electric machines.

New to ECCE/PELS/IAS Reception

Sunday, 4:30 pm – 5:00 pm
Atrium (Hyatt Regency Phoenix)

Are you new to ECCE and have not previously been involved with PELS or IAS? Attend this reception to meet other new attendees and the organization's leaders to enhance your ECCE experience.

Opening Reception

Sunday, 5:00 pm – 7:00 pm
Atrium (Hyatt Regency Phoenix)

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

Guest Breakfast

Monday, 9:00 am – 10:00 am
Suite 322 (Hyatt Regency Phoenix)

ECCE guest ticket holders are invited to attend the ECCE Guest Breakfast. The hotel concierge will join you at 9:30 am to discuss things to do while you are in Phoenix and to answer any specific questions about the city.

Expo Reception

Monday, 5:00 pm – 7:00 pm
West Hall 1 (Phoenix Convention Center)
Supported in part by Opal-RT Technologies, Inc.

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.

Industry Student Dinner

Monday, 8:00 pm – 10:00 pm
West Hall 1 (Phoenix Convention Center)
Supported by GE Global Research and Nexteer Automotive

The Industry Student Dinner will bring together students and industry for an information exchange session. Leading industry representatives will present information on the latest technologies and products they are developing and provide opportunity for the student community to see how their learning experiences are applied in the industry.

All ECCE 2011 student registrants can attend this event for free. Exhibitors have been given three free tickets to the dinner and may purchase additional tickets for $50. Tickets for individuals from non-sponsoring/non-exhibiting organizations are available for $100 and can be purchased at the ECCE Registration Desk.

During the dinner, students will have the opportunity to display posters displaying student projects or other industry-related interests to discuss with industry partners during this event. At the end of the night, each industry participant will be able to vote for the top three posters. These posters will be displayed and announced in the exhibit hall during lunch on Tuesday.

Many students reserved space for their posters in advance of the conference. If you were unable to do so, we still welcome you to bring your poster but space will be allotted on a first come, first serve basis for all posters not reserved in advance. All posters must be removed by 10:10 pm on Monday night.

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

ECCE Banquet

Wednesday, 7:00 pm – 9:30 pm
North 120 B-D (Phoenix Convention Center)

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

Oral Presenters

Speaker Ready Room

Saturday through Thursday
Moran (Hyatt Regency Phoenix)

ALL Oral Presenters must check in at the Speaker Ready Room at least 4 hours prior to their scheduled presentation. 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:

Saturday, September 17	3:00 pm – 5:00 pm
Sunday, September 18	7:00 am – 7:00 pm
Monday, September 19	7:00 am – 7:00 pm
Tuesday, September 20	7:00 am – 6:00 pm
Wednesday, September 21	7:00 am – 7:00 pm
Thursday, September 22	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 queue your presentation onto the networked conference computers. The file will then be transferred to the computer network for presentation in the scheduled room.

Oral Presenters' Orientation and Breakfast

A Presenters' orientation will be held for all presenters and session chairs from 7:00 am – 8:00 am, Monday, Wednesday and Thursday in the Phoenix Ballroom at the Hyatt Regency Phoenix. 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

Poster Presentation Schedule

Tuesday
West Hall 1 (Phoenix Convention Center)

Poster Session I	10:30 am – 12:00 pm
Poster Session II	3:30 pm – 5:00 pm

300 posters will be on display on Tuesday in West Hall 1 of the Phoenix 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 will be presented, please review the complete Technical Program schedule starting on page 34.

Poster Session I Setup
Presenters will have access to the exhibit hall, West Hall 1 (Phoenix Convention Center), starting at 8:30 am to set up their poster. Presenters for Poster Session I must have their posters set-up no later than 10:30 am. Poster presenters must then take their posters down promptly at 12:00 pm. 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. Uncollected posters will be discarded if not picked up by Wednesday at 5:00 pm.

Poster Session II Setup
Presenters for Poster Session II will have from 1:30 pm to 3:00 pm to set-up their posters. Posters for Poster Session II must be set up no later than 3:00 pm and must be removed no later than 5:00 pm.

Do not leave your presentation on the poster board. Posters remaining after 5:30 pm on Tuesday will be removed and kept at the Registration Desk. Uncollected posters will be discarded if not picked up by Wednesday at 5:00 pm.

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.

Poster Presenter's Orientation and Breakfast

The poster presenter's orientation will be held from 7:00 am - 8:00 am, on Tuesday, in the Phoenix Ballroom of the Hyatt Regency Phoenix. Presenters should meet with their respective session chair to review the format and timing of the session and alert conference management of any changes. Only one presenting author per poster should attend; you may only attend breakfast on the day you are scheduled to present (Tuesday).

All of the following meetings will be held at the Hyatt Regency Phoenix.

IAS Committee Meetings

Industrial Power Conversion Systems Department
Sunday, September 18
7:00 pm – 8:00 pm
Sundance

Industrial Drive Committee
Monday, September 19
7:00 pm – 8:00 pm
Russell

PEDCC
Monday, September 19
7:00 pm – 8:00 pm
Cowboy Artists

Electric Machines Committee
Tuesday, September 20
6:00 pm – 8:00 pm
Cowboy Artists

IPCC in conjunction with **PELS Technical Committee**
(Power Conversion Systems and Components)
Tuesday, September 20
6:00 pm – 7:00 pm
Ellis East

ECCE Committee Meetings

2013 ECCE Organizing Committee
Sunday, September 18
8:00 pm – 9:00 pm
Sundance

Technical Program Committee
Monday, September 19
7:00 pm – 8:00 pm
Boardroom, Second Floor

2012 ECCE Organizing Committee
Tuesday, September 20
6:30 pm – 7:30 pm
Suite 318

ECCE Steering Committee
Wednesday, September 21
1:30 pm – 3:30 pm
Boardroom, Second Floor

PELS Committee Meetings

PELS Meetings Committee
Sunday, September 18
11:30 am – 4:30 pm
Borein

Editorial Meeting IEEE Trans. on PE
Sunday, September 18
4:00 pm – 7:00 pm
Suite 324

IEEE PELS Sustainable Energy Technical Committee
Monday, September 19
7:30 pm – 8:30 pm
Remington

PELS Bylaws and Constitution Committee
Tuesday, September 20
8:00 am – 9:00 am
Boardroom, Second Floor

IEEE Power Electronics Society Standards Committee *(PELSC)*
Tuesday, September 20
6:00 pm – 7:00 pm
Suite 324

Technical Committee *(High Performance and Low Cost Applications)*
Wednesday, September 21
11:40 am – 1:30 pm
Suite 324

PELS Nominating Committee
Wednesday, September 21
12:00 pm – 1:00 pm
Suite 318

PELS Electronics Transformers Technical Thrust
Wednesday, September 21
1:00 pm – 4:00 pm
Suite 314

Power Magnetics for Smart Grid: IEEE Standards Roadmap
Wednesday, September 21
4:00 pm – 6:30 pm
Suite 324

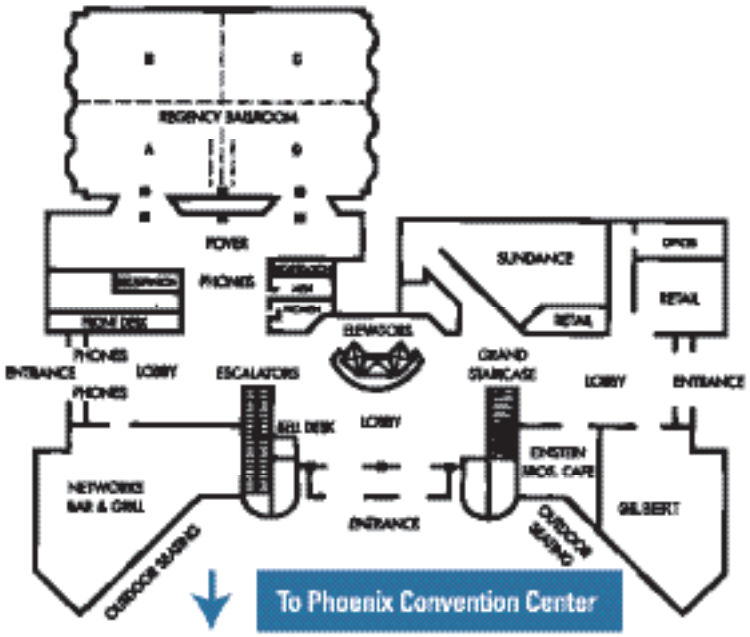
PELS TC Chairs
Thursday, September 22
12:00 pm – 2:00 pm
Boardroom, Second Floor

PELS Operations Committee
Thursday, September 22
4:00 pm – 10:00 pm
Cassidy

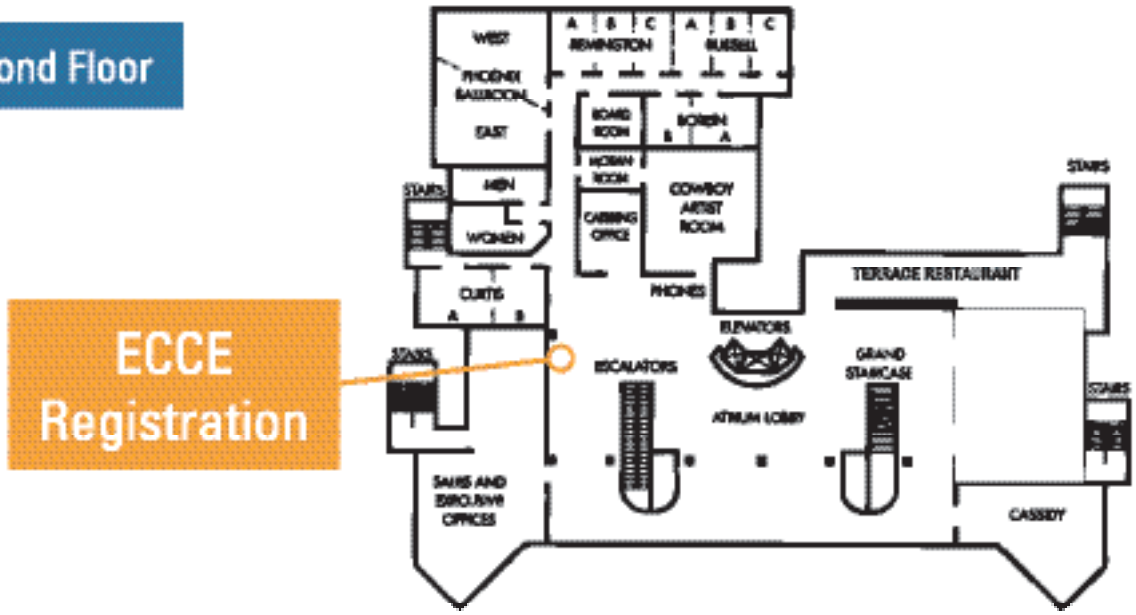
PELS AdCom Committee Meeting
Friday, September 23
7:00 am – 3:00 pm
Ellis

Hyatt Regency Phoenix Floor Plan

First Floor

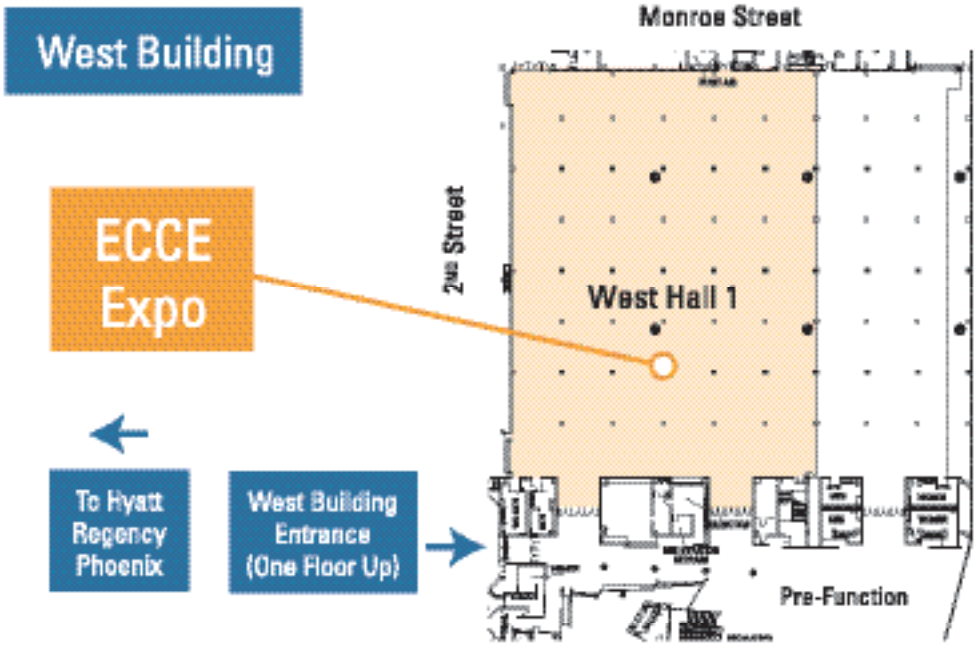


Second Floor



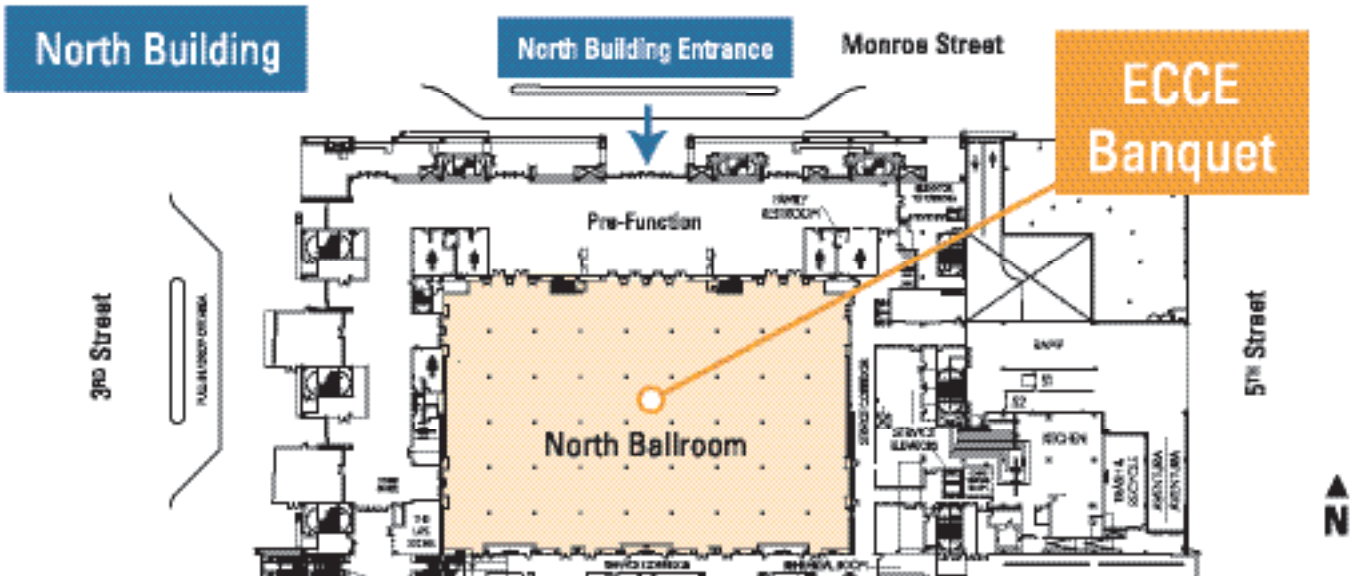
Events held at the Hyatt Regency Phoenix *(see map above)*

Event	Location	Date
Tutorials	Russell, Borein, Cowboy Artist, Curtis, Ellis and Cassidy	September 18
ECCE Opening Reception	Atrium	September 18
Breakout Sessions	Regency, Phoenix, Sundance, Remington, Russell, Borein, Cowboy Artist, Curtis, Ellis West, Ellis East, and Cassidy	September 19-22
Plenary Session	Regency ABCD	September 19
Rap Sessions	Remington, Russell and Borein	September 20
Awards Luncheon	Regency ABCD	September 21



◀ The Phoenix Convention Center West Building is located directly across the street from the front entrance of the Hyatt Regency Phoenix. The entrance to the West Building is on 2nd Street. From there, you will need to take the escalators down one floor to the West Hall located on the Lower Level.

▼ The entrance to the North Building is on Monroe Street.



Events held at the Phoenix Convention Center *(see map above)*

Event	Location		Date
Exposition	West Hall 1		September 19-20
Expo Reception	West Hall 1	*Supported in part by Opal-RT Technologies, Inc.*	September 19
Industry Student Dinner	West Hall 1	*Supported by GE Global Research and Nexteer Automotive*	September 19
Student Demonstrations	West Hall 1		September 20
Industrial Seminars	West Hall 1		September 20
Poster Sessions	West Hall 1		September 20
Cocktail Reception	West Hall 1	*Supported in part by JSOL Corporation and Powersys, Inc.*	September 20
ECCE Banquet	North 120 B-D		September 21

Monday, September 19 **8:00 am – 10:00 am**

Chair: K. Rajashekara, *Rolls Royce Corporation, USA*
Regency ABCD

GaN as a Displacement Technology for Silicon in Power Management

For the past three decades, power management efficiency and cost have shown steady improvement as innovations in power MOSFET structures, technology, and circuit topologies have paced the growing need for electrical power in our daily lives. In the last few years, however, the rate of improvement has slowed as the silicon power MOSFET has asymptotically approached its theoretical bounds. We will address the new game-changing power management products, available today and planned for the near future, that are built using Gallium-Nitride. Enhancement mode eGaNTM FETs, first introduced in June 2009, will be demonstrated in various applications and compared against state-of-the-art silicon power MOSFETs. GaN roadmaps for improved device performance and for system-on-chip integration will also be discussed. Performance is only one dimension in the equation leading to the conclusion that GaN-on-silicon is a broad displacement technology for silicon-based power devices. The other dimensions are product reliability, ease of use, and cost. These topics will also be discussed showing that the capability to displace silicon across a significant portion of the power management market is now in hand.

Dr. Alex Lidow is Co-founder and CEO of Efficient Power Conversion Corporation (EPC). EPC is privately funded and designs, develops, and produces Gallium-Nitride-on-Silicon transistors and integrated circuits used in power management.

The Past, Present, and Future of Photovoltaics

The solar cell industry has grown at an astonishingly high rate over the past decade. This growth has been both in what one could consider the "traditional" areas such as flat panel crystalline silicon arrays, as well as in "new" technologies such as thin film CdTe arrays on glass. A review will be presented of the past developments in the photovoltaic landscape from the early days and their use in space exploration to their explosive growth in terrestrial power production today. A snapshot of the current PV industry along with a summary of the current technological barriers will be given. Finally, examples of the future areas of research and a summary of what is needed to continue to accelerate PV adoption in the U.S. will be provided.

Dr. Ryne Raffaelle is presently the Vice President for Research and Associate Provost at Rochester Institute of Technology, Rochester, NY. Prior to this, he was the Director of National Center for Photovoltaics in the U.S. Department of Energy's (DOE) National Renewable Energy Laboratory (NREL).

A Joule in Hand Is Worth Ten in the Ground

In many applications, the energy converted to useful work is a small fraction of the potential energy of the natural resource used. Consequently, there is a vast resource of wasted energy available to be tapped. This is the near-term opportunity of energy efficiency and can be harnessed by adopting a systems approach and recognizing the value of demand-side management together with advances on the supply side. Within this broader context, power conversion technologies play a critical role enabling gains in overall system efficiency in applications ranging from buildings to airplanes over their full life cycle.

Dr. David Parekh serves as Vice President, Research, and Director, UTRC, responsible for advancing the corporation's commitment to growth through technology and innovation. UTRC is the corporate research center for the businesses of United Technologies.

Tuesday, September 20 **7:30 pm – 9:00 pm**

R1 Mission Impossible? A 100% Renewable Energy Society

Remington

Two presentations by invited experts will briefly describe the latest initiatives and plans for Hawaii in the US and for Denmark in the EU. In "The US Story — Hawaii", Professor Anthony Kuh from the University of Hawaii will discuss the Hawaii Clean Energy Initiative and Renewable Energy and Island Sustainability (REIS) program at the University of Hawaii at Manoa. In "The European Story — Denmark", Dr. Carsten Hein Westergaard will discuss the current state of wind energy in Denmark, and what it takes to go beyond and even reach 100%.

Moderator
Dan M. Ionel, *Chief Scientist, Vestas Americas*

Presenters
Anthony Kuh, *Chair, Electrical Engineering Department, University of Hawaii, and Director, Renewable Energy and Island Sustainability (REIS) Center*
Carsten Hein Westergaard, *Director of Global Technology, Vestas Americas*

R2 Vehicle Electrification Technologies, Today and Tomorrow

Russell

Electric drive vehicles use grid electricity to displace the usage of gasoline and reduce total emissions in personal and commercial transportation systems. It is clear that, with strong support from government and industry around the world, the paradigm shift is inevitable. Power electronics and electric machines are the enabling technology propelling this paradigm shift. Manufacturers and suppliers are racing to develop and perfect new technologies which will not only affect consumers, but will also affect society as a whole, having economic, governmental and also environmental impacts. This rap session is to look at the emerging technologies in the field that may have profound impacts on the electrification of the automobile.

Moderator
Chris Mi, *Associate Professor, University of Michigan – Dearborn*

Presenters
Chris Mi, *Associate Professor, University of Michigan – Dearborn*
Jim Spangler, *Senior Researcher, Argonne National Laboratory*
Burak Ozpineci, *Group Leader, Oak Ridge National Laboratory*
Chun-Taek Rim, *Professor, Korea Advanced Institute of Science and Technology*

R3 Plug-in Electric Vehicles and the Electric Power Grid: Colliding Industries

Borein

With the predicted rise of Plug-in hybrid electric vehicles, the first time in the history, automotive manufacturers and electric power companies are working together to identify conflicts, challenges, and benefits. Collaborative fleet studies are being carried out around the country. Automotive companies are investigating fuel economy, battery life, and warranty related issues; and electric power companies are looking at impact to existing infrastructure and possible usages of PHEVs to alleviate problems such as mismatch between demand and supply. Meanwhile, to make things more complex, large fleet owners are expecting to maximize the return of their investments by providing ancillary functions such as frequency regulation. For all the parties involved, expectations and doubts co-exist. Thus, with three presentations by experts from industry, national lab, and academia, this rap session will focus on the interactions between Plug-in hybrid vehicles and electric power grids. Load impact, vehicle to grid, communication, ancillary functions, ownership, charging facilities, policy and standards will be discussed.

Moderator
Jin Wang, *Professor, Ohio State University*

Presenters
Jin Wang, *Professor, Ohio State University*
Haukur Asgeirsson, *Manager, DTE Energy*
Ted Bohn, *Senior Researcher, Argonne National Laboratory*

Note: All tutorials are held on September 18, 2011. Pre-registration for each tutorial is required. Please visit the Registration Desk for space availability.

Sunday, September 18 **8:30 am – 12:00 pm**
Morning Sessions

T1-1 Practical Aspects in Modern Design Process of Electric Motors

Russell

Instructors: David A. Staton, *Motor Design Ltd., UK;* Dan M. Ionel, *Vestas R&D Technology Americas, Inc., USA;* David G. Dorrell, *University of Technology Sydney, Australia,* and Gianmario Pellegrino, *Politecnico di Torino, Italy*

The tutorial covers from an industrial perspective some of the latest developments in the subject of electric machines and includes timely topics such as heating and ventilation, the effect of manufacturing tolerances, the influence of fabrication processes on material properties, the unbalanced magnetic pull and the torque ripple due to eccentricity, manufacturing technologies like segmented stators for brushless PM machines and die-cast copper rotors for induction motors, the role of computer aided engineering in the industrial environment. The fundamental theory of brushless DC, inverter and line-fed synchronous PM, induction and switched reluctance machines is briefly reviewed. The relative merits of each machine type are discussed. The state of the art topologies and the emerging trends are also presented. Particular emphasis is placed on the possible shortage of NdFeB magnets and on potential alternatives for rare-earth free or even magnet free solutions. The presentation includes the main aspects of power electronics and controls directly affecting the electric machines. Topics such as the risk for PM demagnetization, the effect of switching frequency, supplementary losses and heating are discussed. Design procedures that include a multi-physics approach encompassing the electromagnetic and the thermal field together with the mechanical stress are described. The electromagnetic methods range from analytical closed-form techniques to ultra-fast simplified FEA and time stepping transient FEA. A lumped parameter model is preferred for the thermal study. Extensive details are provided for the thermal analysis of electric machines, which is a topic less covered in the published literature. Many examples are provided from a variety of industries ranging from very small motors for house hold appliances, to fans and pumps that account for the largest proportion of energy consumption and go all the way to some of the largest traction motors and generators developed for renewable and alternative energy applications. A discussion of the trends and anticipated industry developments is also included. The course topics are structured as follows: (I) Efficient multi-physics analysis of electrical motors; (II) Thermal analysis of electrical machines – the neglected design aspect; (III) Application example – Interior permanent magnet motor; (IV) Manufacturing process effects on the electrical motors design procedures.

T1-2 Understanding of Electrical Concepts in Wind Turbines and Photovoltaic Arrays

Ellis West

Instructor: Ned Mohan, *University of Minnesota, USA*

This 4 hour tutorial will present the basic concepts in understanding how electricity is generated by wind turbines and photovoltaic arrays. The primary audience is engineers (EE, ME, CE, etc) who are involved with developing these plants, and are not very familiar with the electrical basics that they should know. The topics include basics of power systems and power electronics, as well as of electric drives required in wind turbines. The interface between the source (wind turbines or PV arrays) and the grid needs to be controlled such as the overall system operates at the maximum power point under varying input conditions. In addition to providing the big picture, the following topics will be covered: Energy Scenario, Power Systems Basics, Power Electronics and Electric Drives.

T1-3 Carrier Based PWM Methods For AC-DC-AC and AC-AC Power Conversion Systems

Cowboy Artists

Instructors: Seung-Ki Sul, *Seoul National University, Republic of Korea,* and Ahmet M. Hava, *Middle East Technical University, Turkey*

Switch mode power converters such as voltage source inverters/converters (VSI/VSC) are widely employed in most electric energy systems (in AC motor drives in industry, wind turbine and PV systems in renewable energy, in HVAC systems in residential areas, in electric drives of HEV applications, etc.). Operating with fixed DC bus voltage, VSIs provide controlled frequency and voltage output at the AC terminals by means of pulse width modulation (PWM) techniques. Recently reaching the commercialization stage, matrix converters also utilize the PWM techniques. Thus, PWM methods are widely employed in AC/DC/AC or AC/AC switch mode power conversion. Starting in 1960s and developing rapidly (at the most accelerated pace over the last decade), the carrier based PWM (CB-PWM) techniques have been exclusively researched. With various power converter topologies available and large number of PWM techniques existing, the understanding, selection, and implementation of CB-PWM methods is a significant challenge; a methodical classification, selection, and implementation technique is required. Intended, for intermediate level audience, this tutorial provides the attendant the necessary in depth background on CB-PWM methods for switch mode power converters. The modern power converter topologies utilizing CB-PWM are reviewed, CB-PWM principles reviewed, and then CB-PWM methods are investigated in detail. The methods are classified, their performance characteristics evaluated, and their implementation and application examples are discussed. Attendees can directly apply the knowledge gained to their practical design and implementation problems. The proposed tutorial is a half day tutorial and it consists of the four main parts below listed. Part 1: Basic Voltage Source Converter Topologies Utilizing PWM; Part 2: The Task and The Location of The PWM Unit in The VSI/VSC of a Power Conversion System; Part 3: PWM Principles, Methods, Performance Characteristics, and Implementation Issues; Part 4: Applications of PWM Methods in Power Converters.

T1-4 Reliability of IGBT Modules in Energy Conversion

Ellis East

Instructors: John F. Donlon and Eric R. Motto, *Powerex, Inc., USA*

This tutorial addresses the reliability of the IGBT power module which is the heart of converters used in energy conversion applications. It has proven to be a highly reliable and rugged component. However, it must be applied within its ratings and capabilities. This tutorial will discuss the proper selection of the IGBT, its limitations and failure modes, the precautions that must be taken to ensure long life, and the design and application considerations that affect reliability. Attendees will gain an understanding of the need to protect the IGBT from internal and external disturbances and practical solutions to over current, over voltage, and over temperature conditions. The workshop is intended to be of interest to those who use, apply, procure, or specify power electronic products based on the IGBT as the power switch.

