IEEE ENERGY CONVERSION CONGRESS & EXPO

2015

MONTREAL, CANADA | SEPTEMBER 20-24, 2015

PROGRAM

PALAIS DES CONGRÈS DE MONTRÉAL

MONTREAL CONVENTION CENTRE

SPONSORED BY THE IEEE POWER ELECTRONICS AND INDUSTRY APPLICATIONS SOCIETIES

pels IEEE POWER ELECTRONICS SOCIETY Powering a Sustainable Future

50 years IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

IEEE Advancing Technology for Humanity

ECCE 2015 SUPPORTERS AND PARTNERS

ECCE 2015 would like to express our gratitude for the generous support received from the following:

Gold Supporter

imagination at work

infolytica corporation

Silver Supporter

Halla Mechatronics

Rockwell Automation

Association Partner

mcma Motion Control & Motor Association

Media Partners

Bodo's Power Systems®

HOWEPOWER.COM Answering Your Questions About Power Design

WILEY

Exhibit Hall Reception Supporter

OPAL·RT

TABLE OF CONTENTS

MESSAGE FROM OUR GENERAL CHAIR: LIUCHEN CHANG

Dear Friends, Colleagues and Supporters,

I wish to extend my warm welcome to you to the Seventh Annual IEEE Energy Conversion Congress & Exposition (ECCE 2015) hosted in the charming city of Montreal, Quebec, Canada. This is the first time that ECCE is held outside of the USA.

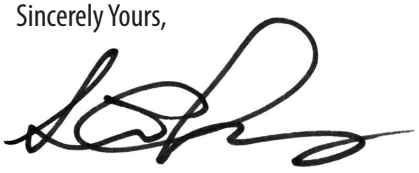
In addition to technical breakout sessions, tutorials, keynote speeches, industry expositions, town hall meetings and student activities, ECCE 2015 also features industry-driven products & services sessions and application-oriented special technical sessions.

A breathtaking combination of European charm and North American energy, Montreal is a major global metropolitan celebrated not only for its international-calibre culture, history, entertainment, cuisine and shopping, but also as a world leader in industries such as aerospace, biotechnology, manufacturing, energy, information, and finance. ECCE 2015 is held at the downtown Palais des congrès de Montréal (Montreal Convention Centre) which is known for its ultramodern facilities and superior sustainable energy performance, as well as being the hub that links Montreal's international district to historic Old Montreal and Chinatown. Safe, friendly and easy to navigate, the international metropolis of Montreal will present ECCE 2015 attendees with a warm welcome, beautiful fall colors, vibrant neighbourhoods and a unique cultural experience.

Acclaimed for the top quality contents, ECCE's have been IEEE's flagship conferences in energy conversion technologies and practices. People from the energy conversion industry and academia gather yearly at ECCE to interact in a convivial and innovative atmosphere – a perfect blend of technical prowess and commercial opportunities in one attractive location. ECCE 2015 is an ideal forum to disseminate and exchange state-of-the-art research results and a pivotal venue to showcase innovative products and services pertinent to a broad spectrum of energy conversion technologies – from components and materials, to systems and resources, to applications and practices. ECCE 2015 brings together practicing engineers, researchers, entrepreneurs and other professionals for interactive and multidisciplinary discussions on the latest advances in energy conversion technologies.

I am excited about, and very grateful for, your participation in and contribution to ECCE 2015. Continuing the tradition of excellence, your **ECCE 2015 Organizing Team** has been working hard preparing a superb technical and social program for you. I hope that ECCE 2015 will offer you a memorable and unique experience in Montreal, Canada.

Sincerely Yours,



General Chair, Liuchen Chang

ORGANIZING COMMITTEE

General Chair
Liuchen Chang, University of New Brunswick, Canada

General Co-Chairs
Andy Knight, University of Calgary, Canada
Yan-Fei Liu, Queens University, Canada
Pragasen Pillay, Concordia University, Canada

Technical Program Chairs
Dan Ionel, Regal Beloit, USA
Xinbo Ruan, Nanjing University of Aeronautics and Astronautics, China
Nashir Uddin, Lakehead University, Canada
Bin Wu, Ryerson University, Canada

Exhibits & Sponsorship Chairs
Steve Sprague, Proto Laminations, USA
Navid Zargari, Rockwell Automation, USA

Plenary, Tutorial and Town Hall Chairs
Sudip Mazumder, University of Illinois, Chicago, USA
Wei Qiao, University of Nebraska – Lincoln, USA
Dehong Xu, Zhejiang University, China

Local Organization Chairs
Sabrina Benzid, Opal-RT, Canada
Pragasen Pillay, Concordia University, Canada

Award Chair
Emmanuel Agamloh, Advanced Energy, USA

Student Activities Chairs
Ambrish Chandra, ETS, Canada
Akshay Kumar Rathore, National University of Singapore, Singapore
Sheldon Williamson, UOIT, Canada

Publication Chair
Saleh Saleh, University of New Brunswick, Canada

Publicity Chair
David Dorrell, University of Technology, Sydney, Australia

Website & Social Media Chair
Jennifer Vining, Oscilla Power, USA

Treasurer
Yunwei (Ryan) Li, University of Alberta, Canada

ECCE 2014 General Chair
Ayman EL-Refaie, GE Global Research, USA

Conference Management
Lauren Deaton, Courtesy Associates, USA
Marika Lendl, Courtesy Associates, USA
Timothy Thoms-Cappello, Courtesy Associates, USA

Conference App

Scan here to check out the ECCE 2015 Conference App and get the latest conference information

Program Subcommittees

Renewable and Sustainable Energy

Alireza Bakhshai (Vice Chair), Queen's University, Canada
Yilmaz Sozer (Vice Chair), University of Akron, USA
Bilal Akin, University of Texas at Dallas, USA
Ahmed Elasser, GE Global Research Center, USA
Ali Elrayyah, Qatar Environmental and Energy Research Inst., Qatar
Qiang Fu, EATON, USA
Joanne Hui, Queen's University, Canada
Majid Pahlevaninezhad, SPARQ, Canada
Akshay Rathore, National University of Singapore, Singapore
Alireza Safaee, OSRAM SYLVANIA, USA
Dezso Sera, Aalborg University, Denmark
Nathan Weise, Marquette University, USA

Smart Grid & Utility Applications

Gerry Moschopoulos (Vice Chair), Western University, Canada
Adel Nasiri (Vice Chair), University of Wisconsin, Milwaukee, USA
Chad Abbey, Smart Grid Solutions, USA
Omar Abdel-baqi, MSOE, USA
Pritam Das, National University of Singapore, Singapore
Mehdi Ferdowsi, Missouri University of Science and Technology, USA
Qiang Fu, EATON, USA
David Gao, Tennessee Tech University, USA
Josep M. Guerrero, Aalborg University, Denmark
Houshang Karimi, Polytechnique, Canada
Masoud Karimi-Ghartemani, Mississippi State University, USA
Ali Khajehoddin, University of Alberta, Canada
Alvaro Luna, UPC, Spain
Behrooz Mirafzal, Kansas State University, USA
Omer Onar, Oak Ridge National Laboratory, USA
Leila Parsa, Rensselaer Polytechnic Institute, USA
Yogesh Patel, Rockwell Automation, USA
Vijay Sood, UOIT, Canada
Yongsug Suh, Chonbuk National University Korea, Republic of Korea
Huai Wang, Aalborg University Denmark
Lingfeng Wang, University of Wisconsin Milwaukee, USA

Computer and Telecommunication

John M. Hawkins (Vice Chair), Telepower, Australia
Sonny Xue (Vice Chair), Siemens Corporate Research, USA
Dong Dong, General Electric, USA
Liming Liu, ABB, USA
Behrooz Mirafzal, Kansas State University, USA
Kai Tian, Ryerson University, Canada

Transportation Applications

Mohammad Islam (Vice Chair), Halla Mechatronics, USA
Amirnaser Yazdani (Vice Chair), Ryerson University, Canada
Ali Bazzi, University of Connecticut, USA
Dong Cao, North Dakota State University, USA
Mazharul Chowdhury, Halla Mectronics, USA
Rakib Islam, Nexteer Automotive, USA
Antonio J. Marques Cardoso, University of Beira Interior (UBI), Portugal
Jae-Do Park, University of Colorado Denver, USA
Rashmi Prasad, General Motors, USA
Yue Zhao, Virginia Commonwealth University, USA

Power Converter Topologies

Khurram Afridi (Vice Chair), University of Colorado Boulder, USA
Pericle Zanchetta (Vice Chair), University of Nottingham, United Kingdom
Stefano Bifaretti, University of Rome Tor Vergata, Italy
Maurizio Cirrincione, University of the South Pacific, Fiji
Yehui Han, University of Wisconsin-Madison, USA
Faisal Khan, The University of Utah, USA
Alessandro Lidozzi, ROMA TRE University, Italy
Fuxin Liu, Nanjing University of Aeronautics and Astronautics, China
Dragan Maksimovic, University of Colorado at Boulder, USA
Madhav Manjrekar, University of North Carolina at Charlotte, USA
David Perreault, MIT, USA
Brandon Pierquet, Tesla Motors, USA
Marcello Pucci, ISSIA-CNR, Italy
David Reigosa, University of Oviedo, Spain
Juan Rivas-Davila, Stanford University, USA
Andrew Rockhill, Eaton Corporate Research and Technology, USA
Luca Solero, University Roma Tre, Italy
Gui-Jia Su, Oak Ridge National Lab, USA
Jon Are Suul, SINTEF Energy Research, Norway
Luca Tarisciotti, University of Nottingham, United Kingdom
Hongliang Wang, Queen's University, Canada
Luca Zarri, University of Bologna, Italy
Zhiliang Zhang, Nanjing University of Aeronautics and Astronautics, China

Control and Applications of Converters

Rolando Burgos (Vice Chair), Virginia Tech, USA
Jian Sun (Vice Chair), Rensselaer Polytechnic Institute, USA
Drazen Dujic, EPFL, Switzerland
Jesus Ivan Gonzalez, Newport News Shipbuilding, USA
Zhiyuan Hu, Texas Instruments, USA
Hui Li, Florida State University, USA
Jun Li, ABB, USA
Qiang Li, Virginia Tech, USA
Marco Liserre, Christian-Albrechts-Universitaet zu Kiel, Germany
Paolo Mattavelli, University of Padova, Italy
Brendan McGrath, RMIT University, Australia
Marta Molinas, NTNU, Norway
Antonello Monti, RWTH Aachen University, Germany
Yasuyuki Nishida, Chiba Institute of Technology, Japan
Martin Ordonez, University of British Columbia, Canada
Babak Parkhideh, University of North Carolina at Charlotte, USA
Jean-Luc Schanen, G2ELab, France
Yongsug Suh, Chonbuk National University Korea, Republic of Korea
Fengfeng Tao, GE, USA
Remus Teodorescu, Aalborg University, Denmark
Pat Wheeler, University of Nottingham, United Kingdom
Sonny Xue, Siemens Corporate Research, USA

Electrical Machines

Emmanuel Agamloh (Vice Chair), Advanced Energy, USA
Mircea Popescu (Vice Chair), Motor Design Ltd., United Kingdom
Ali Bazzi, University of Connecticut, USA
Jonathan Bird, University of North Carolina at Charlotte, USA
Ian Brown, Illinois Institute of Technology, USA
Andrea Cavagnino, Politecnico di Torino, Italy
Akira Chiba, Tokyo Institute of Technology, Japan
Francesco Cupertino, Politecnico di Bari, Italy
Giulio De Donato, University of Rome "La Sapienza", Italy
Greg Heins, Regal Beloit, Australia
Patrick Luk, Cranfield University, United Kingdom
Antonio J. Marques Cardoso, University of Beira Interior, Portugal
Wen Ouyang, ABB US Research Center, USA
Yves Perriard, EPFL, Switzerland
Rashmi Prasad, General Motors, USA
Ronghai Qu, Huazhong University of Science and Technology, China
Khwaja Rahman, General Motors, USA
Bulent Sarlioglu, WEMPEC, University of Wisconsin-Madison, USA
Jagadeesh Tangudu, United Technologies Research Center, USA
Art Wagner, San Jose State University, USA
Thomas Wu, University of Central Florida, USA
Peng Zhang, General Motors, USA
Pinjia Zhang, GE Global Research, USA
Ping Zhou, ANSYS INC, USA

Electric Drives

Fernando Briz (Vice Chair), Univerity of Oviedo, Spain
Mahesh Swamy (Vice Chair), Yaskawa America, Inc., USA
Brian Welchko (Vice Chair), University of Wisconsin Madison, USA
Bilal Akin, University of Texas at Dallas, USA
Davide Barater, University of Parma, Italy
Ali Bazzi, University of Connecticut, USA
Uday Deshpande, Ingersoll Rand, USA
Lei Hao, General Motors, USA
Ernesto Inoa, Caterpillar, Inc., USA
Antonio J. Marques Cardoso, University of Beira Interior (UBI), Portugal
Gianmario Pellegrino, Politecnico di Torino, Italy
Faz Rahman, Ther University of New South Wales, Australia
Giacomo Scelba, University of Catania, Italy
Stefan Schroeder, GE Global Research, Germany
Jul-Ki Seok, Yeungnam University Korea, Republic of Korea
Mahinda Vilathgamuwa, Queensland University of Technology, Australia
Luca Zarri, University of Bologna, Italy
Yue Zhao, Virginia Commonwealth University, USA

Components, Packaging, Materials

Filippo Chimento (Vice Chair), ABB Corporate Research, Sweden
Robert Pilawa-Podgurski (Vice Chair), University of Illinois Urbana Champaign, USA
Muhammad Nawaz, ABB Corporate Research, Sweden
Jelena Popovic, Delft University of Technology, Netherlands
Juan Rivas-Davila, Stanford University, USA
Adam Skorek, University of Quebec at Trois-Rivieres, Canada
Jason T. Stauth, Dartmouth College, USA
Huai Wang, Aalborg University, Denmark
Ruxi Wang, GE global research, USA

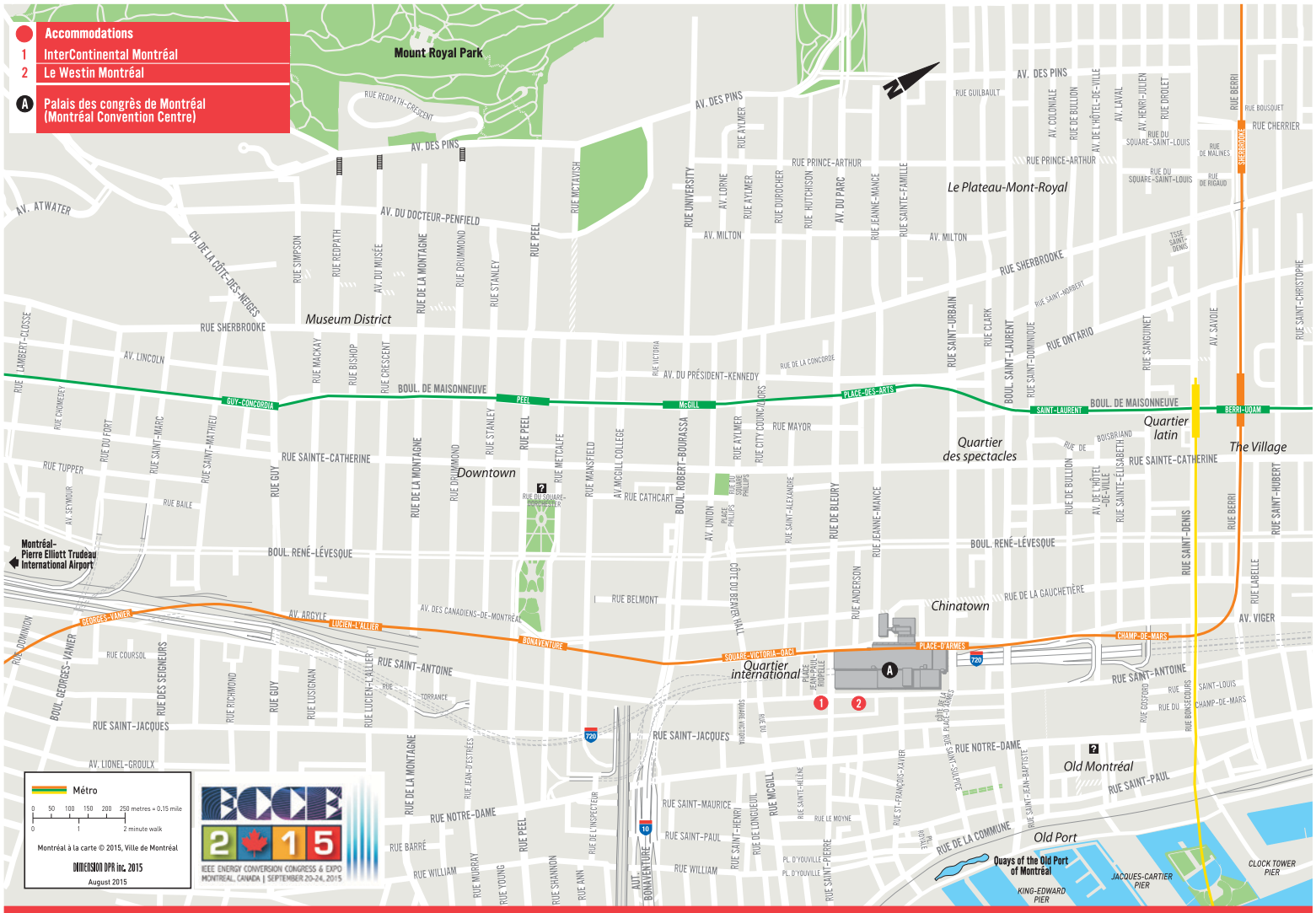
Other Energy Conversion Related Topics

Shashank Krishnamurthy (Vice Chair), United Technologies Research Center, USA
Jean-Luc Schanen, G2ELab, France
Longcheng Tan, Ryerson University, Canada

Emerging Technologies (Special Track)

Yaow-Ming Chen (Vice Chair), National Taiwan University, Taiwan
Tsorng-Juu Liang (Vice Chair), National Cheng Kung University, Taiwan
Huang-Jen Chiu, National Taiwan University of Science and Technology, Taiwan
Douglas C. Hopkins, NC State University, USA
Oscar Lucia, University of Zaraggoza, Spain
Carl Ngai-Man Ho, University of Manitoba, Canada
Hiroo Sekiya, Chiba University, Japan
Jin Wang, The Ohio State University, USA

DOWNTOWN MAP



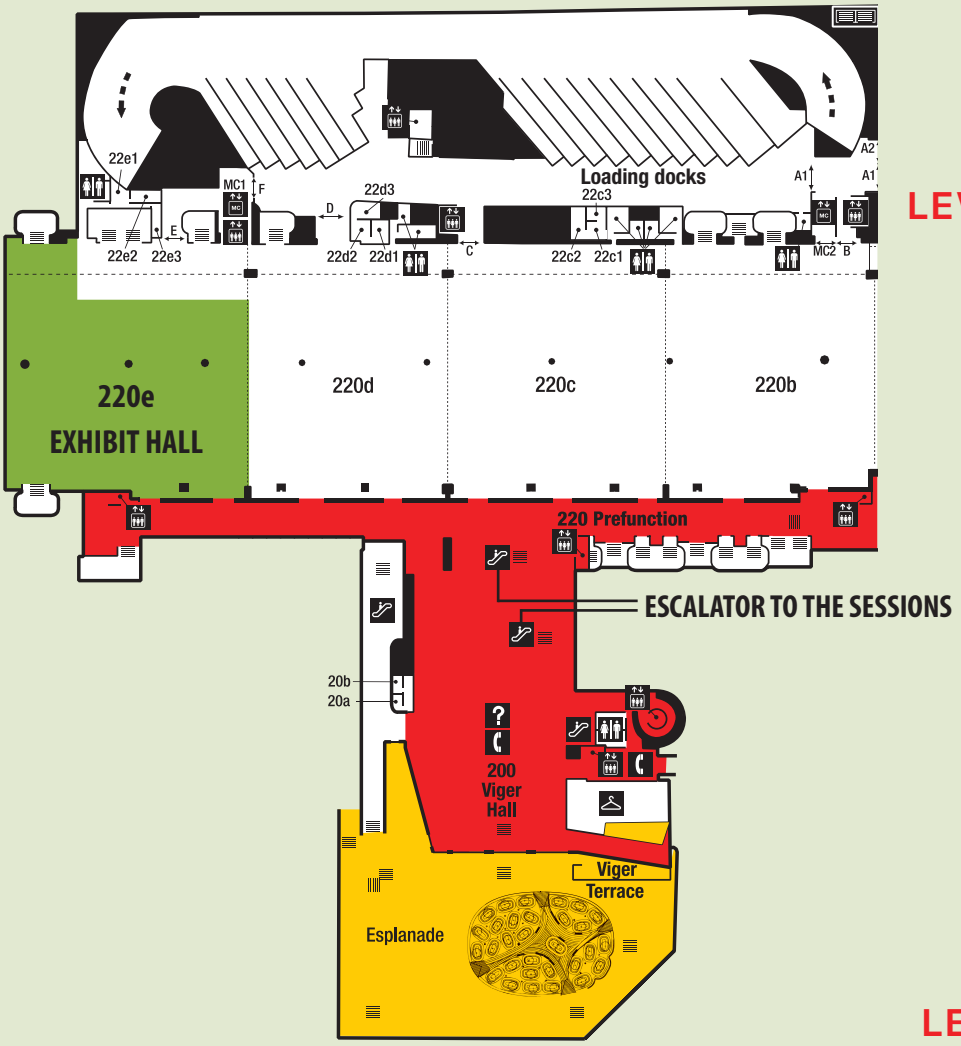
DOWNTOWN MONTRÉAL

IEEE Energy Conversion Congress & Expo 2015 – September 20–24, 2015

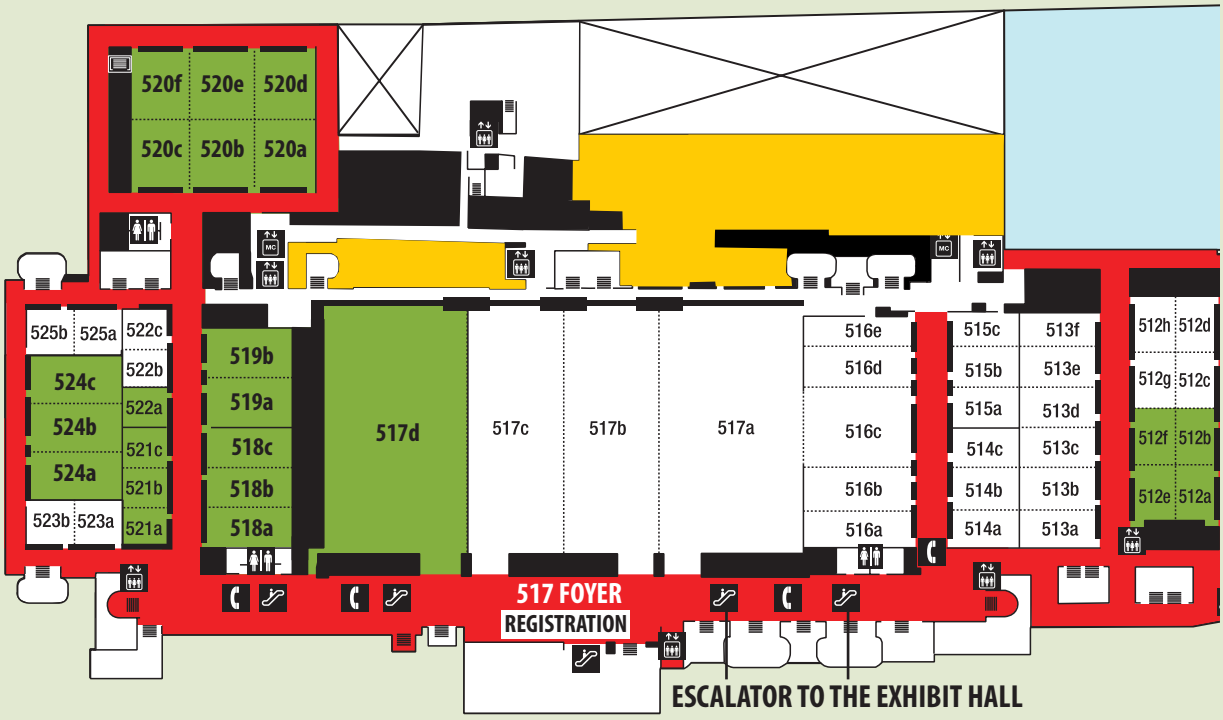
Palais des congrès de Montréal (Montréal Convention Centre)

CONVENTION FLOOR PLAN

LEVEL 2



LEVEL 5



SCHEDULE-AT-A-GLANCE

Saturday, September 19

5:00PM– 7:00PM	**Registration** ..... *517 Foyer*

Sunday, September 20

7:00AM– 7:00PM	**Registration** ..... *517 Foyer*

Tutorials Group 1 • 8:00AM – 12:00PM

520A	520B	520C	520D	520E	520F
Improving DC-DC Converter Performance with GaN Transistors	Design and Manufacturing of PM Electrical Machines	Control and Stability Analysis of HVDC Converters and Systems	Dynamic Modeling and Control of Grid-Connected Renewable Energy Conversion Systems	Virtual Synchronous Machines for Power Electronics based Power Systems and Microgrids	Fuel Cell Systems for Transportation and Stationary Power Generation

12:00PM – 1:00PM	**Lunch on Your Own**

Tutorials Group 2 • 1:00PM – 5:00PM

520A	520B	520C	520D	520E	520F
Design Challenges for High Frequency Magnetic Circuit Design for Power Conversion	Modelling of Lithium-Ion Battery Energy Storage Systems for Grid Support Services	Operation, Control, and Applications of Modular Multilevel Converters	EMI and Its Reduction for Power Electronics Systems	Design for Reliability of Power Electronic Systems	Next Generation Time-Domain Control of Power Electronics Systems using Predictive Switching Sequences

5:00PM – 7:00PM	**Opening Reception** ..... *La Ruelle, InterContinental Montreal*

Monday, September 21

7:00AM – 7:00PM	**Registration** ..... *517 Foyer*
8:30AM – 10:30AM	**Plenary Session** *517D*
10:30AM – 10:50AM	**AM Break** ..... *517 Foyer*

Oral Sessions • 10:50AM – 12:30PM

519A	518A	518B	520A	524B	524C	520F	521AB	524A	520B	520C	520D	520E	519B	518C
S1: Energy Storage Systems I	**S2:** Solar PV Systems	**S3:** Energy Storage	**S4:** Electric Drivetrains	**S5:** Soft-Switching DC-DC Converters	**S6:** Grid-Tied Single-Phase Converters I	**S7:** DC-DC Converter Modeling	**S8:** Control of Rectifiers	**S9:** Common-Mode EMI	**S10:** Induction Machines	**S11:** Diagnostics of Electric Machines I	**S12:** Control of Electric Drives	**S13:** PM and IPM Motor Drives I	**S14:** Wideband-gap Devices I	**S15:** Energy Harvesting

12:30PM – 2:00PM	**Lunch on Your Own**

Oral Sessions • 2:00PM – 4:05PM

519A	518C	518A	524A	518B	524B	524C	520F	521AB	520B	520C	520D	520E	519B	520A
S16: Utility Interactive Solar PV Systems	**S17:** Wind Energy – Control and Operations I	**S18:** Microgrid Droop Control	**S19:** Resonant Converters	**S20:** Inductive Power Transfer	**S21:** Dual Active Bridge Based Converters	**S22:** Grid-Tied Single-Phase Converters II	**S23:** Pulse-Width Modulation – I	**S24:** Converter-Grid System Stability Modeling and Control	**S25:** PM Machines I	**S26:** Design and Modeling of Electric Machines I	**S27:** Sensorless Drives	**S28:** General Topics on Motor Drives	**S29:** Wide-bandgap Devices II	**SPECIAL TRACK: Product Session I**

4:00PM – 6:30PM	**Exhibit Hall Open** ..... *Exhibit Hall 220E*
4:10PM – 6:30PM	**Student Demonstrations** ..... *Exhibit Hall 220E*
4:00PM – 6:30PM	**Expo Reception** ..... *Exhibit Hall 220E*
5:00PM – 6:30PM	**Poster Session I** ..... *Exhibit Hall 220E*

Tuesday, September 22

7:30AM – 5:30PM	**Registration** ..... *517 Foyer*

Oral Sessions • 8:30AM – 10:10AM

519A	518A	518B	524B	524C	520F	521AB	524A	520C	520D	520E	519B	518C	520B	520A
S30: Wind Energy – Control and Operations II	**S31:** Grid Integrated Power Converters	**S32:** Solar PV in Grids and Microgrids I	**S33:** Capacitor Based Converters	**S34:** Grid-Tied Single-Phase Converters III	**S35:** DC-DC Converter Control	**S36:** Pulse-Width Modulation II	**S37:** Thermal Modeling and Analysis	**S38:** Flux-Switching Machines	**S39:** Induction Motor Drives I	**S40:** Drive Applications	**S41:** Wide-bandgap Devices III	**S42:** Wireless Power Transfer I	**SS1:** Power Electronics Standards	**SPECIAL TRACK: Product Session II**

10:00AM – 5:30PM	**Exhibit Hall Open** ..... *Exhibit Hall 220E*
10:10AM – 10:30AM	**AM Break** ..... *Exhibit Hall 220E*
10:30AM – 12:00PM	**Poster Session II** ..... *Exhibit Hall 220E*
12:30PM – 2:00PM	**Lunch** ..... *Exhibit Hall 220E*
3:30PM – 5:00PM	**Poster Session III** ..... *Exhibit Hall 220E*
5:30PM – 7:00PM	**Town Hall I: Advances in SiC and GaN based Devices, Packaging, and Systems** *518C*
5:30PM – 7:00PM	**Town Hall II: Microgrid is Practical for the Future Grid or Just Fiction?** *518A*

Wednesday, September 23

7:30AM– 6:00PM — **Registration** ..... *517 Foyer*

Oral Sessions • 8:30AM – 10:10AM

519A	518A	518B	524B	524C	520F	521AB	524A	520B	520C	520D	520E	519B	518C	520A
S43: DFIG Based Wind Systems	**S44:** Converter Control Techniques	**S45:** Solar PV in Grids and Microgrids II	**S46:** High Frequency DC-DC Converters I	**S47:** Multi-Level Converters I	**S48:** Predictive Control of Inverters	**S49:** New Control Concepts	**S50:** Differential-Mode EMI	**S51:** PM Machines II	**S52:** Losses in Electric Machines	**S53:** Induction Motor Drives II	**S54:** Medium Voltage and High Power Drives I	**S55:** Power Electronic Modules I	**S56:** Wireless Power Transfer II	**SS2:** Future Electric Aircrafts – Systems

10:10AM – 10:30AM — **AM Break** ..... *517 Foyer*

Oral Sessions • 10:30AM – 12:10PM

519A	518A	518B	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B	518C	520A
S57: Micro-inverters for Solar PV Systems	**S58:** Grid Inverter Control	**S59:** Distributed Generation Manage-ment	**S60:** DC-DC Converters	**S61:** Grid-Tied Multi-Phase Converters	**S62:** Modular Multi-Level Converters I	**S63:** Control and Stability of AC Converters and Systems	**S64:** Fault Analysis and Protection	**S65:** DC-DC Converters for Renewable Energy	**S66:** Synchronous Reluctance Machines	**S67:** Materials and Manufacturing Issues of Elec-tric Machines I	**S68:** Energy Efficient Motor Drives	**S69:** Power Electronic Modules II	**S70:** Wireless Power Transfer III	**SS3:** Future Electric Aircrafts – Components

12:10PM – 2:00PM — **Lunch on Your Own**

Oral Sessions • 2:00PM – 3:40PM

519A	518A	518B	520A	524B	524C	520F	521AB	520B	520C	520D	519B	518C	520E	524A
S71: Utility Scale Battery Systems	**S72:** HVDC and FACTS I	**S73:** Electronic Transformer and Grid Devices	**S74:** Batteries and Battery Manage-ment	**S75:** High Frequency DC-DC Converters II	**S76:** Multi-Level Converters II	**S77:** Control of Grid-Connected Inverters	**S78:** Control and Stability of DC Converters & Systems	**S79:** Non-Conventional Machine Configura-tions I	**S80:** Electric Machines for Automotive Applications I	**S81:** PM and IPM Motor Drives II	**S82:** Magnetics I	**S83:** LED Drivers	**SS4:** DC Microgrids: Control, Operations and Trends	**SS5:** Modules for MV/HV Applications

3:40PM – 4:00PM — **PM Break** ..... *517 Foyer*

Oral Sessions • 4:00PM – 5:40PM

519A	518A	518B	520A	524B	524C	520F	521AB	520B	520C	520D	519B	520E	518C	524A
S84: Converter for Solar PV Systems	**S85:** HVDC and FACTS II	**S86:** V2G and G2V	**S87:** Traction, Aerospace, Mining and Marine	**S88:** Resonant DC-DC Converters	**S89:** Multi-Level Converter Applications	**S90:** Three-Phase Converter Modeling & Analysis	**S91:** Reliability Analysis and Improve-ment	**S92:** Switched Reluctance Machines	**S93:** Design and Modeling of Electric Machines II	**S94:** PM and IPM Motor Drives III	**S95:** Magnetics II	**S96:** Thermal Manage-ment	**S97:** Emerging Technologies	**SS6:** Design of Integrated Machines and Drives

7:00PM – 9:30PM — **ECCE Banquet** *517D*

Thursday, September 24

7:30AM – 12:00PM — **Registration** ..... *517 Foyer*

Oral Sessions • 8:30AM – 10:10AM

519A	518A	518B	518C	520A	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B
S98: Solar PV Technologies	**S99:** HVDC and FACTS III	**S100:** Stability and Power Quality I – Stability Analysis	**S101:** Power Quality and Stability	**S102:** Portable Devices and Electronics	**S103:** DC-DC Isolated Converters I	**S104:** AC-AC Converters	**S105:** Converter Filtering and Thermal Aspects	**S106:** Grid-Connected Converter Control	**S107:** Power Electronics in EV	**S108:** Solid-State Transformer and MMC	**S109:** Fractional Slot Machines	**S110:** Materials and Manufactur-ing Issues of Electric Machines II	**S111:** PM and IPM Motor Drives IV	**S112:** Gate Drive Technologies I

10:10AM – 10:30AM — **AM Break** ..... *517 Foyer*

Oral Sessions • 10:30AM – 12:10PM

519A	518A	518B	518C	520A	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B
S113: Energy Storage Systems II	**S114:** DC Distribution and DC Microgrids I	**S115:** Stability and Power Quality II – Power Quality	**S116:** Power Electronics for Renewable Energy Systems	**S117:** Transporta-tion Applications	**S118:** DC-DC Isolated Converters II	**S119:** Modular Multi-Level Converters II	**S120:** Modeling and Control I	**S121:** Active Power Filters and Harmonics	**S122:** Solar MPPT	**S123:** Application and Control of DG Inverters	**S124:** Non-Conventional Machine Configura-tions II	**S125:** Electric Machines for Automotive Applications II	**S126:** Medium Voltage and High Power Drives II	**S127:** Other Energy Conversion Related Topics

12:10PM – 2:00PM — **Awards Luncheon** *517D*

Oral Sessions • 2:00PM – 3:40PM

519A	520A	518A	518B	518C	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B
S128: MPPT for Solar PV Systems	**S129:** Energy Harvesting Systems	**S130:** DC Distribution and DC Microgrids II	**S131:** Stability and Power Quality III – Control Strategies	**S132:** Smart Grid and Utility Applications	**S133:** AC-DC Multi-Phase Converters	**S134:** Modular Multi-Level Converters III	**S135:** Modeling and Control II	**S136:** Converter Control in Weak Grids	**S137:** Converters for Solar Energy	**S138:** Microgrids	**S139:** Multi-Phase Machines	**S140:** Diagnostics of Electric Machines II	**S141:** Drive Utility Interface	**S142:** Gate Drive Technologies II

Saturday, September 19

5:00PM – 7:00PM	**Registration** ..... *517 Foyer*

Sunday, September 20

7:00AM – 7:00PM	**Registration** ..... *517 Foyer*

Tutorials Group 1 • 8:00AM – 12:00PM

520A	520B	520C	520D	520E	520F
Improving DC-DC Converter Performance with GaN Transistors	Design and Manufacturing of PM Electrical Machines	Control and Stability Analysis of HVDC Converters and Systems	Dynamic Modeling and Control of Grid-Connected Renewable Energy Conversion Systems	Virtual Synchronous Machines for Power Electronics based Power Systems and Microgrids	Fuel Cell Systems for Transportation and Stationary Power Generation

12:00PM – 1:00PM	**Lunch on Your Own**

Tutorials Group 2 • 1:00PM – 5:00PM

520A	520B	520C	520D	520E	520F
Design Challenges for High Frequency Magnetic Circuit Design for Power Conversion	Modelling of Lithium-Ion Battery Energy Storage Systems for Grid Support Services	Operation, Control, and Applications of Modular Multilevel Converters	EMI and Its Reduction for Power Electronics Systems	Design for Reliability of Power Electronic Systems	Next Generation Time-Domain Control of Power Electronics Systems using Predictive Switching Sequences

5:00PM – 7:00PM	**Opening Reception** ..... *La Ruelle, InterContinental Montreal*

Monday, September 21

7:00AM – 7:00PM	**Registration** ..... *517 Foyer*
8:30AM – 10:30AM	**Plenary Session** *517D*
10:30AM – 10:50AM	**AM Break** ..... *517 Foyer*

Oral Sessions • 10:50AM – 12:30PM

	519A	518A	518B	520A	524B	524C	520F	521AB	524A	520B	520C	520D	520E	519B	518C
	S1: Energy Storage Systems I	**S2:** Solar PV Systems	**S3:** Energy Storage	**S4:** Electric Drivetrains	**S5:** Soft-Switching DC-DC Converters	**S6:** Grid-Tied Single-Phase Converters I	**S7:** DC-DC Converter Modeling	**S8:** Control of Rectifiers	**S9:** Common-Mode EMI	**S10:** Induction Machines	**S11:** Diagnostics of Electric Machines I	**S12:** Control of Electric Drives	**S13:** PM and IPM Motor Drives I	**S14:** Widebandgap Devices I	**S15:** Energy Harvesting
10:50AM – 11:15AM	Multiple Time Scale Optimal Operation of MMC Battery Energy Storage System	Minimizing the Levelized Cost of Energy in Single-Phase Photovoltaic Systems with an Absolute Active Power Control	A Utility Scale Battery Energy Storage System for Intermittency Mitigation in Multilevel Medium Voltage Photovoltaic System	Modular Switched-Capacitor DC-DC Converters Tied with Lithium-Ion Batteries for use in Battery Electric Vehicles	A High Step-Up Ratio Resonant Converter for High-Power Applications	Power Decoupling Method Comparison of Isolated Single-phase Matrix Converters using Center-tapped Transformer with PDM	Small-Signal Equivalent Circuit Model of Series Resonant Converter	New Boundary Mode Sinusoidal Input Current Control of the VIENNA Rectifier	Common Mode EMI Reduction Technique for Interleaved MHz Critical Mode PFC Converter with Coupled Inductor	Investigation into Loss Reduced Rotor Slot Structure by Analyzing Local Behaviors of Harmonic Magnetic Fluxes of Inverter Feeding Induction Motor	Rotor Position Estimation of a Pseudo Direct Drive PM Machine using Extended Kalman Filter	Single-Electrical-Port Control of Cascaded Brushless Doubly-Fed Induction Drive for EV/HEV Applications	Uncontrolled Generator Operation of PM Synchronous Machine Drive with Current Source Inverter using Normally-On Switches	Improving High Frequency DC-DC Converter Performance with Monolithic Half Bridge GaN ICs	Phase/RMS Maximum Power Point Tracking for Inductive Energy Harvesting System
11:15AM – 11:40AM	State-of-Charge Balancing Control for Battery Energy Stored Quasi-Z Source Cascaded Multilevel Inverter based Photovoltaic Power System	Intelligent Photovoltaic Power Plants Management Strategy for Market Participation	Integrated Optimal Control of Battery Energy Storage Management System for Energy Management and PV Capacity Firming	DC-Link Voltage Control Strategy of a Bi-Directional DC/DC Converter for Electric Vehicles	High Step-Up ZVS Dual Switches Converter with Three-Winding-Coupled Inductor	A High-Efficiency High Energy Density Buffer Architecture for Power Pulsation Decoupling in Grid-Interfaced Converters	Easy Current Slope Detection for Low Cost Implementation of the Direct Adaptive Current Control for DC-DC-Converters	Nonlinear Control and Model Predictive Control Applied to Multi-Cell AFE Rectifier	Reduced Common-Mode Noise Modulation Strategies for Gradient Driver with Cascaded H-Bridge Multilevel Structure	Impact of Number of Poles on the Steady-State Performance of Induction Motors	Monitoring of Journal Bearing Faults based on Motor Current Signature Analysis for Induction Motors	Optimal Torque Sharing in Direct Instantaneous Torque Control of Switched Reluctance Motors	Adaptive Neuro-Fuzzy and Loss Minimization based High Performance Control of IPMSM Drive	Investigation of CCM Boost PFC Converter Efficiency Improvement with 600V Wide Band-Gap Power Semiconductor Devices	Analysis of a Watt-Range Contactless Electromechanical Energy Harvester Facing a Moving Conductive Surface
11:40AM – 12:05PM	Degradation Behaviour of Lithium-Ion Batteries based on Field Measured Frequency Regulation Mission Profile	Three-Phase DC-Bypass Topologies with Reduced Leakage Current for Transformerless PV Systems	Interlinking Modular Multilevel Converter of Hybrid AC-DC Distribution System with Integrated Battery Energy Storage	Effect of Brake Power Distribution on Dynamic Programming Technique in Plug-In Series Hybrid Electric Vehicle Control Strategy	Non-Isolated Interleaved High Step-Up Converter with Reduced Voltage Multiplier Stages and a Regenerative Turn-Off Snubber	Novel DC to Single-Phase AC Isolated Current Source Inverter with Power Decoupling Capability for a Micro-Inverter System	Fast Transient Response of Series Resonant Converter using an Average Large Signal Model	Performance Evaluation of Direct Power Control and Model Predictive Control for Three-Level AC/DC Converters	Modeling and Stability Analysis of Active/Hybrid Common-Mode EMI Filters for DC/DC Power Converters	The Detection and Suppression of Unbalanced Magnetic Pull in Wound Rotor Induction Motors using Pole-Specific Search Coils and Auxiliary Windings	Dynamic Characteristic Analysis of Irreversible Demagnetization in SPM- and IPM- Type BLDC Motors	Suboptimal Search Strategies with Bounded Computational Complexity to Solve Long-Horizon Direct Model Predictive Control Problems	Comparative Analysis of Scalar and Vector Control Drives of IPMSM under Inter-Tum Fault Condition Considering Nonlinearities	CMOS-Compatible Enhancement-Mode GaN-on-Si MOS-HEMT with High Breakdown Voltage (930V) using Thermal Oxidation and TMAH Wet Etching	A Bridgeless Rectification Circuit for Wi-Fi Energy Harvesting System
12:05PM – 12:30PM	Combination between Adaptive SMO and DWT-based an Adjusted EDCV Signal for Robust SOC Estimation in Battery Pack Applications	Equivalent Model of a Synchronous PV Power Plant	Second Life Battery Energy Storage System for Enhancing Renewable Energy Grid Integration	Influence of Dry Clutch and ICE Transmission Integration on the Thermal Load of a PM based Integrated Starter-Generator	A Transformerless Dual Active Half-Bridge DC-DC Converter for Point-of-Load Power Supplies	Interleaved Totem-Pole Bridgeless PFC Rectifier with ZVS and Low Input Current Ripple	Small-Signal Characterization of Synchronous Buck Converters under Light Load Conditions	Discontinuous Pulse Width Modulation Methods with Neutral Point Voltage Balancing for Three Phase Vienna Rectifiers	On Discussion of Mixed Mode Noise in H-Bridge Converters	A Utility and Accurate Electrical Loss Model and Application for Induction Motors Utilizing 2-D Finite Element Analysis	Modeling and Analysis of AC Resistance of a Permanent Magnet Machine for Online Estimation Purposes	Module-Integrated GMR-Based Current Sensing for Closed Loop Control of a Motor Drive	A Universal Restart Strategy for Permanent Magnet Synchronous Machines	Characterization of an Enhancement-Mode 650-V GaN HFET	Enhancement on Energy Extraction from Magnetic Energy Harvesters

Monday, September 21 (continued)

12:30PM – 2:00PM **Lunch on Your Own**

Oral Sessions • 2:00PM – 4:05PM

	519A	518C	518A	524A	518B	524B	524C	520F	521AB	520B	520C	520D	520E	519B	520A
	S16: Utility Interactive Solar PV Systems	**S17:** Wind Energy – Control and Operations I	**S18:** Microgrid Droop Control	**S19:** Resonant Converters	**S20:** Inductive Power Transfer	**S21:** Dual Active Bridge Based Converters	**S22:** Grid-Tied Single-Phase Converters II	**S23:** Pulse-Width Modulation – I	**S24:** Converter-Grid System Stability Modeling and Control	**S25:** PM Machines I	**S26:** Design and Modeling of Electric Machines I	**S27:** Sensorless Drives	**S28:** General Topics on Motor Drives	**S29:** Widebandgap Devices II	**SPECIAL TRACK: Product Session I**
2:00PM – 2:25PM	A Multifunctional Grid Tied Solar Energy Conversion System with ANF based Control Approach	Power System Frequency Control with Dead Band by using Kinetic Energy of Variable Speed Wind Power Generators	Optimal Angle Droop Power Sharing Control for Autonomous Microgrid	Impedance Control Network Resonant Step-Down DC-DC Converter Architecture	Harmonic Burst Mode Control Strategy for Full-Bridge Series Resonant Converters for Electric Vehicles Application	Fundamental Duty Modulation of Dual-Active-Bridge Converter for Universal Reduced Conduction	Bi-Directional Active-Filter-Integrated AC/DC Converter without Electrolytic Capacitor and Extra Power Switches	Harmonic Elimination for Multilevel Converter with Groebner Bases and Symmetric Polynomials	A Detailed Analytical Model of a Solid State Transformer	Influence of On-Load Voltage Distortion on Torque-Speed Characteristic of Interior Permanent Magnet Machines	Low Speed Test in Two-Axis Actively Positioned Bearingless Machines with Non-Collocated Structure for Wind Power Applications	Carrier Signal Injection based Sensorless Control of Permanent Magnet Synchronous Machines without the Need of Magnetic Polarity Identification	SVPWM Technique with Varying DC-Link Voltage for Common Mode Voltage Reduction in an Indirect Matrix Converter	Investigation of the Dynamic On-State Resistance of 600V Normally-Off and Normally-On GaN HEMTs	
2:25PM – 2:50PM	Neutral-Point-Clamped Circuits of Single-Phase PV Inverters: Generalized Principle and Implementations	Exploring Common Mode Voltage Stress and Circulating Currents in Offshore Wind Turbine to MVDC Collection Grid Interfaces	Optimized Settings of Droop Parameters using Stochastic Load Modeling for Effective DC Microgrids Operation	A Common Inductor Multi-Phase LLC Resonant Converter	A Novel Position Sensorless Power Transfer Control of Lumped Coil-Based In-Motion Wireless Power Transfer Systems	Maximum Efficiency Point Tracking Algorithm for Dual Active Bridge Converters	Control and Modulation of a Family of Bidirectional AC-DC Converters with Active Power Compensation	Reduced Switching Random PWM Technique for Two-Level Inverters	Analysis of Harmonic Coupling and Stability in Back-to-Back Converter Systems for Wind Turbines using Harmonic State Space (HSS)	Permanent Magnet Temperature Distribution Estimation in PMSMs using BEMF Harmonics	A Coupled Field-Circuit Method for Thermal Modeling of Electrical Machine	Computation and Measurement of High Frequency Parameters in a Synchronous Machine	Integrated Multi-Drives Configuration for Starter-Alternator Applications	On the Short Circuit Robustness Evaluation of Silicon Carbide High Power Modules	
2:50PM – 3:15PM	Flexible Grid Connection and Islanding of SPC-Based PV Power Converters	The Feasibility Study on Thermal Loading Control of Wind Power Converters with a Flexible Switching Frequency	A Synchronization Control Method for Micro-Grid with Droop Control	LCLC Resonant Converter for Hold Up Mode Operation	Efficiency Analysis of Bi-Directional DC/DC Converter for Wireless Energy Transfer Applications	Improved Steady-State Model of the Dual-Active-Bridge Converter	Current Sensorless Control for Dual-Boost Half-Bridge PFC Converter	An Adaptive SPWM Technique for Cascaded Multilevel Converters	Impedance Shaping for Improved Load Sharing Among Inverters in AC Microgrids	Design of a Surface PM Vernier Motor for a Practical Variable Speed Application	Design of a Brushless PM Starter-Generator for Low-Cost Manufacture and a High-Aspect-Ratio Mechanical Space Envelope	Sensor-less Vector Control of the Nine-phase Concentrated Wound Interior Permanent Magnet Motor Drive using a Unique Third Sequence High Frequency Injection into the Stator Windings	Hexagon Voltage Manipulating Control (HVMC) for AC Motor Drives Operating in the Maximum Torque Per Voltage (MTPV) Region	Comparative Evaluation of 15 kV SiC MOSFET and 15 kV SiC IGBT for Medium Voltage Converter under Same dv/dt Conditions	
3:15PM – 3:40PM	A New Modulation Technique to Reduce Leakage Current without Compromising Modulation Index in PV Systems	Minimum Junction Temperature Swing for DFIG to Ride through Symmetrical Voltage Dips	A Harmonic Current Suppression Control Strategy for Droop-Controlled Inverter Connected to the Distorted Grid	A Resonant Switched-Capacitor Converter with GaN Transistors for Series-Stacked Processors with 99.8% Power Delivery Efficiency	Design a High-Frequency-Fed Unity Power-Factor AC-DC Power Converter for Wireless Power Transfer Application	Impact of Different Transformer-Winding Configurations on the Performance of a Three-Phase Dual Active Bridge DC-DC Converter	Partial Power Assistance Operation for Single-Phase Grid-Fed Motor Drive System with DC-Link Shunt Compensator	Full Inverter Characterization of PWM Algorithms Implemented with a Very Large Flash Memory SD Card	Virtual Admittance Loop Voltage Harmonic Compensation in Microgrids	Rotor Design Considerations for a Variable-Flux Flux-Intensifying Interior Permanent Magnet Machine with Improved Torque Quality and Reduced Magnetization Current	Comparison of Torque Characteristics in Permanent Magnet Synchronous Machine with Conventional and Herringbone Rotor Step Skewing Techniques	Enhanced Rotor Position/Speed Observer for Sensorless Control of Salient-Pole Permanent-Magnet Synchronous Machines	Magnetic Gear: Radial Force, Cogging Torque, Skewing and Optimization	A Dynamic Measurement Method for Parasitic Capacitances of High Voltage SiC MOSFETs	
3:40PM – 4:05PM	High Density Control Circuit Integration for Low Cost Grid Tied Inverter	Analysis of Subsynchronous Control Interactions in DFIG-Based Wind Farms: ERCOT Case Study	State Space Modeling and Stability Assessment for a Microgrid	A Series-Stacked Power Delivery Architecture with Hot-Swapping for High-Efficiency Data Centers	Isolated Wired and Wireless Battery Charger with Integrated Boost Converter for PEV Applications	Quad-Active-Bridge as Cross-Link for Medium Voltage Modular Inverters	Design of GaN-Based MHz Totem-Pole PFC Rectifier	Model Predictive Control of Neutral-Point Clamped Inverter with Harmonic Spectrum Shaping	Reactive Power Control with an Energy Management System in Single Phase AC Microgrids	Permanent Magnet Transverse Flux Machine with Overlapping Stator Poles	Design and Optimisation of Grid Compliant Variable-Flux PM Synchronous Generator for Wind Turbine Applications	Discrete-Time Observer Design for Sensorless Synchronous Motor Drives	Phase Current Reconstruction with Single DC-Link Current Sensor for Six-Step Operation in Three Phase Inverter	A New Proportional base Drive Technique for SiC Bipolar Junction Transistors	

4:00PM – 6:30PM **Exhibit Hall Open** ..... *Exhibit Hall 220E*

4:10PM – 6:30PM **Student Demonstrations** ..... *Exhibit Hall 220E*

4:00PM – 6:30PM **Expo Reception** ..... *Exhibit Hall 220E*

5:00PM – 6:30PM **Poster Session I** ..... *Exhibit Hall 220E*

Tuesday, September 22

7:30AM – 5:30PM	**Registration** ..... *517 Foyer*

Oral Sessions • 8:30AM – 10:10AM

	519A	518A	518B	524B	524C	520F	521AB	524A	520C	520D	520E	519B	518C	520B	520A
	S30: Wind Energy – Control and Operations II	**S31:** Grid Integrated Power Converters	**S32:** Solar PV in Grids and Microgrids I	**S33:** Capacitor Based Converters	**S34:** Grid-Tied Single-Phase Converters III	**S35:** DC-DC Converter Control	**S36:** Pulse-Width Modulation II	**S37:** Thermal Modeling and Analysis	**S38:** Flux-Switching Machines	**S39:** Induction Motor Drives I	**S40:** Drive Applications	**S41:** Widebandgap Devices III	**S42:** Wireless Power Transfer I	**SS1:** Power Electronics Standards	**SPECIAL TRACK: Product Session II**
8:30AM – 8:55AM	A Hybrid Adaptive Fuzzy Control Strategy for DFIG-Based Wind Turbines with Super-Capacitor Energy Storage to Realize Short-Term Grid Frequency Support	Assessment of Sensorless Kalman Filter-Based Dual-Loop Control Strategies for Grid-Connected VSIs with LCL Filters	ΔP – ΔQ Area Assessment of Temporary Unintentional Islanding with P/f and Q/V Droop Controlled PV Generators in Distribution Networks	A Central Capacitor Partial Power Processing DC/DC Converter	A Time-Sharing Principle-Based Current-Fed ZCS High-Frequency Resonant Self-Commutated Inverter for Inductive Power Transfer	A Fixed Frequency ZVS Integrated Boost Dual Three-Phase Bridge DC-DC LCL-Type Series Resonant Converter	Carrier Multi-Modulation used for the Common-Mode Voltage Suppression in a Three-Phase Inverter	A Low-Cost Closed-Form Transient Thermal Model for Area-Efficient Power MOS Sizing and Reliable Inductive Load Switching	Investigation of a Five-Phase E-Core Hybrid-Excitation Flux-Switching Machine for EV and HEV Applications	Deadbeat Current Control for Open-End Winding Induction Motor using Current Prediction with Two Different Time-Horizons	On-Line Turn Fault Detection of Interior Permanent Magnet Machines using the Pulsating-Type Voltage Injection	Analysis of SiC MOSFETs under Hard and Soft-Switching	Crossed Dipole Coils for an Omni-directional Wireless Power Zone with DQ Rotating Magnetic Field	Issues In Modulating Current for High Brightness LED Lighting	
8:55AM – 9:20AM	Bootstrap Prediction Interval Estimation for Wind Speed Forecasting	Geometric Analysis of Grid-Connected VSI with LCL-Filter using Poincaré Map	Locking Frequency Band Detection Method for Grid-Tied PV Inverter Islanding Protection	Automatic Current Sharing Mechanism in the Series Capacitor Buck Converter	Three Winding Coupled Inductor based High Boost Inverter with Increased Gain Control	Multi-Step Simplified Optimal Trajectory Control (SOTC) for Fast Transient Response of High Frequency LLC Converters	DSP based Pre-Processed PWM Scheme for 3-Limb Core Coupled Inductor Inverters	Thermal Stress Reduced Maximum Power Point Tracking for Two Stages Photovoltaic Converters	Axial Flux Segmental Rotor Flux-Switching Synchronous Motor	Speed Sensorless Control of Induction Motors based on MCA EXIN Pisarenko Method	LC-Filter Resonance Cancellation with DPWM Inverters in Adjustable Speed Drives	Comparative Analysis of False Turn-ON in Silicon Bipolar and SiC Unipolar Power Devices	Modeling and Investigation of Magnetically Coupled Resonant Wireless Power Transfer System with Varying Spatial Scales	Transformers and Inductors in Electronic Power Conversion Equipment	
9:20AM – 9:45AM	Evaluation of Flux Switching PM Machines for Medium-Speed Wind Generator Drives	Interaction and Aggregated Modeling of Multiple Paralleled Inverters with LCL Filter	Synchronous PV Support to an Isolated Power System	Multi-Cell DC-DC Converter with High Step-Down Voltage Ratio	Generalized Stability Regions of Current Control for LCL-Filtered Grid-Connected Converters without Passive or Active Damping	Dual-Loop Geometric-Based Control of Boost Converters	A Novel Capacitor Voltage Balancing Method in Modular Multilevel Converters	Frequency-Domain Thermal Modelling of Power Semiconductor Devices	Topologies and Analysis of Flux-Modulation Machines	Real-Time Parameter Identification and Integration on Deadbeat-Direct Torque and Flux Control (DB-DTFC) without Inducing Additional Torque Ripple	Multistress Characterization of Insulation Aging Mechanisms in Aerospace Electric Actuators	An Analysis of False Turn-On Mechanism on High-Frequency Power Devices	Ringing Suppressing Method in 13.56MHz Resonant Inverter for Wireless Power Transfer Systems	Wide Band Gap SiC MOSFET Study: An Update	
9:45AM – 10:10AM	Direct Active and Reactive Power Regulation of A DFIG based Wind Power System with Constant Switching Frequency and Reduced Ripple	Measurement Results and Performance Analysis of the Grid Impedance in Different Low Voltage Grids for a Wide Frequency Band to Support Grid Integration of Renewables	Reactive Power Management for Overvoltage Prevention at High PV Penetration in Low Voltage Distribution System	A High-Power-Density Wide-Input-Voltage-Range Isolated DC-DC Converter having a MultiTrack Architecture	DCM Boost PFC Converter with Optimum Utilization Control of Switching Cycles	A New Current Mode Control for Higher Noise Immunity and Faster Transient Response in Multi-Phase Operation	A Voltage Balancing Control based on Average Power Flow Management for the Delta-Connected Cascaded H-Bridges Converter	Reliability Analysis of Single-Phase PV Inverters with Reactive Power Injection at Night Considering Mission Profiles	Analytical Modeling of a Novel Transverse Flux Machine Designed for Direct Drive Wind Turbine Applications	Sensorless Control of Induction Motors by the MSA based MUSIC Technique	Robust Control of High-Speed Synchronous Reluctance Machines	High Speed Switching Issues of High Power Rated Silicon-Carbide Devices and the Mitigation Methods	A High Efficiency 3.3kW Loosely-Coupled Wireless Power Transfer System without Magnetic Material	Standards for Power Electronic Components and Systems (IEEE 1573)	

