



Sept. 18-22
Milwaukee, WI



PROGRAM



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ECCE 2016 Supporters and Partners

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Welcome from General Chair: John Shen



It is my pleasure to welcome you to the 8th Annual IEEE Energy Conversion Congress & Exposition (ECCE 2016), sponsored by the IEEE Power Electronics Society (PELS) and the IEEE Industry Applications Society (IAS), in Milwaukee, the heartland of North America's electric drive and electrical equipment industry.

As the world's leading technical conference and exposition for energy conversion solutions, ECCE provides a unique opportunity to engineers, researchers, students, and other professionals from the broad spectrum of energy conversion for exchange of technical knowledge, networking, and exposure to the latest technology trends. ECCE is unique in our emphasis on integrated systems, presenting the best in contemporary energy conversion research alongside innovations from more traditional component topics.

ECCE 2016 features keynote speeches from Prof. Arun Majumdar from Stanford University and former Director of ARPA-E; Mr. Blake Moret, CEO of Rockwell Automation; Prof. Massoud Amin from University of Minnesota; Mr. Michael Regelski, CTO/Electrical Sector of Eaton Corporation; and Dr. Guangfu Tang, Vice President, Global Energy Interconnection Research Institute of China. We are extremely fortunate to have these distinguished

leaders from industry and academia to share their visions and wisdoms with us on the opening day of the conference.

ECCE 2016 features 925 technical presentations which are selected from an all-time record high 1717 digests submitted from across the globe, organized in 16 parallel oral sessions and 3 consecutive poster dialog sessions. In addition, 7 special sessions are organized by the field experts on timely and practical topics including "Cyber Security of the Grid", "Modeling and Simulation", "SiC Devices", "Electricity and Water Nexus", and "Advanced Electrical Machines". Our Town Hall Meetings this year include two moderated debates on "Industrial Internet of Things: Why Do We Care?" and "Close to the Edge: The New Frontier of the Grid" on Tuesday. On Sunday, we have 12 tutorials offering an in-depth discussion of important and complex technical topics which combine practical application with theory.

We are very pleased to acknowledge the support of Wolong Electric (Platinum), ABB (Gold), Danfoss (Gold), Eaton Corporation (Gold), General Motors (Gold), Rockwell Automation (Gold), Delta (Silver), Halla Mechatronics (Silver), and Keysight Technologies (Silver). Their support and participation has created a very strong industrial relationship and relevance. We will have 60 exhibitors in the Exhibition Hall on Monday and Tuesday. The exhibitors will showcase their state-of-the-art technologies, products, and solutions, creating a highly interactive networking environment when mixing with the poster sessions and student demonstrations on the same floor.

Milwaukee offers a unique experience to millions of visitors each year, ranging from its German heritage to its famous beers to Harley Davidson motorcycles to the beautiful lake shore. We will make ECCE 2016 not only a successful technical forum but also a memorable social event for the attendees. On Sunday, we will host our Welcome Reception in the Milwaukee Art Museum, with its landmark modern architecture, and a great view of Lake Michigan. On Wednesday evening, we expect to see you all at the ECCE 2016 Oktoberfest Night to enjoy German folk music and dance, and special Milwaukee brewed Oktoberfest beers. We will also have a special Award Luncheon on Thursday to celebrate the great achievement of some of our colleagues. Technical and city walking tours are also organized during the week.

For many of our attendees, the ECCE conference is like a homecoming event where you can catch up with old friends and meet new ones. ECCE 2016 provides two free-to-use lounges in the convention center. The IAS/PELS Community Lounge can be reserved for exclusive use for group events (school or company reunion, or a quick project review meeting, etc.) on a first-come-first-serve basis. The Creative Digressions Lounge does not need reservation and provides a place for colleagues and friends to hang out and perhaps brainstorm on a few ideas generated during the conference. Complimentary coffee and refreshments will be served in both rooms through the day. For our first time ECCE attendees, we extend you a special welcome by inviting you to a first timer session just before the Sunday Welcome Reception event.

I would like to express my utmost gratitude to the members of the organizing committee, the technical program committee, the steering committee, and Courtesy Associates, who with hard work and selfless dedication have made possible this event. I would like to thank PELS and IAS for their sponsorship and stewardship, and the generous support of our Platinum, Gold, and Silver corporate partners. I would like to thank each and every one of you as a presenter, an attendee, an exhibitor, a volunteer, or any combined role of the above for your contribution and participation.

Once again I welcome you to ECCE 2016. Together we help deliver a more sustainable future.

A stylized, handwritten signature in black ink, appearing to read 'J. Shen'.

John Shen
General Chair

Welcome from Technical Program Chairs

Whether it is power converters, motor/motor drives, renewable energy, devices, controls, LED lighting, smart grid or the countless other technical sub-fields related to electrical energy conversion – we are in a period of immense opportunity for our industry. Since the start of the ECCE conference series, there has been a tremendous growth in the numbers of technical papers submitted and attendees to the conference. We are pleased that you consider ECCE to be a flagship conference and worthy of your time as an author and attendee.

This year we have received 1715 digests – more than a 10% increase over the previous record set in 2015. We are able to accept 925 papers into 16 parallel oral sessions and 3 poster sessions. This represents a very competitive 53.9% acceptance rate. In addition, several presentation-only special sessions are scheduled throughout the week.

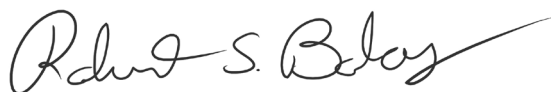
All submitted digests underwent a rigorous and fair peer review process by subject domain experts. Each paper received a minimum of three (3) reviews with the average of approximately 4.2 reviews per digest. The review process is managed by the Technical Program Committee (TPC), which is comprised of the Chairs, Vice Chairs, and Topic Chairs. Each Reviewer made his/her recommendation to the Topic Chair responsible for that technical sub-track, which then made a recommendation to the Vice Chair responsible for track, which in-turn made a recommendation to the TPC Chairs. This means that each digest was read by a minimum of: 3 Reviewers + 1 Topic Chair + 1 Vice Chair = 5 members of the technical community. In most cases, this number ranges from 6 to 8.

This year, the TPC Chairs accepted all of the recommendations of the Vice Chairs without subsequent unilateral action. This was a bottom-up process driven by your subject-domain peers. Nevertheless, the TPC Chairs were actively engaged by constantly monitoring the review process and communicating with the Vice Chairs to ensure a uniform acceptance standard across all the tracks. In addition, the TPC Chairs accepted most of the recommendations of the Vice-Chairs with regard to format (oral/poster) selection and session groupings. In a limited number of cases, the TPC Chairs did make decisions subsequent to the Vice-Chair recommendations as needed to balance the overall technical program.

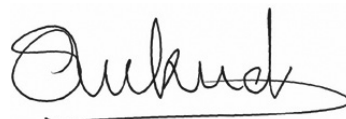
It is the official policy of the TPC that all accepted papers are considered to be of equal technical quality and merit, irrespective of whether selected for oral or poster session. Other than for programmatic identification, there will be no distinction made between papers presented in an oral or poster session. Papers will be uploaded to IEEE Explore Digital Library without any differentiation. Please reference this official conference policy if your institution requires conference attendance justification.

On behalf of the entire Technical Program Committee, we firmly believe that you will consider 2016 to be the best ECCE yet. We look forward to seeing you in Milwaukee. Once again, we wanted to thank all of you who have contributed to ECCE2016 as an author, reviewer, or TPC member.

Sincerely,



Robert S. Balog
Texas A&M University



Avoki Omekanda
General Motors – R&D Center



Maryam Saeedifard
Georgia Institute of Technology

ECCE 2016 Technical Program Chairs

Welcome from Society Presidents



On behalf of the IEEE Power Electronics Society and Industry Applications Society, it gives us immense pleasure to welcome you all to Milwaukee to attend the 8th Annual IEEE Energy Conversion Congress and Exposition (ECCE). Considering the growing importance of electrical energy conversion driven by the urgent need to reduce carbon emissions and save energy, the two Societies came together to establish the first ECCE in 2009. The objective was to provide a forum for the exchange of information among students, researchers and practicing professionals in the energy conversion business. ECCE 2016 organizing committee has worked diligently so we can once again bring together both users and researchers of energy conversion systems and sub systems with an emphasis on the content of technical papers and on the quality of the growing exposition.

Whether you are a first time attendee or regular attendee since 2009 or anything in between, we encourage you to enjoy the ECCE experience, create new networks and get involved in the organization of the future ECCE's. The technical committees of the two Societies work hard in consistently delivering an excellent technical program at ECCE. The committees conduct their meetings at various times during ECCE (Please refer to the meeting calendar in the program booklet) and are open to all Society members. If you are not a Society member, please visit the Society booth at the exposition area and become a member (see the free first year membership offer at the booth). The Society volunteers will be ready to answer any questions you may have.

Many thanks to our ECCE 2016 General Chair Prof. John Shen and his dedicated organizing committee who have developed an excellent program that is rich in its technical content with plenty of socializing opportunities. Please make use of this opportunity to network with other professionals in the energy conversion area. It is our hope that all the interactions and technical programs will give you and your organization the tools to advance the field and address the challenges of the industry.

Again, on behalf of both Societies, we welcome you to Milwaukee and wish you a pleasant and productive conference!

Braham Ferreira
President
IEEE Power Electronics Society

David Durocher
President
IEEE Industry Applications Society

Alan Mantooth
President Elect
IEEE Power Electronics Society

Tomy Sebastian
President Elect
IEEE Industry Applications Society

Organizing Committee

General Chair

John Shen, Illinois Institute of Technology, USA

Technical Program Chairs

Robert Balog, Texas A&M University, USA

Avoki Omekanda, General Motors, USA

Maryam Saeedfard, Georgia Institute of Technology, USA

Finance Chair

Jin Wang, Ohio State University, USA

Industrial Partnership Chair

Bruno Lequesne, E-Motors Consulting, USA

Exhibition Chair

Navid Zargari, Rockwell Automation, Canada

Plenary Chairs

K. Rajashekara, University of Texas at Dallas, USA

Iqbal Husain, North Carolina State University, USA

Tutorial Chairs

Sudip Mazumder, University of Illinois Chicago, USA

Qingchang Zhong, Illinois Institute of Technology, USA

Local Arrangement Chairs

Adel Nasiri, University of Wisconsin Milwaukee, USA

Rob Cuzner, University of Wisconsin Milwaukee, USA

Special Sessions and Town Hall Meetings Chair

Pete Wung, General Electric Aviation, USA

Publicity Chairs

Tiefu Zhao, University of North Carolina-Charlotte, USA

David Morrison, How2Power, USA

Publication Chair

Ian Brown, Illinois Institute of Technology, USA

Student Activities Chairs

Robert Pilawa-Podgurski, University of Illinois Urbana-Champaign, USA

Sheldon Williamson, UOIT, Canada

Webmaster and Social Media Chair

Jennifer Vining, Oscilla Power, USA

Student Travel Grant Chair

Mahesh Krishnamurthy, Illinois Institute of Technology, USA

Awards Program Chair

Tom Habetler, Georgia Institute of Technology, USA

Conference Management

Dave Weil, Courtesy Associates, USA

Bobbie Praske, Courtesy Associates, USA

Annie Foster, Courtesy Associates, USA

Nataki Hemmings, Courtesy Associates, USA

Michelle Brereton, Courtesy Associates, USA

John Heiser, Courtesy Associates, USA



Conference App



Scan here to check out the ECCE 2016 Conference App
and get the latest conference information

Renewable and Sustainable Energy Applications

Sudip K. Mazumder (Vice Chair), University of Illinois Chicago, USA
 Yilmaz Sozer (Vice Chair), University of Akron, USA
 Bilal Akin, UT Dallas, USA
 Francisco Canales, ABB Corporate Research, Switzerland
 Jaeho Choi, Chungbuk National University, South Korea
 Ahmed Elasser, GE Global Research Center, USA
 Ali Elrattyah, Qatar Environment and Energy Research Institute, Qatar
 Liming Liu, ABB, USA
 Ke Ma, Aalborg University, Denmark
 Martin Ordonez, UBC, Canada
 Akshay Kumar Rathore, National University of Singapore, Singapore
 Tirthajyoti Sarkar, Fairchild Semiconductor, USA
 Dezso Sera, Aalborg University, Denmark
 Jin Wang, Ohio State University, USA

Smart Grid & Utility Applications

Adel Nasiri (Vice Chair), University of Wisconsin-Milwaukee, USA
 Amirnaser Yazdani (Vice Chair), Ryerson University, Canada
 Omar Abdel-baqi, Caterpillar, USA
 Mahshid Amirabadi, Northeastern University, USA
 Ali Davoudi, University of Texas at Arlington, USA
 Kumar Dinesh, Danfoss Drives A/S, USA
 Qiang Fu, Eaton, USA
 Hui Li, Florida State University, USA
 Xiaonan Lu, Argonne National Laboratory, USA
 Goran Mandic, Eaton, USA
 Ali Mehrizi-Sani, Washington State University, USA
 Behrooz Mirafzal, Kansas State University, USA
 Yogesh Patel, Rockwell Automation, USA
 Liyan Qu, University of Nebraska Lincoln, USA
 Akshay Kumar Rathore, National University of Singapore, Singapore
 Tiefu Zhao, University of North Carolina-Charlotte

Transportation Electrification Applications

Bulent Sarlioglu (Vice Chair), University of Wisconsin-Madison, USA
 Anand Sathyan (Vice Chair), FCA US LLC, USA
 Sachin Bhide, FCA US LLC, USA
 Berker Bilgin, McMaster University, Canada
 Bing Cheng, Mercedes Benz R&D, USA
 Hossein Dadkhah, FCA US LLC, USA
 Gurunath Kedar Dongarkar, FCA US LLC, USA
 Suresh Gopalakrishnan, General Motors, USA
 Oliver Gross, FCA US LLC, USA
 Alireza Khaligh, University of Maryland, USA
 Mahesh Krishnamurthy, Illinois Institute of Technology, USA
 Konstantinos Laskaris, Tesla Motors, USA
 Young Joo Lee, General Motors, USA

Srdjan Lukic, North Carolina State University, USA
 Omer Onar, Oak Ridge National Laboratory
 Venkateswara Sankaran, Ford Motor Company, USA
 Rich Scholer, FCA US LLC, USA
 Baiming Shao, Mercedes Benz R&D, USA
 Xiaodong Shi, Mercedes Benz R&D, USA
 Hong Yang, Magna, USA

Power Converter Topologies

Ali Khajehoddin (Vice Chair), University of Alberta, Canada
 Grant Pitel (Vice Chair), Magna-Power Electronics, USA
 Yunwei (Ryan) Li (Vice Chair), University of Alberta, Canada
 Ali Bazzi, University of Connecticut, USA
 Jack Bourne, NWL, USA
 Rob Cuzner, University of Wisconsin – Milwaukee, USA
 Michael Harke, UTC Aerospace Systems, USA
 Houshang Karimi, Polytechnique Montreal, Canada
 Masoud Karimi-Ghartemani, Mississippi state university, USA
 Greg Kish, University of Alberta, Canada
 Ali Mehrizi-Sani, Washington State University, USA
 Alireza Safaee, OSRAM SYLVANIA, USA
 Giri Venkataramanan, University of Wisconsin-Madison, USA

Control, Modelling and Optimization of Power Converters

Luca Solero (Vice Chair), Roma Tre University, Italy
 Pericle Zanchetta (Vice Chair), University of Nottingham, UK
 Stefano Bifaretti, University of Rome Tor Vergata, Italy
 Maurizio Cirrincione, University of South Pacific, Fiji
 David Diaz, University of Oviedo, Spain
 Andrea Formentini, University of Nottingham, UK
 Alessandro Lidozzi, ROMA TRE University, Italy
 Giovanna Oriti, Naval Postgraduate School, USA
 Roberto Petrella, DIEG - University of Udine, Italy
 Matthias Preindl, University of Columbia, USA
 Marcello Pucci, ISSIA-CNR, Italy
 Jon Are Suul SINTEF, Norwegian University of Science and Technology, Norway
 Lixiang Wei, Rockwell Automation, USA
 Navid Zargari, Rockwell Automation, Canada

Electrical Machines

Emmanuel Agamloh (Vice Chair), Advanced Energy, USA
 Akira Chiba (Vice Chair), Tokyo Institute of Technology, Japan
 Luigi Alberti, Free University of Bozen-Bolzano, Italy
 Ali Bazzi, University of Connecticut, USA
 Nicola Bianchi, University of Padova, Italy
 Andrea Cavagnino, Politecnico di Torino, Italy
 Francesco Cupertino, Politecnico Bari, Italy

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Giulio De Donato, University of Rome “La Sapienza”, Italy
David Diaz Reigosa, University of Oviedo, Spain
Abraham Gebregergis, Halla Mechatronics, USA
Greg Heins, Regal Beloit, USA
Mohammad Islam, Halla Mechatronics, USA
Sang Bin Lee, Korea University, South Korea
Renato Lyra, Aerotech Inc., USA
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Wen Ouyang, ABB US Corporate Research Center, USA
Yves Perriard, EPFL, Switzerland
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Marcello Pucci, ISSIA-CNR, Italy
Ronghai Qu, Huazhong University of Science and Technology, China
Khawaja Rahman, General Motors, USA
Manoj Shah, GE -Global Research, USA
Thomas Wu, University of Central Florida, USA
Wei Xu, Huazhong University of Science and Technology, USA
Shih-Chin Yang, National Taiwan University, Taiwan
Julia Zhang, Oregon State University, USA

Electric Drives

Fabio Giulii Capponi (Vice Chair), University of Roma “La Sapienza”, Italy
Mahesh Swamy (Vice Chair), Yaskawa America, Inc., USA
Davide Barater, University of Parma, Italy
Ali Bazzi, University of Connecticut, USA
Nicola Bianchi, University of Padova, Italy
Wenping Cao, Aston University, UK
Mazharul Chowdhury, Halla Mechatronics, USA
Uday Deshpande, Ingersoll Rand, USA
David Diaz Reigosa, University of Oviedo, Spain
Rukmi Dutta, UNSW, Australia
Marko Hinkkanen, Aalto University, Finland
Rakib Islam, Nexteer Automotive, USA
Dong Jiang, Huazhong University of Science and Technology, China
Antonio J. Marques Cardoso, University of Beira Interior, Portugal
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Takahiro Suzuki, Hitachi, Ltd., Japan
Shih-Chin Yang, National Taiwan University, Taiwan
Pinjia Zhang, Tsinghua University, China
Yue Zhao, University of Arkansas, USA