T1-5 Ultra-Capacitors in Power Conversion: Analysis, Modeling and Design in Theory and Practice

Cassidy

Instructor: Petar J. Grbovic, *HUAWEI Technologies, Germany*

In this tutorial, we will discuss application of ultra-capacitors in power conversion, with particular attention on analysis, modeling and design. In first part of the tutorial background and history of power conversion systems will be presented. Needs for the use of energy storage in these applications will be identified and discussed. Background theory of ultra-capacitors will be given in the second part of the tutorial. The ultra-capacitor modeling with attention to the application oriented model will be given. Method to compute the ultra-capacitor current stress and power losses for different conditions will be discussed. We will see how the ultra-capacitor losses depend on the charge/discharge frequency and how the losses can be computed when the charge/discharge current frequency is in range of mHz (very low frequency) and in range of couple of Hz (low frequency). Some application examples, such as variable speed drives with braking and ride through capability will be given. In the third part of the tutorial, structure of a typical power conversion system with ultra-capacitor energy storage will be presented. Different power conversion systems such as variable speed drives, renewable applications (wind for example), autonomous diesel generators, STATCOM devices with short term active power capability and short term UPS will be discussed. The main functional blocks of such systems will be identified. In the fourth part the tutorial, we will discuss selection and design of the ultra-capacitor module. We will see how the ultra-capacitor rated voltage and capacitance should be selected according to the application requirement. Then, losses and efficiency of the ultra-capacitor module versus size and cost will be discussed. Couple of application examples such as variable speed drives will be given. Finally, some aspects of the ultracapacitor module design will be presented. Series connection of elementary ultra-capacitor cells and voltage balancing issue will be discussed. The module thermal design will be considered too. Further, some details of the interface dc-dc converters will be given. Needs for the dc-dc converter will be discussed. State of the art topologies will be compared according to the applications requirement and design guidelines will be given. Couple of design examples will be given. In concluding part of the tutorial, trends in development of the ultra-capacitors and applications will be discussed. This tutorial is aimed at power electronics engineers who want to improve their knowledge and understanding of advanced ultra-capacitor energy storage devices and their application in power conversion, nowadays as well as in the near future.

T1-6 Inductive Wireless Power Transmission

Curtis

Instructor: Eberhard Waffenschmidt, *Fachhochschule Köln, Germany*

Wireless power transmission is known since more than a century, but recently it got more and more attention, because users demand wireless operation for a growing number of applications. Cheap power electronics at suitable operating frequencies are nowadays available and could make those whishes possible. However, the design of such a system is not always straight forward, and engineers are facing a number of issues they didn't have before. Therefore, this tutorial is offered to all, who intend to design an inductive wireless power system and to those, who have to decide, whether an application would be possible. The tutorial covers the following topics: (1) Applications — From Milliwatts to Kilowatts: A number of examples for wireless power applications will be presented ranging from small mobile devices to electric vehicle charging. These will be existing products and examples from R&D; (2) Resonant power transmission: It will be discussed, what the real benefit of resonant operation is. The differences of resonances on the transmitter and the receiver side and parallel and series resonant operation will be investigated. Based on this, the influence on power transfer, losses, efficiency and control will be explained; (3) Limits of inductive power transmission: The wireless power transfer is limited by several parameters. Here, the limits which are determined by efficiency and by magnetic emissions will be determined; (4) Free positioning of receivers: Many wireless power applications benefit from a free placement of a power receiver. Suitable coil arrangements and winding designs will be presented; (5) Design of transmitter and receiver inductors: The quality factor of the transmitter and receiver coils is a crucial parameter for an efficient wireless power system. However, at higher operating frequencies AC losses significantly deteriorate the coil properties. The losses can be minimized by an optimized design, which will be shown for wire-wound and printed circuit board inductors; (6) The Wireless Power Consortium and the Qi standard for mobile devices: In 2010 the Wireless Power Consortium released the first worldwide inductive wireless power standard for mobile devices named Qi. Details of this standard including operating frequency, power control, device detection, and communication format will be explained.

Sunday, September 18 **1:00 pm – 5:00 pm**
Afternoon Sessions

T2-1 Design and Modeling of Dual Fed Asynchronous Generators: Application to Wind Power Generation

Russell

Instructors: James Hendershot and Tanvir Rahman, *Infolytica Corporation, USA*

The design and modeling of dual fed induction generators is considered in this tutorial. The topic will be covered by using examples that are focused primarily for wind power generation applications. The tutorial will begin with an overview of such systems and component identification. The design and modeling methodologies and challenges of various components will be discussed then. This will be followed by discussions on the design of induction generators and their field oriented control strategies. Topics covered will include design strategy for initial design (sizing, material and winding designs), load point analysis, and machine performance etc. Multiphysics aspect (electromagnetic, thermal, and mechanical) of the design algorithms will also be discussed. Aside from generator design, there will also be some general discussions on inverter topology and simulation specific to such devices. Modern computer aided design software will be used to illustrate the various design and simulation strategies related to such systems. As well, a literature review will accompany the presentation to highlight the state-of-the-art of such systems.

T2-2 Design Considerations for Photovoltaic Systems Installed on Curved Surfaces

Ellis West

Instructors: Robert S. Balog and Prasad N. Enjeti, *Texas A&M University, USA*

With the advent of thin film technology, solar photovoltaic (PV) systems can now be installed on any surface which facilitates a paradigm shift from the traditional building applied rigid planar modules to free-form building integrated photovoltaic systems. PV arrays installed on curved surfaces enable new concepts for PV applications but also presents new challenges for balance-of-system components, electrical interconnections and power conditioning electronics. Non-uniform and rapid changes in insolation complicate maximum power point tracking. The aim of this tutorial is to present design considerations for photovoltaic systems installed in or on non-planar surfaces and their associate power conditioning architectures. The tutorial begins with examples of traditional PV systems and emerging applications. Detailed analysis is presented for estimating the available electrical power for PV systems installed on arbitrarily non-planar curved surface along with an analytical thermal model to predict the cell-by-cell operating temperature, which is an important factor in cell efficiency and reliability as well as an important consideration for module integrated power electronics. By way of example, it will be shown that a) conventional "string" PV architectures in which PV modules are connected in series/parallel to a central DC-AC inverter and b) module integrated micro-inverters are not optimal for PV systems installed on highly curved or irregular surfaces. Several new approaches are then reviewed for extracting maximum power along with possible interconnection of module integrated converters with PV cells. Throughout the course numerous design examples of PV systems installed on curved surfaces will be presented with simulation and experimental. Power electronic design engineers who deal with DC-DC; DC-AC converters for renewable energy systems will find this course informative and new knowledge gained in this seminar can be immediately applied.

T2-3 Artificial Intelligence Techniques in Power Electronics and Motor Drives

Cowboy Artists

Instructor: Bimal K. Bose, *University of Tennessee, USA*

Artificial intelligence (AI) techniques, such as expert system (ES), fuzzy logic (FL), artificial neural network (ANN), and genetic algorithm (GA) have recently brought a new and advancing frontier in power electronics and motor drives area, which is already a complex and interdisciplinary technology. The goal of AI is to plant human intelligence in a computer so that a computer can think intelligently like a human being. Computational intelligence has been debated over a long time. There is no denying the fact that AI techniques can solve complex problems which are difficult to solve by traditional methods. Currently, AI technology is advancing at a fast rate, and its applications in power electronics and motor drives are growing fast, as evident by large number of publications in IEEE journals. Recent advancement of powerful DSPs and FPGAs is making implementation of fuzzy and neural systems economical with improvement of performance, compact and more competitive. Evidently, the future impact of this technology on power electronics and motor drives is very significant. The frontier of AI is bringing a new challenge to the traditional engineers specialized in power electronics and motor drives. The tutorial presentation will discuss comprehensively the principles of AI and its applications in power electronics and motor drives. In the beginning, the importance of AI will be reviewed, which will be followed by brief discussion on principles of different AI techniques. However, the presentation will mainly focus on fuzzy logic and neural network (main focus) applications in the control and estimation of power electronic systems, illustrating some application examples. Fuzzy logic example applications will include robust motor speed control, online efficiency optimization of ac drive, and optimal control of modern wind generation system. The ANN application examples will include space vector PWM wave synthesis for 2-level and multi-level converters, delayless filtering of inverter output waves, waveform generation for converters, model referencing adaptive control (MRAC) of ac drives, drift-free flux estimation of drives (approaching zero speed), and neuro-fuzzy control of drives. Time permitting, computer-aided design examples of fuzzy and neural systems will be discussed. Finally, in conclusion, the future prognosis of the technology will be reviewed.

T2-4 Practical Design and Challenges of Traction Inverter for Electrified Vehicles

Ellis East

Instructor: Lihua Chen, *Ford Motor Company, USA*

Specifications provided by automakers for electric drive vary considerably and can leave the traction inverter suppliers with many questions regarding power delivery and key component selection. Requirements the traction inverter designer must meet include voltage and current ratings, steady-state and transient power delivery, high reliability and durability, size, package, and cost, etc. However, compared with regular inverter designs, the harsh vehicle operating environment and worst case scenarios usually are not fully understood by designers until their inverters are failed in vehicle test. The intent of this seminar is to introduce the design and challenges of traction inverter for electrified vehicle applications from a practical point of view. Traction inverter design specifications derived from vehicle applications will be explained; questions and concerns an inverter designer might have will be addressed by technical details and benchmarking inverter examples. Inverter key component selection and sizing will be intensively discussed. Vehicle operation related extreme conditions and worst case scenarios which usually drive the inverter design will also be explained. The attendee should leave the seminar with improved knowledge of particular requirements of traction inverter design and practical challenges. The seminar is to aid design engineer better understanding of traction inverter design to meet automotive application requirements. It should also be of interest to engineers who work on power electronics circuitry for various power conversion applications.

T2-5 Designing with Lithium-Ion Batteries: An Engineering Perspective

Cassidy

Instructor: Ashish Arora, *Exponent, Arizona, USA*

The Lithium-ion chemistry is being adopted rapidly by new sectors of the electronics and electrical industry with the automotive sectors being the latest markets to move towards using Lithium-ion as a power source. Low cost, high energy density, high reliability and low weight are all features commonly listed as reasons that have made various industries move away from Nickel based chemistries (NiCad and NiMH) towards Lithium-ion over the past decade. However, the speed of adaptation of this technology has varied by industries. While the consumer electronics industry has been quick to transition almost completely to using Lithium-ion as an energy storage medium, other industries such as the medical electronics industry has been a slower adapter. Part of the reason for the reluctance by certain industries may be that although Lithium-ion batteries are highly reliable, they do have some unique failure modes. Under rare circumstances, Lithium-ion batteries can go into thermal runaway. During this four hour tutorial, the following topics will be covered: (1) Introduction of the lithium-ion technology and an insight into how the chemistry functions; (2) Comparison of the lithium-ion technology with other battery technologies; (3) Discussion of the typical steps involved in the manufacturing of lithium-ion cells and the quality checks performed during the manufacturing process; (4) Discussion of the safety concerns typically associated with the lithium-ion technology and steps taken to mitigate these concerns in battery and system designs; (5) Discussion of the typical techniques used to evaluate and characterize the performance of these batteries in the field; (6) Examples of the ongoing reliability test (ORT) procedures typically needed once the battery system is in the field in actual applications; (7) Introduction of the typical design topologies and battery management architectures employed for small and large format lithium-ion batteries. This will include examples of typical architectures used in the consumer electronics, telecommunications and automotive industries; and (8) Discussion of the various industry standards that have been developed for evaluating both the safety and reliability of lithium-ion batteries. This will include a description of the approaches taken by the various industry standards. It is expected that the attendee through this tutorial will gain an understanding of lithium-ion batteries and understand not only how the chemistry functions, but also gain insight into techniques used and things to consider when adapting this technology for real-world applications.

T2-6 Multilevel Converters: Recent Development of Topologies and PWM Control Methods

Curtis

Instructors: Yongdong Li, *Tsinghua University, China;* Hirofumi Akagi, *Tokyo Institute of Technology, Japan;* Fangzheng Peng, *Michigan State University, USA;* Jose Rodriduez, *Universidad Técnica Federic Santa Maria, Chile,* and Thiery Meynard, *Institut National Polytechnique de Toulouse, France*

Multilevel converters have become the enabling power conversion technology for high voltage high power applications in power systems and large motor drives. Since the mid of 1990s, many contributors have made great effort in developing new multilevel inverter topologies because the existing multilevel topologies have certain limitations and are not operable in some applications. In this tutorial, the relationship between the existing topologies of multilevel converters, like NPC, flying capacitor, cascaded, MMC and next generation multilevel converters will be analyzed and the different control methods be summarized, and their pros and cons in practical applications are reviewed by the world-class specialists. The emphasis of the tutorial is given to recent development of topologies and their control methods, and the following issues will be covered: (1) Multilevel inverters: a survey of topologies, controls, and application; (2) Recent Advances in Multilevel Converter/ Inverter Topologies and Applications; (3) Topologies of Multi-level Converters and their development; (4) Classification, and Application of Modular Multilevel Cascade Converter; and (5) Multi-level conversion: SMC high voltage inverters.

Monday, September 19 10:20 am – 12:00 pm

S1 Solar PV Technology

Ellis West
Chair: Ahmed Elasser, *GE Global Research Center, USA,* and David Torrey, *Advanced Energy Conversion, USA*

10:20 am • Novel Non-Flat Photovoltaic Module Geometries and Implications to Power Conversion
Amulya Karavadi and Robert Balog, Texas A and M University, College Station, USA

10:45 am • A Test Bench for Accelerated Thermal Ageing of III-V Concentration Solar Cells Using Forward Bias Injection
Fabio Immovilli, Claudio Bianchini, Alberto Bellini and Andrea Sala, DISMI - University of Modena and Reggio Emilia, Italy

11:10 am • Challenges to Overcurrent Protection Devices Under Line-Line Faults in Solar Photovoltaic Arrays
Ye Zhao, Brad Lehman, Jean-Francois De Palma, Jerry Mosesian and Robert Lyons, Northeastern University, USA; Mersen USA Newburyport-MA, LLC., USA

11:35 am • Analysis and Mitigation of Common Mode Voltages in Photovoltaic Power Systems
Somasundaram Essakiappan, Prasad Enjeti, Robert Balog and Shehab Ahmed, Texas A and M University, USA; Texas A and M University - Qatar, Qatar

S2 Power Semiconductors: Thermal Management

Curtis
Chair: Adam Skorek, *University of Québec at Trois-Rivières, Canada*

10:20 am • Study and Realization of a High Power Density Electronics Device Cooling Loop Using a Liquid Metal Coolant
Mansour Tawk, Yvan Avenas, Afef Kedous-Lebouc and Mickael Petit, Grenoble INP-UJF, France

10:45 am • Drift Region Integrated Microchannel Structure for Direct Cooling of Power Electronics
Kremena Vladimirova, Jean-Christophe Crebier, Yvan Avenas and Christian Schaeffer, G2Elab, France

11:10 am • Thermal Management of Compact SMT Multilayer Power Converters
Ivan Josifovic, Jelena Popovic-Gerber and Jan Abraham Ferreira, Delft University of Technology, Netherlands

11:35 am • Development and Electrical Characterization of a Vertical Electrical and Thermal Test Chip (VTTC)
Benoit Thollin, Jean-Christophe Crebier, Yvan Avenas, Pierre-Olivier Jeannin, Zoubir Khatir and Laurent Dupont, G2Elab, France; LTN/IFSTTAR, France

S3 Model-Based Sensorless Control

Cassidy
Chair: Fernando Briz, *University of Oviedo, Spain*

10:20 am • Sensorless Multiphase Induction Motor Drive Based on a Speed Observer Operating with Third-Order Field Harmonics
Luca Zarri, Michele Mengoni, Angelo Tani, Giovanni Serra and Domenico Casadei, University of Bologna, Italy

10:45 am • Square Root Unscented Kalman Filters for State Estimation of Induction Motor Drives
Saeed Jafarzadeh, Cristian Lascu and Fadali Sami, University of Nevada Reno, USA

11:10 am • The Opportunities of Two-Phase Hybrid Stepping Motor Back EMF Sampling
Stijn Derammelaere, Lennart Carlier, Peter Cox, Bram Vervisch and Colin Debruyne, Technical University College of West-Flanders, Belgium; ON Semiconductor, Belgium

11:35 am • Analysis and Design of a Position Observer with Resistance Adaptation for Synchronous Reluctance Motor Drives
Toni Tuovinen, Marko Hinkkanen and Jorma Luomi, Aalto University School of Electrical Engng, Finland

S4 Distributed Utility Voltage Regulation

Ellis East
Chairs: Liuchen Chang, *University of New Brunswick, Canada,* and Remus Teodorescu, *Aalborg University, Denmark*

10:20 am • A Full-Feedforward Scheme of Grid Voltages for a Three-Phase Grid-Connected Inverter with an LCL Filter
Weiwei Li, Donghua Pan, Xinbo Ruan and Xuehua Wang, Huazhong University of Science and Technology, China

10:45 am • Optimal Size and Location of Distributed Generation Unit for Voltage Stability Enhancement
Mamdouh Abdel-Akher, Abdel-Fatah Ali, Ahmed Eid and Hassan El-Kishky, South Valley University, Egypt; University of Texas at Tyler, USA

11:10 am • A Time-Coordination Approach for Compensating Pulse-Load Using Flywheel
Hamed Afshari, Mahdi Saghaleini, Brian Hadley, Behrooz Mirafzal and Chris Edrington, Florida International University, USA; Kansas State University, USA; Florida State University, USA

S5 DC-DC Converters: Topologies I

Remington
Chairs: Gerry Moschopoulos, *University of Western Ontario, Canada,* and Luca Corradini, *University of Colorado at Boulder, USA*

10:20 am • Design and Analysis for ZVS Forward-Flyback DC-DC Converter
Frank Chen, Haibing Hu, Khalid Rustom, John Shen and Issa Batarseh, University of Central Florida, USA; Petrasolar, USA

10:45 am • Interleaved Power Converter with Current Ripple Cancelation at a Selectable Duty Cycle
Julio Rosas-Caro, Jesus Valdez-Resendiz, Jonathan Mayo-Maldonado, Ruben Salas-Cabrera, Juan Ramirez-Arredondo and Joel Salome-Baylon, Madero City Technological Institute, Mexico; CINVESTAV Unidad Guadalajara, Mexico

11:10 am • Comparison of Bi-Directional Isolated Full-bridge Converters with Combinations of Active and Passive Snubbers
Tsai-Fu Wu, Jeng-Gung Yang, Chia-Ling Kuo, Kun-Han Sun and Yu-Kai Chen, EPARC, Natl. Chung Cheng University, Taiwan; IDEAL, National Formosa University, Taiwan

11:35 am • Study and Implementation of a Novel Bi-Directional DC-DC Converter with High Conversion Ratio
Wei-Chih Liao, Tsorng-Juu Liang, Hsiu-Hao Liang, Hsueh-Ko Liao, Lung-Sheng Yang, Kai-Cheung Juang and Jiann-Fuh Chen, National Cheng Kung University, Taiwan; Far East University, Taiwan; Information and Communications Research Laborato, Taiwan

S6 Induction Machines

Cowboy Artists
Chairs: Emmanuel Agamloh, *Advanced Energy Corporation, USA* and Andrea Cavagnino, *Politecnico di Torino, Italy*

10:20 am • Stray Losses in the Stator and Rotor of Induction Machines with Sinusoidal Supplies
Omar Laldin, Purdue University, USA

10:45 am • Harmonic Loss and Torque Analysis of High Speed Induction Motors
Katsumi Yamazaki, Akihiro Suzuki, Motomichi Ohto and Teruyuki Takakura, Chiba Institute of Technology, Japan; Yaskawa Electric Corporation, Japan

11:10 am • Analysis and Modeling of Rotor Slot Enclosure Effects in High Speed Induction Motors
Aldo Boglietti, Radu Bojoi, Andrea Cavagnino, Paolo Guglielmi and Alessio Miotto, Politecnico di Torino, Italy; Politecnco di Torino, Italy

11:35 am • Measurement Proven Analytical and Numerical Models for Calculation of the Teeth Flux Pulsations and Harmonic Torques of Skewed Squirrel Cage Standard Induction Machines
Thomas Knopik and Andreas Binder, Darmstadt University of Technology, Germany

S7 Multilevel Converters I

Russell
Chair: Jinjun Liu, *Xi An Jiaotong University, China*

10:20 am • Virtual-Vector-Based Space Vector Pulse Width Modulation of the DC-AC Multilevel-Clamped Multilevel Converter (MLC2)
Pedro Rodriguez, Raul S. Munoz-Aguilar, Sergio Busquets-Monge, Maria D. Bellar and Frede Blaabjerg, Universitat Politecnica de Catalunya, Spain; Universidade do Estado do Rio de Janeiro, Brazil; Aalborg University, Denmark

10:45 am • A New Voltage-Balancing Controller in Cascaded Multilevel Converters
Xu She, Alex Huang, Gangyao Wang, Tiefu Zhao, Fei Wang and Wenxi Yao, North Carolina State University, USA; Eaton Corporation, USA; Zhejiang University, China

11:10 am • Multilevel Cascade H-Bridge Inverter DC Voltage Estimation Through Output Voltage Sensing
Faete Filho, Leon Tolbert and Burak Ozpineci, The Univerity of Tennessee, USA; Oak Ridge National Laboratory, USA

11:35 am • Experimental Verification of Loss Reduction in Diode-Clamped Mutilevel Inverters
Yukihiko Sato and Takumi Ito, Chiba University, Japan

S8 MPPT Algorithms for Solar PV Systems

Sundance
Chairs: Adel Nasiri, *University of Wisconsin, Milwaukee, USA,* and Jian Sun, *Rensselaer Polytechnic Institute, USA*

10:20 am • Integrated CMOS DC-DC Converter with Digital Maximum Power Point Tracking for a Portable Thermophotovoltaic Power Generator
Robert Pilawa-Podgurski, Wei Li, Ivan Celanovic and David Perreault, MIT, USA

10:45 am • Study and Evaluation of Load Current Based MPPT Control for PV Solar Systems
Yuncong Jiang and Jaber Abu Qahouq, The University of Alabama, USA

11:10 am • Improved MPPT Short-Circuit Current Method by a Fuzzy Short-Circuit Current Estimator
Nelson Diaz, Adriana Luna and Oscar Duarte, Universidad Distrital F.J.C., Colombia; Universidad Libre, Colombia; Universidad Nacional, Colombia

11:35 am • An Optimal Control Method for Grid-Connected Photovoltaic Micro-Inverter to Improve the Efficiency at Light-Load Condition
Zhe Zhang, Chen Min, Gao Mingzhi, Qiong Mo and Zhaoming Qian, Zhejiang University, China

S9 Indirect AC-AC Converters I

Borein
Chairs: Lixiang Wei, *Rockwell Automation, USA,* and Vietson Nguyen, *Hamilton Sundstrand, United Technologies, USA*

10:20 am • Modulation of Indirect Matrix Converter Under Unbalanced Source Voltage Condition
Vishal Vekhande, B. B. Pimple and B. G. Fernandes, Indian Institute of Technology Bombay, India

10:45 am • An Investigation of High Efficiency Operation Conditions for a Three-Port Energy Source System Using an Indirect Matrix Converter
Koji Kato and Jun-ichi Itoh, Sanken Electric CO, LTD., Japan; Nagaoka University of Technology, Japan

11:10 am • A Compact Versatile Matrix Converter to Integrate Various Energy Resources to Utility Network
Xiong Liu, Poh Chiang Loh, Peng Wang and Frede Blaabjerg, EEE, Nanyang Technological University, Singapore; Aalborg University, Denmark

11:35 am • Hybrid PWM Control for Z-Source Matrix Converter
Qin Lei, Baoming Ge and Fangzheng Peng, Michigan State University, USA

S10 Transportation Applications: General

Phoenix
Chair: Gui-Jia Su, *Oak Ridge National Lab, USA*

10:20 am • Development of a Drive Cycle Based Evaluation Method for Variable Voltage Converter in Vehicle Electrification Applications
Lihua Chen, Liwen Xu, Nagaraj Narayanachar and Shahram Zarei, Ford Motor Company, USA

10:45 am • Small-Size Light-Weight Transformer with New Core Structure for Contactless Electric Vehicle Power Transfer System
Chigira Masato, Nagatsuka Yuichi, Kaneko Yasuyoshi, Abe Shigeru and Yasuda Tomio, Saitama University, Japan; Technova Inc., Japan

11:10 am • Fault-Tolerant Control of Induction Motor Drive for Automotive Belt-Alternator-Starter Application
Chandra Namuduri, Suresh Gopalakrishnan, Keith Van Maanen, Bryan Ludwig and Bonho Bae, General Motors, USA

11:35 am • Energy Efficiency in Plug-In Hybrid Electric Vehicle Chargers: Evaluation and Comparison of Front End AC-DC Topologies
Fariborz Musavi, Murray Edington, Wilson Eberle and William G. Dunford, Delta-Q Technologies Corp., Canada; University of British Columbia, Canada

SP1 Special Session: Wind Energy Conversion

Regency ABCD
Chair: Dan Ionel, *Vestas Technology R&D Americas, Inc.*

10:20 am • Power Electronics Converters for Wind Turbine Systems
Frede Blaabjerg, Marco Liserre and Ke Ma, Aalborg University, Denmark

10:45 am • A Commercial Perspective on Wind Technology Development Needs
Juan M. de Bedout, GE Global Research Center, USA

11:10 am • Short Term Energy Storage in Wind Power Generation
Eduard Muljadi, National Renewable Energy Laboratory (NREL), USA

11:35 am • Wind Power Plant Grid Connection — Challenges, Opportunities and Solutions Ahead
Philip Carne Kjær, Vestas Wind Systems A/S, Technology R&D, Denmark

Monday, September 19 1:20 pm – 3:00 pm

S11 Wind Energy: Generators and Drives

Ellis West
Chairs: Yao Duan, *Vestas Technology R&D Americas, Inc., USA,* and Hamid Toliyat, *Texas A and M University, USA*

1:20 pm • Quasi-Z Source Inverter Based PMSG Wind Power Generation System
Yushan Liu, Baoming Ge, Fang Zheng Peng, Abu Rub Haitham and Anibal T de Almeida, Beijing Jiaotong University, China; Michigan State University, USA; Texas A and M University at Qatar, Qatar; University of Coimbra, Portugal

1:45 pm • Supercapacitor Energy Storage for Wind Energy Integration
Eunice Naswali, Chianna Alexander, Hai-Yue Han, David Naviaux, Alexander Bistrika, von Jouanne Annette, Yokochi Alexandre and Brekken Ted, Oregon State University, USA

2:10 pm • Mechanical Stress Reduction in Variable Speed Wind Turbine Drivetrains
Goran Mandic, Adel Nasiri, Eduard Muljadi, Ehsan Ghotbi and Francisco Oyague, UW-Milwaukee, USA; National Renewable Energy Lab, USA; Boulder Wind Power, USA

2:35 pm • Bearing Fault Detection for Direct-Drive Wind Turbines via Stator Current Spectrum Analysis
Xiang Gong and Wei Qiao, University of Nebraska-Lincoln, USA

S12 Power Semiconductors: Packaging

Curtis
Chair: Kai Ngo, *Virginia Tech, USA*

1:20 pm • Thermomechanical Reliability Investigation of Large Temperature Excursions in Power Electronics Packages
Puqi Ning, Fred Wang and Khai Ngo, Oak Ridge National Lab, USA; CPES of Virginia Tech, USA

1:45 pm • Design of Power Converters on 3D-MIDs for Driving Three-Dimensional LED-Lamps
Werner Thomas and Johannes Pforr, University of Applied Sciences Ingolstadt, Germany

2:10 pm • A Novel Hybrid Packaging Structure for High-Temperature SiC Power Modules
Ruxi Wang, Zheng Chen, Dushan Boroyevich, Yiying Yao and Li Jiang, Virginia Tech, CPES, USA

2:35 pm • In-Situ Measurement of Wirebond Strain in Electrically Active Power Semiconductors
Seth Avery and Robert Lorenz, University of Wisconsin-Madison, USA