10:00AM – 5:30PM	**Exhibit Hall Open** ..... *Exhibit Hall 220E*
10:10AM – 10:30AM	**AM Break** ..... *Exhibit Hall 220E*
10:30AM – 12:00PM	**Poster Session II** ..... *Exhibit Hall 220E*
12:30PM – 2:00PM	**Lunch** ..... *Exhibit Hall 220E*
3:30PM – 5:00PM	**Poster Session III** ..... *Exhibit Hall 220E*
5:30PM – 7:00PM	**Town Hall I: Advances in SiC and GaN based Devices, Packaging, and Systems** *518C*
5:30PM – 7:00PM	**Town Hall II: Microgrid is Practical for the Future Grid or Just Fiction?** *518A*

Wednesday, September 23

7:30AM– 6:00PM **Registration**..... *517 Foyer*

Oral Sessions • 8:30AM – 10:10AM

	519A	518A	518B	524B	524C	520F	521AB	524A	520B	520C	520D	520E	519B	518C	520A
	S43: DFIG Based Wind Systems	**S44:** Converter Control Techniques	**S45:** Solar PV in Grids and Microgrids II	**S46:** High Frequency DC-DC Converters I	**S47:** Multi-Level Converters I	**S48:** Predictive Control of Inverters	**S49:** New Control Concepts	**S50:** Differential-Mode EMI	**S51:** PM Machines II	**S52:** Losses in Electric Machines	**S53:** Induction Motor Drives II	**S54:** Medium Voltage and High Power Drives I	**S55:** Power Electronic Modules I	**S56:** Wireless Power Transfer II	**SS2:** Future Electric Aircrafts – Systems
8:30AM – 8:55AM	Mitigation of Torsional Vibrations in the Drivetrain of DFIGbased Grid-Connected Wind Turbine	Procedure to Match the Dynamic Response of MPPT and Droop-Controlled Microinverters	Stability Analysis for Isolated AC Microgrids based on PV-Active Generators	Design of a High Efficiency 30 kW Boost Composite Converter	Three-Phase Three-Level LC-type Parallel Resonant DC/DC Converter with Variable Frequency Control	A Predictive Current Control of Voltage Source Inverters for Common-Mode Current Attenuation	A Sensorless Parabolic Current Control Method for Single Phase Stand-alone Inverters	Novel Double Clamp Method-ology to Reduce Shielded Cable Radiated Emissions Initiated by Electronic Device Switching	Large-Scale Electro-magnetic Design Optimization of PM Machines Over a Target Operating Cycle	An Accurate Iron Loss Evaluation Method based on Finite Element Analysis for Switched Reluctance Motors	Soft-Restarting of Free-Run Induction Motors driven by Small DC-Link Capacitor Inverters	Impact of DC-Link Voltage Ripples on the Machine-Side Performance in NPC H-Bridge Topology	Integration Technologies for a Medium Voltage Modular Multi-Level Converter with Hot Swap Capability	Galvanic Isolation System for Multiple Gate Drivers with Inductive Power Transfer – Drive of Three-phase Inverter	Hybrid Electric and Distributed Propulsion Technologies for Large Commercial Aircraft: A NASA Perspective
8:55AM – 9:20AM	Stator Current-Based Sliding Mode Observer for Sensorless Vector Contorl of Doubly-Fed Induction Generators	An Accurate Deadbeat Control Method for Grid-Tied Converter using Weighted Average Current Sensing	Optimal Power Flow Management in a Photovoltaic Nanogrid with Batteries	27.12MHz GaN Resonant Power Converter with PCB Embedded Resonant Air Core Inductors and Capacitors	A Novel Seven-Level Voltage Source Converter for Medium-Voltage (MV) Applications	Model Predictive PWM of a Single Phase Inverter: A Nonlinear Transformation Approach	Load Adaptive Zero-Phase-Shift Direct Repetitive Control for Stand-Alone Four-Leg VSI	Switching Frequency Modulation for GaN-Based Power Converters	Impact of Mechanical Stress on Characteristics of Interior Permanent Magnet Synchronous Motors	Loss Investigation of Slotless Bearingless Disk Drives	An Improved DC-Signal-Injection Method with Active Torque-Ripple Mitigation for Thermal Monitoring of Field-Orient-ed-Controlled Induction Motors	Enhanced Estimation of the Rotor Position of MV-Synchronous Machines in the Low Speed Range	New SLIM Package Intelligent Power Modules (SLIMDIP) with Thin RC-IGBT for Consumer Goods Applications	The Selection and Comparison of Multi-Coil Wireless Power Transmission Solutions via Magnetic Resonances	Hybrid Electric Geared Turbofan Propulsion System Conceptual Design
9:20AM – 9:45AM	Islanding Operation for DFIG based Wind Farm	Low-Cost Power Regulation Scheme for Grid-Connected Variable-Speed Wind Turbine using TPPL Lead-Acid Batteries	Research on Adaptive Control of Grid-Connected PV Inverters in Weak Grid	Design and Control of 10-MHz Class E DC-DC Converter with Reduced Voltage Stress	Multi-Level Operation of Triple Two-Level PWM Converters	FPGA-Based Model Predictive Current Controller for 3x3 Direct Matrix Converter	Digital and Analog Implementations of Nonlinear-Feedforward Controller for a Dual-Active-Bridge Converter	Differential-Mode EMI Emission Prediction of SiC-Based Power Converters Using a Mixed-Mode Unterminated Behavioral Model	A Simple Analytical Approach to Model Saturation in Surface Mounted Permanent Magnet Synchronous Motors	Practical Investigation of End Effect Losses in a Motor Integrated Permanent Magnet Gear	A Modified Four-Step Commu-tation to Suppress Common-Mode Voltage during Commutations in Open-End Winding Matrix Converter Drives	A Novel Control Scheme for Medium Voltage Drives Operated by Optimized Pulse Patterns	Novel Built-In Sensor for In-Situ Monitoring of Temperature and Thermal Stress in Power Modules	Self-Oscillating Contactless Resonant Converter with Power Transfer and Current Sensing Integrated Transformer	Status of Cryogenic/ Superconducting Power System and Impacts for Hybrid-Electric Aircraft Propulsion
9:45AM – 10:10AM	Comprehensive Analysis of the Dynamic Behavior of Grid-Connected DFIG-Based Wind Turbines under LVRT Conditions	A Novel Control Approach for Protection of Multi-Terminal VSC based HVDC Transmission System against DC Faults	Low Cost Plug-and-Play PV System for DC Microgrid	A GaN-Based 97% Efficient Hybrid Switched-Capacitor Converter with Lossless Regulation Capability	Structural Design of a Five-Level Hybrid Active NPC Converter for High Power Density Motor Drives	Control of a Direct Matrix Converter Induction Motor Drive with Modulated Model Predictive Control	Interleaved Converter with Massive Paral-lelization of High Frequency GaN Switching-Cells using Decentralized Modular Analog Controller	Design of an Active Differential Mode Current Filter for a Boost Power Factor Correction AC-DC Converter	Rotor Design for a High-Speed High-Power Permanent-Magnet Synchronous Machine	Impact of Slot Shape on Loss and Thermal Behaviour of Open-Slot Modular Stator Windings	Feedback Linearizing Control of Induction Motor Considering Magnetic Saturation Effects	Reduced Common Mode Voltage based DC-Bus Voltage Balancing Algorithm for Three-Level Neutral Point Clamped (NPC) Inverter Drive	A 650 V / 150 A Enhancement Mode GaN-Based Half-Bridge Power Module for High Frequency Power Conversion Systems	Design of an On-Board Charger for Universal Inductive Charging in Electric Vehicles	Architecture, Voltage and Components for a Turboelectric Distributed Propulsion Electric Grid

10:10AM – 10:30AM **AM Break**..... *517 Foyer*

Oral Sessions • 10:30AM – 12:10PM

	519A	518A	518B	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B	518C	520A
	S57: Microinverters for Solar PV Systems	**S58:** Grid Inverter Control	**S59:** Distributed Generation Management	**S60:** DC-DC Converters	**S61:** Grid-Tied Multi-Phase Converters	**S62:** Modular Multi-Level Converters I	**S63:** Control and Stability of AC Converters and Systems	**S64:** Fault Analysis and Protection	**S65:** DC-DC Converters for Renewable Energy	**S66:** Synchronous Reluctance Machines	**S67:** Materials and Manufacturing Issues of Electric Machines I	**S68:** Energy Efficient Motor Drives	**S69:** Power Electronic Modules II	**S70:** Wireless Power Transfer III	**SS3:** Future Electric Aircrafts – Components
10:30AM – 10:55AM	A Novel Single-Stage Isolated PWM Half-Bridge Microinverter for Solar Photovoltaic Modules	Parallel Operation of Bi-Directional Interfacing Converters in a Hybrid AC/DC Microgrid under Unbalanced Grid Conditions	Coordinated Operation in a Multi-Inverter based Microgrid for Both Grid-Connected and Islanded Modes using Conservative Power Theory	High Efficiency Bidirectional 5kW DC-DC Converter with Super-Junction MOSFETs for Electric Vehicle Super-Capacitor Systems	Silicon and Hybrid Si-SiC Tandem Inverter Analytical Loss Characterization and Comparison to PWM-Modulated Voltage Source Inverter	Asymmetrical Modular Mutilevel Converter (A-MMC) based HVDC System	Comparison of Two Control Approaches for Stability Enhancement using STATCOM with Active Power Injection Capability	On-Line Diagnosis for Rectifier Open Circuit Faults and Input Voltage Unbalance based on the Output DC Voltage	High-Power Multilevel Step-Up DC/DC Converter for Offshore Wind Energy Systems	Design of Synchronous Reluctance Motor Utilizing Dual-Phase Materials for Traction Applications	Effect of Manufacturing Variations on Cogging Torque in Surface-Mounted Permanent Magnet Motors	Control of an Open-Ended Induction Machine using a Dual Inverter System with a Floating Capacitor Bridge	Static and Dynamic Performance Assessment of Commercial SiC MOSFET Power Modules	Modeling and Experimentation of Loosely-Coupled Coils with Transmitter having Orthogonally-Placed Windings	High Power Density Megawatt (MW) Class Non-Superconducting Electric Machines
10:55AM – 11:20AM	Low Complexity Structure and Control for Microinverters with Reactive Power Support Capability	A Two-Stage Combined Control Strategy for Parallel Operation of Inverter	Test and Analysis of 3kW PV Battery Energy Storage System	Application of a Floating H-Bridge Converter to Stabilize the Automotive Energy Net	A Zeta-Converter based Four-Switch Three-Phase DC-AC Inverter	Comparative Study of the Sinusoidal-Wave and Square-Wave Circulating Current Injection Methods for Low-Frequency Operation of the Modular Multilevel Converters	Enhanced Stability of Capacitor-Current Feedback Active Damping for LCL-Filtered Grid Converters	A Fast Short-Circuit Protection Method using Gate Charge Characteristics of SiC MOSFETs	Modular Isolated High Frequency Medium Voltage (MV) Step-Up Resonant DC/DC Converters with High-Gain Rectifier for Wind Energy Systems	Line-Start Synchronous Reluctance Motors: Design Guidelines and Testing via Active Inertia Emulation	Influence of Electric Discharge Activity on Bearing Lubricating Grease Degradation	A Novel Energy Saving Method for use with Variable Frequency Drives	Integrated Double Sided Cooling Packaging of Planar SiC Power Modules	A Practical Implementation of Wireless Power Transfer Systems for Socially Interactive Robots	Opportunities and Trends for Non-Cryogenic Electric Machines and Drives for Future Electric Aircraft

Wednesday, September 23 (continued)

Oral Sessions • 10:30AM – 12:10PM

	519A	518A	518B	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B	518C	520A
	S57: Microinverters for Solar PV Systems	**S58:** Grid Inverter Control	**S59:** Distributed Generation Management	**S60:** DC-DC Converters	**S61:** Grid-Tied Multi-Phase Converters	**S62:** Modular Multi-Level Converters I	**S63:** Control and Stability of AC Converters and Systems	**S64:** Fault Analysis and Protection	**S65:** DC-DC Converters for Renewable Energy	**S66:** Synchronous Reluctance Machines	**S67:** Materials and Manufacturing Issues of Electric Machines I	**S68:** Energy Efficient Motor Drives	**S69:** Power Electronic Modules II	**S70:** Wireless Power Transfer III	**SS3:** Future Electric Aircrafts – Components
11:20AM – 11:45AM	Transformer-Less Grid-Connected Inverter with Low Leakage Currents for Photovoltaic Generation System	Controller Design for Three-Phase Inverter with Power Unbalanced Loads Applied in Microgrids	Online Energy Management System for Distributed Generators in a Grid-Connected Microgrid	Using Fourier Series to Derive Optimal Soft-Switching Modulation Schemes for Dual Active Bridge Converters	Isolated DC to Three-phase AC Converter using Indirect Matrix Converter with ZVS Applied to All Switches	Energy-Balancing Control of a Delta-Configured Modular Multilevel Cascade Inverter for Utility-Scale Photovoltaic Systems	The Influence of Phase-Locked Loop on the Stability of Single-Phase Grid-Connected Inverter	A Novel Active T-type Three-Level Converter with Open-Circuit Fault-Tolerant Control	Design Optimization for Ultrahigh Efficiency Buck Regulator using Wide Bandgap Devices	Design of High-Speed Synchronous Reluctance Machines	Characterising the Performance of Selected Electrical Machine Insulation Systems	An Adjustable Speed PFC Bridgeless-SEPIC fed Brushless DC Motor Drive	Silicon Carbide Power Chip on Chip Module based on Embedded Die Technology with Paralleled Dies	A Moving Wireless Power Transfer System Applicable to a Stationary System	High Power Density Motor Drives for Aircraft Flight Propulsion and Electric Ground Aircraft Launch Systems
11:45AM – 12:10PM	A Soft-Switched Three-Port Single-Stage Inverter for Photovoltaic-Battery Systems	Smart Control for Active Power Generation, Voltage Level and Harmonic Content based on Photovoltaic Generators	Frequency-Dependent Criterion for Mitigation of Transmission-Line Effects in a High-Frequency Distributed Power Systems	A Soft Switching Bidirectional DC-DC Converter based on Three-State Switching Cell	A New Three-Phase AC-DC-AC Multilevel Converter based on Cascaded Three-Leg Converters	A Modular Multilevel Cascade Converter (MMCC) with a Resonant High-Frequency Link	Interactive Energy Management Strategy for MMC-Based EV Fleet Integrated into Smart Grid	Study of Failures in a Three-Phase Active Neutral Point Clamped Rectifier: Short-Circuit and Open-Circuit Faults	Three-Phase Interleaved High Step-Up Boost Converter with Voltage Multiplier for Fuel Cell Power System	Sinusoidal Reluctance Machine with DC Winding: An Attractive Non-Permanent Magnet Option	Stator Winding Thermal Conductivity Evaluation: An Industrial Production Assessment	Behavioral Comprehensive Efficiency Modeling of Motor Drive Systems based on Physical Measurements	A Very Thin Power Conversion Unit for Equalizing Currents through Paralleled Power Modules	Power and Energy of 2-D Omni-Directional Wireless Power Transfer Systems	High Field Superconducting Machines

12:10PM – 2:00PM **Lunch on Your Own**

Oral Sessions • 2:00PM – 3:40PM

	519A	518A	518B	520A	524B	524C	520F	521AB	520B	520C	520D	519B	518C	520E	524A
	S71: Utility Scale Battery Systems	**S72:** HVDC and FACTS I	**S73:** Electronic Transformer and Grid Devices	**S74:** Batteries and Battery Management	**S75:** High Frequency DC-DC Converters II	**S76:** Multi-Level Converters II	**S77:** Control of Grid-Connected Inverters	**S78:** Control and Stability of DC Converters & Systems	**S79:** Non-Conventional Machine Configurations I	**S80:** Electric Machines for Automotive Applications I	**S81:** PM and IPM Motor Drives II	**S82:** Magnetics I	**S83:** LED Drivers	**SS4:** DC Microgrids: Control, Operations and Trends	**SS5:** Modules for MV/HV Applications
2:00PM – 2:25PM	Power Flow Management of a Grid Tied PV-Battery Powered Fast Electric Vehicle Charging Station	Compact Dynamic Phase Angle Regulator for Power Flow Control	Modular Multilevel Converter (MMC) based Resonant High Voltage Multiplier	An Integrated Electric Vehicle Power Conversion System using Modular Multilevel Converter	27.12 MHz Isolated High Voltage Gain Multi-Level Resonant DC-DC Converter	Low Frequency State-Space Model for the Five-Level Unidirectional T-Rectifier	Use of Boundary Control with Second-Order Switching Surface to Reduce the System Order for Deadbeat Controller in Grid-Connected Inverter	Analysis on Feedback Interconnections of Cascaded DC-DC Converter Systems	Design and Evaluation of a PM Vernier Machine	Next Generation Chevy Volt Electric Machines: Design, Optimization and Control for Performance and Rare Earth Mitigation	Control Strategy of a Variable Flux Machine using AlNiCo Permanent Magnets	Loss Comparison of Core Materials used for the Inductor of a Buck-Chopper Circuit	Primary-Side Controller IC Design for Quasi-Resonant Flyback LED Driver	New Research Challenges on Microgrids and DC Homes	SiC Power Blocks – Accelerating the Next Generation of Power Electronics
2:25PM – 2:50PM	Life Test Design for Retired xEV Batteries Aiming at Smart Home Applications	Application of Transformer-Less UPFC for Interconnecting Synchronous AC Grids	Analysis and Design of Fixed Voltage Transfer Ratio DC/DC Converter Cells for Phase-Modular Solid-State Transformers	Coulomb Counting State-of-Charge Algorithm for Electric Vehicles with a Physics-Based Temperature-Dependent Battery Model	Megahertz-Frequency Isolated Resonant DC-DC Converter using Impedance Control Network for High-Efficiency Wide-Range Operation	Performance Evaluation for the Five-Level Unidirectional T-Rectifier in High-Speed Electric Generating Units	Design of LCL-Filters with LCL Resonance Frequencies beyond the Nyquist Frequency for Grid-Connected Converters	Stability Impact of Trailing-Edge and Leading-Edge Modulations on DC/DC Converters	Design Considerations and Parameter Optimization of Stator Wound Field Synchronous Machines Based on Magnetic the Gear Effect	Vibro-Acoustic Simulation and Optimization of a Claw-Pole Alternator	Control Method for Mono Inverter Dual Parallel Interior Permanent Magnet Synchronous Machine Drive System	An Integrated Unit of LCL Filter for Grid-Connected Inverter	Current-Ripple-Based Control Strategy to Achieve Low-Frequency Ripple Cancellation in Single-Stage High-Power LED Driver	Inverter System Operation and Control for Harmonized AC and DC Microgrids	LinPak – A Medium Voltage Module for Fast Switching Si and SiC Applications
2:50PM – 3:15PM	Li-Ion Batteries and Li-Ion Ultracapacitors: Characteristics, Modeling and Grid Applications	Design Considerations and Experimental Results for a 12.47-kV 3-Phase 1 MVA Power Router	Design, Analysis and Implementation of Discontinuous Mode Dyna-C AC/AC Converter for Solid State Transformer Applications	Optimized Design Guideline of Battery-Cell Equalizers based on the Wave-Trap Concept	A Novel Driving Scheme for Synchronous Rectifier in MHz CRM Flyback Converters with GaN Devices	Power Recovery and Cost Reduction Oriented Optimization of Regenerative Cells Embedded in Cascaded Multilevel Converter	Polynomial Design Method for a Current Controller Applied to a Single-Phase Grid-Connected VSI with LCL Filter	A DC Capacitor Voltage Control Method for Active Power Filters using Modified Reference Including the Voltage Ripple Derived from a Theoretical Analysis	Design of a Modular E-Core Flux Concentrating Axial Flux Machine	Development of Constrained Optimization Routine for the U.S. DRIVE Specifications using Coupled Electromagnetic/Thermal Electric Machine Model	Single-Phase Stator Control of Interior Permanent Magnet Machines with MTPA Operation	An Integrated Inductor and Capacitor with Co-Located Electric and Magnetic Fields	A Low-Cost High-Efficiency Linear LED Driver with Concave Current Control	Control of Bi-Directional Interfacing Converters in Hybrid AC/DC Microgrids	3.3kV SiC MOSFET Update for Medium Voltage Applications
3:15PM – 3:40PM	Low Cost Digital-analog Hybrid Controlled Photovoltaic Battery Charger based on Interleaved BCM Boost Converter and Improved MPPT Algorithm	Design Considerations and Experimental Results for a 13-kV 3-Phase 1 MVA Power Router	Miniaturization of Magnetic Components for an Electric Transformer based on Bi-Directional Isolated DC-DC Converter	Hysteresis Modeling for Model-Based Condition Monitoring of Lithium-Ion Batteries	A Novel Asymmetrical Three-Level BUCK(ATL BUCK) Converter for Point-of-Load(POL) Application	A Repetitive Control Scheme for Neutral-Point Low-frequency Fluctuation Suppression of Three-Level Neutral-Point-Clamped Converter	A Harmonic Constrained Minimum Energy Controller for a Single-Phase Grid-Tied Inverter using Model Predictive Control	Stabilizing Controller Design for Multi-Bus MVDC Distribution Systems using a Passivity based Stability Criterion and Positive Feed-Forward Control	A Fast Mechanical Switch for Medium Voltage Hybrid DC and AC Circuit Breakers	Super-High-Speed Switched Reluctance Motor for Automotive Traction	Closed-Loop, Flux Weakening Control for Hybrid Excitation Synchronous Machines	High Efficiency On-Silicon Coupled Inductors using Stacked Copper Windings	Dimmable LED Driver with Variable Inductor based on a Resonant Switched-Capacitor Topology	Coordinated Control and Optimization of Renewable Energy Sources in DC Microgrids: Towards a Resilient Architecture	10 - 25 kV Silicon Carbide Power Modules for Medium Voltage Applications

3:40PM – 4:00PM **PM Break**..... *517 Foyer*

Wednesday, September 23 (continued)

Oral Sessions • 4:00PM – 5:40PM

	519A	518A	518B	520A	524B	524C	520F	521AB	520B	520C	520D	519B	520E	518C	524A
	S84: Converter for Solar PV Systems	**S85:** HVDC and FACTS II	**S86:** V2G and G2V	**S87:** Traction, Aerospace, Mining and Marine	**S88:** Resonant DC-DC Converters	**S89:** Multi-Level Converter Applications	**S90:** Three-Phase Converter Modeling & Analysis	**S91:** Reliability Analysis and Improvement	**S92:** Switched Reluctance Machines	**S93:** Design and Modeling of Electric Machines II	**S94:** PM and IPM Motor Drives III	**S95:** Magnetics II	**S96:** Thermal Management	**S97:** Emerging Technologies	**SS6:** Design of Integrated Machines and Drives
4:00PM – 4:25PM	Enhanced HERIC based Transformerless Inverter with Hybrid Clamping Cell for Leakage Current Elimination	Hardware implementation of a Four-Terminal HVDC Test-Bed	A High Efficiency Bi-Directional EV Charger with Seamless Mode Transfer for V2G and V2H Application	Analysis of Electro-Mechanical Interaction in Aircraft Generator Systems	A New LLC Converter Family with Synchronous Rectifier to Increase Voltage Gain for Hold-Up Application	DVR with Five-Level Converter based on Three- and Two-Level Legs Connections	Analysis of Freewheeling State in Z-source Inverter under Three-phase Shoot-through Mode	A Novel Fault-Tolerant Control Scheme for Shunt Active Power Filter with High Reliability	A Relationship of Radial Force Sum and Current Waveforms in Switched Reluctance Motor for Noise Reduction	Design and Performance Characterization of a Novel Low-Pole Dual-Stator Flux Switching Permanent Magnet Machine	Comparison of Carrier Signal Injection Methods for Sensorless Control of PMSM Drives	High-Frequency, High-Current Transformer Designs for Silicon Carbide based LLC Converters	Enhancement of Electric Motor Thermal Management through Axial Cooling Methods: A Materials Approach	MVDC Microgrids enabled by 15kV SiC IGBT based Flexible Three Phase Dual Active Bridge Isolated DC-DC Converter	Integrating Motors and Drives in the Oil and Gas Industry
4:25PM – 4:50PM	Evaluation of Commercial Scale Transformerless Solar Inverter Technology	Directional Current Breaking Capacity Requirements for HVDC Circuit Breakers	A Voltage Control Technique for Grid-Connected Single-Phase AC/DC Converters with G2V/V2G Capability	Hybrid CPU-Core and FPGA based Real-Time Implementation of a High Frequency Aircraft Power System	Design Considerations for a High Efficiency 3 kW LLC Resonant DC/DC Transformer	Operating and Control of Cascaded Photovoltaic Systems Suffering Module-Mismatch	State Observer for Sensorless Control of a Grid-Connected Converter Equipped with an LCL Filter: Direct Discrete-Time Design	Capacitor Aging Detection in DC-DC Converter Output Stage	Concentrated Winding Segmented Rotor Switched Reluctance Machine (SRM) using Three-Phase Standard Inverters	Fast Multi-Objective CMODE-Type Optimization of Electric Machines for Multicore Desktop Computers	Comparison of Rotor Position Estimation Performance in Fundamental-Model-Based Sensorless Control of PMSM	Measurements and Performance Factor Comparisons of Magnetic Materials at High Frequency	Increasing Windings Efficiency at High Frequencies: Hollow Conductors and Clad Metals Round Conductors	Implementation Aspects of On-Chip Printed Micro Heat Sinks for Power Semiconductors	Integrated Design of Electrical Machines and Drives for Electric and Hybrid-electric Vehicles
4:50PM – 5:15PM	High Efficiency Impedance Control Network Resonant DC-DC Converter with Optimized Startup Control	A Comprehensive AC Side Single Line to Ground Fault Ride through Strategy of a Modular Multilevel Converter for HVDC System	Impact of Grid and Load Disturbances on Electric Vehicle Battery in G2V/V2G and V2H Mode	Coordinated Control of a DC Electrical Power System in the More Electric Aircraft Integrated with Energy Storage	A High-Efficiency Hybrid Series Resonant DC-DC Converter with Boost Converter as Secondary for Photovoltaic Applications	Experimental Verification of TS-BC-Based Electrical Drives when the Motor Frequency is Passing through, or Equal to, the Supply Frequency	Equivalence of Generalized State-Space Averaging with DQ Modelling Methods in a Balanced Three-Phase System	A New Approach based on Flatness Control to Improve Reliability of Parallel Connected Inverters	Design of a Switched Reluctance Machine Assisted by DC Field Windings for a Turbo Blower	Design Methodology of a Brushless IPM Machine for a Zero-Speed Injection based Sensorless Control	Beatless Control in Over-Modulation Range for Permanent Magnet Synchronous Motor Drives	Design of Optimized Coupling Factor for Minimum Inductor Current Ripple in Rapid EV Charger Systems using Multi-Winding Coupled Inductor	Evaluating Different Implementations of Online Junction Temperature Sensing for Switching Power Semiconductors	Analysis and Design of Current-Fed (L) (C) (LC) Converter for Inductive Wireless Power Transfer (IWPT)	Electromagnetic and Thermal Analysis of Electric Motors with Complex Duty Cycles – Case Studies from Servomotors and Formula-E
5:15PM – 5:40PM	A Novel ZVT/ZCT PWM Converter Used for Solar Battery Chargers with Reduced Conduction Loss	Operation of Hybrid Multi-Terminal DC System Under Normal and DC Fault Operating Conditions	Novel Simple Harmonics Compensation Method for Smart Charger with Constant DC-Capacitor Voltage Control for Electric Vehicles on Single-Phase Three-Wire Distribution Feeders	A New Active Output Filter (AOF) for Variable Speed Constant Frequency (VSCF) Power System in Aerospace Applications	Accurate Modeling and Design of LLC Resonant Converter with Planar Transformers	A Novel Modulation Method of the Full Bridge Three-Level LLC Resonant Converter for Battery Charger of Electrical Vehicles	Stability Control for LC-L Filter based Load Side Converter of BDFG Ship Shaft Power Generation System without Extra Damping	Reliability-Oriented Switching Frequency Analysis for Modular Multilevel Converter (MMC)	Performance Comparison of Switched Reluctance Motor with Sinusoidal and Conventional Excitations	Analytical Model for the Minimization of Torque Ripple in Permanent Magnets Assisted Synchronous Reluctance Motors Through Asymmetric Rotor Poles	Analysis of Magnetizing Trajectories for Variable Flux PM Synchronous Machines Considering Voltage, High Speed Capability, Torque Ripple, and Time Duration	Power Losses Calculations in Windings of Gapped Magnetic Components: The i2D Method Applied to Flyback Transformers	A Simple Approach on Junction Temperature Estimation for SiC MOSFET Dynamic Operations within Safe Operating Area	A High-Frequency Current-Output-Type Inverter aimed for Wireless Power Transmission System	
7:00PM – 9:30PM	**ECCE Banquet**. *517D*														

Thursday, September 24

7:30AM – 12:00PM **Registration** ..... *517 Foyer*

Oral Sessions • 8:30AM – 10:10AM

	519A	518A	518B	518C	520A	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B
	S98: Solar PV Technologies	**S99:** HVDC and FACTS III	**S100:** Stability and Power Quality I – Stability Analysis	**S101:** Power Quality and Stability	**S102:** Portable Devices and Electronics	**S103:** DC-DC Isolated Converters I	**S104:** AC-AC Converters	**S105:** Converter Filtering and Thermal Aspects	**S106:** Grid-Connected Converter Control	**S107:** Power Electronics in EV	**S108:** Solid-State Transformer and MMC	**S109:** Fractional Slot Machines	**S110:** Materials and Manufacturing Issues of Electric Machines II	**S111:** PM and IPM Motor Drives IV	**S112:** Gate Drive Technologies I
8:30AM – 8:55AM	Solar PV Array Fed Water Pumping using BLDC Motor Drive with Boost-Buck Converter	Design, Analysis and Experimental Evaluation of a Virtual-Synchronous-Machine-based STATCOM with LCL Filter	Stability Analysis of Harmonic Compensation System under Weak Grid Conditions	Passivity Enhancement of Grid-Tied Converter by Series LC-Filtered Active Damper	Universal AC Input High Density Power Adapter Design with a Clamped Series Resonant Converter	Design and Implementation of a Novel Interleaved Flyback Converter with Leakage Energy Recycled	Three-Phase/ Single-Phase Quasi-Z-Source Matrix Converter: Circuit Topology, Model, and Analysis	Electromagnetic Interference Issues of Power Electronics Systems with Wide Band Gap Semiconductor Devices	A Novel Strategy to Achieve Distributed Control and Redundancy for Input-Series-Output-Parallel Inverter System	Development of a Power Dense and Environmentally Robust Traction Power Inverter for the Second-Generation Chevrolet VOLT Extended-Range EV	Space-Vectors based Hierarchical Model Predictive Control for a Modular Multilevel Converter	Performance Comparison of Fractional Slot Concentrated Winding Spoke Type Synchronous Motors with Different Slot-Pole Combinations	Epstein Frame Measurement based Determination of Original Non-Degraded and Fully Degraded Magnetic Characteristics of Material Submitted to Laser Cutting	Sensitivity Analysis of High Frequency Signal Injection based Temperature Estimation Methods to Machine Assembling Tolerances	Analytical Loss Model for Power Converters with SiC MOSFET and SiC Schottky Diode Pair
8:55AM – 9:20AM	Multi-Timescale Modelling for the Loading Behaviours of Power Electronics Converter	Analysis and Mitigation of Instabilities Originated from DC-Side Resonances in VSC-HVDC Systems	Dynamic Stability Analysis of Power Network	A Fuzzy Reasoning Approach for Optimal Location and Sizing of Shunt Capacitors in Radial Power Systems	Bendable Transformer for Wearable Electronics	Flyback Lossless Passive Snubber	Constant Speed Control for Reverse Matrix Converter under Variable Input Conditions	An Integrated Inductor for Parallel Interleaved VSCs Connected in a Whiffletree Configuration	Control Strategy for Seamless Transfer Between Island and Grid-Connected Operation for a Dual-Mode Photovoltaic Inverter	Current Ripple Reduction in 4kW LLC Resonant Converter based Battery Charger for Electric Vehicles	Delta-Connected Cascaded H-Bridge Converter Application in Unbalanced Load Compensation	Inductances of a Fractional-Slot Concentrated-Winding Interior PM Synchronous Machine Considering Effects of Saturation and Cross Magnetization	Detection of Lamination Faults from Rotating Magnetic Fields	Comparisons of the Influence of PM Drive System with Voltage Adaptation or Machine Winding Reconfiguration on HEV/EV Application	Effect of Load Parasitics on the Losses and Ringing in High Switching Speed SiC MOSFET based Power Converters
9:20AM – 9:45AM	Peculiar Dynamics of the Stand-Alone Current Source Converter based Photovoltaic System	A DC Controller for Continuous Variable Series Reactors (CVSRs)	A Unified Impedance-Based Stability Criterion (UIBSC) for Paralleled Grid-Tied Inverters using Global Minor Loop Gain (GMLG)	Electric Springs for Improving Transient Stability of Micro-grids in Islanding Operations	Current Sensorless Control of a Boost-Type Switch Mode Rectifier using an Adaptive Inductor Model	Analysis and Design of Passive Components for Interleaved Flyback Converter with Integrated Transformer	Investigation of Three-Phase AC-DC-AC Multilevel Nine-Leg Converter	Modulation Schemes with Enhanced Switch Thermal Distribution for Single-Phase AC-DC-AC Reduced-Switch Converters	Low-Cost Digital Realization of Phase Synchronization for Grid Tied Micro Inverter	Control and Optimization Strategies for Interleaved DC-DC Converters for EV Battery Charging Applications	A New SST Topology Comprising Boost Three-Level AC/DC Converters for Applications in Electric Power Distribution Systems	High Torque Density Ferrite Permanent Magnet Vernier Motor Analysis and Design with Demagnetization Consideration	Computationally Efficient Method for Identifying Manufacturing Induced Rotor and Stator Misalignment in Permanent Magnet Brushless Machines	Global Loss Minimization Control of PMSM Considering Cross-Coupling and Saturation	A High Temperature De-saturation Protection and Under Voltage Lock Out Circuit for SiC MOSFET
9:45AM – 10:10AM	Auto-Inspection and Permitting with a PV Utility Interface (PUI) for Residential Plug-and-Play Solar Photovoltaic Unit	A Novel Decentralized Control Strategy for MultiTerminal HVDC Transmission Grids	Small-Signal State-Space Modeling of Modular Multilevel Converters for System Stability Analysis	Voltage Regulation using a Permanent Magnet Synchronous Condenser with a Series Compensator	Using Real-Time System Design Methods to Integrate SMPS Control Software with Application Software	Center-Tapped Transformer based Bidirectional DC-DC Converter with Wide Input Voltage Range	Hybrid Single-Phase AC-AC Double-Star Chopper-Cells (DSCC) Converters with Modulation and DC-Link Voltage Ripple Improvement	Pulse Pattern Modulated Strategy for Harmonic Current Components Reduction in Three-Phase AC-DC Converters	Enhancing the Frequency Adaptability of Periodic Current Controllers for Grid-Connected Power Converters	Interleaved Active Clump Forward Converter with Novel Integrated Magnetic Components	Adding Capacity to an Existing Electric Power Distribution Network using a Solid State Transformer System	Low Cost PM Synchronous Servo-Applications Employing Asynchronous-Motor Frame	A Simplified Numerical Approach to Analyze Magnet Defects in Permanent Magnet Synchronous Motors	Analytical Design of Flux-Weakening Voltage Regulation Loop in IPMSM Drives	Challenges in Switching Waveforms Measurement for a High-Speed Switching Module

10:10AM – 10:30AM **AM Break** ..... *517 Foyer*

Oral Sessions • 10:30AM – 12:10PM

	519A	518A	518B	518C	520A	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B
	S113: Energy Storage Systems II	**S114:** DC Distribution and DC Microgrids I	**S115:** Stability and Power Quality II – Power Quality	**S116:** Power Electronics for Renewable Energy Systems	**S117:** Transportation Applications	**S118:** DC-DC Isolated Converters II	**S119:** Modular Multi-Level Converters II	**S120:** Modeling and Control I	**S121:** Active Power Filters and Harmonics	**S122:** Solar MPPT	**S123:** Application and Control of DG Inverters	**S124:** Non-Conventional Machine Configurations II	**S125:** Electric Machines for Automotive Applications II	**S126:** Medium Voltage and High Power Drives II	**S127:** Other Energy Conversion Related Topics
10:30AM – 10:55AM	Estimation and Control of Battery Charging Current for the Asymmetrical Z-Source Topology in the HESS Application	A Seamless Switching Control Strategy of Photovoltaic Units in Droop-Controlled DC Microgrids	The Modeling and Harmonic Coupling Analysis of Multi-Parallel Connected Inverter using Harmonic State Space (HSS)	Efficiency Comparison of a Single-Phase Grid-Interface Bidirectional AC/DC Converter for DC Distribution Systems	The Integrated LLC Resonant Converter using Center-Tapped Transformer for On-Board EV Charger	A Hybrid Isolated Boost Converter with Reduced Output Capacitance and Integrated Auxiliary Circuit for ZVS	Enhancement on Capacitor-Voltage-Balancing Capability of a Modular Multilevel Cascade Inverter for Medium-Voltage Synchronous-Motor Drives	ZVS PWM Scheme to Suppress Ground Leakage Current of Full-Bridge Grid Inverter	Extending Multi-Function Capabilities of Individual-Phase Decoupled P-Q Control of VSCs to include Active Filtering under Symmetrical and Asymmetrical Operating Conditions	An Efficient MPPT Technique with Fixed Frequency Finite-Set Model Predictive Control	Control Strategies of Three-Phase Distributed Generation Inverters for Grid Unbalanced Voltage Compensation	Minimizing the Circulating Current of a Slotless BLDC Motor through Winding Reconfiguration	Performance and Efficiency Comparisons for Interior PM and Flux-Switching PM Machines with Ferrite Magnets for Automotive Traction Applications	A New Sensorless Start-Up Method of LCI System for Gas-Turbine	Crosstalk Calibration for High Precision Power Measurement
10:55AM – 11:20AM	An SOC Estimation Method based on Sliding Mode Observer and the Nernst Equation	Line Loss Optimization based OPF Strategy by Hierarchical Control for DC Microgrid	Harmonic Current Suppression using Single-Phase DG Units in Three-Phase Grids with Unbalanced Harmonic Sources	Experimental Evaluation of Capacitors for Power Buffering in Single-Phase Power Converters	Onboard Unidirectional Automotive G2V Battery Charger using Sine Charging and its Effect on Li-Ion Batteries	Voltage Oscillation Elimination in Output Rectifier Diodes in Zero-Voltage-Switching PWM Full-Bridge Converter: An Overview	Current Control and Branch Energy Balancing of the Modular Multilevel Matrix Converter	High-Efficiency Switching Strategy and Neutral-Point Voltage Control in Single-Phase Three-Level Inverters	Three-Phase Four-Wire Shunt Active Power Filter with the Interconnection of Single-Phase and Three-Phase Converters	An Experimental Investigation of Modified Predictive Hysteresis Control based MPPT Strategy for PV Applications	Performance Analysis of Global Synchronous Pulsewidth Modulation for Distributed Inverters	Analysis for Design Optimisation of Double PM-Rotor Radial Flux Eddy Current Couplers	Multi-physics Analysis of a High Torque Density Motor for Electric Racing Cars	Modeling and Control of Neutral-Point-Clamping (NPC) Three-Level Inverters Fed Dual-Three Phase PMSM Drives	A Simple Technique to Measure the Semiconductor Switching and Conduction Losses of Inverters at Specified Chip Temperatures

Thursday, September 24 (continued)

Oral Sessions • 10:30AM – 12:10PM

	519A	518A	518B	518C	520A	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B
	S113: Energy Storage Systems II	**S114:** DC Distribution and DC Microgrids I	**S115:** Stability and Power Quality II – Power Quality	**S116:** Power Electronics for Renewable Energy Systems	**S117:** Transportation Applications	**S118:** DC-DC Isolated Converters II	**S119:** Modular Multi-Level Converters I	**S120:** Modeling and Control I	**S121:** Active Power Filters and Harmonics	**S122:** Solar MPPT	**S123:** Application and Control of DG Inverters	**S124:** Non-Conventional Machine Configurations II	**S125:** Electric Machines for Automotive Applications II	**S126:** Medium Voltage and High Power Drives II	**S127:** Other Energy Conversion Related Topics
11:20AM – 11:45AM	Performance Model for High-Power Lithium Titanate Oxide Batteries based on Extended Characterization Tests	A New DC-DC Power Converter Derived from the TAB for Bipolar DC Microgrids	Comparative Stability Study of DC Current Control Strategies for a Droop-Controlled PMSM System	Three Phase Modular Multilevel DC/DC Converter for Power Electronic Transformer Application	An Integrated Onboard Charger and Accessory Power Converter using WBG Devices	An Input Current Ripple-Free Flyback-Type Converter with Passive Pulsating Ripple Cancelling Circuit	Optimised Phase Disposition (PD) Modulation of a Modular Multilevel Converter using a State Machine Decoder	Arbitrary Order Generalized State Space Average Modeling of Switching Converters	Grid Harmonics Compensation by using High-Power PWM Converter based on Combination Approach	A Simple MPPT Control Method for Thermoelectric Energy Harvesting	Output Current Control for Grid Interfacing VSI under Low Switching Frequency and Distorted Grid	Design and Analysis of an Axial Flux Magnetically Geared Generator	Wide Range Operation by Low-Voltage Inverter-Fed MATRIX Motor with Single-Layer Distributed Winding for Automobile Traction Motor	Common-Mode Resonance Suppression in Transformerless PWM Current-Source Drive	Online Chip Temperature Monitoring using V_{ce}-Load Current and IR Thermography
11:45AM – 12:10PM	Hybrid Energy Storage System for Conventional Vehicle Start-Stop Application	A Multi-Terminal Power Flow Control Method for Next-Generation DC Power Network	Novel Structure for Unbalance, Reactive Power and Harmonic Compensation based on VFF-RLS and SOGI-FLL in Three Phase Four Wire Power System	Input Impedance based Nyquist Stability Criterion for Subsynchronous Resonance Analysis in DFIG Based Wind Farm	Evaluation of Integrated Active Filter Auxiliary Power Modules in Electrified Vehicle Applications	Dual Active Bridge DC-DC Converter using Both Full and Half Bridge Topologies to Achieve High Efficiency for Wide Load	A Sensorless Control Method for Capacitor Voltage Balance and Circulating Current Suppression of Modular Multilevel Converter	Dynamic Modeling and Control of a Capacitor Coupled DC-DC Converter	Harmonic Suppression and Resonance Damping for Shunt APF with Selective Closed-Loop Regulation of PCC Voltage	Current Sensorless Maximum Power Point Tracking in a Cascaded H-Bridge Photovoltaic Power System	Comparative Study of Three-Phase Grid Connected Inverter Sharing Unbalanced Three-Phase and/or Single-Phase Systems	Design Concepts for a 3-Phase Axial Peg Style Electrostatic Rotating Machine Utilizing Variable Elastance	A Novel Grain Oriented Lamination Rotor Core Assembly for a Synchronous Reluctance Traction Motor with Reduced Torque Ripple	Open-End Multilevel Six-Phase Machine Drive System with Five Three-Leg Converters	Electromagnetic Noise Coupling and Mitigation in Dynamic Tests of High Power Switching Devices

12:10PM – 2:00PM **Awards Luncheon** *517D*

Oral Sessions • 2:00PM – 3:40PM

	519A	520A	518A	518B	518C	524B	524C	520E	520F	521AB	524A	520B	520C	520D	519B
	S128: MPPT for Solar PV Systems	**S129:** Energy Harvesting Systems	**S130:** DC Distribution and DC Microgrids II	**S131:** Stability and Power Quality III – Control Strategies	**S132:** Smart Grid and Utility Applications	**S133:** AC-DC Multi-Phase Converters	**S134:** Modular Multi-Level Converters III	**S135:** Modeling and Control II	**S136:** Converter Control in Weak Grids	**S137:** Converters for Solar Energy	**S138:** Microgrids	**S139:** Multi-Phase Machines	**S140:** Diagnostics of Electric Machines II	**S141:** Drive Utility Interface	**S142:** Gate Drive Technologies II
2:00PM – 2:25PM	Dynamic Modeling of Partial Shading on Photovoltaic Arrays	Use of Active Diodes in Autonomous Sensorless Three-Phase Boost-Rectifier for Energy Harvesting Applications	Topology Simplification Method based on Switch Multiplexing Technique to Deliver DC-DC-AC Converters for Microgrid Applications	Individual-Phase Reactive Power Control Strategy with Constant DC-Capacitor Voltage Control for Active Load Balancer on Three-Phase Four-Wire Distribution Feeders	Collection and Transmission Losses of Offshore Wind Farms for Optimization Purposes	Soft-Switching Three-Phase Matrix based Isolated AC-DC Converter for DC Distribution System	Improvement of Device Current Ratings in Modular Multilevel Converter by Utilizing Circulating Current	A Discrete Random PWM Technique for Acoustic Noise Reduction in Electric Traction Drives	Stability Design of Electric Springs in Power Grids	A Grid-Tied Photovoltaic Generation System based on Series-Connected Module Integrated Inverters with Adjustable Power Factor	Comparison of Oversampled Current Controllers for Microgrid Utility Interface Converters	Design and Analysis of Two Six-Phase Hybrid-Excitation Flux-Switching Machines for Electric Vehicles	In-Service Monitoring of Stator Slot Magnetic Wedge Condition for Induction Motors	Doubly-Fed Induction Generator Enabled Power Generation in Ocean Wave Energy Conversion System	A Novel Active Gate Drive for HV-IGBTs using Feed-Forward Gate Charge Control Strategy
2:25PM – 2:50PM	A Simple Distributed Maximum Power Point Tracking (DMPPT) Scheme for Solar Photovoltaic Applications	Family of Cascaded High-Voltage-Gain Bidirectional Switched-Capacitor DC-DC Converters	Three-Phase 4.16 kV Medium Voltage Grid Tied AC-DC Converter based on 15 kV/40 A SiC IGBTs	Fast-Transient Repetitive Controller based Current Control Strategy for a Cascaded DSTATCOM	Turning Distribution Feeders into STATCOMs	Discontinuous Mode Sparse Dyna-C Rectifier for Efficient AC/DC Power Conversion	Design and Control of Modular Multilevel Alternate Arm Converter (AAC) with Zero Current Switching of Director Switches	SPWM-Based D-Σ Digital Control for Paralleled Three-Phase Grid-Connected Inverters	Impact of the Voltage Feed-Forward and Current Decoupling on VSC Current Control Stability in Weak Grid based on Complex Variables	High Efficient Common-Mode Current Suppression SVM Method for Three-Phase Three-Level Transformer-Less Photovoltaic Inverters	Negative Sequence Droop Method based Hierarchical Control for Low Voltage Ride-Through in Grid-Interactive Microgrids	Six-Phase Double-Stator Inner-Rotor Axial Flux PM Machine with Novel Detached Winding	Irreversible Demagnetization Diagnosis of IPM-Type BLDC Motor using BEMF Harmonic Characteristics based on Space Harmonics	High Power Density Adjustable Speed Drive Topology with Medium Frequency Transformer Isolation	The Effect of Gate Drive Topology on Online Silicon-Carbide MOSFET Junction Temperature Sensing
2:50PM – 3:15PM	A Data-Driven Approach to the Design of Photovoltaic Maximum Power Point Tracking Techniques using Field Transient Data	Adaptive Power Control of Wave Energy Converters for Maximum Power Absorption under Irregular Sea-State Conditions	Series and Shunt DC Electric Springs	Real-Time Testing of Power Control Implemented with IEC 61850 GOOSE Messaging in Wind Farms Featuring Energy Storage	Control of Electric Springs with Coordinated Battery Management	Investigation and Design of Modular Multilevel Converter in AFE Mode with Minimized Passive Elements	Comparison Study of the Fundamental Switching Frequency Modulation for DC-DC Modular Multilevel Converter	A Dual-Loop Voltage Control for Optocoupler Feedback in Capacitive Output Filter Converter	A Composite Compensation Method of a Grid-Connected AC/DC Converter to Improve Robustness under Weak Grid Conditions	Modeling and Control of the Modular Multilevel Cascade Converter based on Chopper-Cells for Grid-Connected Photovoltaic Systems	A Communication-less Solution for Transient Frequency Drift Compensation on Weak Microgrids using a D-Statcom with an Energy Storage System	Open-End Nine-Phase Machine Conversion Systems	An Online Monitoring Method of DC-Link Capacitor's ESR and C for Boost PFC Converter	Three, Single-Phase Power Factor Correction (PFC) Boost Converter for use with Three-Phase, 3-Wire Variable Frequency Drive Systems	A Gate Driver of SiC MOSFET with Passive Triggered Auxiliary Transistor in a Phase-Leg Configuration
3:15PM – 3:40PM	Maximum Power Point Tracking of Photovoltaic Systems using Sensorless Current-Based Model Predictive Control	Reconfiguration of a Wind Turbine with Hydrostatic Drivetrain to Improve Annual Energy Production	High-Efficiency MOSFET-Based MMC for LVDC Distribution Systems	Experimental Verification of Impedance-Based Small-Signal Stability Analysis for Single-Phase Interconnected Power Systems	SmartBuilds: An Energy and Power Simulation Framework for Buildings and Districts	Analysis and Design of an Isolated Single-Stage Three-Phase Full-Bridge with Current Injection Path PFC Rectifier for Aircraft Application	Asymmetrical Phase-Shifting Carrier Pulse-Width Modulation for Harmonics Suppression in Cascaded Multilevel Converter under Unbalanced DC-Link Voltages	Reverse Matrix Converter for Permanent Magnet Synchronous Motor Drives using a Direct Power Control	Analysis and Suppression of Interaction between STATCOM and Voltage-Source Inverter in Islanded Micro-Grid	An Optimized Multilevel Inverter Topology with Asymmetrical DC Sources for Photovoltaic Power Generation Interface	A Multi-Module Current-Source Power Conditioning System (PCS) for SMES to Improve Voltage Stability of Microgrid	Investigation on Phase Shift between Multiple-Winding Sets in Multiphase Flux-Switching Permanent Magnet Machines	Analytical Modeling of Inter-Turn Short Circuit for Multiphase Fault-Tolerant PM Machines with Fractional-Slot Concentrated Windings	A Novel Harmonic Elimination Approach in Three-Phase Multi-Motor Drives	High Current Gate Drive Circuit with High Temperature Potential for SiC MOSFET Module

EVENT SERVICES

Registration

Saturday through Thursday

517 Foyer

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

Saturday, September 19 ..... 5:00PM – 7:00PM
Sunday, September 20 ..... 7:00AM – 7:00PM
Monday, September 21 ..... 7:00AM – 7:00PM
Tuesday, September 22 ..... 7:30AM – 5:30PM
Wednesday, September 23 ..... 7:30AM – 5:30PM
Thursday, September 24 ..... 7:30AM – 12:00PM

Full Conference and Tutorial Registration

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

Tutorials will take place on Sunday, September 20, 2015. 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

On-Site Registration Rates

	Conference Only	Tutorial Only*	Conference & Tutorial
IEEE Member	$900.00	$475.00	$1,300.00
Student IEEE Member	$400.00	$425.00	$750.00
Student Non-Member	$450.00	$475.00	$800.00
Society Member	$850.00	$425.00	$1,250.00
Life Member	$400.00	$400.00	$750.00
Non-Member	$1,050.00	$ 475.00	$1,450.00

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

One-Day Registration

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

One-Day Registration Rates

Society Member $300.00
IEEE Member ..... $ 350.00
Non-Member $450.00

Certificate of Attendance

Certificates of Attendance will not be provided for ECCE 2015.

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.

Expo Only

Expo Only Registration allows access to the Expo only on Tuesday, September 22. Attendees may have access to the Expo hall complimentary on September 22 after 2PM. You may purchase an Expo Only Registration for $25 at the Registration Desk located in the 517 Foyer before 2PM.

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 guest's 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.

Full Guest Ticket $175.00
Opening Reception Only $60.00
ECCE Banquet Only $100.00
Awards Luncheon Only $60.00

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.

Consent to Use of Photographic Images

Registration and attendance at, or participation in, ECCE constitutes an agreement by the registrant to ECCE's use and distribution (both now and in the future) of the registrant or attendee's image or voice in photographs, videotapes, electronic reproductions and audiotapes of such events and activities.

Creative Digressions

Sunday through Thursday

Room: 521C

Creative Digressions is what we call a space reserved for those conference attendees who need to go someplace to think, to discuss, to organize their minds around the hubbub of activities around them. ECCE 2015 is packed with activities that fully engage mental capacities of the participants, the din of activity and the excitement of absorbing and understanding new information and knowledge can sometimes be overwhelming. Think of Creative Digressions as an oasis within the conference. The room has been set aside with large tables set up for relaxed conversations rather than for presentation purposes; note pads, easels and white boards are provided in place of cocktail napkins and backs of envelopes to facilitate one-on-one discussions, idea generation sessions, business meetings, or social interactions. Coffee and tea, the lifeblood of engineering, will be provided to fuel the physical mind so that the innovative process can continues apace.

Accessibility for Registrants with Disabilities

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

Business Center

The Palais des congrès de Montréal Information Desk located in Viger Hall is open according to the event schedule. Copies and print outs are charged at 10 cents per page (black and white).

Cameras and Recording Devices

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

First Aid

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

Hopital Saint-Luc
1058 Rue Saint-Denis
Montreal, QC H2X 3J4
Phone: 514.890.8000

Hotels

The ECCE 2015 headquarters hotels are Le Westin Montréal and the InterContinental Montreal.

Le Westin Montréal
270 Saint Antoine Ouest
Phone: 514.380.3333

InterContinental Montreal
World Trade Centre Montréal
360 Saint Antoine Ouest
Phone: 514.987.9900

Internet Access

Guest Room Internet is complimentary in IEEE Guestrooms at the Le Westin Montréal and the InterContinental Montréal.

There is complimentary wifi in various areas throughout the Palais des congrès de Montréal. Please note that wifi will be marked for 30 minutes at a time.

Local Transportation

Taxis Stands are located on the Viger Street corner of St-Urbain. The address is 201 Viger Street West. Staff at the information desk can also assist you in calling a taxi.

Lost & Found

Lost and found is located at the security office on level 1 of the Palais des congrès de Montréal.

Visitor Information Desk

The Palais des congrès de Montréal has an information desk located in Viger Hall. This desk is staffed during event hours. The staff specializes in Montreal recommendations: restaurants, dining reservations, attractions, tours, things to do, and transportation options. The desk is also stocked with brochures.

Parking

Daily Convention Center Parking:
Self-Parking ..... $22 CAD per day

Le Westin Montréal Parking:
Valet Parking ..... $32 CAD per day

InterContinental Montreal Parking:
Self-Parking ..... $24 CAD per day
Valet Parking ..... $34 CAD per day

Meals & Refreshments

Morning Refreshments

Monday, Wednesday and Thursday – *517 Foyer*
Tuesday – *Exhibit Hall 220E*

Monday, September 15 ..... 10:30AM – 10:50AM
Tuesday, September 16 ..... 10:10AM – 10:30AM
Wednesday, September 17 ..... 10:10AM – 10:30AM
Thursday, September 18. ..... 10:10AM – 10:30AM

Lunch

Tuesday – *Exhibit Hall 220E*

Tuesday, September 22 ..... 12:30PM – 2:00PM

Awards Luncheon

Thursday – *517D*

Thursday, September 24. ..... 12:10PM – 2:00PM

Afternoon Refreshments

Wednesday – *517 Foyer*
Tuesday – *Exhibit Hall 220E*

Tuesday, September 22 ..... 4:00PM
Wednesday, September 23 ..... 3:10PM – 3:30PM

COMMITTEE MEETINGS

All of the following meetings will be held at the Palais des congrès de Montréal (except where otherwise noted).

IAS Committee Meetings

IAS-IPCSD Department Meeting
Sunday, September 20
7:00PM – 8:00PM
Room: 520B

IAS Industrial Power Converter Committee (IPCC)
Monday, September 21
7:00PM – 8:00PM
Room: 520B

IAS Renewable and Sustainable Energy Conversion Systems (RESC) Meeting
Tuesday, September 22
2:00PM – 3:00PM
Room: 520B

IAS Transportation Systems Committee (TSC) Meeting
Tuesday, September 22
3:00PM – 4:00PM
Room: 520C

IAS Power Electronics Devices and Components Committee (PEDCC) Meeting
Tuesday, September 22
5:00PM – 6:30PM
Room: 520B

IAS Electrical Machines Committee (EMC) Meeting
Tuesday, September 22
5:00PM – 6:00PM
Room: 520C

IAS Industrial Drives Committee (IDC) Meeting
Tuesday, September 22
6:00PM – 7:00PM
Room: 520D

ECCE Committee Meetings

ECCE Asia Coordination Committee Meeting
Monday, September 21
12:00PM – 2:00PM
Room: 515B

ECCE Steering Committee
Tuesday, September 22
10:30AM – 12:00PM
Room: 523AB

ECCE 2015-2017
Wednesday, September 23
8:00AM – 9:00AM
Room: 523AB

ECCE 2016 Organizing Committee
Wednesday, September 23
10:30AM – 12:30PM
Room: 523AB

PELS and PELS/IAS Joint Committee Meetings

To register and for meeting updates, plesae visit the PELS registration site via the QR code.