Power Semiconductor Devices, Passive Components, Packaging, Integration, and Materials

Shashank Krishnamurthy (Vice Chair), UTRC, USA
Ty McNutt (Vice Chair), Wolfspeed, a Cree Company, USA
Daniel Costinett, University of Tennessee, USA
Muhammad Nawaz, ABB Corporate Research, Sweden
Jelena Popovic, Delft University of Technology, Netherlands
Pradeep S. Shenoy, Texas Instruments, USA
Charles Sullivan, Dartmouth College, USA
Ruxi Wang, General Electric Global Research Center, USA

Energy Efficiency Systems and Applications

Dehong Xu (Vice Chair), Zhejiang University, China
Khurram Afridi (Vice Chair), University of Colorado Boulder, USA
Francisco Canales, ABB Corporate Research, Switzerland
David Perreault, Massachusetts Institute of Technology, USA

Emerging Technologies and Applications

Tsorn-Juu Liang (Vice Chair), National Cheng Kung University, Taiwan
Yaosuo “Sonny” Xue (Vice Chair), Oak Ridge National Laboratory, USA
Yaow-Ming Chen, National Taiwan University, Taiwan
Huang-Jen Chiu, National Taiwan University of Science and Technology, Taiwan
Oscar Lucia, University of Zaragoza, Spain
Huai Wang, Aalborg University, Denmark
Jin Wang, Ohio State University, USA
Francisco Canales, ABB Corporate Research, Switzerland
David Perreault, Massachusetts Institute of Technology, USA

Datacenters and Telecommunication Applications

Robert Pilawa-Podgurski (Vice Chair), University of Illinois Urbana-Champaign, USA
Alexis Kwasinski (Vice Chair), University of Pittsburgh, USA



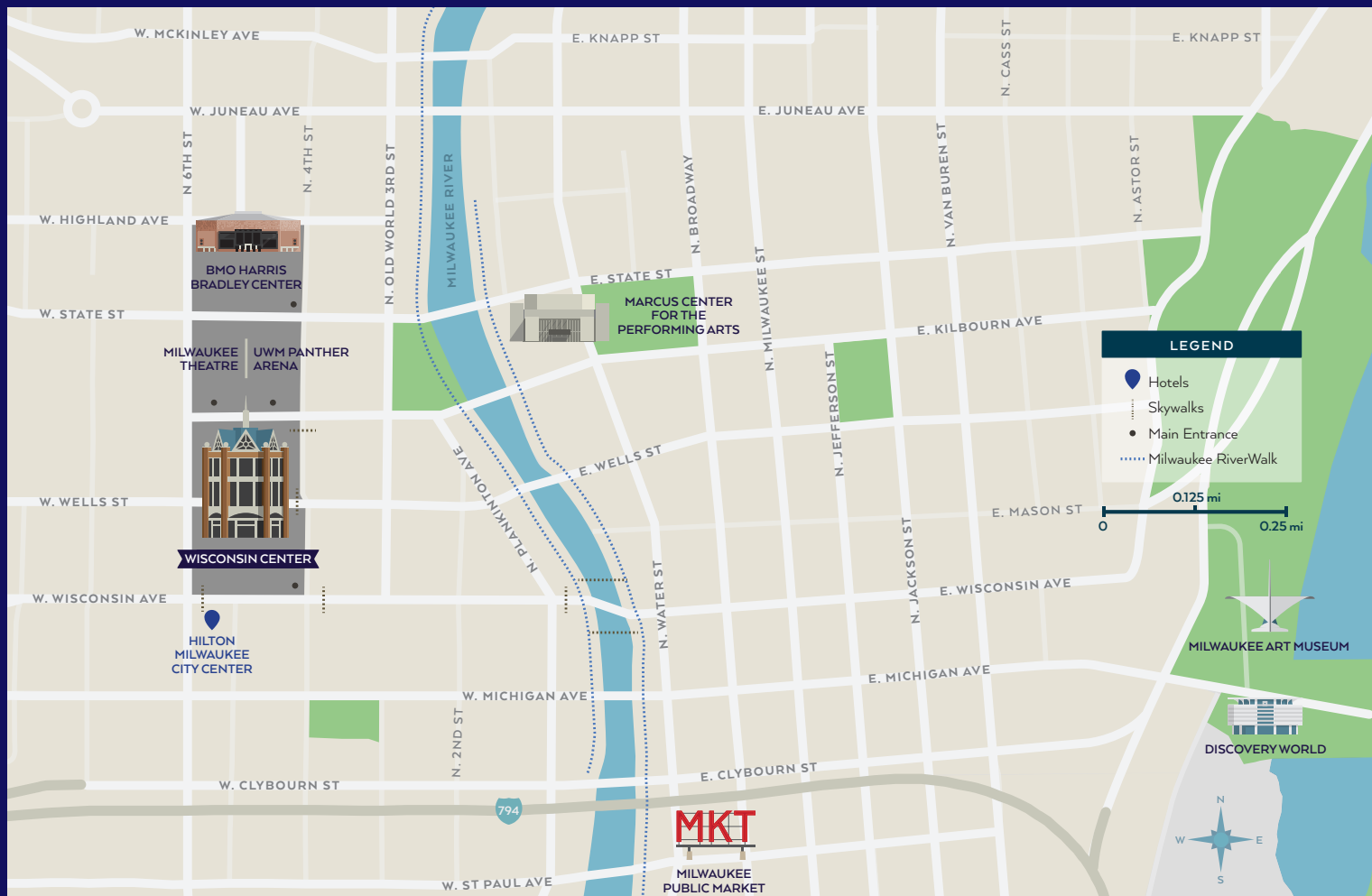
Notes

Downtown Map



Downtown Milwaukee »»»

visitmilwaukee.org | 1-800-231-0903



Milwaukee Fun Facts

Largest city in the state of Wisconsin with a population of 2.2 million

There are 17 museums in downtown Milwaukee and 25 including the surrounding counties

Home to 12 major colleges and universities

There are 150 restaurants in downtown Milwaukee

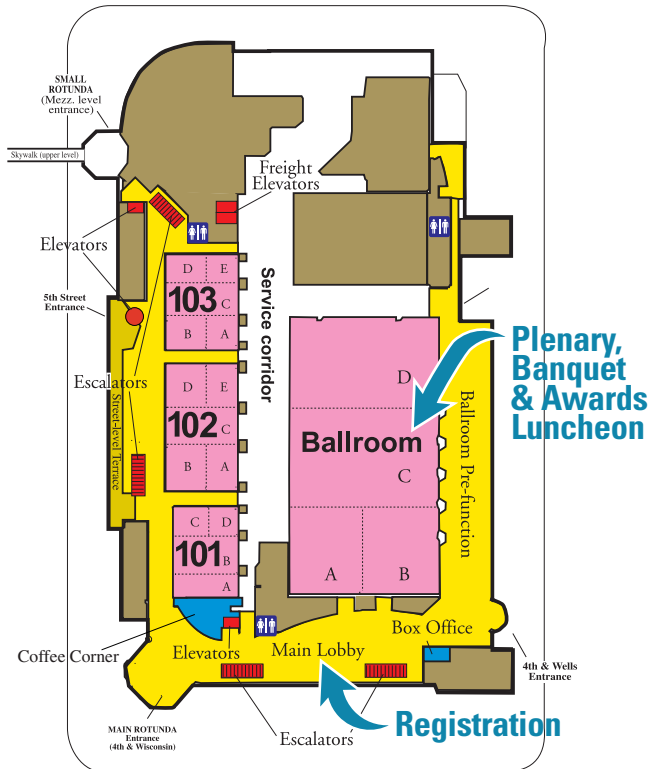
Home to over 150 state and country parks

Nicknamed Cream City because of its distinctive cream-colored brick and Brew City because of its rich brewing history

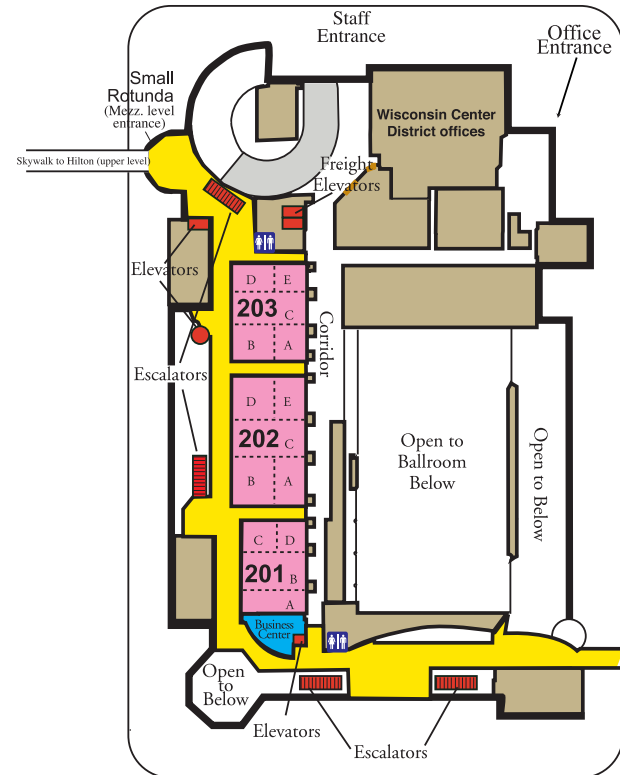
7 Fortune 500 Companies in the City including Johnson Controls, Rockwell Automation and Harley-Davidson

Wisconsin Center Convention Floor Plan

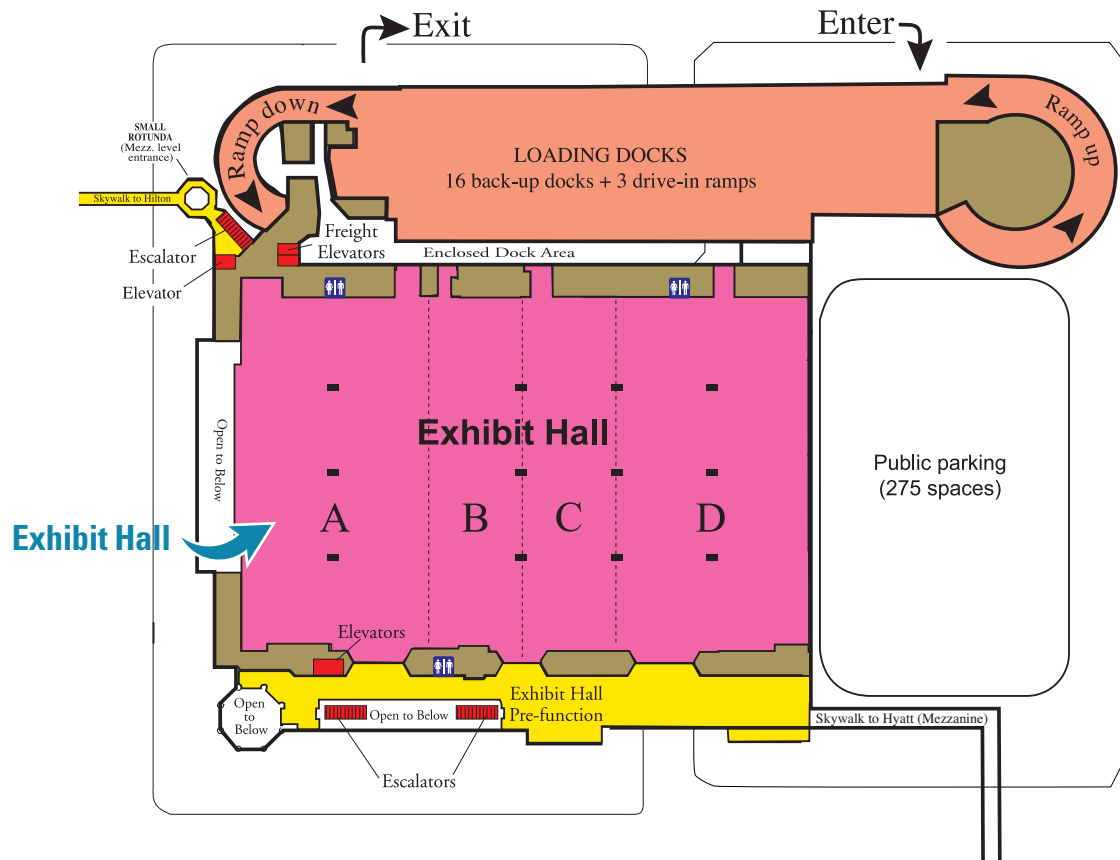
FIRST FLOOR



SECOND FLOOR



THIRD FLOOR



Schedule-at-a-Glance

Saturday, September 17th

5:00PM – 7:00PM **Registration** Main Lobby Foyer – 1st Floor Wisconsin Center

Sunday, September 18th

7:00AM – 7:00PM **Registration** Main Lobby Foyer – 1st Floor Wisconsin Center

AM Tutorials • 8:00AM – 12:00PM

101B	101CD	102B	102C	102D	103C
T1-1: Mechanical, Solid State and Hybrid Circuit Breakers for Protection of DC and AC Grids	T1-2: Principles and Applications of Modular Multilevel Converters	T1-3: Linearized Modeling and Stability Analysis of AC Power Electronic Based Power Systems	T1-4: The Origin of Converters	T1-5: Advanced High-Power Industrial Drives	T1-6: Power Semiconductors for Vehicle Traction Inverters: From Discretes to Power Modules, from Silicon to Wide Band Gap Devices

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

PM Tutorials • 1:00PM – 5:00PM

101B	101CD	102B	102C	102D	103C
T2-1: Electric Machine Design for Automotive Applications	T2-2: High Power Si & SiC Module Technology & Application Considerations	T2-3: Shipboard DC Microgrids	T2-4: Renewables, Energy Storage and Power Electronics as Enabling Technologies for the Smart Grid	T2-5: Modeling and Control of Grid Inverters	T2-6: Predictive Control – A Simple and Powerful Method of Control Power Converters and Drives

5:30PM – 7:30PM **Opening Reception** Milwaukee Art Museum

Monday, September 19th

7:00AM – 7:00PM **Registration** Main Lobby Foyer – 1st Floor Wisconsin Center

8:30AM – 12:00PM **Plenary Session** Ballroom ABCD

10:30AM – 10:50AM **AM Break** 100/200 Foyers

12:30PM – 1:30PM **Lunch on Your Own**

12:30PM – 4:00PM **Exhibitor Products and Services Sessions** Room 103C

Oral Sessions • 1:30PM – 4:00PM

203DE	203C	202A	102D	202E	203AB	102C	102E	102A	202D	101A	102B	101CD	101B	202C	202B
S1: Modular Multi-Level Converters, HVDC, and DC Grids I	S2: Renewable Energy I	S3: Modelling, Analysis, and Control of Grid-Connected Converters	S4: DC-DC Converters: Switched Capacitor	S5: Multi-Phase Rectifiers	S6: Single-Phase Inverters	S7: DC-DC Converters I	S8: DC-DC: Dual Active Bridge	S9: Electro-magnetic Interference (EMI) in Power Converters	S10: Modeling and Control of DC-AC Converters I	S11: Induction Machines	S12: Prof. S. Nandi Memorial Session: Diagnostics of Electric Machines	S13: Control of Electric Drives I	S14: Medium Voltage Drives and High Power Drives,	S15: Power Modules	S16: Wireless Power Transfer I

4:00PM – 8:00PM **Exhibit Hall Open** Exhibit Hall A

4:00PM – 8:00PM **Expo Reception** Exhibit Hall A

4:10PM – 6:30PM **Student Demonstrations** Exhibit Hall A

5:30PM – 7:00PM **Poster Session I** Exhibit Hall A

Tuesday, September 20th

7:30AM – 5:30PM **Registration** Main Lobby Foyer – 1st Floor Wisconsin Center

Oral Sessions • 8:30AM – 11:00AM

203AB	203DE	203C	202A	102D	202E	102C	102E	202D	102B	101A	101B	101CD	202C	102A	202B	103C
S17: Photo-voltaic Converters I	S18: Modular Multi-Level Converters, HVDC, and DC Grids II	S19: Renewable Energy II	S20: Utility Applications I	S21: Electric Machines for Transportation Electrification	S22: Multilevel Converter Applications	S23: Modeling and Control of DC-DC Converters I	S24: Modulation Techniques I	S25: Model Predictive Control of Power Converters	S26: Reluctance Machines	S27: Materials and Manufacturing Issues of Electric Machines	S28: Induction Motor Drives	S29: PM and IPM Motor Drives I,	S30: Wide Bandgap Applications: Comparative Studies	S31: Gate Drive Techniques I	S32: Wireless Power Transfer II	SS1: Simulation and Modelling

11:00AM – 5:30PM **Exhibit Hall Open** Exhibit Hall A

11:00AM – 12:30PM **Poster Session II** Exhibit Hall A

11:10AM – 11:30AM **AM Break** Exhibit Hall A

1:00PM – 2:30PM **Lunch** Exhibit Hall A

3:00PM – 4:30PM **Poster Session III** Exhibit Hall A

4:30PM – 5:00PM **PM Break** Exhibit Hall A

5:30PM – 7:30PM **Town Hall I: Internet of Things: Why Do We Care?** Room 102C

5:30PM – 7:30PM **Town Hall II: Close to the Edge: The New Frontier of the Grid** Room 202C

Wednesday, September 21st

7:30AM – 5:30PM **Registration** Main Lobby Foyer – 1st Floor Wisconsin Center

Oral Sessions • 8:30AM – 10:10AM

203AB	203C	202D	202A	203DE	102D	102C	102E	202E	102B	101A	101B	101CD	202C	102A	202B	103C
S33: Photovoltaic Converters II	S34: Converter Applications for Alternative Energy Systems	S35: Modeling, Analysis, and Control of Grid-Connected Converters I	S36: Utility Applications II	S37: DC Microgrids I	S38: Transportation Electrification I	S39: Modeling and Control of DC-DC Converters II	S40: Modulation Techniques II	S41: Modeling, Control and Stability of Modular Multilevel Converters	S42: Reluctance Machines II	S43: PM Machines I	S44: Drive/Utility Interface	S45: PM and IPM Motor Drives II	S46: Modeling of WBG Devices and Modules	S47: Gate Drive Techniques II	S48: Wireless Power Transfer III	SS2: Cyber Security Grid I