S13 Direct Torque Control

Cassidy
Chair: Radu Bojoi, *Politecnico di Torino, Italy*

1:20 pm • Sensorless Direct Flux and Torque Control for Direct Drive Washing Machine Applications
Iustin Radu Bojoi, Biao He, Fabio Rosa and Fernando Pegoraro, Politecnico di Torino, Italy; Whirlpool Corporation, USA

1:45 pm • Model Predictive Direct Torque Control: Derivation and Analysis of the Explicit Control Law
Tobias Geyer, The University of Auckland, New Zealand

2:10 pm • Model Predictive Direct Torque Control of a Five-Level ANPC Converter Drive System
Tobias Geyer and Silvia Mastellone, The University of Auckland, New Zealand; ABB Corporate Research, Switzerland

2:35 pm • Deadbeat-Direct Torque and Flux Control for Interior PM Synchronous Motors Operating at Voltage and Current Limits
Jul-Ki Seok, Chan-Hee Choi and Robert Lorenz, YeungNam University, Republic of Korea; UW-Madison, USA

S14 Distributed Grid Controls

Ellis East
Chairs: Jian Sun, *Rensselaer Polytechnic Institute, USA,* and Fancisco Canales, *ABB Corporate Research, Switzerland*

1:20 pm • Optimized Pole and Zero Placement with State Observer for LCL-Type Grid-Connected Inverter
Mingyu Xue, Yu Zhang, Fangrui Liu, Yong Kang and Yongxian Yi, Huazhong University of Science and Technology, China; Huazhong University of Science and Technology, China

1:45 pm • Smart-Grid Technologies and Progress in Europe and the United States
Marcelo Simoes, Robin Roche, Elias Kyriakides, Abdellatif Miraoui, Benjamin Blunier, Kerry McBee, Siddharth Suryanarayanan, Phuong Nguyen and Paulo Ribeiro, Colorado School of Mines, USA; University of Technology of Belfort-Montbeliard, France; University of Cyprus, Cyprus; Colorado State University, USA; Technische Universiteit Eindhoven, Netherlands

2:10 pm • Enhanced Power Calculator for Droop Control in Single-Phase Systems
Gustavo M. S. Azevedo, Marcelo C. Cavalcanti, Fabricio Bradaschia, Pedro Rodriguez, Joan Rocabert and Francisco A. S. Neves, Federal University of Pernambuco, Brazil; Technical University of Catalonia, Spain

S15 DC-DC Converters: Controls I

Remington
Chairs: Jaber Abu-Qahouq, *University of Alabama Tuscaloosa, USA,* and Jon Cronk, *Power Products, USA*

1:20 pm • A Practical Control Strategy to Improve Unloading Transient Response Performance for Buck Converters
Liang Jia, Zhiyuan Hu, Yan-fei Liu and Paresh C. Sen, Queen's University, Canada

1:45 pm • A Small Signal Model for Average Current Mode Control Based On Describing Function Approach
Feng Yu, Fred C. Lee and Paolo Mattavelli, CPES, Virginia Tech, USA

2:10 pm • A Novel Control Method for Light-Loaded Multiphase Boost Converter with Voltage Multiplier Used as a Front-End of a Grid-Connected Fuel-Cell Generation
Xiaotian Wu, Longlong Zhang, Guoqiao Shen, Dehong Xu and Adrian Ioinovici, Zhejiang Uninversity, China; Holon Institute of Technology, Israel

2:35 pm • Asymmetrical Bridge Double-Input DC-DC Converters Adopting Pulsating Voltage Source Cells
Fuxin Liu, Yunyu Mao, Zhicheng Wang and Xinbo Ruan, Nanjing University of Aeronautics and Astronautics, China

S16 Thermal Analysis and Losses I

Cowboy Artists
Chairs: Mircea Popescu, *Motor Design Ltd, UK,* and Aldo Boglietti, *Politecnico di Torino, Italy*

1:20 pm • Thermal Analysis of a Balanced Calorimeter for Testing Electrical Machines
He Zhang, Wenping Cao, Pericle Zanchetta and Jing Li, University of Nottingham, UK; Newcastle University, UK

1:45 pm • Design of a Novel Test Fixture to Measure Rotational Core Losses in Machine Laminations
Natheer Alatawneh and Pragasen Pillay, Concordia University, Canada

2:10 pm • A Simple Method to Account for PWM Eddy Current Iron Losses in Finite Element Analysis
Andrew Knight, John Salmon and Jeff Ewanchuk, University of Alberta, Canada

2:35 pm • Online Surge Testing Applied to an Induction Machine with Emulated Insulation Breakdown
Stefan Grubic, Jose Restrepo and Thomas Habetler, Georgia Institute of Technology, USA; Universidad Simon Bolivar, Venezuela

S17 Voltage Source Inverters

Russell
Chairs: Jin Wang, *Ohio State University, USA,* and Yasuyuki Nishida, *Chiba Institute of Technology, Japan*

1:20 pm • Inter-Phase Interleaving for Three-Phase Voltage Source Converter Operated with Low Non-Triple Carrier Ratio
Di Zhang, Fred Wang, Rolando Burgos, Xuning Zhang and Dushan Boroyevich, GE Global Research Center, USA; University of Tennessee and ONRL, USA; ABB Corporate Research Center Raleigh, USA; Center for Power Electronics System, USA

1:45 pm • Model Predictive-Based Voltage Regulation of an Islanded Distributed Generation Unit
Behrooz Bahrani and Alfred Rufer, Swiss Federal Institute of Technology, Lausanne, Switzerland

2:10 pm • Reduction of Voltage Harmonics for Parallel-Operated Inverters
Qing-Chang Zhong, Frede Blaabjerg, Josep M. Guerrero and Tomas Hornik, Loughborough University, UK; Aalborg University, Denmark; Universitat Politecnica de Catalunya, Spain; University of Liverpool, UK

2:35 pm • Generalized Closed-Loop Control (GCC) Schemes with Embedded Virtual Impedances for Voltage Source Converters
Jinwei He and Yun Wei Li, University of Alberta, Canada

S18 DC-DC Converters for Solar PV Systems I

Sundance
Chairs: Ahmed Elasser, *GE Global Research Center, USA,* and Dehong Xu, *Zhejiang University, China*

1:20 pm • Current-Fed Quadratic Full-Bridge Buck Converter for PV Systems Interfacing: Dynamic Characterization
Juha Huusari and Teuvo Suntio, Tampere University of Technology, Finland

1:45 pm • Photovoltaic Microinverter using Single-Stage Isolated High-Frequency Link Series Resonant Topology
Hariharan Krishnaswami, University of Texas at San Antonio, USA

2:10 pm • Three-Port Flyback-Type Micro-Inverter with an Active Power Decoupling Circuit
Yaow-Ming Chen and Chien-Yao Liao, National Taiwan University, Taiwan

S19 Indirect AC-AC Converters II

Borein
Chairs: Lixiang Wei, *Rockwell Automation, USA,* and Vietson Nguyen, *Hamilton Sundstrand, United Technologies, USA*

1:20 pm • Active AC Snubber for Direct AC-AC Power Converters
Anish Prasai and Deepak Divan, Georgia Institute of Technology, USA

1:45 pm • Comparison of Boost Chopper and Active Buffer as Single- to Three-Phase Converter
Ohnuma Yoshiya and Itoh Jun-ichi, Nagaoka University of Technology, Japan

2:10 pm • Control of Single-Phase to Three-Phase Matrix Converters for PM Synchronous Motor Drive
Takaharu Takeshita and Tomomi Yamashita, Nagoya Institute of Technology, Japan

2:35 pm • Improvement in the Control Range of Matrix Converters
Luca Zarri, Olorunfemi Ojo and Michele Mengoni, University of Bologna, Italy; Tennessee Tech University, USA

S20 Transportation Applications: Voltage Converters

Regency CD
Chair: Anand Sathyan, *Chrysler LLC, USA*

1:20 pm • Optimal Design of Multilevel Modular Switched-Capacitor DC-DC Converter
Dong Cao, Jiang Shuai and Fang Zheng Peng, Michigan State University, USA

1:45 pm • A Double-Wing Multilevel Modular Capacitor-Clamped DC-DC Converter with Reduced Capacitor Voltage Stress
Dong Cao, Xianhao Yu, Xi Lu, Wei Qian and Fang Zheng Peng, Michigan State University, USA

2:10 pm • Review of High Power Isolated Bi-Directional DC-DC Converters for PHEV/EV DC Charging Infrastructure
Yu Du, Srdjan Lukic, Boris Jacobson and Alex Huang, FREEDM Systems Center, North Carolina State University, USA; Raytheon Company, USA

SP2 Special Session: Power Supply on Chip

Regency AB
Chair: Seth R. Sanders, *University of California, Berkeley, USA*

1:20 pm • Single Chip Power Converters: Products and Manufacturing Considerations
Ashraf Lotfi, Enpirion, USA

1:45 pm • Developing Single-Chip Offline LED Drivers
Vivek Mehrotra and Jian Sun, Teledyne Scientific Company, LLC, USA; Rensselaer Polytechnic Institute, USA

2:10 pm • Nanostructured Scalable Thick-Film Magnetics
S. Prabhakaran, GE Global Research, USA

2:35 pm • Voltage Scalable Switched Capacitor DC-DC Converters for On-Chip Applications
Yogesh K. Ramadass and Anantha P. Chandrakasan, Texas Instruments, USA; Massachusetts Institute of Technology, USA

Monday, September 19 3:20 pm – 5:00 pm

S21 Wind Energy: Power Electronic Converters

Ellis West
Chairs: Bogi Bech Jensen, *Technical University of Denmark, Denmark,* and Ted Breken, *Oregon State University, USA*

3:20 pm • Three-Level Boost Converter Based Medium Voltage Megawatt PMSG Wind Energy Conversion Systems
Venkata Yaramasu and Bin Wu, Ryerson University, Canada

3:45 pm • Electro-Thermal Modeling for Junction Temperature Cycling-Based Lifetime Prediction of a Press-Pack IGBT 3L-NPC-VSC Applied to Large Wind Turbines
Osman S. Senturk, Lars Helle, Stig Munk-Nielsen, Pedro Rodriguez and Remus Teodorescu, Aalborg University, Denmark; Vestas Wind Systems, Denmark; Universitat Politecnica de Catalunya, Spain

4:10 pm • Power Density Investigation on the Press-Pack IGBT 3L-HB-VSCs Applied to Large Wind Turbines
Osman S. Senturk, Lars Helle, Stig Munk-Nielsen, Pedro Rodriguez and Remus Teodorescu, Aalborg University, Denmark; Vestas Wind Systems, Denmark; Universitat Politecnica de Catalunya, Spain

4:35 pm • A Comparison of Medium Voltage High Power DC-DC Converters with High Step-Up Conversion Ratio for Offshore Wind Energy Systems
Wu Chen, Alex Huang, Jan Svensson, Jun Li, Zhenyuan Wang and Srdjan Lukic, North Carolina State University, USA; ABB, Sweden; ABB, USA

S22 Magnetic Component Design and Application

Curtis
Chair: Braham Ferriera, *Delft University of Technology, Netherlands*

3:20 pm • Resonant Converter Transformer Design and Optimization
Garet Gamache and Charles Sullivan, Thayer School of Engineering at Dartmouth, USA

3:45 pm • Novel CCTT Core Integrated Magnetic for High-Power DC-DC Converters
Kevin Hartnett, Marek Rylko, John Hayes and Michael Egan, University College Cork, Ireland

4:10 pm • Iron Loss Evaluation of Filter Inductor Used in PWM Inverters
Keisuke Kakazu, Toshihisa Shimizu, Hiroaki Matsumori, Koushi Takano and Hitoshi Ishii, Tokyo Metropolitan University, Japan; Iwatsu Test Instruments Corporation, Japan

4:35 pm • Development and Evaluation of Single Sided Flux Couplers for Contactless Electric Vehicle Charging
Mickel Budhia, Grant Covic, John Boys and Chang-Yu Huang, The University of Auckland, New Zealand

S23 Sensorless Control Issues

Cassidy
Chair: Giuseppe Scarcella, *University of Catania, Italy*

3:20 pm • Secondary Resistive Losses with High-Frequency Injection-Based Self-Sensing in IPM Machines
Natee Limsuwan, Takashi Kato, Chen-Yen Yu, Jun Tamura, David Reigosa, Kan Akatsu and Robert Lorenz, University of Wisconsin - Madison, USA; Nissan Motor Co., Ltd., Japan; University of Oviedo, Spain; Shibaura Institute of Technology, Japan

3:45 pm • Analysis of Iron and Magnet Losses in Surface Permanent Magnet Machines Resulting from Injection-Based Self-Sensing Position Estimation
Shih-Chin Yang and Robert Lorenz, University of Wisconsin-Madison, USA

4:10 pm • The Influence of Magnetic Hysteresis on HF Injection Based Inductance Calculation
Julien Cordier, Peter Landsmann and Ralph Kennel, Technische Universitaet Muenchen, Germany

4:35 pm • Saliency Based Sensorless Control of Induction Machines at Frequency Overlap of Signal Components
Mohamed Metwally and Thomas Wolbank, Menoufia University, Egypt; Vienna University of Technology, Austria

S24 Microgrid Controls

Ellis East
Chairs: Yilmaz Sozer, *University of Akron, USA,* and Alireza Bakhshai, *Queen's University, Canada*

3:20 pm • Autonomous Control of Interlinking Converters in Hybrid AC-DC Microgrids with Energy Storages
Poh Chiang Loh, Ding Li and Frede Blaabjerg, Nanyang Technological University, Singapore; Aalborg University, Czech Republic

3:45 pm • Comparison of PV Inverter Controller Configurations for CERTS Microgrid Applications
Micah Erickson, Robert Lasseter and Thomas Jahns, University of Wisconsin - Madison, USA

4:10 pm • Phase Locked Loop Control of Inverters in a Microgrid
Matthew Surprenant, Ian Hiskens and Giri Venkataramanan, University of Wisconsin-Madison, USA; University of Michigan, USA

4:35 pm • Enabling High Droop Gain for Improvement of Reactive Power Sharing Accuracy in an Electronically-Interfaced Autonomous Microgrid
Aboutaleb Haddadi, Ali Shojaei and Benoit Boulet, McGill University, Canada

S25 DC-DC Converters: Modeling

Remington
Chairs: Jian Sun, *RPI, USA,* and Oscar Garcia, *Universidad Politécnica de Madrid, Spain*

3:20 pm • A New STS Model DC-DC Converter
Fujio Kurokawa, Junya Sakemi, Akihiro Yamanishi and Hiroyuki Osuga, Nagasaki University, Japan; Mitsubishi Electric Corporation, Japan

3:45 pm • Dynamic Modeling of a ZETA Converter in DCM Applied to Low Power Renewable Sources
Renan Caron Viero and Fernando Soares Dos Reis, PUCRS, Brazil

4:10 pm • Simple Large-Signal Model Based on Gyrator for System Level Analysis
Du Weijing, Zhang Yang, Zhang Junming and Qian Zhaoming, Zhejiang University, China

4:35 pm • Modeling of Multiple-Input DC-DC Converters Considering Input-Coupling Effects
Ruichen Zhao, Sheng-Yang Yu and Alexis Kwasinski, The University of Texas at Austin, USA

S26 Thermal Analysis and Losses II

Cowboy Artists
Chairs: Mircea Popescu, *Motor Design Ltd, UK,* and Andy Knight, *University of Alberta, Canada*

3:20 pm • Advanced Testing and Modeling of Magnetic Materials Including a New Method of Core Loss Separation for Electrical Machines
Maged Ibrahim and Pragasen Pillay, Concordia University, Canada

3:45 pm • A Nonintrusive Thermal Monitoring Method for Closed-Loop Drive-Fed
Siwei Cheng, Yi Du, Jose Restrepo, Pinjia Zhang and Thomas G. Habetler, Georgia Institute of Technology, USA; Universidad Simon Bolivar, Venezuela; GE Global Research, USA

4:10 pm • Loss Measurement of a 40 kW High-Speed Bearingless PM Synchronous Motor
Gabriel Munteanu, Andreas Binder and Tobias Schneider, Darmstadt University of Technology, Germany; Bosch GmbH, Germany

4:35 pm • Induction Motor Rotor Temperature Estimation Using Superheterodyne Receivers
Zhi Gao, Roy Colby and Larry Turner, Schneider Electric, USA

S27 Inverter Control Techniques

Russell
Chairs: Paolo Mattavelli, *Virginia Tech, USA,* and Zheng yu Lv, *Zhejiang University, China*

3:20 pm • Stability Analysis of Droop Control for Inverter Using Dynamic Phasors Method
Xianwei Wang, Fang Zhuo, Haiping Guo, Liang Meng, Meijuan Yang and Jinjun Liu, Xi'an Jiaotong University, China

3:45 pm • A Grid Synchronization Method for Droop Controlled Distributed Energy Resources Converters
Chia-Tse Lee, Rui-Pei Jiang and Po-Tai Cheng, Department of Electrical Engineering, NTHU, Taiwan

4:10 pm • High Performance AC Current Regulation for Low Pulse Ratio Inverters
Brendan McGrath, Stewart Parker and Grahame Holmes, RMIT University, Australia

4:35 pm • Swinging Bus Inverters: New Requirements in Renewable Power and the Natural Switching Surface
Martin Ordonez, Simon Fraser University, Canada

S28 DC-DC Converters for Solar PV Systems II

Sundance
Chairs: David A. Torrey, *Advanced Energy Conversion, USA,* and Adel Nasiri, *University of Wisconsin-Milwaukee, USA*

3:20 pm • DC-DC Converter Topology Assessment for Large Scale Distributed Photovoltaic Plant Architectures
Mohammed Agamy, Maja Harfman-Todorovic, Ahmed Elasser, Juan Sabate, Robert Steigerwald, Yan Jiang and Essakiappan Somasundaram, GE Global Research Center, USA

3:45 pm • Research on Output Current of Interleaved-Flyback in Boundary Conduction Mode for Photovoltaic AC Module Application
Mingzhi Gao, Min Chen, Qiong Mo, Yuhao Luo and Zhaoming Qian, Zhejiang University, China; Altenergy Power System Inc., China

4:10 pm • Power Control in Three-Phase Grid-Connected Current-Source Boost Inverter
Mahdi Saghaleini and Behrooz Mirafzal, Florida International University, USA; Kansas State University, USA

4:35 pm • A Novel Primary-Side-Assisted Soft-Switching and Fault-Tolerance of a High-Frequency-Link Inverter for Renewable-Energy Systems
Rahnamaee Arash, Sudip Mazumder and Tajfar Alireza, University of Illinois, Chicago, USA

S29 Modeling and Control of AC-AC Converters

Borein
Chairs: Lixiang Wei, *Rockwell Automation, USA,* and Vietson Nguyen, *Hamilton Sundstrand, United Technologies, USA*

3:20 pm • Un-Terminated, Low-Frequency Terminal-Behavioral d-q Model of Three-Phase Converters
Igor Cvetkovic, Marko Jaksic, Dushan Boroyevich, Paolo Mattavelli, Fred C. Lee, Zhiyu Shen, Sara Ahmed and Dong Dong, CPES - Virginia Tech, USA

3:45 pm • A Four Legs Matrix Converter Based Ground Power Unit with Selective Harmonic Control
Wesam Rohouma, Lee Empringham, Pericle Zanchetta and Patrick Wheeler, University of Nottingham, UK

4:10 pm • Study of the Bi-Directional Power Flow in Back-to-Back Converters by Using Linear and Nonlinear Control Strategies
Janeth Alcala, Victor Cardenas, Adrian Ramirez and Jorge Gudino, Universidad Autonoma de San Luis Potosi, Mexico; Universidad de Colima, Mexico

4:35 pm • An Integrated Filter and Controller Design for Direct Matrix Converter
Anindya Dasgupta and Parthasarathi Sensarma, Indian Institute of Technology, Kanpur, India

S30 Transportation Applications: Infrastrutures

Regency CD
Chair: Srdjan Lukic, *North Carolina State University, USA*

3:20 pm • A Study of Sectional Tracks in Roadway Inductive Power Transfer System
Wei Zhang, Siu-Chung Wong, Chi K. Tse and Qianhong Chen, The Hong Kong Polytechnic University, Hong Kong; Nanjing University of Aeronautics and Astronautics, China

3:45 pm • Cost Benefits and Vehicle-to-Grid Regulation Services of Unidirectional Charging of Electric Vehicles
Mcdavis Fasugba and Philip Krein, University of Illinois at Urbana-Champaign, USA

4:10 pm • Mitigating Distribution Transformer Lifetime Degradation Caused by Grid-Enabled Vehicle (GEV) Charging
Rohit Moghe, Frank Kreikebaum, Jorge Hernandez, Rajendra P. Kandula and Deepak Divan, Georgia Institute of Technology, USA

4:35 pm • A Study on Receiver Circuit Topology of a Cordless Battery Charger for Electric Vehicles
Kraisorn Throngnumchai, Toshihiro Kai and Yuusuke Minagawa, Nissan Motor Co., Ltd., Japan

SP3 Special Session: PEV Infrastruture and Technologies

Regency AB
Chair: Theodore P. Bohn, *Argonne National Laboratories, USA*

3:20 pm • The EV Project and EV Charging Infrastructure Challenges
Kevin Morrow, ETEC, USA

3:45 pm • Technologies for Bi-Directional EV Battery Charging
Thomas Jahns, University of Wisconsin-Madison, USA

4:10 pm • Current Sensor and Metrology Technologies for EV Charging Sub-Meter Applications
James Spangler, Cirrus Logic/Argonne National Laboratory, USA

4:35 pm • EV Charging Standards
Theodore Bohn, Argonne National Laboratory, USA

Tuesday, September 20 10:30 am – 12:00 pm

Plenary Poster Session: Poster Session I

Phoenix Convention Center West Hall 1
Chairs: Avoki Omekanda, *General Motors, USA,* and Rolando Burgos, *ABB, USA*

P101 • Assessment of Inertial Potential of Variable-Speed Wind Turbines
Samer EL Itani and Geza Joos, McGill University, Canada

P102 • Neural MPPT of Variable Pitch Wind Generators with Induction Machines in a Wide Wind Speed Range
Maurizio Cirrincione, Marcello Pucci and Gianpaolo Vitale, UTBM, France; ISSIA-CNR, Italy

P103 • A Generalized Method for Wind Inverter Control Under Unbalanced Operating Conditions
Shuang Wu and Ana Stankovic, Cleveland State University, USA

P104 • Megawatt Wind Energy Conversion System with Diode Rectifier and Multilevel Current Source Inverter
Jiacheng Wang, Jingya Dai, Bin Wu, Dewei Xu and Navid Zargari, Ryerson University, Canada; Rockwell Automation, Canada

P105 • Diagnosis of the Open-Circuit Fault in Three-Parallel Voltage-Source Converter for a High-Power Wind Turbine
Youngjong Ko, Hae-Gwang Jeong, Kyo-Beum Lee, Dong-Choon Lee and Jang-Mok Kim, Ajou University, Republic of Korea; Yeungnam University, Republic of Korea; Pusan National University, Republic of Korea

P106 • Maximum Power Point Tracker of a Wind Generator Based on the Flatness-Based Control
Hani Alhamed Aldwaihi and Emmanuel Delaleau, ISEN-Brest, France

P107 • Self-Starting DC-DC Boost Converter for Low-Power and Low-Voltage Microbial Electric Generators
Nicolas Degrenne, Bruno Allard, Francois Buret, Zaoui Abderrahime, Florent Morel, Adami Salah-Eddine and Denis Labrousse, Universite de Lyon, Laboratoire Ampere, France

P108 • Bi-Directional HV DC-DC Converters for Energy Harvesting with Dielectric Elastomer Generators
Lars Eitzen, Christian Graf and Juergen Maas, Hochschule Ostwestfalen-Lippe, Germany

P109 • Passivity-Based Control of PEM Fuel Cell/Battery Hybrid Power Source
Ali Tofighi and Mohsen Kalantar, Iran University of Science and Technology, Iran

P110 • Comparison of Cascaded H-Bridge and Modular Multilevel Converters for BESS Application
Lennart Baruschka and Axel Mertens, Leibniz University of Hannover, Germany

P111 • Frequency Measurement Using a Frequency Locked Loop
Zijun Luo, Mary Kaye, Chris Diduch and Liuchen Chang, University of New Brunswick, Canada

P112 • Power Smoothing and Power Ramp Control for Wind Energy Using Energy Storage
Ali Esmaili and Adel Nasiri, University of Wisconsin-Milwaukee, USA

P113 • A New Architecture for Battery Charge Equalization
Bo Dong and Han Yehui, Tsinghua University, China; University of Wisconsin-Madison, USA

P114 • Optimal Transient Control of Microgrids Using a Game Theoretic Approach
Nishantha Ekneligoda and Wayne Weaver, Michigan Technological University, USA

P115 • Optimal Team Communication Structures in Micro Grids
Nishantha Ekneligoda and Wayne Weaver, Michigan Technological University, USA

P116 • The Practical Challenges of Minigrids
Glenn Platt, David Cornforth, Tim Moore and Adam Berry, CSIRO Energy Technology, Australia

P117 • Controller Design and Implementation of Indirect Current Control Based Utility-Interactive Inverter System
Sunjae Yoon, Hyeongmin Oh and Sewan Choi, LS Industrial System, Republic of Korea; Seoul Tech, Republic of Korea

P118 • Hybrid Solar Inverter Based on a Standard Power Electronic Cell for Microgrids Applications
Luis Arnedo, Suman Dwari, Vladimir Blasko and Albert Kroeber, United Technologies Research Center, USA; RWTH Aachen University, Germany

P119 • A Microgrid Modeling and Simulation Platform for System Evaluation on a Range of Time Scales
Alex Brissette, Andy Hoke, Dragan Maksimovic and Annabelle Pratt, University of Colorado, USA; Intel Labs, USA

P120 • Flatness Based Control of an Isolated Three-Port Bi-Directional DC-DC Converter for a Fuel Cell Hybrid Source
Matheepot Phattanasak, Roghayeh Gavagsaz-ghoachani, Jean-Philippe Martin, Serge Pierfederici and Bernard Davat, Nancy University INPL, France

P121 • Evaluation of Power Converters to Implement Bipolar DC Active Distribution Networks - DC-DC Converters
Jackson Lago, Joabel Moia and Marcelo Heldwein, Federal University of Santa Catarina, Brazil

P122 • A PWM Control Strategy for Switched-Boost Inverter
Ravindranath Adda, Santanu Kumar Mishra and Avinash Joshi, Indian Institute of Technology Kanpur, India

P123 • Advances in the Modeling and Control of Micro Hydro Power Stations with Induction Generators
Lucas Giuliani Scherer, Robinson Figueiredo de Camargo, Humberto Pinheiro and Cassiano Rech, Universidade Federal de Santa Maria, Brazil

P124 • Comparison and Performance Evaluation of Renewable to Grid Integration Schemes: Single-Phase High-Frequency Fuel Cells and PV Inverters Applications
Akshay Kumar Rathore, National University of Singapore, Singapore

P125 • Real Time Simulation for the Study on Smart Grid
Feng Guo, Luis Herrera, Robert Murawski, Ernesto Inoa, Chih-Lun Wang, Philippe Beauchamp, Yi Huang, Eylem Ekici and Jin Wang, The Ohio State University, USA; Opal-RT Technologies, Canada

P126 • Finite-Time Current Control of LCL-Filter for Grid-Connected Three-Phase Voltage-Source Inverter
Nishida Katsumi, Nakaoka Mutsuo and Ahmed Tarek, Ube National College of Technology, Japan; Kyungnam University, Japan; Assuit University, Egypt

P127 • Comparison of Calorimetric and Electrical Loss Measurement Methods in a Frequency Converter Research and Development Application
Valtteri Mattsson, ABB Oy, Drives, Finland

P128 • Dynamic Characteristics of Current-Fed Semiquadratic Buck-Boost Converter in Photovoltaic Applications
Lari Nousiainen and Teuvo Suntio, Tampere University of Technology, Finland

P129 • A Power Converter System for Single Cell Photovoltaic Modules
Dodi Garinto, Surya Research International, Indonesia