PELS AdCom Strategy Meeting
Sunday, September 20
12:00PM – 3:00PM
Room: 514

PELS Industry Advisory Board and Magazine Advisory Dinner
Sunday, September 20
7:30PM – 10:00PM
Private Event

PELS Digital Media Meeting
Monday, September 21
10:30AM – 11:30AM
Room: 514A

PELS Membership Committee Meeting
(Students/Liaisons & Chapter Chairs)
Monday, September 21
10:30AM – 12:00PM
Room: 515A

PELS Technical Committee and Standing Committee Chairs
Monday, September 21
12:00PM – 1:30PM
Room: 514B

PELS Bylaws and Committee Meeting
Monday, September 21
2:00PM – 4:00PM
Room: 514C

Asian Power Electronics Coordination Committee Meeting (APECC)
Monday, September 21
2:30PM – 4:00PM
Room: 515B

PELS Southern Conference Steering Committee (COBEP/SPEC)
Tuesday, September 22
8:00AM – 9:00AM
Room: 514A

PELS/IAS Joint Motor Drives and Actuators Meeting (PELS TC3)
Tuesday, September 22
9:00AM – 10:00AM
Room: 514B

International Future Energy Challenge 2016 (IFEC) Information Session
Tuesday, September 22
10:00AM – 12:00PM
Room: 516C

PELS TC1 – Power and Control Core Technologies
Tuesday, September 22
10:00AM – 12:00PM
Room: 516A

PELS Fellows Committee
(Members Only)
Tuesday, September 22
12:00PM – 1:00PM
Room: 514B

PELS TC6 – High Performance and Emerging Technologies
Tuesday, September 22
12:00PM – 2:00PM
Room: 516B

PELS TC2 – Power Conversion Systems and Components
Tuesday, September 22
2:00PM – 3:30PM
Room: 514B

PELS/IAS Joint Vehicle and Transportation Systems Meeting (PELS TC4)
Tuesday, September 22
3:00PM – 4:00PM
Room: 520C

PEDG Steering Committee Meeting
Tuesday, September 22
3:00PM – 5:00PM
Room: 514A

PELS TC5 – Sustainable Energy Technical Committee
Tuesday, September 22
6:30PM – 7:30PM
Room: 516A

IEEE IAS/PELS Young Professional Reception
(Invite Only)
Tuesday, September 22
6:30PM – 10:00PM
Offsite

IEEE PELS Women In Engineering Breakfast (WIPELS)
Wednesday, September 23
8:00AM – 9:00AM
Room: 516A

PELS Products (Transactions) Committee Meeting
Wednesday, September 23
8:00AM – 10:00AM
Room: 516B

PELS JESTPE Paper Awards and Editorial Board
Wednesday, September 23
10:30AM – 12:30PM
Room: 515B

IEEE Transactions on Power Electronics Paper Awards and Editorial Board Meeting
Wednesday, September 23
11:30AM – 1:30PM
Room: 516BC

PELS Nominations Committee
(Members Only)
Wednesday, September 23
12:30PM – 2:30PM
Room: 514A

ECCE Global Partnership Coordinating Meeting
(Committee Members Only)
Wednesday, September 23
1:00PM – 2:30PM
Room: 514B

PELS Technical Operations Committee Meeting
Wednesday, September 23
1:30PM – 3:30PM
Room: 516A

PELS Conferences Committee Meeting
Wednesday, September 23
3:30PM – 5:00PM
Room: 516BC

PELS Standards Committee Meeting
Wednesday, September 23
3:30PM – 5:00PM
Room: 514A

PELS Administrative Committee Meeting
Thursday, September 24
2:00PM – 6:00PM
Room: 516BC

PELS Administrative Committee Dinner
Thursday, September 24
6:30PM – 10:30PM
Offsite

PELS/Smart Village Workshop
Friday, September 25
8:00AM – 12:00PM
Westin Hotel

SPECIAL EVENTS

Newcomers Orientation

Sunday, 4:00PM – 5:00PM
Room: 523AB

The orientation will consist of a short session intended to act as a guide for those who are new to ECCE. The content of this session, however, contains information that should be of interest to anyone who wishes to organize their conference calendar in a meaningful way or to gain a behind the curtains feel for the content and organization of the conference. Many members of the organizing committee will describe the program elements that they were responsible for. Vice-chairs of the Technical Program Committee will briefly discuss the trends and topics that they felt dominated the submissions in various tracks, as well as the submissions to the Special Sessions. We hope to give everyone present a concise briefing on the upcoming conference.

Meet and Greet the Fellows Reception

Sunday, 5:00PM – 7:00PM
LaRuelle, InterContinental Montreal

Join us for a Meet and Greet the Fellows Reception within the Sunday evening Opening Reception of ECCE 2015. A chance to chat, take photos and congratulate the 2015 IEEE Power Electronics Society Class of Fellows that have chosen to receive their award at ECCE.

PELS Fellows

Josef Drobnik
SPARQ Systems Inc.

Honored for development of high performance power converters in industrial applications

Josep Guerrero
Aalborg University

Honored for contributions to distributed power systems and microgrids

Dragan Maksimovic
University of Colorado, Boulder

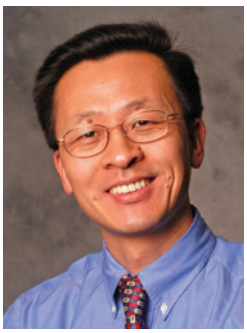
Honored for contributions to digital control of high-frequency switched-mode power converters

Paolo Mattavelli
University of Padova

Honored for contributions to power converters for grid-connected applications and power

Khai Ngo
Virginia Tech

Honored for contributions to unified synthesis and modeling of switched-mode converters



Jian Sun
Rensselaer Polytechnic Institute (RPI)

Honored for contributions to modeling and control of power electronic circuits and systems

Navid Zargari
Rockwell Automation Canada

Honored for contribution to medium voltage drive technologies and applications

IAS Fellows

Ahmed Rubaii
Howard University

Honored for contributions to the development of high-performance controls for motor drives

Nicola Bianchi
University of Padova

Honored for contributions to the theory and practice of electric machine design and control

Mircea Popescu
Motor Design Ltd.

Honored for contributions to AC induction and permanent magnetic electric machines

Opening Reception

Sunday, 5:00PM – 7:00PM
LaRuelle, InterContinental Montreal

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

Expo Reception

Monday, 4:00PM – 6:00PM
Exhibit Hall 220E

Supported by Opal-RT

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

Suraj Sadan

Display outside Exhibit Hall 220E

Suraj Sadan is an outstanding portrait painter, artist, teacher and curator. He has painted many national and international leaders. Aside from the many awards, renowned scholarships, and recognitions that Mr. Sadan has received, his most prized accomplishment is the Mahatma Gandhi International Foundation in Montreal. His work is on display in public and private collections all over the world.

Student Paper Awards

A special thank you to the following companies who have funded this year's student paper awards:

United Technologies Research Center
Best Student Papers

Wiley
Best Student Papers

ECCE on Social Media

@ieee_ecce.com #ecce_2015

facebook.com/ieee.ecce

Join the IEEE Energy Conversion and Exposition Group

SPECIAL EVENTS (continued)

Student-Industry Visit with Exhibitors Passport Game

Tuesday, 10:00AM – 5:00PM
Exhibit Hall 220E

Supported by Opal-RT

Continue the fun from last year with the ECCE 2015 Student-Industry Visit with Exhibits Passport Game. This is a great way of highlighting the important relationship between students and industry companies that exhibit every year.

All students will receive an official Passport game-card at registration and have a chance to win great prizes at the official drawing on Tuesday afternoon in the exhibit hall. Directions on how to complete the game will be included on the back of the card available to students at the registration desk.

Site Visit Tours

ABB Tour

must be pre-registered
Wednesday, 9:00AM – 12:00PM
Location: Palais d[illegible]e Montréal Viger Hall entrance,

SOLD OUT

The ABB factory in Varennes manufactures a vast range of complex, superior quality transformers and shunt reactors, including large power step-up transformers for power plants, auto transformers with a very high primary voltage, transformers especially designed for Static VAR Compensators (SVC) and high voltage direct current power transmission systems (HVDC).

Hydro-Québec's research institute, IREQ Tour

must be pre-registered
Tuesday, 2:00PM – 4:00PM
Location: Palais des co[illegible]e Montréal Viger Hall entrance, depart at 1:15PM

SOLD OUT

[illegible] Québec's research institute, IREQ, is one of the largest integrated electrical research and testing centres in North America. Created in 1967, IREQ has developed large-scale expertise in electrical apparatus, network analysis and control, automation and measurement, materials, chemical and mechanical engineering, and applications of electricity. It has impressive facilities at its disposal: high-voltage laboratory, mechanical-thermomechanical laboratory, a power system study and simulation centre and an electrotechnology laboratory, as well as numerous specialized laboratories, notably in robotics, battery materials and mechanical engineering.

ECCE Banquet

Wednesday, 7:00PM – 9:30PM
Room: 517D

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

Awards Luncheon

Thursday, 12:10PM – 2:00PM
Room: 517D

The Awards Luncheon recognizes the 2015 IEEE Awardees accepting their award at ECCE 2015. The IEEE Awards program pays tribute to technical professionals whose exceptional achievements and outstanding contributions have made a lasting impact on technology, society and the engineering profession.

Oral Presenters

Speaker Ready Room

Sunday through Thursday
Room: 522A

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

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

Sunday, September 20 ..... 8:30AM – 5:00PM
Monday, September 21 ..... 8:30AM – 5:00PM
Tuesday, September 22 ..... 8:30AM – 12:00PM
Wednesday, September 23 ..... 8:30AM – 6:00PM
Thursday, September 24..... 8:30AM – 12:00PM

You may also edit your presentation during speaker ready room hours. If you have edits to your presentation, you will need to re-upload your presentation by 4pm the day prior for speakers presenting before 12noon or by 12noon for speakers presenting after 1pm. Please note, if you have edits to your presentation after the cutoff time, you will need to bring them with you on a flash drive directly to the session room. AV personnel will upload all presentations onto the laptop in your scheduled session room.

Oral Presenters' Orientation Breakfast

A Presenters' orientation will be held for oral presenters and session chairs from 7:00AM – 8:00AM, Monday through Thursday at the Palais des congrès de Montréal. The location for the breakfast is as follows:

Monday/Tuesday
Room 512ABEF

Wednesday/Thursday
Room 517D

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 on days on which you are scheduled to speak.

Poster Presenters

Poster Presentation Schedule

Monday/Tuesday
Exhibit Hall 220E

Poster Session I ..... Monday, September 21, 5:00PM – 6:30PM
Poster Session II..... Tuesday, September 22, 10:30AM – 12:00PM
Poster Session III ..... Tuesday, September 22, 3:30PM – 5:00PM

Posters will be on display on Monday and Tuesday in Exhibit Hall 220E at the Palais des congrès de Montréal. The poster presenters should be available for questions at their display boards during their scheduled poster presentation time. If you are unsure in which session your poster should be presented, please review the complete Technical Session schedule starting on page 31.

Poster Presenters will have access to Exhibit Hall 220E at the Palais des congrès de Montréal to set up and tear down their posters at the times listed below for each of the Poster Sessions.

Poster Session I

Setup ..... Monday, September 21, 2:00PM – 3:00PM
Poster Session ..... Monday, September 21, 5:00PM – 6:30PM
Teardown ..... Monday, September 21, 6:30PM – 7:00PM

Presenters for Poster Session I must have their posters set-up no later than 3:00PM. Any posters that remain on the poster boards at 7:00PM, and do not belong in Poster Session II will be removed and kept at the Registration Desk.

Poster Session II

Setup ..... Tuesday, September 22, 8:00AM – 9:00AM
Poster Session ..... Tuesday, September 22, 10:30AM – 12:00PM
Teardown ..... Tuesday, September 22, 12:00PM – 1:00PM

Presenters for Poster Session II must have their posters set-up no later than 9:00AM. Any posters that remain on the poster boards at 1:00PM, and do not belong in Poster Session III will be removed and kept at the Registration Desk.

Poster Session III

Setup ..... Tuesday, September 22, 2:00PM – 3:00PM
Poster Session ..... Tuesday, September 22, 3:30PM – 5:00PM
Teardown ..... Tuesday, September 22, 5:00PM – 6:00PM

Presenters for Poster Session III must have their posters set-up no later than 3:00PM. Any posters that remain on the poster boards at 6:00PM, will be removed and kept at the Registration Desk.

Uncollected posters will be discarded.

Poster Boards & Push-pins

4'x8' (1.2192m x 2.4384m) 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 Presenters' Orientation

A Presenters' orientation will be held for poster presenters on Monday and Tuesday at the Palais des congrès de Montréal. The orientation will be located in Exhibit Hall 220E as follows:

Orientation..... Monday – 1:30PM – 2:00PM
Orientation..... Tuesday – 7:30AM – 8:00AM

Poster Presenters should attend the orientation each day that they are scheduled to provide a poster presentation.

PLENARY SESSION

Monday, September 21 **8:30AM – 10:30AM**

517 D

The distinguished plenary speakers were invited to share their insights on the trends and the future of various aspects of energy conversion. The topics cover materials, components, subsystems and systems of energy conversion. The diverse mix of presentations from the leaders in their field will set the tone for this year's conference. The organizing committee is pleased to welcome each of these speakers and offers warm appreciation for their contribution to the success of the conference.

Dehong Xu, Sudip Mazumder and Wei Qiao
Plenary/Tutorial/Town Hall Chairs

Dr. Don Tan is the Distinguished Engineer and Senior Staff Manager, Northrop Grumman Aerospace Systems, Redondo Beach, CA. Dr. Tan is a chief technologist, a researcher in power electronic systems, and an authority in space power management and electrical power systems. Accomplishments include 2 national standards, 15 patents , more than 30 industry and company awards and recognitions, more than 100 research and technology articles and presentations. He is widely recognized as an authority in power management technology and electrical power systems not only within NGC, but also with the National Aeronautics and Space Administration (NASA). His recent recognitions include the NGAS Fellow Award in 2011, the NGAS Asian American Achievement Award in 2009, the American Institute of Aerospace and Aeronautics Space Systems Award in 2008 etc.

He is the Immediate Past President of the IEEE Power Electronics Society (PELS), and the founding Editor-in-Chief of the IEEE Journal of Emerging and Selected Topics in Power Electronics (JESTPE). He served as the Guest Editor-in-Chief for the IEEE Transactions on Power Electronics (TPEL).

David B. Durocher is the Global Mining, Metals & Minerals Industry Manager for Eaton's Electrical Business. He has over 35 years of experience with Westinghouse and Eaton serving in a variety of product engineering, sales and global marketing roles. He has authored numerous technical papers that have been presented at conferences around the world and published in IEEE Industry Applications, Plant Engineering and EC&M Magazine. Dave is a Senior Member of the IEEE and presently serves as a member of the IEEE IAS Mining Industry Committee, the Cement Industry Committee, Pulp & Paper Industry Committee and as the President of the IEEE Industry Applications Society.

Dr. John W. Palmour, Chief Technology Officer – Power & RF, directs and conducts all Power Device and Microwave device development at Cree, Inc. He was one of the co-founders of Cree in 1987, a company that currently does $1.6B in revenue and employs over 7000 people worldwide, and served on the Board of Directors for the company from 1995 to 2010. He also served as the Company's Executive Vice President from 2003 to 2008. Dr. Palmour has been a leader in SiC and GaN device development for the last 27 years, and has demonstrated numerous firsts in these technology areas. He has been responsible for the development of high voltage, high temperature 4H-SiC power transistors and diodes, as well as high frequency GaN HEMTs and MMICs. He also manages the Company's government contract research programs. During his career, he has authored or co-authored more than 330 publications and is a co-inventor of 50 U.S. patents and many corresponding foreign patents. Dr. Palmour received his B.S. and Ph.D degrees from North Carolina State University, Raleigh, in 1982 and 1988, respectively, where his major was in Materials Science and Engineering. Dr. Palmour became a Fellow of the IEEE in 2013.

Dr. Gaétan Lantagne is currently the acting senior director of Hydro-Québec research institute (IREQ). Along with his management team, he is also responsible for the scientific and technical development of 500 persons. He has accumulated 25 years of experience in energy related research. He has contributed significantly to the energy efficiency R&D programme of Hydro-Québec as well as its positioning in renewable energy research activities. He is currently chairing the Hydro-Québec steering committee on Wind Power. He also acts as the Vice-president of the board of directors and the executive committee of the center of excellence on commercialization of research created by NSERC in energy efficiency and new energy technologies.

Gaétan Lantagne holds a Ph.D in Chemical Engineering (1990) from the University of Sherbrooke in Canada. He was recently a member of the Natural Sciences and Engineering Research Council (NSERC). He was also a member of the Synergy Awards (2011-2013) for Innovation and Innovation Challenge Awards Selection Committee (NSERC) as well as the Industry-College fund for innovation selection committee of the Canadian Foundation for innovation (CFI) (2012-2013).

TOWN HALL MEETINGS

Tuesday, September 22 **5:30PM – 7:00PM**

There will be two town hall meeting sessions this year at ECCE for attendees to engage in debate concerning critical issues in state of the art and emerging technologies. This year's format is less formal to allow attendees to feel at ease and engage in open discussion with expert panelists. Each panelist will make a brief presentation to initiate the discussion. The meetings will be led by a moderator in order to keep the meandering digressions to a minimum, yet stimulate and promote innovative tangents. Participants are strongly encouraged to contribute to the debate, discussion, and discourse surrounding the selected topics. We are hoping for honest discussion about the topics in a passionate and intelligent way.

Drinks will be served.

Town Hall: Advances in SiC and GaN based Devices, Packaging, and Systems

Room: 518C

SiC and GaN based wide-bandgap devices, owing to their plurality of projected advantages, continue to foster significant interest in the power-electronics community. This town hall meeting will provide a panoramic overview on the relatively recent advances in the area of SiC- and GaN-based wide-bandgap power semiconductor devices and packaging and their applicability and viability for power-electronics systems. The town hall meeting will comprise technology leaders from industries including Cree, Inc., General Electric, APEI, GaN Systems, Infineon, and United Technologies. They will attempt to provide an industrial perspective to the emerging queries related to these wide-bandgap devices.

Moderator:
Sudip K. Mazumder, *University of Illinois, Chicago*

Panelists:
John W. Palmour, Ljubisa Stevanovic, Ty R. McNutt, John Roberts, Eric Persson, Vladimir Blasko

Town Hall: Microgrid Is Practical for the Future Grid or Just Fiction?

Room: 518A

The energy production is becoming globally very dispersed as more and more production is coming from renewables. New grid structures like micro-grid are discussed and also seen demonstrated many places – but what is the time horizon for a real implementation in a large scale for such systems? – or will the grid continue to be controlled by large bulk power producing units and then supplied with the dispersed generation.

Moderator:
Dr. Frede Blaabjerg, *Aalborg University, Denmark*

Panelists:
Dr. Innocent Kamwa, Robert J. Breitzmann, Dr. Pedro Rodriguez, Dr. Ben Kroposki, Dr. Johan Enslin

TUTORIALS

Note: All tutorials are held on September 20, 2015. Pre-registration for each tutorial is required. Please visit the Registration Desk for space availability.

Sunday, September 20 **8:00AM – 12:00PM**

AM Tutorials

T1-1 Improving DC-DC Converter Performance with GaN Transistors

Room: 520A

Instructors: Dr. David Reusch, Dr. John Glaser, *Efficient Power Conversion Corporation (EPC)*

Gallium Nitride (GaN) power semiconductors are being adopted in an increasing number of power conversion applications. The technology is rapidly developing and product experience in the field is expanding. This tutorial will begin with a discussion of the state-ofthe art in GaN technology, including an overview of GaN technology, GaN transistor structures and the latest electrical performance.

The tutorial will continue with design basics fundamental to GaN transistors including drivers, layout, paralleling, dead-time management, and thermal considerations. The design basics will be followed by design examples with a focus on 48 VIN to 1 VOUT network and telecom power supplies. Different architectures will be compared and the benefits of GaN transistors will be quantified over Si MOSFETs for various approaches to get 48 VIN to load.

The tutorial concludes with a look into the future of this relatively young technology and its potential to improve performance in existing applications and enable new applications which are not possible with aging silicon MOSFETs. Beyond the discrete transistor, the extension of GaN technology to fully integrated circuits will be discussed, furthering the potential of GaN to raise the bar in power conversion performance.

T1-2 Design and Manufacturing of PM Electrical Machines

Room: 520B

Instructors: Dr. Bulent Sarlioglu, Dr. Thomas Jahns, *University of Wisconsin – Madison*, Dr. Dan M. Ionel, *Regal Beloit Corporation*

Permanent Magnet (PM) synchronous machines are being used more and more in many applications, mainly because of the advantages such as volume and weight reductions and high power density. Even though the PM machines have many advantages, there are many challenges that need to be considered. These challenges include calculation of the losses in the permanent magnet, selection of winding topologies and manufacturing. For high quality PM machine design, special considerations should be taken to overcome these challenges.

The purpose of this tutorial is to provide the most important challenges and design considerations for PM Machines. Different machine types will be evaluated for various applications and pros and cons will be discussed. Different Winding topologies will be reviewed. Manufacturing techniques and best practices will be shared.

T1-3 Control and Stability Analysis of HVDC Converters and Systems

Room: 520C

Instructors:: Dr. Jian Sun, *Rensselaer Polytechnic Institute*

High-voltage dc (HVDC) transmission has traditionally been used for bulk power transfer over long distance. Recent advances in HVDC converter technologies based on voltage-source converters (VSC) and modular multilevel converters (MMC) have enabled new applications such as dc grids and HVDC transmission of offshore wind energy. Compared to conventional line-commutated converters (LCC), VSC and MMC require less filtering and enable better control performance, including the ability to operate with variable power factor. These features are the results of the high operation frequency of VSC and MMC, and are essential for multiterminal and offshore wind applications. The high operation frequency and fast control, on the other hand, also lead to more complex dynamics over a wide frequency range and create potential for new stability problems at both the converter and the system level. Indeed, resonance problems have been reported for offshore wind farms employing HVDC transmission. Such resonance can damage filter components and/or cause instability of the ac bus voltage, leading to shutdown of the entire wind farm.

Stability of HVDC systems is usually studied by using state-space models and modal analysis. Predicting supersynchronous resonance and other high-frequency instability behaviors requires electromagnetic transient (EMT) models which are highly nonlinear and cannot be linearized in the time domain to support modal analysis. Besides, an offshore wind or multiterminal HVDC system typically involves multiple companies each supplying parts of the system, and it is often impractical for suppliers to share design details required for formulating a system state-space model. As an alternative, the impedance-based stability theory developed in the power electronics community overcomes these difficulties by requiring only an input/output (impedance) model for each device or subsystem. New impedance modeling methods for three-phase converters based on harmonic linearization and symmetrical components allowed the impedance-based stability theory to be extended to ac power systems, including hybrid ac-dc systems that involve HVDC transmission. The resulting sequence impedance models are valid from subsynchronous to supersynchronous frequencies, making it possible to study system stability over a wide frequency range.

This tutorial teaches impedance-based stability analysis and control design methods for HVDC converters and systems. The tutorial starts with an overview of HVDC converter technologies and control methods as well as their applications, especially for grid integration of offshore wind farms. The classical impedance-based stability theory and its recent extensions to three-phase converters and systems are then presented. This is followed by detailed discussion of sequence impedance modeling of various HVDC converters, including LCC, VSC, and MMC. The method is then used to study control stability and resonance in two types of HVDC systems: a) HVDC transmission embedded in an ac network, and b) HVDC transmission for offshore wind farms. In each case, possible forms and root causes of control instability and resonance are identified using impedance models, and practical solutions based on shaping the impedance by control and active damping are discussed. Both Type III and Type-IV turbines are considered in the study of offshore wind HVDC systems.

T1-4 Dynamic Modeling and Control of Grid-Connected Renewable Energy Conversion Systems

Room: 520D

Instructors: Longya Xu, Jin Wang, Yazan Alsmadi, *Center of High Performance Power Electronics (CHPPE)*, Frede Blaabjerg, *Center of Reliable Power Electronics (CORPE)*, Edward Muljadi, *National Renewable Energy Laboratory*

In recent years, there has been a huge increase in the global demand for energy as a result of not only industrial development, but population growth as well. Consequently, the rise in consumption of traditional fossil fuels has led to many serious problems such as energy shortage, pollution, global warming, the shortfall of traditional fossil energy sources, and instability of energy. These factors are driving the development of renewable energy technologies, which are considered an essential part of a well-balanced energy portfolio. Wind and solar power sources are thought to be the most promising alternative energy in the near future.

As the contribution of renewable energy to the power grid increases, serious concern about its influence on the dynamic behavior of the power system has also increased resulting in the power system operators revising the grid codes in several countries such that these alternative energy sources have an operational behavior more similar to that of conventional generation capacity, and more responsibility in the network. Furthermore, significant improvement has been achieved in the design and implementation of robust energy conversion systems that efficiently transform wind and solar energies.

This objective of this tutorial is to provide comprehensive review of the crucial aspects involved in the design and control of the most emerging grid-connected renewable energy sources, wind energy and photovoltaics, which by means of power electronics are changing character from being a minor energy source to be acting as a major power source in the energy system. It will cover the challenges and methods of dynamic modeling and control of single renewable energy generators and whole renewable energy plants (wind power plants, large PV arrays). Technology development, power converter technologies, control of the different systems both singlephase and three-phase, system integration, synchronization methods to the grid, grid codes and how to operate the renewable energy conversion systems under different grid conditions will also be discussed. Finally, future research opportunities will be presented.

T1-5 Virtual Synchronous Machines for Power Electronics based Power Systems and Microgrids

Room: 520E

Instructor: Prof. Qing-Chang Zhong, *Illinois Institute of Technology*

Power systems are going through a paradigm change from centralized generation to distributed generation and further onto smart grids. A huge number of heterogeneous players, including renewable energy sources, electric vehicles, and storage systems etc. on the supply side and different types of smart loads on the demand side, are being connected to power systems. Hence, future power systems will be power-electronics based, instead of electrical machines based, with a huge number of heterogeneous players. This presents great challenges to the power electronics community. Because of the heterogeneous nature and the huge number of players involved, the search for reliable, stable and efficient control techniques so that all heterogeneous players can work together to maintain system stability and achieve desired performance has been ongoing for years. The concept of operating the converters as virtual synchronous machines has attracted a lot of attention in recent years and it has been widely accepted as a promising way to unify the interface of all players with the power systems and achieve autonomous operation for future power systems and microgrids. This paves the way for next-generation smart grids and brings a lot of opportunities to the power electronics society.

This tutorial will systematically covers various aspects of virtual synchronous machines, including the concept of virtual synchronous machines, the synchronverter technology to make inverters behave like synchronous generators, applying the synchronverter technology to make rectifiers behave like synchronous motors, to get rid of phase-locked loops so that synchronverters can self-synchronize with the grid, applying the synchronverter technology to wind power, solar farms and STATCOM etc. Moreover, the architecture for nextgeneration smart grids based on the virtual synchronous machines will be presented. This unifies the interface of all the players with the grid and considerably enhances the operability, stability, scalability, reliability and security of next-generation smart grids. The tutorial will also cover the strategies that only mimic the external function of synchronous machines, which present a simpler solution than the synchronverter technology, including the robust droop control to achieve accurate proportional sharing and tight voltage regulation in the presence of component mismatches/parameter drifts etc., the universal droop control to achieve the parallel operation of inverters with different types of output impedances, the harmonic droop control to improve voltage harmonics via injecting harmonic voltage components etc.

A lot of experimental results will be presented so the tutorial is of high value to practicing engineers, PhD students, researchers and the like.

T1-6 Fuel Cell Systems for Transportation and Stationary Power Generation

Room: 520F

Instructors: Dr. Kaushik Rajashekara, *The University of Texas at Dallas*

The need to reduce emissions has led to the development of electric, hybrid and fuel cell vehicles. Fuel cell based vehicles are already in the demonstration phase. Fuel cells are also being considered for on-board power generation in trucks, airplanes and ships. The use of high temperature fuel cells for stationary power generation is getting increasing importance for distributed power generation and for stand-alone power systems. The power electronics and the control systems are enabling technologies for the advancement of fuel cell based systems.

In this seminar, the different fuel cell technologies are examined for transportation and power generation applications. The proton exchange membrane (PEM) fuel cell based propulsion system architectures for fuel cell vehicles will be presented in detail and simple calculations for the determine the stack size and power will be explained. The operating strategies of fuel cell vehicles with the associated power electronics and control architectures will also be explained.

Detailed operation of Solid Oxide Fuel Cell (SOFC) will be presented and Stationary power generation strategies based on SOFC will be discussed. The power conversion strategies for connecting the fuel cell to grid will also be presented. Simple calculations for determining the fuel requirement for a given power, stack size, and water generation will be presented.

The hybrid fuel cell system consisting of SOFC and Gas turbine system with the associated power conversion and control strategies will be briefly discussed. The status of fuel cell systems and the future strategies will be presented.

Sunday, September 20

PM Tutorials

T2-1 Design Challenges for High Frequency Magnetic Circuit Design for Power Conversion

Room: 520A

Instructor: Prof. W.G. Hurley, *National University of Ireland, Ireland*

The key to reducing the size of power supplies is high frequency operation and magnetic components can play a critical role. The seminar begins with the design rules for inductor design and examples of different types of inductors are given. A special example is the inductor in a flyback converter, since it has more than one coil. This is followed by the general design methodology for transformers and many examples from switched mode power supplies and resonant converters are given. The main focus is placed on modern circuits where non-sinusoidal waveforms are encountered. General rules are established for optimising the design of windings under various excitation and operating conditions. The skin effect and the proximity effect give rise to increased losses in conductors due to the non-uniform distribution of current in the conductors. A new approach to high frequency losses that avoids cumbersome Fourier analysis will be presented to optimise the winding design, for non-sinusoidal waveform encountered in power electronics. Core losses for both sinusoidal and non-sinusoidal flux will be covered. This seminar is of interest to graduate students and practising engineers working with power supplies and energy conversion systems.

This seminar is based on a new textbook authored by the speaker: TRANSFORMERS AND INDUCTORS FOR POWER ELECTRONICS: Theory, Design and Applications, Wiley, 2013.

T2-2 Modelling of Lithium-Ion Battery Energy Storage Systems for Grid Support Services

Room: 520B

Instructors: Remus Teodorescu, Maciej Swierczynski, Daniel Stroe, *Aalborg University*, Pedro Rodriguez, *Abengoa Research*

In recent years, lithium-ion batteries have become the key energy storage technology for the e-mobility industry, because of their outstanding technical characteristics which include fast response, high power capability, and long lifetime. Consequently, due the fast development, which was driven by the portable applications and e-mobility sectors, lithium-ion batteries have started to be more and more considered for various grid support services and for renewable's grid integration. However, lithium-ion batteries are highly nonlinear systems and their performances degrade with time. Therefore, in order to ensure technical and economic viability of a certain project, accurate knowledge about the behaviour of the lithium-ion battery is demanded by the industrial user for both short term operation (seconds to hours – performance modelling) and long term operation (days to years – lifetime modelling).

The objective of this tutorial is to provide the audience with an extensive overview of the lithium-ion battery energy storage technology, its operating principles, advantages and drawbacks, grid integration issues and requirements. Moreover, a large part of the tutorial is dedicated to the performance and lifetime modelling of the lithium-ion batteries. Different modelling methods will be introduced and their characteristics (e.g., accuracy, complexity etc.) will be assessed. Study cases illustrating the development and parameterization of the performance and lifetime models, based on field and extensive laboratory measurements will be presented and discussed as well.

T2-3 Operation, Control, and Applications of Modular Multilevel Converters

Room: 520C

Instructors: Prof. Maryam Saeedifard, *Georgia Institute of Technology,* Assoc. Prof. Staffan Norrga, *KTH Royal Institute of Technology, Sweden*

The modular multilevel converter (MMC) has been the subject of increasing importance for medium- and high-power energy conversion systems, specifically high-voltage direct current (HVDC) transmission. Over the past few years, there has been a significant effort towards addressing the technical challenges associated with the operation and control of the MMC as well as broadening its potential applications and exploiting its salient features. This tutorial provides a comprehensive description and review on the most recent advances and contributions on the operational issues, modeling, control, and modulation techniques of the MMC. This tutorial also highlights the emerging applications of the MMC and outlines their associated challenges.

T2-4 EMI and Its Reduction for Power Electronics Systems

Room: 520D

Instructor: Dr. Shuo Wang, *University of Florida*

This tutorial introduces basic theory and practical solutions for the EMI in power electronics systems. It addresses the generation, measurement and suppression of the EMI in power electronics systems. It is designed for the audience from entry to advanced level. The tutorial would be very valuable to power electronics engineers, students in Universities as well as the researchers in EMI area.

The tutorial will address the following topics: EMI noise sources in power electronics systems, the effects of parasitic parameters on the conductive EMI in power electronics systems, capacitive and inductive near field coupling mechanisms in power electronics systems, suppression techniques for differential mode and common mode EMI, suppression techniques for the EMI due to near field couplings, high performance EMI filter design, power electronics components with improved EMI performance, EMI in motor drive and grid tied inverters, EMI reduction for three phase power electronics systems, measurement of single and three phase EMI, diagnosis of EMI for single and three phase power electronics systems, etc.

T2-5 Design for Reliability of Power Electronic Systems

Room: 520E

Instructors: Frede Blaabjerg, Huai Wang, Ke Ma, *Center of Reliable Power Electronics (CORPE)*

In recent years, the automotive and aerospace industries have brought stringent reliability constraints on power electronic systems because of safety requirements. Today customers of many power electronic products expect up to 20 years of lifetime and they also want to have a "failure free period" and all with focus at the financials. The industrial and energy sectors are also following the same trend, and more and more efforts are being devoted to improving power electronic systems to account for reliability with cost-effective and sustainable solutions. The emphasis of this tutorial is to give a framework on the design for reliability of power electronic systems and the recent research activities and paradigm in this research area. It will cover the reliability requirements in different industry sectors, reliability and lifetime of IGBT modules and capacitors used in power electronic converters, and the specific design for reliability procedure for power electronic systems. Study cases on mission profile based design of photovoltaic inverters and wind power converters, and active thermal control and condition monitoring of power converters are also discussed. The approaches presented in the tutorial are also the common interest for the companies involved in the Center of Reliable Power Electronics (CORPE) at Aalborg University (http://www.corpe.et.aau.dk/). The tutorial will also present the views of the instructors on the future research opportunities in the area of reliability of power electronics.

T2-6 Next Generation Time Domain Control of Power Electronics Systems using Predictive Switching Sequences

Room: 520F

Instructors: Dr. Tobias Geyer, *ABB Corporate Research, Switzerland*, Dr. Sudip K. Mazumder, *University of Illinois, Chicago*

This tutorial provides a fundamentally different perspective to control of switching power electronic systems. It is based on controlling the time evolution of the switching states (i.e., switching sequences) as well as controlling the switching transition of the power semiconductor device of the solid state electronic system. The former – i.e., switching-sequence based control (SBC) yields rapid response under transient condition, optimal equilibrium response, and yields seamless transition between the two states of dynamics. The first part of the tutorial will primarily focus on SBC for power electronics systems. By enabling integration of modulation and control, SBC precludes the need for ad-hoc offline modulation synthesis. In other words, an optimal switching sequence for the power converter is generated dynamically without the need for prior determination of a modulation scheme (which generates a pre-determined switching sequence) in typical conventional approaches. One of the distinctions between SBC and conventional model predictive control (MPC) is that SBC ensure optimal determination of the switching sequence of the power converter under stability bound. The tutorial will provide the mechanism to carry out SBC and MPC control syntheses and demonstrate the differences between SBC and MPC. Several device, converter, and network level implementations (e.g., motor drive, multilevel converter, microgrid, parallel inverters, aircraft power system) of the SBC will be provided.

The second part of the tutorial reviews control and modulation methods that fully exploit the performance potential of high-power converters, by ensuring fast control at very low switching frequencies and low harmonic distortions. To achieve this, the control and modulation problem is addressed in one computational stage. To this end, the benefits of deadbeat control methods (such as direct torque control) are combined with the optimal steady-state performance of optimized pulse patterns, by resolving the antagonism between the two. As a result, the current harmonic distortions and the switching losses can be reduced simultaneously, when compared to carrierbased PWM. Indeed, at low switching frequencies, the resulting steady-state behavior is similar to that of optimized pulse patterns. During transients, however, very fast current and torque response times are achieved, similar to deadbeat control. To this end, two control and modulation methods will be presented. First, a direct MPC with long prediction horizons. Using a branch and bound technique, the optimization problem can be solved efficiently for long prediction horizons. Large performance benefits result for converters with LC filters, which do not require an additional active damping loop. This formulation generalizes the well-known finite control set MPC formulation. Second, a fast closed-loop control based on optimized pulse patterns will be provided. Experimental results on a five-level medium-voltage drive will be demonstrated.

Finally, the tutorial will focus on switching transition control (STC). The primary objective of STC is to demonstrate how key power electronic system parameters including *dv/dt* and *di/dt* stress, switching loss, electromagnetic noise emission can be controlled dynamically by modulating the dynamics of the power semiconductor devices. Both electrical and newly developed optical control mechanisms to achieve STC will be demonstrated. In the context of the latter, mechanisms for monolithic integration of switching sequence control as well as switching transition control will be outlined and the revolutionary impact of such a novel integration on system performance will be demonstrated with practical applications.

Monday, September 21 **10:50AM – 12:30PM**

S1 Energy Storage Systems I

Room: 519A
Chairs: Alvaro Luna, Adel Nasiri

10:50AM | Multiple Time Scale Optimal Operation of MMC Battery Energy Storage System
Qian Zhang, Feng Gao, Lei Zhang, Nan Li, *Shandong University, China*

11:15AM | State-of-Charge Balancing Control for Battery Energy Stored Quasi-Z Source Cascaded Multilevel Inverter based Photovoltaic Power System
Weihua Liang, Yushan Liu, Haitham Abu-Rub, Baoming Ge, *Beijing Jiaotong University, China; Texas A&M University at Qatar, Qatar; Qatar Environment and Energy Research Institute, Qatar; Texas A&M University, United States*

11:40AM | Degradation Behaviour of Lithium-Ion Batteries based on Field Measured Frequency Regulation Mission Profile
Daniel-Ioan Stroe, Maciej Swierczynski, Ana-Irina Stroe, Remus Teodorescu, Rasmus Laerke, Philip Carne Kjaer, *Aalborg University, Denmark; Vestas Technology R&D, Denmark*

12:05PM | Combination between Adaptive SMO and DWT-based an Adjusted EDCV Signal for Robust SOC Estimation in Battery Pack Applications
Jonghoon Kim, Chang Yoon Chun, B.H. Cho, *Chosun University, Korea (South); Seoul National University, Korea (South)*

S2 Solar PV Systems

Room: 518A
Chairs: Alireza Bakhshai, David Xu

10:50AM | Minimizing the Levelized Cost of Energy in Single-Phase Photovoltaic Systems with an Absolute Active Power Control
Yongheng Yang, Eftichios Koutroulis, Ariya Sangwongwanich, Frede Blaabjerg, *Aalborg University, Denmark; Technical University of Crete, Greece*

11:15AM | Intelligent Photovoltaic Power Plants Management Strategy for Market Participation
Andoni Saez-de-Ibarra, Aitor Milo, Haizea Gaztañaga, Victor Isaac Herrera, Ion Etxeberria-Otadui, Asun Padrós, *IK4-IKERLAN Technology Research Centre, Spain; Acciona Energía, Spain*

11:40AM | Three-Phase DC-Bypass Topologies with Reduced Leakage Current for Transformerless PV Systems
Xiaoqiang Guo, David Xu, Bin Wu, *Yanshan University, China; Ryerson University, Canada*

12:05PM | Equivalent Model of a Synchronous PV Power Plant
Daniel Remon, Antoni M. Cantarellas, Mohamed Atef Abbas Elsaharty, Cosmin Koch-Ciobotaru, Pedro Rodriguez, *Abengoa Research, Spain; Technical University of Catalonia, Spain*

S3 Energy Storage

Room: 518B
Chairs: Ali Khajehoddin, Johan Enslin

10:50AM | A Utility Scale Battery Energy Storage System for Intermittency Mitigation in Multilevel Medium Voltage Photovoltaic System
Somasundaram Essakiappan, Madhav Manjrekar, Johan Enslin, Jorge Ramos-Ruiz, Prasad Enjeti, Pawan Garg, *University of North Carolina at Charlotte, United States; Texas A&M University, United States; Infineon Technologies, United States;*

11:15AM | Integrated Optimal Control of Battery Energy Storage Management System for Energy Management and PV Capacity Firming
Sherif Abdelrazek, Sukumar Kamalasadan, Johan Enslin, Tom Fenimore, *University of North Carolina at Charlotte, United States; Duke Energy Corporation, United States*

11:40AM | Interlinking Modular Multilevel Converter of Hybrid AC-DC Distribution System with Integrated Battery Energy Storage
Lei Zhang, Feng Gao, Nan Li, Qian Zhang, Chunyi Wang, *Shandong University, China; State Grid Shandong Electric Power Company, China*

12:05PM | Second Life Battery Energy Storage System for Enhancing Renewable Energy Grid Integration
C. Koch-Ciobotaru, A. Saez-de-Ibarra, E. Martinez-Laserna, D.-I. Stroe, M. Swierczynski, P. Rodriguez, *Abengoa Research, Spain; IK4-IKERLAN, Spain; Aalborg University, Denmark*

S4 Electric Drivetrains

Room: 520A
Chairs: Dong Cao, Rakib Islam

10:50AM | Modular Switched-Capacitor DC-DC Converters Tied with Lithium-Ion Batteries for use in Battery Electric Vehicles
Yue Cao, Yutian Lei, Robert C.N. Pilawa-Podgurski, Philip T. Krein, *University of Illinois-Urbana-Champaign, United States*

11:15AM | DC-Link Voltage Control Strategy of a Bi-Directional DC/DC Converter for Electric Vehicles
Xiaoyu Jia, Changsheng Hu, Shuailin Du, Min Chen, Ping Lin, Dehong Xu, *Zhejiang University, China*

11:40AM | Effect of Brake Power Distribution on Dynamic Programming Technique in Plug-In Series Hybrid Electric Vehicle Control Strategy
Faeza Hafiz, Poria Fajri, Iqbal Husain, North Carolina State University, United States

12:05PM | Influence of Dry Clutch and ICE Transmission Integration on the Thermal Load of a PM based Integrated Starter-Generator
Christian Paar, Annette Muetze, *Graz University of Technology, Austria*

S5 Soft-Switching DC-DC Converters

Room: 524B
Chairs: Dragan Maksimovic, Pradeep Shenoy

10:50AM | A High Step-Up Ratio Resonant Converter for High-Power Applications
Xiaogang Wu, Wu Chen, Liangzhong Yao, Yuanzhi Cao, Renjie Hu, *Southeast University, China; China Electric Power Research Institute, China*

11:15AM | High Step-Up ZVS Dual Switches Converter with Three-Winding-Coupled Inductor
Dongjin Fu, Yu Tang, *Nanjing University of Aeronautics and Astronautics, China*

11:40AM | Non-Isolated Interleaved High Step-Up Converter with Reduced Voltage Multiplier Stages and a Regenerative Turn-Off Snubber
Kazuhiro Umetani, Eiji Hiraki, Masayoshi Yamamoto, *Okayama University, Japan; Shimane University, Japan*

12:05PM | A Transformerless Dual Active Half-Bridge DC-DC Converter for Point-of-Load Power Supplies
Amr Amin, Mahmoud Shousha, Aleksandar Prodi?, Brian Lynch, *University of Toronto, Canada; Texas Instruments, United States*

S6 Grid-Tied Single-Phase Converters I

Room: 524C
Chairs: Huai Wang, Mahshid Amirabadi

10:50AM | Power Decoupling Method Comparison of Isolated Single-phase Matrix Converters using Center-tapped Transformer with PDM
Nagisa Takaoka, Hiroki Takahashi, Jun-ich Itoh, Goh Teck Chiang, Takahide Sugiyama, Masaru Sugai, *Nagaoka University of Technology, Japan; Toyota Central R&D Labs. INC., Japan*

11:15AM | A High-Efficiency High Energy Density Buffer Architecture for Power Pulsation Decoupling in Grid-Interfaced Converters
Shibin Qin, Yutian Lei, Christopher Barth, Wen-Chuen Liu, Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States*

11:40AM | Novel DC to Single-Phase AC Isolated Current Source Inverter with Power Decoupling Capability for a Micro-Inverter System
Hiroki Watanabe, Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

12:05PM | Interleaved Totem-Pole Bridgeless PFC Rectifier with ZVS and Low Input Current Ripple
Long Huang, Wenxi Yao, Zhengyu Lu, *Zhejiang University, China*

S7 DC-DC Converter Modeling

Room: 520F
Chairs: Aleks Prodic, Juri Jatskevich

10:50AM | Small-Signal Equivalent Circuit Model of Series Resonant Converter
Shuilin Tian, Fred C. Lee, Qiang Li, Bin Li, *Virginia Tech, United States*

11:15AM | Easy Current Slope Detection for Low Cost Implementation of the Direct Adaptive Current Control for DC-DC-Converters
Andreas Liske, Fabian Stamer, Michael Braun, *Karlsruhe Institute of Technology (KIT), Germany*

11:40AM | Fast Transient Response of Series Resonant Converter using an Average Large Signal Model
Mehdi Mohammadi, Martin Ordonez, *University of British Columbia, Canada*

12:05PM | Small-Signal Characterization of Synchronous Buck Converters under Light Load Conditions
Ruqi Li, Kan Seto, Jessica Kiefer, Sean Li, *Cisco, Inc., United States*

S8 Control of Rectifiers

Room: 521AB
Chairs: P.C. Sen, Juan Balda

10:50AM | New Boundary Mode Sinusoidal Input Current Control of the VIENNA Rectifier
Michael Leibl, Moreno Darani, Johann W. Kolar, Josef Deuringer, *ETH Zurich, Switzerland; Siemens Healthcare GmbH, Germany*

11:15AM | Nonlinear Control and Model Predictive Control Applied to Multi-Cell AFE Rectifier
Eduardo Espinosa, Jose Espinoza, Jaime Rohten, Pedro Melin, Javier Muñoz, Carlos Baier, *Universidad Católica de la Santisima Concepcion, Chile; Universidad de Concepcion, Chile; Universidad del Bío-Bío, Chile; Universidad de Talca, Chile*

11:40AM | Performance Evaluation of Direct Power Control and Model Predictive Control for Three-Level AC/DC Converters
Yongchang Zhang, Yubin Peng, *North China University of Technology, China*

12:05PM | Discontinuous Pulse Width Modulation Methods with Neutral Point Voltage Balancing for Three Phase Vienna Rectifiers
Xuning Zhang, Qiong Wang, Rolando Burgos, Dushan Boroyevich, *Virginia Tech, United States*

S9 Common-Mode EMI

Room: 524A
Chairs: Fred Wang, Martin Ordonez

10:50AM | Common Mode EMI Reduction Technique for Interleaved MHz Critical Mode PFC Converter with Coupled Inductor
Yuchen Yang, Mingkai Mu, Zhengyang Liu, Fred C. Lee, Qiang Li, *Virginia Tech, United States*

11:15AM | Reduced Common-Mode Noise Modulation Strategies for Gradient Driver with Cascaded H-Bridge Multilevel Structure
Ruxi Wang, Juan Sabate, Ying Mei, Jianguo Xiao, Song Chi, *GE Global Research, United States*

11:40AM | Modeling and Stability Analysis of Active/Hybrid Common-Mode EMI Filters for DC/DC Power Converters
Yongbin Chu, Shuo Wang, Qinghai Wang, Rajib Goswami, *University of Texas at San Antonio, United States; University of Florida, United States; Huawei Technology Co., Ltd, China*

12:05PM | On Discussion of Mixed Mode Noise in H-Bridge Converters
Xuning Zhang, Dushan Boroyevich, Rolando Burgos, *Virginia Tech, United States*

S10 Induction Machines

Room: 520B
Chairs: Andy Knight, Andrea Cavagnino

10:50AM | Investigation into Loss Reduced Rotor Slot Structure by Analyzing Local Behaviors of Harmonic Magnetic Fluxes of Inverter Feeding Induction Motor
Naoki Kunihiro, Kazuo Nishihama, Motonobu Iizuka, Kenichi Sugimoto, Masanori Sawahata, *Hitachi, Ltd., Japan*

11:15AM | Impact of Number of Poles on the Steady-State Performance of Induction Motors
Emmanuel Agamloh, Andrea Cavagnino, Silvio Vaschetto, *Advanced Energy Corporation, United States; Politecnico di Torino, Italy*

11:40AM | The Detection and Suppression of Unbalanced Magnetic Pull in Wound Rotor Induction Motors using Pole-Specific Search Coils and Auxiliary Windings
David G. Dorrell, Ahmad Salah, Obaid Kayani, *University of Technology Sydney, Australia*

12:05PM | A Utility and Accurate Electrical Loss Model and Application for Induction Motors Utilizing 2-D Finite Element Analysis
Qing Gu, Liqiang Yuan, Fang Liu, Zhengming Zhao, Ting Lu, *Tsinghua University, China*

S11 Diagnostics of Electric Machines I

Room: 520C
Chairs: Antonio Cardoso, Pinjia Zhang

10:50AM | Rotor Position Estimation of a Pseudo Direct Drive PM Machine using Extended Kalman Filter
Mohammed Bouheraoua, Jiabin Wang, Kais Atallah, *Magnomatics Ltd, United Kingdom; University of Sheffield, United Kingdom*

11:15AM | Monitoring of Journal Bearing Faults based on Motor Current Signature Analysis for Induction Motors
Junyeong Jung, Yonghyun Park, Sang Bin Lee, Changhee Cho, Kwonhee Kim, Ernesto Wiedenbrug, Mike Teska, *Korea University, Korea (South); SKF Condition Monitoring Center, United States*

11:40AM | Dynamic Characteristic Analysis of Irreversible Demagnetization in SPM- and IPM- Type BLDC Motors
Hyung-Kyu Kim, Jin Hur, *University of Ulsan, Korea (South); Incheon National University, Korea (South)*

12:05PM | Modeling and Analysis of AC Resistance of a Permanent Magnet Machine for Online Estimation Purposes
Shamsuddeen Nalakath, Matthias Preindl, Berker Bilgin, Bing Cheng, Ali Emadi, *McMaster University, Canada*

S12 Control of Electric Drives

Room: 520D
Chairs: Fabio G. Capponi, Davide Barater

10:50AM | Single-Electrical-Port Control of Cascaded Brushless Doubly-Fed Induction Drive for EV/HEV Applications
Peng Han, Ming Cheng, Sa Zhu, Zhe Chen, *Southeast University, China; Aalborg University, Denmark*

11:15AM | Optimal Torque Sharing in Direct Instantaneous Torque Control of Switched Reluctance Motors
Tetsuya Kojima, Rik W. De Doncker, *Mitsubishi Electric Corporation, Japan; RWTH Aachen University, Germany*

11:40AM | Suboptimal Search Strategies with Bounded Computational Complexity to Solve Long-Horizon Direct Model Predictive Control Problems
Petros Karamanakos, Tobias Geyer, Ralph Kennel, *Technische Universität München, Germany; ABB Corporate Research, Switzerland*

12:05PM | Module-Integrated GMR-Based Current Sensing for Closed Loop Control of a Motor Drive
Tyler J. Brauhn, Minhao Sheng, Bryan A. Dow, Hiroyuki Nogawa, Robert D. Lorenz, *University of Wisconsin-Madison, United States; Fuji Electric Co., Ltd., Japan*

S13 PM and IPM Motor Drives I

Room: 520E
Chairs: Marcello Pucci, Nicola Bianchi

10:50AM | Uncontrolled Generator Operation of PM Synchronous Machine Drive with Current Source Inverter using Normally-On Switches
Yichao Zhang, T.M. Jahns, *University of Wisconsin-Madison, United States*

11:15AM | Adaptive Neuro-Fuzzy and Loss Minimization based High Performance Control of IPMSM Drive
M. Nasir Uddin, Bhavinkumar Patel, *Lakehead University, Canada*

11:40AM | Comparative Analysis of Scalar and Vector Control Drives of IPMSM under Inter-Turn Fault Condition Considering Nonlinearities
Zia Ullah, Jun-kyu Park, Kyung-Tae Kim, Bong-gu Kang, Jin Hur, *Senior IEEE; University of Ulsan, Korea (South); Incheon National University, Korea (South)*

12:05PM | A Universal Restart Strategy for Permanent Magnet Synchronous Machines
Kibok Lee, Srdjan Lukic, Sara Ahmed, *North Carolina State University, United States; ABB, United States*

S14 Widebandgap Devices I

Room: 519B
Chairs: Robert Pilawa, Jerry Hudgins

10:50AM | Improving High Frequency DC-DC Converter Performance with Monolithic Half Bridge GaN ICs
David Reusch, Johan Strydom, John Glaser, *Efficient Power Conversion Corporation, United States*

11:15AM | Investigation of CCM Boost PFC Converter Efficiency Improvement with 600V Wide Band-Gap Power Semiconductor Devices
Saijun Mao, Ramanujam Ramabhadran, Jelena Popovic, Jan Abraham Ferreira, *GE Global Research, China; GE Global Research, United States; Delft University of Technology, Netherlands*

11:40AM | CMOS-Compatible Enhancement-Mode GaN-on-Si MOS-HEMT with High Breakdown Voltage (930V) using Thermal Oxidation and TMAH Wet Etching
Cen Tang, Mingchen Hou, Xueyang Li, Gang Xie, Kuang Sheng, *Zhejiang University, China*

12:05PM | Characterization of an Enhancement-Mode 650-V GaN HFET
Edward A. Jones, Fred Wang, Daniel Costinett, Zheyu Zhang, Ben Guo, Bo Liu, Ren Ren, *University of Tennessee, United States*

S15 Energy Harvesting

Room: 518C
Chairs: Hiroo Sekiya, Katherine Kim

10:50AM | Phase/RMS Maximum Power Point Tracking for Inductive Energy Harvesting System
Qian Sun, Sumeet Patil, Nian-Xiang Sun, Brad Lehman, *Northeastern University, United States*

11:15AM | Analysis of a Watt-Range Contactless Electromechanical Energy Harvester Facing a Moving Conductive Surface
Michael Flankl, Arda Tüysüz, Johann W. Kolar, *ETH Zurich, Switzerland*

11:40AM | A Bridgeless Rectification Circuit for Wi-Fi Energy Harvesting System
Ermeey Abd. Kadir, Morteza Biglari-Abhari, Augio Patrick Hu, Kean C. Aw, *University of Auckland, New Zealand*

12:05PM | Enhancement on Energy Extraction from Magnetic Energy Harvesters
Jinyeong Moon, Steven B. Leeb, *Massachusetts Institute of Technology, United States*

S16 Utility Interactive Solar PV Systems

Room: 519A
Chairs: Majid Pahlevaninezhad, Rabort S. Balog

2:00PM | A Multifunctional Grid Tied Solar Energy Conversion System with ANF based Control Approach
Bhim Singh, Chinmay Jain, Sagar Goel, Ambrish Chandra, Kamal Al-Haddad, *IIT Delhi, India; ETS, Canada*

2:25PM | Neutral-Point-Clamped Circuits of Single-Phase PV Inverters: Generalized Principle and Implementations
Liwei Zhou, Feng Gao, Tingting Yang, *Shandong University, China; State Grid Chongqing Electric Power Company, China*

2:50PM | Flexible Grid Connection and Islanding of SPC-Based PV Power Converters
Pedro Rodriguez, Costantino Citro, Ignacio Candela, Joan Rocabert, Alvaro Luna, *Abengoa Research, Spain; Technical University of Catalunya, Spain*

3:15PM | A New Modulation Technique to Reduce Leakage Current without Compromising Modulation Index in PV Systems
Zhiping Chen, Wensong Yu, Xijun Ni, Alex Huang, *North Carolina State University, United States*

3:40PM | High Density Control Circuit Integration for Low Cost Grid Tied Inverter
Tanya Kirilova Gachovska, Gabriel Scarlatescu, Tudor Lipan, Arthur Chung, Chris Gerolami, Ray Orr, Nikolay Radimov, Tony Reinberger, Mihai Varlan, Seste Dell'Aera, *Solantro Semiconductor Corporation, Canada*

S17 Wind Energy – Control and Operations I

Room: 518C
Chairs: Bulent Sarlioglu, Hamid Toliyat

2:00PM | Power System Frequency Control with Dead Band by using Kinetic Energy of Variable Speed Wind Power Generators
Yuta Yoshida, Kenta Koiwa, Atsushi Umemura, Rion Takahashi, Junji Tamura, *Kitami Institute of Technology, Japan*

2:25PM | Exploring Common Mode Voltage Stress and Circulating Currents in Offshore Wind Turbine to MVDC Collection Grid Interfaces
Michael T. Daniel, Prasad N. Enjeti, *Texas A&M University, United States*

2:50PM | The Feasibility Study on Thermal Loading Control of Wind Power Converters with a Flexible Switching Frequency
Zian Qin, Huai Wang, Frede Blaabjerg, Poh Chiang Loh, *Aalborg University, Denmark*

3:15PM | Minimum Junction Temperature Swing for DFIG to Ride through Symmetrical Voltage Dips
Dao Zhou, Frede Blaabjerg, *Aalborg University, Denmark*

3:40PM | Analysis of Subsynchronous Control Interactions in DFIG-Based Wind Farms: ERCOT Case Study
Hossein Ali Mohammadpour, Enrico Santi, *NRG Renew, United States; University of South Carolina, United States*

S18 Microgrid Droop Control

Room: 518A
Chairs: Adel Nasiri, Kai Sun

2:00PM | Optimal Angle Droop Power Sharing Control for Autonomous Microgrid
Hassan Moussa, Ahmed Shahin, Fadi Sharif, Jean-Philippe Martin, Serge Pierfederici, *Université de Lorraine, France*

2:25PM | Optimized Settings of Droop Parameters using Stochastic Load Modeling for Effective DC Microgrids Operation
Fatih Cingoz, Ali Elrayyah, Yilmaz Sozer, *University of Akron, United States; Qatar Environment and Energy Research Institute, Qatar*

2:50PM | A Synchronization Control Method for Micro-Grid with Droop Control
Zhongwei Chen, Wei Zhang, Jiuqing Cai, Tao Cai, Zhiqiang Xu, Nana Yan, *State Grid Hunan Electric Power Corporation, China; Huazhong University of Science and Technology, China*

3:15PM | A Harmonic Current Suppression Control Strategy for Droop-Controlled Inverter Connected to the Distorted Grid
Wei Feng, Kai Sun, Yajuan Guan, Josep M. Guerrero, Xi Xiao, *Tsinghua University, China; Aalborg University, Denmark*

3:40PM | State Space Modeling and Stability Assessment for a Microgrid
A. Solanki, A. Nasiri, B. Novakovic, V. Bhavaraju, *University of Wisconsin-Milwaukee, United States; Eaton Corporation, United States*

S19 Resonant Converters

Room: 524A
Chairs: Liming Liu, Shuo Wang

2:00PM | Impedance Control Network Resonant Step-Down DC-DC Converter Architecture
Samantha J. Gunter, Khurram K. Afridi, David M. Otten, Rose A. Abramson, David J. Perreault, *Massachusetts Institute of Technology, United States; University of Colorado-Boulder, United States*

2:25PM | A Common Inductor Multi-Phase LLC Resonant Converter
Hongliang Wang, Yang Chen, Yan-Fei Liu, Jahangir Afsharian, Zhihua (Alex) Yang, *Queen's University, Canada; Murata Power Solutions, Canada*

2:50PM | LCLC Resonant Converter for Hold Up Mode Operation
Yang Chen, Hongliang Wang, Zhiyuan Hu, Yan-Fei Liu, Jahangir Afsharian, Zhihua (Alex) Yang, *Queen's University, Canada; Murata Power Solutions, Canada*

3:15PM | A Resonant Switched-Capacitor Converter with GaN Transistors for Series-Stacked Processors with 99.8% Power Delivery Efficiency
Andrew Stillwell, Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States*

3:40PM | A Series-Stacked Power Delivery Architecture with Hot-Swapping for High-Efficiency Data Centers
Enver Candan, Derek Heeger, Pradeep S. Shenoy, Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States; Texas Instruments, United States*

S20 Inductive Power Transfer

Room: 518B
Chairs: Antonio J. M. Cardoso, Rashmi Prasad

2:00PM | Harmonic Burst Mode Control Strategy for Full-Bridge Series Resonant Converters for Electric Vehicles Application
Hulong Zeng, Nomar S. González-Santini, Yaodong Yu, Shuitao Yang, Fang Zheng Peng, *Michigan State University, United States*

2:25PM | A Novel Position Sensorless Power Transfer Control of Lumped Coil-Based In-Motion Wireless Power Transfer Systems
Nazmul Hasan, Hongjie Wang, Tarak Saha, Zeljko Pantic, *Utah State University, United States*

2:50PM | Efficiency Analysis of Bi-Directional DC/DC Converter for Wireless Energy Transfer Applications
Erdem Asa, Kerim Colak, Dariusz Czarkowski, Bunyamin Tamyurek, *New York University, United States; Istanbul Ulasim A.S., Turkey; Eskisehir Osmangazi University, Turkey*