10:10AM – 10:30AM **AM Break** 100/200 Foyers

Oral Sessions • 10:30AM – 12:10PM

203AB	203C	202A	202D	203DE	102E	102D	202E	202B	102C	102B	101A	101B	101CD	202C	102A	103C
S49: Control for Photovoltaic Applications	S50: Photovoltaic Characterization and Modeling	S51: Utility Applications III	S52: Modeling, Analysis, and Control of Grid-Connected Converters II	S53: DC Microgrids II	S54: Datacenters and Telecommunication Applications	S55: Transportation Electrification II	S56: PFC Rectifiers	S57: Modeling and Control of Multilevel Converters	S58: Modeling and Control of Resonant Converters	S59: Electric Machines for Automotive Applications I	S60: PM Machines II	S61: Multilevel Motor Drives	S62: PM and IPM Motor Drives III	S63: Wide Bandgap Applications: SiC	S64: LED Drivers	SS3: Cyber Security Grid II

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

Oral Sessions • 1:30PM – 3:10PM

203C	202A	202D	102D	202E	202B	102C	102E	102B	101A	101B	101CD	102A	202C	203AB	203DE	103C
S65: Modeling and Control of Alternative Energy Applications	S66: Utility Applications IV	S67: Modeling, Analysis, and Control of Grid-Connected Converters III	S68: WBG in Traction Application	S69: Single Phase Rectifiers	S70: Multilevel Converters	S71: DC-DC Converters II	S72: Reliability, Diagnostic and Faults Analysis in Power Converters I	S73: Electric Machines for Automotive Applications II	S74: PM Machines III	S75: Drive Applications	S76: Sensorless Drives I	S77: Junction Temperature Sensing and Monitoring	S78: Wide Bandgap Applications: GaN	S79: Applications of Droop Control	S80: DC Microgrids III	SS4: SiC Device

3:10PM – 3:30PM **PM Break** 100/200 Foyers

Oral Sessions • 3:30PM – 5:10PM

203AB	203C	202A	202D	102D	102C	202E	203DE	102E	202B	102B	101A	101B	101CD	202C	102A	103C
S81: Wind Energy Control and Operations	S82: Energy Harvesting Systems	S83: Utility Applications V	S84: Modeling, Analysis, and Control of Grid-Connected Converters IV	S85: More Electric Aircraft	S86: DC-DC Converters: High Frequency	S87: Modeling and Control of AC-DC Converters	S88: Converter Control in Microgrids and Distributed Generation	S89: Reliability, Diagnostic and Faults Analysis in Power Converters II	S90: Reliability and Fault Tolerance in Multilevel Converters	S91: Electric Machines for Automotive Applications III	S92: PM Machines IV	S93: Energy Efficient Motor Drives	S94: Sensorless Drives II	S95: Silicon and WBG Devices	S96: Distribution-System Utility Interface	SS5: Electricity Water Nexus

7:00PM – 9:30PM **ECCE Oktoberfest Banquet** Ballroom ABCD

Schedule-at-a-Glance (continued)

Thursday, September 22nd

7:30AM – 12:00PM **Registration** Main Lobby Foyer – 1st Floor Wisconsin Center

Oral Sessions • 8:30AM – 10:10AM

203AB	203C	101B	203DE	102D	202A	202B	102C	202D	102E	102B	101A	101CD	202C	102A	202E	103C
S97: Converter	S98: Energy Storage Systems	S99: Power Quality I	S100: AC Micro-grids I:	S101: Battery Management for Transportation Electrification I	S102: Grid	S103: D Modular	S104: DC-DC Isolated: LLC	S105: Modeling and Control of Grid	S106: Fault Prognosis for Power Devices	S107: Thermal Analyses of Electric Machines	S108:	S109: Control of Electric Drives II	S110: Power	S111: Magnetics I	S112: Grid Synchronization	SS6: Advanced Electrical Machines

10:10AM – 10:30AM **AM Break** 100/200 Foyers

Oral Sessions • 10:30AM – 12:10PM

203AB	203C	203DE	102D	202A	202E	202B	102C	202D	101B	102E	101A	102B	101CD	102A	202C	103C
S113: Electric	S114: Converter Topologies for Energy Storage Systems	S115: AC Micro-grids II: Sharing and Coordination	S116: Batteries and Battery Management for Transportation Electrification II	S117: Multi-Phase Inverter	S118: AC-AC Converters I	S119: Modular Multilevel Converters (MMC) II	S120: DC-DC Isolated: Resonant	S121: Modeling and Control of Grid Connected Converter II	S122: Power Quality II	S123: Stability in Power Converters I	S124: Non-Conventional Machine Configurations I	S125: Noise and Vibration Issues in Electric Machines	S126: Electrical Drives for Aerospace and Traction Applications	S127: Magnetics II	S128: Device Short Circuit Capability	SS7: Advanced Electrical Machines II

12:10PM – 2:00PM **Awards Luncheon** Ballroom ABCD

Oral Sessions • 2:00PM – 3:40PM

203AB	203C	203DE	102D	202A	202E	202B	102C	202D	102E	202C	101B	101A	102B	101CD	102A
S129: DFIG Based Wind Power Systems	S130: Utility Scale Battery Systems	S131: AC Micro-grids III: Operation, Control and Energy Management	S132: Battery Charging for Transportation Electrification	S133: Three-Phase Inverter PWM	S134: AC-AC Converters II	S135: Modular Multilevel Converters (MMC) III	S136: DC-DC: Isolated Converters	S137: Modeling and Control of DC-AC Converters II	S138: Stability in Power Converters II	S139: Design Optimization of Power Converters,	S140: Active Power Filters	S141: Non-Conventional Machine Configurations II	S142: Magnetic Gears	S143: High Speed and Direct Drives	S144: Power Assemblies

Plenary Session

The plenary session features keynote speeches from Prof. Arun Majumdar from Stanford University and former Director of ARPA-E; Mr. Blake Moret, CEO of Rockwell Automation; Prof. Massoud Amin from University of Minnesota; Mr. Michael Regelski, CTO/Electrical Sector of Eaton Corporation; and Dr. Guangfu Tang, Vice President, Global Energy Interconnection Research Institute of China on a wide range of topics related to energy and sustainability. We are extremely fortunate to have these distinguished leaders from industry and academia to share their visions and wisdoms with us on the opening day of the conference.

Oral Sessions

The Technical Program Committee organized a rigorous peer review process and has carefully picked over 600 papers making up 16 parallel Oral Sessions. The technical program includes papers of broad appeal scheduled for oral presentation from Monday afternoon through Thursday morning. The various technical venues cover all areas of technical interest to the practicing power electronics professional. The papers are sure to give you many new design ideas that you can apply to your work immediately.

Poster Sessions

ECCE's poster sessions gives our attendees a unique opportunity to engage in discussions with 300 or so presenters in a way more interactive and more in depth way than possible in oral sessions. Each of our 3 poster presentation sessions will allow nearly 100 ideas to be viewed by our ECCE community. Our poster presenters will have an hour and a half to present their topics over the course of Monday evening and throughout the day on Tuesday. A broad range of topics and ideas will be covered during these interactive dialogues.

Town Hall Meetings

Town Halls serve as a public forum during the conference to discuss topics that are state of the art, controversial, forward looking, and motivate creative and innovative thinking. Town Halls create interaction between a panel of experts and attendees. It could become a massive debate with opportunities for a lot of back and forth. The panel will give their opinions and thought on the topic while also fielding dissenting opinions and questions. Beer and chips will be provided. Join us on Tuesday from 5:30 – 7:30 PM for moderated discussion on the following topics:

- Industrial Internet of Things: Why Do We Care?
- Close to the Edge: The New Frontier of the Grid

Special Sessions

We are pleased to offer 7 special sessions this year presented by a field of experts Tuesday through Thursday. These presentation-only sessions are focused on timely and practical topics in the field.

Exhibitor Products and Services Sessions

ECCE is the ideal place for companies to exhibit and promote their products and services and for savvy engineers, industry veterans and fresh startups alike to stay abreast of the research. These half-hour, industry-driven sessions, provide an in-depth look off the show floor from our exhibitors, showcasing their innovative products and services. The sessions will occur Monday afternoon in Room 103C.

Exhibit Hall Opening Reception

Join us for the opening of the ECCE 2016 Exhibit Hall! Enjoy a drink and hor d'oeuvres as 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. The Hall opens Monday, September 19th – 4:00 PM to 8:00 PM in the Wisconsin Center Exhibit Hall A.

Conference Highlights

Student Demonstrations

Since 2011, ECCE has introduced the hardware demo event for students to showcase their research outcomes and interact with academia and industry. This year's selected students were chosen from an impressive group of applicants. Visit the Student Demonstration Lounge in the Exhibit Hall A and support the social network among students from different universities and countries as they demonstrate their research on emerging technology. The Student Demonstration Lounge is open during Exhibit Hall hours.

Social Events

Social events provide an opportunity for attendees to network in a social setting and to further indulge in conversation around the conference or to simply catch up with an old friend or colleague! Special events also allow attendees the chance to relax and unwind and become acquainted with the conference city. This year's conference includes some of the following special events: Opening Reception at the Milwaukee Art Museum, ECCE's Banquet Oktoberfest, and an Award Luncheon to recognize and honor outstanding folks in the industry. You will need tickets for admission into these events.

Sunday Welcome Reception

The conference will host a Sunday Reception in the Milwaukee Art Museum, with its landmark modern architecture, and a great view of Lake Michigan. The museum is only 15 minute walk from the convention center. Bus service is available for those who wish to use. The Presidents of IAS and PELS will greet attendees at the event. You will also have a chance to thank and mingle with our corporate partners, and meet and greet our colleagues who have become IEEE Fellows this year. For the first time ECCE attendees, you will have a unique opportunity to get through the museum door 30 minutes before everyone else and enjoy a special orientation session. Join us on Sunday from 5:30 – 7:30 PM (Bus leaves Convention Center 5:00-5:30, and returns 7:00-8:00)

Wednesday Oktoberfest Banquet

Milwaukee is proud of its German heritage and its beer brewing history. There is no better way to celebrate our conference than a true Oktoberfest themed banquet. Milwaukee brewed special Oktoberfest beers and non-alcohol drinks will be served in our own ECCE beer steins that are for you to take home as souvenirs. Folk music and dance performance will make you forget about these technical topics for a moment or two. Join us on Wednesday from 7:00 – 9:30 PM in Ballroom ABCD.

Thursday IEEE Award Luncheon

We will gather to celebrate the great achievement of some of our colleagues at our traditional IEEE Award Luncheon event. Join us on Thursday from 12:10 – 2:00 PM in Ballroom ABCD.

Newcomer's Orientation

ECCE has grown into a very large conference, the amount of parallel activities is staggering. This session is our service to our first time attendees, serving as the introductory session for our colleagues who have not been to our conference before. We will cover everything that you need to know about the conference, the schedules, all of the program offerings, some behind the curtain tricks and tidbits to help the first time attendee to get comfortable and be able to confidently navigate this conference week.

The ECCE Steering Committee members will be presenting and answering your questions regarding any issues that you may have regarding the conference.

Detailed Schedule

Saturday, September 17th																
5:00PM – 7:00PM		Registration														
Main Lobby Foyer – 1st Floor Wisconsin Center																
Sunday, September 18th																
7:00AM – 7:00PM		Registration														
Main Lobby Foyer – 1st Floor Wisconsin Center																
Tutorials Group 1 • 8:00AM – 12:00PM																
101B	T1-1: Mechanical, Solid State and Hybrid Circuit Breakers for Protection of DC and AC Grids	101CD	T1-2: Principles and Applications of Modular Multilevel Converters	102B	T1-3: Linearized Modeling and Stability Analysis of AC Power Electronic Based Power Systems	102C	T1-4: The Origin of Converters	102D	T1-5: Advanced High-Power Industrial Drives	103C	T1-6: Power Semiconductors for Vehicle Traction Inverters: From Discretes to Power Modules, from Silicon to Wide Band Gap Devices					
Lunch on Your Own																
12:00PM – 1:00PM																
101B	T2-1: Electric Machine Design for Automotive Applications	102CD	T2-2: High Power Si & SiC Module Technology & Application Considerations	102B	T2-3: Shipboard DC Microgrids	102C	T2-4: Renewables, Energy Storage and Power Electronics as Enabling Technologies for the Smart Grid	102D	T2-5: Modeling and Control of Grid Inverters	103C	T2-6: Predictive Control – A Simple and Powerful Method of Control Power Converters and Drives					
5:30PM – 7:30PM		Opening Reception														
Milwaukee Art Museum																
Monday, September 19th																
7:00AM – 7:00PM		Registration														
8:30AM – 12:00PM		Plenary Session														
10:30AM – 10:50AM		AM Break														
12:30PM – 2:00PM		Lunch on Your Own														
12:30PM – 3:00PM		Exhibitor Products and Services Sessions														
Room 103C																
Oral Sessions • 1:30PM – 12:30PM																
	203DE	203C	202A	102D	202E	203AB	102C	102E	102A	202D	101A	102B	101CD	101B	202C	202B
1:30PM – 1:55PM	S1: Modular Multi-Level Converters, HVDC, and DC Grids I	S2: Renewable Energy I	S3: Modelling, Analysis, and Control of Grid- Connected Converters	S4: DC-DC Converters: Switched Capacitor	S5: Multi-Phase Rectifiers	S6: Single-Phase Inverters	S7: DC-DC Converters I	S8: Dual Active Bridge	S9: Electro- magnetic Interference (EMI) in Pow- er Converters	S10: Modeling and Control of DC-AC Converters I	S11: Induction Machines	S12: Prof. S. Nandi Memorial Session: Diagnostics of Electric Machines	S13: Control of Electric Drives I	S14: Medium Voltage Drives and High Power Drives,	S15: Power Modules	S16: Wireless Power Transfer I
	The Modular Embedded Multilevel Converter: A Voltage Source Converter with IGBTs and Thyristors	Energy Storage Opportunities and Capabilities in a Type 3 Wind Turbine Generator	A Method for Improving Stability of LCL-Type Grid-Tied Inverters in Weak Grid with Resonant Feed forward Control	Hybrid Switched-Capacitor Quadratic Boost Converters with Very High DC Gain and Low Voltage Stress On Their Semiconductor Devices	A Review of Electronic Inductor Technique for Power Factor Correction in Three-Phase Adjustable Speed Drives	A Generic Topology Derivation Method for Single-Phase Converters with Active Capacitive DC-links	Single-Input Multiple-Output Synchronous dc-dc Buck Converter	Analytically Constrained ZVS Operation to Reduce Commutation Losses for High Power Dual-Active Bridge Converters	A Simple Low-Cost Common Mode Active EMI Filter Using a Push-pull Amplifier	Compensation for Inverter Nonlinearity Considering Voltage Drops and Switching Delays of Each Leg's Switches	High Torque Density Induction Motor with Integrated Magnetic Gear	A Voltage Based Approach for Fault Detection and Separation in Permanent Magnet Synchronous Machines	Minimizing Torque Ripple of Highly Saturated Salient Pole Synchronous Machines by Applying DB-DFC	A Pumpback Test Bench for IGBT-Based 11MW/595Hz Variable-Frequency-Drives with 1.25MW Grid Capability	Performance Comparison of 10 kV-15 kV High-Voltage SiC Modules and High Voltage Switches Using Series Connected LV SiC MOSFET Devices	An Inductive and Capacitive Integrated Coupler and Its Application to High-Voltage SiC Modules and High Voltage Switches Using Series Connected LV SiC MOSFET Transfer
1:55PM – 2:20PM	Multimodule Cas- cade High-Voltage Composite Switch	Assessment of System Energy Support Effect of a PMSG-WTG Using Torque-Limit Based Inertial Control	Passivity Enhancement in RES Based Power Plant with Paralleled Grid-Connected Inverters	Mixed Switched-Capacitor Based High Conversion Ratio Converter and Generalization for Renewable Energy Applications	The Power Loss Analysis and Efficiency Maximization of A Silicon-Carbide MOSFET Based Three-phase Bi-directional Variable-DC-Bus Control	Power Decoupling Method for Single-Phase PV System Using Out-Of-Balance Micro-inverter	Dual-Input Dual-Output Single-Switch DC-DC Converter for Renewable Energy Applications	Passive Auxiliary Circuit for ZVS Operation of A Wide-DC-Range Dual-Active-Bridge Bidirectional Converter for Transposition Applications	Two-capacitor Transformer Winding Capacitance Common-Mode EMI Noise Analysis in Isolated DC-DC Converters	Small-signal Terminal-Characteristics Modeling of Three-Phase Drop-Controlled Inverters	Accurate Determination of Induction Machine Torque and Current versus Speed Characteristics	Permanent Magnet Generator Turn Fault Detection Using Kalman Filter Technique	Using Volt-sec. Sensing to Directly Improve Torque Accuracy and Self-Sensing at Very Low Speeds	Grounding Concept and Common-Mode Filter Design Methodology for Transformerless IM Drives	Development of an Ultra-High Density Power Chip on Bus (PCoB) Module for Transformerless Inductive Power Transfer (IPT) for Electric Vehicles	Design Procedure of Optimum Self-Inductances of Magnetic Pads in Inductive Power Transfer (IPT) for Electric Vehicles

Exhibit Hall A

Detailed Schedule (continued)