P130 • An Effective PV Power Generation Control System Using Quasi-Z Source Inverter with Battery
Baoming Ge, Qin Lei, Fang Zheng Peng, Dongsen Sun, Yushan Liu and Abu Rub Haitham, Michigan State University, USA; Beijing Jiaotong University, China; Texas A and M University at Qatar, Qatar

P131 • Power Flow Control for Quasi-Z Source Inverter with Battery Based PV Power Generation System
Dongsen Sun, Baoming Ge, Haitham Abu Rub, Fang Z. Peng and Anibal T. de Almeida, Beijing Jiaotong University, China; Texas A and M University at Qatar, Qatar; Michigan State University, USA; University of Coimbra, Portugal

P132 • Single-Stage Boost Inverter for Photovoltaic System
Wenxin Huang, Yufei Zhou, Ping Zhao and Jianwu Zhao, Nanjing University of Aeronautics and Astronautics, China

P133 • Current Harmonic Minimization of a Grid-Connected Photovoltaic 500kW Three-Phase Inverter Using PR Control
Byeong-Mun Song, Youngroc Kim, Hanju Cha and Hakju Lee, Baylor University, USA; Chungnam National Univeristy, Republic of Korea; Korea Electric Power Research Insitute, Republic of Korea

P134 • A Current-Sensorless MPPT Quasi-Double-Boost Converter for PV Systems
Christopher Lohmeier, Jianwu Zeng, Wei Qiao, Liyan Qu and Jerry Hudgins, University of Nebraska-Lincoln, USA

P135 • Comparison of Soft and Hard-Switching Losses in Three-Phase Micro-Inverters
Dehua Zhang, Qian Zhang, Anna Grishina, Amirahmadi Ahmadreza, Haibing Hu, John Shen and Issa Batarseh, University of Central Florida, USA

P136 • Energy Saving in Constant Speed Running Motors by Means of Adaptive Sinusoidal Voltage
Shimon Limor and Doron Shmilovitz, PowerSines LTD., Israel; Tel Aviv University, Israel

P137 • Series-Stacked Medium Voltage Electronic Voltage Regulator
Males Tomlinson, Dewald Abrie and Toit Mouton, Universiteit Stellenbosch, South Africa

P138 • Fast Harmonic Detection Based on Cascaded Delayed Signal Cancellation PLL
Yi Fei Wang and Yun Wei Li, University of Alberta, Canada

P139 • A Family of Shunt Active Filter Based on the Interleaved Buck Switch Cell
Zhong Chen, Miao Chen, Yingpeng Luo and Lei Shi, Nanjing University of Aeronautics and Astronautics, China

P140 • Study and Design of Power Quality Control for Oilfield Drilling Rig Electrical System
Yi Hao, Zhuo Fang, Sun Xinxin and Liu Jinjun, Xi'an Jiaotong University, China

P141 • Converter Rating Reduction in Hybrid Active Power Filters (HAPF)
Hamid Karshenas, Iman Aminoroaya, Alireza Bakhshai and Praveen Jain, Queen's University, Canada; Isfahan University of Technology, Iran

P142 • A Fast On-Load Tap Changing Regulator with Semi Natural Commutation
Jose Alvarez, Rodolfo Echavarria and Armando Flores, Universidad Politecnica de Victoria, Mexico

P143 • Transformer-Less Current Controlled Driver for a Dielectric Barrier Discharge Lamp using HV Silicon Carbide (SiC) Switching Devices
Amgad El-Deib, Francis Dawson and Georges Zissis, University of Toronto, Canada; Universite de Toulouse, France

P144 • Modeling and Design of L-Complementary Self-Oscillating Class D Inverter with Output Voltage Clamping During Starting
Wei Xiong, Ana Stankovic and Louis Nerone, ULT, USA; Cleveland State University, USA; General Electric Lighting, USA

P145 • High Efficiency Hybrid Multi-Stage Adaptor with AC and DC Input Capability
Yongjiang Bai, Qiaoliang Chen, Julu Sun, Ming Xu and Xu Yang, China

P146 • A Cascaded Shunt Active Power Filter with High Performance for Aircraft Electric Power System
Yingpeng Luo, Zhong Chen, Miao Chen and Jianxia Li, Nanjing University of Aeronautics and Astronautics, China

P147 • Grid Synchronization PLL Robust to Frequency Variation, Unbalanced and Distorted Voltage
Sanghoey Lee, Hanju Cha and Jeong-Hoon Lee, Doosan H.I. Wind Turbine Development Engine, Republic of Korea; Chungnam National University, Republic of Korea

P148 • Switched-Capacitor Converters with Multiphase Interleaving Control
Sitthisak Kiratipongvoot, Siew-Chong Tan and Adrian Ioinovici, Hong Kong Polytechnic University, Hong Kong; Holon Institute of Technology, Israel

P149 • Two-Stage Electronic Ballast for HID Lamp with Buck PFC
Tsorng-Juu Liang, Hsueh-Ko Liao, Chien-Ming Huang, Hsiu-Hao Liang, Yuan-Min Cheng, Chun-An Cheng and Jiann-Fuh Chen, National Cheng-Kung University, Taiwan; I-Shou University, Taiwan

P150 • Analysis and Design of a ZVS-PWM Full-Bridge Converter with Reduced Conduction Losses
Dunisha Wijeratne and Gerry Moschopoulos, University of Western Ontario, Canada

P151 • ZCS PWM Bi-Directional Converter with One Auxiliary Switch
Ahmad Mousavi, Pritam Das, Majid Pahlevaninezhad and Praveen Jain, University of Western Ontario, Canada; Queen's University, Canada

P152 • Adaptive Current Source Drivers for Efficiency Optimization of High Frequency Synchronous Buck Converters
Zhiliang Zhang, Pengcheng Xu, Yan-fei Liu and Paresh C. Sen, Nanjing University of Aeronautics and Astronautics, China; Queen's University, Canada

P153 • Battery Management System Using Active Charge Equalization Technique Based on a DC-DC Converter Topology
Sriram Yarlagadda, Tom Hartley and Iqbal Husain, The University of Akron, USA

P154 • Adaptive Current Source Drivers to Achieve Efficiency Improvement in Wide Load Range
Zhiliang Zhang, Wei Cai and Pengcheng Xu, Nanjing University of Aeronautics and Astronautics, China

P155 • A Novel Feedback-Clamped Magnetically Coupled Bi-Directional Optimal Battery Charging System
Rajeev Kumar Singh and Santanu Kumar Mishra, Indian Institute of Technology Kanpur, India

P156 • Optimum Design of an Envelope Tracking Buck Converter for RF PA using GaN HEMTs
Dejana Cucak, Miroslav Vasic, Oscar Garcia, Jesus Oliver and Pedro Alou, Universidad Politecnica de Madrid, Spain

P157 • Comparison of Si and GaN Power Devices Used in PV Module Integrated Converters
Milos Acanski, Jelena Popovic-Gerber and Braham Ferreira, TU Delft, Netherlands

P158 • Proposal of a Low Power, 1.6 MHz, 90% Efficiency, Single Inductor, Dual Symmetrical Outputs Integrated DC-DC Converter for CCM and DCM Operations
Xavier Branca, Bruno Allard, David Chesneau and Xuefang Lin-shi, IEEE, France; STEricsson, France

P159 • A 10 MHz Mixed-Signal CPM Controlled DC-DC Converter IC with Novel Gate Swing Circuit and Instantaneous Efficiency Optimization
Amir Parayandeh, Behzad Mahdavikhah, Sm Ahsanuzzaman, Aleksandar Radic and Aleksandar Prodic, University of Toronto, Canada

P160 • A Small Signal Model for V2 Control with Composite Output Capacitors Based On Describing Function Approach
Feng Yu, Fred C. Lee and Paolo Mattavelli, CPES, Virginia Tech, USA

P161 • A Novel Ripple-Based Constant On-Time Control with Virtual Inductance and Offset Cancellation for DC Power Converters
Yu-Cheng Lin, Ching-Jan Chen, Dan Chen and Brian Wang, National Taiwan University, Taiwan; Richtek Technology Corporation, Taiwan

P162 • Capacitor Current Programming Technique for Phase-Shift DC-DC Converter
Victor Cheung and Henry Chung, City University of Hong Kong, Hong Kong

P163 • Transient Mitigation of DC-DC Converters Using an Auxiliary Switching Circuit
*Zhenyu Shan, Siew-Chong Tan and Chi K. Tse, Hong Kong Polytechnic University, Hong Kong; EPGC, ICES, A*STAR, Singapore*

P164 • Energy and Impedance State Modeling of Power Electronic Converters
Gregory Vosters and Wayne Weaver, Michigan Technological University, USA

P165 • DC-DC Boost Converter with Network Model for Photovoltaic System
Saichol Chudjuarjeen, Juan Jimenez, Sachi Jayasuriya, Chika Nwankpa, Karen Miu and Anawach Sangswang, Drexel University and KMUTT (Thailand), Thailand; Drexel University, USA; King Mongkut's University of Technology Thonburi, Thailand

P166 • Design of Envelope Amplifier Based on Interleaved Multiphase Buck Converter with Minimum Time Control for RF Application
Pengming Cheng, Miroslav Vasic, Oscar Garcia, Pedro Alou, Jesus Oliver and Jose Antonio Cobos, Universidad Politecnica de Madrid, Spain

P167 • A Contribution to the Dynamic Modeling of Switched-Capacitor Converters
Jonathan Mayo-Maldonado, Julio Rosas-Caro, Jesus Valdez-Resendiz, Ruben Salas-Cabrera, Eduardo Nacu Salas-Cabrera and Hermenegildo Cisneros-Villegas, Instituto Tecnologico de Ciudad Madero, Mexico

P168 • A Zero-Current-Switching Multilevel Switched Capacitor DC-DC Converter
Matthew Gebben, Jorge G. Cintron-Rivera, Wei Qian, Dong Cao, Xuejun Pei and Fang Z. Peng, Michigan State University, USA

P169 • Optimizing Dual Half Bridge Converter for Full Range Soft Switching and High Efficiency
Hamid Daneshpajooh, Alireza Bakhshai and Praveen Jain, Queen's University, Canada

P170 • A Novel A-D Conversion for Digital Control Switching Power Supply
Fujio Kurokawa, Ryuya Yoshida, Yuki Maeda, Tsukasa Takahashi, Kouta Bansho, Toru Tanaka and Keiichi Hirose, Nagasaki University, Japan; NTT-Facilities, Japan

P171 • Digital Current Sharing Method for Multiphase DC-DC Converters Using the Peak Input Voltage
Suyong Chae, Yujin Song, Sukin Park and Hakgeun Jeong, Korea Institute of Energy Research, Republic of Korea

P172 • A High Step-Up Current Fed Multi-Resonant Converter with Coupled Inductor
Donghao Li, Bo Liu, Bo Yuan, Yang Xu, Duan Jason and Zhai Jerry, Xi'an Jiaotong University, China; Analog Devices, Inc., China

P173 • Inductor Optimization Procedure for Power Supply in Package and Power Supply on Chip
Toke M. Andersen, Claudius M. Zingerli, Florian Krismer, Johann W. Kolar and Cian O'Mathuna, Power Electronic Systems Laboratory, ETH Zurich, Switzerland; Tyndall National Institute, Cork, Ireland

P174 • Diagnosis and Fault-Tolerant Control of Three-Phase AC-DC PWM Converter System
Won-Sang Im, Jang-Mok Kim, Dong-Choon Lee and Kyo-Beum Lee, Pusan National University, Republic of Korea; Youngnam University, Republic of Korea; Ajou University, Republic of Korea

P175 • A New Control Scheme for Boost PFC Converters for Both CCM and DCM Operations
Chung-Ping Ku, Sheng-Hsien Lin and Dan Chen, National Taiwan University, Taiwan; Delta Electronics Inc., Taiwan

P176 • Three-Phase Z-Source Power Supply Design and Dynamic Modeling
Giovanni Lo Calzo, Alessandro Lidozzi, Luca Solero and Fabio Crescimbini, University Roma Tre - DIMI, Italy

P177 • Adaptive Discontinuous Current Source Driver to Achieve Switching Loss Reduction for MHz PFC Applications
Pengcheng Xu, Zhiliang Zhang, Yan-fei Liu and P.C. Sen, Nanjing University of Aeronautics and Astronautics, China; Queen's University, Canada

P178 • Analysis and Design of a Three-Phase Reduced Switch Buck-Boost AC-DC Converter
Dunisha Wijeratne and Gerry Moschopoulos, University of Western Ontario, Canada

P179 • One-Cycle Controlled Three-Switch Buck-type Rectifier
Shao Zhang and King Jet Tseng, Nanyang Technological University, Singapore

P180 • Six Switches Solution for Single-Phase AC-DC-AC Converter with Capability of Second-Order Power Mitigation in DC-Link Capacitor
Xiong Liu, Peng Wang, Poh Chiang Loh, Frede Blaabjerg and Mingyu Xue, EEE, Nanyang Technological University, Singapore; Institute of Energy Technology, Aalborg Univers, Denmark; Huazhong University of Science and Technology, China

P181 • Voltage Sensorless Feedforward Control of a Dual Boost PFC Converter for Battery Charger Applications
Sung Min Park, Yong Duk Lee and Sung Yeul Park, University of Connecticut, USA

P182 • Catastrophic Bifurcation in Three-Phase Boost Rectifiers
Meng Huang, Siu-Chung Wong, Chi K. Tse and Xinbo Ruan, The Hong Kong Polytechnic University, Hong Kong; Huazhong University of Science and Technology, China

P183 • A Control Method to Reduce a Surge Voltage of Indirect Matrix Converter by Using Zero Current and Zero Voltage Switching
Jun-ichi Itoh, Toshifumi Hinata and Koji Kato, Nagaoka University of Technology, Japan

P184 • High Power Density High Efficiency DC-DC Converter
Daocheng Huang, David Gilham, Weiyi Feng, Pengju Kong, Dianbo Fu and Fred. C. Lee, Virginia Tech, USA; Intersil Corporation, USA; Huawei Technologies Co., Ltd., USA

P185 • A Bi-Directional Single-Phase Soft-Switched AC-AC Converter
Alireza Safaee, Davood Yazdani, Alireza Bakhshai and Praveen Jain, Queen's University, Canada; ReDriven Power Inc., Canada

P186 • A Sense Winding Based Synchronization Technique for Bi-Directional IPT Pick-Ups
Duleepa J. Thrimawithana, Udaya K. Madawala, Michael Neath and Tobias Geyer, The University of Auckland, New Zealand

P187 • A Single Stage Micro-Inverter Based on a Three-Port Flyback with Power Decoupling Capability
Haibing Hu, Qian Zhang, Xiang Fang, John Shen and Issa Batarseh, University of Central Florida, USA

P188 • Novel Family of Quasi-Z Source AC-AC Converter with Safe-Commutation
He Liangzong, Peng Fangzheng and Duan Shanxu, Huazhong University of Science and Technology, China; Michigan State University, USA

Tuesday, September 20 **3:30 pm – 5:00 pm**

Plenary Poster Session: Poster Session II

Phoenix Convention Center West Hall 1
Chairs: Jian Sun, *Rensselaer Polytechnic Institute, USA,* and Subhashish Bhattacharya, *North Carolina State University, USA*

P301 • Design and Force Control of Slotted Tubular Linear Motor for Active Pedal
Bon-Gwan Gu, Young-Kyoun Kim, In-Soung Jung, Jeongyeol An and Jongsang Noh, KETI, Republic of Korea; DH Holdings Co., Republic of Korea

P302 • Modeling, Implementation and Analysis of a Li-Ion Battery Powered Electric Truck
Prasanna Mantravadi, Iqbal Husain and Yilmaz Sozer, University of Akron, USA

P303 • Analytical Model of PMSM Designed for High-Frequency Operation 'Machine and Inverter Sizing Compromise'
Mohand Sough, Daniel Depernet, Frederic Dubas, Christophe Espanet and Benali Boualem, ALSTOM Transport, France; University of Technology of Belfort-Montbeliard, France; University of Franche-Comte, France

P304 • Benefits of Cascaded Inverter for Electrical Vehicles' Drive-Trains
Benoit Sarrazin, Nicolas Rouger, Jean-Paul Ferrieux and Yvan Avenas, G2Elab, CNRS, Grenoble University, France

P305 • Lithium-Ion Cell Modeling from Impedance Spectroscopy for EV Applications
Akram Eddahech, Olivier Briat, Ramzi Chaari, Nicolas Bertrand, Herve Henry and Jean-Michel Vinassa, IMS laboratory, France

P306 • Design and Analysis of Three-Port DC-DC Converters for Satellite Platform Power System
Zhijun Qian, Osama Abdel-Rahman, Kejiu Zhang, Haibing Hu, John Shen and Issa Batarseh, Linear Technology, USA; Advanced Power Electronics Corporation, USA; DELL, USA; University of Central Florida, USA

P307 • Control Strategy for Electric Starter Generators Embedded in a Gas Turbine Engine for Aerospace Applications
Bikramjit Bhangu and Rajashekara Kaushik, Rolls-Royce, Singapore; Rolls-Royce, USA

P308 • Low Frequency Ripple Current Compensation with DC Active Filter for the Single-Phase Aeronautic Static Inverter
Zhong Chen, Miao Chen, Yingpeng Luo and Changyou Wang, Nanjing University of Aeronautics and Astronautics, China

P309 • Effects of Electrical Power Off-Take on Finite Inertia Mechanical Systems
Rebecca Todd, Frank Bryan, Andrew Forsyth, Chengwei Gan and James Bossard, The University of Manchester, UK; Rolls-Royce, UK

P310 • Multi-Sampled Carrier-Based PWM for Multilevel Active Shunt Power Filters for Aerospace Applications
Milijana Odavic, Veronica Biagini, Mark Sumner, Pericle Zanchetta and Marco Degano, The University of Nottingham, UK

P311 • A New Battery Parameter Identification Considering Current, SOC and Peukert's Effect for Hybrid Electric Vehicles
Jongkyung Lee, Youngroc Kim and Hanju Cha, Chungnam National University, Republic of Korea

P312 • Power and Efficiency Measurements and Design Improvement of a 50kW Switched Reluctance Motor for Hybrid Electric Vehicles
Motoki Takeno, Akira Chiba, Nobukazu Hoshi, Masatsugu Takemoto and Satoshi Ogasawara, Tokyo University of Science, Japan; Tokyo Institute of Technology, Japan; Hokkaido University, Japan

P313 • Analysis and Mitigation of Torsional Vibration of PM Brushless DC Drives with Direct Torque Controller
Z.Q. Zhu and J.H. Leong, University of Sheffield, UK

P314 • Design for Self-Sensing of a Linear Actuator
Joel Maridor, Miroslav Markovic and Yves Perriard, EPFL IMT LAI, Switzerland

P315 • Independent Speed Control of Two Induction Motors Fed by a Five-Leg Inverter with Space Vector Modulation
Atsushi Hara, Hiroyuki Enokijima and Kouki Matsuse, Meiji University, Japan

P316 • Homopolar Machines for Power Generation: A Review
Claudio Bianchini, Fabio Immovilli, Alberto Bellini, Emilio Lorenzani and Carlo Concari, DISMI University of Modena and Reggio E., Italy; DII University of Parma, Italy

P317 • Effect of Stator and Rotor Saturation on Sensorless Rotor Position Detection
Emanuele Fornasiero, Nicola Bianchi and Silverio Bolognani, University of Padova, Italy

P318 • Weight Optimization of a Surface Mount Permanent Magnet Synchronous Motor Using Genetic Algorithms and a Combined Electromagnetic-Thermal Co-Simulation Environment
Mohand ou Ramdane Hamiti, Chris Gerada and Michael Rottach, The University of Nottingham, UK

P319 • Optimization of the Winding Arrangement to Increase the Leakage Inductance of a Synchronous Machine with Multi-Functional Converter Drive
Thomas Hackner and Johannes Pforr, University of Applied Sciences Ingolstadt, Germany

P320 • Mitigation of Voltage Regulation Problem in Flux Reversal Machine
Vandana Rallabandi and Fernandes B.G., Indian Institute of Technology Bombay, India

P321 • Mechanically Commutated Self Control of PM-Synchronous Machines
Tobias Roesmann and Stefan Soter, Moog Unna, Germany; University of Wuppertal, Germany

P322 • Reduction of Magnetic Saturation by Using Additional Permanent Magnets in Synchronous Machines
Katsumi Yamazaki, Tamiya Shuichi, Kazuo Shima and Tadashi Fukami, Chiba Institute of Technology, Japan; Kanazawa Institute of Technology, Japan

P323 • A Geometrical Interpretation of Current Space Vector Components Due to Induction Machines Rotor Faults
Carlo Concari, Giovanni Franceschini, Carla Tassoni and Andrea Toscani, Universita' degli Studi di Parma, Italy

P324 • Analysis of Two-Part Rotor, Axial Flux Permanent Magnet Machines
Gianmario Pellegrino, Paolo Giangrande, Francesco Cupertino, Davide Ronchetto, Mark Sumner and Chris Gerada, Politecnico di Torino, Italy; Politecnico di Bari, Italy; University of Nottingham, UK

P325 • The Effect of Magnetic Saturation on Sensorless Control of a Brushless Permanent Magnet Motor under AC and DC Excitation
Antonio Griffo, Rafal Wrobel, Philip Mellor, Derrick Holliday and Parminder Sangha, University of Bristol, UK; University of Strathclyde, UK; Goodrich Corporation, UK

P326 • Performance Comparison Between Unipolar and Bipolar Excitations in Switched Reluctance Machine with Sinusoidal and Rectangular Waveforms
Xu Liu, Z.Q. Zhu, Masahiko Hasegawa, Rajesh Deodhar and Adam Pride, University of Sheffield, UK; IMRA Europe SAS, UK Research Centre, UK

P327 • DC-Link Capacitance Requirement and Noise and Vibration Reduction in 6/4 Switched Reluctance Machine with Sinusoidal Bipolar Excitation
Xu Liu, Z.Q. Zhu, Masahiko Hasegawa, Adam Pride and Rajesh Deohar, University of Sheffield, UK; IMRA Europe SAS, UK Research Centre, UK

P328 • Impact of the Rotor Back-Iron Resistivity on the Rotor Eddy-Current Losses in Fractional-Slot Concentrated Windings PM Machines
Andrea Cavagnino, Mario Lazzari, Alessio Miotto, Alberto Tenconi and Silvio Vaschetto, Politecnico di Torino, Italy

P329 • Damper Windings in Induction Machines for Reduction of Unbalanced Magnetic Pull and Bearing Wear
David Dorrell, Jonathan Shek, Min-Fu Hseih and Markus Mueller, University of Technology Sydney, Australia; University of Edinburgh, UK; National Cheng Kung University, Taiwan

P330 • Comparison of Air-Cored and Iron-Cored Non-Overlap Winding Radial Flux Permanent Magnet Direct Drive Wind Generators
Maarten Kamper, Johannes Potgieter, Abraham Stegmann and Pieter Bouwer, Stellenbosch University, South Africa

P331 • Design of a Sustainable Wind Generator System using Redundant Materials
Hartmut Jagau, Azeem Khan and Paul Barendse, University of Cape Town, South Africa

P332 • Modeling, Construction and Testing of a Simple HTS Machine Demonstrator
Bogi Jensen and Asger Abrahamsen, Technical University of Denmark, Denmark

P333 • A Novel Analytical Method for Prediction of the Broken Bar Fault Signature Amplitude in Synchronous Machine Damper Winding and Induction Machine Cage Rotor
Mina Rahimian, Seung Choi and Karen Butler-Purry, Texas A and M University, USA; Toshiba, USA

P334 • Levitation Performance of Two Opposed Permanent Magnet Pole-Pair Separated Conical Bearingless Motors
Peter Kascak, Jansen Ralph, Dever Timothy, Nagorny Aleksandr and Loparo Kenneth, NASA Glenn Research Center, USA; ResMed Motor Technologies, USA; Case Western Reserve University, USA

P335 • Switched Reluctance Motor without Torque Ripple or Electrolytic Capacitors
Ethan Swint and Jason Lai, Virginia Tech, USA

P336 • Capacitive Power Transfer for Slip Ring Replacement in Wound Field Synchronous Machines
Daniel Ludois, Kyle Hanson and Justin Reed, University of Wisconsin-Madison, USA

P337 • Scalability Investigation of Proximity Losses in Fractional-Slot Concentrated WindGing Surface PM Machines During High-Speed Operation
Patel Reddy and Thomas Jahns, GE Global Research Center, Niskayuna, USA; University of Wisconsin-Madison, USA

P338 • Maximum Torque Per Ampere Control of Phase Advance Modulation of a SPM Wind Generator
Mehanathan Pathmanathan, Wen Soong and Nesimi Ertugrul, The University of Adelaide, Australia

P339 • Modeling and Control of Three-Phase PMSMs under Open-Phase Fault
Alberto Gaeta, Giacomo Scelba and Alfio Consoli, University of Catania, Italy

P340 • Modeling the Dynamic Suspension Behavior of an Eddy Current Device
Jonathan Bird, Nirmal Paudel, Subhra Paul and Bobba Dheeraj, University of North Carolina at Charlotte, USA

P341 • An Accurate Rotor Time Constant Estimation Method for Self-Commissioning of Multi-Scale Induction Motor Drives
Shuang Sheng, Xiaomeng Cheng, Haifeng Lu, Wenlong Qu and Yituo Li, Tsinghua University, China

P342 • Research on Optimized Control Technique of Electrical Vehicles Propulsion System with Dual PMSM Connection
Jian Zhang, Xuhui Wen and Youlong Wang, Institute of Electrical Engineering, CAS, China

P343 • Speed Control of Electrical Drives Using Classical Control Methods
Lennart Harnefors, Seppo Saarakkala and Marko Hinkkanen, ABB Power Systems - HVDC, Sweden; Aalto University, Finland

P344 • Adaptive Wide Angle PWM Control Strategy of BLDC Motor Drive for Efficiency Optimization and Wide Speed Control Range
Kai-Sheng Kan and Ying-Yu Tzou, National Chiao Tung University, Taiwan

P345 • Transformer-Isolated Gate Drive Design for SiC JFET Phase-Leg Module
Ruxi Wang, Milisav Danilovic, Zheng Chen and Dushan Boroyevich, Virginia Tech, CPES, USA

P346 • Optimal Torque Trajectories Minimizing Loss of Induction Motor Under Given Condition of Rotational Angle
Kaoru Inoue, Keito Kotera and Toshiji Kato, Doshisha University, Japan

P347 • A Novel Single Phase Hybrid Switched Reluctance Motor Drive System
Jianing Liang, Guoqing Xu, Linni Jian, Jakobsen Uffe and Jin-Woo Ahn, Shenzhen Institutes of Advanced Technology, China; The Chinese University of Hong Kong, China; Aalborg University, Denmark; Kyungsung University, Republic of Korea

P348 • Experimental Methods for Synchronous Machines Evaluation by an Accurate Magnetic Model Identification
Paolo Guglielmi, Eric Armando, Iustin Radu Bojoi, Gianmario Pellegrino and Michele Pastorelli, Politecnico di Torino, Italy

P349 • Electromechanical Regeneration Actuator with Fault Tolerance Capability for Automotive Chassis Applications
Lei Hao and Chandra Namuduri, General Motors RD Center, USA

P350 • A New High Frequency Injection Method for Sensorless Control at Doubly-Fed Induction Machines
Longya Xu, Ernesto Inoa, Yu Liu and Bo Guan, The Ohio State University, USA

P351 • MRAS Speed Observer for High Performance Linear Induction Motor Drives Based on Linear Neural Networks
Angelo Accetta, Maurizio Cirrincione, Marcello Pucci and Gianpaolo Vitale, University of Palermo, Italy; UTBM, France; ISSIA-CNR, Italy

P352 • Optimum Torque Control Algorithm for Wide Speed Range and Four Quadrant Operation of Stator Flux Oriented Induction Machine Drive without Regenerative Unit
Valeriu Olarescu, Sorin Musuroi, Ciprian Sorandaru, Martin Weinmann and Stefan Zeh, Diehl AKO Stiftung, Germany; University "Politehnica" of Timisoara, Romania

P353 • Rotor Position Measurement for a Magnetically Levitated 500000 rpm Permanent Magnet Machine
Claudius Martin Zingerli, Imoberdorf Philipp, Thomas Nussbaumer and Johann Walter Kolar, ETH Zurich, Switzerland; Levitronix, Switzerland