3:15PM | Design a High-Frequency-Fed Unity Power-Factor AC-DC Power Converter for Wireless Power Transfer Application
Sitthisak Kiratipongvoot, Zhe Yang, Chi Kwan Lee, Siu Shing Ho, *University of Hong Kong, Hong Kong*

3:40PM | Isolated Wired and Wireless Battery Charger with Integrated Boost Converter for PEV Applications
M. Chinthavali, O.C. Onar, S.L. Campbell, L.M. Tolbert, *Oak Ridge National Laboratory, United States*

S21 Dual Active Bridge Based Converters

Room: 524B
Chairs: Khurram Afridi, Tiefu Zhao

2:00PM | Fundamental Duty Modulation of Dual-Active-Bridge Converter for Universal Reduced Conduction
Wooin Choi, Bo-Hyung Cho, *Seoul National University, Korea (South)*

2:25PM | Maximum Efficiency Point Tracking Algorithm for Dual Active Bridge Converters
Vesa Väisänen, Jani Hiltunen, *Lappeenranta University of Technology, Finland*

2:50PM | Improved Steady-State Model of the Dual-Active-Bridge Converter
Fan Zhang, M. Muneeb Ur Rehman, Regan Zane, Dragan Maksimovi?, *University of Colorado-Boulder, United States; Utah State University, United States*

3:15PM | Impact of Different Transformer-Winding Configurations on the Performance of a Three-Phase Dual Active Bridge DC-DC Converter
Nico Baars, Jordi Everts, Korneel Wijnands, Elena Lomonova, *Eindhoven University of Technology, Netherlands*

3:40PM | Quad-Active-Bridge as Cross-Link for Medium Voltage Modular Inverters
Levy F. Costa, Giampaolo Buticchi, Marco Liserre, *Christian-Albrechts-Universität zu Kiel, Germany*

S22 Grid-Tied Single-Phase Converters II

Room: 524C
Chairs: David Perreault, Alessandro Lidozzi

2:00PM | Bi-Directional Active-Filter-Integrated AC/DC Converter without Electrolytic Capacitor and Extra Power Switches
Sinan Li, Wenlong Qi, Siew-Chong Tan, S.Y. (Ron) Hui, Hui Wang, *University of Hong Kong, Hong Kong; Shandong University, China*

2:25PM | Control and Modulation of a Family of Bidirectional AC-DC Converters with Active Power Compensation
Hao Wu, Siu-Chung Wong, C.K. Tse, Qianhong Chen, *Hong Kong Polytechnic University, Hong Kong; Nanjing University of Aeronautics and Astronautics, China*

2:50PM | Current Sensorless Control for Dual-Boost Half-Bridge PFC Converter
Che-Yu Lu, Hung-Chi Chen, Wei-Cheng Chen, Chung-Yi Li, *National Chiao Tung University, Taiwan; Chang Gung University, Taiwan*

3:15PM | Partial Power Assistance Operation for Single-Phase Grid-Fed Motor Drive System with DC-Link Shunt Compensator
Hojoon Shin, Hyeon-Gyu Choi, Youngho Chae, Jung-Ik Ha, *Seoul National University, Korea (South)*

3:40PM | Design of GaN-Based MHz Totem-Pole PFC Rectifier
Zhengyang Liu, Fred C. Lee, Qiang Li, Yuchen Yang, *Virginia Tech, United States*

S23 Pulse-Width Modulation I

Room: 520F
Chairs: Peter Lehn, Brad Lehman

2:00PM | Harmonic Elimination for Multilevel Converter with Groebner Bases and Symmetric Polynomials
Kehu Yang, Qi Zhang, Ruyi Yuan, Wensheng Yu, Jin Wang, *China University of Mining and Technology, Beijing, China; Chinese Academy of Sciences, China; Beijing University of Posts and Telecommunications, China; Ohio State University, United States*

2:25PM | Reduced Switching Random PWM Technique for Two-Level Inverters
Subhadeep Bhattacharya, Diego Mascarella, Geza Joos, Gerry Moschopoulos, *McGill University, Canada; University of Western Ontario, Canada*

2:50PM | An Adaptive SPWM Technique for Cascaded Multilevel Converters
Jacob Lamb, Behrooz Mirafzal, *Kansas State University, United States*

3:15PM | Full Inverter Characterization of PWM Algorithms Implemented with a Very Large Flash Memory SD Card
Dorin O. Neac?u, Yue Zheng, Bradley Lehman, *Northeastern University, United States; Technical University of Iasi, Romania*

3:40PM | Model Predictive Control of Neutral-Point Clamped Inverter with Harmonic Spectrum Shaping
J. Rubinic, V. Yaramasu, B. Wu, N. Zargari, *Ryerson University, Canada; Rockwell Automation Canada, Canada*

S24 Converter-Grid System Stability Modeling and Control

Room: 521AB
Chairs: Philip Krein, Chun T. Rim

2:00PM | A Detailed Analytical Model of a Solid State Transformer
Ziwei Yu, Raja Ayyanar, Iqbal Husain, *Arizona State University, United States; North Carolina State University, United States*

2:25PM | Analysis of Harmonic Coupling and Stability in Back-to-Back Converter Systems for Wind Turbines using Harmonic State Space (HSS)
JunBum Kwon, Xiongfei Wang, Claus Leth Bak, Frede Blaabjerg, *Aalborg University, Denmark*

2:50PM | Impedance Shaping for Improved Load Sharing Among Inverters in AC Microgrids
Subhajyoti Mukherjee, Pourya Shamsi, Mehdi Ferdowsi, *Missouri University of Science and Technology, United States*

3:15PM | Virtual Admittance Loop Voltage Harmonic Compensation in Microgrids
Cristian Blanco, David Reigosa, Juan Carlos Vasquez, Josep M. Guerrero, Fernando Briz, *University of Oviedo, Spain; Aalborg University, Denmark*

3:40PM | Reactive Power Control with an Energy Management System in Single Phase AC Microgrids
Giovanna Oriti, Alexander L. Julian, *Naval Postgraduate School, United States*

S25 PM Machines I

Room: 520B
Chairs: Greg Heins, Ayman El-Refaie

2:00PM | Influence of On-Load Voltage Distortion on Torque-Speed Characteristic of Interior Permanent Magnet Machines
Z.Q. Zhu, D. Wu, M.C. Wu, I.W. Lan, *University of Sheffield, United Kingdom; Industrial Technology Research Institute, Taiwan*

2:25PM | Permanent Magnet Temperature Distribution Estimation in PMSMs using BEMF Harmonics
David Reigosa, Daniel Fernandez, Tsutomu Tanimoto, Takashi Kato, Fernando Briz, *University of Oviedo, Spain; Nissan Motor Co., Ltd., Japan*

2:50PM | Design of a Surface PM Vernier Motor for a Practical Variable Speed Application
Byungtaek Kim, Thomas A. Lipo, *Kunsan National University, Korea (South); University of Wisconsin-Madison, United States*

3:15PM | Rotor Design Considerations for a Variable-Flux Flux-Intensifying Interior Permanent Magnet Machine with Improved Torque Quality and Reduced Magnetization Current
Afang Sun, Jian Li, Ronghai Qu, Junhua Chen Chen, Hanxiao Lu, *Huazhong University of Science and Technology, China*

3:40PM | Permanent Magnet Transverse Flux Machine with Overlapping Stator Poles
Adeeb Ahmed, Zhao Wan, Iqbal Husain, *North Carolina State University, United States*

S26 Design and Modeling of Electric Machines I

Room: 520C
Chairs: Thomas Wu, Emmanuel Agamloh

2:00PM | Low Speed Test in Two-Axis Actively Positioned Bearingless Machines with Non-Collocated Structure for Wind Power Applications
Hiroya Sugimoto, Masahito Miyoshi, Akira Chiba, *Tokyo Institute of Technology, Japan*

2:25PM | A Coupled Field-Circuit Method for Thermal Modeling of Electrical Machine
Sa Zhu, Ming Cheng, XiuHua Cai, Minghao Tong, Peng Han, *Southeast University, China*

2:50PM | Design of a Brushless PM Starter-Generator for Low-Cost Manufacture and a High-Aspect-Ratio Mechanical Space Envelope
Rafal Wrobel, Nick Simpson, Phil H. Mellor, James Goss, Dave A. Staton, *University of Bristol, United Kingdom; Motor Design Ltd., United Kingdom*

3:15PM | Modeling and Performance Evaluation of a Hysteresis IPM Motor Drive for Electric Submersible Pumps
S.F.Rabbi, M.A.Rahman, M.M.Sarker, S.D.Butt, *Memorial University of Newfoundland, Canada*

3:40PM | Design and Optimisation of Grid Compliant Variable-Flux PM Synchronous Generator for Wind Turbine Applications
L.L. Amuhaya, M.J. Kamper, *University of Stellenbosch, South Africa*

S27 Sensorless Drives

Room: 520D
Chairs: Faz Rahman, Marcello Pucci

2:00PM | Carrier Signal Injection based Sensorless Control of Permanent Magnet Synchronous Machines without the Need of Magnetic Polarity Identification
P.L. Xu, Z.Q. Zhu, D. Wu, *University of Sheffield, United Kingdom*

2:25PM | Computation and Measurement of High Frequency Parameters in a Synchronous Machine
Luigi Alberti, Omar Bottesi, Silverio Bolognani, *Free University of Bolzano, Italy; University of Padova, Italy*

2:50PM | Sensor-less Vector Control of the Nine-phase Concentrated Wound Interior Permanent Magnet Motor Drive using a Unique Third Sequence High Frequency Injection into the Stator Windings
Olorunfemi Ojo, Mehdi Ramezani, Amrit Gautam, *Tennessee Technology University, United States*

3:15PM | Enhanced Rotor Position/Speed Observer for Sensorless Control of Salient-Pole Permanent-Magnet Synchronous Machines
Yue Zhao, Wei Qiao, *University of Arkansas, United States; University of Nebraska-Lincoln, United States*

3:40PM | Discrete-Time Observer Design for Sensorless Synchronous Motor Drives
Toni Tuovinen, Hafiz Asad Ali Awan, Seppo S. Saarakkala, Marko Hinkkanen, *ABB Drives, Finland; Aalto University, Finland*

S28 General Topics on Motor Drives

Room: 520E
Chairs: Uday Deshpande, Robert Cuzner

2:00PM | SVPWM Technique with Varying DC-Link Voltage for Common Mode Voltage Reduction in an Indirect Matrix Converter
Varsha Padhee, Ashish Kumar Sahoo, Ned Mohan, *University of Minnesota, United States*

2:25PM | Integrated Multi-Drives Configuration for Starter-Alternator Applications
G. Scarcella, G. Scelba, M. Cacciato, A. Spampinato, M.M. Harbaugh, *University of Catania, Italy; Rockwell Automation, United States*

2:50PM | Hexagon Voltage Manipulating Control (HVMC) for AC Motor Drives Operating in the Maximum Torque Per Voltage (MTPV) Region
SeHwan Kim, Jul-Ki Seok, *Yeungnam University, Korea (South)*

3:15PM | Magnetic Gear: Radial Force, Cogging Torque, Skewing and Optimization
Gerald Jungmayr, Jens Loeffler, Bjoern Winter, Frank Jeske, Wolfgang Amrhein, *Johannes Kepler University Linz, Austria; ebmpapst St. Georgen GmbH and Company KG, Germany*

3:40PM | Phase Current Reconstruction with Single DC-Link Current Sensor for Six-Step Operation in Three Phase Inverter
Jaeyong Park, Sungho Jung, Jung-Ik Ha, *Seoul National University, Korea (South)*

S29 Widebandgap Devices II

Room: 519B
Chairs: Filippo Chimento,Muhammad Nawaz

2:00PM | Investigation of the Dynamic On-State Resistance of 600V Normally-Off and Normally-On GaN HEMTs
Nasser Badawi, Oliver Hilt, Eldad Bahat-Treidel, Jan Böcker, Joachim Würfl, Sibylle Dieckerhoff, *Technical University of Berlin, Germany; Ferdinand-Braun-Institut, Germany*

2:25PM | On the Short Circuit Robustness Evaluation of Silicon Carbide High Power Modules
Filippo Chimento, Muhammad Nawaz, *ABB Corporate Research, Sweden*

2:50PM | Comparative Evaluation of 15 kV SiC MOSFET and 15 kV SiC IGBT for Medium Voltage Converter under Same dv/dt Conditions
Kasunaidu Vechalapu, Subhashish Bhattacharya, Edward Van Brunt, Sei-Hyung Ryu, Dave Grider, John W. Palmour, *North Carolina State University, United States; Cree, Inc., United States*

3:15PM | A Dynamic Measurement Method for Parasitic Capacitances of High Voltage SiC MOSFETs
Xiaoqing Song, Alex Q. Huang, Mengjia Lee, Gangyao Wang, *North Carolina State University, United States; Cree Inc., United States*

3:40PM | A New Proportional base Drive Technique for SiC Bipolar Junction Transistors
Linyuan Liao, Sai Tang, Jun Wang, Zhikang Shuai, Xin Yin, Z. John Shen, *Hunan University, China*

Tuesday, September 22 8:30AM – 10:10AM

S30 Wind Energy – Control and Operations II

Room: 519A
Chairs: Eduard Muljadi, Ion Boldea

8:30AM | A Hybrid Adaptive Fuzzy Control Strategy for DFIG-Based Wind Turbines with Super-Capacitor Energy Storage to Realize Short-Term Grid Frequency Support
Xiang Hao, Tianpei Zhou, Jin Wang, Xu Yang, *Ohio State University, United States; Xi'an Jiaotong University, China*

8:55AM | Bootstrap Prediction Interval Estimation for Wind Speed Forecasting
Rachid Errouissi, Julian Cardenas-Barrera, Julian Meng, Eduardo Castillo-Guerra, Xun Gong, Liuchen Chang, *Petroleum Institute, United Arab Emirates; University of New Brunswick, Canada*

9:20AM | Evaluation of Flux Switching PM Machines for Medium-Speed Wind Generator Drives
Udochukwu B. Akuru, Maarten J. Kamper, *Stellenbosch University, South Africa*

9:45AM | Direct Active and Reactive Power Regulation of A DFIG based Wind Power System with Constant Switching Frequency and Reduced Ripple
Sam Mahmodicherati, Malik Elbuluk, Yilmaz Sozer, *University of Akron, United States*

S31 Grid Integrated Power Converters

Room: 518A
Chairs: Josept Gurrero, Houshang Karimi

8:30AM | Assessment of Sensorless Kalman Filter-Based Dual-Loop Control Strategies for Grid-Connected VSIs with LCL Filters
H.M. El-Deeb, A. Massoud, A.S. Abdel-Khalik, S. Ahmed, *Qatar University, Qatar; Texas A&M University at Qatar, Qatar*

8:55AM | Geometric Analysis of Grid-Connected VSI with LCL-Filter using Poincaré Map
Suzan Eren, Alireza Bakhshai, Praveen Jain, *Queen's University, Canada*

9:20AM | Interaction and Aggregated Modeling of Multiple Paralleled Inverters with LCL Filter
Minghui Lu, Xiongfei Wang, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark*

9:45AM | Measurement Results and Performance Analysis of the Grid Impedance in Different Low Voltage Grids for a Wide Frequency Band to Support Grid Integration of Renewables
Lars Jessen, Sandro Günter, Friedrich W. Fuchs, Martin Gottschalk, Hans-J. Hinrichs, *Christian-Albrechts-University of Kiel, Germany; Kiel University of Applied Sciences, Germany*

S32 Solar PV in Grids and Microgrids I

Room: 518B
Chairs: Behrooz Mirafzal, Majid Pahlevaninejad

8:30AM | ΔP – ΔQ Area Assessment of Temporary Unintentional Islanding with P/f and Q/V Droop Controlled PV Generators in Distribution Networks
Stefano Lissandron, Riccardo Sgarbossa, Luca Dalla Santa, Paolo Mattavelli, Roberto Turri, Alberto Cerretti, *University of Padova, Italy; ENEL Spa, Italy*

8:55AM | Locking Frequency Band Detection Method for Grid-Tied PV Inverter Islanding Protection
Iman Mazhari, Hamidreza Jafarian, Babak Parkhideh, Saurabh Trivedi, Shibashis Bhowmik, *University of North Carolina, United States; SineWatts Inc., United States*

9:20AM | Synchronous PV Support to an Isolated Power System
Daniel Remon, Antoni M. Cantarellas, Mohamed Atef Abbas Elsaharty, Cosmin Koch-Ciobotaru, Pedro Rodriguez, *Abengoa Research, Spain; Technical University of Catalonia, Spain*

9:45AM | Reactive Power Management for Overvoltage Prevention at High PV Penetration in Low Voltage Distribution System
Ali Safayet, Poria Fajri, Iqbal Husain, *North Carolina State University, United States*

S33 Capacitor Based Converters

Room: 524B
Chairs: Robert Pilawa, Olivier Trescases

8:30AM | A Central Capacitor Partial Power Processing DC/DC Converter Mengxing
Chen, Feng Gao, Tingting Yang, *Shandong University, China; State Grid Chongqing Electric Power Company, China*

8:55AM | Automatic Current Sharing Mechanism in the Series Capacitor Buck Converter
Pradeep S. Shenoy, Orlando Lazaro, Mike Amaro, Ramanathan Ramani, Wlodek Wiktor, Brian Lynch, Joseph Khayat, *Texas Instruments, United States*

9:20AM | Multi-Cell DC-DC Converter with High Step-Down Voltage Ratio
Gabriel Tibola, Jorge L. Duarte, Andrei Blinov, *Eindhoven University of Technology, Netherlands; KTH Royal Institute of Technology, Sweden*

9:45AM | A High-Power-Density Wide-Input-Voltage-Range Isolated DC-DC Converter having a MultiTrack Architecture
Minjie Chen, Khurram K. Afridi, Sombuddha Chakraborty, David J. Perreault, *Massachusetts Institute of Technology, United States; University of Colorado-Boulder, United States; Texas Instruments, United States*

S34 Grid-Tied Single-Phase Converters III

Room: 524C
Chairs: Henry Chung, Ali Khajehoddin

8:30AM | A Time-Sharing Principle-Based Current-Fed ZCS High-Frequency Resonant Self-Commutated Inverter for Inductive Power Transfer
Tomokazu Mishima, Kyohei Konishi, Mutsuo Nakaoka, *Kobe University, Japan; Kyungnam University, Korea (South)*

8:55AM | Three Winding Coupled Inductor based High Boost Inverter with Increased Gain Control
Soumya Shubhra Nag, Santanu Mishra, *Indian Institute of Technology Kanpur, India*

9:20AM | Generalized Stability Regions of Current Control for LCL-Filtered Grid-Connected Converters without Passive or Active Damping
Yi Tang, Changwoo Yoon, Rongwu Zhu, Frede Blaabjerg, *Nanyang Technological University, Singapore; Aalborg University, Denmark*

9:45AM | DCM Boost PFC Converter with Optimum Utilization Control of Switching Cycles
Kai Yao, Qiang Li, Jianguo Lv, *Nanjing University of Science and Technology, China*

S35 DC-DC Converter Control

Room: 520F
Chairs: John Salmon, Fengfeng Tao

8:30AM | A Fixed Frequency ZVS Integrated Boost Dual Three-Phase Bridge DC-DC LCL-Type Series Resonant Converter
Nagendrappa Harischandrappa, Ashoka K.S. Bhat, *University of Victoria, Canada*

8:55AM | Multi-Step Simplified Optimal Trajectory Control (SOTC) for Fast Transient Response of High Frequency LLC Converters
Chao Fei, Fred C. Lee, Qiang Li, *Virginia Tech, United States*

9:20AM | Dual-Loop Geometric-Based Control of Boost Converters
Ignacio Galiano Zurbriggen, Martin Ordonez, Marco Andres Bianchi, *University of British Columbia, Canada*

9:45AM | A New Current Mode Control for Higher Noise Immunity and Faster Transient Response in Multi-Phase Operation
Syed Bari, Qiang Li, Fred C. Lee, *Virginia Tech, United States*

S36 Pulse-Width Modulation II

Room: 521AB
Chairs: Grahame Holmes, Rajib Datta

8:30AM | Carrier Multi-Modulation used for the Common-Mode Voltage Suppression in a Three-Phase Inverter
Jin Huang, Haixia Shi, *Huazhong University of Science and Technology, China; Wuhan Textile University, China*

8:55AM | DSP based Pre-Processed PWM Scheme for 3-Limb Core Coupled Inductor Inverters
Nirmana Perera, Reaz Ul Haque, John Salmon, *University of Alberta, Canada*

9:20AM | A Novel Capacitor Voltage Balancing Method in Modular Multilevel Converters
Prashanth Chennamsetty, Viswanathan Kanakasabai, Rajendra Naik, *GE Global Research, India*

9:45AM | A Voltage Balancing Control based on Average Power Flow Management for the Delta-Connected Cascaded H-Bridges Converter
Hsin-Chih Chen, Ping-Heng Wu, Ching-Wei Wang, Po-Tai Cheng, *National Tsing Hua University, Taiwan*

S37 Thermal Modeling and Analysis

Room: 524A
Chairs: Adam Skorek, Jun Li

8:30AM | A Low-Cost Closed-Form Transient Thermal Model for Area-Efficient Power MOS Sizing and Reliable Inductive Load Switching
Hoi Lee, Timothy P. Duryea, *University of Texas at Dallas, United States; Texas Instruments Inc., United States*

8:55AM | Thermal Stress Reduced Maximum Power Point Tracking for Two Stages Photovoltaic Converters
Markus Andresen, Giampaolo Buticchi, Marco Liserre, *Christian-Albrechts-Universität zu Kiel, Germany*

9:20AM | Frequency-Domain Thermal Modelling of Power Semiconductor Devices
Ke Ma, Ning He, Frede Blaabjerg, Markus Andresen, Marco Liserre, *Aalborg University, Denmark; Christian-Albrechts-Universität zu Kiel, Germany*

9:45AM | Reliability Analysis of Single-Phase PV Inverters with Reactive Power Injection at Night Considering Mission Profiles
Anup Anurag, Yongheng Yang, Frede Blaabjerg, *Swiss Federal Institute of Technology (ETH), Switzerland; Aalborg University, Denmark*

S38 Flux-Switching Machines

Room: 520C
Chairs: Iqbal Husain, Abraham Gebregergis

8:30AM | Investigation of a Five-Phase E-Core Hybrid-Excitation Flux-Switching Machine for EV and HEV Applications
Peng Su, Wei Hua, Minghao Tong, Jianjian Meng, *Southeast University, China*

8:55AM | Axial Flux Segmental Rotor Flux-Switching Synchronous Motor
Md Ashfanoor Kabir, Adeeb Ahmed, Iqbal Husain, *North Carolina State University, United States*

9:20AM | Topologies and Analysis of Flux-Modulation Machines
Dawei Li, Ronghai Qu, Jian Li, *Huazhong University of Science and Technology, China*

9:45AM | Analytical Modeling of a Novel Transverse Flux Machine Designed for Direct Drive Wind Turbine Applications
Iftekhar Hasan, Tausif Husain, Wasi Uddin, Yilmaz Sozer, Iqbal Husain, Eduard Muljadi, *University of Akron, United States; North Carolina State University, United States; National Renewable Energy Lab, United States*

S39 Induction Motor Drives I

Room: 520D
Chairs: Jul-Ki Seok, Di Pan

8:30AM | Deadbeat Current Control for Open-End Winding Induction Motor using Current Prediction with Two Different Time-Horizons
Hajime Kubo, Yasuhiro Yamamoto, Takeshi Kondo, Kaushik Rajashekara, Bohang Zhu, *Meidensha Corporation Japan; University of Texas at Dallas, United States*

8:55AM | Speed Sensorless Control of Induction Motors based on MCA EXIN Pisarenko Method
Binying Ye, Maurizio Cirrincione, Marcello Pucci, Giansalvo Cirrincione, *Université de Technologie de Belfort-Montbéliard, France; University of the South Pacific, Fiji; ISSIA-CNR, Italy; Université de Picardie Jules Verne, France*

9:20AM | Real-Time Parameter Identification and Integration on Deadbeat-Direct Torque and Flux Control (DB-DTFC) without Inducing Additional Torque Ripple
Yukai Wang, Naoto Niimura, Robert D. Lorenz, *University of Wisconsin-Madison, United States; Toshiba Mitsubishi - Electric Industrial Systems Corporation, Japan*

9:45AM | Sensorless Control of Induction Motors by the MSA based MUSIC Technique
Binying Ye, Maurizio Cirrincione, Marcello Pucci, Giansalvo Cirrincione, *Université de Technologie de Belfort-Montbéliard, France; University of the South Pacific, Fiji; ISSIA-CNR, Italy; University of Picardie Jules Verne, France*

S40 Drive Applications

Room: 520E
Chairs: Giacomo Scelba, Marcello Pucci

8:30AM | On-Line Turn Fault Detection of Interior Permanent Magnet Machines using the Pulsating-Type Voltage Injection
Shih-Chin Yang, *National Taiwan University, Taiwan*

8:55AM | LC-Filter Resonance Cancellation with DPWM Inverters in Adjustable Speed Drives
Casper Vadstrup, Xiongfei Wang, Frede Blaabjerg, *Aalborg University, Denmark*

9:20AM | Multistress Characterization of Insulation Aging Mechanisms in Aerospace Electric Actuators
D. Barater, G. Buticchi, A. Soldati, G. Franceschini, Fabio Immovilli, Michael Galea, Chris Gerada, *University of Parma, Italy; Raw Power srl, Italy; University of Nottingham, United Kingdom*

9:45AM | Robust Control of High-Speed Synchronous Reluctance Machines
Alessandra Guagnano, Gianluca Rizzello, Francesco Cupertino, David Naso, *Politecnico di Bari, Italy*

S41 Widebandgap Devices III

Room: 519B
Chairs: Ruxi Wang, Brandon Pirquet

8:30AM | Analysis of SiC MOSFETs under Hard and Soft-Switching
M.R. Ahmed, R. Todd, A.J. Forsyth, *University of Manchester, United Kingdom*

8:55AM | Comparative Analysis of False Turn-ON in Silicon Bipolar and SiC Unipolar Power Devices
Saeed Jahdi, Olayiwola Alatise, Jose Ortiz Gonzalez, Li Ran, Philip Mawby, *University of Warwick, United Kingdom*

9:20AM | An Analysis of False Turn-On Mechanism on High-Frequency Power Devices
Hiroki Ishibashi, Akihiro Nishigaki, Hirokatsu Umegami, Wilmar Martinez, Masayoshi Yamamoto, *Shimane University, Japan*

9:45AM | High Speed Switching Issues of High Power Rated Silicon-Carbide Devices and the Mitigation Methods
Hao Chen, Deepak Divan, *Georgia Institute of Technology, United States*

S42 Wireless Power Transfer I

Room: 518C
Ã"scar LucÃa, Henry Chung

8:30AM | Crossed Dipole Coils for an Omnidirectional Wireless Power Zone with DQ Rotating Magnetic Field
Bo H. Choi, Eun S. Lee, Yeong H. Sohn, Ji H. Kim, Chun T. Rim, *KAIST, Korea (South)*

8:55AM | Modeling and Investigation of Magnetically Coupled Resonant Wireless Power Transfer System with Varying Spatial Scales
Dan Jiang, Yong Yang, Fuxin Liu, Xinbo Ruan, Chenghua Wang, *Nanjing University of Aeronautics and Astronautics, China*

9:20AM | Ringing Suppressing Method in 13.56MHz Resonant Inverter for Wireless Power Transfer Systems
Nguyen Kien Trung, Kan Akatsu, *Shibaura Institute of Technology, Japan*

9:45AM | A High Efficiency 3.3kW Loosely-Coupled Wireless Power Transfer System without Magnetic Material
Fei Lu, Hua Zhang, Heath Hofmann, Chris Mi, *University of Michigan-Ann Arbor, United States; University of Michigan-Dearborn, United States; Northwestern Polytechnical University, China*

SS1 Power Electronics Standards

Room: 520B
Chair: Peter Wilson

8:30AM | Issues In Modulating Current for High Brightness LED Lighting
Brad Lehman, *North East University, United States*

8:55AM | Transformers and Inductors in Electronic Power Conversion Equipment
Matt Willkowski, *Altera, NJ USA*

9:20AM | Wide Band Gap SiC MOSFET Study: An Update
Enrico Santi, Jerry Hudgins, *University of South Carolina and University of Nebraska-Lincoln, USA*

9:45AM | Standards for Power Electronic Components and Systems (IEEE 1573)
Peter Wilson, *University of Bath, UK*

Wednesday, September 23 8:30AM – 10:10AM

S43 DFIG Based Wind Systems

Room: 519A
Chairs: Pragasen Pillay, David Dorrell

8:30AM | Mitigation of Torsional Vibrations in the Drivetrain of DFIGbased Grid-Connected Wind Turbine
Fariba Fateh, Warren N. White, Don Gruenbacher, *Kansas State University, United States*

8:55AM | Stator Current-Based Sliding Mode Observer for Sensorless Vector Contorl of Doubly-Fed Induction Generators
Chun Wei, Zhe Zhang, Jianwu Zeng, Wei Qiao, *University of Nebraska-Lincoln, United States*

9:20AM | Islanding Operation for DFIG based Wind Farm
Jimmy Y. Zhang, Boon-teck Ooi, *AESO, Canada; McGill University, Canada*

9:45AM | Comprehensive Analysis of the Dynamic Behavior of Grid-Connected DFIG-Based Wind Turbines under LVRT Conditions
Yazan M. Alsmadi, Longya Xu, Frede Blaabjerg, Alejandro Pina Ortega, Aimeng Wang, *Ohio State University, United States; Aalborg University, Denmark; North China Electric Power University, China*

S44 Converter Control Techniques

Room: 518A
Chairs: Yogesh Patel, Katsumi Nishida

8:30AM | Procedure to Match the Dynamic Response of MPPT and Droop-Controlled Microinverters
Ruben B. Godoy, Douglas B. Bizarro, Elvey T. de Andrade, Jurandir de O. Soares, Pedro E. Ribeiro, Márcio L.M. Kimpara, Leonardo A. Carniato, João O.P. Pinto, Kamal Al-Haddad, Carlos A. Canesin, *Federal University of Mato Grosso do Sul, Brazil; Federal University of Itajuba, Brazil; Universidade Estadual Paulista, Brazil; École de technologie supérieure, Canada*

8:55AM | An Accurate Deadbeat Control Method for Grid-Tied Converter using Weighted Average Current Sensing
Jinwei He, Yun Wei Li, *Tian Jin University, Canada; University of Alberta, Canada*

9:20AM | Low-Cost Power Regulation Scheme for Grid-Connected Variable-Speed Wind Turbine using TPPL Lead-Acid Batteries
Tarek Ahmed, Katsumi Nishida, Ikuo Nanno, Mutsuo Nakaoka, *Assiut University, Egypt; Ube National College of Technology, Japan; Kyungnam University, Japan*

9:45AM | A Novel Control Approach for Protection of Multi-Terminal VSC based HVDC Transmission System against DC Faults
M. Mobarrez, M.G. Kashani, G. Chavan, S. Bhattacharya, *North Carolina State University, United States*

S45 Solar PV in Grids and Microgrids II

Room: 518B
Chairs: Thomas Jahns, Majid Pahlevaninejad

8:30AM | Stability Analysis for Isolated AC Microgrids based on PV-Active Generators
Nelson L. Díaz, Ernane Alves Coelho, Juan C. Vásquez, Josep M. Guerrero, *Aalborg University, Denmark; Universidade Federal de Uberlandia, Brazil*

8:55AM | Optimal Power Flow Management in a Photovoltaic Nanogrid with Batteries
Su Sheng, Peng Li, Chung-Ti Tsu, Brad Lehman, *Northeastern University, United States*

9:20AM | Research on Adaptive Control of Grid-Connected PV Inverters in Weak Grid
Guihua Liu, Xiaojiao Cao, Tong Shi, Wei Wang, *Harbin Institute of Technology, China*

9:45AM | Low Cost Plug-and-Play PV System for DC Microgrid
Elie M. Najm, Yizhe Xu, Alex Q. Huang, *North Carolina State University, United States*

S46 High Frequency DC-DC Converters I

Room: 524B
Chairs: Seth Sanders, Khurram Afridi

8:30AM | Design of a High Efficiency 30 kW Boost Composite Converter
HyeokJin Kim, Hua Chen, Dragan Maksimovi?, Robert Erickson, *University of Colorado-Boulder, United States*

8:55AM | 27.12MHz GaN Resonant Power Converter with PCB Embedded Resonant Air Core Inductors and Capacitors
Wei Liang, Luke Raymond, Lei Gu, Juan Rivas-Davila, *Stanford University, United States*

9:20AM | Design and Control of 10-MHz Class E DC-DC Converter with Reduced Voltage Stress
Kyung-Hwan Lee, Euihoon Chung, Yongsu Han, Jung-Ik Ha, *Seoul National University, Korea (South)*

9:45AM | A GaN-Based 97% Efficient Hybrid Switched-Capacitor Converter with Lossless Regulation Capability
Yutian Lei, Zichao Ye, Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States*

S47 Multi-Level Converters I

Room: 524C
Chairs: Xinbo Ruan, Bilal Akin

8:30AM | Three-Phase Three-Level LC-type Parallel Resonant DC/DC Converter with Variable Frequency Control
Lu Chen, Fuxin Liu, Yue Chen, Xinbo Ruan, Chenghua Wang, *Nanjing University of Aeronautics and Astronautics, China*

8:55AM | A Novel Seven-Level Voltage Source Converter for Medium-Voltage (MV) Applications
Mehdi Narimani, Bin Wu, Navid Reza Zargari, *Ryerson University, Canada; Rockwell Automation Canada, Canada*

9:20AM | Multi-Level Operation of Triple Two-Level PWM Converters
Sungjae Ohn, Yongsoon Park, Seung-Ki Sul, *Seoul National University, Korea (South)*

9:45AM | Structural Design of a Five-Level Hybrid Active NPC Converter for High Power Density Motor Drives
Yulin Zhong, Chushan Li, David Xu, *Ryerson University, Canada*

S48 Predictive Control of Inverters

Room: 520F
Chairs: Ralph Kennel, Xinbo Ruan

8:30AM | A Predictive Current Control of Voltage Source Inverters for Common-Mode Current Attenuation
Jiefeng Hu, Qishuang Ma, Chuanqi Ren, David G. Dorrell, *Sun Yat-sun University, China; Beihang University, China; University of Technology Sydney, Australia*

8:55AM | Model Predictive PWM of a Single Phase Inverter: A Nonlinear Transformation Approach
Stefan Almér, *ABB Corporate Research, Switzerland*

9:20AM | FPGA-Based Model Predictive Current Controller for 3x3 Direct Matrix Converter
Ozan Gulbudak, Janosch Marquart, Enrico Santi, *University of South Carolina, United States; University of Applied Science NTB, Switzerland*

9:45AM | Control of a Direct Matrix Converter Induction Motor Drive with Modulated Model Predictive Control
Manjusha Vijayagopal, Lee Empringham, Liliana De Lillo, Luca Tarisciotti, Pericle Zanchetta, Patrick Wheeler, *University of Nottingham, United Kingdom*

S49 New Control Concepts

Room: 521AB
Chairs: Qiang Li, Juan Rivas-Davila

8:30AM | A Sensorless Parabolic Current Control Method for Single Phase Standalone Inverters
Lanhua Zhang, Rachael Born, Baifeng Chen, Xiaonan Zhao, Cong Zheng, Xueshen Cui, Chung-Yi Lin, Yu-Chen Liu, Jih-Sheng Lai, Hongbo Ma, *Virginia Tech, United States; Southwest Jiaotong University, China*

8:55AM | Load Adaptive Zero-Phase-Shift Direct Repetitive Control for Stand-Alone Four-Leg VSI
Alessandro Lidozzi, Luca Solero, Fabio Crescimbini, Chao Ji, Pericle Zanchetta, *Roma Tre University, Italy; University of Nottingham, United Kingdom*

9:20AM | Digital and Analog Implementations of Nonlinear-Feedforward Controller for a Dual-Active-Bridge Converter
Zhenyu Shan, Juri Jatskevich, *University of British Columbia, Canada*

9:45AM | Interleaved Converter with Massive Parallelization of High Frequency GaN Switching-Cells using Decentralized Modular Analog Controller
Marc Cousineau, Bernardo Cougo, *Universite de Toulouse, France*

S50 Differential-Mode EMI

Room: 524A
Chairs: Juan Sabate, Leon Tolbert

8:30AM | Novel Double Clamp Methodology to Reduce Shielded Cable Radiated Emissions Initiated by Electronic Device Switching
Zoran Vrankovic, Gary L. Skibinski, Craig Winterhalter, *Rockwell Automation, United States*

8:55AM | Switching Frequency Modulation for GaN-Based Power Converters
B. Weiss, R. Reiner, R. Quay, P. Waltereit, F. Benkhelifa, M. Mikulla, M. Schlechtweg, O. Ambacher, *Fraunhofer Institute of Applied Solid State Physics, Germany*

9:20AM | Differential-Mode EMI Emission Prediction of SiC-Based Power Converters Using a Mixed-Mode Unterminated Behavioral Model
Bingyao Sun, Rolando Burgos, Xuning Zhang, Dushan Boroyevich, *Virginia Tech, United States*

9:45AM | Design of an Active Differential Mode Current Filter for a Boost Power Factor Correction AC-DC Converter
Rajib Goswami, Shuo Wang, Yongbin Chu, *University of Texas at San Antonio, United States; University of Florida, United States*

S51 PM Machines II

Room: 520B
Chairs: Francesco Cupertino, Bulent Sarlioglu

8:30AM | Large-Scale Electromagnetic Design Optimization of PM Machines Over a Target Operating Cycle
Alireza Fatemi, Nabeel A.O. Demerdash, Dan M. Ionel, Thomas W. Nehl, *Marquette University, United States; General Motors Corporation, United States*

8:55AM | Impact of Mechanical Stress on Characteristics of Interior Permanent Magnet Synchronous Motors
Katsumi Yamazaki, Hidetada Takeuchi, *Chiba Institute of Technology, Japan*

9:20AM | A Simple Analytical Approach to Model Saturation in Surface Mounted Permanent Magnet Synchronous Motors
M. Said Berkani, M. Laid Sough, Stefan Giurgea, Fréderic Dubas, Benali Boualem, Christophe Espanet, *FEMTO-ST Institute, France; Alstom Transport, France*

9:45AM | Rotor Design for a High-Speed High-Power Permanent-Magnet Synchronous Machine
Haiyang Fang, Ronghai Qu, Jian Li, Pei Zheng, Xinggang Fan, *Huazhong University of Science and Technology, China*

S52 Losses in Electric Machines

Room: 520C
Chairs: Aldo Boglietti, Authur Wagner

8:30AM | An Accurate Iron Loss Evaluation Method based on Finite Element Analysis for Switched Reluctance Motors
Katsuyuki Narita, Tatsuya Asanuma, Kazuki Semba, Hiroyuki Sano, Takashi Yamada, Kouhei Aiso, Kan Akatsu, *JSOL Corporation, Ltd., Japan; Shibaura Institute of Technology, Japan*

8:55AM | Loss Investigation of Slotless Bearingless Disk Drives
Daniel Steinert, Ivana Kovacevic-Badstübner, Thomas Nussbaumer, Johann W. Kolar, *ETH Zurich, Switzerland; Levitronix GmbH, Switzerland*

9:20AM | Practical Investigation of End Effect Losses in a Motor Integrated Permanent Magnet Gear
T.V. Frandsen, P.O. Rasmussen, *Aalborg University, Denmark*

9:45AM | Impact of Slot Shape on Loss and Thermal Behaviour of Open-Slot Modular Stator Windings
Rafal Wrobel, Samuel J. Williamson, Nick Simpson, Sabrina Ayat, Jason Yon, Phil H. Mellor, *University of Bristol, United Kingdom*

S53 Induction Motor Drives II

Room: 520D
Chairs: Lei Hao, David Diaz-Reigosa

8:30AM | Soft-Restarting of Free-Run Induction Motors driven by Small DC-Link Capacitor Inverters
SeHwan Kim, HeoKyoung Park, Anno Yoo, Hak-Jun Lee, Jul-Ki Seok, *Yeungnam University, Korea (South); LSIS Co., Korea (South)*

8:55AM | An Improved DC-Signal-Injection Method with Active Torque-Ripple Mitigation for Thermal Monitoring of Field-Oriented-Controlled Induction Motors
Lijun He, José Restrepo, Siwei Cheng, Ronald G. Harley, Thomas G. Habetler, *Georgia Institute of Technology, United States; Universidad Simón Bolívar, Venezuela; Naval University of Engineering, China*

9:20AM | A Modified Four-Step Commutation to Suppress Common-Mode Voltage during Commutations in Open-End Winding Matrix Converter Drives
Rohit Baranwal, Kaushik Basu, Ashish Kumar Sahoo, Ned Mohan, *University of Minnesota, United States; Dynapower Company, United States*

9:45AM | Feedback Linearizing Control of Induction Motor Considering Magnetic Saturation Effects
A. Accetta, F. Alonge, M. Cirrincione, M. Pucci, A. Sferlazza, *ISSIA-CNR, Italy; University of Palermo, Italy; University of South Pacific, Fiji*

S54 Medium Voltage and High Power Drives I

Room: 520E
Chairs: Gianmario Pellegrino, Ruxi Wang

8:30AM | Impact of DC-Link Voltage Ripples on the Machine-Side Performance in NPC H-Bridge Topology
Jie Shen, Stefan Schröder, Jinping Gao, Bo Qu, *GE Global Research, China; GE Global Research, Germany*

8:55AM | Enhanced Estimation of the Rotor Position of MV-Synchronous Machines in the Low Speed Range
Simon Feuersänger, Mario Pacas, *Universität Siegen, Germany*

9:20AM | A Novel Control Scheme for Medium Voltage Drives Operated by Optimized Pulse Patterns
Andreas Hoffmann, Martin Wagner, Steffen Bernet, *Technische Universität Dresden, Germany*

9:45AM | Reduced Common Mode Voltage based DC-Bus Voltage Balancing Algorithm for Three-Level Neutral Point Clamped (NPC) Inverter Drive
Abhijit Choudhury, Pragasen Pillay, *Concordia University, Canada*

S55 Power Electronic Modules I

Room: 519B
Chairs: Shashank Krishnamurthy, Entico Santi

8:30AM | Integration Technologies for a Medium Voltage Modular Multi-Level Converter with Hot Swap Capability
Didier Cottet, Francesco Agostini, Thomas Gradinger, Rudi Velthuis, Bernhard Wunsch, David Baumann, Willi Gerig, Andrea Rüetschi, Dacfey Dzung, Harald Vefling, Anne Elisabeth Vallestad, Dalimir Orfanus, Reidar Indergaard, Tormod Wien, Wim van der Merwe, *ABB Switzerland Ltd., Switzerland; ABB Norway Ltd., Norway*

8:55AM | New SLIM Package Intelligent Power Modules (SLIMDIP) with Thin RC-IGBT for Consumer Goods Applications
Nicholas Clark, Eric Motto, Shogo Shibata, *Powerex, Inc., United States; Mitsubishi Electric Corporation, Japan*

9:20AM | Novel Built-In Sensor for In-Situ Monitoring of Temperature and Thermal Stress in Power Modules
Min-ki Kim, Sang Won Yoon, *Hanyang University, Korea (South)*

9:45AM | A 650 V / 150 A Enhancement Mode GaN-Based Half-Bridge Power Module for High Frequency Power Conversion Systems
B. Passmore, S. Storkov, B. McGee, J. Stabach, G. Falling, A. Curbow, P. Killeen, T. Flint, D. Simco, R. Shaw, K. Olejniczak, *APEI, United States*

S56 Wireless Power Transfer II

Room: 518C
Chairs: Yaow-Ming Chen, Michael Evzelman

8:30AM | Galvanic Isolation System for Multiple Gate Drivers with Inductive Power Transfer – Drive of Three-phase Inverter
Keisuke Kusaka, Masakazu Kato, Koji Orikawa, Jun-ichi Itoh, Isamu Hasegawa, Kazunori Morita, Takeshi Kondo, *Nagaoka University of Technology, Japan; Meidensha Corporation, Japan*

8:55AM | The Selection and Comparison of Multi-Coil Wireless Power Transmission Solutions via Magnetic Resonances
Juntao Huang, Qianhong Chen, Xiaoyong Ren, Siu-Chung Wong, *Nanjing University of Aeronautics-Astronautic, China; Hong Kong Polytechnic University, China*

9:20AM | Self-Oscillating Contactless Resonant Converter with Power Transfer and Current Sensing Integrated Transformer
Ligang Xu, Qianhong Chen, Xiaoyong Ren, Shen Ping, Siu-Chung Wong, *Nanjing University of Aeronautics-Astronautics, China; Hong Kong Polytechnic University, Hong Kong*

9:45AM | Design of an On-Board Charger for Universal Inductive Charging in Electric Vehicles
Nan Liu, Thomas G. Habetler, *Georgia Institute of Technology, United States*

SS2 Future Electric Aircrafts – Systems

Room: 520A
Chair: Kiruba Haran

8:30AM | Hybrid Electric and Distributed Propulsion Technologies for Large Commercial Aircraft: A NASA Perspective
Nateri Madavan, *NASA Ames Research Center, USA*

8:55AM | Hybrid Electric Geared Turbofan Propulsion System Conceptual Design
Charles Lents, *Principal Research Engineer, UTRC, USA*

9:20AM | Status of Cryogenic/Superconducting Power System and Impacts for Hybrid-Electric Aircraft Propulsion
T.J. Haugan, G.Y. Panasyuk, *Air Force Research Lab, USA*

9:45AM | Architecture, Voltage and Components for a Turboelectric Distributed Propulsion Electric Grid
Antonio Caiafa, Pan Yan, *GE Global Research Center, USA*

Wednesday, September 23 10:30AM – 12:10PM

S57 Microinverters for Solar PV Systems

Room: 519A
Chairs: Ahmed Elasser, Pedro Rodriguez

10:30AM | A Novel Single-Stage Isolated PWM Half-Bridge Microinverter for Solar Photovoltaic Modules
Ravi Kiran Surapaneni, Akshay Kumar Rathore, *National University of Singapore, Singapore*

10:55AM | Low Complexity Structure and Control for Microinverters with Reactive Power Support Capability
Ali Elrayyah, Yilmaz Sozer, *Qatar Environment and Energy Research Institute, Qatar; University of Akron, United States*

11:20AM | Transformer-Less Grid-Connected Inverter with Low Leakage Currents for Photovoltaic Generation System
Bangyin Liu, Zhaosong Zeng, Qikang Wei, Shanxu Duan, *Huazhong University of Science and Technology, China*

11:45AM | A Soft-Switched Three-Port Single-Stage Inverter for Photovoltaic-Battery Systems
Jianwu Zeng, Wei Qiao, Chun Wei, Liyan Qu, *University of Nebraska-Lincoln, United States*

S58 Grid Inverter Control

Room: 518A
Chairs: Paolo Mattavelli, Dewei Xu

10:30AM | Parallel Operation of Bi-Directional Interfacing Converters in a Hybrid AC/DC Microgrid under Unbalanced Grid Conditions
Xiaosheng Wang, Kai Sun, Yunwei Li, Farzam Nejabatkhah, Yang Mei, *Tsinghua University, China; University of Alberta, Canada; North China University of Technology, China*

10:55AM | A Two-Stage Combined Control Strategy for Parallel Operation of Inverter
Zhi Chen, Xuejun Pei, Wenjing Zhu, Xinmin Liu, Li Peng, *Huazhong University of Science and Technology, China*

11:20AM | Controller Design for Three-Phase Inverter with Power Unbalanced Loads Applied in Microgrids
Huanyu Cai, Ping Zhang, Hengyang Zhao, Jianjiang Shi, Wenxi Yao, Xiangning He, *Zhejiang University, China*

11:45AM | Smart Control for Active Power Generation, Voltage Level and Harmonic Content based on Photovoltaic Generators
Camila S. Gehrke, Antonio M.N. Lima, Alexandre C. Oliveira, *Federal University of Paraíba, Brazil; Federal University of Campina Grande, Brazil*

S59 Distributed Generation Management

Room: 518B
Chairs: Remus Teodorescu, Masoud Karimi Ghartemani

10:30AM | Coordinated Operation in a Multi-Inverter based Microgrid for Both Grid-Connected and Islanded Modes using Conservative Power Theory
Ali Mortezaei, M. Godoy Simões, Ahmed Al Durra, Fernando P. Marafão, Tiago D. Curi Busarello, *Colorado School of Mines, United States; The Petroleum Institute, United Arab Emirates; UNESP - University Estadual Paulista, Brazil; University of Campinas, Brazil*

10:55AM | Test and Analysis of 3kW PV Battery Energy Storage System
Jung-Muk Choe, Jih-Sheng Lai, Jong-Ung Lim, Gyu-Ha Choe, *Virginia Tech, United States; Konkuk University, Korea (South)*

11:20AM | Online Energy Management System for Distributed Generators in a Grid-Connected Microgrid
Adriana C. Luna, Nelson L. Diaz, Moisès Graells, Juan C. Vasquez, Josep M. Guerrero, *Aalborg University, Denmark; Universidad Distrital, Bogota, Colombia; Universitat Politècnica de Catalunya, Spain*

11:45AM | Frequency-Dependent Criterion for Mitigation of Transmission-Line Effects in a High-Frequency Distributed Power Systems
A. Gupta, N. Kumar, S.K. Mazumder, *University of Illinois-Chicago, United States*

S60 DC-DC Converters

Room: 524B
Chairs: Johann Kolar, Faisal Khan

10:30AM | High Efficiency Bidirectional 5kW DC-DC Converter with Super-Junction MOSFETs for Electric Vehicle Super-Capacitor Systems
Andrew Hopkins, Neville McNeill, Philip Anthony, Phil Mellor, *University of Bristol, United Kingdom*

10:55AM | Application of a Floating H-Bridge Converter to Stabilize the Automotive Energy Net
M. Mürken, M. Simon, J. Pforr, T. Hackner, *Technische Hochschule Ingolstadt, Germany; AUDI AG, Germany*

11:20AM | Using Fourier Series to Derive Optimal Soft-Switching Modulation Schemes for Dual Active Bridge Converters
Jordi Everts, Georgios E. Sfakianakis, Elena A. Lomonova, *Eindhoven University of Technology, Netherlands*

11:45AM | A Soft Switching Bidirectional DC-DC Converter based on Three-State Switching Cell
Luan C.S. Mazza, Demercil S. Oliveira Jr., Fernando L.M. Antunes, Diego B.S. Alves, Luiz H.S.C. Barreto, José J.S. Souza, *Federal University of Ceara, Brazil; Federal Institute of Ceara, Brazil*

S61 Grid-Tied Multi-Phase Converters

Room: 524C
Chairs: Pericle Zanchetta, Madhav Manjrekar

10:30AM | Silicon and Hybrid Si-SiC Tandem Inverter Analytical Loss Characterization and Comparison to PWM-Modulated Voltage Source Inverter
Antonio Di Gioia, Ian P. Brown, *Illinois Institute of Technology, United States*

10:55AM | A Zeta-Converter based Four-Switch Three-Phase DC-AC Inverter
M.S. Diab, A. Elserougi, A.S. Abdel-khalik, A.M. Massoud, Shehab Ahmed, *Alexandria University, Egypt; Texas A&M University at Qatar, Qatar; Qatar University, Qatar*

11:20AM | Isolated DC to Three-phase AC Converter using Indirect Matrix Converter with ZVS Applied to All Switches
Shunsuke Takuma, Koji Orikawa, Jun-ichi Itoh, Ryo Oshima, Hiroki Takahashi, *Nagaoka University of Technology, Japan*

11:45AM | A New Three-Phase AC-DC-AC Multilevel Converter based on Cascaded Three-Leg Converters
Ayslan C.N. Maia, Cursino B. Jacobina, Gregory A.A. Carlos, *Federal University of Campina Grande, Brazil; Federal Institute of Alagoas, Brazil*

S62 Modular Multi-Level Converters I

Room: 520E
Chairs: Leon Tolbert, Dong Cao

10:30AM | Asymmetrical Modular Mutilevel Converter (A-MMC) based HVDC System
Kartik V. Iyer, Ashish Kumar Sahoo, Ned Mohan, *University of Minnesota, United States*

10:55AM | Comparative Study of the Sinusoidal-Wave and Square-Wave Circulating Current Injection Methods for Low-Frequency Operation of the Modular Multilevel Converters
Binbin Li, Shaoze Zhou, Dandan Xu, Dianguo Xu, Wei Wang, *Harbin Institute of Technology, China*

11:20AM | Energy-Balancing Control of a Delta-Configured Modular Multilevel Cascade Inverter for Utility-Scale Photovoltaic Systems
Paul Sochor, Hirofumi Akagi, *Tokyo Institute of Technology, Japan*

11:45AM | A Modular Multilevel Cascade Converter (MMCC) with a Resonant High-Frequency Link
Takushi Jimichi, Naoto Niimura, Ritaka Nakamura, *Mitsubishi Electric Corporation, Japan; TMEIC, Japan*

S63 Control and Stability of AC Converters and Systems

Room: 520F
Chairs: Jian Sun, Marco Lisserre

10:30AM | Comparison of Two Control Approaches for Stability Enhancement using STATCOM with Active Power Injection Capability
Mebtu Beza, Massimo Bongiorno, *Chalmers University of Technology, Sweden*

10:55AM | Enhanced Stability of Capacitor-Current Feedback Active Damping for LCL-Filtered Grid Converters
Zhen Xin, Xiongfei Wang, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark*

11:20AM | The Influence of Phase-Locked Loop on the Stability of Single-Phase Grid-Connected Inverter
Chong Zhang, Xiongfei Wang, Frede Blaabjerg, Weisheng Wang, Chun Liu, *China Electric Power Research Institute, China; Aalborg University, Denmark*

11:45AM | Interactive Energy Management Strategy for MMC-Based EV Fleet Integrated into Smart Grid
Meiqin Mao, Tinghuan Tao, Yong Ding, Jingjing Li, Liuchen Chang, *Hefei University of Technology, China; University of New Brunswick, Canada*

S64 Fault Analysis and Protection

Room: 521AB
Chairs: Hirofumi Akagi, Drazen Dujic

10:30AM | On-Line Diagnosis for Rectifier Open Circuit Faults and Input Voltage Unbalance based on the Output DC Voltage
Tamer Kamel, Yevgen Biletskiy, Liuchen Chang, Bo Cao, *University of New Brunswick, Canada*

10:55AM | A Fast Short-Circuit Protection Method using Gate Charge Characteristics of SiC MOSFETs
Takeshi Horiguchi, Shin-ichi Kinouchi, Yasushi Nakayama, Hirofumi Akagi, *Mitsubishi Electric Corporation, Japan; Tokyo Institute of Technology, Japan*

11:20AM | A Novel Active T-type Three-Level Converter with Open-Circuit Fault-Tolerant Control
Ui-Min Choi, Frede Blaabjerg, *Aalborg University, Denmark*

11:45AM | Study of Failures in a Three-Phase Active Neutral Point Clamped Rectifier: Short-Circuit and Open-Circuit Faults
Antônio L. de Lacerda, Edison R.C. da Silva, *Federal University of Campina Grande, Brazil; Federal University of Paraiba, Brazil*

S65 DC-DC Converters for Renewable Energy

Room: 524A
Chairs: Jih-Sheng Lai, Carl N M Ho

10:30AM | High-Power Multilevel Step-Up DC/DC Converter for Offshore Wind Energy Systems
Amir Parastar, Jul-Ki Seok, *Yeungnam University, Korea (South)*

10:55AM | Modular Isolated High Frequency Medium Voltage (MV) Step-Up Resonant DC/DC Converters with High-Gain Rectifier for Wind Energy Systems
Sanjida Moury, John Lam, *York University, Canada*

11:20AM | Design Optimization for Ultrahigh Efficiency Buck Regulator using Wide Bandgap Devices
Jih-Sheng Lai, Chung-Yi Lin, Yu-Chen Liu, Lanhua Zhang, Xiaonan Zhao, *Virginia Tech, United States; Flextronics Power, Taiwan; National Taiwan University of Science and Technology, Taiwan*

11:45AM | Three-Phase Interleaved High Step-Up Boost Converter with Voltage Multiplier for Fuel Cell Power System
Longlong Zhang, Dehong Xu, Haijin Li, Guoqiao Shen, Min Chen, *Zhejiang University, China*

S66 Synchronous Reluctance Machines

Room: 520B
Chairs: Gianmario Pellegrino, Patel Reddy

10:30AM | Design of Synchronous Reluctance Motor Utilizing Dual-Phase Materials for Traction Applications
Patel Bhageerath Reddy, Ayman El-Refaie, Steven Galioto, James P. Alexander, *GE Global Research Center, United States*

10:55AM | Line-Start Synchronous Reluctance Motors: Design Guidelines and Testing via Active Inertia Emulation
M. Gamba, E. Armando, G. Pellegrino, A. Vagati, B. Janjic, J. Schaab, *Politecnico di Torino, Italy; KSB Aktiengesellschaft, Germany*

11:20AM | Design of High-Speed Synchronous Reluctance Machines
Francesco Cupertino, Marco Palmieri, Gianmario Pellegrino, *Politecnico di Bari, Italy; Politecnico di Torino, Italy*

11:45AM | Sinusoidal Reluctance Machine with DC Winding: An Attractive Non-Permanent Magnet Option
Tsarafidy Raminosoa, David Torrey, Ayman El-Refaie, Kevin Grace, Di Pan, Stefan Grubic, Karthik Bodla, Kum-Kang Huh, *GE Global Research, United States*

S67 Materials and Manufacturing Issues of Electric Machines I

Room: 520C
Chairs: Pete Wung, Bilal Akin

10:30AM | Effect of Manufacturing Variations on Cogging Torque in Surface-Mounted Permanent Magnet Motors
Alejandro J. Piña, Subhra Paul, Rakib Islam, Longya Xu, *Ohio State University, United States; Nexteer Automotive, United States*

10:55AM | Influence of Electric Discharge Activity on Bearing Lubricating Grease Degradation
Aleksei Romanenko, Jero Ahola, Annette Muetze, *Lappeenranta University of Technology, Finland; Graz University of Technology, Austria*

11:20AM | Characterising the Performance of Selected Electrical Machine Insulation Systems
Rafal Wrobel, Samuel J. Williamson, Julian D. Booker, Phil H. Mellor, *University of Bristol, United Kingdom*

11:45AM | Stator Winding Thermal Conductivity Evaluation: An Industrial Production Assessment
Aldo Boglietti, Enrico Carpaneto, Marco Cossale, Silvio Vaschetto, Mircea Popescu, Dave Staton, *Politecnico di Torino, Italy; Motor Design Ltd, United Kingdom*

S68 Energy Efficient Motor Drives

Room: 520D
Chairs: Ali M. Bazzi, Luza Zarri

10:30AM | Control of an Open-Ended Induction Machine using a Dual Inverter System with a Floating Capacitor Bridge
M. Mengoni, A. Tani, L. Zarri, G. Rizzoli, G. Serra, D. Casadei, *University of Bologna, Italy*

10:55AM | A Novel Energy Saving Method for use with Variable Frequency Drives
Mahesh Swamy, Anupama Balakrishnan, *Yaskawa America, Inc., United States*