Tuesday, September 20th

Main Lobby Foyer – 1st Floor Wisconsin Center

Registration

Oral Sessions • 8:30AM – 11:00AM

	203AB	203DE	203C	202A	102D	202E	102C	102E	202D	102B	101A	101B	101CD	202C	102A	202B	103C
	S17: Photovoltaic Converters I	S18: Modular Multi-Level Converters, HVDC, and DC Grids II	S19: Renewable Energy II	S20: Utility Applications I	S21: Electric Machines for Transportation Electrification	S22: Multilevel Converter Applications	S23: Modeling and Control of DC-DC Converters I	S24: Modulation Techniques I	S25: Model Predictive Control of Power Converters	S26: Reluctance Machines	S27: Materials and Manufacturing Issues of Electric Machines	S28: Induction Motor Drives	S29: PM and IPM Motor Drives I	S30: Wide Bandgap Applications: Comparative Studies	S31: Gate Drive Techniques I	S32: Wireless Power Transfer II	S31: Simulation and Modeling
8:30AM – 8:55AM	Low Power Factor Operation of the PV Inverter with Power Decoupling Function	Impact on Small-Signal Dynamics of a VSC-HVDC Using Circulating Currents Instead of AC Currents to Control the DC Voltage in MMC HVDC Terminals	Partial Power DC-DC Converter for Photovoltaic String Inverters	Multi-Frequency Power Routing for Cascaded H-Bridge Inverters in Smart Transformer Application	Electrical Machine Acoustic Noise Reduction Based on Rotor Surface Modifications	A Fully FPGA-Based Real-time Simulation for the Cascaded STATCOM	Observer-based Nonlinear Control for Modulated Dual-Active-Bridge Converter	A Unified SVM Algorithm for Lifetime Prolongation of Thermally-Overheated Power Devices in Multi-Level Inverters	Constrained Long-Horizon Direct-Model Predictive Control for Power Electronics	A New Application Experimental Validation of Magnet Assisted Synchronous Reluctance Machine	Stator Lamination Geometry Influence on the Building Factor of Synchronous Reluctance Motor Cores	A Compact Active Filter to Eliminate Common-Mode Voltage in a Synchronous Reluctance Motor	Maximum Torque Control per Ampere Flux Linkage Synchronous Frame for DTC-based PMSM Drives Without Inductance	Comparative Evaluation of 15 kV SiC IGBT and 15 kV SiC MOS-FET for 3-Phase Medium Voltage Grid Connected Converter Applications	High-Speed Optical Gate Driver for Wide Band Gap Power Transistors	A Mistuning-Tolerant and Controllable Power Supply for Wireless Power Systems	S31: Simulation and Modeling
8:55AM – 9:20AM	Stand-Alone Photovoltaic Asymmetrical Cascade Converter	Control of VSC-HVDC with Electromechanical Characteristics and Unified Primary Strategy	On Reactive Power Injection Control of Distributed AC-Stacked PV Inverter Architecture	High Power Medium Voltage Resonant Dual Active Bridge for AC Distribution Networks	Integrated Control of an IPM Motor Drive and Hybrid Energy Storage System for Electric Vehicles	A Broad Range of Speed Control of a Permanent Magnet Synchronous Motor Driven by a Modular Multilevel TSC Converter	Novel Control Architecture for Dual Output DC-DC Converter Driving AC-AC Inverter System	Pulse-Width Modulation Strategy in Double-Delta Sourced Windings	Thermal-based Finite Control Set Model Predictive Control for IGBT Power Electronic Converters	Magnetic Field Analytical Computation in Synchronous Reluctance Machines Considering the Iron Saturation	Influence of PM Coating on PM Magnetization State Estimation Methods Based on Magnetostrictive Force Effect	Stator Inter-Turn Fault Detection for Seamless Fault-Tolerant Operation of Five-Phase Induction Motors	A Novel Direct Torque Control Strategy for Interior Permanent Magnet Synchronous Motors Driven by a Three-level Neutral Point	Comparison Between SiC and GaN Devices in 6.78 MHz 2.2 kW Resonant Inverters for Wireless Power Transfer	Reduction of Oscillations in a GaN Bridge Leg Driving Active Gate Using With-Sub-Ns Resolution, Arbitrary Gate-Impedance Patents	Power Converter with Novel Transformer Structure for Wireless Power Transfer Using a D2D Power Receiver Coil Set	
9:20AM – 9:45AM	Ground Leakage Current Suppression in a 50 kW E-level F-Type Transformerless PV Inverter	A Novel Inletting DC Power Flow Controller for Meshed HVDC Grids	A Cost-Effective Power Rate Control Strategy for Single-Phase Two-Stage Grid-Connected Photovoltaic Systems	Multi-Synthesized Robust Controller for Multi-Stage Islanded Smart Grid	Investigation and Analysis of Temperature Effects on Interior Permanent Magnet Machines	Comparison of SiC and GaN Devices for Front-End Isolation of Quasi-Z-Source Cascaded Multilevel Photovoltaic Inverter	Dynamic Bus Voltage Control for Light Load Efficiency Improvement of Quasi-Z-Source DC-DC Converter	A Quasi-Periodic Modulation Strategy to Gate-Base EMI for a GaN-based Quasi-Z-Source DC-DC Converter	Modulated Model Predictive Control for Active Split DC-Bus 4-leg Inverters	Performance Comparison of Short-Pulse and Full-Pulse Switched Reluctance Machines for Off-Road Vehicle Applications	Investigation of the Impact of Process Parameters on Iron Losses of Laminated Stator Cores for Electric Machines	Rotor Temperature Estimation in Dually Fed Induction Machines Using Rotating Signal Injection	Fault-Tolerant Capability of Direct Deadbeat–Direct Torque and Flux Control for Three-Phase PMSM Drives	Comparison of GaN-FET and SiC MOSFET Based Vienna Rectifiers	Design Considerations and Comparison of High-Speed Si IGBT and SiC MOSFET Modules	A Wireless Power Transfer System with a Double Current Rectifier for EVs	
9:45AM – 10:10AM	A High Performance Type-III Double-Graded Transformerless Photovoltaic Inverter with Active Power Decoupling	Impedance-based and Eigenvalue Based Stability Analysis of a VSC-HVDC System Compared in VSC-HVDC System	Delta Power Control Strategy for Grid-Tied PV Inverters	Cascade Open-End Winding Transformer-Based DVR	A Novel Flux-Switching Permanent Magnet Motor with Integrated Airfoil-Shaped Rotor Design	Which is more suitable to a Modulated Multilevel Inverter for Ultra-Scale PV Applications: PWM or Level-Shifted PWM?	A General Space Vector PWM Scheme for Multilevel Inverters	Computational Efficient Space Vector Modulation for Predictive Control	A Fault-Tolerant Machine Drive Based on Assisted Synchronous Reluctance Machine	Influence of Manufacturing Tolerances on Interior Permanent Magnet Machines with Eccentric and Sinusoidal Rotor Contours	Maximum Torque Output for VSC-Based Induction Machines in Flux-weakening Region	Online MTPA Control for PMSM Drives	Comparison of GaN and SiC Power Devices for a 2.2 kW SiC MOSFET Based Quasi-Z-Source Dual-Z-Source Cascaded Multilevel Inverters	Active Gate Driving technique for a 2.2 kW SiC MOSFET Based Quasi-Z-Source Dual-Z-Source Cascaded Multilevel Inverters	Hybrid Control of Inductive Power Transfer Charger for EVs	Research on Seamless Transfer from DC to AC by a Bidirectional SiC MOSFETs System Based on Doublesided LLC Compensation Network	
10:10AM – 10:35AM	Low Leakage Current Transformerless Photovoltaic Inverter	Performance Analysis of a Bridge-Active Bridge Converter System with a Future DC-Grids	Battery Storage String for a Grid-Tied PV System Based on System Parameter Minimization	Modeling and Control of a Grid-Based Multiport Power Converter	Novel 6-Slot 4-Pole Dual-Stator Flux-Switching Permanent Magnet Machine Comparison Studies for High-Speed Applications	A Symmetrical Hybrid Nine-Level Inverter for High-Speed Motor Drive System	A Study on the Control Loop Design of High-Speed Motor Drive System	Fixed-Frequency Finite-State Model Predictive Control for Indirect Matrix Converters with Optimal Switching Pattern	A General Approach for the Analysis and Design of Hybrid Synchronous Machines with Single-Axis Excitation	Investigation of Emerging Magnetic Materials for Application in High-Speed PM Machines	Performance Investigation of Selected Predictive Control Based FOC for 3L NPC Inverter Fed Motor Drive	Automatic MTPA Tracking in PMSM Drives: Dynamic Response and Auto-Tuning	Comparison of Deadtime Effects on the Performance of SiC MOSFETs	Comprehensive Evaluation of Gate Boost Driver for SiC MOSFETs	Research on Seamless Transfer from DC to AC by a Bidirectional SiC MOSFETs System Based on Doublesided LLC Compensation Network		
10:35AM – 11:00AM	Operation of Dual-Input Central Capacitor Photovoltaic Inverter Under Unbalanced Grid Voltage Condition	Dc Fault Protection of Multi-Terminal VSC-HVDC System with Hybrid DC Circuit Breaker	Dynamic Braking System of a Tidal Generator	Economic Feasibility Analysis and Operational Testing of a Community Energy Storage System	High-Specific-Power Electric Machines for Electrified Transportation Applications and Technology Options	Control of Neutral-Point Voltage in Three-Phase Four-Wire Inverter-Rectifier System of Zero Level	Improved Steady State Behavior of Finite Control Set Model Predictive Control Applied to a Flying Capacitor Converter	Flux Modulation Principles of DC-Based Synchronous Current Vector-Modulated Reluctance Machines	Investigation of Inverter-fed Drive Stator Insulation Monitoring on Reflection in High-Speed Synchronous Voltage Step Excitation	Reduction of Unbalanced Axial Magnet Force in Fast-Fault Operation of a Non-Synchronous Double-Star Axial Flux PM Machine Using Model Predictive Control	Gate Driver for the Active Thermal Control of a DDC GAN based Converter	Characterization and Comparison of Latest Generation 300-V and 600-V SiC MOSFETs	Gate Driver for the Active Thermal Control of a DDC GAN based Converter	Closed-Loop Control Design for WPT System Using Power and Data Transfer over a Dual-Multi-plexing Technique			

11:10AM – 5:30PM	Exhibit Hall Open	Exhibit Hall A
11:00AM – 12:30PM	Poster Session II	Exhibit Hall A
11:10AM – 11:30AM	AM Break	Exhibit Hall A
1:00PM – 2:30PM	Lunch	Exhibit Hall A
3:00PM – 4:30PM	Poster Session III	Exhibit Hall A
5:30PM – 7:30PM	Town Hall I: Internet of Things	102C
5:30PM – 7:30PM	Town Hall II: Close to the Edge: The New Frontier of the Grid	202C

Wednesday, September 21st

Main Lobby Foyer – 1st Floor Wisconsin Center

Registration

7:30AM – 5:30PM

Oral Sessions • 8:30AM – 10:10AM

	203AB	203C	202D	202A	203DE	202D	202C	202E	202B	101A	101B	101CD	202C	102A	202B	103C	
	S33: Photovoltaic Converters II	S34: Converter Applications for Alternative Energy Systems	S35: Modeling, Analysis, and Control of Grid-Connected Converters I	S36: Utility Applications II	S37: DC Microgrids I	S38: Transportation Electrification I	S39: Modeling and Control of DC-DC Converters II	S40: Modulation Techniques II	S41: Modeling, Control and Stability of Modular Multilevel Converters	S42: Reluctance Machines II	S43: PM Machines I	S44: Drive/Utility Interface	S45: PMI and IPM Motor Drives II	S46: Modeling of WBG Devices and Modules	S47: Gate Drive Techniques II	S48: Wireless Power Transfer III	SS2: Cyber Security Grid I
8:30AM – 8:55AM	A 50kW High Power Density Parallel-Five-level PV Converter based on SiC T-Type MOSFET Modules	Control Scheme for the Wide Operation Range of Induction Generator with a Vienna Rectifier in Wind Turbine Systems	Seamless Transfer Strategy Considering Power Balance in Parallel Operation	Full-ZVS Modulation for All-SiC ISOP-Type Isolated Front End Transformer	Hierarchical Coordination of a Hybrid AC/DC SmartGrid with Central/Distributed Energy Storage	A Modified Z-source Converter-based Single Phase PV/Grid Inter-connected DC Charging Converter for Future Transportation Electrification	A New High-Frequency Simulation Model for Multi-Winding Transformers used in Switched-Mode Power Supplies	Steady-State Analysis of the Phase Shift Modulated LLC Resonant Converter	MMC-HVDC: Simulation and Control Strategy	Segmented Rotor Design of Concentrated Wound Switched Reluctance Motor (SRM) for Torque Ripple Minimization	Proposal of Electrically Reversible Magneto-Pole Type Variable Magnetic Flux PM Motor	Synchronous Switching of Non-Line Start Permanent Magnet Synchronous Machines Between Inverter and Grid Drives	Effect of Position Sensor Error on the Performance of IPMSM Drives	PSpace Modeling Platform for SiC Power MOSFET Modules with Extensive Experimental Validation	Automatic Optimization of IGBT Gate Driving Waveform Using Simulated Annealing for Programmable Gate Driver IC	Performance Analysis of Magnetic Power Pads for Inductive Power Transfer Systems with Ferrite Structure Variation	
8:55AM – 9:20AM	PV Array Voltage Range Extension for Photovoltaic Inverters Using a Mini-Boost	Gain Based High Gain Non-Isolated DC-DC Stage of Microconverter with Extended-Duty-Ratio Boost	Robust Control for Parallel Operated L-Inverters with Uncertainty and Disturbance Estimator	Stability Issues in Reverse Power Flow Limitation in a Smart Transformer-Fed Distribution Grid	Dynamic Optimal Power Flow for DC Microgrids with Distributed Battery Energy Storage Systems	Comprehensive Design Comparison of Using Different Order Harmonics as the Power Carrier in Wireless Power Transfer for PHEV and EV Wireless Charging	Multi-Phase Sliding Mode Control for Chattering Suppression in a DC-DC Converter	Practical Implementation of Global Synchronous Pulse Width Modulation with Time Delay Compensation and Distributed Calculation Capabilities	Hybrid Railway Power Conditioner Based on Half-Bridge Modular Multilevel Converter	Extending the Speed Range of a Switched Reluctance Motor using a Fast Demagnetizing Technique	Torque and Core Loss Characterization of a Variable-Flux Permanent-Magnet Machine	Instability Detection and Protection Scheme for Efficiency Optimized VFI Driven Synchronous Reluctance Motors (SYRM)	Signal-Injection-Aided Position Estimation for PMSM Drives with Low-Resolution Position Sensors	Development of Simulink-Based SiC MOSFET Modeling Platform for Series Connected Devices	Active dv/dt Control of 600V GaN Transistors for IPT Systems for EV Charging	Analysis of Mutually Decoupled Primary Coils for IPT Systems for EV Charging	
9:20AM – 9:45AM	Submodule Integrated Boost DC-DC Converters with No External Input Capacitor or Input Inductor for Low Power Photovoltaic Applications	High-Efficiency Three-Level SEPIC for Grid-Tied PV Systems	Active and Reactive Power Operational Regulation for Grid-Interconnected Active Cascaded H-Bridge Multilevel Converters	Smart Transformer-Based Hybrid Grid Loads Support in Partial Disconnection of M/HV Power System	DC Electric Springs with Modified Droop Control for Storage Reduction in DC Microgrids	A New Inductive Transfer Topology Using Current-Fed Full-Bridge LLC Converter Configuration	Gradient-Refined-Current Control of Tri-state Buck Converter to Improve Dynamic Response over Wide Load Range	Research on Zero-Sequence Circulating Currents in Parallel Three-Level Grid-Tied Photovoltaic Inverters	A PWM Method Reducing Harmonics of Two Interleaved Converters	Development and Analysis of a Zero-Switched Reluctance Machine	Examination to Enhance Efficiency of V-shaped IPMSM Using Concentrated Winding Structure at High Speed and High Torque Area	Power-Quality Oriented Optimization in Multiple Three-Phase Adjustable Speed Drives	Integrated Switch Current Sensor for Short-Circuit Protection and Current Control of 1.7-kV SiC MOS-FET Modules	An Accurate Subcircuit Model of SiC Half Bridge Module for Switching Loss Optimization	Commutation Strategies for Single-Chip Dual-Gate Bidirectional IGBTs in Matrix Converters	Dynamic Matching System for Radio-Frequency Plasma Generation	
9:45AM – 10:10AM	Effective Control Approach for Multi-PVs Based Resonant Converter through Cross-switched Structure	A Novel Zero-voltage-switched Multi-resonant DC-DC Converter	Harmonic Stability Analysis and Controller Parameter Design of Three-Phase Inverter-Based Multi-Bus AC Systems Based on Sequence Impedances	Soft-Switching Solid State Transformer (SST)	Optimal Droop Control of DC Microgrids Based on Battery State of Charge	Reduction on Radiation Noise Level for Inductive Power Transfer Systems with Spread Spectrum Focusing on Combined Impedance of Coils and Capacitors	A Control Strategy for Parallel Bi-Directional DC-DC Converters Used in Energy Storage Systems	Modified Pulse Energy Modulation Technique of a Three-Switch Buck-Boost Inverter	DC Impedance Modeling and Stability Analysis of Modular Multilevel Converter for MVDC Application	Torque Ripple and Acoustic Noise of Current Modulations of a Pseudo-Sinusoidal Switched Reluctance Motor	Advanced High Torque Density Non-overlapping Winding PM Verner Machines	A Four-Quadrant Permanent Magnet Synchronous Machine Drive with a Tiny DC Link Capacitor	Current Reconstruction Method for PMSM Drive System with a DC Link Shunt Resistor	Spatial Electro-Thermal Modeling and Simulation of Power Electronic Modules	Two Comparison-Alternative High Temperature PCB-Embedded Transformer Designs for a 2 W Gate Driver Power Supply	A Loosely Coupled Capacitive Power Transfer System with LC Compensation for a Circuit Topology	

AM Break

10:10AM – 10:30AM

100/200 Foyers

Detailed Schedule (continued)