P354 • Innovative Measuring System for Wear-Out Indication of High Power IGBT Modules
Jens Due, Stig Munk-Nielsen and Rasmus Nielsen, Institute of Energy Technology - Aalborg University, Denmark

P355 • Resonant Power Shoes for Humanoid Robots
Lee Byunghun, Kim Hyunjae, Lee Sung Woo, Park Chang Byung and Rim Chun Taek, KAIST, Republic of Korea

P356 • Loss Evaluation of an AC-AC Direct Converter with a New GaN HEMT SPICE Model
Okamoto Masayuki, Toyoda Genki, Hiraki Eiji, Tanaka Toshihiko and Hashizume Tamotsu, Yamaguchi University, Japan; Hokkaido University, Japan

P357 • A New High Frequency Inductor Loss Measurement Method
Mingkai Mu and Lee Fred, CPES, Virginia Tech, USA

P358 • Optimal Design Method for Interleaved Single-Phase PFC Converter with Coupled Inductor
Jun Imaoka, Yuki Ishikura, Takahiro Kawashima and Masayoshi Yamamoto, Shimane University, Japan

P359 • Lithium-Ion Supercapacitors for Pulsed Power Applications
Raymond Sepe, Anton Steyerl and Steven Bastien, Electro Standards Laboratories, USA

P360 • Zero Voltage Switching Performance of 1200V SiC MOSFET, 1200V Silicon IGBT and 900V CoolMOS MOSFET
Arun Kadavelugu, Vinay Baliga, Subhashish Bhattacharya, Mrinal Das and Anant Agarwal, North Carolina State University, USA; Cree, Inc., USA

P361 • Novel Silicon-Embedded Coreless Coupled Inductors for High Efficiency On-Chip DC-DC Conversion
Rongxiang Wu and Johnny K.O. Sin, Hong Kong University of Science and Technology, Hong Kong

P362 • A Bipolar Primary Pad Topology for EV Stationary Charging and Highway Power by Inductive Coupling
Grant Covic, Michael Kissin, Dariusz Kacprzak, Niels Clausen and Hao Hao, The University of Auckland, New Zealand

P363 • Integrated Magnetic Design of Small Planar Transformers for LLC Resonant Converters
Samuel Robert Cove, Martin Ordonez, Federico Luchino and John Quaicoe, Memorial University of Newfoundland, Canada; Simon Fraser University, Canada

P364 • Microfabricated V-Groove Power Inductors Using Multilayer Co-Zr-O Thin Films for Very-High-Frequency DC-DC Converters
Di Yao, Christopher Levey and Charles Sullivan, Maxim Integrated Products, USA; Thayer School of Engineering at Dartmouth, USA

P365 • Boundary-Dependent Circuit Model for the Transient Behavior of a Thermal Stack in Power Modules
Xiao Cao, Guo-Quan Lu and Khai Ngo, Virginia Tech, USA

P366 • A Comprehensive Design for High Power Density CM EMI Inductor
Luo Fang, Boroyevich Dushan, Mattavelli Paolo and Nicolas Gazel, CPES, Virginia Tech, USA; SAFRAN Group, France

P367 • Analysis of Impact of Self-Power Function on Emitter Turn-Off Thyristor
Qian Chen and Alex Huang, North Carolina State University, USA

P368 • Analytical Modeling of a Medium-Voltage and High-Frequency Resonant Coaxial-Type Power Transformer for a Solid State Transformer Application
Seunghun Baek and Subhashish Bhattacharya, North Carolina State University, USA

P369 • PWM Method's Influence on the Common-Mode Choke of Motor Drives
Dong Jiang, Fei Wang and Jing Xue, the University of Tennessee, USA

P370 • A New Compact, Isolated and Integrated Gate Driver Using High Frequency Transformer for Interleaved Boost Converter
The Van Nguyen, Pierre-Olivier Jeannin, Jean-Christophe Crebier and Jean-Luc Schanen, Grenoble Electrical Engineering Laboratory, France

P371 • Doubly Fed Induction Machine Drive Distance Learning Laboratory for Wind Power and Electric Ship Propulsion Applications
Giovanna Oriti, Alexander Julian and Dan Zulaica, Naval Postgraduate School, USA

P372 • Teaching Digital Control of Switch Mode Power Supplies
Oscar Garcia, Jesus Oliver, Daniel Diaz, Benoit Duret, Pedro Alou and Jose Cobos, Universidad Politecnica de Madrid, Spain

P373 • EMC Modeling of Drives for Aircraft Applications: Modeling Process, EMI Filter Optimization and Technological Choice
Baidy Toure, Jean-Luc Schanen, Laurent Gerbaud, Thierry Meynard and Jean-Pierre Carayon, Liebherr Aerospace, France; G2Elab, France; Laplace, France

P374 • MOSFET Power Loss Characterization: Evolving into Multivariate Response Surface
Federico Luchino, Martin Ordonez, German Oggier and John Quaicoe, Simon Fraser University, Canada; Universidad Nacional de Rio Cuarto, Argentina; Memorial University of Newfoundland, Canada

P375 • Performance Evaluation of Full SiC Switching Cell in an Interleaved Boost Converter for PV Applications
Carl N.M. Ho, Francisco Canales, Sami Pettersson, Gerardo Escobar, Antonio Coccia and Nikolaos Oikonomou, ABB Switzerland Ltd., Switzerland

P376 • Impact of Power Factor Correction and Harmonic Compensation by STATCOM on Converter Temperature and Reliability
Lakshmi GopiReddy, Leon Tolbert, Burak Ozpineci, Yan Xu and Tom Rizy, University of Tennessee, USA; Oak Ridge National Laboratory, USA

P377 • PEEC Based Virtual Design of EMI Input Filters
Ivana Kovacevic, Thomas Friedli, Andreas Muesing and Johann Kolar, Power Electronic Systems Laboratory, ETH Zurich, Switzerland

P378 • A Waveform-Based Power Estimator for Variable Power Loads
Warit Wichakool, Zachary N. Remscrim, Uzoma A. Orji and Steven B. Leeb, Massachusetts Institute of Technology, USA

P379 • Evaluation of Point Field Sensing in IGBT Modules for High Bandwidth Current Measurement
Patrick Schneider and Robert Lorenz, University of Wisconsin-Madison, USA

P380 • An Efficient Resonant Gate Drive Scheme for High Frequency Applications
Mahesh Swamy, Tsuneo Kume and Noriyuki Takada, Yaskawa America Incorporated, USA; Yaskawa Electric Corporation, Japan

P381 • Innovation of a Large Capacity 5-level IGBT Inverter for Oil and Gas Industry
Mostafa Al Mamun, Masahiko Tsukakoshi, Kazunori Hashimura, Hiromi Hosoda and Steven C. Peak, Toshiba Mitsubishi Electric Industrial Sys. Co., Japan; TM GE Automation Systems LLC, USA

P382 • Constant Common Mode Voltage Modulation Strategy for the FB10 Power Converter
Pedro Rodriguez, Raul S. Munoz-Aguilar, Gerardo Vazquez, Ignacio Candela and Remus Teodorescu, Universitat Politecnica de Catalunya, Spain; Aalborg University, Denmark

P383 • PWM Technique to Extend Current Reconstruction Range and Reduce Common-Mode Voltage for Three-Phase Inverter Using DC-Link Current Sensor Only
Yong-Kai Lin and Yen-Shin Lai, Industrial Technology Research Institute, Taiwan; National Taipei University of Technology, Taiwan

P384 • An Inrush Current Reduction Technique for Multiple Inverter-Fed Transformers
Yu-Hsing Chen, Ming-Yang Yeh, Po-Tai Cheng, Steven Liao and Charles Tsai, National Tsing Hua University, Taiwan; Delta Electronics, Taiwan

P385 • Transition Control Strategy Between Standalone and Grid Connected Operation of the Voltage Source Inverters
Nayeem Arafat, Sreeshailam Palle, Iqbal Husain and Yilmaz Sozer, University of Akron, USA

P386 • Pulse Energy Modulation of a Buck-Boost Inverter
Abraham Tareke Woldegiorgis, Yonggao Zhang and Liuchen Chang, University of New Brunswick, Canada

P387 • Compensation of DC Link Oscilation in Single-Phase VSI and CSI Converters for Photovoltaic Grid Connection
Montie Vitorino and Mauricio Correa, Federal University of Campina Grande, Brazil

P388 • Modeling and Analysis of a DC Current Compensator in Distribution Power Lines
Giampaolo Buticchi, Luca Consolini, Emilio Lorenzani and Carlo Concari, University of Parma, Italy; University of Modena and Reggio Emilia, Italy

P389 • Investigating a H-Infinite Control Method Considering Frequency Uncertainty for CLC Type Inductively Coupled Power Transfer System
Xin Dai, Aiguo Patrick Hu, Chunsen Tang, Yue Sun and Zhihui Wang, Chongqing University, China; The Auckland University, New Zealand

P390 • Robustness Analysis of Active Damping Methods for a Grid Connected Inverter with an LCL filter
Ricchiuto Domenico, Liserre Marco, Kerekes Tamas, Teodorescu Remus and Blaabjerg Frede, Politecnico di Bari, Denmark; Aalborg University, Denmark

P391 • Switching-Sequence Based Global Stability and Control of Standalone and Interactive Power Converters
Sudip Mazumder, University of Illinois, Chicago, USA

P392 • Design and Performance of a SiC High Frequency Inverter
Miaosen Shen, Shashank Krishnamurthy and Mihir Mudholkar, United Technologies Research Center, USA; University of Arkansas, USA

P393 • Core-Loss Analysis in AC Inductors for a Single-Phase Pulse-Width Modulated Solar Power Conditioner
Hideaki Fujita, Tokyo Institute of Technology, Japan

P394 • Proposal of a Series Configuration Hybrid AC Power Source
Rafael Concatto Beltrame, Matheus Iensen Desconzi, Mario Lucio da Silva Martins, Cassiano Rech and Helio Leaes Hey, Federal University of Santa Maria - UFSM, Brazil; Federal University of Technology - Parana, Brazil

P395 • A New Single-Phase Five-Level Inverter with No Problem of Voltage Balancing
Zixin Li, Ping Wang, Yaohua Li and Gao Fanqiang, Chinese Academy of Sciences, China

P396 • Voltage Fluctuation Suppression Method of Floating Capacitors in a New Modular Multilevel Converter
Kui Wang, Yongdong Li, Zedong Zheng and Lie Xu, Tsinghua University, China

P397 • Theoretical Analysis of Self-Balancing Function of Capacitor Voltages in Flying Capacitor Multi-Level Converters
Hidemine Obara and Yukihiko Sato, Chiba University, Japan

P398 • Neutral-Point Current Modeling and Control for Neutral-Point Clamped Three-Level Converter Drive with Small DC-Link Capacitors
Ramkrishan Maheshwari, Stig Munk-Nielsen and Sergio Busquets-Monge, Aalborg University, Denmark; Technical University of Catalonia, Spain

P399 • Improved Interleaved Discontinuous Carrier-Based PWM Strategy for Three-Level Coupled Inductor Inverters
Behzad Vafakhah, Androw M. Knight and Salmon John, Ford Motor Company, USA; University of Alberta, Canada

P400 • Control and Design Principle of a Soft-Switching Boost DC to AC Converter without Smoothing Capacitor Using a MERS Pulse Link Concept
Yohei Otani, Takanori Isobe and Ryuichi Shimada, Tokyo Institute of Technology, Japan

Wednesday, September 21 — 8:00 am – 9:40 am

S31 Wind Energy: Grid Connection and System Integration

Ellis West
Chairs: Yilmaz Sozer, *University of Akron, USA*, and Waqas Arshad, *ABB Inc. Corporate Research, USA*

8:00 am • Modeling and Mitigation of Harmonic Resonance Between Wind Turbines and the Grid
Mauricio Cespedes and Jian Sun, Rensselaer Polytechnic Institute, USA

8:25 am • Thermal Analysis of Multilevel Grid Side Converters for 10 MW Wind Turbines Under Low Voltage Ride Through
Ke Ma, Frede Blaabjerg and Marco Liserre, Aalborg University, Denmark; Polytechnic of Bari, Italy

8:50 am • Power Capacity Specification for Energy Storage in Wind Application Using Probability-Based Method
Wenzhong Gao, Xiaoyu Wang and Eduard Muljadi, University of Denver, USA; National Renewable Energy Laboratory, USA

S32 Magnetics

Regency C
Chair: Charlie Sullivan, *Dartmouth University, USA*

8:00 am • Magnetic Characterization of Low Temperature Co-Fired Ceramic (LTCC) Ferrite Materials for High Frequency Power Converters
Mingkai Mu, Yipeng Su, Qiang Li and Fred Lee, CPES, Virginia Tech, USA

8:25 am • Predicting Inductance Roll-Off with DC Excitations
Jennifer D. Pollock, Weyman Lundquist and Charles R. Sullivan, Thayer School of Engineering at Dartmouth, USA; West Coast Magnetics, USA

8:50 am • High Frequency Inductor Design and Comparison for High Efficiency High Density POLs with GaN Device
Yipeng Su, Qiang Li, Mingkai Mu and Fred C. Lee, Virginia Tech, USA

S33 Drive Issues I

Cassidy
Chair: Tony O'Gorman, *PESC, Inc., USA*

8:00 am • Influence of High-Frequency Leakage Current on Motor Position Control in PWM Inverter-Fed Servo Drives
Kotaro Tagami and Satoshi Ogasawara, NSK Ltd., Japan; Hokkaido University, Japan

8:25 am • A Review of Mitigation Methods for Overvoltage in Long-Cable-Fed PWM AC Drives
Jiangbiao He, Gennadi Sizov, Peng Zhang and Nabeel Demerdash, Marquette University, USA

8:50 am • Investigation of Voltage Stresses Inside Adjustable Speed Drives
Lixiang Wei, Zhijun Liu and Gary Skibinski, Rockwell Automation, USA

9:15 am • Identifying Ground Fault Location in High Resistance Grounded Systems using Adjustable Speed Drive
Lixiang Wei, Liu Zhijun, Russ Kerkman and Gary Skibinski, Rockwell Automation, USA

S34 Transient Behavior in Grid Connected and Stand Alone Systems

Ellis East
Chairs: Francisco Canales, *ABB Corporate Research, Switzerland,* and Tom Jahns, *University of Wisconsin-Madison, USA*

8:00 am • Active Islanding Detection Using High Frequency Signal Injection
David Reigosa, Fernando Briz, Christian Blanco, Pablo Garcia and Juan Manuel Guerrero, University of Oviedo, Spain

8:25 am • Safe Transient Operation of Microgrids Based on Master-Slave Configuration
Gustavo M. S. Azevedo, Joan Rocabert, Pedro Rodriguez, Fabricio Bradaschia, Marcelo C. Cavalcanti and Francisco A. S. Neves, Federal University of Pernambuco, Brazil; Technical University of Catalonia, Spain

8:50 am • Droop-Controlled Inverters with Seamless Transition Between Islanding and Grid-Connected Operations
Shang-Hung Hu, Chun-Yi Kuo, Tzung-Lin Lee and Josep M. Guerrero, National Sun Yat-sen University, Taiwan; Aalborg University, Denmark

9:15 am • Engine Generator Efficiency and Transient Characteristics Improvement Using a Series Compensator Named MERS
Kouhei Kashiwagi, Takanori Isobe and Ryuichi Shimada, Tokyo Institute of Technology, Japan

S35 Resonant DC-DC Converters I

Remington
Chairs: Praveen Jain, *Queen's University, Canada,* and Xu Yang, *Xi An Jiaotong University, China*

8:00 am • A New DC-DC Converter with Wide-Range ZVS and Zero Circulating Current
Mehdi Narimani and Gerry Moschopoulos, University of Western Ontario, Canada

8:25 am • Zero Voltage Switching Technique for Bi-Directional DC-DC Converters
Luca Corradini, Daniel Seltzer, Douglas Bloomquist, Regan Zane, Dragan Maksimovic and Boris Jacobson, University of Colorado at Boulder, USA; Raytheon Company, USA

8:50 am • Soft Switching Chopper with Tail Loss Cancel Circuit
Yukinori Tsuruta and Atsuo Kawamura, Yokohama National University, Japan

9:15 am • The Resonant LLC vs. LCC Converter — Comparing Two Optimized Prototypes
Alexander Pawellek, Christian Oeder, Juergen Stahl and Duerbaum Thomas, University of Erlangen-Nuremberg, Germany

S36 Fractional Slot Machines

Cowboy Artists
Chairs: Nicola Bianchi, *Univerrsity of Padova,* and Tom Jahns, *University of Wisconsin-Madison, USA*

8:00 am • Design, Analysis and Loss Minimization of a Fractional-Slot Concentrated Winding Interior Permanent Magnet Machine for Traction Applications
Jagadeesh Tangudu, Thomas Jahns and Theodore Bohn, University of Wisconsin-Madison, USA; Argonne National Laboratory, USA

8:25 am • Influence of Alternate Slot Openings on Torque-Speed Characteristics and Cogging Torque of Fractional Slot IPM Brushless AC Machines
Ziad Azar, Z.Q. Zhu and Grzegorz Ombach, University of Sheffield, UK; BROSE FAHRZEUGTEILE GmbH and Co, Germany

8:50 am • Comparison of Interior and Surface PM Machines Equipped with Fractional-Slot Concentrated-Windings for Hybrid Traction Applications
Ayman EL-Refaie, Patel Reddy, Kum-Kang Huh, Jagadeesh Tangudu and Thomas Jahns, GE Global Research, USA; University of Wisconsin-Madison, USA

S37 Z-Source Inverters

Russell
Chair: Hideaki Fujita, *Tokyo Institute of Technology, Japan*

8:00 am • Single-Phase Z-Source Inverter: Analysis and Low-Frequency Harmonics Elimination Pulse Width Modulation
Yifan Yu, Qianfan Zhang, Bin Liang and Shumei Cui, Harbin Institute of Technology, China

8:25 am • Stability Analysis of Reduced Leakage Current Modulation Techniques for Z-Source Inverters in Transformerless Photovoltaic Applications
Fabricio Bradaschia, Marcelo C. Cavalcanti, Pedro E. P. Ferraz, Gustavo M. S. Azevedo, Francisco A. S. Neves and Euzeli C. dos Santos Jr., Federal University of Pernambuco, Brazil; Federal University of Campina Grande, Brazil

8:50 am • High Step-Up Continuous Input Current LCCT-Z-Source Inverters for Fuel Cells
Marek Adamowicz, Jaroslaw Guzinski, Fang Zheng Peng, Ryszard Strzelecki and Haitham Abu-Rub, Gdansk University of Technology, Poland; Michigan State University, USA; Gynia Maritime University, Poland; Texas A and M University at Qatar, Qatar

9:15 am • Transient Modeling Of Current-fed Quasi-Z-Source Inverter
Qin Lei, Fangzheng Peng and Ge Baoming, USA

S38 LED Drivers I

Sundance
Chair: Yehui Han, *University of Wisconsin-Madison, USA*

8:00 am • A Universal-Input High-Power-Factor PFC Pre-Regulator without Electrolytic Capacitor for PWM Dimming LED Lighting Application
Hongbo Ma, Jih-Sheng Lai, Wensong Yu, Quanyuan Feng, Cong Zheng and Bo-yuan Chen, Virginia Tech, USA; Southwest Jiaotong University, China

8:25 am • A Novel High Efficiency and Low-Cost Current Balancing Method for Multi-LED Driver
Jianfeng Wang, Junming Zhang, Xinke Wu, Yangyu Shi and Zhaoming Qian, Electrical Engineering of Zhe-Jiang University, China

8:50 am • Off-Line LED Driver with Bi-Directional Second Stage for Reducing Energy Storage
Qingcong Hu and Regan Zane, University of Colorado at Boulder, USA

9:15 am • A Novel SEPIC-Derived PFC Pre-Regulator without Electrolytic Capacitor for PWM Dimming LED Lighting Application Based on Valley Fill Circuit
Hongbo Ma, Jih-Sheng Lai, Wensong Yu, Cong Zheng and Quanyuan Feng, Virginia Tech, USA; Southwest Jiaotong University, China

S39 AC-DC Rectifiers: Design and Analysis

Borein
Chairs: Rolando Burgos, *ABB Corporate Research, USA,* and Sung-Yeul Park, *University of Connecticut, USA*

8:00 am • A Flicker-Free Electrolytic Capacitor-Less AC-DC LED Driver
Shu Wang, Xinbo Ruan, Kai Yao and Zhihong Ye, Nanjing University of Aeronautics and Astronautics, China; Lite-on Technology Corp., China

8:25 am • An AC-DC Single-Stage Full-Bridge Converter with Buck-Boost Input Section
Navid Golbon and Gerry Moschopoulos, University of Western Ontario, Canada

8:50 am • Class E Rectifier Using Switch-Controlled Capacitor
Kazuaki Fukui and Hirotaka Koizumi, Tokyo University of Science, Japan

9:15 am • MHz Power Factor Correction with Adaptive Current Source Drivers
Pengcheng Xu, Zhiliang Zhang, Wei Cai, Yan-fei Liu and Paresh C. Sen, Nanjing University of Aeronautics and Astronautics, China; Queen's University, Canada

S40 Transportation Applications: Electric Drivetrain

Regency D
Chair: Syed Hossain, *Globe Motors, USA*

8:00 am • Design and Analysis of a 55-kW Air Cooled Automotive Traction Drive Inverter
Madhu Sudhan Chinthavali, Tawfik Jonathan and Rao Arimilli, Oak Ridge National Laboratory, USA; University of Tennessee, USA

8:25 am • Back to Back Z-Source Inverter Topology for the Series Hybrid Electric Bus
Craig Rogers and Fang Peng, Michigan State University, USA

8:50 am • A Novel Current Angle Control of a Current Source Inverter Fed Permanent Magnet Synchronous Motor Drive for Automotive Applications
Lixin Tang and Gui-Jia Su, Oak Ridge National Laboratory, USA

SP4 Special Session: Power Magnetics for Smart Grid Applications

Regency AB
Chairs: Ahmed Zobaa, *Brunel University, UK,* and Subhashish Bhattacharya, *North Carolina State University, USA*

8:00 am • Magnetic Components for High Voltage DC Transmission Converters and Static Var Compensators
Sarath B. Tennakoon, Staffordshire University, UK

8:25 am • Magnetic Components in Electric Circuits — Understanding Thermal Behaviour and Stress
Peter R. Wilson, University of Southampton, UK

8:50 am • Transformer Construction and its Affect on Transformer Stability
Kevin McGivern, Bicron Electronics, USA

9:15 am • Design, Development, and Testing of a 1 MVA, 13.8 kV/465 V Solid-State Transformer with 10 kV Silicon Carbide Switches
Ravisekhar N. Raju, GE Global Research, USA

Wednesday, September 21 10:00 am – 11:40 am

S41 Wind Energy: Generators and Controls

Ellis West
Chairs: Annette von Jouanne, *Oregon State University, USA,* and Eduard Muljadi, *National Renewable Energy Lab, USA*

10:00 am • Vector Control of Mulpitle-Module Transverse Flux PM Generator for Large-Scale Direct-Drive Wind Turbines
Seon-Hwan Hwang, Hui Li, Je-Wook Park, Jang-Mok Kim and Deok-Je Bang, Florida State University, USA; Pusan National University, Republic of Korea; Delft University of Technology, Netherlands

10:25 am • Direct Grid Connection of a Slip-Permanent Magnet Wind Turbine Generator
Ulwin Hoffmann, Pieter Bouwer and Maarten Kamper, University of Stellenbosch, South Africa

10:50 am • Predictive Direct Control of Doubly Fed Induction Generator for Grid Synchronization in Wind Power Generation
Jiefeng Hu, Jianguo Zhu, Yongchang Zhang, Glenn Platt and David Dorrell, University of Technology, Sydney, Australia; CSIRO Energy Centre, Australia

11:15 am • Feed-Forward Transient Compensation Control for DFIG Wind Generators During Both Balanced and Unbalanced Grid Disturbances
Jiaqi Liang and Ronald Harley, Georgia Institute of Technology, USA

S42 Power Semiconductors: High Temperature Devices

Regency C
Chair: Fred Wang, *University of Tennessee, USA*

10:00 am • Investigation of Si IGBT Operation at 200 Degree Centigrade for Traction Application
Zhuxian Xu, Ming Li, Fred Wang and Zhenxian Liang, University of Tennessee, USA; Oak Ridge National Laboratory, USA

10:25 am • Characterization of a High Temperature Multichip SiC JFET-Based Module
Fan Xu, Dong Jiang, Jing Wang, Fred Wang, Leon M. Tolbert, Timothy Junghee Han and Sung Joon Kim, The University of Tennessee, USA; Global Power Electronics, Inc., USA

10:50 am • Development of a 10 kW High Temperature High Power Density Three-Phase AC-DC-AC SiC Converter
Puqi Ning, Di Zhang, Rixin Lai, Jiang Dong, Fred Wang, Boroyevich Dushan, Ngo Khai, Burgos Rolando, Karimi Kamiar, Immanuel Vikram and Solodovnik Eugene, Oak Ridge National Lab, USA; General Electric, USA; The University of Tennessee, USA; Virginia Tech, USA; ABB, USA; Boeing, USA

11:15 am • Design Comparison of High Power Medium-Voltage Converters Based on 6.5kV Si-IGBT/Si-PiN Diode, 6.5kV Si-IGBT/SiC-JBS Diode, and 10kV SiC MOSFET/SiC-JBS Diode
Hesam Mirzaee, De Ankan, Tripathi Awneesh and Bhattacharya Subhashish, North Carolina State University, USA

S43 PM Machine Controls

Cassidy
Chair: Jul-Ki Seok, *YeungNam University, Republic of Korea*

10:00 am • Magnet Temperature Estimation in Surface PM Machines During Six-Step Operation
David Reigosa, Fernando Briz, Michael W. Degner, Pablo Garcia and Juan Manuel Guerrero, University of Oviedo, Spain; Ford Motor Company, USA

10:25 am • Adaptive Flux-Weakening Controller for IPMSM Drives
Silverio Bolognani, Sandro Calligaro and Roberto Petrella, DIE - University of Padova, Italy; DIEGM - University of Udine, Italy

10:50 am • Voltage Disturbance State-Filter Design for Precise Torque-Controlled Interior PM Synchronous Motors
Kim SeHwan, Choi Chan-Hee and Seok Jul-Ki, YeungNam University, Republic of Korea

11:15 am • Torque Ripple Control for Synchronous Motors Using Instantaneous Torque Estimation
Noriya Nakao and Kan Akatsu, Shibaura Institute of Technology, Japan

S44 Grid Interactive Solar PV Systems I

Ellis East
Chairs: Behrooz Mirafzal, *Florida International University, USA,* and Vladimir Blasko, *United Technologies Research Center, USA*

10:00 am • Leakage Current Analysis of Grid Connected Transformerless Solar Inverters with Zero Vector Isolation
Ziya Ozkan and Ahmet Hava, Middle East Technical University, Turkey

10:25 am • Towards Next Generation Photovoltaic Inverters
Yaosuo Xue, Divya Kurthakoti Chandrashekhara, Gerd Griepentrog, Liviu Mihalache, Sindhu Suresh and Madhav Manjrekar, Siemens Corporate Research, USA; Corporate Technology, Siemens AG, Germany; Siemens Energy Inc., USA

10:50 am • Single-Stage Grid-Connected Forward Microinverter with Boundary Mode Control
David Meneses, Oscar Garcia, Pedro Alou, Jesus Angel Oliver and Roberto Prieto, Universidad Politecnica de Madrid, Spain

11:15 am • Research on a Non-Complementary Active Clamp Flyback Converter with Unfolding DC-AC Inverter for Decentralized Grid-Connected PV Systems
Qiong Mo, Min Chen, Zhe Zhang, Mingzhi Gao and Zhaoming Qian, Zhejiang University, China

S45 DC-DC Converters: Topologies II

Remington
Chairs: Javier Sebastian, *Universidad de Oviedo, Spain,* and Wilson Eberle, *University of British Columbia, Canada*

10:00 am • Serial or Parallel Linear-Assisted Switching Converter as Envelope Amplifier: Optimization and Comparison
Miroslav Vasic, Oscar Garcia, Jesus Angel Oliver, Pedro Alou and Jose Antonio Cobos, Universidad Politecnica de Madrid, Spain