11:20AM | An Adjustable Speed PFC Bridgeless-SEPIC fed Brushless DC Motor Drive
Vashist Bist, Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, *IIT Delhi, India; ETS, Canada*

11:45AM | Behavioral Comprehensive Efficiency Modeling of Motor Drive Systems based on Physical Measurements
Artur Ulatowski, Yiqi Liu, Ali M. Bazzi, *University of Connecticut, United States*

S69 Power Electronic Modules II

Room: 519B
Chairs: Jelena Popovic, Jason Stauth

10:30AM | Static and Dynamic Performance Assessment of Commercial SiC MOSFET Power Modules
Muhammad Nawaz, Filippo Chimento, Kalle Ilves, *ABB Corporate Research, Sweden*

10:55AM | Integrated Double Sided Cooling Packaging of Planar SiC Power Modules
Zhenxian Liang, *Oak Ridge National Laboratory, United States*

11:20AM | Silicon Carbide Power Chip on Chip Module based on Embedded Die Technology with Paralleled Dies
Guillaume Regnat, Pierre-Olivier Jeannin, Guillaume Lefevre, Jeffrey Ewanchuk, David Frey, Stefan Mollov, Jean-Paul Ferrieux, *University Grenoble Alpes, France; Mitsubishi Electric R&D Centre Europe, France*

11:45AM | A Very Thin Power Conversion Unit for Equalizing Currents through Paralleled Power Modules
Yukio Hattori, Hiroshi Kamizuma, Akira Mima, Daisuke Matsumoto, Tetsuya Kawashima, Yuichi Mabuchi, *Hitachi, Ltd., Japan*

S70 Wireless Power Transfer III

Room: 518C
Chairs: Jin Wang, Suman Dwari

10:30AM | Modeling and Experimentation of Loosely-Coupled Coils with Transmitter having Orthogonally-Placed Windings
Jeff Po Wa Chow, Henry Shu Hung Chung, Chun Sing Cheng, Abdulmecit Gungor, Sai Chun Tang, Leanne Lai Hang Chan, *City University of Hong Kong, Hong Kong; Shanghai Maritime University, China; Harvard Medical School, United States*

10:55AM | A Practical Implementation of Wireless Power Transfer Systems for Socially Interactive Robot
Nazmul Hasan, Isaac Cocar, Thomas Amely, Hongjie Wang, Regan Zane, Zeljko Pantic, Cathy Bodine, *Utah State University, United States; University of Colorado-Denver, United States*

11:20AM | A Moving Wireless Power Transfer System Applicable to a Stationary System
Toshiyuki Fujita, Tomio Yasuda, Hirofumi Akagi, *Technova Inc., Japan; Tokyo Institute of Technology, Japan*

11:45AM | Power and Energy of 2-D Omni-Directional Wireless Power Transfer Systems
Deyan Lin, Cheng Zhang, S.Y. (Ron) Hui, *University of Hong Kong, Hong Kong; Imperial College London, United Kingdom*

SS3 Future Electric Aircrafts – Components

Room: 520A
Chair: Nateri Madavan

10:30AM | High Power Density Megawatt (MW) Class Non-Superconducting Electric Machines
Andrew Provenza, *NASA Glenn Research Center, USA*

10:55AM | Opportunities and Trends for Non-Cryogenic Electric Machines and Drives for Future Electric Aircraft
Bulent Sarlioglu, *University of Wisconsin-Madison, USA*

11:20AM | High Power Density Motor Drives for Aircraft Flight Propulsion and Electric Ground Aircraft Launch Systems
Pat Wheeler, Gerada Chris, Cox Tom, *University of Nottingham, UK*

11:45AM | High Field Superconducting Machines
Kiruba Haran, David Loder, *University of Illinois, Urbana-Champaign, USA*

Wednesday, September 23 **2:00PM – 3:40PM**

S71 Utility Scale Battery Systems

Room: 519A
Chairs: Erkan Mese, Tiefu Zhao

2:00PM | Power Flow Management of a Grid Tied PV-Battery Powered Fast Electric Vehicle Charging Station
Mohamed O. Badawy, Yilmaz Sozer, *University of Akron, United States*

2:25PM | Life Test Design for Retired xEV Batteries Aiming at Smart Home Applications
He Li, Mohammed Alsolami, Yifan Xiao, Xiaotao Dong, Ke Zhu, Jin Wang, *Ohio State University, United States*

2:50PM | Li-Ion Batteries and Li-Ion Ultracapacitors: Characteristics, Modeling and Grid Applications
Seyed Ahmad Hamidi, Emad Manla, Adel Nasiri, *University of Wisconsin-Milwaukee, United States*

3:15PM | Low Cost Digital-analog Hybrid Controlled Photovoltaic Battery Charger based on Interleaved BCM Boost Converter and Improved MPPT Algorithm
Kunsheng Peng, Xiaogao Xie, Jiangsong Li, *Hangzhou Dianzi University, China*

S72 HVDC and FACTS I

Room: 518A
Chairs: Ian P. Brown, Xiongfei Wang

2:00PM | Compact Dynamic Phase Angle Regulator for Power Flow Control
Anish Prasai, R.P. Kandula, Rohit Moghe, Timothy Heidel, Colin Schauder, Deepak Divan, *Varentec, Inc., United States; ARPA-E, United States; Booz Allen Hamilton, Inc., United States; Georgia Institute of Technology, United States*

2:25PM | Application of Transformer-Less UPFC for Interconnecting Synchronous AC Grids
Shuitao Yang, Deepak Gunasekaran, Yang Liu, Ujjwal Karki, Fang Z. Peng, *Michigan State University, United States*

2:50PM | Design Considerations and Experimental Results for a 12.47-kV 3-Phase 1 MVA Power Router
R.P. Kandula, Anish Prasai, Hao Chen, Rhett Mayor, Frank Lambert, Timothy Heidel, Colin Schauder, Deepak Divan, *Varentec, Inc., United States; Georgia Institute of Technology, United States; ARPA-E, United States; Booz Allen Hamilton, Inc., United States*

3:15PM | Design Considerations and Experimental Results for a 13-kV 3-Phase 1 MVA Power Router
R.P. Kandula, Amrit Iyer, Frank Lambert, Timothy Heidel, Colin Schauder, Deepak Divan, *Varentec, Inc., United States; ARPA-E, United States; Booz Allen Hamilton, United States; Georgia Institute of Technology, United States*

S73 Electronic Transformer and Grid Devices

Room: 518B
Chairs: Qiang Fu, John Lam

2:00PM | Modular Multilevel Converter (MMC) Based Resonant High Voltage Multiplier
Liming Liu, Sandeep Bala, *ABB Inc., United States*

2:25PM | Analysis and Design of Fixed Voltage Transfer Ratio DC/DC Converter Cells for Phase-Modular Solid-State Transformers
Jonas E. Huber, Johann W. Kolar, *ETH Zurich, Switzerland*

2:50PM | Design, Analysis and Implementation of Discontinuous Mode Dyna-C AC/AC Converter for Solid State Transformer Applications
Ankan De, Subhashish Bhattacharya, *North Carolina State University, United States*

3:15PM | Miniaturization of Magnetic Components for an Electric Transformer based on Bi-Directional Isolated DC-DC Converter
Mizuki Nakahara, Keiji Wada, *Tokyo Metropolitan University, Japan*

S74 Batteries and Battery Management

Room: 520A
Chairs: Ali M Bazzi, Yue Zhao

2:00PM | An Integrated Electric Vehicle Power Conversion System using Modular Multilevel Converter
Nan Li, Feng Gao, Tingting Yang, Lei Zhang, Qian Zhang, Guangqian Ding, *Shandong University, China; State Grid Chongqing Electric Power Company, China*

2:25PM | Coulomb Counting State-of-Charge Algorithm for Electric Vehicles with a Physics-Based Temperature-Dependent Battery Model
Larry W. Juang, Phillip J. Kollmeyer, Ruxiu Zhao, T.M. Jahns, R.D. Lorenz, *University of Wisconsin-Madison, United States*

2:50PM | Optimized Design Guideline of Battery-Cell Equalizers based on the Wave-Trap Concept
M. Arias, J. Sebastian, M.M. Hernando, A. Vazquez, U. Viscarret, *University of Oviedo, Spain; Ikerlan, Spain*

3:15PM | Hysteresis Modeling for Model-Based Condition Monitoring of Lithium-Ion Batteries
Taesic Kim, Wei Qiao, Liyan Qu, *University of Nebraska-Lincoln, United States*

S75 High Frequency DC-DC Converters II

Room: 524B
Chairs: Juan Rivas, Pericle Zanchetta

2:00PM | 27.12 MHz Isolated High Voltage Gain Multi-Level Resonant DC-DC Converter
Luke Raymond, Wei Liang, Kawin Surakitbovorn, Juan Rivas Davila, *Stanford University, United States*

2:25PM | Megahertz-Frequency Isolated Resonant DC-DC Converter using Impedance Control Network for High-Efficiency Wide-Range Operation
Ashish Kumar, Khurram K. Afridi, *University of Colorado-Boulder, United States*

2:50PM | A Novel Driving Scheme for Synchronous Rectifier in MHz CRM Flyback Converters with GaN Devices
Xiucheng Huang, Weijing Du, Fred C. Lee, Qiang Li, *Virginia Tech, United States*

3:15PM | A Novel Asymmetrical Three-Level BUCK(ATL BUCK) Converter for Point-of-Load(POL) Application
Tianshu Liu, Hongliang Wang, Wenbo Liu, Yan-Fei Liu, Laili Wang, Hamid Danesh, Doug Malcolm, *Queen's University, Canada; Sumida Corporation, Canada*

S76 Multi-Level Converters II

Room: 524C
Chairs: Rolando Burgos, Gui-Jia Su

2:00PM | Low Frequency State-Space Model for the Five-Level Unidirectional T-Rectifier Marco Di Benedetto, Alessandro Lidozzi, Luca Solero, Fabio Crescimbini, Petar J. Grbovic, *Roma Tre University, Italy; Huawei Energy Competence Center Europe, Germany*

2:25PM | Performance Evaluation for the Five-Level Unidirectional T-Rectifier in High-Speed Electric Generating Units
Petar Grbovic, Alessandro Lidozzi, Luca Solero, Fabio Crescimbini, *Roma Tre University, Italy; Huawei Energy Competence Center Europe, Germany*

2:50PM | Power Recovery and Cost Reduction Oriented Optimization of Regenerative Cells Embedded in Cascaded Multilevel Converter
Juntao Yao, Fei Liu, Jinwu Gong, Xiaoming Zha, *Wuhan University, China*

3:15PM | A Repetitive Control Scheme for Neutral-Point Low-frequency Fluctuation Suppression of Three-Level Neutral-Point-Clamped Converter
Zhigang Liang, Xinchun Lin, Xuesong Qiao, Kang Yong, *Huazhong University of Science and Technology, China*

S77 Control of Grid-Connected Inverters

Room: 520F
Chairs: Yunwei Li, Johan Kolar

2:00PM | Use of Boundary Control with Second-Order Switching Surface to Reduce the System Order for Deadbeat Controller in Grid-Connected Inverter
Yuanbin He, Henry Shu-hung Chung, *City University of Hong Kong, Hong Kong*

2:25PM | Design of LCL-Filters with LCL Resonance Frequencies beyond the Nyquist Frequency for Grid-Connected Converters
Yi Tang, Wenli Yao, Poh Chiang Loh, Frede Blaabjerg, *Nanyang Technological University, Singapore; Aalborg University, Denmark*

2:50PM | Polynomial Design Method for a Current Controller Applied to a Single-Phase Grid-Connected VSI with LCL Filter
Emanoel L. Silva, João B.M. Santos, Maurício B.R. Correa, Antonio M.N. Lima, *UFCG, Brazil*

3:15PM | A Harmonic Constrained Minimum Energy Controller for a Single-Phase Grid-Tied Inverter using Model Predictive Control
Xiao Li, Mohammad B. Shadmand, Robert S. Balog, Haitham Abu Rub, *Texas A&M University, United States; Texas A&M University at Qatar, Qatar; Qatar Environment and Energy Research Institute, Qatar*

S78 Control and Stability of DC Converters and Systems

Room: 521AB
Chairs: Juri Jatskevich, Babak Parkhideh

2:00PM | Analysis on Feedback Interconnections of Cascaded DC-DC Converter Systems
Sucheng Liu, Xiaodong Liu, Yan-Fei Liu, *Anhui University of Technology, China; Queen's University, Canada*

2:25PM | Stability Impact of Trailing-Edge and Leading-Edge Modulations on DC/DC Converters
Xin Zhang, Qing-Chang Zhong, Wen-Long Ming, *University of Sheffield, United Kingdom; Illinois Institute of Technology, United States*

2:50PM | A DC Capacitor Voltage Control Method for Active Power Filters using Modified Reference Including the Voltage Ripple Derived from a Theoretical Analysis
Tomoyuki Mannen, Hideaki Fujita, *Tokyo Institute of Technology, Japan*

3:15PM | Stabilizing Controller Design for Multi-Bus MVDC Distribution Systems using a Passivity based Stability Criterion and Positive Feed-Forward Control
Jonathan Siegers, Silvia Arrua, Enrico Santi, *University of South Carolina, United States*

S79 Non-Conventional Machine Configurations I

Room: 520B
Chairs: Yves Perriard and Guilio de Donato

2:00PM | Design and Evaluation of a PM Vernier Machine
Stiaan Gerber, Rong-Jie Wang, *Stellenbosch University, South Africa*

2:25PM | Design Considerations and Parameter Optimization of Stator Wound Field Synchronous Machines Based on Magnetic the Gear Effect
Shaofeng Jia, Ronghai Qu, Jian Li, *Huazhong University of Science and Technology, China*

2:50PM | Design of a Modular E-Core Flux Concentrating Axial Flux Machine
Tausif Husain, Yilmaz Sozer, Iqbal Husain, Eduard Muljadi, *University of Akron, United States; North Carolina State University, United States; National Renewable Energy Lab, United States*

3:15PM | A Fast Mechanical Switch for Medium Voltage Hybrid DC and AC Circuit Breakers
Chang Peng, Iqbal Husain, Alex Huang, Bruno Lequesne, Roger Briggs, *North Carolina State University, United States; E-Motors Consulting, LLC, United States; Energy Efficiency Research, LLC, United States*

S80 Electric Machines for Automotive Applications I

Room: 520C
Chairs: Khwaja Rahman, Wen Ouyang

2:00PM | Next Generation Chevy Volt Electric Machines: Design, Optimization and Control for Performance and Rare Earth Mitigation
Sinisa Jurkovic, Khwaja Rahman, Bonho Bae, Nitin Patel, Peter Savagian, *General Motors Company, United States*

2:25PM | Vibro-Acoustic Simulation and Optimization of a Claw-Pole Alternator
A. Tan-Kim, V. Lanfranchi, S. Vivier, J. Legranger, F. Palleschi, *Université de Technologie de Compiègne, France; Valeo, France*

2:50PM | Development of Constrained Optimization Routine for the U.S. DRIVE Specifications using Coupled Electromagnetic/Thermal Electric Machine Model
Wenying Jiang, T.M. Jahns, *Nanjing University of Aeronautics and Astronautics, China; University of Wisconsin-Madison, United States*

3:15PM | Super-High-Speed Switched Reluctance Motor for Automotive Traction
M. Besharati, J. Widmer, G. Atkinson, V. Pickert, Jamie Washington, *Newcastle University, United Kingdom; Höganäs AB, Sweden*

S81 PM and IPM Motor Drives II

Room: 520D
Chairs: Thomas Jahns, Pingjia Zhang

2:00PM | Control Strategy of a Variable Flux Machine using AlNiCo Permanent Magnets
Lesedi Masisi, Maged Ibrahim, Pragasen Pillay, *Concordia University, Canada*

2:25PM | Control Method for Mono Inverter Dual Parallel Interior Permanent Magnet Synchronous Machine Drive System
Yongjae Lee, Jung-Ik Ha, *Seoul National University, Korea (South)*

2:50PM | Single-Phase Stator Control of Interior Permanent Magnet Machines with MTPA Operation
Kahyun Lee, Jung-Ik Ha, *Seoul National University, Korea (South)*

3:15PM | Closed-Loop, Flux Weakening Control for Hybrid Excitation Synchronous Machines
Fabio Giulii Capponi, Gabriele Borocci, Giulio De Donato, Federico Caricchi, *University of Roma "La Sapienza", Italy*

S82 Magnetics I

Room: 519B
Chairs: John Siefken, Adam Skorek

2:00PM | Loss Comparison of Core Materials used for the Inductor of a Buck-Chopper Circuit
Yoshihiro Miwa, Toshihisa Shimizu, *Tokyo Metropolitan University, Japan*

2:25PM | An Integrated Unit of LCL Filter for Grid-Connected Inverter
Cheng Deng, Xian Shi, Yeyu Zhong, *Xiangtan University, China*

2:50PM | An Integrated Inductor and Capacitor with Co-Located Electric and Magnetic Fields
Andy Schroedermeier, Daniel C. Ludois, *University of Wisconsin-Madison, United States*

3:15PM | High Efficiency On-Silicon Coupled Inductors using Stacked Copper Windings
Zoran Pavlovi, Santosh Kulkarni, Ningning Wang, Cian Ó Mathúna, *University College Cork, Ireland*

S83 LED Drivers

Room: 518C
Chairs: Liang Jia, Tsorng-Juu Liang

2:00PM | Primary-Side Controller IC Design for Quasi-Resonant Flyback LED Driver
Ji-Shiuan Li, Tsrong-Juu Liang, Kai-Hui Chen, Yi-Ju Lu, Jhih-Sian Li, *National Cheng Kung University, Taiwan*

2:25PM | Current-Ripple-Based Control Strategy to Achieve Low-Frequency Ripple Cancellation in Single-Stage High-Power LED Driver
Yajie Qiu, Hongliang Wang, Laili Wang, Yan-Fei Liu, P.C. Sen, *Queen's University, Canada*

2:50PM | A Low-Cost High-Efficiency Linear LED Driver with Concave Current Control
Xiaofeng Lyu, Yanchao Li, Dong Cao, Guoqiang Liu, *North Dakota State University, United States; Joulwatt Company, China*

3:15PM | Dimmable LED Driver with Variable Inductor based on a Resonant Switched-Capacitor Topology
M. Martins, M.S. Perdigão, A.S. Mendes, R.A. Pinto, J.M. Alonso, *University of Coimbra, Portugal; ISEC Engenharia, Portugal; Federal University of Santa Maria, Brazil; University of Oviedo, Spain*

SS4 DC Microgrids: Control, Operations and Trends

Room: 520E
Chair: Josep M. Guerrero

2:00PM | New Research Challenges on Microgrids and DC Homes
Josep M. Guerrero, *Aalborg University, Denmark*

2:25PM | Inverter System Operation and Control for Harmonized AC and DC Microgrids
Tsai-Fu Wu, *National Tsing-Hua University, Taiwan*

2:50PM | Control of Bi-Directional Interfacing Converters in Hybrid AC/DC Microgrids
Kai Sun, *Tsinghua University, China*

3:15PM | Coordinated Control and Optimization of Renewable Energy Sources in DC Microgrids: Towards a Resilient Architecture
Xiaonan Lu, *Argonne National Laboratory, USA*

SS5 Modules for MV/HV Applications

Room: 524A
Chair: Filippo Chimento

2:00PM | SiC Power Blocks – Accelerating the Next Generation of Power Electronics
Rajib Datta, *GE, USA*

2:25PM | LinPak – A Medium Voltage Module for Fast Switching Si and SiC Applications
Raffael Schnell, *ABB Switzerland Ltd, Switzerland*

2:50PM | 3.3kV SiC MOSFET Update for Medium Voltage Applications
Jeffrey B. Casady, *CREE, USA*

3:15PM | 10 - 25 kV Silicon Carbide Power Modules for Medium Voltage Applications
Brandon Passmore, *APEI, USA*

Wednesday, September 23 4:00PM – 5:40PM

S84 Converter for Solar PV Systems

Room: 519A
Chairs: Behrooz Mirafzal, Ahmed Elasser

4:00PM | Enhanced HERIC based Transformerless Inverter with Hybrid Clamping Cell for Leakage Current Elimination
Senjun Hu, Chenming Li, Wuhua Li, Xiangning He, Fengwen Cao, *Zhejiang University, China; Suzhou Vocational University, China*

4:25PM | Evaluation of Commercial Scale Transformerless Solar Inverter Technology
Tiefu Zhao, Vijay Bhavaraju, Prasanna Nirantare, Jun Xu, *Eaton Corporate Research & Technology, United States, India, and China*

4:50PM | High Efficiency Impedance Control Network Resonant DC-DC Converter with Optimized Startup Control
Jie Lu, Khurram K. Afridi, *University of Colorado-Boulder, United States*

5:15PM | A Novel ZVT/ZCT PWM Converter Used for Solar Battery Chargers with Reduced Conduction Loss
Hossein Mousavian, Alireza Bakhshai, Praveen Jain, M.R. Zolghadri, *Queen's University, Canada; Sharif University of Technology, Iran*

S85 HVDC and FACTS II

Room: 518A
Chairs: Robert S. Balog, Geraint Chaffey

4:00PM | Hardware implementation of a Four-Terminal HVDC Test-Bed
Yalong Li, Xiaojie Shi, Bo Liu, Fred Wang, Leon M. Tolbert, Wanjun Lei, *University of Tennessee, United States; Xi'an Jiaotong University, China*

4:25PM | Directional Current Breaking Capacity Requirements for HVDC Circuit Breakers
Geraint Chaffey, Tim C. Green, *Imperial College London, United Kingdom*

4:50PM | A Comprehensive AC Side Single Line to Ground Fault Ride through Strategy of a Modular Multilevel Converter for HVDC System
Shenghui Cui, Hak-Jun Lee, Jae-Jung Jung, Younggi Lee, Seung-Ki Sul, *RWTH Aachen University, Germany; LSIS Co., Ltd, Korea (South); Seoul National University, Korea (South)*

5:15PM | Operation of Hybrid Multi-Terminal DC System Under Normal and DC Fault Operating Conditions
Sayan Acharya, Ali Azidehak, Kasunaidu Vechalapu, Mahsa Kashani, Govind Chavan, Subhashish Bhattacharya, Nima Yousefpoor, *North Carolina State University, United States; Quanta Technology, United States*

S86 V2G and G2V

Room: 518B
Chairs: Leila Parsa, Toshihiko Tanaka

4:00PM | A High Efficiency Bi-Directional EV Charger with Seamless Mode Transfer for V2G and V2H Application
MinHo Kwon, SeHyung Jung, Sewan Choi, *Seoul National University of Science and Technology, Korea (South)*

4:25PM | A Voltage Control Technique for Grid-Connected Single-Phase AC/DC Converters with G2V/V2G Capability
Majid Pahlevani, Suzan Eren, Alireza Balhshai, Praveen Jain, *Queen's University, Canada*

4:50PM | Impact of Grid and Load Disturbances on Electric Vehicle Battery in G2V/V2G and V2H Mode
Xiaoqiang Guo, Jian Li, Xiaoyu Wang, *Yanshan University, China; Carleton University, Canada*

5:15PM | Novel Simple Harmonics Compensation Method for Smart Charger with Constant DC-Capacitor Voltage Control for Electric Vehicles on Single-Phase Three-Wire Distribution Feeders
Toshihiko Tanaka, Fuka Ikeda, Hidenori Tanaka, Hiroaki Yamada, Masayuki Okamoto, *Yamaguchi University, Japan; Ube College, Japan*

S87 Traction, Aerospace, Mining and Marine

Room: 520A
Chairs: Jae-Do Park, Mazharul Chowdhury

4:00PM | Analysis of Electro-Mechanical Interaction in Aircraft Generator Systems
Tom Feehally, Judith Apsley, *University of Manchester, United Kingdom*

4:25PM | Hybrid CPU-Core and FPGA based Real-Time Implementation of a High Frequency Aircraft Power System
Amitkumar K.S., Ilamparithi T., Ohm Prakash, Jean Belanger, *Opal-RT Technologies, India; Opal-RT Technologies, Canada*

4:50PM | Coordinated Control of a DC Electrical Power System in the More Electric Aircraft Integrated with Energy Storage
Fei Gao, Seang Yeoh, Serhiy Bozhko, Greg Asher, *University of Nottingham, United Kingdom*

5:15PM | A New Active Output Filter (AOF) for Variable Speed Constant Frequency (VSCF) Power System in Aerospace Applications
Fahad Alhuwaishel, Ahmed Morsy, Prasad Enjeti, *Texas A&M University, United States*

S88 Resonant DC-DC Converters

Room: 524B
Chairs: Yehui Han, Srdjan Lukic

4:00PM | A New LLC Converter Family with Synchronous Rectifier to Increase Voltage Gain for Hold-Up Application
Hongliang Wang, Yang Chen, Yan-Fei Liu, Jahangir Afsharian, Zhihua (Alex) Yang, *Queen's University, Canada; Murata Power Solutions, Canada*

4:25PM | Design Considerations for a High Efficiency 3 kW LLC Resonant DC/DC Transformer
Qiong Wang, Xuning Zhang, Rolando Burgos, Dushan Boroyevich, Adam White, Mustansir Kheraluwala, *Virginia Tech, United States; UTC Aerospace Systems, United States*

4:50PM | A High-Efficiency Hybrid Series Resonant DC-DC Converter with Boost Converter as Secondary for Photovoltaic Applications
Xiaonan Zhao, Lanhua Zhang, Xueshen Cui, Cong Zheng, Chung-Yi Lin, Yu-Chen Liu, Jih-Sheng Lai, *Virginia Tech, United States*

5:15PM | Accurate Modeling and Design of LLC Resonant Converter with Planar Transformers
Navid Shafiei, Martin Ordonez, Samuel Robert Cove, Marian Craciun, Chris Botting, *University of British Columbia, Canada; Delta-Q Technologies Corp., Canada*

S89 Multi-Level Converter Applications

Room: 524C
Chairs: Maryam Saeedifard, Zeljko Pantic

4:00PM | DVR with Five-Level Converter based on Three- and Two-Level Legs Connections
Gregory A.A. Carlos, Euzeli C. dos Santos Jr., Reuben P.R. Sousa, Cursino B. Jacobina, Luciano M. Barros, Alexandre C. Oliveira, *Federal Institute of Alagoas, Brazil; Federal University of Campina Grande, Brazil; Indiana University-Purdue University Indianapolis, United States*

4:25PM | Operating and Control of Cascaded Photovoltaic Systems Suffering Module-Mismatch
Cheng Wang, Kai Zhang, Liming Liu, Wenxin Liu, *Huazhong University of Science and Technology, China; ABB Inc., United States; Lehigh University, United States*

4:50PM | Experimental Verification of TSBC-Based Electrical Drives when the Motor Frequency is Passing through, or Equal to, the Supply Frequency
Wataru Kawamura, Yuto Chiba, Makoto Hagiwara, Hirofumi Akagi, *Tokyo Institute of Technology, Japan*

5:15PM | A Novel Modulation Method of the Full Bridge Three-Level LLC Resonant Converter for Battery Charger of Electrical Vehicles
Hiroyuki Haga, Fujio Kurokawa, *Shindengen Electric Manufacturing Co., Ltd., Japan; Nagasaki University, Japan*

S90 Three-Phase Converter Modeling and Analysis

Room: 520F
Rolando Burgos, Yasuyuki Nishida

4:00PM | Analysis of Freewheeling State in Z-source Inverter under Three-phase Shoot-through Mode
Qianfan Zhang, Shuai Dong, Chunyang Zhao, Haole Wang, Shukang Cheng, Rui Wang, *Harbin Institute of Technology, China*

4:25PM | State Observer for Sensorless Control of a Grid-Connected Converter Equipped with an LCL Filter: Direct Discrete-Time Design
Jarno Kukkola, Marko Hinkkanen, *Aalto University, Finland*

4:50PM | Equivalence of Generalized State-Space Averaging with DQ Modelling Methods in a Balanced Three-Phase System
Alexey Bodrov, Yoann Nauel, Rebecca Todd, Judith Apsley, *University of Manchester, United Kingdom*

5:15PM | Stability Control for LC-L Filter based Load Side Converter of BDFG Ship Shaft Power Generation System without Extra Damping
Meilin Wang, Hua Lin, Fei Gong, Hongbin Yang, Xingwei Wang, *Huazhong University of Science and Technology, China*

S91 Reliability Analysis and Improvement

Room: 521AB
Chairs: Axel Mertens, Remus Teodorescu

4:00PM | A Novel Fault-Tolerant Control Scheme for Shunt Active Power Filter with High Reliability
Qunwei Xu, Yue Wang, Mian Wang, Jinxiang Zhan, Guozhu Chen, *Zhejiang University, China*

4:25PM | Capacitor Aging Detection in DC-DC Converter Output Stage
Janne Hannonen, Jari Honkanen, Juha-Pekka Ström, Tommi Kärkkäinen, Pertti Silventoinen, Samuli Räisänen, *Lapppeenranta University of Technology, Finland; Powernet Oy, Finland*

4:50PM | A New Approach based on Flatness Control to Improve Reliability of Parallel Connected Inverters
A. Shahin, S. Eskander, H. Moussa, J.-P. Martin, B. Nahid-Mobarakeh, S. Pierfederici, *Mansoura University, Egypt; University of Lorraine, France*

5:15PM | Reliability-Oriented Switching Frequency Analysis for Modular Multilevel Converter (MMC)
Vahid Najmi, Jun Wang, Rolando Burgos, Dushan Boroyevich, *Virginia Tech, United States*

S92 Switched Reluctance Machines

Room: 520B
Chairs: Akira Chiba, Avoki Omekanda

4:00PM | A Relationship of Radial Force Sum and Current Waveforms in Switched Reluctance Motor for Noise Reduction
Noboru Kurihara, Akira Chiba, Kentaro Yamada, Akihiko Souda, *Tokyo Institute of Technology, Japan; Komatsu Ltd., Japan*

4:25PM | Concentrated Winding Segmented Rotor Switched Reluctance Machine (SRM) using Three-Phase Standard Inverters
Md Ashfanoor Kabir, Iqbal Husain, *North Carolina State University, United States*

4:50PM | Design of a Switched Reluctance Machine Assisted by DC Field Windings for a Turbo Blower
Jin Hong, Hongsik Hwang, Jeonghyun Cho, Cheewoo Lee, *Pusan National University, Korea (South)*

5:15PM | Performance Comparison of Switched Reluctance Motor with Sinusoidal and Conventional Excitations
V. Rallabandi, S. Mallampalli, R. Rahul, D.A. Torrey, *GE Global Research, India; GE Global Research, United States*

S93 Design and Modeling of Electric Machines II

Room: 520C
Chairs: Mircea Popescu, Elena Lomonova

4:00PM | Design and Performance Characterization of a Novel Low-Pole Dual-Stator Flux Switching Permanent Magnet Machin
Yingjie Li, Dheeraj Bobba, Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

4:25PM | Fast Multi-Objective CMODE-Type Optimization of Electric Machines for Multicore Desktop Computers
Alireza Fatemi, Dan M. Ionel, Nabeel A.O. Demerdash, Thomas W. Nehl, *Marquette University, United States; General Motors Corporation, United States*

4:50PM | Design Methodology of a Brushless IPM Machine for a Zero-Speed Injection based Sensorless Control
J. Godbehere, R. Wrobel, D. Drury, P.H. Mellor, *University of Bristol, United Kingdom*

5:15PM | Analytical Model for the Minimization of Torque Ripple in Permanent Magnets Assisted Synchronous Reluctance Motors Through Asymmetric Rotor Poles
Alejandro J. Piña, Haiwei Cai, Yazan Alsmadi, Longya Xu, *Ohio State University, United States*

S94 PM and IPM Motor Drives III

Room: 520D
Chairs: Fabio G. Capponi, A.J. Marques Cardoso

4:00PM | Comparison of Carrier Signal Injection Methods for Sensorless Control of PMSM Drives
P.L. Xu, Z.Q. Zhu, *University of Sheffield, United Kingdom*

4:25PM | Comparison of Rotor Position Estimation Performance in Fundamental-Model-Based Sensorless Control of PMSM
Younggi Lee, Yong-Cheol Kwon, Seung-Ki Sul, *Seoul National University, Korea (South)*

4:50PM | Beatless Control in Over-Modulation Range for Permanent Magnet Synchronous Motor Drives
Dongsheng Li, Yasuo Notohara, Wataru Hatsuse, Kenji Tamura, Tatsuo Ando, *Hitachi Ltd., Japan; Hitachi Appliances, Inc., Japan*

5:15PM | Analysis of Magnetizing Trajectories for Variable Flux PM Synchronous Machines Considering Voltage, High Speed Capability, Torque Ripple, and Time Duration
Brent S. Gagas, Kensuke Sasaki, Takashi Fukushige, Apoorva Athavale, Takashi Kato, Robert D. Lorenz, *University of Wisconsin-Madison, United States; Nissan Motor Co., Ltd., Japan*

S95 Magnetics II

Room: 519B
Chairs: Charlie Sullivan, Yehui Han

4:00PM | High-Frequency, High-Current Transformer Designs for Silicon Carbide based LLC Converters
Vishnu Mahadeva Iyer, Satish Prabhakaran, Pradeep Vijayan, *GE Global Research, India; GE Global Research, United States*

4:25PM | Measurements and Performance Factor Comparisons of Magnetic Materials at High Frequency
Alex J. Hanson, Julia A. Belk, Seungbum Lim, David J. Perreault, Charles R. Sullivan, *Massachusetts Institute of Technology, United States; Thayer School of Engineering at Dartmouth, United States*

4:50PM | Design of Optimized Coupling Factor for Minimum Inductor Current Ripple in Rapid EV Charger Systems using Multi-Winding Coupled Inductor
Taewon Kang, Yongsug Suh, *Chonbuk National University, Korea (South)*

5:15PM | Power Losses Calculations in Windings of Gapped Magnetic Components: The i2D Method Applied to Flyback Transformers
Fermin A. Holguin, Roberto Prieto, Rafael Asensi, Jose A. Cobos, *Universidad Politécnica de Madrid, Spain*

S96 Thermal Management

Room: 520E
Chairs: Adam Skorek, Alan Mantooth

4:00PM | Enhancement of Electric Motor Thermal Management through Axial Cooling Methods: A Materials Approach
Cody Rhebergen, Berker Bilgin, Ali Emadi, Elizabeth Rowan, Jason Lo, *McMaster University, Canada; Natural Resources Canada, Canada*

4:25PM | Increasing Windings Efficiency at High Frequencies: Hollow Conductors and Clad Metals Round Conductors
Timothe Delaforge, Herve Chazal, Jean-Luc Schanen, Robert J. Pasterczyk, *Grenoble Electrical Engineering Laboratory, France; Schneider Electric ITB, France*

4:50PM | Evaluating Different Implementations of Online Junction Temperature Sensing for Switching Power Semiconductors
He Niu, Robert D. Lorenz, *University of Wisconsin-Madison, United States*

5:15PM | A Simple Approach on Junction Temperature Estimation for SiC MOSFET Dynamic Operations within Safe Operating Area
Yuan Zhang, Yung C. Liang, *National University of Singapore, Singapore*

S97 Emerging Technologies

Room: 518C
Chairs: Huang-Jen Chiu, Carl N M Ho

4:00PM | MVDC Microgrids enabled by 15kV SiC IGBT based Flexible Three Phase Dual Active Bridge Isolated DC-DC Converter
Awneesh Tripathi, Krishna Mainali, Sachin Madhusoodhanan, Dhaval Patel, Arun Kadavelugu, Samir Hazra, Subhashish Bhattacharya, Kamalesh Hatua, *North Carolina State University, United States; IIT Madras, India*

4:25PM | Implementation Aspects of On-Chip Printed Micro Heat Sinks for Power Semiconductors
Marcus Conrad, Andrei Diatlov, Rik W. De Doncker, *RWTH Aachen University, Germany; Fraunhofer ILT, Germany*

4:50PM | Analysis and Design of Current-Fed (L)(C) (LC) Converter for Inductive Wireless Power Transfer (IWPT)
Suvendu Samanta, Akshay Kumar Rathore, *National University of Singapore, Singapore*

5:15PM | A High-Frequency Current-Output-Type Inverter aimed for Wireless Power Transmission System
Shun Suzuki, Toshihisa Shimizu, *Tokyo Metropolitan University, Japan*

SS6 Design of Integrated Machines and Drives

Room: 524A
Chairs: Ping Zhou, Dan M. Ionel

4:00PM | Integrating Motors and Drives in the Oil and Gas Industry
David Torrey, *General Electric Corporate R&D, USA*

4:25PM | Integrated Design of Electrical Machines and Drives for Electric and Hybrid-electric Vehicles
Constantin Stancu, *General Motors, USA*

4:50PM | Electromagnetic and Thermal Analysis of Electric Motors with Complex Duty Cycles – Case Studies from Servomotors and Formula-E
David Staton, *Motor Design Ltd., UK*

Thursday, September 24 8:30AM – 10:10AM

S98 Solar PV Technologies

Room: 519A
Chairs: Alireza Bakhshai, Bilal Akin

8:30AM | Solar PV Array Fed Water Pumping using BLDC Motor Drive with Boost-Buck Converter
Rajan Kumar, Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, *Indian Institute of Technology Delhi, New Delhi, India; ETS, Canada*

8:55AM | Multi-Timescale Modelling for the Loading Behaviours of Power Electronics Converter
Ke Ma, Frede Blaabjerg, *Aalborg University, Denmark*

9:20AM | Peculiar Dynamics of the Stand-Alone Current Source Converter based Photovoltaic System
Mehdy Khayamy, Olorunfemi Ojo, *Tennessee Technology University, United States*

9:45AM | Auto-Inspection and Permitting with a PV Utility Interface (PUI) for Residential Plug-and-Play Solar Photovoltaic Unit
Md Tanvir Arafat Khan, Gregory Norris, Ritwik Chattopadhyay, Iqbal Husain, Subhashish Bhattacharya, *North Carolina State University, United States*

S99 HVDC and FACTS III

Room: 518A
Chairs: Thomas Wu, JinJun Liu

8:30AM | Design, Analysis and Experimental Evaluation of a Virtual-Synchronous-Machine-based STATCOM with LCL Filter
Chi Li, Rolando Burgos, Igor Cvetkovic, Dushan Boroyevich, Lamine Mili, *Virginia Tech, United States*

8:55AM | Analysis and Mitigation of Instabilities Originated from DC-Side Resonances in VSC-HVDC Systems
Gustavo Pinares, Massimo Bongiorno, *Chalmers University of Technology, Sweden*

9:20AM | A DC Controller for Continuous Variable Series Reactors (CVSRs)
Sheng Zheng, Jingxin Wang, Fei Yang, Fred Wang, Leon M. Tolbert, Daniel J. Costinett, *University of Tennessee, United States*

9:45AM | A Novel Decentralized Control Strategy for MultiTerminal HVDC Transmission Grids
Georgios Stamatiou, Massimo Bongiorno, *Chalmers University of Technology, Sweden*

S100 Stability and Power Quality I – Stability Analysis

Room: 518B
Chairs: Yogesh Patel, Hui Li

8:30AM | Stability Analysis of Harmonic Compensation System under Weak Grid Conditions
Hui Zhou, Jianjun Sun, Wei Hu, Yiming Jiang, Xiaoming Zha, Minghai Gao, Lifeng Qu, *Wuhan University, China; Keliyuan Company, China*

8:55AM | Dynamic Stability Analysis of Power Network
Sudip K. Mazumder, Eduardo Pilo de la Fuente, *University of Illinois-Chicago, United States; EPRail Research and Consulting, Spain*

9:20AM | A Unified Impedance-Based Stability Criterion (UIBSC) for Paralleled Grid-Tied Inverters using Global Minor Loop Gain (GMLG)
Qing Ye, Ran Mo, Yanjun Shi, Hui Li, *Florida State University, United States*

9:45AM | Small-Signal State-Space Modeling of Modular Multilevel Converters for System Stability Analysis
Gilbert Bergna Diaz, Jon Are Suul, Salvatore D'Arco, *SINTEF Energy Research, Norway; Norwegian University of Science and Technology, Norway*

S101 Power Quality and Stability

Room: 518C
Chairs: Yongsug Suh, John Lam

8:30AM | Passivity Enhancement of Grid-Tied Converter by Series LC-Filtered Active Damper
Haofeng Bai, Xiongfei Wang, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark*

8:55AM | A Fuzzy Reasoning Approach for Optimal Location and Sizing of Shunt Capacitors in Radial Power Systems
Yesim A. Baysal, Ismail H. Altas, *Karadeniz Technical University, Turkey*

9:20AM | Electric Springs for Improving Transient Stability of Micro-grids in Islanding Operations
Shuo Yan, Xiao Luo, Siew-Chong Tan, S.Y. Ron Hui, *University of Hong Kong, Hong Kong; Imperial College London, United Kingdom*

9:45AM | Voltage Regulation using a Permanent Magnet Synchronous Condenser with a Series Compensator
Ping Hsu, Eduard Muljadi, Ziping Wu, Wenzhong Gao, *San Jose State University, United States; National Renewable Energy Laboratory, United States; University of Denver, United States*

S102 Portable Devices and Electronics

Room: 520A
Chairs: Behrooz Mirafzal, Dong Dong

8:30AM | Universal AC Input High Density Power Adapter Design with a Clamped Series Resonant Converter
Ramanujam Ramabhadran, Xu She, Yehuda Levy, John Glaser, Ravisekhar Raju, Rajib Datta, *General Electric Global Research, United States; GE* Lighting, Israel; Efficient Power Conversion, United States

8:55AM | Bendable Transformer for Wearable Electronics
Godwin K.Y. Ho, Cheng Zhang, Byran M.H. Pong, Ron S.Y. Hui, *University of Hong Kong, Hong Kong*

9:20AM | Current Sensorless Control of a Boost-Type Switch Mode Rectifier using an Adaptive Inductor Model
Adrian Engel, Subhasis Nandi, Ilya Panfilov, *University of Victoria, Canada*

9:45AM | Using Real-Time System Design Methods to Integrate SMPS Control Software with Application Software
Avik Juneja, Alexander G. Dean, Subhashish Bhattacharya, *North Carolina State University, United States*

S103 DC-DC Isolated Converters I

Room: 524B
Chairs: Fred Lee, Brandon Pierquet

8:30AM | Design and Implementation of a Novel Interleaved Flyback Converter with Leakage Energy Recycled
Chih-Hung Wu, Tsrong-Juu Liang, Kai-Hui Chen, Wen-Yu Huang, Po-Yen Lin, Yi-Ju Lu, Jhih-Sian Li, *National Cheng Kung University, Taiwan*

8:55AM | Flyback Lossless Passive Snubber
Mehdi Mohammadi, Martin Ordonez, *University of British Columbia, Canada*

9:20AM | Analysis and Design of Passive Components for Interleaved Flyback Converter with Integrated Transformer
Masataka Ishihara, Shota Kimura, Wilmar Martinez, Masayoshi Yamamoto, *Shimane University, Japan*

9:45AM | Center-Tapped Transformer based Bidirectional DC-DC Converter with Wide Input Voltage Range
Xiaofeng Sun, Yanfeng Shen, Wuying Li, Baocheng Wang, Lu Wang, Xin Li, *Yanshan University, China*

S104 AC-AC Converters

Room: 524C
Chairs: Shashank Krishnamuthy, Luca Zarri

8:30AM | Three-Phase/Single-Phase Quasi-Z-Source Matrix Converter: Circuit Topology, Model, and Analysis
Ning Nie, Yushan Liu, Baoming Ge, Haitham Abu-Rub, *Beijing Jiaotong University, China; Texas A&M University at Qatar, Qatar; Texas AM University, United States; Qatar Environment and Energy Research Institute, Qatar*

8:55AM | Constant Speed Control for Reverse Matrix Converter under Variable Input Conditions
Yeongsu Bak, Eunsil Lee, Yongsoo Cho, Kyo-Beum Lee, *Ajou University, Korea (South)*

9:20AM | Investigation of Three-Phase AC-DC-AC Multilevel Nine-Leg Converter
Ayslan C.N. Maia, Cursino B. Jacobina, Nayara B. Freitas, Montie A. Vitorino, *Federal University of Campina Grande, Brazil; Federal Institute of Alagoas, Brazil*

9:45AM | Hybrid Single-Phase AC-AC Double-Star Chopper-Cells (DSCC) Converters with Modulation and DC-Link Voltage Ripple Improvement
Italo Roger F.M.P. Da Silva, Alexandre C. Oliveira, Cursino B. Jacobina, *Federal University of Campina Grande, Brazil*

S105 Converter Filtering and Thermal Aspects

Room: 520E
Chairs: Charlie Sullivan, Saleh Saleh

8:30AM | Electromagnetic Interference Issues of Power Electronics Systems with Wide Band Gap Semiconductor Devices
Firuz Zare, Dinesh Kumar, Marian Lungeanu, Aupke Andreas, *Danfoss Drives A/S, Denmark*

8:55AM | An Integrated Inductor for Parallel Interleaved VSCs Connected in a Whiffletree Configuration
Ghanshyamsinh Gohil, Lorand Bede, Remus Teodorescu, Tamas Kerekes, Frede Blaabjerg, *Aalborg University, Denmark*

9:20AM | Modulation Schemes with Enhanced Switch Thermal Distribution for Single-Phase AC-DC-AC Reduced-Switch Converters
Zian Qin, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark*

9:45AM | Pulse Pattern Modulated Strategy for Harmonic Current Components Reduction in Three-Phase AC-DC Converters
Pooya Davari, Firuz Zare, Frede Blaabjerg, *Aalborg University, Denmark; Danfoss Power Electronics A/S, Denmark*

S106 Grid-Connected Converter Control

Room: 520F
Chairs: Enrico Santi, Raja Ayyanar

8:30AM | A Novel Strategy to Achieve Distributed Control and Redundancy for Input-Series-Output-Parallel Inverter System
Le Shen, Tianzhi Fang, Wei He, Xinbo Ruan, *Nanjing University of Aeronautics and Astronautics, China*

8:55AM | Control Strategy for Seamless Transfer Between Island and Grid-Connected Operation for a Dual-Mode Photovoltaic Inverter
Xiao Li, Haiyu Zhang, Robert Balog, *Texas A&M University, United States*

9:20AM | Low-Cost Digital Realization of Phase Synchronization for Grid Tied Micro Inverter
Sanjay Tolani, Tuhin Subhra Sasmal, Parthasarathi Sensarma, *Indian Institute of Technology Kanpur, India*

9:45AM | Enhancing the Frequency Adaptability of Periodic Current Controllers for Grid-Connected Power Converters
Yongheng Yang, Keliang Zhou, Frede Blaabjerg, *Aalborg University, Denmark; University of Glasgow, United Kingdom*

S107 Power Electronics in EV

Room: 521AB
Chairs: Chris Mi, Rik DeDoncker

8:30AM | Development of a Power Dense and Environmentally Robust Traction Power Inverter for the Second-Generation Chevrolet VOLT Extended-Range EV
Mohammad Anwar, S.M.N. Hasan, Mehrdad Teimor, Mark Korich, Monty B. Hayes, *General Motors, United States; Delphi Electronics and Safety, United States*

8:55AM | Current Ripple Reduction in 4kW LLC Resonant Converter based Battery Charger for Electric Vehicles
Chaohui Liu, Jiabin Wang, Kalhana Colombage, Chris Gould, Bhaskar Sen, Dave Stone, *University of Sheffield, United Kingdom*

9:20AM | Control and Optimization Strategies for Interleaved DC-DC Converters for EV Battery Charging Applications
Marco Jung, Georgios Lempidis, Daniel Hölsch, Jonas Steffen, *Fraunhofer IWES, Germany*

9:45AM | Interleaved Active Clump Forward Converter with Novel Integrated Magnetic Components
Shota Kimura, Shogo Aoto, Masataka Ishihara, Jun Imaoka, Masayoshi Yamamoto, *Shimane University, Japan*

S108 Solid-State Transformer and MMC

Room: 524A
Chairs: Dushan Boroyevich, Subhashish Bhattacharya

8:30AM | Space-Vectors based Hierarchical Model Predictive Control for a Modular Multilevel Converter
Lang Huang, Xu Yang, Xin Ma, Bin Zhang, Liang Qiao, Mofan Tian, *Xi'an Jiaotong University, China*

8:55AM | Delta-Connected Cascaded H-Bridge Converter Application in Unbalanced Load Compensation
Ping-Heng Wu, Hsin-Chih Chen, Yi-Ting Chang, Po-Tai Cheng, *National Tsing Hua University, Taiwan*

9:20AM | A New SST Topology Comprising Boost Three-Level AC/DC Converters for Applications in Electric Power Distribution Systems
Luciano A. Garcia Rodriguez, Juan Carlos Balda, Adithya Mallela, Andrés Escobar-Mejía, *University of Arkansas, United States; Universidad Tecnológica de Pereira, Colombia*

9:45AM | Adding Capacity to an Existing Electric Power Distribution Network using a Solid State Transformer System
Jorge Ramos-Ruiz, Harish Krishnamoorthy, Prasad Enjeti, *Texas A&M University, United States*

S109 Fractional Slot Machines

Room: 520B
Chairs: Nicola Bianchi, Rakib Islam

8:30AM | Performance Comparison of Fractional Slot Concentrated Winding Spoke Type Synchronous Motors with Different Slot-Pole Combinations
Enrico Carraro, Nicola Bianchi, Sunny Zhang, Matthias Koch, *University of Padova, Italy; Brose Fahrzeugteile GmbH & Co. KG, Germany*

8:55AM | Inductances of a Fractional-Slot Concentrated-Winding Interior PM Synchronous Machine Considering Effects of Saturation and Cross Magnetization
A. Pouramin, R. Dutta, M.F. Rahman, D. Xiao, *University of New South Wales, Australia*

9:20AM | High Torque Density Ferrite Permanent Magnet Vernier Motor Analysis and Design with Demagnetization Consideration
Zhentao S. Du, Thomas A. Lipo, *University of Wisconsin-Madison, United States*

9:45AM | Low Cost PM Synchronous Servo-Applications Employing Asynchronous-Motor Frame
Claudio Bianchini, Matteo Davoli, Gianmario Pellegrino, Fabio Immovilli, Emilio Lorenzani, *University of Modena and Reggio Emilia, Italy; Politecnico di Torino, Italy*

S110 Materials and Manufacturing Issues of Electric Machines II

Room: 520C
Chairs: Annette Muetze, Rafal Wrobel

8:30AM | Epstein Frame Measurement based Determination of Original Non-Degraded and Fully Degraded Magnetic Characteristics of Material Submitted to Laser Cutting
Madeleine Bali, Herbert De Gersem, Annette Muetze, Graz *University of Technology, Austria; Darmstadt University of Technology, Germany*

8:55AM | Detection of Lamination Faults from Rotating Magnetic Fields
J.C. Akiror, P. Pillay, A. Merkhouf, *Concordia University, Canada; Hydro-Quebec Research Institute, Canada*

9:20AM | Computationally Efficient Method for Identifying Manufacturing Induced Rotor and Stator Misalignment in Permanent Magnet Brushless Machines
Mark Thiele, Greg Heins, *Regal Beloit, Australia*

9:45AM | A Simplified Numerical Approach to Analyze Magnet Defects in Permanent Magnet Synchronous Motors
Mohsen Zafarani, Taner Goktas, Bilal Akin, *University of Texas at Dallas, United States*

S111 PM and IPM Motor Drives IV

Room: 520D
Chairs: Brij N. Singh, Bilal Akin

8:30AM | Sensitivity Analysis of High Frequency Signal Injection based Temperature Estimation Methods to Machine Assembling Tolerances
David Reigosa, Daniel Fernandez, Tsutomu Tanimoto, Takashi Kato, Fernando Briz, *University of Oviedo, Spain; Nissan Motor Co., Ltd., Japan*

8:55AM | Comparisons of the Influence of PM Drive System with Voltage Adaptation or Machine Winding Reconfiguration on HEV/EV Application
Lei Hao, Chandra Namuduri, Suresh Gopalakrishnan, Chad Freitas, *General Motors, United States*

9:20AM | Global Loss Minimization Control of PMSM Considering Cross-Coupling and Saturation
Hao Ge, Berker Bilgin, Ali Emadi, *McMaster University, Canada*

9:45AM | Analytical Design of Flux-Weakening Voltage Regulation Loop in IPMSM Drives
Nicola Bedetti, Sandro Calligaro, Roberto Petrella, *Gefran s.p.a., Italy; University of Udine, Italy*

S112 Gate Drive Technologies I

Room: 519B
Chairs: Pradeep Shenoy, Huai Wang

8:30AM | Analytical Loss Model for Power Converters with SiC MOSFET and SiC Schottky Diode Pair
Kang Peng, Soheila Eskandari, Enrico Santi, *University of South Carolina, United States*

8:55AM | Effect of Load Parasitics on the Losses and Ringing in High Switching Speed SiC MOSFET based Power Converters
Sam Walder, Xibo Yuan, *University of Bristol, United Kingdom*

9:20AM | A High Temperature De-saturation Protection and Under Voltage Lock Out Circuit for SiC MOSFET
Feng Qi, Longya Xu, Bo Zhao, Zhe Zhou, *Ohio State University, United States; Smart Grid Research Inst. of SGCC, China*

9:45AM | Challenges in Switching Waveforms Measurement for a High-Speed Switching Module
C.F. Tong, A. Nawawi, Yitao Liu, Shan Yin, K.J. Tseng, Yong Liu, K.Y. See, A. Sakanova, Rejeki Simanjorang, C.J. Gajanayake, A. Gupta, *Rolls-Royce at NTU Corporate Lab, Singapore; Nanyang Technological University, Singapore; Rolls-Royce Singapore Pte. Ltd, Singapore*

S113 Energy Storage Systems II

Room: 519A
Chairs: Akshay Kumar Rathore, Ali Elrayyah

10:30AM | Estimation and Control of Battery Charging Current for the Asymmetrical Z-Source Topology in the HESS Application
Zipeng Liang, Sideng Hu, Senjun Hu, Wuhua Li, Xiangning He, *Zhejiang University, China*

10:55AM | An SOC Estimation Method based on Sliding Mode Observer and the Nernst Equation
Fengqi Chang, Zedong Zheng, *Tsinghua University, China*

11:20AM | Performance Model for High-Power Lithium Titanate Oxide Batteries based on Extended Characterization Tests
Ana-Irina Stroe, Maciej Swierczynski, Daniel-Ioan Stroe, Remus Teodorescu, *Aalborg University, Denmark*

11:45AM | Hybrid Energy Storage System for Conventional Vehicle Start-Stop Application
Emad Manla, Mohamad Sabbah, Adel Nasiri, *University of Wisconsin-Milwaukee, United States*

S114 DC Distribution and DC Microgrids I

Room: 518A
Chairs: Rolando Burgos, Xu Yang

10:30AM | A Seamless Switching Control Strategy of Photovoltaic Units in Droop-Controlled DC Microgrids
Panbao Wang, Xu Yang, Wei Wang, Guihua Liu, Dianguo Xu, *Harbin Institute of Technology, China*

10:55AM | Line Loss Optimization based OPF Strategy by Hierarchical Control for DC Microgrid
Junchao Ma, Fanbo He, Zhengming Zhao, *Tsinghua University, China*

11:20AM | A New DC-DC Power Converter Derived from the TAB for Bipolar DC Microgrids
Henrique R. Mamede, Walbermark M. dos Santos, Denizar C. Martins, *Federal University of Santa Catarina, Brazil*

11:45AM | A Multi-Terminal Power Flow Control Method for Next-Generation DC Power Network
Yoshinori Takahashi, Kenji Natori, Yukihiko Sato, *Chiba University, Japan*

S115 Stability and Power Quality II – Power Quality

Room: 518B
Chairs: Ali Khajehoddin, Keiji Wada

10:30AM | The Modeling and Harmonic Coupling Analysis of Multi-Parallel Connected Inverter using Harmonic State Space (HSS)
JunBum Kwon, Xiongfei Wang, Claus Leth Bak, Frede Blaabjerg, *Aalborg University, Denmark*

10:55AM | Harmonic Current Suppression using Single-Phase DG Units in Three-Phase Grids with Unbalanced Harmonic Sources
Hidehito Yoshida, Keiji Wada, Po-Tai Cheng, *Tokyo Metropolitan University, Japan; National Tsing Hua University, Taiwan*

11:20AM | Comparative Stability Study of DC Current Control Strategies for a Droop-Controlled PMSM System
Fei Gao, Serhiy Bozhko, Greg Asher, Pat Wheeler, *University of Nottingham, United Kingdom*

11:45AM | Novel Structure for Unbalance, Reactive Power and Harmonic Compensation based on VFF-RLS and SOGI-FLL in Three Phase Four Wire Power System
Mehdi Fallah, Mitra Imani, Hosein Madadi Kojabadi, Mostafa Abarzadeh, Mohammad Tavakoli Bina, Liuchen Chang, *Sahad University of Technology, Iran; KNT University of Technology, Iran; University of New Brunswick, Canada*

S116 Power Electronics for Renewable Energy Systems

Room: 518C
Chairs: Omer Onar, Hua Lin

10:30AM | Efficiency Comparison of a Single-Phase Grid-Interface Bidirectional AC/DC Converter for DC Distribution Systems
Fang Chen, Rolando Burgos, Dushan Boroyevich, *Virginia Tech, United States*

10:55AM | Experimental Evaluation of Capacitors for Power Buffering in Single-Phase Power Converters
Christopher B. Barth, Intae Moon, Yutian Lei, Shibin Qin, Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana Champaign, United States*

11:20AM | Three Phase Modular Multilevel DC/DC Converter for Power Electronic Transformer Application
Zhaohui Wang, Tianwei Wang, Junming Zhang, *Zhejiang University, China*

11:45AM | Input Impedance based Nyquist Stability Criterion for Subsynchronous Resonance Analysis in DFIG Based Wind Farm
Selam Chernet, Massimo Bongiorno, *Chalmers University of Technology, Sweden*

S117 Transportation Applications

Room: 520A
Chairs: Abraham Gegregergis, Jae-Do Park

10:30AM | The Integrated LLC Resonant Converter using Center-Tapped Transformer for On-Board EV Charger
Mingshuo Li, Qianhong Chen, Xiaoyong Ren, Yusheng Zhang, Ke Jin, Boping Chen, *Nanjing University of Aeronautics and Astronautics, China; Huawei Electronics Co., Ltd, China*

10:55AM | Onboard Unidirectional Automotive G2V Battery Charger using Sine Charging and its Effect on Li-Ion Batteries
Rashmi Prasad, Chandra Namuduri, Phillip Kollmeyer, *General Motors, United States; University of Wisconsin-Madison, United States*

11:20AM | An Integrated Onboard Charger and Accessory Power Converter using WBG Devices
Gui-Jia Su, Lixin Tang, *Oak Ridge National Laboratory, United States*

11:45AM | Evaluation of Integrated Active Filter Auxiliary Power Modules in Electrified Vehicle Applications
Ruoyu Hou, Ali Emadi, *McMaster University, Canada*

S118 DC-DC Isolated Converters II

Room: 524B
Chairs: Regan Zane, David Diaz Reigosa

10:30AM | A Hybrid Isolated Boost Converter with Reduced Output Capacitance and Integrated Auxiliary Circuit for ZVS
Nareshkumar Kummari, Shiladri Chakraborty, Souvik Chattopadhyay, *IIT Kharagpur, India*