Wednesday, September 21st (continued)																	
Oral Sessions • 10:30AM – 12:10PM																	
	2034B	203C	202A	202D	203DE	102E	102D	202E	202B	102C	102B	101A	101B	101CD	202C	102A	103C
	S49: Control for Photovoltaic Applications	S50: Photovoltaic Characterization and Modeling	S51: Utility Applications III	S52: Modeling, Analysis, and Control of Grid-Connected Converters II	S53: DC Microgrids II, Chair	S54: Datacenters and Telecommunication Applications	S55: Transportation Electrification II	S56: PFC Rectifiers	S57: Modeling and Control of Multilevel Converters	S58: Modeling and Control of Resonant Converters	S59: Electric Machines for Automotive Applications I	S60: PM Machines II	S61: Multilevel Motor Drives	S62: IPM Motor Drives III	S63: Wide Bandgap Applications: SiC	S64: LED Drivers	SS3: Cyber Security Grid II
10:30AM – 10:55AM	A Variable Step-Size MPPT for Sensorless Current Model Predictive Control for Photovoltaic Systems	A Rapid I-V Curve Generation for PV Modeling Based on Input-Series-Output-Parallel Dual-Active-Bridge for MWDC Power Distribution	DC Solid State Transformer Based on Input-Series-Output-Parallel Dual-Active-Bridge for MWDC Power Distribution	Advanced Control of a High Power Converter Connected to Weak Grids	An Adaptive Power Distributed Control Method to Ensure Proportional Load Power Sharing in DC Microgrid Considering Equivalent Line Impedances	Soft Switching Operation of a Multi-Phase Resonant Output-Inductor Bridge-Less Full-Bridge Converter for Use in a Hybrid Electric Vehicle Drivetrain	Loss Optimizing Control of a Multi-Phase Interleaving DC-DC Converter for Use in a Hybrid Electric Vehicle Drivetrain	Active Virtual Ground - Bridge-Less PFC Topology	An Improved Proportional Pulse Compensation Strategy for DC Voltage Balance of Cascaded H-Bridge Rectifier	Extreme Start-Up Response of LLC Converters Using Average Geometric Control	Retrospective of Electric Machines for EV and ICEV Traction Applications at General Motors	Experimental Verification of Torque Demand Realization in a Fractional Slot Concentrated-Winding PM Synchronous Machine under Drive Fault Conditions	A Fault-Tolerant Flyer Multilevel Inverter Topology with Soft-Switching Capability Based on Si and SiC Hybrid Phase Legs	Magnet Temperature Effects on Torque Characteristics of Permanent Magnet Machines and a Mitigating Method for Magnetization Charges	A Compact 100-A, 850-V Silicon Carbide Solid-State DC Circuit Breaker	Precise and Full-Range Dimming Control for an On-Off-Line Single-Output-Multiple-Input LED Driver	
10:55AM – 11:20AM	Study on the Unbalanced Current Injection Capability of Grid-Connected Photovoltaic Neutral-Point-Clamped Inverter	Photovoltaic Panel Simulation Based on Individual Cell Condition	Six-Leg Single-Phase to Three-Phase Converter	A Power Density Optimization Method for a Power Pulsation Decoupling Buffer in Single-Phase DC-AC Converters	The Performance of Polytopic Models in Smart DC Microgrids	High Efficiency Two-Stage 48V VRM with PCB Winding Matrix Transformer	Traction Inverter Evaluation Method Based on Driving Cycles for Electric and Hybrid Electric Vehicles	A 500-KHz, 3 kW Power Factor Correction Circuit With Low Loss Auxiliary ZVT Circuit	Cost Effective Capacitor Voltage Balancing Control for Five-level Grid-Tied Inverters	Optimized Resonant Pulsed Power Supplies With Deadbeat Regulation	High-Performance Partitioned-Stage Switched Flux Memory Machines with Hybrid Magnets on External Stator for Automotive Traction	Influence of Stator Configuration on High Frequency Signal Injection Based Permanent Magnet Temperature Estimation in PMSMs	An On-Line Diagnostic Method for Open-Circuit Switch Faults in NPC Multilevel Converters	Noninvasive Online Rotor Permanent Magnet Temperature Tracking for Permanent Magnet Synchronous Machine Based on Third Harmonic Voltage	Matrix Converter with Sinusoidal Input-Output Filter and Filter Derivatising Using SiC Devices	Design and Implementation of a Beroff LED Lens for AC Mains and Ballasts	
11:20AM – 11:45AM	Adaptive DC Link Voltage Control Scheme for Single Phase Inverters with Dynamic Power Decoupling	Development and Implementation of a PV Performance Monitoring System Based on Inverter Measurements	Flexible Transformers for Distribution Grid Control	Control Design in SS-Synthesis Framework for Grid-Connected Inverters with Higher Order Filters	Study on DC AC Faults in Ring-Bus DC Microgrids with Constant Power Loads	Hierarchical Protection 380V DC Data Center Application	Model Predictive Control based on Field-weakening Strategy for Traction EV used Induction Motor	A Two-Switch Buck-Boost PFC Rectifier With Automatic Power Decoupling Capability	A Single Phase Type Inverter Operating in Boundary Conduction Mode	Control and Operation of Medium-power High-power Bi-directional Resonant DC-DC Converters in Shipboard DC Distribution Systems	Test Results for High Temperature Non-Permanent Magnet Traction Motor	Analysis and Design Guidelines to Mitigate Demagnetization Vulnerability in PM Synchronous Machines	Analysis of Neutral Point Deviation in 3-level NPC Converter under Unbalanced 3-phase AC Grid	Permanent Magnet Block with SiC Power MOSFETs for Pulsed Power Application	H-Bridge Building Block with SiC Power MOSFETs for Pulsed Power Application	A Current Compensator for Mitigating the Influence of Long Cable Inductance between the LED Driver and the Light Source	
11:45AM – 12:10PM	ZVS Analysis and Power Flow Control for Three Limb Transformer Enabled SiC Masfer Classed Three Port DAB Integrating PV and Energy Storage(ES)	Characterization of Silicon Based Photovoltaic Cells Using Broadband Impedance Spectroscopy	Comparative Analysis of Modular Multiport Power Electronic Transformer Topologies	Sensorless Current Model Predictive Control for Maximum Power-Point Tracking of Single-Phase subMultilevel Inverter for Photovoltaic Systems	Stability Analysis and Improvement of a Dual Active Bridge (DAB) Converter Enabled DC Microgrid based on a Reduced-order Low Frequency Model	Device Loss Comparison of GaN Device Based LLC Dual Active Bridge and Phase Shift Quasi Switched Capacitor Circuit	Design Optimization and Development of Electric Traction Machines for Cadillac CT6 HEV	High Efficiency Bridgeless Power Factor Converter for High Frequency AC Systems	Three-Phase Four-Wire AC-DC-AC Multilevel Topologies Obtained from an Interconnection of Three-leg Converters	Inductance Cancellation in RF Resonant Power Converters	Vehicular Suppression of Propulsion Using Double Sided Linear Inductance Machines	The Nature of the Torque Ripple in Fractional Slot Synchronous PMAHEL Machines	A Modulation Technique of Neutral Point Clamped Converters with Voltage Reduction and Neutral-Point Balance	Analysis and Suppression of Zero Sequence Circulating Current in Open Winding Permanent Magnet Synchronous Machine Drives with Common DC Bus	Three-phase Active Front-end Rectifier Efficiency Improvement with Silicon Carbide Power Modules	Investigation into the Use of Single Inductor Driving Multiple Series-Connected LED Channels	
12:10PM – 2:00PM	Lunch on Your Own																

Wednesday, September 21st (continued)

Oral Sessions • 1:30PM – 3:10PM

	203C	202A	202D	102D	202E	202B	102C	102E	102B	101A	101B	101CD	102A	202C	203AB	203DE	103C
	S65: Modeling and Control of Alternative Energy Applications	S66: Utility Applications IV	S67: Modeling, Analysis, and Control of Grid-Connected Converters III	S68: WBG in Traction Application	S69: Single Phase Rectifiers	S70: Multilevel Converters	S71: DC-DC Converters II	S72: Reliability, Diagnostic and Faults Analysis in Power Converters I	S73: Electric Machines for Automotive Applications II	S74: PM Machines III	S75: Drive Applications	S76: Sensorless Drives I	S77: Junction Temperature Sensing and Monitoring	S78: Wide Bandgap Applications: GaN	S79: Applications of Droop Control	S80: DC Microgrids III	SS4: SiC Devices
1:30PM – 1:55PM	Using Markov Switching Model for Solar Irradiance Forecasting in Remote Microgrids	Field Test Results for a 12.47 kV 3-Phase 1 MVA Power Router	A Comparative Study of Methods for Estimating Virtual Flux at the Point of Common Coupling in Grid Connected Voltage Source Converters With LCL Filter	Component Design and Implementation of a 60 kW Full SiC Traction Inverter with Boost Converter	Current-stress Reduction of the Neutral Inductor in a Rectifier with Two Outputs	Modulation Method for Single-Phase Six-Switch Five-Level ANPC Inverter	Small-Signal Model and Control of the Interleaved Two-Phase Coupled-Inductor Boost Converter	System-level Reliability Assessment of Power Stage in Fuel Cell Application	Optimization of the Torque Quality of a Combined Phase Transverse Flux Machine for Traction Applications	Active Voltage Regulation of Partitioned Star Switched Flux Permanent Magnet Generator Supplying Isolated Passive Load	A New Normal Mode dv/dt Filter With Resistor Failure Detection Circuit	Design Consideration of Interior Permanent Magnet Machine Sensorless Drive Using Square-Wave Voltage Injection	An IGBT Junction Temperature Measurement Method via Combined TSEPs For Eliminating Impact of Collector Current	Design of a 10 kW GaN-based High Power Density Three Phase Inverter	Energy Storage Size and Fuel Consumption Reduction in a Microgrid Using Virtual Droop Control Framework	A New Secondary Control Approach for Voltage Regulation in DC Microgrids	
1:55PM – 2:20PM	Determining Maximum MPPT Tracking Frequency for Input-Voltage-Controlled PV-Interfacing Converter	DC Capacitor Voltage Balancing Control for Delta-Connected Cascaded H-Bridge STATCOM Considering the Unbalanced Grid and Load Conditions	A Novel Model Predictive Sliding Mode Control for AC/DC Converters with Output Voltage and Load Resistance Variations	Design Methodology for a Planarized-High-Power Density EV/HEV Traction Drive using SiC Power Modules	Single-stage AC/DC Dual Inductor BCM Current-Fed Push-Pull for HB-LED Lighting Applications	Modified SVMWM to Eliminate Common-Mode Voltages for Five-Level ANPC Inverters	A Robust Design Framework for Stable Digital Peak Current-Mode Control Under Uniform Sampling	A Novel Online ESR and C Identification Method for Output Capacitor of Flyback Converter	An Examination for improvement of Constant Output Characteristics at High-Speed Region in a Spoke-Type IPMSM using Magnet by Changing the Shape of Rotor Surface	Coupled and Simplified Model of the Symmetrical Asymmetrical Triple Star Nine-Phase Interior Permanent Magnet Machines	Simulation of Cable Charging Current and Its Effects on Operation of Low Power AC Drives	A Synchro-Perspective-Based High-Frequency Signal Injection Method for Position-Sensorless Vector Control of Doubly-Fed Induction Machines	Delta Control of Switching Power Devices at Thermal Boundaries via Physics-Based Loss Manipulation	High-Frequency DC-DC Converter in Electric Vehicle Based on GaN Transistors	Seamless Black Start and Reconnection of LCL-filtered Solid State Transformer Based On Droop Control	CERTS Microgrids with Photovoltaic Microsources and Feeder Flow Control	
2:20PM – 2:45PM	Real-time Emulation of a Pressure Reinforced Osmotic Power Generation System	Advanced Grid Simulator for Multi-Megawatt Power Converter Testing and Certification	A Novel Virtual Synchronous Generator Control Strategy Based on Improved Swing Equation Emulating and Power Decoupling Method	A SiC-Based High-Performance Medium-Voltage Fast Charger for Plug-in Electric Vehicles	Asymmetric Single-Phase Rectifier for Current Source	THD and Efficiency Improvement in Multi-Level Inverters through an Open End Winding Configuration	Modeling and Decoupled Control of a Non-Isolated High-Step-up/down Bidirectional DC-DC Converter	Fault Ride-Through Capability for Grid-Supporting Inverters	Variable Flux Permanent Magnet Synchronous Machine (VF-PMSM) Design to Meet Electric Vehicle Traction Requirements with Reduced Losses	Design and Analysis of a Novel Three-phase Flux Reversal Machine	Systematic Modeling for a Three Phase Inverter with Motor and Long Cable Using Optimization Method	Enhancing Estimation Accuracy by Applying Cross-Correlation Image Tracking to Self-Evaluation on a Low Salt-ery Ratio Machine	Online Junction Temperature Monitoring Using Turn-Off Delay Time for Silicon Carbide Power Devices	A GaN-based Flying-Capacitor Multilevel Boost Converter for High Step-up Conversion	A Circulating Current Suppression Method for Parallel Connected Voltage-Source-Inverters (VSI) with Common DC and AC Bus-ess	Combined Optimization of SSCB Snubber and Freewheeling Path for Surgeless and Quick Bus Fault Interruption in Low-Voltage DC Microgrid	
2:45PM – 3:10PM	Efficient FCTV Provision considering DWT and DWPT-based Noise Suppression for Overcoming the Noise-Induced Voltage Loss in PEM Fuel Cell	Experimental Verification of Capacitance Reduction in MMC-Based STATCOM	Virtual Impedance-Based Active Damping for LCL Resonance in Grid-Connected Voltage Source Inverters with Grid Current Feedback	An Integrated Onboard Charger and Accessory Power Converter for Traction Drive Systems with a Boost Converter	A Bridgeless Controlled Rectifier for Single Split-Phase Systems	A Source-Type Harmonic Energy Unbalance Suppression Method Based on Carrier Frequency Optimization for Cascaded Multi-level APF	Non-Isolated High-Gain Three-Port Converter for Hybrid Storage Systems	Analysis of Hybrid Energy Storage Systems with DC Link-Fault Ride-Through Capability	Comparison of Traction Motors that Reduce or Eliminate Rare-Earth Materials	Design, Control and Implementation of a Non-Rare-Earth Flux Switching Permanent Magnet Machine	Performance Evaluation of SIC MOSFETs with Long Power Cable and Induction Motor	The Crowded Axis of the Frequency: Optimal Pole/Zero Allocation for a Full Speed Sensorless Synchronous Motor Drives	Simple Analog Detection of Turn-off Delay Time for IGBT Junction Temperature Estimation	A GaN based High Frequency Active-clamp Buck Converter for Automotive Applications	Decentralized Method for Load Sharing and Power Management in a Hybrid Single/Three-Phase Islanded Microgrid Consisting of Hybrid Source PV/Battery Units	Symmetric Droop Control for Improved Hybrid AC/DC Microgrid Transient Performance	

3:10PM – 3:30PM **PM Break** 100/200 Foyers

Detailed Schedule (continued)

Wednesday, September 21st (continued)

Oral Sessions • 3:30PM – 5:10PM

	203AB	203C	202A	202D	102D	102C	202E	203DE	102E	202B	102B	101A	101B	101CD	202C	102A	103C
	S81 Wind Energy Control and Operations	S82 Energy Harvesting Systems	S83 Utility Applications V	S84 Modeling, Analysis, and Control of Grid- Connected Converters IV	S85 More Electric Aircraft	S86 DC-DC Converters: High Frequency	S87 Modeling and Control of AC-DC Converters	S88 Converter Control in Microgrids and Distributed Generation	S89 Reliability, Diagnostic and Faults Analysis in Power Converters II	S90 Reliability and Fault Tolerance in Multilevel Converters	S91 Electric Machines for Automotive Applications III	S92 PM Machines IV	S93 Energy Efficient Motor Drives	S94 Sensorless Drives II	S95 Silicon and WBG Devices	S96 Distribution- System Utility Interface	S95 Electricity Water Nexus
3:30PM – 3:55PM	Small Scale Reluctance Synchronous Generator Wind-Turbine System with DC Transmission Linked Inverters	Temperature Dependence of Efficiency in Renewable Mag- netohydrodynamic Power Generation Systems	Field Upgradeable Transformer: A Fractionally-Rated Voltage Regulator for the Distribu- tion System	Evaluation of Active Islanding Detection Based Methods Under Non-Linear Loads Scenarios	An Induction Generator based Auxiliary Power Unit for Power Generation and Management System for More Electric Aircraft	A GaN-Based Partial Power Con- verter with MHz Switching Reconfigurable Switched-Capaci- tor and RF SEPIC	Dynamic Response Optimi- zation for Three- phase VEMNA Rectifier with Load Feedforward Control	A Feed-Forward Based Harmonic Compensation Approach for Low Switching Frequency Grid Interfacing VSI	Computation and Analysis of Dielectric Losses in MV Power Elec- tronic Converter Insulation	Highly Reliable Transformerless Neutral Point Clamped Inverter with Separated Inductors	Design of a Wound Field Synchronous Ma- chine for Electric Vehicle Traction with Brushless Capacitive Field Excitation	Tolerance Study to Forecast Performance of Permanent Ma- gnet Synchron- ous Machines Using Segmented Stator for Mass Production	Electrical Loss Minimization Technique for Wind Generators based on a Comprehensive Dynamic Model- ling of Induction Machines	A Robust Magnetic Polar- ity Self-Sensing Method for Start-Up of PM Synchronous Machine in Fan- Like System	Super Junction Cascode, a Configuration to Break the Silicon Switching Frequency Limit	Unbalanced Volt- age Compensation in LV Residential AC Grids	
3:55PM – 4:20PM	Short-Term Forecasting of Inertial Response from a Wind Power Plant	Modeling, Anal- ysis and Design of An Undersea Storage System	New Configuration of Multi-Functional Grid-Connected Inverter to Improve Both Current-Based and Voltage-Based Power Quality	Decentralized Adaptive Control for Interconnected Boost Converters Based On Backstepping Approach	Design and Optimization of a High Performance Isolated Three Phase AC/DC Con- verter for Aircraft Applications	Monolithic Multilevel GaN Converter for Envelope Tracking in RF Power Amplifiers	A Compensation Scheme to Reduce Input Current Distortion in GaN Based 450 kHz Three-Phase Vienna Type PFC	An Embedded Voltage Harmonic Compensation Strategy for Current-Controlled IG Interfacing Converters	Computational Light-Union Temperature Estimator for Active Thermal Control	Fault Detection and Tolerant Control of Open-circuit Failure in MMC with Full-Bridge Sub-modules	Design and Devel- opment of a MLC Based Compact Active Suspension System - Featuring Air Spring and Energy Harvesting Capabilities	Permanent Magnet Material and Pulsating Torque Minimi- zation in Spoke Type Interior PM Machines	Maximum Efficiency Control Method in 7-phase BLDC Motor by Chang- ing the Number of the Excited Phase Windings	Universal Sensorless Vector Control Applicable to Line-Start Per- manent Magnet Synchronous Motors with Damper Winding	Maximizing the Performance of 650 V p-GaN Gate HEMTs: Dynamic Ren Charac- terization and Gate-Drive Design Considerations	The Hierarchical Energy Manage- ment Control for Residential Energy Harvesting System	
4:20PM – 4:45PM	A 3.0MW Case Study of the Influence of PM Cost on Wind Turbine Cost of Energy	The Joint Design of a Compressed Air and Wind Energy System for Mechanical Split- tage Recovery	Model Predictive Control of A Matrix Converter Based Solid State Transformer for Utility Grid Interaction	Impedance Synthesis by Inverter Control for Active Loads in Anti-Islanding Testbenches	Taking Into Account Interac- tions Between Converters in the Design of Aircraft Power Networks	An Improved PDM Control Method for a High Frequency Quasi-Resonant Converter	Modeling and Analysis for Input Characteristics of Line-Frequency Rectifiers	Analysis and Damping of Har- monic Propagation in DG-Penetrated Distribution Networks	Fast Fault Diagnosis and Identification Method for Boost Converter Based on Inductor Current Emulator	Control Strategy of Single Phase Back-to-back Converter for Medium Voltage Drive under Cell Fault Condition	A Simple Design Method for Surface-mounted PM machines for Traction Application	Mechanical Design Method for a High-Speed Surface Perma- nent Magnet Rotor	Control Strategy for Dual Three- Phase PMSMs With Minimum Losses in the Full Torque Operation Range Under Single Open- Phase Fault	Improvement of Back-EMF Self-Sensing for Induction Ma- chines when using Deadbeat-Direct Torque and Flux Control (DB-DTC)	15kV/40A FREDM Super-Cascade: A Cost Effective SIC High Voltage and High Frequency Power Switch Application	Reactive Power Distribution Strat- egy using Power Factor Correction Converters for Smart Home Application	
4:45PM – 5:10PM	Direct Power Control of a Dou- bly Fed Induction Generator Wind Power System in Stand-Alone and Grid-Connected Modes with Seamless Transition	Experimental Control of a Hydraulic Wind Power Transfer System under Wind and Load Disturbances	A Triple Port Active Bridge Converter based Power Electronic Transformer	A Unified Impedance Model of Voltage-Source Converters with Phase-Locked Loop Effect	Stability Assessment of A Drop-Controlled Multi-Generator System in the More Electric Aircraft Using Parametric Space Approach	Automotive LED Driver Based On High Frequency Zero Voltage Switching Hesi- graded Magnetics Cuk Converter	Hybrid Damping for Active Front End Converter	Voltage and Current Regula- tors Design of Power Converters in Islanded Microgrids based on State Feedback Decoupling	Modeling and Improvement of Thermal Cycling in Power Electronics for Motor Drive Applications	Fault Tolerance Analysis for the S-Level Unidirectional TRIrectifier	Design Optimiza- tion of Spoke-Type PM Motors for Formula E Racing Cars	Analysis and Design of Triple-Rotor Axial-Flux Spoke-Array Vernier Permanent Magnet Machines	A Multi-Pulse Front-End Rectifier System with Electronic Phase-Shifting for Harmonic Mitigation in Motor Drive Applications	Sensorless Position Control of PMSM Operating at Low Switching Frequency for High Efficiency Climate Control Systems	Active Voltage Balancing Control for Multi-HV IGBTs in Series Connection	A Study of Dynamic High Voltage Output Charge Measure- ment for 15 kV SIC MOSFET	
7:00PM – 9:30PM																	<i>Ballroom ABCD</i>
	ECOE Oktoberfest Banquet																
	7:00PM – 9:30PM																