10:25 am • A Large DC-Gain Highly Efficient Hybrid Switched-Capacitor-Boost Converter for Renewable Energy Systems
Dazhong Gu, Dariusz Czarkowski and Adrian Ioinovici, Polytechnic Institute of New York University, USA; Holon Academic Institute of Technology, Israel

10:50 am • A Gallium-Nitride Switched-Capacitor Circuit Using Synchronous Rectification
Mark J Scott, Ke Zou, Jin Wang, Chingchi Chen, Ming Su and Lihua Chen, The Ohio State University, USA; Ford Motor Company, USA

11:15 am • A Novel Push-Pull Forward Converter for High Reliability and High Input Voltage Applications
Yanbing Xia, Hongfei Wu, Wei Liu, Yan Xing and Xudong Ma, Nanjing University of Aeronautics and Astronautics, China; Southeast University, China

S46 Faults and Diagnostics

Cowboy Artists
Chairs: Gerald Capolino, *University of Picardie "Jules Verne," France,* and Bin Lu, *Eaton Corporation, China*

10:00 am • Detection and Classification of Rotor Demagnetization and Eccentricity Faults for PM Synchronous Motors
Jongman Hong, Doosoo Hyun, Tae-june Kang, Sang Bin Lee, Christian Kral and Anton Haumer, Korea University, Republic of Korea; Austrian Institute of Technology, Austria

10:25 am • Detection of Inter-Coil Short Circuits in the Stator Winding of a PM Machine by Using Saliency Tracking Schemes
Jesus Arellano-Padilla, Mark Sumner, Chris Gerada and Gary Buckley, University of Nottingham, UK

10:50 am • Bearing Fault Detection Capability of Frequency Response Measurement in Speed-Sensorless Operated Two-Mass-Systems
Henning Zoubek and Mario Pacas, Universitaet Siegen, Germany

11:15 am • A Low Conductivity Composite Rotor for Fractional Pitch Concentrated Winding Machines
Johan Wolmarans, Martin Van der Geest, Henk Polinder, Bram Ferreira and Dennis Zeilstra, Delft University of Technology, Netherlands; Aeronamic BV, Netherlands

S47 Modeling and Control of Single-Phase Inverters

Russell
Chair: Pedro Rodriguez, *Catalonia Polytechnic University, Spain*

10:00 am • Fast Current-Tracking Control for Grid-Connected Inverter with an LCL Filter by Sinusoidal Compensation
Toshiji Kato, Kaoru Inoue and Yoshihisa Donomoto, Doshisha University, Japan

10:25 am • Wide Bandwidth System Identification of AC System Impedances by Applying Perturbations to an Existing Converter
Daniel Martin, Adam Barkley and Enrico Santi, University of South Carolina, USA

10:50 am • A Frequency Adaptive Resonant Controller for Fixed Point Digital Implementation at High Sampling Frequency
Sayed Ali Khajehoddin, Masoud Karimi-Ghartemani, Praveen Jain and Alireza Bakhshai, Queen's University, Canada

11:15 am • Current Mode with RMS Voltage and Offset Control Loops for a Single-Phase Aircraft Inverter Suitable for Parallel and Three-Phase Operation Modes
Pablo Varela Fraile, David Meneses Herrera, Oscar Garcia Suarez, Jesus Angel Oliver Ramirez and Pedro Alou Cervera, Universidad Politecnica de Madrid, Spain

S48 LED Drivers II

Sundance
Chair: Raylee Lin, *National Cheng Kung University, Taiwan,* and Brad Lehman, *Northeastern University, USA*

10:00 am • Multi-Channel Constant Current (MC3) LLC Resonant LED Driver
Haoran Wu, Shu Ji, Fred C. Lee and Xinke Wu, CPES, Virginia Tech, USA; Zhejiang University, China

10:25 am • An Energy Conservation Based High-Efficiency Dimmable Multi-Channel LED Driver
April (Yang) Zhao and Wai Tung Ng, University of Toronto, Canada

10:50 am • Analysis of the Asymmetrical Half-Bridge for Street LED-Lighting Applications
Manuel Arias, Diego Lamar, Aitor Vazquez, Javier Sebastian, Didier Balocco and Almadidi Diallo, Universidad de Oviedo, Spain; AEG Power Solutions, France

11:15 am • Single Switch Three-Level Boost Converter for PWM Dimming LED Lighting
Cong Zheng, Jih-Sheng Lai, Wensong Yu and Hongbo Ma, Virginia Tech, USA

S49 High Performance Power Factor Correction

Borein
Chair: Toshihisa Shimizu, *Tokyo Metropolitan University, Japan*

10:00 am • Boundary Control of Boost-Derived PFCs Using the Natural Switching Surface: Derivation and Enhanced Properties
Juan Galvez and Martin Ordonez, Simon Fraser University, Canada

10:25 am • Digital Primary-Side Sensing and PFC Control of a Flyback Converter
Chih-Wei Lin and Ying-Yu Tzou, National Chiao Tung University, Taiwan

10:50 am • A Snubber Cell for Single-Stage PFC with a Boost Type Input Current Shaper and Isolated DC-DC Converter
Qian Zhang, John Shen, Issa Batarseh, Haibing Hu and Osama Abdel-Rahman, University of Central Florida, USA

11:15 am • The Input EMI Filter Design of Interleaved Critical Conduction Mode Boost PFC Converter with Coupled Inductor
Fei Yang, Xinbo Ruan, Qing Ji and Zhihong Ye, Nanjing University of Aeronautics and Astronautics, China; Lite-On Technology Power SBG ATD-NJ RD Center, China

S50 Transportation Applications: Battery Modeling and Charging

Regency D
Chair: Ashish Arora, *Exponent, USA*

10:00 am • Battery Modeling Based on the Coupling of Electrical Circuit and Computational Fluid Dynamics
Shaohua Lin, Scott Stanton, Wenyu Lian and Thomas Wu, ANSYS, USA; General Motor Company, USA; University of Central Florida, USA

10:25 am • Improved Nonlinear Model for Electrode Voltage-Current Relationship for More Consistent Online Battery System Identification
Larry Juang, Phillip Kollmeyer, Thomas Jahns and Robert Lorenz, University of Wisconsin-Madison, USA

10:50 am • A Transient-Based Approach for Estimating the Parameters of a Lithium-Ion Battery Model
Lalit Mandal and Robert Cox, University of North Carolina-Charlotte, USA

11:15 am • A Three-Phase High Frequency Semi-Controlled Battery Charging Power Converter for Plug-In Hybrid Electric Vehicles
Mahmoud Amin and Osama Mohammed, Florida International University, USA

SP5 Special Session: Superconducting Machines

Regency AB
Chair: Konrad Weeber, *GE Global Research Center, USA*

10:00 am • Towards Commercial Application of HTS Rotating Machines
Clive Lewis, Converteam UK Ltd, UK

10:25 am • Fault Current Limiting HTS Power Transformer
Shirish Mehta, Waukesha Electric Systems, USA

10:50 am • Overview on the Development of High-Temperature Superconducting (HTS) Machines at Siemens
Joern Grundmann, Siemens, Germany

11:15 am • Design Considerations for Large Direct Drive Wind Turbine Generators with Superconductor Field Windings
Greg Snitchler, Bruce Gamble and Peter Winn, American Superconductor Corporation, USA

Wednesday, September 21 1:30 pm – 3:10 pm

S51 Wind Energy: Control Techniques

Ellis West
Chairs: Dan Ionel, *Vestas Technology R&D Americas, Inc., USA,* and Zhe Chen, *Aalborg University, Denmark*

1:30 pm • Control of Power Converters in Distributed Generation Applications Under Grid Fault Conditions
Alvaro Luna, Raul Munoz, Pedro Rodriguez, Felipe Corcoles, Frede Blaabjerg and Teodorescu Remus, UPC, Spain; AAU, Denmark

1:55 pm • The Steady-State Interaction of a Grid-Connected Doubly-Fed Induction Generator and the Wind Turbine
Kennedy Aganah, Joseph Ojo and Bijaya Pokharel, Tennessee Technological University, USA

2:20 pm • An Adaptive Approximation Method for Maximum Power Point Tracking (MPPT) in Wind Energy Systems
Joanne Hui, Alireza Bakhshai and Praveen Jain, Queen's University, Canada

2:45 pm • Design of a Novel Simulation Platform for the EMS-MG Based on MAS
Meiqin Mao, Wei Dong and Liuchen Chang, Hefei University of Technology, China; University of New Brunswick, Canada

S52 Power Semiconductors: Wide Bandgap Devices

Regency C
Chair: Jerry Hudgins, *University of Nebraska, USA*

1:30 pm • Switching Characteristics of Diamond-Based m-i-p+ Diodes in Power Electronic Applications
Arie Nawawi, King Jet Tseng, Rusli Rusli and Gehan A.J. Amaratunga, Nanyang Technological University, Singapore; University of Cambridge, UK

1:55 pm • Evaluation of the Switching Characteristics of a Gallium-Nitride Transistor
Milisav Danilovic, Zheng Chen, Ruxi Wang, Fang Luo, Dushan Boroyevich and Paolo Mattavelli, Virginia Tech, CPES, USA

2:20 pm • 10 kV, 120 A SiC Half H-Bridge Power MOSFET Modules Suitable for High Frequency, Medium Voltage Applications
Mrinal Das, Craig Capell, David Grider, Scott Leslie, Ravi Raju, Michael Schutten, Jeffrey Nasadoski and Allen Hefner, Cree, Inc., USA; Powerex, USA; General Electric, USA; NIST, USA

2:45 pm • Optimal Stray Magnetic Couplings for EMC Filters
Thomas De Oliveira, Jean-Luc Schanen, Jean-Michel Guichon and Laurent Gerbaud, G2Elab, France

S53 Sensorless Control I

Cassidy
Chair: Kevin Lee, *Eaton Corporation, USA*

1:30 pm • Comparison of Resistance-Based and Inductance-Based Self-Sensing Control for Surface Permanent Magnet Machine Using High Frequency Signal Injection
Shih-Chin Yang and Robert Lorenz, University of Wisconsin-Madison, USA

1:55 pm • Sensorless Control of Surface Permanent Magnet Synchronous Machines Using the High Frequency Resistance
Pablo Garcia, David Reigosa, Fernando Briz, Christian Blanco and Juan M. Guerrero, University of Oviedo, Spain

2:20 pm • High-Resolution Sensorless Position Estimation Using Delta-Sigma-Modulated Current Measurement
Wolfgang Hammel and Ralph Kennel, SEW-Eurodrive GmbH, Germany; Technische Universitaet Muenchen, Germany

2:45 pm • High Frequency Injection Assisted "Active Flux" Based Sensorless Vector Control of Reluctance Synchronous Motors, with Experiments from Zero Speed
Sorin-Cristian Agarlita, Ion Boldea and Frede Blaabjerg, Politehnica University of Timisoara, Romania; Institute of Energy Technology, Aalborg, Denmark

S54 Grid Interactive Solar PV Systems II

Ellis East
Chairs: Remus Teodorescu, *Aalborg University, Denmark,* and Behrooz Mirafzal, *Florida International University, USA*

1:30 pm • Single-Phase Cascaded H-Bridge Multilevel Inverter with Nonactive Power Compensation for Grid-Connected Photovoltaic Generators
Bailu Xiao, Faete Filho and Leon Tolbert, University of Tennessee, USA

1:55 pm • 1 MHz Cascaded Z-Source Inverters for Scalable Grid-Interactive Photovoltaic (PV) Applications Using GaN Device
Liming Liu, Hui Li, John Shen, Yi Zhao and Xiangning He, Florida State University, USA; University of Central Florida, USA; Zhejiang University, China

2:20 pm • Low Frequency Current Reduction Using a Quasi-Notch Filter Operated in Two-Stage DC-DC-AC Grid-Connected Systems
Hong-Ju Jung, Keun-Soo Ha, Byeong-Mun Song, Jih-Sheng Lai, Dong-Seok Hyun and Rae-Young Kim, Hanyang University, Republic of Korea; LG Electronics Inc., Republic of Korea; Baylor University, USA; Virginia Tech, USA

2:45 pm • Multi-String Single-Stage Grid-Connected Inverter for PV System
Yaow-Ming Chen, Kuo-Yuan Lo and Yung-Ruei Chang, National Taiwan University, Taiwan; Institute of Nuclear Energy Research, Taiwan

S55 Resonant DC-DC Converters II

Remington
Chairs: Xinbo Ruan, *Huazhong University of Science and Technology, China,* and Mor Peretz, *Ben-Gurion University, Israel*

1:30 pm • Small Signal Phasor Modeling of Dual Active Bridge Series Resonant DC-DC Converters with Multi-Angle Phase Shift Modulation
Daniel Seltzer, Luca Corradini, Bloomquist Doug, Regan Zane and Dragan Maksimovic, University of Colorado at Boulder, USA

1:55 pm • Research on Key Application Issues of Smart Synchronous Rectifier Driver IC in LLC Resonant Converter
Jianfeng Wang, Junming Zhang, Guoxing Zhang, Ming Xu and Zhaoming Qian, Zhejiang University, China; fsp-powerland.Ltd, China

2:20 pm • Analysis and Design Considerations of LLCC Resonant DC-DC Converter with Precise Current Sharing for Two-Channel LED Driver
Yue Chen, Xinke Wu and Zhaoming Qian, Zhejiang University, China

2:45 pm • A Novel Two-stage Electronic Ballast for MH Lamp with Frequency Modulation Control
Co-Hang Chiang, Tsorng-Juu Liang, Jia-You Lee, Hsueh-Ko Liao, Chun-An Cheng and Kuan-Hsien Chou, National Cheng-Kung University, Taiwan; I-Shou University, Taiwan

S56 Electric Traction Machines

Cowboy Artists
Chairs: Avoki Omekanda, *General Motors, USA,* and Marcello Pucci, *ISSIA-CNR, Italy*

1:30 pm • Influence of Winding Design on Losses in Brushless AC IPM Propulsion Motors
Philip Mellor, Rafal Wrobel, Adrain Mlot, Tony Horseman and Dave Staton, University of Bristol, UK; Motor Design Ltd, UK

1:55 pm • Design of a Ferrite Magnet Vernier Machine for an In-Wheel Machine
Ryota Hosoya, Hiroyuki Shimada and Shoji Shimomura, Shibaura Institute of Technology, Japan

2:20 pm • Feasibility and Electromagnetic Design of Direct Drive Wheel Actuator for Green Taxiing
Tsarafidy Raminosoa, Mohand Hamiti, Michael Galea and Chris Gerada, GE Global Research - Niskayuna, USA; The University of Nottingham, UK

2:45 pm • Fundamental Characteristics of a Ferrite Permanent Magnet Axial Gap Motor with Segmented Rotor Structure for the Hybrid Electric Vehicle
Shinji Chino, Takahiko Miura, Masatsugu Takemoto, Satoshi Ogasawara and Akira Chiba, Hokkaido University, Japan; Tokyo Institute of Technology, Japan

S57 Modeling and Control of Three-Phase Inverters

Russell
Chair: Bin Lu, *Eaton Corporation, USA*

1:30 pm • Power Synchronization Control for Capacitor Minimization in Solid State Transformers (SST)
Tiefu Zhao, Gangyao Wang, Xu She, Fei Wang and Subhashish Bhattacharya, Eaton Corp Innovation Center, USA; NCSU, USA

1:55 pm • Low THD, Fast Transient and Cost-Effective Synchronous-Frame Repetitive Controller for Three-Phase UPS Inverters
Shuai Jiang, Dong Cao, Yuan Li, Jianfeng Liu and Fang Z. Peng, Michigan State University, USA; Sichuan University, China; Central South University, China

2:20 pm • Control and Elimination of Sinusoidal Harmonics in Power Electronics Equipment: A System Approach
Vladimir Blasko, Luis Arnedo, Parag Kshirsagar and Suman Dwari, United Technologies Research Center, USA

2:45 pm • Active Filter Under Constant-Frequency Hysteresis Control Based on a Synchronous Reference Frame
Claudio A. Molina, Jose R. Espinoza, Felipe A. Villarroel, Eduardo E. Espinosa and Pedro E. Melin, Concepcion University, Chile

S58 Lighting Applications

Sundance
Chairs: Huang-Jen Chiu, *National Taiwan University of Science and Technology, Taiwan,* and Annabelle Pratt, *Intel, USA*

1:30 pm • A Series Tuned High Power IPT Stage Lighting Controller
Jason James, Alex Chu, Almas Sabitov, Daniel Robertson and Grant Covic, The University of Auckland, New Zealand

1:55 pm • A Multi-Functional Digital Controller for a High Power Factor Electronic Ballast Dimmable with Standard Phase-Cut Dimmers
John Lam, Joanne Hui and Praveen K Jain, Queen's University, Canada

2:20 pm • Collective Dimming of Discharge Lamps with Improved Input Power Factor Using MERS-PFC Converter
Cheng Miao-miao, Mustapha Ilhami Bin, Isobe Takanori and Shimada Ryuichi, Tokyo Institute of Technology, Japan

2:45 pm • Proposing Meaures of Flicker in the Low Frequencies for Lighting Applications
Brad Lehman, Arnold Wilkins, Berman Sam, Poplawski Michael and Naomi Johnson Miller, Northeastern University, USA; University of Essex, UK; Lawrence Berkeley National Laboratory Emeritus, USA; Pacific Northwest National Laboratory, USA

S59 AC-DC Rectifiers: Control I

Borein
Chairs: Min Chen, *National Semiconductor Coporation, USA,* and Sudip K. Mazumder, *University of Illinois, USA*

1:30 pm • An Optimal Lyapanov-Based Control Strategy for Digitally Controlled Single-Phase Power Factor Correction AC-DC Converters
Majid Pahlevaninezhad, Pritam Das, Alireza Safaee, Praveen Jain, Alireza Bakhshai and Gerry Moschopoulos, Queen's University, Canada; University of Western Ontario, Canada

1:55 pm • Bridgeless Isolated PFC Rectifier Using Bi-Directional Switch and Dual Output Windings
Jong-Won Shin, Jong-Bok Baek and Bo-Hyung Cho, Seoul National University, Republic of Korea

2:20 pm • Forward-Based AC-DC Converter with Quasi-Active Input Current Shaping Technique
Hussain Athab and Dylan Dah-Chuan Lu, Faculty of Engineering/ Multimedia University, Malaysia; University of Sydney, Australia

2:45 pm • Dynamic Behavior of Current Controllers for Selective Harmonic Compensation in Three-Phase Active Power Filters
Fernando Briz, David Reigosa, Pablo Garcia, Michael W. Degner and Juan M. Guerrero, University of Oviedo, Spain; Ford Motor Company, USA

S60 Transportation Applications: Batteries, Ultracapacitors and Fuel Cells

Regency D
Chair: Abraham Gebregergis, *Nexteer Automotive, USA*

1:30 pm • Sizing Considerations for Ultra-Capacitors in Hybrid Energy Storage Systems
Valentin Bolborici, Francis Dawson and Keryn Lian, University of Toronto, Canada

1:55 pm • A Modular Balancing Bridge for Series Connected Li-Ion Batteries
Jeffrey Ewanchuk, Dominic Yague and John Salmon, University of Alberta, Canada

2:20 pm • Optimal Power Flow for Hybrid Ultracapacitor Systems in Light Electric Vehicles
Omar Laldin, Mazhar Moshirvaziri and Olivier Trescases, University of Toronto, Canada

2:45 pm • A Parallel Energy-Sharing Control for a Fuel Cell-Battery-Ultracapacitor Hybrid Vehicles
Jenn Hwa Wong, Nik Rumzi Nik Idris, Makbul Anwari and Taufik Taufik, Universiti Teknologi Malaysia, Malaysia; University of Umm Al-Qura, Saudi Arabia; Cal Poly State University, USA

S61 DC-DC Converters: Digital Control

Regency A
Chair: A. Prodic, *University of Toronto, Canada*

1:30 pm • Digital Control Implementation to Reduce the Cost and Improve the Performance of the Control Stage of an Industrial Switch-Mode Power Supply
Daniel Diaz, Oscar Garcia, Jesus Angel Oliver, Pedro Alou and Felix Moreno, Universidad Politecnica de Madrid, Spain

1:55 pm • Novel Random Switching PWM Technique with Constant Sampling Frequency and Constant Inductor Average Current for Digital-Controlled Converter
Ye-Then Chang, Bo-Yuan Chen and Yen-Shin Lai, National Taipei University of Technology, Taiwan

2:20 pm • Small-Signal Model Analysis and Design of Constant On-Time V2 Control for Low-ESR Caps with External Ramp Compensation
Shuilin Tian, KuangYao Cheng, Fred Lee and Paolo Mattavelli, CPES, Virginia Tech, USA; Texas Instruments, USA

2:45 pm • Dynamic Respose Improvement of Power Converter Using an Adaptive Frequency Control Law
Vara Prasad Arikatla and Jaber Abu Qahouq, The University of Alabama, USA

Wednesday, September 21 3:30 pm – 5:10 pm

S62 Energy Storage I

Ellis West
Chairs: Subhashish Bhattacharya, *North Carolina State University, USA,* and Dehong Xu, *Zhejiang University, China*

3:30 pm • Testing and Modeling of Lithium-Ion Ultracapacitors
Emad Manla, Goran Mandic and Adel Nasiri, University of Wisconsin-Milwaukee, USA

3:55 pm • An Analysis on the Possibility of Using Flying Capacitors of a Three-Level Capacitor Clamped Inverter as Power Smoothing Elements for Wind Power Systems
Gamini Jayasinghe, Don Mahinda Vilathgamuwa and Udaya Madawala, Nanyang Technological University, Singapore; The University of Auckland, New Zealand

4:20 pm • A Modular Hybrid Fuel Cell System with Energy Storage
Prasad Enjeti, Somasundaram Essakiappan and Joshua Hawke, IEEE, USA

4:45 pm • Power Oscillation Damping Controller by Static Synchronous Compensator with Energy Storage
Mebtu Beza and Massimo Bongiorno, Chalmers University of Technology, Sweden

S63 Power Devices: Parallel and Series Operation

Regency C
Chair: Enrico Santi, *University of South Carolina, USA*

3:30 pm • Series Connection of Power Switches in High Input Voltage with Wide Range Power Supply for Gate Driving Application
Filippo Chimento, Salvatore Tomarchio, Angelo Raciti, Simone Buonuomo and Antonino Gaito, ABB Corporate Research, Sweden; University of Catania, Italy; ST Microelectronics, Italy

3:55 pm • Digital Adaptive Driving Strategies for High-Voltage IGBTs
Axel Mertens, Harald Kuhn and Lan Dang, Leibniz University Hannover, Germany

4:20 pm • A New Delay Time Compensation Principle for Parallel Connected IGBTs
Rodrigo Alvarez and Steffen Bernet, Technische Universitaet Dresden, Germany

4:45 pm • The Voltage Sharing of Commercial IGBTS in Series with Passive Components
Sheng Zheng, Yousheng Wang, Xinke Wu, Zhaoming Qian and F.Z. Peng, Zhejiang University, China; Michigan State University, USA

S64 Sensorless Control II

Cassidy
Chair: Mahesh Swamy, *Yaskawa America Inc., USA*

3:30 pm • Encoderless Servo Drive with Adequately Designed IPMSM for Pulse Voltage Injection Based Position Detection
Soji Murakami, Masaki Hisatsune, Takayuki Shiota, Motomichi Ohto and Kozo Ide, Yaskawa Electric Corporation, Japan

3:55 pm • PWM Switching Frequency Signal Injection Sensorless Method in IPMSM
Sungmin Kim, Jung-Ik Ha and Seung-Ki Sul, Seoul National University, Republic of Korea

4:20 pm • Position Self-Sensing Evaluation of a FI-IPMSM Based on High Frequency Signal Injection Methods
Chen-Yen Yu, Jun Tamura, David Reigosa and Robert Lorenz, University of Wisconsin-Madison, USA; Nissan Motor Co., Ltd., Japan; University of Oviedo, Spain

4:45 pm • Sensorless Rotor Position Detection Capability of a Dual Three-Phase Fractional-Slot IPM Machine
Massimo Barcaro, Adriano Faggion, Nicola Bianchi and Silverio Bolognani, University of Padova, Italy

S65 Impact of Renewable Energy Systems on Utility Grid

Ellis East
Chairs: Burak Ozpineci, *Oak Ridge National Laboratory, USA*, and Sudip Mazumder, *University of Illinois, Chicago, USA*

3:30 pm • A Review on Fundamental Grid-Voltage Detection Methods Under Highly Distorted Conditions in Distributed Power-Generation Networks
Nils Hoffmann, Ralf Lohde, Lucian Asiminoaei, Friedrich W. Fuchs and Paul B. Thoegersen, Christian-Albrechts-University of Kiel, Germany; Danfoss Drives A/S, Denmark; KK-Electronic A/S, Denmark

3:55 pm • Two Methods for Addressing DC Component in Phase-Locked Loop (PLL) Systems
Masoud Karimi-Ghartemani, Sayed Ali Khajehoddin, Praveen Jain and Alireza Bakhshai, Queen's University, Canada

4:20 pm • Monte Carlo Analysis of the Impacts of High Renewable Power Penetration
Douglas Halamay and Ted Brekken, Oregon State University, USA

4:45 pm • Online Grid-Adaptive Control and Active-Filter Functionality of PWM-Converters to Mitigate Voltage-Unbalances and Voltage-Harmonics — A Control Concept Based on Grid-Impedance Measurement
Nils Hoffmann, Lucian Asiminoaei and Friedrich W. Fuchs, Christian-Albrechts-University of Kiel, Germany; Danfoss Drives A/S, Denmark

S66 Resonant DC-DC Converters III

Remington
Chairs: Paolo Mattavelli, *Virginia Tech, USA*, and Alireza Bakhshai, *Queen's University, Canada*

3:30 pm • A Resonant Bi-Directional DC-DC Converter for Aerospace Applications
Alireza Safaee, Alireza Bakhshai and Praveen Jain, Queen's University, Canada

3:55 pm • Hybrid Half- and Full-Bridge Converter with High Efficiency and Full Soft-Switching Range
Wensong Yu, Jih-Sheng Lai, Wei-Han Lai and Hongmei Wan, Virginia Tech, USA

4:20 pm • Practical Performance Evaluations of a Soft Switching PWM Boost DC-DC Converter with High Efficiency and High Scalability Edge Resonant Switched Capacitor Modular
Tomokazu Mishima, Yujiro Takeuchi and Mutsuo Nakaoka, Kobe University, Japan; Kyungnam University and Yamaguchi University, Japan

4:45 pm • Optimal Design Considerations for a Modified LLC Converter with Wide Input Voltage Range Capability Suitable for PV Applications
Haibing Hu, Xiang Fang, Qian Zhang, John Shen and Issa Batarseh, University of Central Florida, USA

S67 Advanced Electric Machine Design I

Cowboy Artists
Chairs: David Dorrell, *University of Technology, Australia*, and Chris Gerada, *University of Nottingham, UK*

3:30 pm • Induction Motor Design Methodology Based on Rotor Diameter Progressive Growth
Aldo Boglietti, Andrea Cavagnino, Mario Lazzari, Alessio Miotto and Silvio Vaschetto, Politecnico di Torino, Italy

3:55 pm • Theory and Design of Fractional-Slot Multilayer Winding
Luigi Alberti and Nicola Bianchi, University of Padova, Italy

4:20 pm • Integer-Slot vs Fractional-Slot Concentrated-Winding Axial-Flux Permanent Magnet Machines: Comparative Design, FEA and Experimental Tests
Giulio De Donato, Fabio Giulii Capponi, Antonio Rivellini and Federico Caricchi, University of Rome "La Sapienza", Italy

4:45 pm • Design and Analysis of Brushless Doubly Fed Reluctance Machines
Andrew Knight, Robert Betz and David Dorrell, University of Alberta, Canada; University of Newcastle, Australia; University of Technology Sydney, Australia

S68 High Power Inverters

Russell
Chair: Toshihisa Shimizu, *Tokyo Metropolitan University, Japan*

3:30 pm • Common-Mode Voltage Reduction Methods for Medium-Voltage Current Source Inverter-Fed Drives
Ning Zhu, Bin Wu, Dewei Xu, Navid R. Zargari and Mehrdad Kazerani, Ryerson University, Canada; Rockwell Automation Canada Company, Canada; University of Waterloo, Canada