10:55AM | Voltage Oscillation Elimination in Output Rectifier Diodes in Zero-Voltage-Switching PWM Full-Bridge Converter: An Overview
Xinbo Ruan, Li Zhang, *Nanjing University of Aeronautics and Astronautics, China*

11:20AM | An Input Current Ripple-Free Flyback-Type Converter with Passive Pulsating Ripple Cancelling Circuit
Ming-Chieh Cheng, Ching-Tsai Pan, *Chicony Power Technology Co., Ltd., Taiwan; National Tsing Hua University, Taiwan*

11:45AM | Dual Active Bridge DC-DC Converter using Both Full and Half Bridge Topologies to Achieve High Efficiency for Wide Load
Hayato Higa, Shunsuke Takume, Koji Orikawa, Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

S119 Modular Multi-Level Converters II

Room: 524C
Chairs: Jin Wang, Luca Solero

10:30AM | Enhancement on Capacitor-Voltage-Balancing Capability of a Modular Multilevel Cascade Inverter for Medium-Voltage Synchronous-Motor Drives
Yuhei Okazaki, Hitoshi Matsui, Mbugua Moses Muhoro, Makoto Hagiwara, Hirofumi Akagi, *Tokyo Institute of Technology, Japan*

10:55AM | Current Control and Branch Energy Balancing of the Modular Multilevel Matrix Converter
Dennis Karwatzki, Lennart Baruschka, Jakub Kucka, Axel Mertens, *Leibniz Universität Hannover, Germany; Protolar GmbH, Germany*

11:20AM | Optimised Phase Disposition (PD) Modulation of a Modular Multilevel Converter using a State Machine Decoder
B.P. McGrath, C.A. Teixeira, D.G. Holmes, *RMIT University, Australia*

11:45AM | A Sensorless Control Method for Capacitor Voltage Balance and Circulating Current Suppression of Modular Multilevel Converter
Hui Liu, Ke Ma, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark*

S120 Modeling and Control I

Room: 520E
Brad Lehman, Daniel Costinett

10:30AM | ZVS PWM Scheme to Suppress Ground Leakage Current of Full-Bridge Grid Inverter
Jiangbei Xi, Guangyuan Liu, Yenan Chen, Min Chen, Dehong Xu, *Zhejiang University, China*

10:55AM | High-Efficiency Switching Strategy and Neutral-Point Voltage Control in Single-Phase Three-Level Inverters
Seung-Joo Lee, June-Seok Lee, Kyo-Beum Lee, *Ajou University, Korea (South)*

11:20AM | Arbitrary Order Generalized State Space Average Modeling of Switching Converters
Uzair Javaid, Dražen Duji?, *École Polytechnique Fédérale de Lausanne, Switzerland*

11:45AM | Dynamic Modeling and Control of a Capacitor Coupled DC-DC Converter
Parikshith Channegowda, Giri Venkataramanan, *University of Wisconsin-Madison, United States*

S121 Active Power Filters and Harmonics

Room: 520F
Chairs: Poh Chiang Loh, Yongsug Suh

10:30AM | Extending Multi-Function Capabilities of Individual-Phase Decoupled P-Q Control of VSCs to include Active Filtering under Symmetrical and Asymmetrical Operating Conditions
S.M. Fazeli, W.P. Hew, N. Abd Rahim, J. Hu, B.T. Ooi, *University of Malaya, Malaysia; McGill University, Canada*

10:55AM | Three-Phase Four-Wire Shunt Active Power Filter with the Interconnection of Single-Phase and Three-Phase Converters
Alvaro de M. Maciel, Cursino B. Jacobina, Euzeli C. Santos Jr., Victor M.B. Melo, Gregory A.A. Carlos, *IFPB, Brazil; UFCG, Brazil; IFAL, Brazil; IUPUI, United States*

11:20AM | Grid Harmonics Compensation by using High-Power PWM Converter based on Combination Approach
Ye Zhang, Yun Wei Li, *University of Alberta, Canada*

11:45AM | Harmonic Suppression and Resonance Damping for Shunt APF with Selective Closed-Loop Regulation of PCC Voltage
Xinwen Chen, Ke Dai, Chen Xu, Xinchun Lin, *Huazhong University of Science and Technology, China*

S122 Solar MPPT

Room: 521AB
Chairs: Henry Chung, Jason Stauth

10:30AM | An Efficient MPPT Technique with Fixed Frequency Finite-Set Model Predictive Control
Omar Abdel-Rahim, Hirohito Funato, Junnosuke Haruna, *Aswan University, Egypt; Utsunomiya University, Japan*

10:55AM | An Experimental Investigation of Modified Predictive Hysteresis Control based MPPT Strategy for PV Applications
Omar Abdel-Rahim, Hirohito Funato, *Aswan University, Egypt; Utsunomiya University, Japan*

11:20AM | A Simple MPPT Control Method for Thermoelectric Energy Harvesting
Shota Nakayama, Keisuke Kimura, Yukito Kushino, Hirotaka Koizumi, *Tokyo University of Science, Japan*

11:45AM | Current Sensorless Maximum Power Point Tracking in a Cascaded H-Bridge Photovoltaic Power System
N.D. Marks, T.J. Summers, R.E. Betz, *University of Newcastle, Australia*

S123 Application and Control of DG Inverters

Room: 524A
Chairs: Marta Molinas, Andreas Lindemann

10:30AM | Control Strategies of Three-Phase Distributed Generation Inverters for Grid Unbalanced Voltage Compensation
Farzam Nejabatkhah, Yunwei Li, Bin Wu, *University of Alberta, Canada; Ryerson University, Canada*

10:55AM | Performance Analysis of Global Synchronous Pulsewidth Modulation for Distributed Inverters
Tao Xu, Feng Gao, Wen Duan, Ran Wei, *Shandong University, China; State Grid Jining Electric Power Supply Company, China*

11:20AM | Output Current Control for Grid Interfacing VSI under Low Switching Frequency and Distorted Grid
Hao Tian, Yun Wei Li, *University of Alberta, Canada*

11:45AM | Comparative Study of Three-Phase Grid Connected Inverter Sharing Unbalanced Three-Phase and/or Single-Phase Systems
Andrew Hintz, Rajagopal Prasanna, Kaushik Rajashekara, *University of Texas at Dallas, United States*

S124 Non-Conventional Machine Configurations II

Room: 520B
Chairs: Ali M. Bazzi, Jonathan Bird

10:30AM | Minimizing the Circulating Current of a Slotless BLDC Motor through Winding Reconfiguration
Florian Copt, Christian Koechli, Yves Perriard, *EPFL, Switzerland*

10:55AM | Analysis for Design Optimisation of Double PM-Rotor Radial Flux Eddy Current Couplers
A.S. Erasmus, M.J. Kamper, *Stellenbosch University, South Africa*

11:20AM | Design and Analysis of an Axial Flux Magnetically Geared Generator
Matthew Johnson, Matthew C. Gardner, Hamid A. Toliyat, *Texas A&M University, United States*

11:45AM | Design Concepts for a 3-Phase Axial Peg Style Electrostatic Rotating Machine Utilizing Variable Elastance
B. Ge, D.C. Ludois, *University of Wisconsin-Madison, United States*

S125 Electric Machines for Automotive Applications II

Room: 520C
Chairs: Ronghai Qu, Ed Lovelace

10:30AM | Performance and Efficiency Comparisons for Interior PM and Flux-Switching PM Machines with Ferrite Magnets for Automotive Traction Applications
James D. McFarland, T.M. Jahns, Ayman M. EL-Refaie, *University of Wisconsin-Madison, United States; GE Global Research Center, United States*

10:55AM | Multi-physics Analysis of a High Torque Density Motor for Electric Racing Cars
Mircea Popescu, Ian Foley, David A. Staton, James E. Goss, *Motor Design Ltd., United Kingdom; Equipmake Ltd., United Kingdom*

11:20AM | Wide Range Operation by Low-Voltage Inverter-Fed MATRIX Motor with Single-Layer Distributed Winding for Automobile Traction Motor
Hiroki Hijikata, Yuki Sakai, Kan Akatsu, Yoshihiro Miyama, Hideaki Arita, Akihiro Daikoku, *Shibaura Institute of Technology, Japan; Mitsubishi Electric Corporation, Japan*

11:45AM | A Novel Grain Oriented Lamination Rotor Core Assembly for a Synchronous Reluctance Traction Motor with Reduced Torque Ripple
Seyedmorteza Taghavi, Pragasen Pillay, *Concordia University, Canada*

S126 Medium Voltage and High Power Drives II

Room: 520D
Chairs: Stefan Schroeder, Jingya Dai

10:30AM | A New Sensorless Start-Up Method of LCI System for Gas-Turbine
Hyunsung An, Byung-Moon Han, Hanju Cha, *Chungnam National University, Korea (South); Myongji University, Korea (South)*

10:55AM | Modeling and Control of Neutral-Point-Clamping (NPC) Three-Level Inverters Fed Dual-Three Phase PMSM Drives
Zheng Wang, Jian Chen, Ming Cheng, *Southeast University, China*

11:20AM | Common-Mode Resonance Suppression in Transformerless PWM Current-Source Drive
Yujuan Lian, Ye Zhang, Yunwei Li, Navid Reza Zargari, Zhongyuan Cheng, *University of Alberta, Canada; Rockwell Automation, Canada*

11:45AM | Open-End Multilevel Six-Phase Machine Drive System with Five Three-Leg Converters
Ayslan C.N. Maia, Cursino B. Jacobina, Nayara B. Freitas, Italo R.F.M.P. da Silva, *Federal University of Campina Grande, Brazil; Federal Institute of Alagoas, Brazil*

S127 Other Energy Conversion Related Topics

Room: 519B
Chairs: Jean Luc Schanen, Yvan Avenas

10:30AM | Crosstalk Calibration for High Precision Power Measurement
Minghua Fu, Kaichien Tsai, Saidu Prashanth, *Texas Instruments, United States*

10:55AM | A Simple Technique to Measure the Semiconductor Switching and Conduction Losses of Inverters at Specified Chip Temperatures
Maximilian Wechsler, Markus Simon, Sebastian Edler, Johannes Pforr, *Technische Hochschule Ingolstadt, Germany*

11:20AM | Online Chip Temperature Monitoring using VCE-Load Current and IR Thermography
Pramod Ghimire, Kristian Bonderup Pedersen, Ionut Trintis, Bjørn Rannestad, Stig Munk-Nielsen, *Aalborg University, Denmark; KK Wind Solutions a/s, Denmark*

11:45AM | Electromagnetic Noise Coupling and Mitigation in Dynamic Tests of High Power Switching Devices
Chengcheng Yao, Mingzhi Leng, He Li, Lixing Fu, Fang Luo, Jin Wang, Ke Zou, Chingchi Chen, *Ohio State University, United States; Ford Motor Company, United States*

Thursday, September 24 **2:00PM – 3:40PM**

S128 MPPT for Solar PV Systems

Room: 519A
Chairs: Nathan Weise, Ojo Olorunfemi

2:00PM | Dynamic Modeling of Partial Shading on Photovoltaic Arrays
Yang Haoyuan, Yan Shuo, Siew-Chong Tan, S.Y. (Ron) Hui, *University of Hong Kong, Hong Kong*

2:25PM | A Simple Distributed Maximum P... Point Tracking (DMPPT) Scheme for Solar Photovoltaic Applica Withdrawn
Dipankar Debnath, Pronoy De, Kishore Chatterjee, *Indian Institue of Technology Bombay, India*

2:50PM | A Data-Driven Approach to the Design of Photovoltaic Maximum Power Point Tracking Techniques using Field Transient Data
Shibin Qin, Rodrigo Serna, Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States*

3:15PM | Maximum Power Point Tracking of Photovoltaic Systems using Sensorless Current-Based Model Predictive Control
Morcos Metry, Mohammad B. Shadmand, Yushan Liu, Robert S. Balog, Haitham Abu Rub, *Texas A&M University, United States; Texas A&M University at Qatar, Qatar; Qatar Environment and Energy Research Institute, Qatar*

S129 Energy Harvesting Systems

Room: 520A
Chairs: Alireza Safaee, Wei Qiao

2:00PM | Use of Active Diodes in Autonomous Sensorless Three-Phase Boost-Rectifier for Energy Harvesting Applications
Alejandro Tapia-Hernandez, Mario Ponce-Silva, Victor Hugo Olivares-Peregrino, Carlos Aguilar-Castillo, Jesus E. Valdez-Resendiz, *CENIDET, Mexico*

2:25PM | Family of Cascaded High-Voltage-Gain Bidirectional Switched-Capacitor DC-DC Converters
Song Xiong, Siew-Chong Tan, *University of Hong Kong, Hong Kong*

2:50PM | Adaptive Power Control of Wave Energy Converters for Maximum Power Absorption under Irregular Sea-State Conditions
Antoni M. Cantarellas, Daniel Remon, Cosmin Koch-Ciobotaru, Pedro Rodriguez, *Abengoa Research, Spain; Technical University of Catalonia, Spain*

3:15PM | Reconfiguration of a Wind Turbine with Hydrostatic Drivetrain to Improve Annual Energy Production
Majid Deldar, Afshin Izadian, Sohel Anwar, *Indiana University – Purdue University Indianapolis, United States*

S130 DC Distribution ans DC Microgrids II

Room: 518A
Chairs: Fernando Briz, Yongdong Li

2:00PM | Topology Simplification Method based on Switch Multiplexing Technique to Deliver DC-DC-AC Converters for Microgrid Applications
Wen Cai, Fan Yi, *University of Texas at Dallas, United States*

2:25PM | Three-Phase 4.16 kV Medium Voltage Grid Tied AC-DC Converter based on 15 kV/40 A SiC IGBTs
Sachin Madhusoodhanan, Awneesh Tripathi, Krishna Mainali, Arun Kadavelugu, Dhaval Patel, Subhashish Bhattacharya, Kamalesh Hatua, *North Carolina State University, United States; Indian Institute of Technology Madras, India*

2:50PM | Series and Shunt DC Electric Springs
Ming-Hao Wang, Kwan-Tat Mok, Siew-Chong Tan, Shu-Yuen (Ron) Hui, *University of Hong Kong, Hong Kong*

3:15PM | High-Efficiency MOSFET-Based MMC for LVDC Distribution Systems
Y. Zhong, D. Holliday, S.J. Finney, *University of Strathclyde, United Kingdom*

S131 Stability and Power Quality III – Control Strategies

Room: 518B
Chairs: Patrick Wheeler, Dianguo Xu

2:00PM | Individual-Phase Reactive Power Control Strategy with Constant DC-Capacitor Voltage Control for Active Load Balancer on Three-Phase Four-Wire Distribution Feeders
oshihiro Hisada, Su Hlaing Wint, Hiroaki Yamada, Toshihiko Tanaka, Masayuki Okamoto, Seong Ryong Lee, *Yamaguchi University, Japan; Ube College, Japan; Kunsan National University, Korea (South)*

2:25PM | Fast-Transient Repetitive Controller based Current Control Strategy for a Cascaded DSTATCOM
Yue Wang, Qunwei Xu, Yaowei Hu, Guozhu Chen, *Zhejiang University, China*

2:50PM | Real-Time Testing of Power Control Implemented with IEC 61850 GOOSE Messaging in Wind Farms Featuring Energy Storage
Diego Mascarella, Martine Chlela, Geza Joos, Philippe Venne, *McGill University, Canada; Hydro-Quebec, Canada*

3:15PM | Experimental Verification of Impedance-Based Small-Signal Stability Analysis for Single-Phase Interconnected Power Systems
Stefano Lissandron, Luca Dalla Santa, Paolo Mattavelli, Bo Wen, *University of Padova, Italy; University of Cambridge, United Kingdom*

S132 Smart Grid and Utility Applications

Room: 518C
Chairs: Iqbal Husain, Bulent Sarlioglu

2:00PM | Collection and Transmission Losses of Offshore Wind Farms for Optimization Purposes
A. Papadopoulos, S. Rodrigues, E. Kontos, T. Todorcevic, P. Bauer, R. Teixeira Pinto, *Delft University of Technology, Netherlands; CITCEA-UPC, Spain*

2:25PM | Turning Distribution Feeders into STATCOMs
Rohit Moghe, Deepak Divan, Dexter Lewis, Joe Schatz, *Varentec, Inc., United States; Southern Company, United States*

2:50PM | Control of Electric Springs with Coordinated Battery Management
Tianbo Yang, Kwan-Tat Mok, Siew-Chong Tan, S.Y. (Ron) Hui, *University of Hong Kong, Hong Kong; Imperial College London, United Kingdom*

3:15PM | SmartBuilds: An Energy and Power Simulation Framework for Buildings and Districts
Shaun Duerr, Cristinel Ababei, Dan M. Ionel, *Marquette University, United States; University of Wisconsin-Milwaukee, United States*

S133 AC-DC Multi-Phase Converters

Room: 524B
Chairs: Frede Blaabjerg, Sonny Xue

2:00PM | Soft-Switching Three-Phase Matrix based Isolated AC-DC Converter for DC Distribution System
Chushan Li, Yulin Zhong, David Xu, *Ryerson University, Canada*

2:25PM | Discontinuous Mode Sparse Dyna-C Rectifier for Efficient AC/DC Power Conversion
Ankan De, Subhashish Bhattacharya, *North Carolina State University, United States*

2:50PM | Investigation and Design of Modular Multilevel Converter in AFE Mode with Minimized Passive Elements
Alinaghi Marzoughi, Rolando Burgos, Dushan Boroyevich, Yaosuo Xue, *Virginia Tech, United States; Siemens Corporate Research, United States*

3:15PM | Analysis and Design of an Isolated Single-Stage Three-Phase Full-Bridge with Current Injection Path PFC Rectifier for Aircraft Application
S. Zhao, M. Silva, J.A. Oliver, P. Alou, O. Garcia, J.A. Cobos, *Universidad Politécnica de Madrid, Spain*

S134 Modular Multi-Level Converters III

Room: 524C
Chairs: Tom Jahns, Amel Lachichi

2:00PM | Improvement of Device Current Ratings in Modular Multilevel Converter by Utilizing Circulating Current
Mohammad Kazem Bakhshizadeh, Ke Ma, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark*

2:25PM | Design and Control of Modular Multilevel Alternate Arm Converter (AAC) with Zero Current Switching of Director Switches
Vahid Najmi, Rolando Burgos, Dushan Boroyevich, *Virginia Tech, United States*

2:50PM | Comparison Study of the Fundamental Switching Frequency Modulation for DC-DC Modular Multilevel Converter
Yuqing Cui, Yu Chen, Yong Kang, Xinying Wang, Xiaoguang Wei, *Huazhong University of Science and Technology, China; State Grid Smart Grid Research Institute, China*

3:15PM | Asymmetrical Phase-Shifting Carrier Pulse-Width Modulation for Harmonics Suppression in Cascaded Multilevel Converter under Unbalanced DC-Link Voltages
Shangsheng Li, Zezhou Yang, Qionglin Li, Jinwu Gong, Jianjun Sun, Xiaoming Zha, *Wuhan University, China; Henan Electric Power Research Institute, China*

S135 Modeling and Control II

Room: 520E
Chairs: Robert Erickson, Zhiliang Zhang

2:00PM | A Discrete Random PWM Technique for Acoustic Noise Reduction in Electric Traction Drives
Subhadeep Bhattacharya, Diego Mascarella, Geza Joos, Gerry Moschopoulos, *McGill University, Canada; University of Western Ontario, Canada*

2:25PM | SPWM-Based D-Σ Digital Control for Paralleled Three-Phase Grid-Connected Inverters
T.-F. Wu, Y.-Y. Chang, C.-H. Chang, T.-C. Zou, Y.-R. Chang, *National Tsing Hua University, Taiwan; Atomic Energy Council, Taiwan*

2:50PM | A Dual-Loop Voltage Control for Optocoupler Feedback in Capacitive Output Filter Converter
Sang-Woo Kang, Hye-Jin Kim, Bo-Hyung Cho, *Seoul National University, Korea (South)*

3:15PM | Reverse Matrix Converter for Permanent Magnet Synchronous Motor Drives using a Direct Power Control
Yeongsu Bak, Yongsoo Cho, Kyo-Beum Lee, *Ajou University, Korea (South)*

S136 Converter Control in Weak Grids

Room: 520F
Chairs: Brendan McGrath, Paolo Mattavelli

2:00PM | Stability Design of Electric Springs in Power Grids
Yun Yang, Siu-Shing Ho, Siew-Chong Tan, S.Y.R. Hui, *University of Hong Kong, Hong Kong*

2:25PM | Impact of the Voltage Feed-Forward and Current Decoupling on VSC Current Control Stability in Weak Grid based on Complex Variables
Jin Huang, Xiaoming Yuan, *Huazhong University of Science and Technology, China*

2:50PM | A Composite Compensation Method of a Grid-Connected AC/DC Converter to Improve Robustness under Weak Grid Conditions
Tiannuo Su, Wenjun Liu, Yi Wang, Jianjun Sun, Xiaoming Zha, *Wuhan University, China*

3:15PM | Analysis and Suppression of Interaction between STATCOM and Voltage-Source Inverter in Islanded Micro-Grid
Yiming Jiang, Jianjun Sun, Wei Hu, Shangsheng Li, Hui Zhou, Xiaoming Zha, *Wuhan University, China*

S137 Converters for Solar Energy

Room: 521AB
Chairs: Hui Li, Robert Pilawa

2:00PM | A Grid-Tied Photovoltaic Generation System based on Series-Connected Module Integrated Inverters with Adjustable Power Factor
Li Zhang, Kai Sun, Zhen Huang, Yun Wei Li, *Hohai University, China; Tsinghua University, China; University of Alberta, Canada*

2:25PM | High Efficient Common-Mode Current Suppression SVM Method for Three-Phase Three-Level Transformer-Less Photovoltaic Inverters
Yu Sang, Fanbo He, Liqiang Yuan, Zhengming Zhao, Shusheng Wei, Ting Lu, *Tsinghua University, China*

2:50PM | Modeling and Control of the Modular Multilevel Cascade Converter based on Chopper-Cells for Grid-Connected Photovoltaic Systems
Bruno Emmanuel de O. B. Luna, Cursino B. Jacobina, Alexandre C. Oliveira, Italo Roger F.M.P. da Silva, *Universidade Federal de Campina Grande, Brazil*

3:15PM | An Optimized Multilevel Inverter Topology with Asymmetrical DC Sources for Photovoltaic Power Generation Interface
Mohamed Amer Chaaban, Madhav Manjrekar, Prasanth Kumar Sahu, Yaosuo Xue, *University of North Carolina at Charlotte, United States; Siemens Corporation, United States*

S138 Microgrids

Room: 524A
Chairs: Josep M. Guerrero, Ron Hui

2:00PM | Comparison of Oversampled Current Controllers for Microgrid Utility Interface Converters
Simone Buso, Tommaso Caldognetto, Danilo Iglesias Brandao, *University of Padova, Italy; University of Campinas, Brazil*

2:25PM | Negative Sequence Droop Method based Hierarchical Control for Low Voltage Ride-Through in Grid-Interactive Microgrids
Xin Zhao, Mehdi Savaghebi, Josep M. Guerrero, Juan C. Vasquez, Kai Sun, Xiaohua Wu, Guoliang Chen, Libing Sun, *Aalborg University, Denmark; Tsinghua University, China; Northwestern Polytechnical University, China; Shanghai Solar Energy and Technology Co., Ltd., China*

2:50PM | A Communication-less Solution for Transient Frequency Drift Compensation on Weak Microgrids using a D-Statcom with an Energy Storage System
Ángel Navarro-Rodríguez, Pablo García, Ramy Georgious, Jorge García, *University of Oviedo, Spain*

3:15PM | A Multi-Module Current-Source Power Conditioning System (PCS) for SMES to Improve Voltage Stability of Microgrid
Zhihong Bai, Sanmin (Samuel) Wei, Dewei (David) Xu, *Zhejiang University, China; Beijing XD Hopelec Technology Co., Ltd, China; Ryerson University, Canada*

S139 Multi-Phase Machines

Room: 520B
Chairs: Dave Dorrell, Marteen Kamper

2:00PM | Design and Analysis of Two Six-Phase Hybrid-Excitation Flux-Switching Machines for Electric Vehicles
Gan Zhang, Wei Hua, Peng Su, Jinguo Liao, Ming Cheng, *Southeast University, China*

2:25PM | Six-Phase Double-Stator Inner-Rotor Axial Flux PM Machine with Novel Detached Winding
Linyuan Xiao, Jian Li, Ronghai Qu, Dawei Li, Rui Zhang, *Huazhong University of Science and Technology, China*

2:50PM | Open-End Nine-Phase Machine Conversion Systems
Victor F.M.B. Melo, Cursino B. Jacobina, Nayara B. de Freitas, *Federal University of Campina Grande, Brazil; Federal Institute of Technology of Pernambuco, Brazil*

3:15PM | Investigation on Phase Shift between Multiple-Winding Sets in Multiphase Flux-Switching Permanent Magnet Machines
Lingyun Shao, Wei Hua, Ming Cheng, *Southeast University, China*

S140 Diagnostics of Electric Machines II

Room: 520C
Chairs: Sang Bin Lee, Prabhakar Neti

2:00PM | In-Service Monitoring of Stator Slot Magnetic Wedge Condition for Induction Motors
Sangwoo Han, Junyeong Jung, Kun Wang Lee, Sang Bin Lee, Subhasis Nandi, Byunghwan Kim, Byunghee Kang, *Korea University, Korea (South); University of Victoria, Canada; Hyosung Power and Industrial Systems, Korea (South)*

2:25PM | Irreversible Demagnetization Diagnosis of IPM-Type BLDC Motor using BEMF Harmonic Characteristics based on Space Harmonics
Dong-Hyeok Kang, Hyung-Kyu Kim, Jin Hur, *University of Ulsan, Korea (South); Incheon National University, Korea (South)*

2:50PM | An Online Monitoring Method of DC-Link Capacitor's ESR and C for Boost PFC Converter
Kai Yao, Weijie Tang, Xiaopeng Bi, *Nanjing University of Science and Technology, China*

3:15PM | Analytical Modeling of Inter-Turn Short Circuit for Multiphase Fault-Tolerant PM Machines with Fractional-Slot Concentrated Windings
Fan Wu, Ping Zheng, Thomas M. Jahns, *Harbin Institute of Technology, China; University of Wisconsin-Madison, United States*

S141 Drive Utility Interface

Room: 520D
Chairs: Ernesto Inoa, Takahiro Suzuki

2:00PM | Doubly-Fed Induction Generator Enabled Power Generation in Ocean Wave Energy Conversion System
Samir Hazra, Alexander G. Dean, Subhashish Bhattacharya, *North Carolina State University, United States*

2:25PM | High Power Density Adjustable Speed Drive Topology with Medium Frequency Transformer Isolation
José Juan Sandoval, Harish Krishnamoorthy, Prasad Enjeti, Sewan Choi, *Texas A&M University, United States; Seoul National University of Science andTechnology, Korea (South)*

2:50PM | Three, Single-Phase Power Factor Correction (PFC) Boost Converter for use with Three-Phase, 3-Wire Variable Frequency Drive Systems
Mahesh Swamy, Anupama Balakrishnan, *Yaskawa America, Inc., United States*

3:15PM | A Novel Harmonic Elimination Approach in Three-Phase Multi-Motor Drives
Pooya Davari, Yongheng Yang, Firuz Zare, Frede Blaabjerg, *Aalborg University, Denmark; Danfoss Power Electronics A/S, Denmark*

S142 Gate Drive Technologies II

Room: 519B
Chairs: Juan Rivas, Daniel Costinett

2:00PM | A Novel Active Gate Drive for HV-IGBTs using Feed-Forward Gate Charge Control Strategy
Fan Zhang, Yu Ren, Mofan Tian, Xu Yang, *Xi'an Jiaotong University, China*

2:25PM | The Effect of Gate Drive Topology on Online Silicon-Carbide MOSFET Junction Temperature Sensing
He Niu, Robert D. Lorenz, *University of Wisconsin-Madison, United States*

2:50PM | A Gate Driver of SiC MOSFET with Passive Triggered Auxiliary Transistor in a Phase-Leg Configuration
Qi Zhou, Feng Gao, Tao Jiang, *Shandong University, China; Beijing Qifeng Energy-storage Technology Co. Ltd., China*

3:15PM | High Current Gate Drive Circuit with High Temperature Potential for SiC MOSFET Module
Feng Qi, Longya Xu, Bo Zhao, Zhe Zhou, *Ohio State University, United States; Smart Grid Research Inst. of SGCC, China*

TECHNICAL PROGRAM SCHEDULE

POSTER SESSIONS

Monday, September 21 **5:00PM – 6:30PM**

Wind and Energy Storage Systems

N

Room: Exhibit Hall 220E
Chairs: Yilmaz Sozer, Akshay Kumar Rathore

P101 | An Integrated Neural Approach for Maximum Power Point Tracking and Electrical Losses Minimization of Wind Generators with Induction Machines
M. Pucci, *ISSIA-CNR, Italy*

P102 | Dynamic Behaviour of a Multi-MW Wind Turbine
Bo Wang, Melanie Michon, Rob Holehouse, Kais Atallah, *Romax Technology Ltd, United Kingdom; University of Sheffield, United Kingdom*

P103 | An Analytical Method for the Response of DFIG Under Voltage Dips
Shuying Yang, Tianbao Zhou, Liuchen Chang, Riming Shao, Xie Zhen, Xing Zhang, *Hefei University of Technology, China; University of New Brunswick, Canada*

P104 | Fault Characteristics of the DFIG Rotor Inter-Turn Short Circuit Considering Inherent Imbalance and Static Eccentricity
Junqing Li, Lipeng Zhang, Weiming Shi, *North China Electric Power University, China*

P105 | Modular Multilevel Converter for Direct MVDC Connection of Offshore Wind Farms
Joseph Carr, Debrup Das, Jun Li, Jiuping Pan, Stephan Ebner, Oscar Apeldoorn, *ABB Corporate Research, United States; ABB Power Conversion, Switzerland*

P106 | Investigating Instability of the Wind Turbine Simulator with the Conventional Inertia Emulation Scheme
Weijie Li, Minghui Yin, Rui Zhou, Minghe Jiang, Yun Zou, *Nanjing University of Science and Technology, China*

P107 | Development of a 5kW Scaled Prototype of a 2.5 MW Doubly-Fed Induction Generator
Hossein Dehnavifard, Mohamed Azeem Khan, Paul Barendse, *University of Cape Town, South Africa*

P108 | Control and Emulation of Small Wind Turbines using Torque Estimators
Juan M. Guerrero, Carlos Lumbreras, David Reigosa, Pablo García, Fernando Briz, *University of Oviedo, Spain*

P109 | Development of a Computer Twins-Based Wind Farm Testbed
Yazan M. Alsmadi, Longya Xu, Aimeng Wang, *Ohio State University, United States; North China Electric Power University, China*

P110 | Grid Synchronization for a Virtual Direct Power-Controlled DFIG Wind Power System
Sam Mahmodicherati, Malik Elbuluk, Yilmaz Sozer, *University of Akron, United States*

P111 | Dual Three-Phase PMSG based Wind Energy Conversion System using 9-Switch Dual Converter
Carlos A. Reusser, Samir Kouro, Roberto Cardenas, *Universidad Tecnica Federico Santa Maria, Chile; Universidad de Chile, Chile*

P112 | Effectiveness of a GNG-Based MPPT and Related Control System for Marine Current Turbines in Unsteady Operating Conditions
L. Greco, C. Testa, M. Pucci, G. Vitale, M. Cirrincione, *INSEAN-CNR, Italy; ISSIA-CNR, Italy; University of the South Pacific, Fiji*

P113 | Experimental Investigation on an Ocean Kinetic Energy Harvester for Underwater Gliders
Wenjun Ding, Baowei Song, Zhaoyong Mao, Keyan Wang, *Northwestern Polytechnical University, China*

P114 | BEBB based Design for Underground Coal Mine Emergency Power Application
George You Zhou, Tong Wu, Lulu Zhao, Jianna Niu, Yujian Fan, *National Institute of Clean-Low Carbon Energy, China*

P115 | Boost-Zeta High Step-Up PV Module Integrated Converter
António M.S.S. Andrade, Julian C. Giacomini, Cassiano Rech, Luciano Schuch, Mário L. da S. Martins, *Federal University of Santa Maria, Brazil*

P116 | Marine Current Generation System with Embedded Maximum Point Tracking, Electrical Losses Minimization Techniques and Discontinuous PWM
M. Pucci, *ISSIA-CNR, Italy*

P117 | New MPPT Algorithm based on Indirect Open Circuit Voltage and Short Circuit Current Detection for Thermoelectric Generators
Zakariya M. Dalala, Zaka Ullah Zahid, *German Jordanian University, Jordan; Virginia Tech, United States*

P118 | Control of Doubly-Fed Induction Generators in a Multiple Wind Turbine System Operating in a Stand-Alone Mode
Dennis Kwon, Spencer Matteson, Ping Hsu, *San Jose State University, United States*

Smart Grid and Utility Applications I

W

Room: Exhibit Hall 220E
Chairs: Yongsug Suh, Dehong Xu,

P302 | SSTS-Based Soft Transfer Control Method of Motor Load under Different Residual Voltage Condition
Xueshen Cui, Zili Zhang, Haisen Zhao, Lanhua Zhang, Xiaonan Zhao, Jih-sheng Lai, *North China Electric Power University, China; Virginia Tech, United States*

P302 | Voltage Balancing Strategy Discussion on Modular Multilevel DC/DC Converter
Zhaohui Wang, Junming Zhang, *Zhejiang University, China*

P303 | Positive Sequence Detector based on Cascaded Delayed Quadrature Signal Cancellation
Manlin Chen, Li Peng, Qian Zhao, Xudong Zou, Xinying Wang, Xiaoguang Wei, *Huazhong University of Science and Technology, China; State Grid Smart Grid Research Institute, China*

P304 | Irradiance Estimation for a Smart PV Array
Henry Braun, Shwetang Peshin, Andreas Spanias, Cihan Tepedelenlioglu, Mahesh Banavar, Girish Kalyanasundaram, Devarajan Srinivasan, *Arizona State University, United States; Clarkson University, United States*

P305 | Predictive Current Control of a Current-Source Inverter with Active Damping Method |
Chunshui Du, Jiangwei Zhou, Yiwei Ma,, *Shandong University, China; University of Tennessee, United States*

P306 | Suggested Operation of Grid-Connected Lithium-Ion Battery Energy Storage System for Primary Frequency Regulation: Lifetime Perspective
Daniel-Ioan Stroe, Vaclav Knap, Maciej Swierczynski, Ana-Irina Stroe, Remus Teodorescu, *Aalborg University, Denmark*

P307 | The Real-World Challenges and Opportunities of Distributed Generation
G. Platt, S. West, T. Moore, *CSIRO Energy Flagship, Australia*

P308 | Three Phase PWM Converter for Renewable Energy System with Hybrid Mode Control to Improve Performance at Light Load Condition
Keun-Wan Koo, Cheol-Hun Kwak, Dong-Hee Kim, Byoung-Kuk Lee, *YPP Corporation, Korea (South); Sungkyunkwan University, Korea (South)*

P309 | Review on the Stochastic Nature of Photovoltaic Generation and its Impact on the Energy Systems: Why it Matters
Fabrizio Fattori, Norma Anglani, *University of Pavia, Italy*

P310 | Design and Implementation of Distributed Control Architecture of an AC-Stacked PV Inverter
Hamidreza Jafarian, Iman Mazhari, Babak Parkhideh, Saurabh Trivedi, Deepak Somayajula, Robert Cox, Shibashis Bhowmik, *University of North Carolina, United States; SineWatts Inc., United States*

P311 | Minimizing Inverter Self-Synchronization due to Reactive Power Injection on Weak Grids
Kathleen Lentijo, Daniel F. Opila, *UEC Electronics, United States; United States Naval Academy, United States*

P312 | Single-Phase Distributed Generation Synchronization with a Distorted or Weak Grid
Abdulaziz Alkuhayli, Ali Safayet, Iqbal Husain, *North Carolina State University, United States*

P313 | Short Transient Recovery of Low Voltage-Grid-Tied DC Distributed Generation
Farnaz Harirchi, M. Godoy Simões, Ahmed Al Durra, S.M. Muyeen, *Colorado School of Mines, United States; Petroleum Institue, United Arab Emirates*

P314 | Trigonometric Angle based Power Control of Cycloconverter-Type High-Frequency Link Converter for Vehicle-to-Grid Applications
Sungmin Park, Sung-Yeul Park, Michael Kelley, Matthew Tarca, *United Technologies Research Center, United States; University of Connecticut, United States; DRS Technologies, United States*

P315 | Development of a Predictive Pole-Slip Protection Function for Synchronous Generators
L. Lamont, J.A. de Kock, *North West University, South Africa*

P316 | A Transient Reactive Current Compensation for Load-Side Converter of BDFG in Stand-Alone Operation
Xingwei Wang, Zhe Wang, Hua Lin, *Huazhong University of Science and Technology, China*

P317 | LCL-Filter Design for Grid-Connected Inverter to Suppress Grid-Induced Low-Order Current Harmonics
Jinming Xu, Shaojun Xie, Jiarong Kan, *Nanjing University of Aeronautics and Astronautics, China*

P318 | A Scaled-Down Microgrid Laboratory Testbed
Yusi Liu, Chris Farnell, Kenny George, H. Alan Mantooth, Juan Carlos Balda, *University of Arkansas, United States*

P319 | Sensitive Load Voltage Compensation with a Suitable Control Method
Darlan A. Fernandes, Fabiano F. Costa, João R.S. Martins, Alberto S. Lock, Edison R.C. da Silva, Montiê A. Vitorino, *Federal University of Paraíba, Brazil; Federal University of Bahia, Brazil; Federal University of Campina Grande, Brazil*

P320 | Development of Hardware-in-the-Loop Microgrid Testbed
Bailu Xiao, Michael Starke, Guodong Liu, Ben Ollis, Philip Irminger, Aleksandar Dimitrovski, Kumaraguru Prabakar, Kevin Dowling, Yan Xu, *Oak Ridge National Laboratory, United States; University of Tennessee, United States*

P321 | New Smart-Grid Operation-Based Network Access Control
Herman Cheung, Cungang Yang, Helen Cheung, *Ryerson University, Canada*

P322 | Fault Tolerant Control of Five-Phase Permanent Magnet Assisted Synchronous Reluctance Motor based on Dynamic Current Phase Advance
Akm Arafat, Seungdeog Choi, *University of Akron, United States*

P323 | Dual-Active-Bridge Series Resonant Converter: A New Control Strategy using Phase-Shifting Combined Frequency Modulation
Duy-Dinh Nguyen, Duc Tuyen Nguyen, Toshihisa Funabashi, Goro Fujita, *Shibaura Institute of Technology, Japan*

P324 | Evaluation of Current Limiting Methods for Grid Forming Inverters in Medium Voltage Microgrids
Aris Gkountaras, Sibylle Dieckerhoff, Tevfik Sezi, *Technical University of Berlin, Germany; Siemens AG, Germany*

Uninterruptible Power Supplies

W

Room: Exhibit Hall 220E
Chairs: Ismail Altas, Saleh Saleh

P501 | Renewable Uninterruptible Power Supply System Deploying a Single-Phase Front-End Converter with Integrated PFC and DC-DC Functions
Renato S. Maciel, Augusto M. Costa, João B. Vieira Jr., Ernane A.A. Coelho, Gustavo B. Lima, Luiz C.G. Freitas, *NUPEP-FEELT-UFU, Brazil*

P502 | Stability Analysis of Instantaneous Average Current Sharing Control Strategy for Parallel Operation of UPS Modules
Peng Liu, Changsong Chen, Jiuqing Cai, Shanxu Duan, *Huazhong University of Science and Technology, China*

P503 | Adaptive Current-Sharing Control Strategy with Virtual Circulating Impedance for Parallel Operation of UPS
Jiuqing Cai, Changsong Chen, Peng Liu, Shanxu Duan, *Huazhong University of Science and Technology, China*

P504 | Design and Implementation of a DC Line-Interactive Uninterruptible Power Supply (UPS) with Load Leveling
Seyed Ahmad Hamidi, Jason S. Katcha, Adel Nasiri, *University of Wisconsin-Milwaukee, United States*

P505 | Evaluation of PWM Methods for Suppressing Circulating Current among Parallel Connected Four-Pole Inverters
Meng-Jiang Tsai, Po-Tai Cheng, *National Tsing Hua University, Taiwan*

P506 | Improvement in Input Current Waveform of High Efficiency AC-AC Converter for Online UPS
Jun-ichi Itoh, Kazuki Yoneda, Hiroki Takahashi, *Nagaoka University of Technology, Japan*

Transportation Applications

W

Room: Exhibit Hall 220E
Chairs: Meigin Mao, Ali Emadi

P701 | Multi-Tap Transformer Topologies for Improved Tolerance against Misalignment in Inductive Power Transfer Systems for Electric Vehicles
Marinus Petersen, Friedrich W. Fuchs, *Christian-Albrechts-Universität zu Kiel, Germany*

P702 | A New Current-Fed (C)(LC) (LC) Topology for Inductive Wireless Power Transfer (IWPT) Application: Analysis, Design, and Experimental Results
Suvendu Samanta, Akshay Kumar Rathore, *National University of Singapore, Singapore*

P703 | A Magnetically Enhanced Wireless Power Transfer System for Compensation of Misalignment in Mobile Charging Platforms
Devendra Patil, Mark Ditsworth, Jose Pacheco, Wen Cai, *University of Texas at Dallas, United States*

P704 | Design and Implementation of a SiC based Contactless Battery Charger for Electric Vehicles
I. Villar, U. Iruretagoyena, A. Rujas, A. Garcia-Bediaga, I. Perez de Arenaza, *IK4-IKERLAN, Spain*

P705 | Optimization of LCL Resonant Inverter in Inductive Power Transfer Systems based on High-Order Harmonics Analysis
Hao Feng, Xiaoming Zhang, Tao Cai, Shanxu Duan, Jinbo Zhao, *Huazhong University of Science and Technology, China*

P706 | Development of Mutual Inductance Formula for Misaligned Planar Circular Spiral Coils
Bryan Esteban, Nikola Stojakovic, Maher Sid-Ahmed, Narayan C. Kar, *University of Windsor, Canada*

P707 | Large Signal Stabilization Method of Constant Power Loads by Adding R Parallel Damping Filters
Xinbo Liu, Shuohan Ma, *North China University of Technology, China; China Longyuan Power Group Corporation Limited, China*

P708 | DC Railway System Emulator for Stray Current and Touch Voltage Prediction
Amr Ibrahem, Ali Elrayyah, Yilmaz Sozer, Alexis De Abreu, *University of Akron, United States*

P709 | Verification of Control Method of Multiple Power Converter to Stabilize Hydrogen Supply from Reactor Fueled by Sodium Tetrahydroborate
Keisuke Tomoda, Yuto Aisaka, Taishi Fukuzawa, Nobukazu Hoshi, Noboru Katayama, Atsuhiro Yoshizaki, Keiichi Hirata, *Tokyo University of Science, Japan; Hidric Power Systems, Japan*

P710 | An Extremum Seeking based Control Strategy for Pantograph-Catenary Contact Force of High-Speed Trains
Haikuan Jiang, Jianfeng Liu, Heng Li, Zhiwu Huang, *Central South University, China*

P711 | Implementation of a Bidirectional DC-DC in Electric Powertrains for Drive Cycles used by Medium Duty Delivery Trucks
Ali Najmabadi, Kieran Humphries, Benoit Boulet, *McGill University, Canada*

P712 | A LiFePO4 Battery Management System for Heavy-Haul Train Electrically Controlled Pneumatic Brake System Application
Xiaohui Gong, Zhiwu Huang, Kaiyang Liu, Heng Li, Weirong Liu, *Central South University, China*

P713 | Evaluation of a Module-Integrated Distributed Battery Energy Storage System
Ye Li, Yehui Han, *University of Wisconsin-Madison, United States*

P714 | Optimal Energy Management of a Battery-Supercapacitor based Light Rail Vehicle using Genetic Algorithms
Victor Isaac Herrera, Haizea Gaztañaga, Aitor Milo, Andoni Saez-de-Ibarra, Ion Etxeberria-Otadui, Txomin Nieva, *IK4-IKERLAN Technology Research Centre, Spain; CAF Power and Automation, Spain*

P715 | An Agent-Based Approach for Battery Management Systems
Feng Yang, Robin Roche, Franck Gechter, Fei Gao, Abderrafiaa Koukam, *University of Bourgogne Franche-Comté, France*

P716 | Electrical Circuit Models for Performance Modeling of Lithium-Sulfur Batteries
Vaclav Knap, Daniel-Ioan Stroe, Remus Teodorescu, Maciej Swierczynski, Tiberiu Stanciu, *Aalborg University, Denmark*

P717 | Performance Comparison of Diffusion, Circuit-Based and Kinetic Battery Models
Nikolaos Daniil, David Drury, Phil H. Mellor, *University of Bristol, United Kingdom*

P718 | Proposal of Self-Excited Wound-Field Magnetic Geared Motor for HEV Application
Masahiro Aoyama, Yoshihisa Kubota, Toshihiko Noguchi, *Shizuoka University, Japan; Suzuki Motor Corporation, Japan*

DC-DC Converters

S

Room: Exhibit Hall 220E
Chairs: Gerard Hurley, Marcello Pucci, Maja Todorovic, Alex Brissette

P901 | Switched-Inductor-Based Non-Isolated Large Conversion Ratio, Low Components Count DC-DC Regulators
Yafei Hu, Kerui Li, Zhijian Yin, Adrian Ioinovici, *Sun Yat-sen University, China; Holon Institute of Technology, Israel*

P902 | A Novel Inductor-Link Open H-Bridge Topology-Based ZCS-PWM Bidirectional DC-DC Converter for Non-Inverting Multi-Mode Voltage Regulations
Tomokazu Mishima, Mutsuo Nakaoka, *Kobe University, Japan; University of Malaya, Malaysia*

P903 | Use of Stabilizing Ramp to Eliminate Limit Cycle in Converters with Power Semiconductor Filter
Wing-to Fan, Shu-hung Chung, *City University of Hong Kong, Hong Kong*

P904 | Principle Verification Prototype Chopper using SiC MOSFET Module Developed for Partial Boost Circuit System
Yukinori Tsuruta, Atsuo Kawamura, *Yokohama National University, Japan*

P905 | Reliability-Oriented Design of LC Filter in Buck DC-DC Converters
Yi Liu, Meng Huang, Huai Wang, Xiaoming Zha, Jinwu Gong, Jianjun Sun, *Wuhan University, China; Aalborg University, Denmark*

P906 | Constant ON-Time 3-Level Buck Converter for Low Power Applications
Brian M. Cassidy, Dong Sam Ha, Qiang Li, *Virginia Tech, United States*

P907 | A Novel Switched-Capacitor based Partial Power Architecture for a 20 MHz Resonant SEPIC
Junjian Zhao, Yehui Han, *University of Wisconsin-Madison, United States*

P908 | A Quasi Zero-Current-Switching DC/DC Modular-Multilevel Converter (MMC) with LCL Circuit for DC Grids
Xinying Wang, Guangfu Tang, Xiaoguang Wei, Zhiyuan He, Xiao Ding, Yu Chen, Yuqing Cui, Yong Kang, *State Grid Smart Grid Research Institute, China; Huazhong University of Science and Technology, China*

P909 | Design of Single Switch DC-DC Converter with Parasitic Parameters
Euihoon Chung, Kyung-Hwan Lee, Yongsu Han, Jung-Ik Ha, *Seoul National University, Korea (South)*

P910 | Optimized Modulation Scheme for Isolated Bidirectional Dual Active Bridge DC-DC Converter to Minimize Current Stress in the Whole Load Range
Jun Huang, Yue Wang, Zhuoqiang Li, Wanjun Lei, *Xi'an Jiaotong University, China*

P911 | Predictive Valley-Peak Current Control of Isolated Bidirectional Dual Active Bridge DC-DC Converter
Jun Huang, Yue Wang, Zhuoqiang Li, Wanjun Lei, *Xi'an Jiaotong University, China*

P912 | An Improved Wide Input Voltage Buck-Boost + LLC Cascaded Converter
Xiaofeng Sun, Jiangfeng Qiu, Xiaohua Li, Baocheng Wang, Lu Wang, Xin Li, *Yanshan University, China*

P913 | A 110-250V 2MHz Isolated DC-DC Converter with Integrated High-Speed Synchronous Three-Level Gate Drive
Lin Cong, Hoi Lee, *University of Texas at Dallas, United States*

P914 | A Simple Control Method of Phase-Shift Full Bridge Converter to Reduce the Power Loss Under Light Load and Standby Conditions
Lei Zhao, Haoyu Li, Yanxue Yu, Yutian Wang, *Harbin Institute of Technology, China*

P915 | A Novel Hybrid ZVZCS Full-Bridge Converter Suitable for Wide Input Voltage Range
Guipeng Chen, Yan Deng, Jie Dong, Xiangning He, Yousheng Wang, *Zhejiang University, China*

P916 | Phase Modulated LCCL Resonant DC-DC Converter for Boost Applications
Utsab Kundu, Supratik Sikder, Parthasarathi Sensarma, *Indian Institute of Technology Kanpur, India*

P917 | Harmonic-Based Determination of Soft Switching Boundaries for 3-Level Modulated Single-Phase Dual Active Bridge Converters
J. Riedel, D.G. Holmes, C. Teixeira, B.P. McGrath, *Robert Bosch (SEA) Pte Ltd, Singapore; RMIT University, Australia*

P918 | Mode Analysis and Optimum Design of Bidirectional CLLC Resonant Converter for High-Frequency Isolation of DC Distribution Systems
Zheng Lv, Xiangwu Yan, Yukang Fang, Lei Sun, *North China Electric Power University, China; Agricultural University of Hebei, China*

P919 | Analysis of a ZVS DC-DC Full-Bridge Converter with Natural Hold-Up Time
Ramprakash Kathiresan, Parthiban T., Pritam Das, Majid Pahlevaninezhad, *National University of Singapore, Singapore; Queen's University, Canada*

P920 | Integrated Dual-Output Synchronous DC-DC Buck Converter
Guipeng Chen, Jie Dong, Yan Deng, Xiangning He, Yousheng Wang, *Zhejiang University, China*

Converter Control and Applications I

S

Room: Exhibit Hall 220E
Chairs: Martin Ordonez, Jun Li, Sonny Xue, Sandeep Bala

P1101 | Optimal Variable Switching Frequency Scheme to Reduce Combined Switching Loss and Inductor Core Loss of Single Phase Grid Connected Inverter
Yinglai Xia, Raja Ayyanar, *Arizona State University, United States*

P1102 | Current Regulation and Fault Tolerance in Double-Delta Sourced Transformer
Yongsoon Park, Jeong-Mock Yoo, Seung-Ki Sul, *Seoul National University, Korea (South)*

P1103 | Dead-Time Compensation based on Pole Voltage Measurement
Seung-Jun Chee, Jaesuk Kim, Seung-Ki Sul, *Seoul National University, Korea (South)*

P1104 | Finite States Modulated Model Predictive Control for Active Power Filtering Systems
Roberto Rabbeni, Luca Tarisciotti, Alberto Gaeta, Andrea Formentini, Pericle Zanchetta, Marcello Pucci, Marco Degano, Marco Rivera, *University of Palermo, Italy; University of Nottingham, United Kingdom; CNR - ISSIA UOS Palermo, Italy; Universidad de Talca, Chile*

P1105 | A Generalized Control Scheme Derivation Approach for Front-End DC-DC Converters in Two-Stage Inverters
Li Zhang, Xinbo Ruan, Xiaoyong Ren, *Nanjing University of Aeronautics and Astronautics, China*

P1106 | Analysis of the Low-Frequency Oscillation Phenomenon in Constant-on-Time Controlled Boost Converter
Jinping Wang, Liangkui Hou, Liang Zhang, Sheng Xiang, Yigang He, *Hefei University of Technology, China*

P1107 | Minimising Conversion Losses in Isolated Multisource DC-DC Converters with Non-Negligible Resistive Components
Claudia Fischer, Sébastien Mariéthoz, Manfred Morari, *ETH Zurich, Switzerland; BFH Biel, Switzerland*

P1108 | Model Predictive Control of Dual-Output Nine-Switch Inverter with Output Filter
Ozan Gulbudak, Enrico Santi, *University of South Carolina, United States*

P1109 | CAN-Based Distributed Control of a MMC Optimized for Low Number of Submodules
Andrew The, Christian Bruening, Sibylle Dieckerhoff, *Technische Universität Berlin, Germany*

P1110 | Online Predictive Model Fitting Algorithm for Supply Inductance Estimation
Bilal Arif, Luca Tarisciotti, Pericle Zanchetta, Patrick Wheeler, Marco Rivera, *University of Nottingham, United Kingdom; University of Talca, Chile*

P1111 | Electrolytic Capacitorless 3-Level Inverter with Diode Front End for PMSM Drive
Sehwa Choe, Seung-Ki Sul, Je-Hyung Cho, Hansol Seo, Hyun-Soo Park, *Seoul National University, Korea (South); Samsung Electronics Co., Ltd., Korea (South)*

P1112 | Multi-Objective Optimization Control of a Four-Level Hybrid-Clamped Inverter
Kui Wang, Lie Xu, Zedong Zheng, Yongdong Li, *Tsinghua University, China*

P1113 | Robust Control of Three Phase VSI with LCL Filter for Distributed Generation in Microgrids Environment
José Carlos U. Pena, Carlos A. Canesin, Leonardo P. Sampaio, *Universidade Estadual Paulista, Brazil; Universidade Tecnologica Federal do Parana, Brazil*

P1114 | Analysis and Comparison of Resonant-Based Current Controllers Implemented in Stationary Reference Frame: A Complex Pole-Zero Placement Perspective
Sizhan Zhou, Jinjun Liu, *Xi'an Jiaotong University, China*

P1115 | Investigation of a Fault-Tolerant Three-Level T-Type Inverter System
Shuai Xu, Janzhong Zhang, Jun Hang, *Southeast University, China*

P1116 | Sensitive Load Voltage Compensation with a Suitable Control Method
Darlan A. Fernandes, Fabiano F. Costa, João R.S. Martins, Alberto S. Lock, Edison R.C. da Silva, Montie A. Vitorino, *Federal University of Paraiba, Brazil; Federal University of Bahia, Brazil; Federal University of Campina Grande, Brazil*

P1117 | Unified Transient and Steady-State Boost Converter Boundary Control Law
Yue Nie, Ian P. Brown, *Illinois Institute of Technology, United States*

P1118 | Light Load Efficiency Improvement for High Frequency LLC Converters with Simplified Optimal Trajectory Control (SOTC)
Chao Fei, Fred C. Lee, Qiang Li, *Virginia Tech, United States*

P1119 | Power Losses Balancing in a Three-Level NPC Converter Driving a PMSM in an Electric Vehicle
Luiz A.C. Lopes, Nazak Soleimanpour, *Concordia University, Canada*

P1120 | A Universal Controller for Grid-Connected and Autonomous Operation of Three-Phase DC/AC Converters
Masoud Karimi-Ghartemani, Prasanna Piya, Mohammad Ebrahimi, S. Ali Khajehoddin, *Mississippi State University, United States; University of Alberta, Canada*

P1121 | A Two-Phase Buck Converter with Optimum Phase Selection for Low Power Applications
Taylor Yeago, Ji Hoon Hyun, Dong Sam Ha, Qiang Li, *Virginia Tech, United States*

P1122 | PI Parameters Design of Universal Controller for PMSG-WGS based on Per-Unit System
Meiqin Mao, Zhongyang Zhang, Yong Ding, Hanjie Shi, Liuchen Chang, *Hefei University of Technology, China; University of New Brunswick, Canada*

P1123 | Frequency Adaptive Repetitive Control of Grid-Tied Single-Phase PV Inverter
Keliang Zhou, Yongheng Yang, Frede Blaabjerg, *University of Glasgow, United Kingdom; Aalborg University, Denmark*

P1124 | ISOP DC-DC Converters Equipped 5-Level Unidirectional T-Rectifier for Aerospace Applications
Marco Di Benedetto, Alessandro Lidozzi, Luca Solero, Petar J. Grbovic, Stefano Bifaretti, *Roma Tre University, Italy; Huawei Energy Competence Center Europe, Germany; University of Tor Vergata, Italy*

P1125 | Control Strategies for a ZVT Full Bridge DC-DC Converter
Stefano Bifaretti, Sabino Pipolo, Alessandro Lidozzi, Luca Solero, *University of Rome Tor Vergata, Italy; University Roma Tre, Italy*

P1126 | Optimal Voltage Balancing Control based on Phase Shift Variation
Wim van der Merwe, Peter Hokayem, Lidia Stepanova, *ABB Corporate Research Center, Switzerland; École Polytechnique Fédérale de Lausanne, Switzerland*

P1127 | Bridged-T Voltage Control of a High Bandwidth SiC Inverter for Various Output Waveforms with/without DC Offset at Wide Range of Frequencies
Burak Tekgun, Asif Mahmood Chowdhury, Yilmaz Sozer, *University of Akron, United States*

P1128 | Auto-Tuned Minimum-Deviation Digital Controller for LLC Resonant Converters
Maryam S. Amouzandeh, Behzad Mahdavikhah, Aleksandar Prodic, Brent McDonald, *University of Toronto, Canada; Texas Instruments Incorporated, United States*

P1129 | Resonant Mechanism of Multi Grid-Connected Inverters in Distribution Power Systems
Haining Wang, Peng Zhang, Jianhui Su, Guorong Zhang, *Hefei University of Technology, China*

P1130 | Short-Circuit Fault Protection Strategy of Parallel Three-Phase Inverters
Hongliang Wang, Xunjun Pei, Yu Chen, Yong Kang, Yan-Fei Liu, *Huazhong University of Science and Technology, China; Queen's University, Canada*

P1131 | An AC Side-Active Power Decoupling Modular for Single Phase Power Converter
Hao-Ran Wang, Guo-Rong Zhu, Xiao-Bin Fu, Si-Yuan Ma, Ming Xie, Xiao-Song Li, Jing Jiang, *Wuhan University of Technology, China; Wuhan Gangdi Electric Co. Ltd., China; University of Western Ontario, Canada*

Permanent Magnet Design and Applications

E

Room: Exhibit Hall 220E
Chairs: Rajeev Vyas, Mazhural Chowdhury

P1301 | Numerical Approach for Thermal Analysis of Heat Transfer into a Very Narrow Air Gap of a Totally Enclosed Permanent Magnet Integrated Starter Generator
Ayoub Ben Nachouane, Abdenour Abdelli, Guy Friedrich, Stéphane Vivier, *IFP Énergies nouvelles, France; Laboratoire d'Électromecanique de Compiègne, France*

P1302 | A Permanent Magnet Motor with Reversible Salient Poles
Kazuto Sakai, Kouki Matsuda, *Toyo University, Japan*

P1303 | Analytical Comparison for Synchronous Reluctance and Surface Permanent Magnet Machines with Rotor Eccentricity
Hanafy Mahmoud, Nicola Bianchi, *University of Padova, Italy*