Ballroom ABCD

ECCE Oktoberfest Banquet

Thursday, September 22nd

Registration

7:30AM – 12:00PM

Main Lobby Foyer – 1st Floor Wisconsin Center

Oral Sessions • 8:30AM – 10:10AM

10:10AM – 10:30AM

203AB	203C	101B	203DE	102D	202A	202B	102C	202D	102E	102B	101A	101CD	202C	102A	202E	103C
S97: Converter Topologies for Wind Power Systems	S98: Energy Storage Systems	S99: Power Quality I	S100: AC Microgrids and Stability	S101: Battery Management for Transportation Electrification I	S102: Grid Connected Single-Phase Inverters	S103: D Modular Multilevel Converters (MMC) I	S104: DC-DC Isolated: LLC	S105: Modeling and Control of Grid Connected Converter I	S106: Fault Prognosis for Power Devices	S107: Thermal Analyses of Electric Machines	S108: Transverse Flux Machines	S109: Control of Electric Drives II	S110: Power Packaging	S111: Magnetics I	S112: Grid Synchronization	SS6: Advanced Electric Machines
The DOE Next-Generation Drivetrain for Wind Turbine Applications: Gearbox, Generator, and Advanced Si/SiC Hybrid Inverter System	A Comparison of Broadband Impedance Measurement Techniques for Lithium-Ion Batteries	Enhanced Power Quality and Minimized Peak Current Control in An Inverter based Microgrid under Unbalanced Grid Faults	Modeling and Stability Analysis of the Small-AC-Signal Drop Based Secondary Control for Islanded Microgrids	A Pack-to-Cell-to-Pack Battery Equalizer with Soft-Switching Based on Buck-Boost and Bidirectional LC Resonant Converters	Double Line Frequency Ripple Cancelling for Single-Phase Quasi-Z-Source Inverter	DC Fault Ride Through of Multilevel Converters	A New Tightly Regulated Dual Output LLC Resonant Converter with PFM plus Phase-shift Control	A Unified Control of Back-to-Back Converter	Remaining Useful Lifetime Estimation for Thermally Aged Power Mosfets With Ransac Denoising Algorithm	Experimental Calibration in Thermal Analysis of PM Electrical Machines	A Hybrid-Excited Axial Transverse Flux Permanent Magnet Machine	A Novel Six-Phase Inverter System for High-Power Synchronous Motor Drives	A Quasi-online Method of Thermal Network Parameter Identification of IGBT Module	NiCoZn Ferrite Cores by Gelcasting: Processing and Properties	A New Phase-Locked Loop Method for Three-Phase System	
Inductorless Boost Rectifier for Small Power Wind Energy Converters	Evaluation of Lithium-Ion Battery Second Life Performance and Degradation	Parallel Interfacing Converters under Unbalanced Voltage Active Power Oscillation Cancellation with Peak Current Sharing	A Small-AC-Signal Injection Based Harmonic Power Sharing Method for Islanded Microgrids	A New Perspective on Battery Cell Balancing: Thermal Balancing and Relative Temperature Control	Hybrid Control Scheme for the Current Loop of a Grid Connected Inverter Operating With Highly Distorted Grid Voltage	Reverse Blocking Sub-Module Based Multilevel Converter with DC Fault Ride-Through Capability	Analytical Model of Converter With Variable Duty-Cycle Control	Control of an Islanded Power-Electronic Converter as an Oscillator	An Analytical Model for False Turn-On Evaluation of GaN Transistor in Bridge-Leg Configuration	Thermal Conductivity Evaluation of Fractional-Slot Concentrated-Winding Machines	Reduction of Cogging Torque in Transverse Flux Machines by Stator and Rotor Pole Shaping	State-Space Flux-Linkage Control of Bearingless Synchronous Reluctance Motors	Direct-cooled Power Module With a Thick Cu Heat Spreader Featuring a Suppressed Structure for EV/HEV Inverters	Low-Capacitance Planar Spiral Windings Employing Inverse Track-Width-Ratio	A New Second-Order Generalized Integrator Based Quadrature Signal Generator With Enhanced Performance	
High-frequency Isolated DC/DC Converter for Onshore Wind Energy Systems	A Distributed ESO based Cooperative Current Sharing Strategy for Parallel Charging Systems Under Disturbances	The Reverse Zero-Sequence Current Compensation Strategy for Back-to-Back Active Power Conditions	Improvement of Transient Stability in Inverter Based AC Microgrid via Adaptive Virtual Inertia	Advanced Cell-level Control for Hybrid Electric Vehicle Battery Pack Lifetime	Single-Phase LLC Filter-based Grid-Tied Inverter with P+PSS Filter Based Capacitor Current Feedback Active Damp	Closed-loop Control of the DC/DC Modular Multilevel Converter	Three-Phase LLC Resonant Converter with Integrated Magnetics	Power control for Grid-connected Converter to Comply with Safety Operation Limits during Grid Faults	Advanced Condition Monitoring System Based on On-Line Semiconductor Loss Measurements	Thermal Performance Modeling of Full-Wave Rectifier Connected Grids in Electric Machines	Design Considerations of a Transverse Flux Machine for DOL Drive Wind Turbine Applications	Current Harmonic Compensation for Inverter Machines With Amplitude Modulation Winding Arrangement	Impact of Poly-Crystalline Diamond with Power Semiconductor High-Voltage Device Modules in a Converter	On-Chip Transformers with Shielding Structures for High-Voltage Immunity Isolated Gate Drive	A Modified SPF-PWM for Phase and Frequency Measurement of Single-Phase Systems	
A New Three-phase AC/DC High Power Factor Self-switched Step-up Converter with High Gain Rectifier Modules for Medium Voltage Grid in Wind Systems	A Comprehensive Study on the Degradation of Lithium-Ion Batteries During Calendar Aging: The Internal Resistance Increase	Harmonic Mitigation in Interphase Power Controllers Using Passive Filter-Based Phase Shifting Transformer	Frequency Support Properties of the Synchronous Power Control for Grid-Connected Converters	A Battery Cell Balancing Scheme with Minimum Charge Transfer	A Single-Phase Tri-State Integrated Buck-Boost Inverter Suitable to Operate in Grid-Connected and Island Modes	New MMC Capacitor Voltage Balancing Using Sorting-less Strategy in Nearest Level Control	Accurate ZVS Boundary in High-Switching Frequency LLC Converter	An Online Measurement Method for Common-Mode Impedance in Grid-Connected Converters	A Comprehensive Study on Variations of Discrete IGBT Characteristics Due to Package Degradation Triggered by Thermal Stress	Experimental Validation in Operating Conditions of Winding Thermal Model for Short-Time Transient	Analytical Model Based Design Optimization of a Transverse Flux Machine	Post-Fault Operation Strategy for Single Switch Open Circuit Faults in Electric Drives	A Novel 3D Structure for Synchronous Buck Converter Based on Nitride Gallium Transistors	Additive Manufacturing of Toroid Inductor for Power Electronics Applications	Influence Of Double-Line Frequency Power Oscillation in Photovoltaic Generator Efficiency And H-Bridge VSI Performance	

AM Break

100/200 Foyers

10:10AM – 10:30AM

Detailed Schedule (continued)

Thursday, September 22nd (continued)

Oral Sessions • 10:30AM – 12:10PM

	203AB	203C	203DE	102D	202A	202E	202B	102C	202D	101B	102E	101A	102B	101CD	102A	202C	103C
	S113: Electric Machines for Wind Power Systems	S114: Converter Topologies for Energy Storage Systems	S115: AC Microgrids II: Sharing and Coordination	S116: Batteries and Battery Manage- ment for Transporta- tion Electrifi- cation II	S117: Multi-Phase Inverter	S118: AC-AC Converters I	S119: Modular Multilevel Converters (MMC) II	S120: DC-DC Isolated: Resonant	S121: Modeling and Control of Grid Connected Converter II	S122: Power Quality II	S123: Stability in Power Converters I	S124: Non- Conventional Machine Configura- tions I	S125: Noise and Vibration Issues in Electric Machines	S126: Electrical Drives for Aerospace and Traction Applications	S127: Magnetics II	S128: Device Short Circuit Capability	S129: Advanced Electrical Machines II
10:30AM – 10:55AM	Comparison Analysis of PM Transverse Flux Outer Rotor Machines with and without Magnetic Shunts	Design Considerations of an Isolated GaM Bidirectional DC-DC Converter	Harmonic power sharing with Voltage Distortion Compensation of Drop Controlled Islanded Microgrids	Accurate Battery Parameter Estimation with Improved Continuous Time System Identification Methods	Improved L-Z Source Inverter	A Novel Highly Reliable Three Phase Buck-Boost AC-AC Converter	A Series HVDC Power Tapping Using Modular Multilevel Converters	Step-Down Impedance Control Network Resonant DC-DC Converter Utilizing an Enhanced Phase-Shift Control for Wide-Input-Range Operation	Combined DC Voltage Control Scheme for a Three-Port Energy Router Based on Instantaneous Energy Balance	Realization of Quadrature Signal Generator Using Accurate Magnitude Integrator	On Impedance Modeling of Single-Phase Voltage Source Converters	A Novel Stator- Consequent-Pole Memory Machine	Stator Vibration and Acoustic Noise Analysis of FSPM for a Low-Noise Design	Asymmetrical Twelve-Phase/ Induction Starter/ Generator for More Electric Engine in Aircraft	High Power Density Impedance Control Network DC-DC Converter Utilizing an Integrated Magnetic Structure	Robustness in Short-Circuit Mode: Benchmarking of 600V GaN HEMTs with Power Si and SiC MOSFETs	
10:55AM – 11:20AM	A Generator- Converter Design for Direct Drive Wind Turbines	Flexibattery - Merging Multilevel Power Conversion and Energy Storage	Novel Active Synchronization Strategy for Multi- Bus Microgrid with Distributed Cooperation Control	A Real World Technology Testbed for Electric Vehicle Smart Charging Systems and PEV-EVSE Interoperability Evaluation	High-Frequency Six-Phase DC Link Based Bidirectional Three-Phase Inverter without Intermediate Decoupling Capacitor	Hybrid Bidirectional AC/ AC Multilevel Converter	A Zero-sequence Voltage Injection Control Scheme for Modular Multilevel Converter Under Submodule Failure	Soft-Switching Push-Pull Converter with Parallel Resonant Link and Buck- Boost Capability	Grid-Voltage Sensorless Control of a Converter Under Unbalanced Conditions: On the Design of a State Observer	A New Instantaneous Point on Wave Voltage Sag Detection Algorithm and Validation	Design Consideration of Volt-VAR Control in Distribution Systems with Multiple PV Inverters	A Novel Variable Flux Memory Machine with Series Hybrid Magnets	Current Waveform for Noise Reduction of Switched Reluctance Motor in Magnetically Saturated Condition	Axial Position Estimation of Conical Shaped Motor for Green Taxiing Application	Time-Domain Homogenization of Litz-Wire Bundles in FE Calculations	Investigation on the Short-Circuit Safe Operation Area of SiC MOSFET Power Modules	
11:20AM – 11:45AM	Gearbox Fault Diagnosis Using Vibration and Current Information Fusion	A Novel Modular Dual Active Bridge (DAB) DC-DC Converter with DC Fault Ride-Through Capability for Battery Energy Storage Systems	An Inverter- Current-Feedback based Reactive Power Sharing Method for Parallel Inverters in Microgrid	Modeling of Low-Temperature Operation of a Hybrid Energy Storage System with a Butler- Vulmer Equation Based Battery Model	Closed-Form Equations for Analytical Exploration and Comparison of Switching Power Losses in Flying Capacitor Active Neutral- Point-Clamped Multilevel Converters	A Reliable Cascaded AC-AC Converter	An Interconnected Observer for Modular Multilevel Converter	Bidirectional Series-Resonant DC-DC Converter with Fault-Tolerance Capability for Smart Transformer	Current-Mode Boundary Controller with Reduced Number of Current Sensors for a Three-Phase Inverter	Voltage Quality Enhancement with Minimum Power Injection	Extended Stable Boundary of LCL-Filtered Grid-Connected Inverter Based on Grid-Voltage Feedforward Control	On the Feasibility of Carbon Nanotube Windings for Electrical Machines - Case Study for a Coreless Axial Flux Motor	Torque Ripple Reduction Techniques for Stator DC Winding Excited Variable Reluctance Machines	Closed-form Approach for Predicting Overvoltage Transients in Cable-fed PWM Motor Drives for MEA	High Frequency Core Coefficient for Transformer Size Selection	Short-Circuit Protection of 1200V SiC MOSFET Type Module in PV Inverter Application	
11:45AM – 12:10PM	Bearing Fault Diagnosis of Direct-Drive Wind Turbines Using Multiscale Filter- ing Spectrum	A High Current Bidirectional DC-DC Converter for Concept Demonstration of Grid-Scale SMES Systems	Distributed Volt- age Control and Load Sharing for Inverter-Interfaced Microgrid with Resistive Lines	Voltage and Current Signals De-noising with Wavelet Transform Matrix for Improved SOC Estimation of Lithium-ion Battery	Advanced Three Level Active Neutral Point Converter with Fault Tolerant Capabilities	Parallel AC-AC Three-Phase with Shared-Leg Converters	DC Bus Balancing Control Techniques for the Cascaded Neutral Point Clamped Modular Converter	Analysis and Design of Planar Inductor and Transformer for Resonant Converter	Positive- and Neg- ative-Sequence Current Controller for Grid-Tied Converters With LCL Filters	A Universal Variable On-time Compensation to Improve THD of High-Frequency CRM Boost PFC Converter	Allowable Bus Impedance Region for MVDC Distri- bution Systems and Stabilizing Controller Design Using Positive Feed-Forward Control	A Novel Simpli- fied Structure for Single-Drive Bearingless Motor	On the Cross Coupling Effects in Structural Response of Switched Reluctance Motor Drives	An Open Problem for More Electrical Aircraft (MEA): How Insulation Systems of Be- actuators Can Be Qualified?	Very High Fre- quency Integrated Voltage Regulator for Small Portable Devices	Prediction of Short-Circuit-Re- lated Thermal Stress in Aged IGBT Modules	

Awards Luncheon.