3:55 pm • Implementation of a Fully Integrated High Density 50 kW Inverter Using a SiC JFET Based Six-Pack Power Module
Timothy Junghee Han, Jim Nagashima, Sung Joon Kim, Srikanth Kulkarni and Fred Barlow, Global Power Electronics, Inc., USA; University of Idaho, USA

4:20 pm • A Transformerless D-StatCom Based on a Multi-Voltage Cascade Converter Requiring No DC Sources
Kenichiro Sano and Masahiro Takasaki, CRIEPI, Japan

4:45 pm • Optimization of Switching Losses and Harmonic Performance Using Model Predictive Control of a Cascaded H-Bridge Multi-Level StatCom
Chris Townsend, Terry Summers and Robert Betz, University of Newcastle, Australia

S69 Uninterruptible Power Supplies

Sundance
Chair: Ahmet Hava, *Middle East Technical University, Turkey*

3:30 pm • A Cascaded Online Uninterruptible Power Supply Using Reduced Semiconductor
Lei Zhang, Poh Chiang Loh, Feng Gao and Frede Blaabjerg, Nanyang Technological University, Singapore; Shandong University, China; Aalborg University, Denmark

3:55 pm • Comparisons of Different Control Strategies for 20kVA Solid State Transformer
Gangyao Wang, Xu She, Fei Wang, Arun Kadavelugu, Tiefu Zhao, Alex Huang and Wenxi Yao, North Carolina State University, USA; Zhejiang University, China

4:20 pm • On Single-Phase UPS Topologies
Edison Da Silva, Welflen Santos, Cursino Jacobina and Alexandre Cunha, Federal University of Campina Grande, Brazil

S70 Single Phase AC-DC Rectifier: Control and Analysis

Borein
Chairs: Yaow-Ming Chen, *National Taiwan University, Taiwan,* and Mohamed Orabi, *South Valley University, Egypt*

3:30 pm • Digital Control Strategy for Multi-Phase Interleaved Boundary Mode and DCM Boost PFC Converters
Tobias Grote, Frank Schafmeister, Heiko Figge, Norbert Froehleke and Joachim Boecker, University of Paderborn, Germany; DELTA Energy Systems GmbH, Germany

3:55 pm • The Effect of Ripple Steering on Control Loop Stability for a CCM PFC Boost Converter
Fariborz Musavi, Murray Edington, Wilson Eberle and William G. Dunford, Delta-Q Technologies Corp., Canada; University of British Columbia, Canada

4:20 pm • Model Predictive-Based Control Method for Cascaded H-Bridge Multilevel Active Rectifiers
Michail Vasiladiotis, Konstantinos Pavlou, Stefanos Manias and Alfred Rufer, Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland; National Technical University of Athens (NTUA), Greece

S71 Rail, Aerospace and Marine

Regency D
Chair: Mahesh Krishnamurthy, *Illinois Institute of Technology, USA*

3:30 pm • Diode Rectification of Multiphase Synchronous Generators for Aircraft Applications
Steven Jordan and Judith Apsley, University of Manchester, UK

3:55 pm • Self Healing for a DC Zonal Distribution Architecture Using Active Impedance Estimation
Mark Sumner, Edward Christopher, David Thomas and Frans de Wildt, University of Nottingham, UK; MOD UK, UK

4:20 pm • An Algorithm and Implementation System for Measuring Impedance in the D-Q Domain
Francis Gerald, Burgos Rolando, Boroyevich Dushan, Wang Fred and Karimi Kamiar, The Boeing Co., USA; ABB Corporate Research, USA; Virginia Tech - CPES, USA; University of Tennessee, USA

S72 Integrated DC-DC Converters

Regency A
Chairs: Cian Ó Mathúna, *Tyndall University, Ireland,* and Francesco Carabolante, *Qualcomm, USA*

3:30 pm • A Single-Inductor Bipolar-Output Converter with 5 mV Positive Voltage Ripple for Active Matrix OLED
Chen Wei-Chung, Chiu Chao-Chang, Hsieh Chun-Yu, Huang Tzu-Chi and Lee Yu-Huei, ECE, NCTU, Taiwan

3:55 pm • A 1.65W Fully Integrated 90nm Bulk CMOS Intrinsic Charge Recycling Capacitive DC-DC Converter
Hans Meyvaert, Tom Van Breussegem and Michiel Steyaert, Katholieke Universiteit Leuven ESAT-MICAS, Belgium

4:20 pm • Non-Isolated Flyback Switching Capacitor Voltage Regulator
Wenjing Cao, Ke Jin and Xinbo Ruan, Nanjing University of Aeronautics and Astronautics, China

Thursday, September 22 8:00 am – 9:40 am

S73 Energy Storage II

Ellis West
Chairs: Madhav Manjrekar, *Siemens Energy Inc., USA,* and Satish Rajagopalan, *EPRI, USA*

8:00 am • Interleaved Smart Burp PV Charger for Lead Acid Batteries with Incremental Conductance MPPT
Guan-Chyun Hsieh, Shih-Wei Chen and Cheng-Yuan Tsai, Chyun Yuan Christian University, Taiwan; National Taiwan University of Science and Technology, Taiwan

8:25 am • Design and Implementation of a Bi-Directional Isolated DAB-Based DC-DC Converter in Home Area Networks
Sheng-Chieh Lo, Yen-Chun Wu and Tzung-Lin Lee, National Sun Yat-sen University, Taiwan

8:50 am • Power Control Strategy of a CSC Based Wind Energy Conversion System with Superconducting Magnetic Energy Storage System in DC Side
Zheng Wang, Yongqiang Lang, Ming Cheng and Jiacheng Wang, Southeast University, China; Delta Electronics, Nanjing, China; Department of Electrical and Computer Engineering, Canada

9:15 am • Lithium-Based Energy Storage Management for DC Distributed Renewable Energy System
Wei Zhang, Dong Dong, Igor Cvetkovic, Fred C. Lee and Boroyevich Dushan, Virginia Polytechnic Institute and State University, USA

S74 Electric Machine Modeling

Curtis A
Chairs: David Dorrell, *University of Technology, Australia,* and Rafal Wrobel, *University of Bristol, UK*

8:00 am • Modeling and Effects of In-Situ Magnetization of Isotropic Ferrite Magnet Motors
Min-Fu Hsieh, Ching-Kuo Lin, David Dorrell and Peter Wung, National Cheng Kung University, Taiwan; University of Technology, Sydney, Australia; A. O. Smith Corporation, USA

8:25 am • A Basic Study of MATRIX Motor
Hiroki Hijikata and Kan Akatsu, Shibaura Institute of Technology, Japan

8:50 am • Influence of Slot and Pole Number Combinations on Unbalanced Magnetic Force in Permanent Magnet Machines
Z. Q. Zhu, M. L. Mohd Jamil and L. J. Wu, University of Sheffield, UK

S75 Modulation Techniques

Cassidy
Chair: Tim Alt, *Rolls-Royce, USA*

8:00 am • PWM Scheme to Reduce the Common-Mode Current Generated by an AC Drive at Low Modulation Index
Rangarajan Tallam, David Leggate, David Kirschnik and Richard Lukaszewski, Rockwell Automation, USA

8:25 am • Model Predictive Pulse Pattern Control
Tobias Geyer, Nikolaos Oikonomou, Georgios Papafotiou and Frederick Kieferndorf, The University of Auckland, New Zealand; ABB Corporate Research, Switzerland

8:50 am • Quantitative Power Quality and Characteristic Analysis of Multilevel Pulse Width Modulation Methods in Medium Voltage High Power Industrial AC Drives
Kevin Lee and Geraldo Nojima, Eaton Corporation, USA

S76 DC-DC Converters for Renewable Energy Systems

Ellis East
Chairs: Burak Ozpineci, *Oak Ridge National Laboratory, USA,* and Sudip Mazumder, *University of Illinois, Chicago, USA*

8:00 am • Bi-Directional Converter with Low Input/Output Current Ripple for Renewable Energy Applications
Abbas Fardoun, Esam Ismail, Ahmad Sabzali and Mustafa Al-Saffar, UAE University, United Arab Emirates; College of Technological Studies, Kuwait

8:25 am • Swinging Bus Technique for Ripple Current Elimination in Fuel Cell Power Conversion
Martin Ordonez, Simon Fraser University, Canada

8:50 am • Characteristic Analysis and Modeling on PEMFC Degradation Associated with Low Frequency Ripple Current Effects
Jonghoon Kim, Minho Jang, Yongsug Tak and Bohyung Cho, Seoul National University, Republic of Korea; Inha University, Republic of Korea

9:15 am • A Three-Port Half-Bridge Converter with Synchronous Rectification for Renewable Energy Application
Hongfei Wu, Yan Xing, Runruo Chen, Junjun Zhang, Kai Sun and Hongjuan Ge, Nanjing University of Aeronautics and Astronautics, China; Tsinghua University, China

S77 DC-DC Converters: Controls II

Remington
Chairs: Dragan Maksimovic, *University of Colorado at Boulder, USA,* and Jaber Abu-Qahouq, *Arizona University, USA*

8:00 am • Analysis and Implementation of Output Voltage Regulation in Multi-Phase Switched Capacitor Converters
Sam Ben-Yaakov and Alexander Kushnerov, Ben-Gurion University of the Negev, Israel

8:25 am • Flyback Transformer Based Transient Suppression Method for Digitally Controlled Buck Converters
Jing Wang, Aleksandar Prodic and Wai Tung Ng, University of Toronto, Canada

8:50 am • Improvements in Boundary Control of Boost Converters Using the Natural Switching Surface
Juan Galvez, Martin Ordonez, Federico Luchino and John Quaicoe, Simon Fraser University, Canada; Memorial University of Newfoundland, Canada

9:15 am • A Family of Switching Capacitor Regulators
Ling Gu, Wenjing Cao, Ke Jin and Xinbo Ruan, Nanjing University of Aeronautics and Astronautics, China

S78 Advanced Electric Machine Design II

Cowboy Artists
Chairs: Yves Perriard, *Ecole Polytechnique Federale de Lausanne, Switzerland,* and Andreas Binder, *Darmstadt University of Technology, Germany*

8:00 am • Design Study for Exterior Rotor Bearingless Permanent Magnet Machines
Thomas Reichert, Thomas Nussbaumer and Johann W. Kolar, Power Electronic Systems Laboratory, ETH Zurich, Switzerland; Levitronix GmbH, Switzerland

8:25 am • A Novel Technique for Minimizing Torque Ripple in Axial Flux Segmented Rotor SRM
Madhavan Ramanujam and Fernandes B.G., Indian Institute of Technology Bombay, India

8:50 am • Core Axial Lengthening as Effective Solution to Improve the Induction Motor Efficiency Classes
Luigi Alberti, Nicola Bianchi, Aldo Boglietti and Andrea Cavagnino, Universita' di Padova, Italy; Politecnico di Torino, Italy

9:15 am • Characterization of Noise and Vibration in Permanent Magnet Synchronous Motors Using Electromagnetic and Structural Analyses
Mohammad Islam, Rakib Islam and Tomy Sebastian, Nexteer Automotive, USA

S79 Multilevel Converters II

Russell
Chair: Yong Kang, *Huazhong University of Science and Technology, China*

8:00 am • Optimal Pulsewidth Modulation of a Dual Three-Level Inverter System Operated from a Single DC Link
Till Boller, Joachim Holtz and Akshay Rathore, University of Wuppertal, Germany; National University of Singapore, Singapore

8:25 am • Fault-Tolerance Capacity of the Multilevel Active Clamped Topology
Joan Nicolas-Apruzzese, Sergio Busquets-Monge, Josep Bordonau, Salvador Alepuz and Alejandro Calle-Prado, Technical University of Catalonia (UPC), Spain

8:50 am • A Neutral Point Balancing Controller for Three-Level Inverter with Full Power-Factor Range and Low Distortions
Jie Shen, Stefan Schroeder, Duro Basic and Robert Roesner, GE Global Research, Germany; GE Energy, Germany

9:15 am • Equalization of DC Bus Voltage in Three-Level NPC-HB Inverters for PV Applications by Even Harmonics Injection or Fundamental Phase Modulation
Roberto Petrella, Nicola Buonocunto, Alessandro Revelant and Piero Stocco, DIEGM - University of Udine, Italy; MetaSystem Energy s.r.l., Italy

S80 Medium Voltage Industrial Drives

Sundance
Chairs: Sewan Choi, *Seoul National University, Republic of Korea,* and Jason Lai, *Virginia Tech, USA*

8:00 am • Transformerless Multi-Level Converter Based Medium Voltage Drives
Peter Steimer and Manfred Winkelnkemper, ABB Ltd., Switzerland

8:25 am • Quantitative System Compatibility and Characteristics Analysis of Two-Level and Three-Level Low Voltage Industrial Drives
Kevin Lee and Wenxi Yao, Eaton Corporation, USA; Zhejiang University, China

8:50 am • Regenerative Energy Saving in Multi-Axis Servo-Motor-Drives
Ali Kashefi Kaviani, Brian Hadley and Behrooz Mirafzal, Florida International University, USA; Kansas State University, USA

S81 Single Phase AC-DC Rectifier: Topology

Borein
Chairs: Tsorng-Juu (Peter) Liang, *National Cheng Kung University, Taiwan,* and Dylan Lu, *University of Sydney, Australia*

8:00 am • A Transformerless Single-Stage AC-DC Converter with Low Output Voltage
Shu Kong Ki and Dylan Dah-Chuan Lu, The University of Sydney, Australia

8:25 am • Novel Bi-Directional AC-DC MOSFET Converter for Energy Storage System Applications
Hao Qian, Jih-Sheng Lai and Wensong Yu, Virginia Tech, USA

8:50 am • Dynamic Behavior of Single-Phase Full-Wave Rectifiers with Instantaneous Constant-Power Loads
Chimaobi Onwuchekwa and Alexis Kwasinski, The University of Texas at Austin, USA

S82 Contactless Power Transfer

Curtis B
Chair: Fang Peng, *Michigan State University, USA*

8:00 am • Free Positioning for Inductive Wireless Power System
Eberhard Waffenschmidt, Philips Research, Germany

8:25 am • A Contactless Power Transfer System with Capacitively Coupled Matrix Pad
Chao Liu, Patrick Aiguo Hu and Xin Dai, The University of Auckland, New Zealand; Chongqing University, China

8:50 am • A New Tri-State-Boost-Based Pickup Topology for Inductive Power Transfer Applications
Zeljko Pantic, Sanzhong Bai and Srdjan Lukic, North Carolina State University, USA

9:15 am • A Design Methodology for Multi-kW, Large Airgap, MHz Frequency, Wireless Power Transfer Systems
Seung-Hwan Lee and Robert D. Lorenz, University of Wisconsin-Madison, USA

S83 Inverter Applications

Phoenix
Chair: Burak Ozpineci, *Oak Ridge National Lab, USA*

8:00 am • High Performance Gradient Driver for Magnetic Resonance Imaging System
Rixin Lai, Juan Sabate, Song Chi and Wesley Skeffington, GE Global Research Center, USA

8:25 am • High Performance Pulsed Power Resonant Converter for Radio Frequency Applications
Chao Ji, Pericle Zanchetta, Fabio Carastro and Jon Clare, University of Nottingham, UK

8:50 am • H5TM Inverter with Constant-Frequency Asynchronous Sigma-Delta Modulation
Yaow-Ming Chen, Chia-Hsi Chang and Yung-Ruei Chang, National Taiwan University, Taiwan; Institute of Nuclear Energy Research, Taiwan

9:15 am • Variable Sampling Frequency in Iterative Learning Current Control for Shunt Active Filter in Aircraft Power Systems
Pericle Zanchetta, Jun Yi Liu, Marco Degano and Paolo Mattavelli, University of Nottingham, UK; Virginia Tech, USA

Thursday, September 22 10:00 am – 11:40 am

S84 Energy Storage: Batteries

Ellis West
Chairs: Madhav Manjrekar, *Siemens Energy Inc., USA,* and Raju Ravisekhar, *GE Global Research, USA*

10:00 am • Battery Ripple Current Reduction in a Three-Phase Interleaved DC-DC Converter for 5kW Battery Charger
Wujong Lee, Byung-Moon Han and Hanju Cha, Chungnam National University, Republic of Korea; Myongji University, Republic of Korea

10:25 am • Empirical Battery Model Characterizing a Utility-Scale Carbon-Enhanced VRLA Battery
Daniel Fregosi, Subhashish Bhattacharya and Stanley Atcitty, North Carolina State University, USA; Sandia National Laboratories, USA

10:50 am • Self-Reconfigurable Multicell Batteries
Taesic Kim, Wei Qiao and Liyan Qu, University of Nebraska-Lincoln, USA

11:15 am • Evaluating the Application of Energy Storage and Day-Ahead Solar Forecasting to Firm the Output of a Photovoltaic Plant
Frank Kreikebaum, Rohit Moghe, Anish Prasai and Deepak Divan, Georgia Institute of Technology, USA

S85 Switched Reluctance Machines

Curtis A
Chairs: Avoki Omekanda, *General Motors, USA*, and Yilmaz Sozer, *University of Akron, USA*

10:00 am • Design of Switched Reluctance Motor Competitive to 60 kW IPMSM in Third Generation Hybrid Electric Vehicle
Kyohei Kiyota and Akira Chiba, Tokyo Institute of Technology, Japan

10:25 am • Torque Ripple Minimization of Switched Reluctance Machines Through Current Profiling
Rajib Mikail, Yilmaz Sozer, Iqbal Husain, Mohammad Islam and Tomy Sebastian, University of Akron, USA; Nexteer Automotive, USA

10:50 am • Switched Reluctance Generator Controls for Optimal Power Generation and Battery Charging
Sandeep Narla, Yilmaz Sozer and Iqbal Husain, University of Akron, USA

11:15 am • Characteristics of Axial Type Switched Reluctance Motor
Hiromu Arihara and Kan Akatsu, Shibaura Institute of Technology, Japan

S86 Drive Control

Cassidy
Chair: Gui-Jia Su, *Oak Ridge National Laboratory, USA*

10:00 am • Control of Induction Machine with Extended Range of Maximum Torque Capability for Traction Drives
Bin Gu and Jih-Sheng Lai, Virginia Tech, USA

10:25 am • Application of One-Cycle Control to Stator Field-Oriented Control
Alberto Soto-Lock, Edison Da Silva, Malik Elbuluk and Cursino Jacobina, Federal University of Campina Grande, Brazil; University of Akron, USA

10:50 am • Zero-Speed Operation of CSI-Fed Induction Motor Drive
Fangrui Liu, Bin Wu, Manish Pande and Navid Zargari, Ryerson University, Canada; Rockwell Automation, Canada

11:15 am • Input Power Factor Compensation for PWM-CSC Based High-Power Synchronous Motor Drives
Jingya Dai, Manish Pande and Navid Zargari, Rockwell Automation, Canada

S87 Solar PV System Design and Architecture

Ellis East
Chairs: Adel Nasiri, *University of Wisconsin, Milwaukee, USA*, and Vladimir Blasko, *United Technologies Research Center, USA*

10:00 am • Development of an Autonomous Distributed Maximum Power Point Tracking PV System
Yaow-Ming Chen, Cheng-Wei Chen and Yang-Lin Chen, National Taiwan University, Taiwan

10:25 am • Progressive Smooth Transition for Four-Switch Buck-Boost Converter in Photovoltaic Applications
Yaow-Ming Chen, Yang-Lin Chen and Cheng-Wei Chen, National Taiwan University, Taiwan

10:50 am • Photovoltaic-Wind Hybrid System with Battery Back-Up Optimized for Apartment Complexes and other Community Living Environments
Mohammad Bagher Shadmand, Murali Pasupuleti and Robert Balog, Texas A and M University, USA

11:15 am • Flexible Electrical Power System Controller Design and Battery Integration for 1U to 12U CubeSats
Shailesh Notani and Subhashish Bhattacharya, North Carolina State University, USA

S88 DC-DC Converters: Controls III

Remington
Chairs: Regan Zane, *University of Colorado at Boulder, USA*, and Pritam Das, *Queen's University, Canada*

10:00 am • Seamless Boost Converter Control in Critical Boundary Condition for Fuel Cell Power Conditioning System
Tai-Sik Hwang and Sung-Yeul Park, University of Connecticut, USA

10:25 am • Enhanced Load Step Response for a Bi-Directional DC-DC Converter
Dinesh Sekhar Segaran, Grahame Holmes and Brendan McGrath, RMIT University, Australia

10:50 am • A Switching Strategy for Multiple-Input Converters
Chimaobi Onwuchekwa and Alexis Kwasinski, The University of Texas at Austin, USA

11:15 am • Sliding-Mode Control of Quasi-Z-Source Inverter with Battery for Renewable Energy System
Jianfeng Liu, Shuai Jiang, Dong Cao, Xi Lu and Fangzheng Peng, Central South University, China; Michigan State University, USA

S89 Permanent Magnet Machine Optimization

Cowboy Artists
Chairs: Hamid Toliyat, *Texas A and M University, USA*, and Francesco Cupertino, *Politecnico di Bari, Italy*

10:00 am • Automated Bi-Objective Design Optimization of Multi-MW Direct-Drive PM Machines Using CE-FEA and Differential Evolution
Gennadi Sizov, Peng Zhang, Dan Ionel, Demerdash Nabeel and Marius Rosu, Marquette University, USA; ANSYS, USA

10:25 am • Fast Optimization of an IPMSM with Space Mapping Technique
Stephane Vivier, Didier Lemoine and Guy Friedrich, Universite de Technologie de Compiegne, France

10:50 am • Minimization of Cogging Torque in a Small Axial-Flux PMSG with a Parallel-Teeth Stator
John Wanjiku, Hartmut Jagau, Azeem Khan and Paul Barendse, University of Cape Town, South Africa

11:15 am • A Review of Recent Developments in Electrical Machine Design Optimization Methods with a Permanent Magnet Synchronous Motor Benchmark Study
Yao Duan and Dan Ionel, Vestas Technology R&D Americas, Inc., USA

S90 Inverter PWM Techniques

Russell
Chair: Xinbo Ruan, *Huazhong University of Science and Technology, China*

10:00 am • A Novel Switching Loss Minimized PWM Method for a High Switching Frequency Three-Level Inverter with a SiC Clamp Diode
Nam-Joon Ku, Hong-Ju Jung, Rae-Young Kim and Dong-Suk Hyun, Hanyang University, Republic of Korea

10:25 am • SDRE Control of Single Phase PWM Inverter Using FPGA Based Hardware Controller
Takeaki Fujimoto, Hiroki Uchida and Yokoyama Tomoki, Tokyo Denki University, Japan

10:50 am • Introducing the Elliptical Carrier for PWM Inverters: Derivation and Properties for Phase-Shift Compensation
Lucas Sinopoli and Martin Ordonez, Memorial University of Newfoundland, Canada; Simon Fraser University, Canada

11:15 am • A New Three-Phase Hybrid Five-Level Inverter with Reduced Number of High-Frequency Switching Devices
Liviu Mihalache and Yaosuo Xue, Siemens Corporate Research, USA

S91 STATCOM Controls

Sundance
Chairs: Yongsug Suh, *Chonbuk National University, Korea,* and Pericle Zanchetta, *University of Nottingham, UK*

10:00 am • Negative-Sequence Reactive-Power Control by a PWM STATCOM Based on a Modular Multilevel Cascade Converter (MMCC-SDBC)
Makoto Hagiwara, Ryo Maeda and Hirofumi Akagi, Tokyo Institute of Technology, Japan

10:25 am • A Unified Modular Transformer Converter (MTC) System with Advanced Angle Control Structure
Babak Parkhideh and Subhashish Bhattacharya, North Carolina State University, USA

10:50 am • A DSTATCOM with ADALINE Algorithm for Current Compensation in Distributed Generation Systems
Yin-Ching Wang, Shou-Fu Li and Tzung-Lin Lee, National Sun Yat-sen University, Taiwan

11:15 am • Instantaneous Phase-Locked Loop for Performance Improvement of System with STATCOM Under Single-Line to Ground Fault
Xi Zhengping, Babak Parkhideh and Subhashish Bhattacharya, North Carolina State University, USA

S92 AC-DC Rectifiers: Control II

Borein
Chairs: Yasuyuki Nishida, *Chiba Institute of Technology, Japan,* and Yan Xing, *Nanjing University of Aeronautics and Astronautics, China*

10:00 am • AC Stability of High Power Factor Multi-Pulse Rectifiers
Rolando Burgos, Dushan Boroyevich, Fred Wang, Karimi Kamiar and Francis Gerald, ABB Corporate Research, USA; Virginia Tech, CPES, USA; University of Tennessee, USA; The Boeing Co., USA

10:25 am • Multiloop Interleaved Control for Two-Switch Two-Capacitor Three-Level SMR without Capacitor Voltage Balancing Loop
Jhen-Yu Liao and Hung-Chi Chen, National Chiao Tung University, Taiwan

10:50 am • HF Voltage Generation in a Multi-State Switching Cells-Based Single-Phase Multilevel PFC Rectifierer
Marcio Ortmann, Samir Mussa and Marcelo Heldwein, Federal University of Santa Catarina - EEL/INEP, Brazil

11:15 am • Low-Frequency Leakage Current Reduction Using Active Control of Single-Phase PWM Rectifier
Dong Dong, Dushan Boroyevich and Paolo Mattavelli, Virginia Tech, USA

S93 DC-DC Converters: Passive Components

Curtis B
Chairs: Mat Wilkowski, *Enpirion, USA,* and Braham Ferreira, *Delft University of Technology, Netherlands*

10:00 am • A Novel Winding Layout Strategy for Planar Transformer Applicable to High Frequency High Power DC-DC Converters
Majid Pahlevaninezhad, Pritam Das, Josef Drobnik, Praveen Jain, Alireza Bakhshai and Gerry Moschopoulos, Queen's University, Canada; Freescale Semiconductors Inc., USA; University of Western Ontario, Canada

10:25 am • Proposal and Validation of a Medium-Frequency Power Transformer Design Methodology
Irma Villar, Asier Garcia-Bediaga, Unai Viscarret, Ion Etxeberria-Otadui and Alfred Rufer, IKERLAN-IK4 Technology Research Centre, Spain; Industrial Electronics Laboratory, EPFL, Switzerland

10:50 am • Novel Concepts for High Frequency High Efficiency Transformer Design
Dianbo Fu and Shuo Wang, Huawei Technologies, USA; University of Texas at San Antonio, USA

11:15 am • A Novel Integrated Multi-Elements Resonant Converter
Daocheng Huang, Pengju Kong, Fred. C. Lee and Dianbo Fu, Virginia Tech, USA; Intersil Corporation, USA; Huawei Technologies Co., Ltd., USA

S94 General Inverter Technologies

Phoenix
Chairs: Yan Xing, *Nanjing University of Aeronautics and Astronautics, China,* and Jon Clare, *University of Nottingham, UK*

10:00 am • An Improved Virtual Resistance Damping Method for Grid-Connected Inverters with LCL Filters
Yi Lei, Zhengming Zhao, Fanbo He, Sizhao Lu and Lu Yin, Tsinghua University, China

10:25 am • Modeling and Digital Control of LCLC Resonant Inverter with Varying Load
Scott Jensen, Luca Corradini, Miguel Rodriguez and Dragan Maksimovic, University of Colorado at Boulder, USA

10:50 am • Analysis and Characterization of DC Bus Ripple Current of Two-Level Inverters Using the Equivalent Centered Harmonic Approach
Ufuk Ayhan and Ahmet Hava, Middle East Technical University, Turkey

11:15 am • Model Predictive Control of Z-Source Neutral Point Clamped Inverter
Wei Mo, Poh Chiang Loh and Frede Blaabjerg, Nanyang Technological University, Singapore; Aalborg University, Denmark

Thursday, September 22 1:40 pm – 3:20 pm

S95 Ocean and Wave Energy Harvesting I

Ellis West
Chairs: Dehong Xu, *Zhejiang University, China,* and David Dorrel, *University of Technology Sydney, Australia*

1:40 pm • Wave Energy Converter with Wideband Power Absorption
Timothy Lewis, Annette von Jouanne and Ted Brekken, Oregon State University, USA

2:05 pm • Efficient Energy Harvester for Microbial Fuel Cells Using DC-DC Converters
Jae-Do Park and Zhiyong Ren, University of Colorado Denver, USA