P1304 | Improved use of Rare Earth Permanent Magnet Materials and Reduction of Torque Pulsation in Interior Permanent Magnet Machines
Zhentao S. Du, Thomas A. Lipo, *University of Wisconsin-Madison, United States*

P1305 | Post-Demagnetization Characteristics of Permanent Magnet Synchronous Machines
Gilsu Choi, T.M. Jahns, *University of Wisconsin-Madison, United States*

P1306 | High-Speed Switched Reluctance Machine Design with Toroidal-Winding
Jianing Lin, Piranavan Suntharalingam, Fei Peng, Nigel Schofield, Ali Emadi, *McMaster University, Canada*

P1307 | Improvement of Rotor Structure on Irreversible Demagnetization in Double-Layered IPMSM with Dy-Less Magnet
Mitsuhiro Hirota, Masayuki Sanada, Shigeo Morimoto, Yukinori Inoue, *Osaka Prefecture University, Japan*

P1308 | Modeling and Implementation based Control of a Novel Radial-Gap Helical ROTLIN Machine
Christophe S. Cyusa, Yasutaka Fujimoto, *Yokohama National University, Japan*

P1309 | The Detection of Interturn Short Circuit Faults in Axial-Flux Permanent Magnet Machine with Concentrated Windings
Oladapo O. Ogidi, Paul S. Barendse, Mohammed A. Khan, *University of Cape Town, South Africa*

P1310 | Influence of Rotor Topologies and Cogging Torque Minimization Techniques on Axial-Flux Permanent Magnet Machine under Static Eccentricities
Oladapo O. Ogidi, Paul S. Barendse, Mohammed A. Khan, *University of Cape Town, South Africa*

P1311 | Unbalanced Loading Behavior of the Isolated Interior Permanent-Magnet Generator
Solmaz Kahourzade, Wen L. Soong, Paul Lillington, *University of Adelaide, Australia; Radial Flux Laboratories Pty. Ltd., Australia*

P1312 | Influence of Ratio of External Diameter to Stack Length on Torque and Efficiency in Outer Rotor SPMSMs
Shogo Minami, Masayuki Sanada, Shigeo Morimoto, Yukinori Inoue, *Osaka Prefecture University, Japan*

P1313 | High Speed Performance of PM Drive System with Reconfigurable Winding
Lei Hao, Chandra Namuduri, Sanjeev M. Naik, Chad Freitas, *General Motors, United States*

P1314 | Performance of Cage-Less Interior PM Motor with Open-Loop Inverter Drive
Solmaz Kahourzade, Wen L. Soong, Paul Lillington, *University of Adelaide, Australia; Radial Flux Laboratories Pty. Ltd., Australia*

P1315 | Optimum Design of a High-Efficiency Direct-Drive PMSG
Thiago Bazzo, José Fabio Kolzer, Renato Carlson, Frédéric Wurtz, Laurent Gerbaud, *UFSC, Brazil; Université de Grenoble, France*

P1316 | Extended Model of Interior Permanent Magnet Synchronous Motors to Include Harmonics in d- and q- Axes Flux Linkages
Alejandro J. Piña, Prerit Pramod, Rakib Islam, Rakesh Mitra, Longya Xu, *Ohio State University, United States; Nexteer Automotive, United States*

P1317 | New Equivalent Circuit of the IPM-Type BLDC Motor for Calculation of Shaft Voltage by Considering Electric and Magnetic Fields
Thusitha Wellawatta, Jun-kyu Park, Hak-Man Kim, Jin Hur, *University of Ulsan, Korea (South); Incheon National University, Korea (South)*

P1318 | A Novel Proposal to Improve Reliability of Spoke-Type BLDC Motor using Ferrite Permanent Magnet
Chae-Lim Jeong, Jin Hur, *University of Ulsan, Korea (South); Incheon National University, Korea (South)*

P1319 | Development and Experimental Evaluation of a Single-Winding, Dual-Stator, Spoke-Array Vernier Permanent Magnet Machines
Dawei Li, Ronghai Qu, Jian Li, *Huazhong University of Science and Technology, China*

P1320 | Parameter Extraction for Three Phase IPM Machines Through Simple Torque Tests
S.A. Odhano, R. Bojoi, E. Armando, Guilherme Homrich, Aly Ferreira Flores Filho, Mircea Popescu, D.G. Dorrell, *Politecnico di Torino, Italy; Federal University of Rio Grande do Sul, Brazil; Motor Design Ltd, United Kingdom; University of Technology, Sydney, Australia*

P1321 | Detection Technique for Stator Inter-Turn Faults in BLDC Motors based on Third Harmonic Components of Line Currents
SeungTae Lee, Jin Hur, *University of Ulsan, Korea (South); Incheon National University, Korea (South)*

P1322 | Z-Source DC Circuit Breakers with Coupled Inductors
Atif Maqsood, Keith Corzine, *Clemson University, United States*

P1323 | Electrical Resistance Change of Automotive Connectors Submitted to Vibrations and Temperature
Rochdi El Abdi, Erwann Carvou, Noureddine Benjemâa, *University of Rennes1 - IPR, France; Entreprise Contelec, France*

Tuesday, September 22 **10:30AM – 12:00PM**

Smart Grid and Utility Applications II

N

Room: Exhibit Hall 220E
Chairs: Dezso Sera, Yong Kang,

P1501 | Dynamic Performance Evaluation of Hybrid Multi-Terminal HVAC/HVDC Grid
Sayan Acharya, Subhasish Bhattacharya, Nima Yousefpoor, *North Carolina State University, United States; Quanta Technology, United States*

P1502 | PWM Harmonic Signature based Islanding Detection for a Single-Phase Inverter with PWM Frequency Hopping
Kalhana Colombage, Jiabin Wang, Chris Gould, Chaohui Liu, *University of Sheffield, United Kingdom*

P1503 | Single-Phase Three-Stage SST Modeling using RTDS for Controller Hardware-in-the-Loop Application
Tong Yao, Isaac Leonard, Raja Ayyanar, Misha Steurer, *Arizona State University, United States; Florida State University, United States*

P1504 | A Novel Droop Control Meth[illegible]ogrid based on Fuzzy Sliding Mode Control Withdrawn
Yang Mi, Han Zhang, Hongliang Xia, Yunhao Han, *Shanghai University of Electric Power, China; Tianjin University; China*

P1505 | A New Self-Synchronization Control Strategy for Grid Interface Inverters with Local Loads
Shanglin Mo, Bin Peng, Zhikang Shuai, Jun Wang, Chunming Tu, Z. John Shen, Wen Huang, *Hunan University, China*

P1506 | A Dynamic Overvoltage Limiting Technique for Low-Voltage Microgrids
Tommaso Caldognetto, Simone Buso, Paolo Tenti, Danilo Iglesias Brandao, *University of Padova, Italy; University of Campinas, Brazil*

P1507 | Overcurrent Protection for Inverter-Based Distributed Generation System
Xuejun Pei, Zhi Chen, Shunchao Wang, Yong Kang, *Huazhong University of Science and Technology, China*

P1508 | Hierarchical Controlled Grid-Connected Microgrid based on a Novel Autonomous Current Sharing Controller
Yajuan Guan, Juan C. Vasquez, Josep M. Guerrero, *Aalborg University, Denmark*

P1509 | Multi Agent based Restoration for Smart Distribution System with Microgrids
Aneena Felix, H.S.V.S. Kumar Nunna, Suryanarayana Doolla, Anshuman Shukla, *IIT Bombay, India*

P1510 | Ramp Control of Active Power Electronics Loads in Microgrid
Guangqian Ding, Feng Gao, Shicong Ma, *Shandong University, China; China Electric Power Research Institute, China*

P1511 | Solid State Transformer (SST) as an Energy Router: Economic Dispatch based Energy Routing Strategy
Sarah Hambridge, Alex Q. Huang, Ruiyang Yu, *North Carolina State University, United States*

P1512 | High Frequency AC Microgrid based on a Highly Reliable Single-Stage Converter
Abdulgafor Alfares, S.A.KH. Mozaffari Niapour, Mahshid Amirabadi, *Northeastern University, United States*

P1513 | Robust H∞ Controller Design for Microgrid-Tied Inverter Applications
Zeljko Jankovic, Adel Nasiri, Lexiang Wei, *University of Wisconsin-Milwaukee, United States; Rockwell Automation, United States*

P1514 | A Novel Approach to Testing Live Earthing Systems
J.E. Foyster, T.J. Summers, *University of Newcastle, Australia*

P1515 | An Accurate Power Flow Control Strategy based on Voltage-based Power Flow Control in Microgrid
Canhui Zhang, Mingzhi Gao, Min Chen, Zhaoming Qian, *Zhejiang University, China*

P1516 | Control, Dynamics and Operation of a Dual H-Bridge Current Flow Controller
S. Balasubramaniam, J. Liang, C.E. Ugalde-Loo, *Cardiff University, United Kingdom*

P1517 | Investigation of Stabilities of Lyapunov-Based Digital Control for Grid-Connected Inverter
Toshiji Kato, Kaoru Inoue, Masanari Ishida, *Doshisha University, Japan*

P1518 | Modeling for Input Impedance of Buck Converters and its Application Analysis
Xiaolong Yue, Feng Wang, Shuhao Yang, Fang Zhuo, Yunqing Pei, *Xi'an Jiaotong University, China*

AC-DC and DC-AC Converters

W

Room: Exhibit Hall 220E
Chairs: Kaushik Rajashekara, Yilmaz Sozer, Jon Are Suul, Luca Tarisciotti,

P1701 | High-Efficiency Non-Isolated Dynamic Voltage Restorer using Soft-Switching DC-DC Converter for Parallel-Voltage Compensation
Min-Kwon Yang, Seung-Jae Lee, Woo-Young Choi, *Chonbuk National University, Korea (South)*

P1702 | Five-Level Reduced-Switch-Count Boost PFC Rectifier with Multicarrier PWM
Hani Vahedi, Ambrish Chandra, Kamal Al-Haddad, *École de Technologie Supérieure, Canada*

P1703 | Harmonic Instability Analysis of Single Phase Grid Connected Converter using Harmonic State Space (HSS) Modeling Method
JunBum Kwon, Xiongfei Wang, Claus Leth Bak, Frede Blaabjerg, *Aalborg University, Denmark*

P1704 | Modeling and Analysis of Hybrid Differential Mode Filters for AC/DC Converters to Suppress Current Ripples and EMI
Rajib Goswami, Shuo Wang, Yongbin Chu, *University of Texas at San Antonio, United States; University of Florida, United States*

P1705 | Six-Leg Single-Phase Multilevel Rectifier-Inverter: PWM Strategies and Control
N.B. de Freitas, C.B. Jacobina, A.C.N. Maia, V.F.M. Melo, *UFCG, Brazil; IFAL, Brazil*

P1706 | DCM Flyback PFC Converter with Optimum Utilization Control of Switching Cycles
Kai Yao, Xiaoyong Fu, Jianguo Lv, *Nanjing University of Science and Technology, China*

P1707 | An Efficient Dual-Stage Power Supply Topology for Series Connected Control Devices in Intelligent Lighting Systems
Lukas Lohaus, Arne Rossius, Andreas Sturm, Ralf Wunderlich, Stefan Heinen, *RWTH Aachen University, Germany*

P1708 | High Power Wide Bandwidth Inverter Output Filter Design for Various Operating Frequencies and Diverse Waveforms
Asif Mahmood Chowdhury, Burak Tekgun, Yilmaz Sozer, *University of Akron, United States*

P1709 | A Novel Constant Frequency Quasi-CRM Control Scheme of Three-Phase Single-Switch Boost PFC Converter
Kai Yao, Qingsai Meng, Xiaoyong Fu, *Nanjing University of Science and Technology, China*

P1710 | Space Vector Demonstration and Analysis of Zero-Voltage Switching Transitions in Three-Phase Isolated PWM Rectifier
Jahangir Afsharian, Deweo (David) Xu, Bing Gong, Zhihua Yang, *Ryerson University, Canada; Murata Power Solution, Canada*

P1711 | Closed-Loop Pulse Energy Modulation of a Three-Switch Buck-Boost Inverter
Shuang Xu, Shuying Yang, Riming Shao, Liuchen Chang, *University of New Brunswick, Canada; Hefei University of Technology, China*

P1712 | Dual Half-Cycle-Bridges Single-Phase Photovoltaic Inverter
Liwei Zhou, Feng Gao, Tao Xu, Wen Duan, *Shandong University, China*

P1713 | Dead Time Effect on the Double Loop Control Strategy for a Boost Inverter
O.J. Moraka, P.S. Barendse, M.A. Khan, *University of Cape Town, South Africa*

P1714 | Analysis, Design and Implementation of a Quasi-Proportional-Resonant Controller for Multi-Functional Capacitive-Coupling Grid-Connected Inverter
Tao Ye, Ningyi Dai, Chi-Seng Lam, Man-Chung Wong, Josep M. Guerrero, *University of Macau, China; Aalborg University, Denmark*

P1715 | Benchmark of AC and DC Active Power Decoupling Circuits for Second-Order Harmonic Mitigation in kW-Scale Single-Phase Inverters
Zian Qin, Yi Tang, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark; Nanyang Technological University, Singapore*

P1716 | A Resonance Suppression Method for GaN-Based Single-Phase Quasi-Z-Source PV Inverter with High Switching Frequency
HongBo Li, Thierry Kayiranga, Xinchun Lin, Yanjun Shi, Hui Li, *Florida State University, United States*

P1717 | Multi-Port Single-Phase Current Source Converter
Montiê A. Vitorino, Maurício B. R. Corrêa, Emanoel L. Silva, Darlan A. Fernandes, Lucas V. Hartmann, *Federal University of Campina Grande, Brazil; Federal University of Paraiba, Brazil*

P1718 | A Novel PV Power Conditioner Operating under Time-Sharing Sinewave Tracking Boost Chopper-Fed Inverter and its Extended Bidirectional Topology
Koki Ogura, Katsumi Nishida, Saad Mekhilef, Mutsuo Nakaoka, *Kawasaki Heavy Industries, Ltd., Japan; Ube College, Japan; University of Malaya, Malaysia*

P1719 | Power Decoupling Techniques for Single-Phase Power Electronics Systems – An Overview
Yi Tang, Frede Blaabjerg, *Nanyang Technological University, Singapore; Aalborg University, Denmark*

P1720 | A High Power Density Single-Phase Inverter with In-Series and -Parallel Power Decoupling Method
Xiaofeng Lyu, Yanchao Li, Dong Cao, *North Dakota State University, United States*

P1721 | Grid-Tied Operation of Current Source Inverter with Hybrid SiC and Si Semiconductor Switches
Weiqi Wang, Feng Gao, Qi Zhou, *Shandong University, China*

P1722 | Distortion Analysis of Low-THD/High-Bandwidth GaN/SiC Class-D Amplifier Power Stages
M. Mauerer, A. Tüysüz, J.W. Kolar, *ETH Zurich, Switzerland*

P1723 | Enhanced Trans-Z-Source Inverters with Switched Z-Impedance
Hossein Fathi Kivi, Hossein Madadi Kojabadi, Liuchen Chang, *Sahand University of Technology, Iran; University of New Brunswick, Canada*

P1724 | Experimental Comparison between Direct Matrix Converter and Indirect Matrix Converter based on Efficiency
Andrew Trentin, Pericle Zanchetta, Lee Empringham, Liliana De Lillo, Pat Wheeler, Jon Clare, *University of Nottingham, United Kingdom*

P1725 | Single-Phase to Three-Phase AC-DC-AC Drive System based on Parallel Rectifiers with an Uncontrolled Shared-Leg
Nady Rocha, Cursino B. Jacobina, Euzeli Cipriano dos Santos Jr., *UFPB, Brazil; UFCG, Brazil; IUPUI, United States*

P1726 | A New Class of Universal Power Converters with Substantially Higher Power Density and Lifetime
Mahshid Amirabadi, *Northeastern University, United States*

P1727 | Direct AC/AC Converter based Dynamic Voltage Restorer with One Cycle Control
Yu Tang, Jie Ding, *Nanjing University of Aeronautics and Astronautics, China*

P1728 | A Bidirectional AC/AC Multilevel Converter
Ramiar Alaei, S. Ali Khajehoddin, Wilsun Xu, *University of Alberta, Canada*

P1729 | Design Method Considering Magnetic Saturation Issue of Coupled Inductor in Interleaved CCM Boost PFC Converter
Yuki Itoh, Fumiya Hattori, Shota Kimura, Jun Imaoka, Masayoshi Yamamoto, *Shimane University, Japan*

Converter Control and Applications II

W

Room: Exhibit Hall 220E
Chairs: Babak Parkhideh, Ramanujam Ramabhadran, Qiang Li, Luca Zarri

P1901 | Short Circuit Fault Emulation by Shunt Connected Voltage Source Converter
Yiwei Ma, Liu Yang, Fred Wang, Leon M. Tolbert, *University of Tennessee, United States*

P1902 | High-Performance Feedback-Type Active Damping of LCL-Filtered Voltage Source Converters
Xiongfei Wang, Frede Blaabjerg, Poh Chiang Loh, *Aalborg University, Denmark*

P1903 | Analysis of the Passive Transient Damping Branch for Suppressing the Current Spike and Oscillation
Kainan Chen, Zhengming Zhao, Liqiang Yuan, Ting Lu, Fanbo He, Yiming Zhang, *Tsinghua University, China*

P1904 | Determination of the Insertion Loss of EMI Filter using a Black-Box Model
Carlos Cuellar, Nadir Idir, *Université Lille 1, France*

P1905 | EMI Reduction with a Soft-Switched Auxiliary Commutated Pole Inverter
Apollo Charalambous, Xibo Yuan, Neville McNeill, Qingzeng Yan, Niall Oswald, Phil Mellor, *University of Bristol, United Kingdom*

P1906 | Analysis of an Unstable Phenomenon Related to the Different Turn-On Time between the Subsystems in Cascaded Systems
Xin Li, Xinbo Ruan, *Nanjing University of Aeronautics and Astronautics, China*

P1907 | Comparative Analysis of LCL-Filter Designs for Paralleled Inverters
Raimo Juntunen, Juhamatti Korhonen, Tatu Musikka, Liudmila Smirnova, Olli Pyrhönen, Pertti Silventoinen, *Lappeenranta University of Technology, Finland*

P1908 | Direct Power Control [illegible] Type Rectifiers based on Sliding Mode Control Withdrawn
Chen Bing, Xie Yunxiang, Ma Hui, Shi Zeyu, *Jiangsu Electric Power Company, China; South China University of Technology, China*

P1909 | A Novel Stability Analysis Method based on Floquet Theory for Cascaded DC-DC Converters System
Hong Li, Jianing Shang, Xiaojie You, Trillion Zheng, Bo Zhang, JinHu Lü, *Beijing Jiaotong University, China; South China University of Technology, China; Chinese Academy of Sciences, China*

P1910 | Fast Scale Instability Problem of Cascaded Buck Conversion System and its Phase-Shifted-Carrier Solution
Xin Zhang, Qing-Chang Zhong, Wen-Long Ming, *University of Sheffield, United Kingdom; Illinois Institute of Technology, United States*

P1911 | Digital Realization of Capacitor-Voltage Feedback Active Damping for LCL-Filtered Grid Converters
Zhen Xin, Xiongfei Wang, Poh Chiang Loh, Frede Blaabjerg, *Aalborg University, Denmark*

P1912 | Robust Predictive Current Control for Grid-Connected VSIs with Compensation for Time-Delay Effect and Uncertain System Disturbances
Bo Cao, Liuchen Chang, *University of New Brunswick, Canada*

P1913 | Harmonic Analysis of Grid Connected Three Phase Direct Matrix Converter using 2-D Fourier Integral
Anindita Jamatia, K. Bala Subrahmanyam, Parthasarathi Sensarma, *Indian Institute of Technology Kanpur, India*

P1914 | An Inrush Current Elimination Technique for a Voltage Sag Compensator while Powering Transformer-Coupled Loads
Syed Sabir Hussain Bukhari, Shahid Atiq, Byung-il Kwon, *Hanyang University, Korea (South)*

P1915 | Fast and Easily Implementable Detection Circuits for Short-Circuits of Power Semiconductors
Tobias Krone, Chengzhi Xu, Axel Mertens, *Leibniz Universität Hannover, Germany*

P1916 | Fractional Order ESR Modeling of [illegible]lytic Capacitor & Fractional Order Failure Prediction with Applic[illegible] Predictive Maintenance Withdrawn
Hadi Malek, Sara Dadras, YangQuen Chen, *Utah State University, United States; University of California, United States*

P1917 | Transient Response of Three-Phase Voltage-Source Converters under Grid-Side Faults
Yu Peng, Jianjun Sun, Meng Huang, Xiaoming Zha, Zhong Xu, Xiaofei Cui, Chi K. Tse, *Wuhan University, China; Guangzhou Power Supply Bureau Limited, China; Hong Kong Polytechnic University, Hong Kong*

P1918 | A Novel Method to Protect IGBT Module from Explosion during Short-Circuit in Traction Converters
Vinoth Kumar Sundaramoorthy, Enea Bianda, Gerold Knapp, Alexander Heinemann, *ABB Switzerland Ltd, Switzerland*

Selected Topics in Electric Machines I

S

Room: Exhibit Hall 220E
Chairs: Marcello Pucci, Rashmi Prasad

P2101 | Numerical and Experimental Determination of External Heat Transfer Coefficient in Small TENV Electric Machines
Olfa Meksi, Alejandro Ospina Vargas, *Sorbonne Universités, France*

P2102 | Fundamental Study on Rotor Eddy Current Losses in High Frequency Machines due to Current Harmonics
Reza Rajabi Moghaddam, *ABB Corporate Research, Sweden*

P2103 | General Power Equation of Switched Reluctance Machines and Power Density Comparison
Wei Hua, Hao Hua, Guishu Zhao, Ming Cheng, *Southeast University, China*

P2104 | Comparison of Different Inverter-Fed AC Motor Types Regarding Common-Mode Bearing Current
Martin Schuster, Andreas Binder, *Darmstadt University of Technology, Germany*

P2105 | Design Optimization of Brushless Synchronous Machines with Wound-Field Excitation for Hybrid Electric Vehicles
Yoshiaki Kano, *Toyota College, Japan*

P2106 | Control Winding Current-Oriented Control for Stand-Alone Brushless Doubly Fed Power Generation System
Lei Sun, Yu Chen, Li Peng, Yu Zhang, Yong Kang, *Huazhong University of Science and Technology, China*

P2107 | Newly Proposed Hybrid Type Multi-DOF Operation Motor for Multi-Copter UAV Systems
Ho-Joon Lee, Han-Woong Ahn, Jae-Kwang Lee, Ju Lee, Sung-Hong Won, *Hanyang University, Korea (South); Donyang Mirae University, Korea (South)*

P2108 | Efficiency Maps of Electrical Machines
Amin Mahmoudi, Wen L. Soong, Gianmario Pellegrino, Eric Armando, *University of Adelaide, Australia; Politecnico di Torino, Italy*

P2109 | Parameter Estimation of Brushless Doubly-Fed Induction Generator based on Experimental Results
Jingyuan Su, Yu Chen, Lei Sun, Xinmin Liu, Yong Kang, *Huazhong University of Science and Technology, China*

P2110 | Dual Airgap Stator- and Rotor- Permanent Magnet Machines with Spoke-Type Configurations using Phase-Group Concentrated-Coil Windings
Wenliang Zhao, Byung-il Kwon, Thomas A. Lipo | *Hanyang University, Korea (South); Florida State University, United States*

P2111 | Multi-Physics Optimization Strategies for a High Speed Synchronous Reluctance Machines
M. Di Nardo, M. Galea, C. Gerada, M. Palmieri, F. Cupertino, *University of Nottingham, United Kingdom; Politecnico di Bari, Italy*

P2112 | A Novel Stator Structure with Soft Magnetic Composite in One-Axis Actively Positioned Single-Drive Bearingless Motor
Hiroya Sugimoto, Itsuki Shimura, Akira Chiba, *Tokyo Institute of Technology, Japan*

P2113 | Control Winding Quantities Orientation Modeling and Control for Stand-Alone Brushless Doubly-Fed Power Generation System
Min Lu, Yu Chen, Lei Sun, Xudong Zou, Yong Kang, *Huazhong University of Science and Technology, China*

P2114 | Analysis of a New Compound-Excited Doubly Salient Brushless DC Generator with Power Tracking Rectification
Li Yu, Zhuoran Zhang, Xuedong Ma, Yuting Wang, *Nanjing University of Aeronautics and Astronautics, China*

P2115 | Sensorless Speed Estimation of Mains-fed Induction Motors for Condition Monitoring using Motor Relays
Pinjia Zhang, Prabhakar Neti, Stefan Grubic, *GE Global Research, United States*

P2116 | Design of Variable-Flux Permanent Magnet Synchronous Motor for Adjustable Speed Operation
Jin-seok Jang, Muhammad Humza, Byungteak Kim, *Kunsan National University, Korea (South)*

P2117 | Influence of Voltage Excitation and Current Sensors on Monitoring of Stator Winding Insulation based on Transient Current Step Response
C. Zoeller, Th.M. Wolbank, M.A. Vogelsberger, *Vienna University of Technology, Austria; Bombardier Transportation Austria GmbH, Austria*

P2118 | 3D Analytical Model for Estimation of Eddy Current Losses in the Magnets of IPM Machine Considering the Reaction Field of the Induced Eddy Currents
Milind Paradkar, Joachim Böcker, *Universität Paderborn, Germany*

General Topics on Motor Drives I

S

Room: Exhibit Hall 220E
Chairs: Mahesh Swamy, Kevin Bai

P2301 | A Carrier-based Adjustable Discontinuous PWM for Three-Phase Voltage Source Inverter
Hak-Jun Lee, Anno Yoo, Chanook Hong, Jeongjoon Lee, *LSIS Co., Ltd., Korea (South)*

P2302 | Comprehensive Analysis of Drive Performance when using a DC Link Choke vs. an Input Line Reactor
Alia R. Strandt, Rangarajan M. Tallam, *Marquette University, United States; Rockwell Automation, United States*

P2303 | A Comparative Study of Various Methods of IM's Rotor Resistance Estimation
Hossein Madadi Kojabadi, Mostafa Abarzadeh, Liuchen Chang, *Sahad University of Technology, Iran; University of New Brunswick, Canada*

P2304 | A Nonlinear Observer for Rotor Flux Estimation Considering Magnetic Saturation Effects in Induction Motor Drives
F. Alonge, M. Cirrincione, M. Pucci, A. Sferlazza, *University of Palermo, Italy; University of South Pacific, Fiji; ISSIA-CNR, Italy*

P2305 | Parameter Identification of Induction Motors at a Standstill based on Integral Calculation
Anno Yoo, Sang-hoon Lee, Young-doo Yoon, *LSIS, Korea (South); Myongji University, Korea (South)*

P2306 | Position Sensorless Drive for IPMSM based on EEMF with Maximum Torque Control in All Speed Ranges
Tomoya Yokoyama, Hisao Kubota, *Meiji University, Japan*

P2307 | Simplified PWM for Fault Tolerant Control of Open Winding PMSM Fed by Hybrid Inverter
Wenzhi Zhou, Dan Sun, Min Chen, Bin Lin, *Zhejiang University, China*

P2308 | Copper Loss Minimizing Field Current Control for Wound Synchronous Motor
Yoonjae Kim, Kwanghee Nam, *POSTECH, Korea (South)*

P2309 | Analysis of Voltage Modulation based Active Damping Techniques for Small DC-Link Drive System
Dong Wang, Kaiyuan Lu, Peter Omand Rasmussen, Laszlo Mathe, Yang Feng, *Aalborg University, Denmark*

P2310 | Low Speed Position Sensorless Method for Permanent Magnet Synchronous Motors with Closed-Slot Stator Structure
Yoshitaka Iwaji, Kazuaki Tobari, Yusaku Onuma, *Hitachi, Ltd., Japan; Hitachi Industrial Equipment Systems Co., Ltd., Japan*

P2311 | Reduction of Injection Voltage in Signal Injection Sensorless Drives using Capacitor-Integrated Inverter
Yong-Cheol Kwon, Seung-Ki Sul, *Seoul National University, Korea (South)*

P2312 | Mitigation of the Effects of Common-Mode Current on the Operation of SCR-Based Rectifiers for AC Drives
Yogesh P. Patel, Rangarajan M. Tallam, Brian P. Brown, Doyle F. Busse, Jiangang Hu, Daniel Campuzano, Alia R. Strandt, *Rockwell Automation, United States; Marquette University, United States*

P2313 | Investigation of Effect of Slot Opening on Fractional Slot and Integer Slot Axial Flux Permanent Magnet Machine
Ju Hyung Kim, Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

P2314 | On the Proprieties of the Differential Cross-Saturation Inductance in Synchronous Machines
Damiano Mingardi, Mattia Morandin, Silverio Bolognani, Nicola Bianchi, *University of Padova, Italy*

P2315 | Operating Electrical High Speed Drives with Pulse Patterns of Specific Harmonic Content
Klaus Peter, Joachim Böcker, *University of Paderborn, Germany*

P2316 | A Novel Three-Phase Inverter for Common-Mode Voltage Reduction in Electric Drives
Luca Concari, Davide Barater, Carlo Concari, Giampaolo Buticchi, *University of Parma, Italy; University of Kiel, Germany*

P2317 | Online Current and Vibration Signal Monitoring based Fault Detection of Bowed Rotor Induction Motor
M. Nasir Uddin, Md. Mizanur Rahman, *Lakehead University, Canada*

P2318 | Stand-Still Self Identification of Flux Characteristics for SynRM using Novel Saturation Approximating Function and Multiple Linear Regression
Nicola Bedetti, Sandro Calligaro, Roberto Petrella, *Gefran s.p.a., Italy; University of Udine, Italy*

Passives and Converters

S

Room: Exhibit Hall 220E
Chairs: Jean-Luc Schanen, Doug Hopkins

P2501 | Comparison of a State of the Art Si IGBT and Next Generation Fast Switching Devices in a 4 kW Boost Converter
Alexander Anthon, Zhe Zhang, Michael A.E. Andersen, *Technical University of Denmark, Denmark*

P2502 | High Level Integration for Solar Inverter Power Applications
Tanya Kirilova Gachovska, Christian Cojocaru, Igor Miletic, Vincent Karam, Tudor Lipan, Vinod Narayan, Mihai Varlan, *Solantro Semiconductor Corporation, Canada*

P2503 | Design of a 2-D Magnetizer with the Consideration of the z-Component of the Magnetic Field
John Wanjiku, Pragasen Pillay, *Concordia University, Canada*

P2504 | Study on Filtering Performance of Soft Magnetic Composite Inductors for Switching Harmonics in 3-Phase 70 kW PWM Converter Systems
Daniel Pehrman, Yujing Liu, Yuriy V. Serdyuk, Per Karlsson, *Chalmers University of Technology, Sweden; Höganäs AB, Sweden*

P2505 | Study on an Accurate Iron Loss Calculation Method Considering the Non-Uniformity of the Magnetic Flux Density
Hiroaki Sato, Toshihisa Shimizu, *Tokyo Metropolitan University, Japan*

P2506 | High Step-Down Ratio DC-DC Converters with Multi-Leg Transformer
Bo Zhu, Yehui Han, *University of Wisconsin-Madison, United States*

P2507 | Iron Loss Calculation of AC Filter Inductor for Three-Phase PWM Inverter
Hiroaki Matsumori, Toshihisa Shimizu, Koushi Takano, Hitoshi Ishii, *Tokyo Metropolitan University, Japan; Iwatsu Test Instrument Corporation, Japan*

P2508 | Copper Losses Evaluation in Multi-Strands Conductors Formal Solution based on the Magnetic Potential
Timothe Delaforge, Herve Chazal, Jean-Luc Schanen, Robert J. Pasterczyk, *Grenoble Electrical Engineering Laboratory, France; Schneider Electric ITB, France*

P2509 | A Humidity-Dependent Lifetime Derating Factor for DC Film Capacitors
Huai Wang, Paula Diaz Reigosa, Frede Blaabjerg, *Aalborg University, Denmark*

P2510 | A Design Tool for Rapid, Multi-Domain Virtual Prototyping of Power Electronic Systems
P.L. Evans, A. Castellazzi, C.M. Johnson, *University of Nottingham, United Kingdom*

Emerging Technologies in Power Electronics

E

Room: Exhibit Hall 220E
Chairs: Henry Chung, Juri Jatskevich

P2701 | Increasing Power Level of Resonant Wireless Power Transfer with Relay Resonators by Considering Resonator Current Amplitudes
Yiming Zhang, Zhengming Zhao, Fanbo He, Kainan Chen, Ting Lu, Liqiang Yuan, *Tsinghua University, China*

P2702 | Efficiency Optimization Inject Current Characteristic of Laser Diode for Wireless Power Transmission
Weiyang Zhou, Ke Jin, *Nanjing University of Aeronautics and Astronautics, China*

P2703 | Wireless Lithium-Ion Battery Charging Platform with Adaptive Multi-Phase Rapid-Charging Strategy
Bong-Chul Kim, Ki-Young Kim, Sanoop Ramachandran, Ashish Khandelwal, Byoung-Hee Lee, *Samsung Electronics, Korea (South); Samsung Research Institute, India; Hanbat National University, Korea (South)*

P2704 | Common-Mode Noise Comparison Study for Lateral Wire-Bonded and Vertically Integrated Power Modules
Chengcheng Yao, Wenwei Li, He Li, Chaoran Han, Miao Wang, Jinziyang Qian, Xuan Zhang, Fang Luo, Jin Wang, *Ohio State University, United States*

P2705 | Optimization of Thickness and Shape of Core Block in Resonator for 7 kW-Class Wireless Power Transfer System for PHEV/EV Charging
Tetsu Shijo, Kenichirou Ogawa, Shuichi Obayashi, *Toshiba Corporation, Japan*

P2706 | Numerical Modelling of IPT Pad Combinations
Fei Yang Lin, Grant A. Covic, *University of Auckland, New Zealand*

P2707 | Multi-Layer Tubular Conductor for High Q-Factor Wireless Power Transfer System Resonators
Mohammad Etemadrezaei, Srdjan M. Lukic, *North Carolina State University, United States*

P2708 | Asymmetrical Loosely Coupled Transformer for Wireless Laptop Charger with Higher Misalignment Tolerance
Cong Zheng, Lanhua Zhang, Xiaonan Zhao, Jungmuk Choe, Jih-Sheng Lai, *Virginia Tech, United States*

P2709 | Dynamic Filtering of Stochastic Solar Resources using HVAC Drive Control – A Determination of Feasible Bandwidth
Yue Cao, John A. Magerko III, Thomas Navidi, Philip T. Krein, *University of Illinois, United States*

P2710 | Design and Implementation of PV Powered Zeta Converters for Battery Charger Applications
António M.S.S. Andrade, Everson Mattos, Cindy O. Gamba, Luciano Schuch, Mário L. da S. Martins, *Federal University of Santa Maria, Brazil*

P2711 | Sub-Threshold Startup Charge Pump using Depletion MOSFET for a Low-Voltage Harvesting Application
Gaël Pillonnet, Thomas Martinez, *University Grenoble Alpes and CEA-LETI, France; École Polytechnique, France*

P2712 | Novel Single-Sided Ferrite-Less Magnetic Coupler for Roadway EV Charging
Abiezer Tejeda, Grant A. Covic, John T. Boys, *University of Auckland, New Zealand*

P2713 | Coil Design Approach for Indirect-Fed Resonant Wireless Power Transfer System
Ramin Rahmat Samii, Sayed Ali Khajehoddin, *University of Alberta, Canada*

P2714 | A Novel Reliable and Compact Inverter for Wireless Power Transfer
Mahmud-Ul-Tarik Chowdhury, Mahshid Amirabadi, Jeihoon Baek, *Northeastern University, United States; Korea Railroad Research Institute, Korea (South)*

P2715 | Investigation of Energy Harvesting Circuit using a Capacitor-Sourced Buck Converter for a Tubular Linear Generator of a Moball: A Spherical Wind-Driven Exploration Robot
Junichi Asama, Matthew R. Burkhardt, Faranak Davoodi, Joel W. Burdick, *Shizuoka University, Japan; California Institute of Technology, United States*

P2716 | Harmonics Mitigation and Stability Analysis of DTC Motor Drives in MVDC Systems
Hanchao Liu, Jiaqi Liang, Li Qi, *Rensselaer Polytechnic Institute, United States; ABB Inc., United States*

P2717 | Optimal Sizing of Distributed Generations in a connected DC Micro-grid with Hybrid Energy Storage System
Nina Meng, Panbao Wang, Hui Wu, Wei Wang, Weinan Xu, *Harbin Institute of Technology, China; National University of Singapore, Singapore*

P2718 | Comparison of DC Fault Current Limiting Capability of Various Modular Structured Multilevel Converters within a Multi-Terminal DC Grid
Sayan Acharya, Kasunaidu Vechalapu, Subhashish Bhattacharya, Nima Yousefpoor, *North Carolina State University, United States; Quanta Technology, United States*

P2719 | A Simple Decoupling Control Method for Isolated Three-Port Bidirectional Converter in Low-Voltage DC Microgrids
Wei Wang, Panbao Wang, Tianyuan Ma, Hongpeng Liu, Hui Wu, *Harbin Institute of Technology, China*

P2720 | Mid-Range kHz Electrical Resonance Coupling Wireless Power Transfer
Hirokatsu Umegami, Masataka Ishihara, Fumiya Hattori, Mitsuru Masuda, Masayoshi Yamamoto, Kazuhiro Umetani, *Shimane University, Japan; Okayama University, Japan*

P2721 | Omni-Directional Wireless Power Transfer Systems using Discrete Magnetic Field Vector Control
Cheng Zhang, Deyan Lin, S.Y. (Ron) Hui, *University of Hong Kong, Hong Kong; Imperial College London, United Kingdom*

P2722 | Multiple Dipole Receiving Coils for 2-D Omnidirectional Wireless Mobile Charging under Wireless Power Zone
Eun S. Lee, Bo H. Choi, Yeong H. Sohn, Gyu C. Lim, Chun T. Rim, *KAIST, Korea (South)*

P2723 | Non-Linear Feedback Control of Robust Bi-Color LED Lighting
Albert T.L. Lee, Huanting Chen, Siew-Chong Tan, S.Y. (Ron) Hui, *University of Hong Kong, Hong Kong; Imperial College, United Kingdom*

P2724 | Non-Electrolytic Capacitor LED Driver with Feed-Forward Control
Yi-Chien Shen, Tsrong-Juu Liang, Wei-Jing Tseng, Huan Hao Chang, Kai-Hui Chen, Yi-Ju Lu, Jhih-Sian Li, *National Cheng Kung University, Taiwan*

P2725 | High Power Factor Single Stage Flyback Converter for Dimmable LED Driver
Liang Jia, David Fang, Yan-Fei Liu, *Queen's University, Canada; Philips Electronics North America, United States*

P2726 | Improved Power Quality Opto-Couplerless Cuk Converter for Flicker Less LED Lighting
Somnath Pal, Bhim Singh, Ashish Shrivastava, Ambrish Chandra, Kamal Al-Haddad, *Indian Institute of Technology Delhi, India; École de Technologie Superieure, Canada*

P2727 | An Average Current Modulation Method for Single Stage LED Drivers with High Power Factor and Zero Low Frequency Current Ripple
Brian White, Hongliang Wang, Yan-Fei Liu, *Queen's University, Canada*

P2728 | A Single Stage Offline HB-LED Driver with Power Factor Correction for Multi-Color Dynamic Lighting Systems
Kumar Modepalli, Leila Parsa, *Rensselaer Polytechnic Institute, United States*

Tuesday, September 22 **3:30PM – 5:00PM**

Solar PV Systems

N

Room: Exhibit Hall 220E
Chairs: Nathan Weise, Bilal Akin

P2901 | Application of Improved Radial Basis Function Neural Network Method in Global MPPT for PV Array
Qichang Duan, Mingxuan Mao, Pan Duan, Bei Hu, *Chongqing University, China; State Grid Chongqing Electric Power Company Nan'an, China*

P2902 | Development of Fast Simulation Models for Photovoltaic Generation System based on Simulink
Xiaokang Liu, Fang Zhuo, Ying Chen, Liansong Xiong, *Xi'an Jiaotong University, China*

P2903 | A Single-stage CCM Zeta Microinverter for Solar Photovoltaic AC (PVAC) Module
Ravi Kiran Surapaneni, Akshay Kumar Rathore, *National University of Singapore, Singapore*

P2904 | Accuracy Comparison between Gompertz and Polynomial based PV Models
Yousef Mahmoud, Ehab El-Saadany, *University of Waterloo, Canada*

P2905 | Thermal Modelling and Performance Assessment of PV Modules based on Climatic Parameters
Ying Chen, Fang Zhuo, Xiaokang Liu, Liansong Xiong, *Xi'an Jiaotong University, China*

P2906 | Electrical Characteristics Prediction of Microsatellite Photovoltaic Subsystem in Orbit
Ping Shen, Qianhong Chen, Ligang Xu, *Nanjing University of Aeronautics and Astronautics, China*

P2907 | Predictive Control of an H-NPC Converter for Single-Phase Rooftop Photovoltaic Systems
Eduardo Gutierrez, Samir Kouro, Christian A. Rojas, Matias Aguirre, *Universidad Tecnica Federico Santa Maria, Chile*

P2908 | Observer-Based State Feedback Controller for LCL Filter used in PV Applications with Grid Current Measurement Only
A.F.B.O. Silva, S.M. Silva, G. Lobato, B.J.C. Filho, *Federal University of Minas Gerais, Brazil*

P2909 | A High Efficiency Flyback Micro-Inverter with a New Adaptive Snubber for Photovoltaic Applications
Mohammad Ali Rezaei, Kui-Jun Lee, Alex Q. Huang, *North Carolina State University, United States*

P2910 | Prediction of Leakage Current in Transformerless Photovoltaic Inverter System by a More Accurate Method
Xiaomei Song, Wenjie Chen, Jiao Zhang, Xu Yang, Hao Huang, *Xi'an Jiaotong University, China*

P2911 | Comparison of Single-Phase T-Type Multilevel Converters for Grid-Connected PV Systems
Cristian Verdugo, Samir Kouro, Christian Rojas, Thierry Meynard, *Universidad Tecnica Federico Santa Maria, Chile; University of Toulouse, France*

Smart Grid and Utility Applications III

W

Room: Exhibit Hall 220E
Chairs: David Gao, Ambrish Chandra,

P3101 | Module-Capacitor Voltage Fluctuation Optimization Control for an Alternate Arm Converter
Boran Fan, Kui Wang, Yongdong Li, Lie Xu, Zedong Zheng, *Tsinghua University, China*

P3102 | SubModule Failure Detection Methods for the Modular Multilevel Converter
Qichen Yang, Jiangchao Qin, Maryam Saeedifard, *Georgia Institute of Technology, United States; Arizona State University, United States*

P3103 | A Novel HVDC-Link based on Hybrid Voltage-Source Converters
Thanh Hai Nguyen, Quoc Anh Le, Dong-Choon Lee, *Yeungnam University, Korea (South)*

P3104 | A Validation Methodology for Real Time Model of Modular Multilevel Converter
Fei Zhang, Géza Joós, Wei Li, Jean Bélanger, *McGill University, Canada; OPAL-RT Technologies, Canada*

P3105 | Fast DC Fault Recovery Technique for H-Bridge MMC-Based HVDC Networks
E. Kontos, R. Teixeira Pinto, P. Bauer, *Delft University of Technology, Netherlands*

P3106 | Design and Testing of the World's First Single-Level Press-Pack IGBT based Submodule for MMC VSC HVDC Applications
Huifeng Chen, Wenping Cao, Paolo Bordignon, Rong Yi, Haitao Zhang, Wei Shi, *Queen's University Belfast, United Kingdom; Rongxin Power Electronics, China*

P3107 | A Mathematical Model for a Droop-Controlled DC Distribution System with a Large Number of DC-DC Converters
Mansour Tabari, Amirnaser Yazdani, *University of Western Ontario, Canada; Ryerson University, Canada*

P3108 | GA-Based Optimal Power Flow for Microgrids with DC Distribution Network
Mehdi Farasat, Shahab Mehraeen, Amirsaman Arabali, Andrzej Trzynadlowski, *Louisiana State University, United States; University of Nevada, Reno, United States*

P3109 | Implementation of the Differential Protection for MVDC Distribution Systems using Real-Time Simulation and Hardware-in-the-Loop
Mehdi Monadi, Cosmin Koch-Ciobotaru, Alvaro Luna, Jose Ignacio Candela, Pedro Rodriguez, *Technical University of Catalonia, Spain; Abengoa Research, Spain*

P3110 | Multi-Model Control Strategy for DC Bus Regulation of a PISO Converter in Microgrids Applications
Carlos A. Correa, Hugo Calleja, Elías Rodríguez, Adolfo R. López-Núñez, Carlos Aguilar-Castillo, *CENIDET, Electronics, Mexico; Instituto Tecnologico de Celaya, Electronics, Mexico*

P3111 | Design and Analysis of a Modular Magnetically Coupled Quadratic Boost Topology with a Damping Network for DC Microgrid
Anish Ahmad, R.K. Singh, R. Mahanty, *Indian Institute of Technology BHU, India*

P3112 | Control of Modular Dual Active Bridge DC/DC Converter for Photovoltaic Integration
Ali Azidehak, Ritwik Chattopadhyay, Sayan Acharya, Awneesh Kumar Tripathi, Mahsa Ghapandar Kashani, Govind Chavan, Subhashish Bhattacharya, *North Carolina State University, United States*

P3113 | Modeling and Control Architecture of Source and Load Management in Islanded Power Systems
Weisong Tian, Yucheng Zhang, Ruiyun Fu, Yanxiao Zhao, Guodong Wang, Robb Winter, *South Dakota School of Mines and Technology, United States; Mercer University, United States*

P3114 | Series Compensator based on Cascaded Transformers Coupled with Three-Phase Bridge Converters
Gregory A. de Almeida Carlos, Cursino B. Jacobina, *Federal University of Campina Grande, Brazil; Federal Institute of Alagoas, Brazil*

P3115 | Operation of Data Center as a Virtual Power Plant
Shekhar Raj Awasthi, Santosh Chalise, Reinaldo Tonkoski, *South Dakota State University, United States*

P3116 | Events Identification based Load Modeling for Residential Microgrid
He Li, Chengcheng Yao, Jin Wang, Lingyu Zhu, Shaobing Yang, *Ohio State University, United States; Xi'an Jiaotong University, China; Beijing Jiaotong University, China*

P3117 | Implementation of Smart Residential Energy Management System for Smart Grid
Shady S. Refaat, Haitham Abu-Rub, *Texas A&M University at Qatar, Qatar; Qatar Environment and Energy Research Institute, Qatar*

P3118 | Control of Dynamic VAR Compensator based on Current Source Converter
Ankan De, Subhashish Bhattacharya, *North Carolina State University, United States*

P3119 | Optimal Design of Moving Average Filter and its Application in Distorted Grid Synchronization
Liansong Xiong, Fang Zhuo, Xiaokang Liu, Feng Wang, Ying Chen, *Xi'an Jiaotong University, China*

P3120 | A Grid Connected PV Micro-inverter with Optimized Battery Storage Utilization
Vikram Roy Chowdhury, Mohamed Amer Chaaban, Somasundaram Essakiappan, Madhav Manjrekar, Yaosuo Xue, *University of North Carolina at Charlotte, United States; Siemens Corporate Research Inc., United States*

P3121 | Design Consideration of an MMC-HVDC System based on 4500V/4000A Emitter Turn-Off (ETO) Thyristor
Ghazal Falahi, Alex Q. Huang, *North Carolina State University, United States*

P3122 | A D-Q Rotating Frame DC-Bus Voltage Controller for Bi-Directional Single-Phase AC/DC Converters
Sajjad M. Kaviri, Majid Pahlevani, B. Mohammadpour, Praveen Jain, Alireza Bakhshai, *Queen's University, Canada*

P3123 | Bidirectional SiC Three-Phase AC-DC Converter with DQ Current Control
Arjun Raj Prabu Andhra Sridhar, Nathan Weise, Marquette University, United States

P3124 | Cooperated Stabilizing Control of PMSG based Grid Connected Wind Farm
Linda Sartika, Marwan Rosyadi, Atsushi Umemura, Rion Takahashi, Junji Tamura, *Kitami Institute of Technology, Japan*

P3125 | Wireless based Real-Time Power Coordinated Control Strategy for a DC Microgrid
Xialin Li, Yibin Feng, Li Guo, Chengshan Wang, *Tianjin University, China*

Multi-Level Converters

W

Room: Exhibit Hall 220E
Chairs: Berker Bilgin, Stefano Bifaretti, Subhashish Bhattacharya, Hongliang Wang

P3301 | Modular Input-Series-Input-Parallel Output-Series DC/DC Converter Control with Fault Detection and Redundancy
Yiqing Lian, D. Holliday, G.P. Adam, S.J. Finney, *University of Strathclyde, United Kingdom*

P3302 | A Study on Minimum Required Capacitance in Flying Capacitor Multilevel Converters for Grid-Connected Applications
Yukihiko Sato, Miki Iimura, Yuki Dodo, Hidemine Obara, *Chiba University, Japan*

P3303 | A Modified Static Ground Power Unit based on Active Natural Point Clamped Converter
Mostafa Abarzadeh, Hossein Madadi Kojabadi, Liuchen Chang, *Sahand University of Technology, Iran; University of New Brunswick, Canada*

P3304 | High Resonate Pole Frequency M2LC Converter for Medium Voltage Drive and Energy Sector Applications
Marc F. Aiello, Walter Barie, *Regal Beloit, United States*

P3305 | Steady-State Analysis of Voltages and Currents in Modular Multilevel Converter based on Average Model
Alinaghi Marzoughi, Rolando Burgos, Dushan Boroyevich, Yaosuo Xue, *Virginia Tech, United States; Siemens Corporate Research, United States*

P3306 | Comparison and Selection of Magnetic Materials for Coupled Inductor used in Interleaved Three-Level Multi-Phase DC-DC Converters
Mingkai Mu, Fred C. Lee, *Virginia Tech, United States*

P3307 | A High Voltage Gain Modular Multilevel DC-DC Converter
Yanchao Li, Xiaofeng Lyu, Dong Cao, *North Dakota State University, United States*

P3308 | Comparative Evaluation of Losses in 3L and 5L ANPC Converters using HV-IGBT Modules
Alan Wilson, Steffen Bernet, *Technische Universität Dresden, Germany*

P3309 | Operation of Modular Multilevel Converters Under Voltage Constraints
Mario López, Fernando Briz, Alberto Zapico, David Diaz-Reigosa, Juan Manuel Guerrero, *University of Oviedo, Spain*

P3310 | Voltage Drift Mechanism in Modular Multilevel Converter
Jie Shen, Qin Lei, Stefan Schröder, Marius Mechlinski, *GE Global Research, China; ULC Robotics, China; GE Global Research, Germany*

P3311 | A Cascaded Two-Port Bridge Multilevel Converter with Automatic Voltage Balancing Capability
Deepak Gunasekaran, Shuitao Yang, Fang Z. Peng, *Michigan State University, United States*

P3312 | Control Strategies for MMC using Cells with Power Transfer Capability
Mario López, Fernando Briz, Alberto Zapico, Alberto Rodríguez, David Diaz-Reigosa, *University of Oviedo, Spain*

P3313 | Sensitivity Analysis of a Modular Multilevel Converter
Niloofar Rashidi Mehrabadi, Rolando Burgos, Dushan Boroyevich, Christopher Roy, *Virginia Tech, United States*

P3314 | On the Integration of Low Frequency Transformer into Modular Multilevel Converter
Alexandre Christe, Dražen Duji?, *École Polytechnique Fédérale de Lausanne, Switzerland*

P3315 | Improved Modular Multilevel Converter Topology with Magnetically Coupled Branch Inductors
Jakub Kucka, Dennis Karwatzki, Lennart Baruschka, Axel Mertens, *Leibniz Universität Hannover, Germany; Protolar GmbH, Germany*

P3316 | A New Five-Level Half-Bridge based on a Hybrid Active Neutral Point Clamped/Flying DC-Source Inverter
João H.G. Muniz, Edison R.C. da Silva, Abinadabe S. Andrade, Euzeli C. dos Santos Jr., *Federal University of Campina Grande, Brazil; Federal University of Paraiba, Brazil; IUPUI, United States*

P3317 | Current Control and Energy Balancing of a Square-Wave Powered 1AC-3AC Modular Multilevel Converter
Mathias Schnarrenberger, Felix Kammerer, Mario Gommeringer, Johannes Kolb, Michael Braun, *Karlsruhe Institute of Technology (KIT), Germany; Schaeffler Technologies AG & Co. KG, Germany*

P3318 | A Neutral Point Clamped Multilevel Topology Flow Graph and Space NPC Multilevel Topology
Hongliang Wang, Yan-Fei Liu, Paresh C. Sen, *Queen's University, Canada*

P3319 | Performance Evaluation and Selection of PWM Switching and Control Methods for Grid Connected Modular Multilevel Converters
Bar?? ÇiftÇi, Ahmet M. Hava, *Middle East Technical University, Turkey*

P3320 | Thermal and Electromagnetic Characteristics for Cross-Sectional Design Opimization of the Integrated Production Umbilical
So Young Bae, Gyu-Hong Kang, Jung Kwan Seo, *Korea Marine Equipment Research Institute, Korea (South); Pusan National University, Korea (South)*

Converter Control and Applications III

S

Room: Exhibit Hall 220E
Chairs: Amel Lachichi, Drazen Dujic, Carl Ho, Yongsug Suh,

P3501 | Analysis of RMS Current on DC-link Capacitor with Single-Shunt Current Sensing System
Takuro Kanazawa, Kimihisa Furukawa, Shigehisa Aoyagi, *Hitachi, Ltd., Japan*

P3502 | Comparison of the Power Semiconductor Design Rating of Different Inverter Topologies for the Drive Inverter of Electric Vehicles
Stephan Brueske, Berthold Benkendorff, Robert Kulpe, Friedrich W. Fuchs, *Christian-Albrechts-Universität zu Kiel, Germany*

P3503 | Circulating Current Minimization for Dual Three Phase Motor Integrated Battery Charger
Syed Q. Ali, Diego Mascarella, Geza Joos, Gerry Moschopoulos, *McGill University, Canada; University of Western Ontario, Canada*

P3504 | Converter Topologies Comparison for more Electric Aircrafts High Speed Starter/Generator Application
Giovanni Lo Calzo, Pericle Zanchetta, Chris Gerada, Alberto Gaeta, Fabio Crescimbini, *University of Nottingham, United Kingdom; University Roma Tre, Italy*

P3505 | Loss Estimation of an Isolated Three Port DC-DC Converter for Automotive Applications
Kenichi Itoh, Shuntaro Inoue, Masanori Ishigaki, Takahide Sugiyama, Masaru Sugai, *Toyota Central R&D Labs. Inc., Japan*

P3506 | A New State of Charge Control of Modular Multilevel Converters with Supercapacitors for Traction Drives
Nilanjan Mukherjee, Pietro Tricoli, *University of Birmingham, United Kingdom*

P3507 | Modified Virtual Space Vector based DC-Bus Voltage Balancing for Three-Level Neutral Point Clamped (NPC) Traction Inverter Drive
Abhijit Choudhury, Pragasen Pillay, Sheldon S. Williamson, *Concordia University, Canada; University of Ontario-Institute of Technology, Canada*

P3508 | Power Angle and Amplitude Decoupling Control Method for Electric Springs and Static Synchronous Series Compensators
Kwan-Tat Mok, Siew-Chong Tan, Shu-Yuen (Ron) Hui, *University of Hong Kong, Hong Kong*

P3509 | Effects of Suppressing Frequency Fluctuations by Parallel Operation of Virtual Synchronous Generator in Microgrids
Y. Hirase, O. Noro, K. Sugimoto, K. Sakimoto, Y. Shindo, T. Ise, *Kawasaki Technology Co., Ltd., Japan; Kawasaki Heavy Industries, Ltd., Japan; Osaka University, Japan*

P3510 | Comparison of Four Power Electronic Transformer Topologies on Unbalanced Load Correction Capacity
Shaodi Ouyang, Jinjun Liu, Xinyu Wang, Shuguang Song, Xueyu Hou, *Xi'an Jiaotong University, China*

P3511 | Performance Evaluation of 15 kV SiC IGBT based Medium Voltage Grid Connected Three-Phase Three-Level NPC Converter
Sachin Madhusoodhanan, Krishna Mainali, Awneesh Tripathi, Dhaval Patel, Arun Kadavelugu, Subhashish Bhattacharya, Kamalesh Hatua, *North Carolina State University, United States; Indian Institute of Technology Madras, India*

P3512 | Passivity-Based Design of Passive Damping for LCL-Filtered Voltage Source Converters
Xiongfei Wang, Remus Beres, Frede Blaabjerg, Poh Chiang Loh, *Aalborg University, Denmark*

P3513 | Managed DC Voltage Utilization Technique for the Renewable Energy Source Based on the Star-Connected Cascaded H-bridges Converter
Hsin-Chih Chen, Sheng-Yang Tsai, Ping-Heng Wu, Wei-Lun Huang, Po-Tai Cheng, *National Tsing Hua University, Taiwan*

P3514 | Direct Impedance Control of Grid-Connected Inverter
Zheng Zeng, Hu Borong, Weihua Shao, Hui Li, Li Ran, *Chongqing University, China*

P3515 | A Multimode Photovoltaic Inverter with Energy Storage Capability
Bunyamin Tamyurek, Bilgehan Kirimer, *Eskisehir Osmangazi University, Turkey*

P3516 | Improved Thermal Couple Impedance Model and Thermal Analysis of Multi-Chip Paralleled IGBT Module
Hui Li, Xinglin Liao, Yang Li, Shengquan Liu, Yaogang Hu, Zheng Zeng, Li Ran, *Chongqing University, China; Ganzhou Power Supply Company, China*

P3517 | Small Signal Modeling and Stability Analysis on Parallel Photovoltaic Inverters in Microgrid
Hongpeng Liu, Lele Yu, Hui Wu, Guihua Liu, Wei Wang, *Harbin Institute of Technology, China*

P3518 | Step-by-Step Controller Design of Voltage Closed-Loop Control for Virtual Synchronous Generator
Xinran Chen, Xinbo Ruan, Dongsheng Yang, Heng Wu, Wenxin Zhao, *Nanjing University of Aeronautics and Astronautics, China*

P3519 | DC-Link Voltage Coordinative-Proportional Control in Cascaded Converter Systems
Yanjun Tian, Poh Chiang Loh, Fujin Deng, Zhe Chen, Yanting Hu, *Aalborg University, Denmark; University of Chester, United Kingdom*

P3520 | Distributed Grid Voltage and Utility Frequency Stabilization via Shunt-Type Electric Springs
Kwan-Tat Mok, Tianbo Yang, Siew-Chong Tan, Chi-Kwan Lee, Shu-Yuen (Ron) Hui, *University of Hong Kong, Hong Kong; Imperial College London, United Kingdom*

P3521 | Comparison of Different Power Loop Controllers for Synchronous Power Controlled Grid-Interactive Converters
W. Zhang, D. Remon, A. Mir, A. Luna, J. Rocabert, I. Candela, P. Rodriguez, *Technical University of Catalonia, Spain; Abengoa Research, Spain*