12:10PM – 2:00PM

Ballroom ABCD

Thursday, September 22nd (continued)

Oral Sessions • 2:00PM – 3:40PM

	203AB	203C	203DE	102D	202A	202E	202B	102C	202D	102E	202C	101B	101A	102B	101CD	102A
	S129: DFG Based Wind Power Systems	S130: Utility Scale Battery Systems	S131: AC Microgrids III: Operation, Control and Energy Management	S132: Battery Charging for Transportation Electrification	S133: Three-Phase Inverter PWM	S134: AC-AC Converters II	S135: Multilevel Converters (MMC) III	S136: DC-DC, Isolated Converters	S137: Modeling and Control of DC-AC Converters II	S138: Stability in Power Converters II	S139: Design Optimization of Power Converters	S140: Active Power Filters	S141: Non- Conventional Machine Configurations II	S142: Magnetic Gears	S143: High Speed and Direct Drives	S144: Power Assemblies
2:00PM – 2:25PM	Flexible PCC Voltage Unbalance Compensation Strategy for Autonomous Operation of Parallel DFIGs	Controller for Combined Peak-Load Shaving and Capacity Firming Utilizing Multiple Energy Storage Units in a Microgrid	Robust Decentralized Voltage and Frequency Control of Generators in Islanded Microgrids Using SS-Synthesis	A Primary Full- Integrated Active Filter Auxiliary Power Module in Electric Vehicle Applications with Single-Phase Onboard Chargers	SIC MOSFET Zero- Voltage-Switching SVM Controlled Three-Phase Grid Inverter	A Comparison of Indirect Matrix Converter Based Open-End Winding Drives Against States-of-the-Art	Design and Implementation of Finite State Machine Decoders for Phase Disposition Pulse Width Modulation of Modular Multilevel Converters	An Isolated Three-Port DC-DC Converter with High Power Density in 10 cm X 5 cm X 0.8 cm Card Size for Flexible Automotive Systems	A Triangle Phase-Shift Control Strategy for Interleaved Critical- Mode Power Converters	Source-side Series- virtual-Impedance Control Strategy to Stabilize the Cascaded System with Improved Performance	Efficiency-wise Optimal Design Methodology of LLC Converter for Wide Input Voltage Range Applications	Multilevel Nine- Leg Converter Universal Active Power Filter	Design of Dual Purpose No Voltage Combined Windings for Bearingsless Motors	A Novel Reluctance Magnetic Gear for High Speed Motor	Robust Control of an Open-Ended Induction Motor Drive With a Floating Capacitor Bridge over a Wide Speed Range	Implementation and Performance of a Current Sensor for Laminated Bus Bar
2:25PM – 2:50PM	Analysis and Comparison of Super- Synchronous Resonance in Small and Large Scale DFIG System	Energy Storage Configuration Strategy for Virtual Synchronous Machine	Thyristor Based Short Circuit Current Injection in Isolated Grids	Sensitivity Analysis of a Wireless Power Transfer (WPT) System for Electric Vehicle Application	A Novel Soft-switching Modulation Scheme for Isolated DC-to- three-phase-AC Matrix-based Converter Using SIC Device	Common Mode Voltage Reduction in Open-End Multi- phase Load System fed Through Matrix Converter	Control of the AC-AC Modular Multilevel Converter under Submodule Failure	Auxiliary Power Supply Based On a Modular ISOP Flyback Configuration With Very High Input Voltage	Seamless Transition Control between Motoring and Generating Modes of a Bidirectional Multi-Port Power Converter Used in Automotive SRM Drive	Bifurcation Analysis of Photovoltaic- Battery Hybrid Power System with Constant Power Load	Reliability-Oriented Design of LC Filter in Buck DC-DC Converter with Multi-Objective Optimization	Central Control and Distributed Protection of the DSCC and DSCC Modular Multilevel Converters	Synchronous Generator Field Excitation Via Capacitive Coupling Through a Journal Bearing	Analysis of a Magnetically Geared Lead Screw	High Speed Operation of Permanent Magnet Machine Position Sensorless Drive Using Discretized EMF Estimator	Busbar Design for SIC-Based H-Bridge PEBB using 1.7 kV 400 A SIC MOSFETs Operating at 100 kHz
2:50PM – 3:15PM	A Super- synchronous Doubly Fed Induction Generator Option for Wind Turbine Applications	Control of Energy Storage System Integrating Electrochemical Batteries and SC for Grid-connected Applications	Optimized Energy Management System to Reduce Fuel Consumption in Remote Military Microgrids	Design of a Dual- Loop Controller for In-motion Wireless Charging of an Electric Bus	New PWM Technique for Grid-Tie Isolated Bidirectional DC- AC Inverter Based High Frequency Transformer	Experimental Comparison of Devices Thermal Cycling in Direct Matrix Converters (DMC) and Indirect Matrix Converters (IMC) using SIC MOSFETs	Control of a Modular Multilevel Converter with Pulsed DC Load	Design Considerations for Series Resonant Converters with Constant Current Input	Three-Phase Inverter Modeling using Multifrequency Averaging with Third Harmonic Injection	Measurement Technique to Determine the Impedance of Automotive Energy Nets for Stability Analysis Purpose Based on a Floating Capacitor H-Bridge Converter	Optimal Design of Output LC Filter and Cooling for Three-Phase Voltage-Source Inverters Using Teaching-Learning- Based Optimization	Mitigating the Effect of Series Capacitance Unbalance on the Voltage Reduction Capability of an Auxiliary CSI used as Switching Ripple Active Filter	Development of Star-Magnetless Linear Synchronous Motor for Sensorless Control	Design Comparison of Ndrab and Ferre Radial Flux Magnetic Gears	DC Voltage Regulated PWM Inverter for High- Speed Electrical Drives	Ultra-low Inductance Design for a GAN HEMT Based 3L-ANPC Inverter
3:15PM – 3:40PM	Fault Diagnosis of Wind Turbine Gearbox Using DFG Stator Current Analysis	A Novel Approach towards Energy Storage System Sizing Considering Battery Degradation	Analysis and Improvement of the Energy Management of an Isolated Microgrid in Islands Island based on a Linear Optimization Approach	Design of CRM AC/DC Converters for Very High Frequency Wide-Band 6.6kW Bidirectional On-Board Battery Charger	Reduction of Input Current Harmonics Based on Space Vector Modulation in Three-phase VSI with Varied Power Factor	A Carrier-based Modulation Strategy for Multi-Modular Matrix Converters with Zero Common- mode Voltage	Short Circuit Output Prediction of MMC in Voltage Source Control Mode	Globally Isolated Switched- Back-EMF Based DC-DC Converter	Transformation Based Tracking Controller for a GAN Microinverter	Harmonic Suppression and Stability Improvement for Aggregated Current-Controlled Inverters	Using Design by Optimization for Reducing the Weight of a SIC Switching Cell	A New Control Method of Suppressing DC-Capacitor Voltage Ripples Caused by Third- Order Harmonic Compensation in Three-Phase Active Power Filters	Ultralightweight Motor Design Using Electromagnetic Resonance Coupling	Power Transferring of Magnetic- Geared Permanent Magnet Machines	Variable Time Step Control with Synchronous PWM in Low Frequency Modulation Index for AC Machine Drive	Layout Study of Contactless Magnetic Sensor Current Sensor for High Frequency Converters

Event Services

Registration

Saturday through Thursday

Main Lobby Foyer – 1st Floor, Wisconsin Center

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

Saturday, September 17th	5:00PM – 7:00PM
Sunday, September 18th	7:00AM – 7:00PM
Monday, September 19th	7:00AM – 7:00PM
Tuesday, September 20th	7:30AM – 5:30PM
Wednesday, September 21st	7:30AM – 5:30PM
Thursday, September 22nd	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 social function tickets for receptions can be purchased at the Registration Desk.

Tutorials will take place on Sunday, September 18th, 2016. 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 2016.

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 20th. Attendees may have access to the Expo hall complimentary on September 20th after 2:30PM. You may purchase an Expo Only Registration for \$25 at the Registration Desk located in the Main Lobby 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

Monday through Thursday

Room: 103B

Creative Digressions is what we call a space reserved for those conference attendees who need to go someplace to think, to discuss, and to organize their minds around the hubbub of activities around them. ECCE 2016 is packed with activities that fully engage the 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 continue.

IAS/PELS Community Lounge

Monday through Thursday

Room: 103D

The IAS/PELS Community Lounge is an additional space for conference attendees to use as an area for team building and socializing. Unlike the Creative Digressions room, groups can book this room for exclusive use on a first-come, first-served basis. Please visit registration to reserve.

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.

Distributing Commercial Material at ECCE

RULES FOR NON-EXHIBITORS

Distribution of commercial material in the ECCE 2016 hotel space (including directly to the hotel rooms of ECCE participants), meeting space and Exhibit Hall by people or organizations not participating in the Exposition is prohibited.

ECCE reserves the right to remove without notice any materials not in compliance with this policy.

RULES FOR EXHIBITORS

Exhibitors may only distribute commercial materials in their booth, at Exhibitor Product Demos they are conducting and at press conferences they are holding. ECCE reserves the right to remove without notice any materials not in compliance with this policy.

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.

Hotels

The ECCE 2016 headquarter hotel is the Hilton Milwaukee City Center.

Hilton Milwaukee City Center

509 W Wisconsin Avenue
Milwaukee, WI 53203
414-271-7250

Internet Access

Guest Room Internet is complimentary in IEEE Guestrooms at the Hilton Milwaukee City Center.

There is complimentary Wi-Fi in the foyer space throughout the Wisconsin Center.

Local Transportation

Taxis are available in Milwaukee and staff at the information desk can assist you in calling a taxi. Popular ridesharing transportation companies Uber and Lyft are available in Milwaukee and these services offer affordable, discounted rates. For more information on these services, please download their mobile apps.

The Wisconsin Center's parking lot is open to the public. The lot is located at 500 W. Wells Street and costs \$15 to park. A great source for locating additional parking in the area is <http://www.parkmilwaukee.com/>.

General Information

Lost & Found

Any lost & found items should be turned into the Public Safety Office at the Wisconsin Center. The Public Safety Office is located on the north side of the building at 750 N 6th Street.

Visitor Information Desk

VISIT Milwaukee staff members will be available at their information desk in the Wisconsin Center on Monday through Friday, 8:00AM – 5:00PM. The desk is located at the front entrance of the Wisconsin Center, which is at 4th Street and Wisconsin Avenue. Stop by for visitor guides, maps, coupon books and other brochures!

Parking

The Wisconsin Center's parking lot is open to the public. The lot is located at 500 W. Wells Street and costs \$15 to park. A great source for locating additional parking in the area is <http://www.parkmilwaukee.com/>.

Meals & Refreshments

MORNING REFRESHMENTS

Monday, Wednesday and Thursday – Room: 100/200 Foyers

Tuesday – Exhibit Hall A

Monday, September 19th	10:30AM – 10:50AM
Tuesday, September 20th	11:10AM – 11:30AM
Wednesday, September 21st	10:10AM – 10:30AM
Thursday, September 22nd	10:10AM – 10:30AM

LUNCH

Tuesday – Exhibit Hall A

Tuesday, September 20th	1:00PM – 2:30PM
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ECCE BANQUET – OKTOBERFEST

Wednesday – Wisconsin Center Ballroom ABCD

Wednesday, September 21st	7:00PM – 9:30PM
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AWARDS LUNCHEON

Thursday – Wisconsin Center Ballroom ABCD

Thursday, September 22nd	12:10PM – 2:00PM
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AFTERNOON REFRESHMENTS

Tuesday – Exhibit Hall A

Wednesday – 100/200 Foyers

Tuesday, September 20th	4:30PM – 5:00PM
Wednesday, September 21st	3:10PM – 3:30PM

Spouses and Guest

Spouses and other guests of the conference are welcome to meet in the Creative Digressions in Room 103B on Monday and Tuesday from 9:00AM – 10:00AM for coffee and light refreshments. Information on things to do in Milwaukee will be provided.

CHICAGO'S NORTHERN NEIGHBOR ON LAKE MICHIGAN, HOME OF BREWPUBS, SUMMER FESTIVALS, ATTRACTIONS AND COLORFUL NEIGHBORHOODS LINKED BY RIVERWALK.

Milwaukee is the only city in the world where the city icon along the spectacular, Lake Michigan shoreline – the **MILWAUKEE ART MUSEUM** – literally opens its “wings” to welcome all. Next door, maritime heritage meets 21st century cool at **DISCOVERY WORLD** with its high-tech displays and fresh and saltwater aquariums, also summer berth to Wisconsin’s official tall ship, the **S/V DENIS SULLIVAN**.

Stroll down the picturesque **RIVERWALK** – past the “**BRONZE FONZ**” statue of Henry Winkler’s beloved “Happy Days” character – to the **HISTORIC THIRD WARD**. This six-square-block, converted warehouse district contains the city’s highest concentration of art galleries, as well as theaters, specialty stores, restaurants and nightlife, and is anchored by foodie paradise **MILWAUKEE PUBLIC MARKET**, ranked among the top markets by Frommers.

Unleash your inner rebel at the world’s only **HARLEY-DAVIDSON MUSEUM** where a priceless display of 450 bikes celebrates the rich history of Harley, the passion of the riders and Harley’s contribution to pop culture over the years. And it’s game on at **POTAWATOMI HOTEL & CASINO** for the excitement of more than 3,100 slot machines, 100 table games, an expanded, off-track betting room and numerous culinary options. In 2014, the casino expanded to include a 381room connected hotel.

Family fun is guaranteed at the nationally ranked **MILWAUKEE COUNTY ZOO**, **MILWAUKEE PUBLIC MUSEUM** and **MILLER PARK BASEBALL STADIUM**, while adults can enjoy the sample brews on brewery tours offered by MillerCoors and local microbreweries like **SPRECHER BREWING**, **LAKEFRONT BREWERY** (rated in the top 4 per Trip Advisor) and **MILWAUKEE BREWING COMPANY**. **MILWAUKEE FOOD AND CITY TOURS** treats you to culinary tours of the ethnic neighborhoods and excursion boats and kayaks beckon on the Milwaukee River and Lake Michigan.

WELCOME TO *Milwaukee!*



Committee Meetings

IAS Committee Meetings

IAS-IPCS D - Editorial Meeting

Sunday, September 18th
3:00PM – 4:00PM
Room: 102A

IAS-IPCS D Department Meeting

Sunday, September 18th
7:00PM – 8:00PM
Room: 102A

IAS Industrial Power Converter Committee (IPCC) Meeting

Monday, September 19th
6:30PM – 7:30PM
Room: 102A

IAS Renewable and Sustainable Energy Conversion Systems (RESC) Meeting

Tuesday, September 20th
2:00PM – 3:00PM
Room: 102A

IAS Transportation Systems Committee (TSC) Meeting

Tuesday, September 20th
3:00PM – 4:00PM
Room: 102B

IAS Power Electronics Devices and Components Committee (PEDCC) Meeting

Tuesday, September 20th
5:00PM – 6:00PM
Room: 102A



IAS Electrical Machines Committee (EMC) Meeting

Tuesday, September 20th
5:00PM – 6:00PM
Room: 102B

IAS Industrial Drives Committee (IDC) Meeting

Tuesday, September 20th
6:00PM – 7:00PM
Room: 102D

KIPE – IEEE/IAS Meeting

Wednesday, September 21st
4:30PM – 6:00PM
Room: 103D

IEE-J/IAS-IEEE/IAS Meeting

Thursday, September 22nd
10:30AM – 12:00PM
Room: 103B

ECCE Committee Meetings

Committee Appreciation Dinner

Monday, September 19th
7:30PM – 10:00PM
Harley-Davidson MOTOR Bar & Restaurant

2016 Steering Committee Meeting

Tuesday, September 20th
10:30AM – 12:00PM
Gilpatrick / Hyatt Hotel

2016, 2017 & 2018 Organizing Committee Meetings

Wednesday, September 21st
8:00AM – 10:00AM
IAS/PELS Community Lounge (Room 103E), Wisconsin Center

2016 Organizing Committee Debrief Meeting

Thursday, September 22nd
4:00PM – 5:00PM
IAS/PELS Community Lounge (Room 103E), Wisconsin Center



PELS and PELS/IAS Joint Committee Meetings

Please note, the majority of meetings for PELS will take place at the Hyatt. The Hyatt is located at 333 W Kilbourn Avenue and is 5 minutes walking distance from the Wisconsin Center.