2:30 pm • Universal Power Management IC for Small-Scale Energy Harvesting with Adaptive Impedance Matching
Na Kong, T. Shaver Deyerle IV and Dong Sam Ha, Virginia Tech, USA

2:55 pm • Design and Experiments of Linear Tubular Generators for the Inertial Sea Wave Energy Converter
Giovanni Bracco, Ermanno Giorcelli, Giuliana Mattiazzo, Ciro Attaianese and Silvio Carbone, Politecnico di Torino, Italy; University of Cassino, Italy

S96 Power Devices: Measurement and Characterisation

Curtis A
Chair: Jean Luc Schanen, *Grenoble Institute of Technology, France*

1:40 pm • Automatic Measurement of the Reverse Recovery Behavior of Ultra-Fast Diodes
Juergen Stahl, Daniel Kuebrich, Alexander Pawellek, Christian Oeder and Thomas Duerbaum, University of Erlangen-Nuremberg, Germany

2:05 pm • Can Power Devices' Sensitivity to Mechanical Stresses Be Used as a Sensor for Power Assembly Health Monitoring?
Florence Capy, Stephane Azzopardi, Kamal El Boubkari, Yassine Belmehdi and Jean-Yves Deletage, IMS Laboratory, France

2:30 pm • High-Bandwidth, High-Fidelity In-Circuit Measurement of Power Electronic Switching Waveforms for EMI Generation Analysis
Niall Oswald, Bernard Stark, Neville McNeill and Derrick Holliday, University of Bristol, UK

2:55 pm • Experimental Study of Power Module with SiC Devices
Dong Jiang, Fan Xu, Fei Wang, Timothy Junghee Han and Leon Tolbert, University of Tennessee, USA; Global Power Electronics, USA

S97 Drive Issues II

Cassidy
Chair: Parag Kshirsagar, *United Technologies Research Center, USA*

1:40 pm • Control of PWM Voltage Source Inverter in the Pulse Dropping Region to Reduce Reflected Wave Motor Over-Voltage
Rangarajan Tallam and David Leggate, Rockwell Automation, USA

2:05 pm • Embedded-Friendly Online Dead-Time Compensation Using PWM Timer
Takahiro Suzuki, Kiyoshi Sakamoto, Toshihiro Takeuchi and Yasuo Notohara, Hitachi, Ltd., Japan; Hitachi Information and Control Solutions, Ltd., Japan

2:30 pm • Feedforward Control for SPMSM with Final State Control Based on Voltage Limit Circle with Transient Term
Takayuki Miyajima, Hiroshi Fujimoto and Masami Fujitsuna, The University of Tokyo, Japan; DENSO Corporation, Japan

2:55 pm • On-Line Condition Monitoring for MOSFET and IGBT Switches in Digitally Controlled Drives
Jason Anderson and Robert Cox, UNC Charlotte, USA

S98 Grid Interactive Renewable Energy Systems

Ellis East
Chairs: Ahmed Elasser, *GE Global Research Center, USA,* and Robert Balg, *Texas A and M University, USA*

1:40 pm • Utility Grid Impact with High Penetration PV Micro-Inverters Operating Under Burst Mode Using Simplified Simulation Model
Zheng Zhao, Kuan-Hung Wu, Jih-Sheng Lai and Wensong Yu, Virginia Tech, USA; National Taiwan University of Science and Technology, Taiwan

2:05 pm • Energy Capture Improvement of a Solar PV System with a Multilevel Inverter
Nayeem Mahmud, Yilmaz Sozer and Iqbal Husain, University of Akron, USA

2:30 pm • A DC-Link Voltage Control Scheme for Single-Phase Grid-Connected PV Inverters
Fanbo He, Zhengming Zhao, Liqiang Yuan and Sizhao Lu, Tsinghua University, China

S99 DC-DC Converters: Topologies III

Remington
Chairs: Vahid Youfsezadeh, *University of Colorado at Denver, USA,* and Regan Zane, *University of Colorado at Boulder, USA*

1:40 pm • Canonical Small-Signal Model of Double-Input Converters Based on H-Bridge Cells
Reza Ahmadi and Mehdi Ferdowsi, Missouri University of Science and Technology, USA

2:05 pm • A Novel Half-Bridge Converter with Current Ripple Reduction
Ching-Shan Leu and Trong Nha Quang, Nationall Taiwan University of Science and Technology, Taiwan

2:30 pm • Design Considerations of a Multiple-Input Isolated Single Ended Primary Inductor Converter (SEPIC) for Distributed Generation Sources
Sheng-Yang Yu, Ruichen Zhao and Alexis Kwasinski, The University of Texas at Austin, USA

2:55 pm • A Variable Frequency Soft Switching Controlled Boost-Flyback Converter for High Step-Up Applications
Junjun Zhang, Hongfei Wu, Yan Xing, Kai Sun and Xudong Ma, Nanjing University of Aeronautics and Astronautics, China; Tsinghua University, China; Southeast University, China

S100 Special Application Machines

Cowboy Artists
Chairs: Peter Wung, *AO Smith Corporation, USA,* and Akira Chiba, *Tokyo Institute of Technology, Japan*

1:40 pm • Damper Windings for the Magnetic Gear
Siavash Pakdelian, Nicolas Frank and Hamid Toliyat, Texas A and M University, USA; ABB US Corporate Research Center, USA

2:05 pm • Experimental Evaluation of a Motor Integrated Permanent Magnet Gear
Peter Rasmussen, Kasper Koetter, Tommy Frandsen and Kenneth Jessen, Aalborg University, Denmark; Danfoss Drives, Denmark

2:30 pm • A Line-Fed Permanent Magnet Motor Solution for Drum-Motor and Conveyor-Roller Applications
Mircea Popescu, David Staton, Steven Jennings, Thomas Barucki and Joachim Schnuettgen, Motor Design Ltd., UK; Interroll, Germany; Adapted Solutions GmbH, Germany

2:55 pm • Design Study of a Three-Phase Brushless Exciter for Aircraft Starter/Generator
Antonio Griffo, Rafal Wrobel, Adrian Mlot, Jason Yon and Phil Mellor, University of Bristol, UK

S101 Modular Multilevel Converters

Russell
Chairs: Sudip K. Mazumder, *University of Illinois, USA,* and Wuhua Li, *Zhejiang University, China*

1:40 pm • A New Three-Phase AC-AC Modular Multilevel Converter with Six Hexagonally Arranged Branches
Lennart Baruschka and Axel Mertens, Leibniz University of Hannover, Germany

2:05 pm • Complex Phasor Modeling and Control of Modular Multilevel Inverters
Justin Reed, Giri Venkataramanan and Francisco Martinez, University of Wisconsin-Madison, USA; Technical University of Madrid, Spain

2:30 pm • Continuous Model of Modular Multilevel Converter and Experimental Verification
Steffen Rohner, Jens Weber and Steffen Bernet, Dresden University of Technology, Germany

2:55 pm • Capacitor Voltage Balancing Control Based on CPS-PWM of Modular Multilevel Converter
Xiaoqian Li, Qiang Song, Jianguo Li and Wenhua Liu, Tsinghua University, China

S102 Active Filters Applications

Sundance
Chairs: Toshihisa Shimizu, *Tokyo Metropolitan University, Japan,* and Tony O'Gorman, *Continental Automotive, USA*

1:40 pm • Design and Testing of a Medium Voltage Controllable Network Transformer Prototype with an Integrated Hybrid Active Filter
Debrup Das, Javier Munoz, Rajendra Prasad Kandula, Ron Harley, Deepak Divan and Joe Schatz, Georgia Institute of Technology, USA; University of Concepcion, USA; Southern Company, USA

2:05 pm • A High Power Medium-Voltage DC Amplifier System
Hesam Mirzaee, Subhashish Bhattacharya and Sandeep Bala, North Carolina State University, USA; ABB Corporate Research Center, USA

2:30 pm • Study of a New Technique to Reduce the DC-Link Capacitor in a Power Electronic System by Using a Series Voltage Compensator
Huai Wang and Henry Chung, City University of Hong Kong, Hong Kong

2:55 pm • Directional Triplen Hybrid Active Filter for Radial Systems
Rajendra Prasad Kandula, Jorge E. Hernandez and Deepak Divan, Georgia Institute of Technology, USA

S103 Three-Phase AC-DC Rectifiers

Borein
Chairs: Keiji Wada, *Tokyo Metropolitan University, Japan,* and Fujio Kurokawa, *Nagasaki University, Japan*

1:40 pm • Selective Harmonic Compensation (SHC) PWM for Grid-Interfacing High-Power Converters
Hua Zhou, Yun Wei Li, Navid R. Zargari and Zhongyuan Cheng, Rockwell Automation Canada, Canada; University of Alberta, Canada

2:05 pm • Development of an All SiC High Power Density Three-Phase Rectifier with Interleaving
Di Zhang, Puqi Ning, Fred Wang, Dushan Boroyevich, Rolando Burgos, Kamiar Karimi, Vikram Immanuel and Solodovnik Eugene, GE, Global Research Center, USA; University of Tennessee, USA; Oak Ridge National Lab, USA; Virginia Tech, CPES, USA; ABB, USA; Boeing Company, USA

2:30 pm • A Multi-Carrier PWM for Parallel Three-Phase Active Front-End Converters
Chung-Chuan Hou, Chung Hua University, Taiwan

2:55 pm • New Considerations in the Input Filter Design of a Three-Phase Buck-Type PWM Rectifier for Aircraft Applications
Marcelo Silva, Nico Hensgens, Jesus Oliver, Pedro Alou, Oscar Garcia and Jose A Cobos, Universidad Politecnica de Madrid, Spain

S104 Soft-Switching Inverters

Phoenix
Chair: Ichiro Omura, *Kyushu Institute of Technology, Japan*

1:40 pm • Dynamic Analysis and Control of a Zone-Control Induction Heating System
Ngoc Ha Pham, Hideaki Fujita, Kazuhiro Ozaki and Naoki Uchida, Tokyo Institute of Technology, Japan; Mitsui Engineering and Shipbuilding Co., LTD., Japan

2:05 pm • 1/3 Weight Core of a Capacitor-Less ARCP Method Three-Phase Voltage Source Soft-Switching Inverter Suitable for EV
Hirotaka Toda and Masayoshi Yamamoto, Shimane University, Japan

2:30 pm • Switching Control Strategy to Extend the ZVS Operating Range of a Dual Active Bridge AC-DC Converter
Jordi Everts, Jeroen Van den Keybus and Johan Driesen, Catholic University of Leuven, Belgium; Triphase, Belgium

Thursday, September 22 3:40 pm – 5:00 pm

S105 Ocean and Wave Energy Harvesting II

Ellis West
Chairs: Dehong Xu, *Zhejiang University, China,* and David Dorrel, *University of Technology Sydney, Australia*

3:40 pm • Experimental Evaluation of a Doubly-Fed Linear Generator for Ocean Wave Energy Applications
Jennifer Vining, Giri Venkataramanan and Thomas Lipo, University of Wisconsin-Madison, USA

4:05 pm • Per-Unit Wave Energy Converter System Analysis
Timothy Lewis, Annette von Jouanne and Ted Brekken, Oregon State University, USA

S106 IGBT Modules

Curtis A
Chair: Alex Huang, *North Carolina State University, USA*

3:40 pm • Diagnostic Characterization of High-Power IGBTs with Field Instrumentation: Pitfalls in Using Curve Tracers Only and Improvements by Oscilloscopes
Pierluigi Tenca and Filippo Chimento, ABB Corporate Research, Sweden

4:05 pm • Characterization of a 6.5 kV / 500 A IGBT Module in a Series Resonant Converter
Lars Lindenmueller, Steffen Bernet, Rodrigo Alvarez and Philipp Kleinichen, Technische Universitaet Dresden, Germany

4:30 pm • Turn-On Loss vs. Free-Wheel Diode Recovery DV/DT in IGBT Modules
John Donlon, Eric Motto, Marco Honsberg, Thomas Radke and Toru Matsuoka, Powerex, Inc., USA; Mitsubishi Electric Europe BV, Germany; Mitsubishi Electric Corp., Japan

S107 DC Microgrids

Ellis East
Chairs: Liuchen Chang, *University of New Brunswick, Canada,* and Erkan Mese, *Yildiz Technical University, Turkey*

3:40 pm • Game Theoretic Bus Selection in DC Power Systems
Nishantha Ekneligoda and Wayne Weaver, Michigan Technological University, USA

4:05 pm • Control of Parallel-Connected Bi-Directional AC-DC Converters in Stationary Frame for Microgrid Application
Xiaonan Lu, Josep Guerrero, Remus Teodorescu, Tamas Kerekes and Kai Sun, Tsinghua University, China; Technical University of Catalonia, Spain; Aalborg University, Denmark

4:30 pm • DC-Bus Voltage Regulation and Power Compensation with Bi-Directional Inverter in DC-Microgrid Applications
Tsai-Fu Wu, Chia-Ling Kuo, Kun-Han Sun and Yuan-Chih Chang, EPARC, National Chung Cheng University, Taiwan

S108 Multiphase DC-DC Converters

Remington
Chairs: Luca Corradini, *University of Colorado at Boulder, USA,* and Zhiliang Zhang, *Nanjing University of Aeronautics and Astronautics, China*

3:40 pm • Impact of Input and Output Voltage Perturbation on the Behavior of Automotive Multi-Phase Converters with Coupled Inductors
Sebastian Utz and Johannes Pforr, University of Applied Sciences Ingolstadt, Germany

4:05 pm • H2-Optimal Thermal Management for Multi-Phase Current Mode Buck Converters
Mohammad Shawkat Zaman, Pearl (Ke) Cao, Olivier Trescases and Wai Tung Ng, University of Toronto, Canada

4:30 pm • Design and Characterization of a Three-Phase Dual Active Bridge DC-DC Converter in Wye-Delta Connection for a High Frequency and High Power Applications
Seunghun Baek, Sumit Dutta and Bhattacharya Subhashish, North Carolina State University, USA

S109 Synchronous Reluctance Machines

Cowboy Artists
Chairs: Gianmario Pellegrino, *Politecnico di Torino, Italy,* and Daniel Saban, *Danotek Motion Technologies, USA*

3:40 pm • Rotor Structure for Reducing Demagnetization of Magnet in a PMASynRM with Ferrite Permanent Magnet and its Characteristics
Masayuki Sanada, Yukinori Inoue and Shigeo Morimoto, Osaka Prefecture University, Japan

4:05 pm • Performance Evaluation of a High Power Density PMASynRM with Ferrite Magnets
Shohei Ooi, Shigeo Morimoto, Masayuki Sanada and Yukinori Inoue, Osaka Prefecture University, Japan

4:30 pm • Magnet Minimization in IPM-PMASR Motor Design for Wide Speed Range Application
Paolo Guglielmi, Barbara Boazzo, Gianmario Pellegrino, Eric Armando and Alfredo Vagati, Politecnico di Torino, Italy

S110 Boost Inverters

Russell
Chairs: Enrico Santi, *University of South Carolina, USA,* and Zhengyu Lv, *Zhejiang University, China*

3:40 pm • Switched-Boost Inverter based on Inverse Watkins-Johnson Topology
Santanu Mishra, Ravindranath Adda and Avinash Joshi, Indian Institute of Technology Kanpur, India

4:05 pm • High Voltage Gain Boost Converter Topology for Grid Connected Systems
Mohamed Orabi, Moustafa Mousa, Mahrous Ahmed and Mohamed Youssef, APEARC, South Valley University, Egypt; Bombardier Transportation, Canada

4:30 pm • High Step-Up Single-Stage Boost Inverter
Yufei Zhou, Wenxin Huang, Jianwu Zhao and Ping Zhao, Nanjing University of Aeronautics and Astronautics, China

S111 Utility Applications

Sundance
Chairs: Kevin Lee, *Eaton Corporation, USA,* and Friedrich Wilhelm Fuchs, *University of Kiel, Germany*

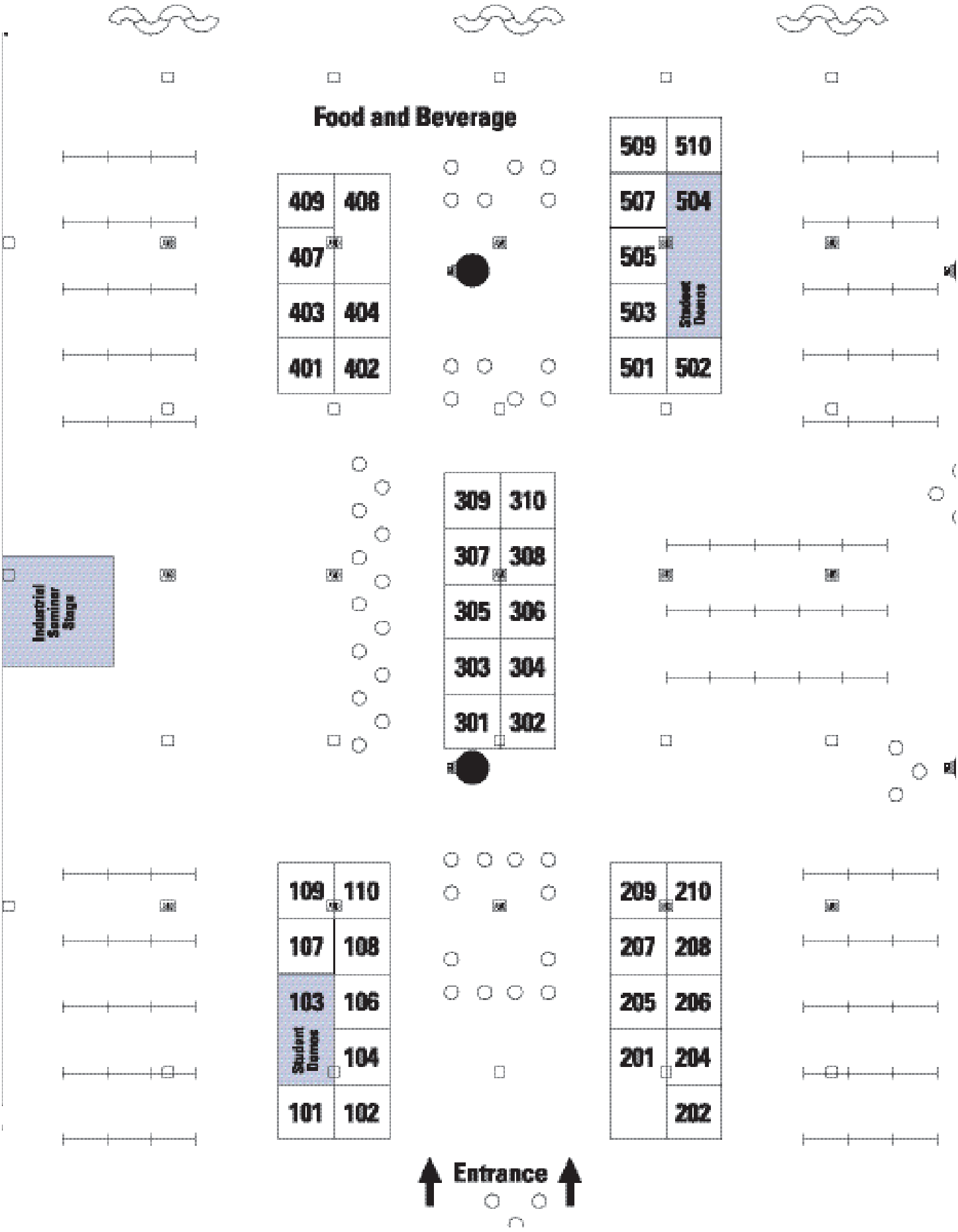
3:40 pm • Transformer-Less Intelligent Power Substation Design with 15kV SiC IGBT for Grid Interconnection
Kamalesh Hatua, Sumit Dutta, Awneesh Tripathi, Seunghun Baek, Giti Karimi and Subhashish Bhattacharya, North Carolina State University, USA

4:05 pm • A Half-Bridge Inverter Based Current Balancer with the Reduced DC Capacitors in Single-Phase Three-Wire Distribution Feeders
Yusuke Baba, Masayuki Okamoto, Eiji Hiraki and Toshihiko Tanaka, Yamaguchi University, Japan

4:30 pm • Design Aspects of a Square-Wave Series Voltage Compensator
Igor A. Pires, Braz de J. Cardoso Filho and Sidelmo M. Silva, Universidade Federal de Minas Gerais, Brazil

4:55 pm • Series Connected IGCT Based Three-Level Neutral Point Clamped Voltage Source Inverter Pole for High Power Converters
Subhashish Bhattacharya and Saman Babaei, North Carolina State University, USA

Exhibit Hall Floorplan



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Company	Booth(s)
5S Components, Inc.	202
Advanced MotorTech LLC	307
ANSYS, Inc.	204
Canadian Electronics	505
Enphase Energy, Inc.	404
Ferroxcube USA, Inc.	110
Ford Motor Company	301
Sustainable Mobility Technologies	
Freescale Semiconductor	501
FSU Center for Advance Power Systems	509
GE Global Research	206
GRAPES	104
(Grid-Connected Advanced Power Electronics Systems)	
How2Power.com	306
IEEE ECCE 2012 Organizating Committee	510
IEEE Industry Applications Society (IAS)	403
IEEE Power Electronics Society (PELS)	107
Infolytica Corporation	101
John Wiley & Sons, Inc	503
JMAG Division, JSOL Corporation and Powersys, Inc.	305
JSR Micro, Inc./JM Energy Corporation	205
Kyocera America, Inc	308
MagneForce Software Systems, Inc.	407
Magnetic Instrumentation, Inc.	108
Magnetics	210
Magnet-Physics, Inc.	310
Magsoft Corporation	109
Microsemi Corporation	402
MK Magnetics, Inc.	408
Nexteer Automotive	207
NORWE, Inc.	106
NSF FREEDM Systems Center	302
Opal-RT Technologies, Inc.	201
Payton America, Inc.	309
Plexim, Inc.	209
Power-One, Inc.	208
Proto Laminations, Inc.	102
Rogers Corporation	304
Thermal Management Solutions	
SBE, Inc.	502
Sidelinesoft LLC	401
Tooh Dineh Industries, Inc.	507
United Technologies Research Center	303
University of Sheffield	409

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Company	Booth(s)
Infolytica Corporation	101
Proto Laminations, Inc.	102
GRAPES	104
(Grid-Connected Advanced Power Electronics Systems)	
NORWE, Inc.	106
IEEE Power Electronics Society (PELS)	107
Magnetic Instrumentation, Inc.	108
Magsoft Corporation	109
Ferroxcube USA, Inc.	110
Opal-RT Technologies, Inc.	201
5S Components, Inc.	202
ANSYS, Inc.	204
JSR Micro, Inc./JM Energy Corporation	205
GE Global Research	206
Nexteer Automotive	207
Power-One, Inc.	208
Plexim, Inc.	209
Magnetics	210
Ford Motor Company	301
Sustainable Mobility Technologies	
NSF FREEDM Systems Center	302
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Rogers Corporation	304
Thermal Management Solutions	
JMAG Division, JSOL Corporation and Powersys, Inc.	305
How2Power.com	306
Advanced MotorTech LLC	307
Kyocera America, Inc	308
Payton America, Inc.	309
Magnet-Physics, Inc.	310
Sidelinesoft LLC	401
Microsemi Corporation	402
IEEE Industry Applications Society (IAS)	403
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IEEE Power Electronics Society (PELS) Booth 107

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MagneForce Software Systems produces software for design and simulation of rotating electric machinery. MagneForce products combine Finite Element techniques together with various time based circuit models to provide a total electric machine design environment. Analysis of both the machine and the associated drive/load circuitry allows MagneForce to produce both steady-state and transient results. MagneForce simulators compute directly machine performance parameters such as voltages, currents, torque, power and efficiency as well as the entire set of machine magnetic parameters. This is all done in an easy to learn and use environment.

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The FREEDM Systems Center is an Engineering Research Center established by the National Science Foundation that partners with universities, industry, and national laboratories to develop technology to revolutionize the nation's power grid. Over 50 utility companies, equipment manufacturers, alternative energy start-ups, and other firms are part of this global partnership.

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The Electrical Machines and Drives group at the University of Sheffield, UK, headed by Professor Z.Q. Zhu, comprises >80 academic/research personnel. It has long-standing and extensive research activities with automotive, aerospace and renewable energy sectors, hosting Rolls-Royce University-Technology-Centre on "Advanced Electrical Machines and Drives" and "Sheffield-Siemens Wind Power Research Centre (S2WP)". It is particularly well-known for its innovative research on permanent-magnet brushless machines and controls, supported by extensive on-site testing and fabrication facilities.

Monday, September 19 5:00 pm – 10:00 pm | Tuesday, September 20 9:00 am – 6:00 pm

Phoenix Convention Center, West Hall 1

In this event, 9 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:

A DC Link Module for Reducing the DC Link Capacitance in a Capacitor-Supported System

Demonstrator: Wang Huai (student)
University: City University of Hong Kong
Advisor: Dr. Henry Chung
email: eeshc@cityu.edu.hk

A Quad-Active Bridge DC-DC Converter for Solid-State Transformer Applications

Demonstrator: Chenhao Nan (student)
University: Arizona State University
Advisor: Dr. Raja Ayyanar
email: rayyanar@asu.edu

A Two-Stage Solid-State Transformer Using an Isolated Boost AC-DC Converter

Demonstrator: Youyuan Jiang (student)
University: Arizona State University
Advisor: Dr. Raja Ayyanar
email: rayyanar@asu.edu

Battery Charger, Grand Prize of IFEC Competition

Demonstrators: Thomas LaBella and Jason Dominic (students)
University: Virginia Tech
Advisor: Dr. Jason Lai
email: laijs@vt.edu

Doubly Excited Brushless Wind Generator

Demonstrator: Ernesto Inoa (student)
University: Ohio State University
Advisor: Dr. Longya Xu
email: longyaxu@gmail.com

GaN Based Switched Capacitor Circuit

Demonstrator: Mark Scott (student)
University: Ohio State University
Advisor: Dr. Jin Wang
email: wang@ece.osu.edu

Power Converters: Essential Components for Top Solar Boat Performance

Demonstrator: Andrew Koch (student)
University: Cedarville University
Advisors: Dr. Gerald Brown (attending), Dr. Timothy Dewhurst
emails: gbrown@cedarville.edu
dewhurst@cedarville.edu

PWAM and Micro-Inverters

Demonstrators: Dong Cao and Qin Lei (students)
University: Michigan State University
Advisor: Dr. F. Peng
email: fzpeng@egr.msu.edu

Regenerative Motor Drive

Demonstrator: Yan Zhou (student)
University: Florida State University
Advisor: Dr. Hui Li
email: hlicaps@gmail.com

Notes

ECCE 2012

IEEE ENERGY CONVERSION CONGRESS & EXPOSITION®

RALEIGH, NORTH CAROLINA | SEPTEMBER 15-20, 2012

CALL for PAPERS

The Fourth Annual IEEE Energy Conversion Congress & Exposition® (ECCE 2012) will be held in Raleigh, North Carolina, on September 16-20, 2012. To be held in Raleigh's brand new convention center, ECCE 2012 will feature both industry-driven and application-oriented technical sessions, as well as industry expositions and seminars. ECCE 2012 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

Important Dates

January 15, 2012
Digest of proposed papers due (to be submitted via ECCE 2012 website)

May 1, 2012
Notification to authors of acceptance/rejection of papers

July 1, 2012
Final papers with IEEE copyright forms due

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.

Close to the Research Triangle Park, Raleigh is the Smart Grid Hub, home to many global companies leader in energy efficiency and smart grid technology, as well as world class universities. Less than two hours away from the North Carolina seashore, and one hour from the Blue Ridge Mountains, there is simply too much to see and do in the Raleigh area. We are looking forward to seeing you in September 2012.

For more information, please visit www.ecce2012.org or contact the ECCE 2012 Technical Program Chairs at ecce2012tpc@gmail.com. For more information on the Expo or becoming an exhibitor at ECCE 2012, please contact the conference Exhibition Chairs at ecce2012exhibit@gmail.com. For information about Raleigh and its surrounding areas, you can visit www.visitraleigh.com.

ECCE 2012 Technical Program Chairs

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Jian Sun, *Rensselaer Polytechnic Institute, USA*
Subhashish Bhattacharya, *NC State University, USA*
Po-Tai Cheng, *National Tsing Hua University, Taiwan*
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