P3522 | Figure of Merit for Selecting Super-Junction MOSFETs in High Efficiency Voltage Source Converters
Andrew Hopkins, Neville McNeill, Philip Anthony, Phil Mellor, *University of Bristol, United Kingdom*

P3523 | A d-q Voltage Droop Control Method for Inverter Paralleling without any Communication between Individual Inverters
Partha Pratim Das, Souvik Chattopadhyay, *IIT Kharagpur, India;*

P3524 | Advanced Phase-Skipping Control with Improved Efficiency of Three-Phase Micro-Inverters
S. Milad Tayebi, Charles Jourdan, Issa Batarseh, *University of Central Florida, United States*

P3525 | Auto-Tuning the Cost Function Weight Factors in a Model Predictive Controller for a Matrix Converter VAR Compensator
Mohammad B. Shadmand, Robert S. Balog, Haitham Abu Rub, *Texas A&M University, United States; Texas A&M University at Qatar, Qatar; Qatar Environment and Energy Research Institute, Qatar*

P3526 | Multilevel Reduced Controlled Switches AC-DC Power Conversion Cells
João P.R.A. Mêllo, Cursino B. Jacobina, Italo R.F.M.P. Silva, *Federal University of Campina Grande, Brazil*

P3527 | Comparative Study of Model Predictive Control and Direct Power Control for PWM Rectifiers with Active Power Ripple Minimization
Yongchang Zhang, Yubin Peng, Changqi Qu, *North China University of Technology, China*

P3528 | Modular Control of a Differential-Mode Inverter
Sudip K. Mazumder, Harshit Soni, *University of Illinois-Chicago, United States*

P3529 | Universal Active Power Filters based on Nine-Leg Converter
P.L.S. Rodrigues, C.B. Jacobina, G.A. de A. Carlos, *UFCG, Brazil*

P3530 | Remaining Useful Lifetime Estimation for Degraded Power MOSFETs Under Cyclic Thermal Stress
Serkan Dusmez, Bilal Akin, *University of Texas at Dallas, United States*

Selected Topics in Electric Machines II

S

Room: Exhibit Hall 220E
Chairs: Maurizio Cirrincione, Rakib Islam

P3701 | Design of a Cost-Efficient High-Speed High-Efficiency PM Machine for Compressor Applications
A. Gilson, S. Tavernier, M. Gerber, C. Espanet, F. Dubas, D. Depernet, *Moving Magnet Technologies, France; FEMTO-ST Institute, France*

P3702 | Multi-Physics Design of High-Energy-Density Wound Components
N. Simpson, R. Wrobel, P.H. Mellor, *University of Bristol, United Kingdom*

P3703 | Concentrated Winding IPM Synchronous Motor Design for Wide Field Weakening Applications
Mohammad Sedigh Toulabi, John Salmon, Andrew M. Knight, *University of Alberta, Canada; University of Calgary, Canada*

P3704 | Operating Limits of a Brushless Doubly Fed Reluctance Machine Driven by Two Converters
Ronald S. Rebeiro, Andrew M. Knight, *University of Calgary, Canada*

P3705 | A Novel Single Phase SRM Simply Driven by Commercial AC Power Supply
Kohei Aiso, Kan Akatsu, *Shibaura Institute of Technology, Japan*

P3706 | Operational Characteristics of an IPM-Type Bearingless Motor with 2-Pole Motor Windings and 4-Pole Suspension Windings
Tatsuya Matsuzaki, Masatsugu Takemoto, Satoshi Ogasawara, Satoru Ota, Kazunobu Oi, Daiki Matsuhashi, *Hokkaido University, Japan; Meidensha Corporation, Japan*

P3707 | Design of High-Speed Machines using Silicon-Carbide based Inverters
Yingjie Li, Di Han, Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

P3708 | Analysis of the Curved Permanent Magnet Linear Machine for a Golf Swing Training System
Bin Li, Tony Camarano, Jonathan Beck, Wei Wu, Louis Chow, Thomas Wu, Don Drumm, Martin Lebouitz, David Napolitano, *University of Central Florida, United States; DNA Sports Trainer, United States*

P3709 | Analysis and Design of a Dual-Rotor Axial-Flux Vernier Permanent Magnet Machine
Tianjie Zou, Ronghai Qu, Jian Li, Dawei Li, *Huazhong University of Science and Technology, China*

P3710 | Permanent Magnet Demagnetization Test Fixture Design and Validation
Han Xiong, Julia Zhang, Michael W. Degner, Chuanbing Rong, Feng Liang, Wanfeng Li, *Oregon State University, United States; Ford Motor Company, United States*

P3711 | Condition Monitoring and Winding Fault Detection of Inductors in LCL Filter Integrated with Active Front End Rectifier
Subash Chandar Athikessavan, Sanjib Kumar Panda, Sivakumar Nadarajan, Amit Kumar Gupta, *National University of Singapore, Singapore*

P3712 | Maximum Torque Control of Induction Machine in Deep Flux Weakening Region
Haiwei Cai, Longya Xu, Alejandro J. Pina, *Ohio State University, United States*

P3713 | Design of an Integrated Electrical Drive using Wound Field Flux Switching Motor Coupled with Z-Source Inverter
G. Tajima, T. Hayashi, T. Kosaka, N. Matsui, *Nagoya Institute of Technology, Japan*

P3714 | Instantaneous Current Profiling Control for Minimizing Torque Ripple in Switched Reluctance Servo Motors
H. Makino, S. Nagata, T. Kosaka, N. Matsui, *Nagoya Institute of Technology, Japan*

P3715 | Permanent Magnet Magnetization State Estimation using High Frequency Signal Injection
Daniel Fernandez, David Reigosa, Juan Manuel Guerrero, Zi-Qiang Zhu, Fernando Briz, *University of Oviedo, Spain; University of Sheffield, United Kingdom*

P3716 | A Case-Based Data-Driven Prediction Framework for Machine Fault Prognostics
Fangzhou Cheng, Liyan Qu, Wei Qiao, *University of Nebraska-Lincoln, United States*

P3717 | Establishing the Relative Merits of Synchronous Reluctance and PM Assisted Technology Through Systematic Design Optimization
Yi Wang, Dan M. Ionel, Minjie Jiang, Steve J. Stretz, *University of Wisconsin-Milwaukee, United States; Regal Beloit Corp., United States*

P3718 | Dual Rotor Mutually Coupled Switched Reluctance Machine for Wide Speed Operating Range
Wasi Uddin, Yilmaz Sozer, *University of Akron, United States*

P3719 | kW, 2000-4500rpm Ferrite PMSM Drive: Comprehensive Characterization and Two Sensorless Control Options
F.J. Kalluf, A.S. I?f?nu?i, L.N. Tutelea, A. Moldovan-Popa, I. Boldea, *Embraco, Brazil; UPT, Romania*

General Topics on Motor Drives II

E

Room: Exhibit Hall 220E
Chairs: Fernando Briz, Elena Lomonova

P3901 | Hall-Effect Sensor Fault Detection, Identification and Compensation in Brushless DC Drives
G. Scelba, G. De Donato, M. Pulvirenti, F. Giulii Capponi, G. Scarcella, *University of Catania, Italy; University of Rome "La Sapienza", Italy*

P3902 | Wireless Permanent Magnet Temperature & Field Distribution Measurement System for IPMSMs
Daniel Fernandez, David Reigosa, Tsutomu Tanimoto, Takashi Kato, Fernando Briz, *University of Oviedo, Spain; Nissan Motor Co., Ltd., Japan*

P3903 | A High-Speed Electric Drive for the More Electric Engine
Davide Lusignani, Davide Barater, Giovanni Franceschini, Giampaolo Buticchi, Michael Galea, Chris Gerada, *University of Parma, Italy; University of Kiel, Germany; University of Nottingham, United Kingdom*

P3904 | Synchronous PWM with Single Voltage Vector per Sector in Voltage Source Inverter
Sungho Jung, Jaeyong Park, Jung-Ik Ha, *Seoul National University, Korea (South)*

P3905 | Torque Ripple Minimization via PWM Control Technique with GaN-Based Motor Drive for High Speed Single Phase Brushless DC Motor
Woongkul Lee, Ju Hyung Kim, Wooyoung Choi, Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

P3906 | Iron Loss Evaluation and Comparison in Application of Reduced Common Mode Voltage PWM Methods
Fang Liu, Ting Lu, Zhengming Zhao, Qing Gu, Liqiang Yuan, Kai Li, *Tsinghua University, China*

P3907 | Design and Comparison of Cascaded H-Bridge, Modular Multilevel Converter and 5-L Active Neutral Point Clamped Topologies for Drive Application
Alinaghi Marzoughi, Rolando Burgos, Dushan Boroyevich, Yaosuo Xue, *Virginia Tech, United States; Siemens Corporate Research, United States*

P3908 | A New Approach to Improve the Current Harmonic Content on Open-End Winding AC Motors Supplied by Multi-Level Inverters
S. Foti, A. Testa, G. Scelba, S. De Caro, M. Cacciato, G. Scarcella, D. Bazzano, T. Scimone, *University of Catania, Italy; University of Messina, Italy*

P3909 | Multi Motor Drive based on a Dual Purpose DC-DC Power Conversion System
Taehyung Kim, Kwang-Woon Lee, Sangshin Kwak, *University of Michigan-Dearborn, United States; Mokpo National Maritime University, Korea (South); Chung-Ang University, Korea (South)*

P3910 | Design and Test Results for Dual-Lane Fault-Tolerant PM Motor for Safety Critical Aircraft Actuator
P.S. Sangha, T. Sawata, *UTC Aerospace Systems, United Kingdom*

P3911 | Low-Power Energy Generation Systems for Two-Phase PM Machine with Reduced-Switch-Count Controlled Switches
Filipe A. da C. Bahia, Cursino B. Jacobina, Nady Rocha, Italo Roger F.M.P. da Silva, Fabiano Salvadori, *UFCG, Brazil; UFPB, Brazil*

P3912 | System Harmonic Interaction between DC and AC Adjustable Speed Drives and Cost Effective Mitigation
Kevin Lee, Daniel Carnovale, Douglas Young, Darrell Ouellette, Joseph Zhou, *Eaton Corporation, United States*

P3913 | Self-Commissioning Algorithm for Matrix Converter Nonlinearity Compensation
Arzhang Yousefi-Talouki, Gianmario Pellegrino, Michele Mengoni, Luca Zarri, *Politecnico di Torino, Italy; University of Bologna, Italy*

P3914 | On Line Detection of Inverter Fed AC Machine Insulation Health State using High Frequency Voltage Excitation
Th.M. Wolbank, *Vienna University of Technology, Austria*

P3915 | A Fast Online Full Parameter Estimation of a PMSM with Sinusoidal Signal Injection
Qian Liu, Kay Hameyer, *RWTH Aachen University, Germany*

P3916 | Assessment Method of Dead-Time Compensation Schemes of Three-Phase Inverters using a Hardware-in-the-Loop Configuration
R. Bojoi, E. Armando, F. Mariut, S. Odhano, *Politecnico di Torino, Italy*

Devices and Modules

E

Room: Exhibit Hall 220E
Chairs: Tanya Gachovska, Doug Hopkins

P4101 | Development of 6kV SiC Hybrid Power Switch based on 1200V SiC JFET and MOSFET
Xijun Ni, Rui Gao, Xiaoqing Song, Alex Q. Huang, Wensong Yu, *North Carolina State University, United States*

P4102 | A Self-Powered Bidirectional DC Solid State Circuit Breaker using Two Normally-On SiC JFETs
Zhenyu Miao, Gourab Sabui, Aref Moradkhani Roshandeh, Cuixia Wang, Z. John Shen, Jun Wang, Zhikang Shuai, Xin Yin, *Illinois Institute of Technology, United States; Hunan University, China*

P4103 | A Self-Adaptive Blanking Circuit for IGBT Short-Circuit Protection based on VCE Measurement
Xingyao Zhang, Min Chen, Nan Zhu, Dehong Xu | *Zhejiang University, China*

P4104 | A Fast Universal Power Module Layout Method
Puqi Ning, Xuhui Wen, Yunhui Mei, Tao Fan, *Chinese Academy of Sciences, China; Collaborative Innovation Center of Electric Vehicles in Beijing, China; Tianjin University, China*

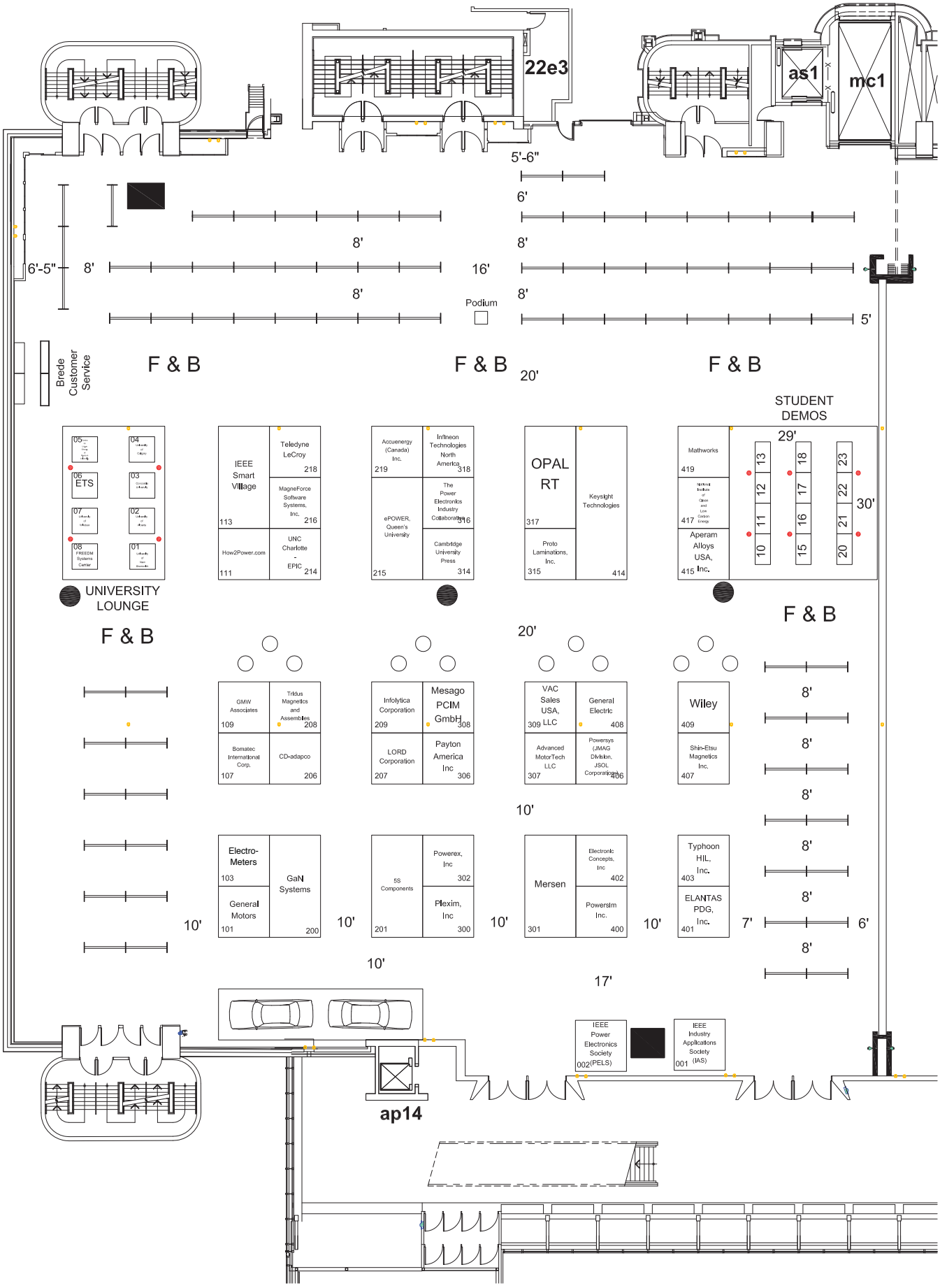
P4105 | Performance Evaluation of Custom-Made 1.2-kV 100-A Silicon Carbide Half-Bridge Module in Three-Phase Grid Connected PWM Rectifier
Sami Pettersson, Slavo Kicin, Enea Bianda, Toni Holm, Paula Räisänen, Francisco Canales, *ABB Corporate Research, Switzerland*

P4106 | 900V Silicon Carbide MOSFETs for Breakthrough Power Supply Design
Vipindas Pala, Adam Barkley, Brett Hull, Gangyao Wang, Sei-Hyung Ryu, Edward Van Brunt, Daniel Lichtenwalner, Jim Richmond, Charlotte Jonas, Craig Capell, Scott Allen, Jeffrey Casady, David Grider, John Palmour, *Cree Inc., United States*

P4107 | Soft Switching Characterization of 15 kV SiC n- IGBT and Performance Evaluation for High Power Converter Applications
Kasunaidu Vechalapu, Awneesh Tripathi, Krishna Mainali, B. Jayant Baliga, Subhashish Bhattacharya, *North Carolina State University, United States*

NOTES

EXHIBIT HALL FLOOR PLAN



EXHIBITOR LISTING

Alphabetical Listing by Exhibitor Name

Company Name	Booth Number
5S Components	201
Accuenergy (Canada) Inc.	219
Advanced MotorTech LLC	307
Aperam Alloys USA, Inc.	415
Bomatec International Corp.	107
Cambridge University Press	314
CD-adapco	206
ELANTAS PDG, Inc.	401
Electro-Meters	103
Electronic Concepts, Inc.	402
Energy Production and Infrastructure Center, UNC Charlotte	214
ePOWER, Queen's University	215
GaN Systems	200
General Electric	408
General Motors	101
GMW Associates	109
How2Power.com	111
IEEE Industry Applications Society (IAS)	001
IEEE Power Electronics Society (PELS)	002
IEEE Smart Village	113
Infineon Technologies North America	318
Infolytica Corporation	209
Keysight Technologies	414
LORD Corporation	207
MagneForce Software Systems, Inc.	216
Mathworks	419
Mersen	301
Mesago PCIM GmbH	308
National Institute of Clean and Low Carbon Energy	417
OPAL RT	317
Payton America Inc	306
Plexim, Inc	300
Power Electronics Industry Collaborative	316
Powerex, Inc	302
Powersim Inc.	400
Powersys (JMAG Division, JSOL Corporation-)	406
Proto Laminations, Inc.	315
Shin-Etsu Magnetics Inc.	407
Teledyne LeCroy	218
Tridus Magnetics and Assemblies	208
Typhoon HIL, Inc.	403
VAC Sales USA, LLC	309
Wiley	409

University	Table Number
Centre for Urban Energy at Ryerson University	5
Concordia University	3
ETS – École de technologie supérieure	6
FREEDM Systems Center	8
RWTH Aachen University	9
University of Alberta	2
University of Calgary	4
University of New Brunswick	1
University of Windsor	7

Alphabetical Listing by Booth Number

Company Name	Booth Number
IEEE Industry Applications Society (IAS)	001
IEEE Power Electronics Society (PELS)	002
General Motors	101
Electro-Meters	103
Bomatec International Corp.	107
GMW Associates	109
How2Power.com	111
IEEE Smart Village	113
GaN Systems	200
5S Components	201
CD-adapco	206
LORD Corporation	207
Tridus Magnetics and Assemblies	208
Infolytica Corporation	209
Energy Production and Infrastructure Center, UNC Charlotte	214
ePOWER, Queen's University	215
MagneForce Software Systems, Inc.	216
Teledyne LeCroy	218
Accuenergy (Canada) Inc.	219
Plexim, Inc	300
Mersen	301
Powerex, Inc	302
Payton America Inc	306
Advanced MotorTech LLC	307
Mesago PCIM GmbH	308
VAC Sales USA, LLC	309
Cambridge University Press	314
Proto Laminations, Inc.	315
Power Electronics Industry Collaborative	316
OPAL RT	317
Infineon Technologies North America	318
Powersim Inc.	400
ELANTAS PDG, Inc.	401
Electronic Concepts, Inc.	402
Typhoon HIL, Inc.	403
Powersys (JMAG Division, JSOL Corporation-)	406
Shin-Etsu Magnetics Inc.	407
General Electric	408
Wiley	409
Keysight Technologies	414
Aperam Alloys USA, Inc.	415
National Institute of Clean and Low Carbon Energy	417
Mathworks	419

University	Table Number
University of New Brunswick	1
University of Alberta	2
Concordia University	3
University of Calgary	4
Centre for Urban Energy at Ryerson University	5
ETS – École de technologie supérieure	6
University of Windsor	7
FREEDM Systems Center	8
RWTH Aachen University	9

EXHIBITOR DIRECTORY

5S Components Inc

BOOTH 201

630 Fifth Avenue
East McKeesport, PA 15035
USA
P | 412-967-5858
F | 412-967-5868
info@5scomponents.com
www.5scomponents.com

5S Components is the distributor of ABB's Semiconductor, current and voltage sensors. Additional product lines include ICAR power film capacitors and Power Integrations IGBT gate units. Stop by our booth to get the latest technical updates.

Accuenergy (Canada) Inc.

BOOTH 219

2 Lansing Sq. Suite 1001
Toronto, Ontario M2J 4P8
Canada
P | 416-497-4100
F | 416-497-4130
marketing@accuenergy.com
www.accuenergy.com

Accuenergy specializes in power metering solutions that leads the industry at revenue grade energy metering, power quality analysis, ease of deployment and advanced communication methods. Reliable Accuenergy power meters has been used across the globe in to monitor electrical systems in commercial buildings, industrial facilities, data centres and cell towers. Accuenergy meters are capable of monitoring and logging revenue grade energy usage, capture power quality event and waveforms. Pre-wired panel metering solution and wireless sub-metering solution offers the simplest way to tenant billing and metering applications.

Advanced MotorTech

BOOTH 307

4951 71st Ave. N
Pinellas Park, FL 33781
USA
P | 727-412-8200
F | 727-412-8299
sales@advancedmotortech.com
www.advancedmotortech.com

Advanced MotorTech is the leader in electric machine design engineering services, including consulting, prototyping and training. All motor types. Experience and expertise ranges from miniature to 1000's of kW/HP, from new designs to failure analysis, from theoretical concepts to practical design, from design for high efficiency to high power density. We know motors and generators.

Aperam Alloys USA, Inc.

BOOTH 415

2650 Eisenhower Avenue
Suite 102A
Audubon, PA 19403
USA
P | 800-523-1777
richard.moschetti@aperam.com
www.aperam.com/alloys-imphy/

Alloys is an integrated mill source, leader in the design, development, manufacture, and marketing of advanced specialty nickel and cobalt alloys, in cold rolled, long and hot rolled forms, in particular magnetic rotor and stator grades (ASTM A801). Our products are primarily focused on aerospace, electrical safety, and automotive markets.

Bomatec International Corp.

BOOTH 107

400 Finchdene Sq., Unit 6
Toronto, ON M1X 1E2
Canada
P | 416-860-9300
F | 416-860-9301
contact@bomatec.com
bomatec.com

Permanent sintered and injection molded Magnets of NdFeB, SmCo, AlNiCo and Ferrite for motors and sensor. Soft magnets of nanocrystalline and amorphous cores for transformers, chokes, EMI filters.

Cambridge University Press

BOOTH 314

32 Avenue of the Americas
New York, NY 10013
USA
P | 212-924-3900
F | 212-691-3239
jmurphy@cambridge.org
www.cambridge.org/us/academic

Cambridge's publishing in books and journals combines state-of-the-art content with the highest standards of scholarship, writing and production. Visit our stand to browse new titles, available at a 20% discount, and to pick up sample issues of our journals. Visit our website to see everything we do: www.cambridge.org/us/academic.

CD-adapco

BOOTH 206

60 Broadhollow Road
Melville, NY 11747
USA
P | 631-549-2300
info@cd-adapco.com
www.cd-adapco.com

CD-adapco is the world's largest independent CFD-focused provider of engineering simulation software, support and services. It has over 30 years of experience in delivering industrial strength engineering simulation to a wide range of industries and application.

ELANTAS PDG, Inc

BOOTH 401

5200 North Second Street
St Louis, MO 63147
USA
P | 314-621-5700
F | 314-436-1030
www.elantas.com/pdg

ELANTAS PDG, Inc. is the global leader in liquid electrical insulation products, including magnet wire enamel, insulating resins, potting compounds, conformal coatings and a wide range of specialty resin systems and adhesives. ISO 9001, TS 16949

Electro-Meters

BOOTH 103

900 McKay Road
Pickering, ON L1W 3X8
Canada
P | 905-428-3413
www.electro-meters.com

Electro-Meters is the leading Canadian distributor of Test & Measurement instruments. We represent market leaders in the field of data acquisition and electrical power measurement products. We will be displaying the Yokogawa Scopecorder System, as well as the latest Digital Power Analyzers and the new Precision Power Scope. These instruments are for the Test and R&D Professionals that demand accuracy and precision for the development of electric motors, drive systems, inverters, battery charging systems and other electrical components. Also featured will be a demonstration of Chroma's AD/DC sources and Electronic loads as well as battery test systems.

Electronic Concepts Inc.

BOOTH 402

526 Industrial Way West
Eatontown, NJ 07724
USA
P | 732-542-7880
F | 732-542-0524
sales@ecicaps.com
www.ecicaps.com

Electronic Concepts is the recognized leader in film capacitor design and manufacture. Our vertical integration and innovative design capability offers the flexibility to meet your most demanding requirements and applications. Our latest development is on film capacitors operating at 125°C, 150°C and 175°C.

Energy Production and Infrastructure Center, UNC Charlotte

BOOTH 214

9201 University City Blvd.
EPIC
Charlotte, NC 28223
USA
P | 704-687-5614
F | 704-687-1819
epic@uncc.edu
www.epic.uncc.edu

The Energy Production and Infrastructure Center (EPIC) at UNC Charlotte serves as a state-of-the-art research center that provides education and applied research opportunities to students with energy related interests. Offering six Applied Research Clusters and four Research Centers, EPIC interdisciplinary researchers collaborate with industry and use state-of-the-art laboratories to work to solve some of today's most difficult energy challenges.

ePOWER, Queen's University

BOOTH 215

19 Union Street
Queen's University
Kingston, ON K7L 3N6
Canada
P | 613-533-3199
F | 613-533-3395
vickeryj@queensu.ca
www.queensu.ca/epower/

The Queen's Centre for Energy and Power Electronics Research (ePOWER) brings together academic and industrial researchers to develop a broad range of applications and expertise, from power transmission to alternative energy, to power consumption to power application-specific integrated circuits.

Fundamental and applied research conducted at ePOWER is resulting in the development of new energy efficient, cost effective and environmentally friendly power electronic technologies. With growing energy demand, shortage of traditional energy sources and increasingly rigorous environmental standards, energy costs are growing, threatening living standards. Work conducted at ePOWER is playing a significant role in conserving energy and protecting the environment.

GaN Systems Inc.

BOOTH 200

1145 Innovation Drive
Ottawa, ON K2K 3G8
Canada
P | 613-686-1996
info@gansystems.com
www.gansystems.com

GaN Systems is the first place systems designers go to realize all of the benefits of gallium nitride in their power conversion and control applications. To overcome silicon's limitations in switching speed, temperature, voltage, and current, the Company develops the most complete range of gallium nitride power switching solutions for a variety of markets. Its unique Island Technology™ addresses today's cost, performance, and manufacturability-related challenges of gallium nitride resulting in devices that are approximately four times smaller, four times more efficient, and one quarter the cost of traditional design approaches.

GE

BOOTH 408

1 Research Circle
Niskayuna, NY 12309
USA
P | 518-387-4413
SiC.Products@ge.com
www.geglobalresearch.com/focus/silicon-carbide

GE imagines things others don't, builds things others can't and delivers outcomes that make the world work better. GE brings together the physical and digital worlds in ways no other company can. In its labs and factories and on the ground with customers, GE is inventing the next industrial era to move, power, build and cure the world.

General Motors

BOOTH 101

777 Joslyn Avenue
Pontiac, MI 48340
USA
P | 248-496-8501
www.gm.com

GM is a automotive manufacture that produces from electric and mini-cars to heavy-duty full-size trucks, monocabs and convertibles, General Motors' dynamic brands offer a comprehensive range of vehicles in more than 120 countries around the world. GM produce cars and trucks through the following brands: Chevrolet, Buick, GMC, Cadillac, Baojun, Holden, Isuzu, Jiefang, Opel, Vauxhall and Wuling.

GMW Associates

BOOTH 109

955 Industrial Road
San Carlos, CA 94070
USA
P | 650-802-8292
ben@gmw.com
www.gmw.com

GMW will show magnetic sensors and instruments for the voltage isolated measurement of electric current and voltage: PCB mounting current sensors with full-scale ranges from ±0.25A to ±85A and frequency bandwidth from dc to 1MHz; Clamp-on Current DC-AC probes to ±16kA; Clip-Around Flexible Rogowski Coil AC Current Probes to ±300kA and 30MHz Bandwidth; and very high accuracy Current Transducers to ±8kA.

How2Power.com

BOOTH 111

P.O. Box 755
Smithtown, NY 11787
USA
P | 631-269-4540
david@how2power.com
How2Power.com

A free power electronics website for engineers, students, and instructors. Great source of practical power design information. Sign up for our free monthly newsletter, How2Power Today, which presents in-depth articles on power supply topologies, control methods, circuits, magnetics, SiC & GaN developments, and much more.

IEEE Industry Applications Society

BOOTH 001

445 Hoes Lane
Piscataway, NJ 08854
USA
P | 732-465-5084
ias-administrator@ieee.org
http://ias.ieee.org/

The Industry Applications Society supports the advancement of the theory and practice of electrical and electronic engineering in the development, design, manufacture and application of electrical systems, apparatuses, devices and controls to the processes and equipment of industry and commerce; the promotion of safe, reliable and economical installations; industry leadership in energy conservation and environmental health and safety issues; the creation of voluntary engineering standards and recommended practices; and the professional development of its membership.

IEEE Power Electronics Society

BOOTH 002

445 Hoes Lane
Piscataway, NJ 08854
USA
P | 732-465-6480
pels-staff@ieee.org
www.ieee-pels.org

The Power Electronics Society is one of the fastest growing technical societies of the Institute of Electrical and Electronics Engineers (IEEE). For over 20 years, PELS has facilitated and guided the development and innovation in power electronics technology. This technology encompasses the effective use of electronic components, the application of circuit theory and design techniques, and the development of analytical tools toward efficient conversion, control and condition of electric power. Our 7,000 members include preeminent researchers, practitioners, and distinguished award winners. IEEE PELS Publishes the IEEE Transactions on Power Electronics, a top referenced journal among all IEEE publications.

The Power Electronics Society is dedicated to:

Upholding the vital scientific and educational aspects of power electronics and its applications.

Keeping its members around the globe up to date on state-of-the-art technological developments and advances in power electronics research.

In striving to build knowledge and awareness of the latest technologies and other advances in power electronics, the Power Electronics Society's goal is to keep members current and competitive in the workplace, and provide them with the tools necessary to help them grow both personally and professionally. We invite you to join us, and benefit from a world of invaluable information and support.

IEEE Smart Village

BOOTH 113

445 Hoes Lane
Piscataway, NJ 08854
USA
P | 609-731-17698
m.deering@ieee.org
IEEE-Smart-Village.org

IEEE Smart Village is a major IEEE initiative to bring innovative and sustainable electrical systems to the developing world. Combining the talents of more than 400,000 members across IEEE with sustainable-development partners in education, business and technologies, IEEE Smart Village delivers immediate, life-changing impact to the world's poorest and most energy-deprived populations.s

Infineon Technologies North America

BOOTH 318

1050 Route 22
Lebanon, NJ 08833
USA
P | 908-236-5600
info.usa@infineon.com
www.Infineon.com/highpower

Infineon modules are the premier choice for industrial/general purpose drives, high-voltage transmission systems, uninterruptible power supplies and renewable energy applications. A recognized technology leader in IGBT products, Infineon offers a comprehensive portfolio in different voltage and current classes; offered as bare dies, discretes components, power modules and complete stack solutions.

Infolytica Corporation — BOOTH 209

300 leo pariseau
Suite 2222
Montreal, QC H2X 4B3
Canada
P | 514-849-8752
F | 514-849-4239
info@infolytica.com
www.infolytica.com

Infolytica Corporation is the developer of MagNet 2D/3D, the leading electromagnetic field simulation software, and ElecNet 2D/3D for electric fields. Some typical design applications include transformers, motors, DC-DC converters, sensors/NDT and much more.

Keysight Technologies — BOOTH 414

1400 Fountaingrove Pkwy
Santa Rosa, CA 95403
USA
P | 800-829-4444
www.keysight.com

Keysight solutions cover your needs for selecting the right power components, designing for efficient power conversion, validating power conversion device performance, and final device test.

LORD Corporation — BOOTH 207

111 LORD Drive
Cary, NC 27511
USA
P | 877 ASK LORD (275 5673)
Customer.Support@lord.com
LORD.com

LORD Corporation is a diversified technology and manufacturing company developing highly reliable adhesives, coatings, motion management devices, and sensing technologies that significantly reduce risk and improve product performance. For 90 years, LORD has worked in collaboration with our customers to provide innovative aerospace, defense, automotive and industrial solutions. With revenues exceeding $880 million, LORD has more than 3,000 employees in 26 countries and operates 16 manufacturing facilities and eight R&D centers worldwide.

MagneForce Software Systems, Inc. — BOOTH 216

5655 South Park Ave
Hamburg, NY 14075
USA
P | 716-646-1773
pbaldassari@magneforcess.com
www.magneforcess.com

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. Unlike general purpose FE packages MagneForce simulators compute directly machine performance parameters such as voltages, currents, torque, power and efficiency. This is all done in an easy to learn and use Windows environment.

MathWorks — BOOTH 419

3 Apple Hill Drive
Natick, MA 01760
USA
P | 508-647-7000
F | 508-652-8740
deveney.kowalczyk@mathworks.com
www.mathworks.com

The MATLAB and Simulink product families are fundamental applied math and computational tools adopted by more than 5000 universities and colleges. MathWorks products help prepare students for careers in industry, where the tools are widely used for data analysis, mathematical modeling, and algorithm development in collaborative research and new product development.

Mersen — BOOTH 301

374 Merrimac Street
Newburyport, MA 01950
USA
P | 978-462-6662
F | 978-465-6419
info.nby@mersen.com
ep.mersen.com

Mersen integrates its extensive expertise in cooling and heatsink technology, laminated bus bar design and semiconductor fuses in your power electronics applications to make them safe, reliable and profitable. With industrial operations in major economic regions of the globe, Mersen's engineering teams provide local customer support with innovative best-fit solutions!

Mesago PCIM GmbH — BOOTH 308

Rotebuehlstrasse 83-85
Stuttgart. Baden-Wuerttemberg 70178
Germany
P | +49 61946-0
F | +49 61946-93
pcim@mesago.com
www.pcim-europe.com

International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management
Nuremberg, 10 – 12 May 2016

PCIM Europe is the international leading exhibition and conference for power electronics, intelligent motion, renewable energy and energy management. From latest developments of power semiconductors and the wide area of power quality and energy-management - PCIM Europe offers a comprehensive and focused presentation of products all under one roof.

National Institute of Clean and Low Carbon Energy — BOOTH 417

B101-Shenhua NICE
Future Science & Technology City,
Changping District
Beijing, Beijing 102209
P.R.China
P | +86-10-57595508
F | +86-10-57595508
niceinquiry@nicenergy.com
www.nicenergy.com

NICE is a national research institute focused on energy which is funded by the Shenhua Group (ranked 165 of Fortune 500 in 2014), an integrated energy conglomerate with businesses including coal mining, power, railway, ports, coal to liquids, and coal to chemicals.

OPAL-RT

BOOTH 317

1751 Richardson
Suite 2525
Montreal, QC H3K 1G6
Canada
P | 514-935-2323
F | 514-935-2323
sabrina.benzid@opal-rt.com
www.opal-rt.com

OPAL-RT TECHNOLOGIES is a leading developer of open, real-time digital simulators and Hardware-In-the-Loop testing equipment for electrical, electro-mechanical and power electronics systems. Our validation and test benches are used by engineers and researchers at leading manufacturers, utilities and universities worldwide. Our technological approach integrates parallel, distributed computing with commercial-off-the-shelf technologies.

Payton America Inc

BOOTH 306

1805 S. Powerline Rd
Suite 109
Deerfield Beach, FL 33442
USA
P | 954-428-3326
F | 9544283308
jim@paytongroup.com
www.paytongroup.com

Payton is the world leader in the design and manufacturing of planar magnetics for SMPS's. Designs in 24 hours and samples in few weeks from few watts to over 100kW, from 20kHz to 5MHz. Production and designs centers in US, Israel, UK, China & Philippines.

Plexim

BOOTH 300

5 Upland Road
Suite 4
Cambridge, MA 02140
USA
P | 617-209-2121
F | 617-209-1111
info@plexim.com
www.plexim.com

Plexim's electrical engineering software PLECS is a simulation package for designing multi-physical domain power conversion systems and their associated controls that yields robust and fast results. Available in two versions, PLECS Blockset works in the MATLAB/Simulink environment while PLECS Standalone is an independent solution. Plexim also now offers a processor-in-the-loop (PIL) tool for developing and testing embedded controls and web-based simulation (WBS) for educational and marketing purposes.

Power Electronics Industry Collaborative

BOOTH 316

P.O. Box 159
Grand Ledge, MI 48837
USA
P | 517-925-8649 ext. 20
info@peic-us.org
http://peic-us.org

The Power Electronics Industry Collaborative (PEIC) is a national, industry driven membership-based consortium comprised of OEMs, suppliers, researchers, and other stakeholders working to advance the U.S. power electronics industry. The PEIC's vision is to position the United States as a global center of power electronics research, design, and manufacturing.

Powerex, Inc.

BOOTH 302

173 Pavilion Lane
Youngwood PA 15697
USA
P | 724-925-7272
globalsales@pwrx.com
www.pwrx.com

Powerex is a leading supplier of discrete devices, modules and integrated high power semiconductor solutions. Its broad product line includes IGBTs (Insulated Gate Bipolar Transistors), HVIGBTs, SiC modules, IPMs (Intelligent Power Modules), rectifiers, thyristors, custom power modules and assemblies.

Powersim Inc.

BOOTH 400

2275 Research Blvd.
500
Rockville, MD 20850
USA
P | 301-841-7445
info@powersimtech.com
www.powersimtech.com

Powersim is a software solutions company that delivers both market-leading power electronics simulation and design tools and deep technical support that engineers demand to accelerate their pace of innovation. Its software expedites getting ideas from design to market efficiently.

Powersys (JMAG Division, JSOL Corporation)

BOOTH 406

2000 Town Center
Suite #1900
Southfield, MI 48075
USA
P | 727-288-8100
jmagsales@powersys-solutions.com
www.powersys-solutions.com

JMAG is the most advanced simulation software for electromechanical design and development. JMAG can accurately capture and quickly evaluate complex physical phenomena inside of machines. Easily perform the simple operations required to obtain precise results. Applications: Motors, generators, transformers, reactor, solenoids, actuators, and more. Analysis Functions: Magnetics, Electrostatics, Structural, Thermal, Multiphysics

Proto Laminations, Inc.

BOOTH 315

13666 East Bora Drive
Santa Fe Springs, CA 90670
USA
P | 909-338-3744
F | 909-338-3744
ssprague@protolam.com
www.protolam.com

Proto Laminations, Inc., specializes in the manufacture of laser cut and stamped short-run laminations for rotating machinery in support of the development, prototype evaluation and limited production needs of academic institutions and motor and generator manufacturers worldwide.

Shin-Etsu Magnetics, Inc.

BOOTH 407

909 Parkview Blvd
Lombard, IL 60148
USA
P | 612-889-1893
F | 630-424-3365
buettner@smisj.com
www.shinetsu-rare-earth-magnet.jp/en

Shin-Etsu is the world's leading producer of advanced high energy sintered NdFeB and SmCo magnets. Please visit our booth to learn more about Shin-Etsu's new NdFeB products including; Dy Free, Reduced Dy and Grain Boundary Diffusion Process (GBDP) grades. These technologies cut cost through the elimination or reduction of heavy rare-earths, while improving or maintaining performance!

Teledyne LeCroy

BOOTH 218

700 Chestnut Ridge Rd.
Chestnut Ridge, NY 10977
USA
P | 800-553-2769
F | 845-578-5985
contact.corp@teledynelecroy.com
http://teledynelecroy.com

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively.

Tridus Magnetics & Assemblies

BOOTH 208

1145 W. Victoria St.
Rancho Dominguez, CA 90220
USA
P | 310-884-3200
F | 310-884-3201
www.tridus.com

Tridus is a US company with a China presence providing customers with a low cost and high reliability path to sintered and bonded rare earth magnet manufacturing. With a quality embedded supply chain that spans from rare earth processing to value added assembly products, we demonstrate high standards of quality, service and pricing.

Typhoon HIL, Inc.

BOOTH 403

35 Medford St.
Suite 305, Somerville
Boston, MA 02143
USA
P | 617 909 - 9705
info@typhoon-hil.com
www.typhoon-hil.com

Typhoon HIL is a technology leader in ultra-high fidelity Hardware-in-the-Loop (HIL) real-time emulators for power electronics. The company was founded in 2008, and since then, it has consistently been introducing new design, test, and verification Hardware-in-the-Loop products distinguished by leading edge technology, unrivaled performance, ease of use, and affordability. With a growing list of global clients in industries including renewables, industry automation, oil and gas, energy storage, and automotive, Typhoon-HIL has emerged as the industry leader in automated test and verification of power electronics control systems.

VAC Sales USA, LLC

BOOTH 309

2935 Dolphin Drive
Suite 102
Elizabethtown, KY 42701
USA
P | 270-769-1333
F | 270-765-3118
info-usa@vacuumschmelze.com
www.vacuumschmelze.com

VACUUMSCHMELZE - a manufacturer of advanced magnetic materials - produces Rare Earth Permanent Magnets, Soft Magnetic Materials & Parts, and Cores & Inductive Components. A world leader in development, production and application know-how of magnetic materials, VAC supports customers selecting innovative materials and customizes unique materials for optimized solutions.

Wiley

BOOTH 409

111 River Street
Hoboken, NJ 07030
USA
P | 201-748-6000
F | 201-748-6617
info@wiley.com
www.wiley.com

Wiley is a global provider of knowledge and knowledge-enabled services that improve outcomes in areas of research, professional practice, and education. Visit www.wiley.com for more information.

Universities

Centre for Urban Energy, Ryerson University

TABLE 5

350 Victoria Street
Toronto, ON M5B 2K3
Canada
P | 416-979-5000
cueinfo@ryerson.ca
www.ryerson.ca/cue

The Centre for Urban Energy (CUE) at Ryerson University is an academic-industry partnership that is exploring and developing sustainable solutions to urban energy challenges such as the advancement of smart grid technologies, energy policy and regulatory issues, storage, electric vehicles, net-zero homes and renewables.

CHARGE Labs at the University of Windsor

TABLE 7

401 Sunset Ave
Windsor, ON N9B 3P4
Canada
P | 519-253-3000 ext. 4796
F | 314-436-1030
nkar@uwindsor.ca
www.chargelabs.ca

CHARGE Labs at the University of Windsor, ON, Canada works on 5 major research areas for Electric Vehicles: Electric machine design, Electric machine testing, Machine drives and control, Electric vehicle simulation and Inductive & conductive charging. The labs facilitate world-class transformative research, develop highly qualified personnel and increase Canada's global competitiveness benefiting its electrified vehicle research landscape.

ETS – École de technologie supérieure

TABLE 6

1100, rue Notre-Dame Ouest
Montréal , QC H3C 1K3
Canada
P | 6(514) 396-8870
F | 6(514) 396-8684
ambrish.chandra@etsmtl.ca
http://www.etsmtl.ca/

The Power Electronics and Industrial Control Research Group (GRÉPCI) is a team of researchers whose work is focused on simulation and smart system controls, power electronics and renewable energy. Working jointly with industry and various research centers, the Group concentrates its activities on applied research, with the research managed and supervised by seven ÉTS professors. The Group consists of graduate students, visiting professors and post-doctoral fellows.

Faculty of Engineering and Computer Science, Concordia University

TABLE 3

1455 De Maisonneuve Blvd. W.
EV-2.169
Montreal, QC H3G 1M8
Canada
P | 514-848-2424 x3062
F | 514-848-4509
exec-sec.engineering@concordia.ca
http://www.concordia.ca/encs.html

Concordia University's Faculty of Engineering and Computer Science is dedicated to providing high-quality and comprehensive undergraduate and graduate education, to promoting high-calibre research, and to the development of the profession of engineering and computer science graduates to solve real world problems in an ethical and socially responsible manner.

FREEDM Systems Center

TABLE 8

1791 Varsity Drive
Raleigh, NC 27606
USA
P | 919-513-2996
kadulane@ncsu.edu
freedm.ncsu.edu

FREEDM is an NSF Engineering Research Center creating the Energy Internet: a network of distributed energy resources utilizing secure communications for intelligent power management enabled through advances in power electronics. Research priorities include power electronics, controls theory, solid state transformers, fault isolation devices and power systems simulation and demonstration.

RWTH Aachen University

TABLE 9

Campus-Boulevard 57
52074 Aachen
Germany
P | 49 241 80 22 471
info@FENaachen.net
www.rwth-aachen.de/cms/~a/root/lidx/1/

RWTH Aachen University is one of European's leading technical universities und holds the status of an "Excellent University" since 2007. With the RWTH Aachen Campus, the university is creating a unique possibility for research and exchange between academia and companies. The Sustainable Energy Cluster is one of them. The E.ON Energy Research Center (ERC) and the Center for Flexible Electrical Networks (FEN) are part of it. Their primary aim is to develop a sustainable, reliable and affordable energy supply with a high share of more environmentally friendly energy sources.

University of Alberta

TABLE 2

11th floor, Donadeo
Innovation Centre for Engineering
9211 - 116 Street NW
Edmonton, AB T6G 1H9
Canada
P | 780-492-3332
http://www.ece.engineering.ualberta.ca/en/Research/EnergySystems.aspx

The University of Alberta is one of Canada's top teaching and research universities. Energy systems research at U of A includes a wide variety of topics, ranging from the operation of a power semiconductor switch to the most complex power system.

University of Calgary

TABLE 4

2500 University Dr NW
Calgary, AB T2N 1N4
Canada
P | 403-220-6282
http://www.ucalgary.ca/

The University of Calgary is taking a leadership role in develo[illegible] innovations. The interdisciplinary research theme, Energy Innovations for Today and Tomorrow, is part of the Eyes High strategic direction to become one of Canada's top five research-intensive universities by 2016

University of New Brunswick

TABLE 1

3 Bailey Drive
Fredericton, NB E3B 5A3
Canada
P | 506-453-4666
www.unb.ca

Established in 1785, the University of New Brunswick is a comprehensive university offering diverse PhD, masters' and bachelors' programs. A strong research focus on sustainable power generously funded by industry and government partners as lead to remarkable innovation and commercialization in distributed generation and intelligent load control systems.

PRODUCT AND SERVICES SESSIONS

Monday, September 21 **2:00PM – 4:00PM**

LinPak: A new Low Inductance Phase Leg IGBT Module

Speaker: Nathan John Siefken

2:00PM | A new low inductance, flexible phase leg package is becoming an industry standard for two level and multilevel converter designs. For the first time, the capacitor/IGBT loop inductance can be rediced to very low values, minimizing the overshoot voltages at IGBT turn-off. Modularity provides for easy parralleling gfor highrr currents

MotorSolve & Hardware in the Loop Simulations

Speaker: Gilles Fillion

2:30PM | The need for simulation has evolved significantly over the last few years. Today, not only is simulation required for the design of electromagnetic parts but the model of the part also has to be included in other simulations. In this seminar we will introduce you to MotorSolve, a motor design package. We will specifically focus on the ability of MotorSolve to generate models for simulation within control circuits and Hardware in the Loop (HIL) applications.

Unrivaled Performance. Endless Possibilities. Leading-edge Technology.

Speaker: Sebastien Cense

3:00PM | ***Introducing the latest generation of eHS.*** As power electronics applications evolve, Hardware-In-The-Loop simulation has to step up for next generation controllers testing requirements. OPAL-RT presents the latest generation of its electrical FPGA hardware solver (eHS) for power electronics applications. The new version brings the capability of higher PWM frequency, smaller time step and optimized power efficiency.

3:30PM | Please check the ECCE App for the latest session description.

Tuesday, September 22 **8:30AM – 10:00AM**

Speaker: Albert Dunford

8:30AM | PSIM is trusted by academics and professionals in power electronics industry to test hypotheses early and easily, and get from design to implementation accurately and quickly. We will demonstrate a digital control workflow from all PSIM simulation to auto code generation, processor-in-the-loop, and hardware-in-the-loop, that greatly speeds up the development.

GE's Silicon Carbide Solutions – the Next Revolution in Power

Speaker: Jeffrey Slotnick

9:00AM | Introducing GE's new SiC device and power converter product lines, based on our world-class SiC MOSFET technology! Learn how you can achieve better performance and accelerate time to market with GE's proven technology and solutions support. Come and see why SiC from GE is the next revolution in power!

Design and Test Challenges for Next Generation Power Converters

Speaker: Neil Forcier

9:30AM | The emergence of wide band gap devices (WBG), silicon carbide and gallium nitride, offers hope of increased efficiency and smaller form factors in future power converter designs. This is enabled by capabilities such as higher switching speeds and higher voltage handling over the incumbent silicon based power devices. In this presentation we will take a look at some of the design and test challenges that arise from the faster switching and higher voltage capabilities of WBG devices and discuss ways to overcome them.

STUDENT DEMONSTRATIONS

In this event, 12 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. Student demonstrations will take place in Exhibit Hall 220E during the following times:

Monday, September 21 **4:10PM – 6:30PM**

Exhibit Hall 220E

Experimental Verification of Modular Multi-level Style Converter Topologies

Demonstrator: Geraint Chaffey
Imperial College London
Advisor: Tim Green

KAIST Omnidirectional Wireless Smartphone Charger at 1m

Demonstrator: Bohwan Choi
KAIST
Advisor: Chun Taek Rim

A 15-kV Sic MOSFET Gate Driver with Laser-Light-Over-Fiber Based Power Supply and Comprehensive Protection Functions

Demonstrator: Xuan Zhang
Ohio State University
Advisor: Jin Wang

A High Power Density, Single-Phase, Double-Grounded Transformer-Less Photovoltaic Inverter with Active Power Decoupling

Demonstrator: Yinglai Xia
Arizona State University
Advisor: Raja Ayyanar

A SiC-Based Power Supply for Dielectric Barrier Discharge Excilamps

Demonstrator: Vanesa Rueda
Pontificia Universidad Javeriana
Advisor: Rafael Díez Medina

Online Regulation of Receiver-side Power and Estimation of Mutual Inductance in Wireless Inductive Link Based on Transmitter-Side Electrical Information

Demonstrator: Po Wa Chow
City University of Hong Kong
Advisor: Shu-hung Henry Chung

Design and Implementation of a High Power Density PUC Multilevel Converter Using GaN Novel Technology

Demonstrator: Hani Vahedi
Ecole de Technologie Supeieure
Advisor: Kamal Al-Haddad

High-Efficiency, High Power Density LLC Resonant Converters with Matrix Transformer and Simplified Optimal Trajectory Control (SOTC)

Demonstrator: Chao Fei
Virginia Tech Qiang Li

A 500 W High-Temperature Isolated Battery Charger Without Electrolytic Capacitors Using SiC MOSFETs

Demonstrator: Wen Cai
University of Texas at Dallas
Advisor: Babak Fahimi

A 2 kW, 450 VDC To 240 VAC Single-Phase 7-Level Flying Capacitor Multi-Level Inverter

Demonstrator: Shibin Qin
University of Illinois Urbana-Champaign
Advisor: Robert Pilawa

Development of a Low Cost Electric Drive for Electric Vehicle Applications

Demonstrator: Lesedi Masisi
Concordia University
Advisor: Pragasen Pillay

Diesel Engine Generator Emulator with Parallel Operation of HKECS in a Microgrid

Demonstrator: Hesam Akbarian
Concordia University
Advisor: Pragasen Pillay

NOTES

ECCE 2016

IEEE ENERGY CONVERSION CONGRESS & EXPO

Sept. 18–22
Milwaukee, WI

Used with permission – VisitMilwaukee.org

Important Dates

January 15, 2016
Digest submission

May 1, 2016
Author notification

July 1, 2016
Final manuscript submission

Call for Papers

ECCE is the foremost IEEE conference in the field of electrical and electromechanical energy conversion. ECCE2016, to be held in Milwaukee, the heartland of the North America energy conversion industry, will provide researchers, engineers and professionals from industry and academia a convivial and innovative atmosphere for interaction and networking. Technical papers are solicited on any subject pertaining to the scope of the conference that includes, but is not limited to, the following topics:

- Renewable energy systems and energy storage
- Smart grid and utility applications
- Energy efficiency and industrial applications
- Computer and telecommunication applications - power supplies, UPS, energy storage, and system architectures
- Transportation applications
- Electric machines and actuators
- Electric motor drives
- Power converters, control, and modeling
- Power semiconductors and packaging
- Magnetic materials and other passive components
- Emerging power electronics technologies

Please check **www.ecceconferences.org** or contact conference organizers for detailed guidelines regarding digest preparation and submission.

IEEE POWER ELECTRONICS SOCIETY
Powering a Sustainable Future

IAS IEEE INDUSTRY APPLICATIONS SOCIETY

IEEE

General Chair
Z. John Shen
Illinois Institute of Technology
johnshen@ieee.org

Technical Program Co-Chairs
Robert S. Balog
Texas A&M University at Qatar

Avoki Omekanda
General Motors – R&D Center

ECCE2016TPC@gmail.com

www.ecceconferences.org

Milwaukee, WI, USA | SEPTEMBER 18-22, 2016

IEEE ENERGY CONVERSION CONGRESS & EXPO 2016

Sept. 18–22
Milwaukee, WI

Used with permission – VisitMilwaukee.org

Important Dates

February 1, 2016
Proposal submission

March 31, 2016
Notification of decision

Call for Tutorials

ECCE is the foremost IEEE conference in the field of electrical and electromechanical energy conversion. ECCE2016, to be held in the heartland of the North America energy conversion industry, will feature both industry-driven and application-oriented technical sessions, as well as industry expositions and seminars. It will provide engineers, researchers, and professionals a perfect blend of state of the art, technical prowess and commercial opportunities in one attractive location.

The ECCE2016 organizing committee invites proposals for half-day tutorials to be presented on Sunday September 18, 2016. Tutorials are solicited on any subject pertaining to the scope of the conference. The organizing committee is particularly interested in tutorials that are of value to practicing engineers, with an emphasis on solutions to practical problems. Tutorials accepted for presentation will receive one conference registration together with an honorarium for $1000.

Tutorial proposals should be submitted as a maximum five-page digest containing the title, abstract (no more than 500 words), outline, contact information and short bio of instructor(s) of the tutorial. The instructor's bio should describe the qualifications for presenting the proposed tutorial, including the work and publications that are most relevant to the proposal)

Please submit the proposal directly to ECCE 2016 Tutorial Chair.

pels IEEE POWER ELECTRONICS SOCIETY Powering a Sustainable Future

IAS IEEE INDUSTRY APPLICATIONS SOCIETY

IEEE

General Chair
Z. John Shen
Illinois Institute of Technology
johnshen@ieee.org

Technical Program Co-Chairs
Robert S. Balog
Texas A&M University at Qatar

Avoki Omekanda
General Motors – R&D Center
ECCE2016TPC@gmail.com

Tutorials Chair
Qing-Chang Zhong
Illinois Institute of Technology
zhongqc@iit.edu

www.ecceconferences.org

Milwaukee, WI, USA | SEPTEMBER 18-22, 2016

IEEE ENERGY CONVERSION CONGRESS & EXPO 2016

Sept. 18–22
Milwaukee, WI

Used with permission – VisitMilwaukee.org

ECCE 2016 Tutorial Proposal Form

1. Title of Tutorial

2. Abstract

(No more than 500 words. If the tutorial is accepted, this abstract will be published on the conference website, program, and proceedings)

3. Outline of Tutorial

(Outline would only define the topics and the subtopics that would be covered. No detailed descriptions should be included in the proposal)

4. Lead Instructor

(Name, affiliation, and contact information)

Name **Affiliation**

Email **Phone**

5. Other Instructor(s) if applicable

(Name, affiliation, and contact information)

Name **Affiliation**

Email **Phone**

6. Instructor Bios: ~150 Words

(Please provide a brief biography for each instructor, describing the qualifications for presenting the proposed tutorial, including the work and publications that are most relevant to the proposal)

IEEE ENERGY CONVERSION CONGRESS & EXPO 2016

Sept. 18–22
Milwaukee, WI

Used with permission – VisitMilwaukee.org

Important Dates

March 31, 2016
Proposal submission

May 1, 2016
Notification of decision

Call for Special Session Organizers

ECCE is the foremost IEEE conference in the field of electrical and electromechanical energy conversion. ECCE2016, to be held in the heartland of the North America energy conversion industry, will feature both industry-driven and application-oriented technical sessions, as well as industry expositions and seminars. It will provide engineers, researchers, and professionals a perfect blend of state of the art, technical prowess and commercial opportunities in one attractive location.

The ECCE2016 organizing committee invites proposals for Special Sessions, which consist of oral presentations only, without requiring written papers and are strongly oriented towards the interests of industry, as well as towards the interaction of it with academia. Presentations typically address the most current trends of industry, research, or market, and are of a more overview and practical nature than those in the standard technical sessions. Presentations are solicited on any subject pertaining to the scope of the conference

Special Session organizers are requested to submit a maximum five-page proposal summarizing the proposed Special Session with 4 or 8 presentations under a focused theme. The proposal should contain the title, justification, and organizer' short bio of the session, and the title, abstract, and presenter's bio of each presentation.

Please submit the proposal directly to ECCE 2016 Special Session Chair.

pels IEEE POWER ELECTRONICS SOCIETY Powering a Sustainable Future

IAS IEEE INDUSTRY APPLICATIONS SOCIETY

IEEE

General Chair
Z. John Shen
Illinois Institute of Technology
johnshen@ieee.org

Technical Program Co-Chairs
Robert S. Balog
Texas A&M University at Qatar

Avoki Omekanda
General Motors – R&D Center
ECCE2016TPC@gmail.com

Special Session Chair
Peter Wung
Regal Beloit
Peter.Wung@regalbeloit.com

www.ecceconferences.org

Milwaukee, WI, USA | SEPTEMBER 18-22, 2016

NOTES

ECCE 2016

IEEE ENERGY CONVERSION CONGRESS & EXPO

Sept. 18–22

Milwaukee, WI

Used with permission – VisitMilwaukee.org

SAVE THE DATE

Conference September 18-22, 2016

Exposition September 19-20, 2016

MILWAUKEE, WI 2016.ecceconferences.org

IEEE ENERGY CONVERSION CONGRESS & EXPO

2015

MONTREAL, CANADA | SEPTEMBER 20-24, 2015

Palais des congrès de Montréal
1001 Place Jean-Paul-Riopelle
Montreal, QC H2Z 1H5
Canada

(514) 871-8122
Congresmtl.com/en