CEU Credit Course – Modeling and Simulation for Power Electronics

Saturday, September 17th

8:00AM – 5:00PM

Room: Crystal | Hyatt Hotel

Pre Strategy Meeting Exec Team

Sunday, September 18th

9:30AM – 12:00PM

Room: Vue North | Hyatt Hotel

PELS AdCom Strategy Meeting

Sunday, September 18th

12:00PM – 5:00PM

Room: Vue North | Hyatt Hotel

Asian Power Electronics Coordination Committee Meeting (APECC)

Sunday, September 18th

6:30PM – 8:00PM

Room: Vue North | Hyatt Hotel

PELS Digital Media Meeting

Monday, September 19th

10:30AM – 11:30AM

Room: Gilpatrick | Hyatt Hotel

FEPPCON Organizing Committee Discussion

Monday, September 19th

10:15AM – 11:30 AM

Room: Lakeshore A | Hyatt Hotel

PELS Technical Committee and Standing Committee Chairs

Monday, September 19th

12:00 PM – 2:00 PM

Room: Lakeshore A | Hyatt Hotel

Editorial and Industry Advisory Board Meeting

Monday, September 19th

12:00 PM – 2:00 PM

Capital Grille Restaurant

ECCE Asia Coordination Committee Meeting

Monday, September 19th

12:00PM – 2:00PM

Room: Gilpatrick | Hyatt Hotel

International Technology Road Map on Wide Band Gap Semi Conductors ITRW Workshops

Monday, September 19th

2:00PM – 5:00PM

Room: Lakeshore B | Hyatt Hotel

PELS Bylaws and Constitution Meeting

Monday, September 19th

2:00PM – 3:30PM

Room: Gilpatrick | Hyatt Hotel

PELS Membership Committee Meeting

Monday, September 19th

2:00PM – 5:00PM

Room: Lakeshore A | Hyatt Hotel

PELS Chapter Chairs Meeting/Forum

Monday, September 19th

5:00PM – 6:30PM

Room: Lakeshore A | Hyatt Hotel

PELS Chapter Chairs Meeting and Dinner

Monday, September 19th

6:30PM – 8:30PM

Room: Lakeshore A | Hyatt Hotel

PELS Southern Conference Steering Committee (COBEP/SPEC)

Tuesday, September 20th

8:00AM – 9:00AM

Room: Lakeshore A | Hyatt Hotel

PELS/IAS Joint Motor Drives and Actuators Meeting (PELS TC3)

Tuesday, September 20th

9:00AM – 10:00AM

Room: Lakeshore A | Hyatt Hotel

Transportation Electrification Community Meeting

Tuesday, September 20th

9:00AM – 10:00AM

Room: Gilpatrick | Hyatt Hotel

PELS TC1 - Power and Control Core Technologies

Tuesday, September 20th

10:00AM – 12:00PM

Room: Lakeshore BC | Hyatt Hotel

International Future Energy Challenge 2016 (IFEC) Information Session

Tuesday, September 20th

10:00AM – 12:00PM

Room: Lakeshore A | Hyatt Hotel

PELS Awards Meeting

Tuesday, September 20th

10:30AM – 11:30AM

Room: Executive AB

PELS Fellows Committee (Members Only)

Tuesday, September 20th

12:00PM – 1:00PM

Room: Lakeshore A | Hyatt Hotel

PELS TC6 – High Performance and Emerging Technologies

Tuesday, September 20th

12:00PM – 2:00PM

Room: Lakeshore BC | Hyatt Hotel

IEMDC Steering Committee

Tuesday, September 20th

1:00PM – 2:00PM

Room: Gilpatrick | Hyatt Hotel

PELS TC2 - Power Conversion Systems and Components

Tuesday, September 20th

2:00PM – 3:30PM

Room: Gilpatrick | Hyatt Hotel

PELS/IAS Joint Vehicle and Transportation Systems Meeting (PELS TC4)

Tuesday, September 20th

3:00PM – 4:00PM

Room: Lakeshore B | Hyatt Hotel

PEDG Steering Committee Meeting

Tuesday, September 20th

3:00PM – 5:00PM

Room: Lakeshore A | Hyatt Hotel

Sister Society Cooperative Planning

Tuesday, September 20th

5:00PM – 6:00PM

Room: Gilpatrick | Hyatt Hotel

PELS TC5 – Sustainable Energy Technical Committee

Tuesday, September 20th

6:30PM – 7:30PM

Room: Gilpatrick | Hyatt Hotel

Women in Engineering Breakfast

Wednesday, September 21st

8:00AM – 9:00AM

Room: Lakeshore BC | Hyatt Hotel

PELS and PELS/IAS Joint Committee Meetings (continued)

PELS Products (Transactions) Committee Meeting

Wednesday, September 21st
9:00AM – 10:30AM

Room: Lakeshore BC / Hyatt Hotel

PELS JESTPE Paper Awards and Editorial Board Meeting

Wednesday, September 21st
10:30AM – 12:30PM

Room: Gilpatrick / Hyatt Hotel

IEEE Transactions on Power Electronics Paper Awards and Editorial Board Meeting

Wednesday, September 21st
11:30AM – 1:30PM

Room: Lakeshore Ballroom / Hyatt Hotel

PELS Nominations Committee (Members Only)

Wednesday, September 21st
12:30PM – 2:30PM

Room: Gilpatrick / Hyatt Hotel

ECCE Global Partnership Coordinating Meeting

Wednesday, September 21st
1:00PM – 2:30PM

Room: Milwaukee / Hyatt Hotel

PELS Technical Operations Committee Meeting

Wednesday, September 21st
1:30PM – 3:30PM

Room: Lakeshore BC / Hyatt Hotel

PELS Conferences Committee Meeting

Wednesday, September 21st
3:30PM – 5:30PM

Room: Gilpatrick / Hyatt Hotel

PELS Standards Committee Meeting

Wednesday, September 21st
2:00PM – 6:30PM

Room: Lakeshore BC / Hyatt Hotel

PELS Administrative Committee Meeting

Thursday, September 22nd
2:00PM – 6:00PM

Room: Lakeshore Ballroom / Hyatt Hotel

PELS Administrative Committee Dinner

Thursday, September 22nd
6:30PM – 9:30PM

Harbor House Restaurant



Special Events



The University of New South Wales
Australian Energy Research Institute
Australia



National Cheng Kung University
Dept of Electrical Engineering
Taiwan



City University of Hong Kong
Dept. of Electronic Eng., Tat Chee Ave.
Hong Kong



Dr. Yoon Gwang

Nanjing University of Aeronautics
& Astronautics
College of Automation Engineering
China



Delta Products Corporation
Fremont, California, USA



SPECIAL EVENTS

IAS Fellows



Dr. Mohammad Islam
Halla Mechatronics
Bay City, Michigan, USA

Honored for development of electromagnetic sensors and actuators for automotive applications



Annette Muetze
Graz University of Technology
Graz, Austria

Honored for contributions to the analysis and mitigation of bearing currents in variable-speed drives



Blake Lloyd
Qualitrol- Iris Power
Mississauga, ON, Canada

Honored for development of non-intrusive diagnostics for electrical motors and generators



ECCE on Social Media



twitter.com/ieee_ecce



www.facebook.com/ieee.ecce



www.linkedin.com/groups/1876618

Opening Reception

Sunday, September 18th, 5:30PM – 7:30PM

Location: Milwaukee Art Museum

Join us at the beautiful Milwaukee Art Museum to kick off ECCE 2016! Take this time to mingle and network before the exciting week ahead. Light appetizers and beverages will be provided.

Bus and Parking information: The museum is within walking distance of the Wisconsin Center. For those planning to walk, volunteers will be stationed along the route to direct you. Transportation will also be provided to and from the reception. Buses will be stationed outside of the Wisconsin Center beginning at 5PM and will rotate on a continuous loop until 8:00PM. Parking is available at the museum for \$8.00.

Expo Reception

Monday, September 19th, 4:00PM – 8:00PM

Exhibit Hall A

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.

Technical Tours – Harley-Davidson Powertrain Operations-Pilgrim Road Tour

Monday, September 19th, 12:15PM – 2:30PM

Location: Menomonee Falls, WI

Visit Harley Davidson's home of the "Big Twin", located at its 849,000 square foot Pilgrim Road Powertrain Operations facility. The factory tour offers a view of the production process and designated machining areas. Come see Harley in action as they assemble their H-D engines and transmissions!

SOLD OUT

Optional Walking Tour

Wednesday, September 21st, 5:00PM – 6:00PM

Location: Wisconsin Center

Complimentary walking tours of Milwaukee will be available on Wednesday, September 21st from 5:00PM to 6:00PM. Historic Milwaukee will be leading tours so be sure to check out all that the downtown Milwaukee has to offer! The tours will be available on a first-come, first-serve basis. If you are interested in a tour, please meet at the front of the Wisconsin Center at 400 W. Wisconsin Ave for a 5:00PM departure.

Special Events (continued)

IAS & PELS Young Professionals Reception

Tuesday, September 20th, 6:30PM – 9:30PM

Safehouse, 779 North Front Street, Milwaukee

How about an opportunity to mingle, interact, learn from the best minds of IEEE and have some fun.

IEEE Industry Application Society – IAS and Power Electronics Society – PELS, give you this opportunity to learn from the life journey of the biggest leaders at ECCE along with an evening well spent talking to people from across the globe.

An evening filled with meeting new people, fun games, learning about the best practices in industry and academia, and having loads of fun with drinks and snacks. This event is free and open to students and young professionals. So make sure you don't miss this wonderful chance to make new friends and meet new people. The event is also co-sponsored by IEEE Milwaukee Section IAS and PELS Chapters.

**Please register @ <https://goo.gl/forms/krf72p3vxfz0PYrB3> ,
to mark your presence for this amazing evening in Milwaukee.**

Oktoberfest

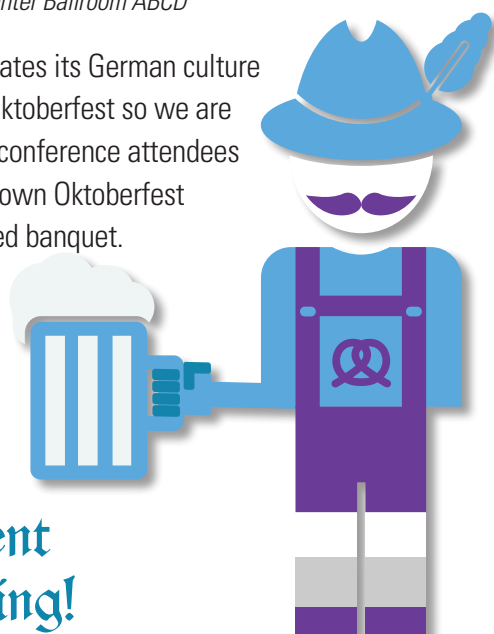
ECCE Banquet

**Wednesday, September 21st
7:00PM – 9:30PM**

Wisconsin Center Ballroom ABCD

Milwaukee celebrates its German culture annually with Oktoberfest so we are pleased to host conference attendees at our very own Oktoberfest themed banquet.

**Join us
for beer,
brats,
entertainment
and networking!**



Awards Luncheon

Thursday, September 22nd, 12:10PM – 2:00PM

Wisconsin Center Ballroom ABCD

The Awards Luncheon recognizes the 2016 IEEE Awardees accepting their award at ECCE 2016. 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.

ECCE Clubhouse

Open during Expo Hall hours

Exhibit Hall A

The ECCE Clubhouse is a place for exhibitors and attendees to recharge. Surrounded by the activity on the exhibit hall, the ECCE Clubhouse provides seating area for impromptu meetings, stimulating conversations and a chance to mingle with your new contacts. The Clubhouse has been set to provide both attendees and exhibitors an area to take a seat, grab a cup of coffee, re-charge their electronics and exchange ideas.

Women in Engineering Breakfast

Wednesday, September 21st, 8:00AM – 9:00AM

Lakeshore AB | Hyatt Hotel

Speaker: Prof. Mahshid Amirabadi

Visit WEMPEC Event on Friday, September 23

The Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC) is celebrating its 35th anniversary this year, and we invite all ECCE attendees – including first-time visitors as well as alumni and long-time friends – to come spend the day after ECCE ends with us at the University of Wisconsin - Madison for this special open house event. For those of you who have not visited us before, Madison is only 120 km away from the conference site in Milwaukee.

Activities planned for the day include a mixture of open lab sessions to meet our students, presentations by our two co-founders, Emeritus Profs. Don Novotny and Tom Lipo, and plenty of opportunities for socializing, including a buffet lunch. Optional afternoon/early evening activities include campus tours and a boat cruise on lovely Lake Monona.

The environment will be CASUAL with an emphasis on schedule flexibility so that you can spend your time doing the things that most interest you. For your convenience and to avoid parking problems, bus transportation (for a minimal fee) is offered from Milwaukee to Madison and return.

For complete details, including a schedule for the day's activities, please use the following link: <https://applications.wempec.wisc.edu/ecce/form/landing.html> Alternatively, you can find the Visit WEMPEC event as a menu item under the "Programs" tab at the top of the ECCE'16 home page.

Registration for our Visit WEMPEC event is required, and the online registration form is accessible from the link above.

If you decide to join us, we ask your cooperation by registering as soon as possible in order to assist us with our preparations. There is a modest US\$20 fee that is required of all participants to help us defray our costs for lunch and refreshments.

*If you have any questions about this event,
please contact our WEMPEC Administrative Director, Helene Demont, at demont@engr.wisc.edu.*

Bob Lorenz and **Tom Jahns**, *WEMPEC Co-Directors*

Giri Venkataramanan, **Bulent Sarlioglu**, and **Dan Ludois**, *WEMPEC Associate Directors*



Presenter Information

Oral Presenters

SPEAKER READY ROOM

Sunday through Thursday

Room: 103A

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 18th	8:30AM – 5:00PM
Monday, September 19th	8:30AM – 5:00PM
Tuesday, September 20th	8:30AM – 12:00PM
Wednesday, September 21st	8:30AM – 6:00PM
Thursday, September 22nd	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

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

Monday

Room: 203ABC

Tuesday through Thursday

Ballroom ABCD

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 A

Poster Session I	Monday, September 19th, 5:30PM – 7:00PM
Poster Session II	Tuesday, September 20th, 11:00AM – 12:30PM
Poster Session III	Tuesday, September 20th, 3:00PM – 4:30PM

Posters will be on display on Monday and Tuesday in Exhibit Hall A at the Wisconsin Center. The poster presenters should be available for questions at their display boards during their scheduled poster presentation time. If you are unsure in which session your poster should be presented, please review the complete Technical Session schedule.

Poster Presenters will have access to Exhibit Hall A at the Wisconsin Center 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 19th, 3:30PM – 4:30PM
Poster Session	Monday, September 19th, 5:30PM – 7:00PM
Breakdown	Monday, September 19th, 7:00PM – 8:00PM

Presenters for Poster Session I must have their posters set-up no later than 4:30PM. Any posters that remain on the poster boards at 8:00PM, and do not belong in Poster Session II will be removed and kept at the Registration Desk.

POSTER SESSION II

Setup	Tuesday, September 20th, 9:00AM – 10:00AM
Poster Session	Tuesday, September 20th, 11:00AM – 12:30PM
Breakdown	Tuesday, September 20th, 12:30PM – 1:30PM

Presenters for Poster Session II must have their posters set-up no later than 10:00AM. Any posters that remain on the poster boards at 1:30PM, and do not belong in Poster Session III will be removed and kept at the Registration Desk.

POSTER SESSION III

Setup	Tuesday, September 20th, 1:30PM – 2:30PM
Poster Session	Tuesday, September 20th, 3:00PM – 4:30PM
Breakdown	Tuesday, September 20th, 4:30PM – 5:30PM

Presenters for Poster Session I must have their posters set-up no later than 2:30PM. Any posters that remain on the poster boards at 5:30PM, 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 Wisconsin Center. The orientation will be located at the back of Exhibit Hall A behind the posters as follows:

Orientation	Monday – 3:00PM – 3:30PM
Orientation	Tuesday – 8:30AM – 9:00AM

Poster Presenters should attend the orientation each day that they are scheduled to provide a poster presentation; you may only attend on days on which you are scheduled to present. Coffee and refreshment will be provided.

Plenary Session

Monday, September 19th

8:30AM – 12:00PM

Wisconsin Center Ballroom ABCD

Plenary Chairs:

Kaushik Rajashekara and Iqbal Husain

The distinguished plenary speakers were invited this year to share their insights on the trends and the future of various aspects 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.



"INTELLIGENT MOTOR CONTROL IN A CONNECTED ENTERPRISE"

Mr. Blake Moret

President and CEO, Rockwell Automation

Blake Moret is the CEO of Rockwell Automation. He has 30 years of experience in sales, systems, services and product groups across

Rockwell Automation. This experience includes international assignments in Europe and Canada. In 2005, He returned to Rockwell Automation global headquarters in Milwaukee to serve as business lead for the company's operator interface business. Two years later, he was named vice president and general manager, Customer Support and Maintenance. He then became the senior vice president of the Control Products and Solutions (CP&S) business of Rockwell Automation which provides intelligent motor control products, automation solutions, and support services to companies around the world. CP&S consists of four business units – Industrial Components Business, Power Control Business, Systems and Solutions Business and Customer Support and Maintenance.



"OPTIONS TO CREATE A SUSTAINABLE ENERGY FUTURE"

Prof. Arun Majumdar

Stanford University and
former Founding Director of APAR-E

Prof. Majumdar's research focuses on thermochemical water splitting reactions to produce carbon-free hydrogen; ionocalorics –electrochemical reactions for thermal energy conversion; understanding the limits of heat and mass transport in nanostructured materials; and re-engineering the electricity grid. In October 2009, President Obama nominated Dr. Majumdar to be the founding director of the Advanced Research Projects Agency–Energy (ARPA-E), where he served until June 2012. Between March 2011 and June 2012, Arun was also the acting Under Secretary of Energy and a senior advisor to Secretary of Energy Steven Chu.



"FUTURE OF THE SMARTGRID"

Prof. Massoud Amin

University of Minnesota

M Massoud Amin is the Director of the Technological Leadership Institute (TLI), holds the Honeywell/H.W. Sweatt Chair, is a professor of Electrical & Computer Engineering (ECE), and a University Distinguished Teaching Professor Award Recipient at the University of Minnesota. He is Chairman of the IEEE Smart Grid, a Fellow of the IEEE and ASME, and a member of two utility industry regional entities that oversee reliability and security: the Texas Reliability Entity (as board chairman) and the Midwest Reliability Organization (as a board member).



"OPTIMIZED POWER MANAGEMENT USING DATA ANALYTICS"

Mr. Michael Regelski

Senior VP of Engineering and
Chief Technology Officer, Electrical Sector,
Eaton Corporation

Mr. Regelski is responsible for overseeing technology development, new product development processes, and codes and standards for all Electrical Sector engineering activities at Eaton Corporation. He also leads the Electrical Sector in developing technology-driven strategies and growth initiatives. Regelski holds three U.S. Patents for Smart Card Utilization in Security Applications; Distributed Multi-Server Enterprise; Architecture for Security Systems; and Automatic Download of information to Security Systems. He is also a published author specializing in distributed computing and data management.



"HVDC RESEARCH AND DEVELOPMENT IN CHINA"

Dr. Guangfu Tang

Vice President, Global Energy Interconnection
Research Institute, China

Guangfu Tang joined the CEPRI in 1998, where his focused on power electronics application in power system, including flexible AC transmission systems (FACTS), high voltage and ultrahigh voltage DC (HVDC/UHVDC) transmission systems, VSC HVDC transmission systems, and DC grids. He became the executive director of the State Grid Smart Grid Research Institute of China in 2012. He is now a vice president of Globe Energy Interconnection Research Institute, China. Dr. Tang served on CIGRE SC B4 committee. He is a member of CIGRESC B4 AG4 and IEC SC22F WG25 and MT22. He is also a member of the IEEE PES Narain Hingorani FACTS and Custom Power Award Committee.

Town Hall Meeting

Tuesday, September 20th

5:30PM – 7:30PM

What does the Industrial Internet of Things (IIoT) have to do with energy conversion? Why should we care?

Room: 102C

Emcee:

Thomas Jahns, Grainger Professor of Power Electronics and Electrical Machines

Organizer:

Peter Wung, Staff Engineer, GE Aviation

Panelists:

Steve Collier, Director Smart Grid Strategies, Milsoft Utility Solutions

Ronnie Pettersson, Global Director of Product Management, ABB

Joseph Salvo, Director at GE Global Research

Cliff Whitehead, Manager, Business Development at Rockwell Automation

Description:

- Why the Internet of Things (IoT)?
- What is the IIoT?
 - ▶ Sensors
 - ▶ Communications
 - ▶ Storage and computing
 - Analytics: Big Data, AI.
 - ▶ Cybersecurity
 - ▶ Resiliency
 - ▶ Standards
- Why are large industrial companies, vendors, and users investing in the IIoT? What is in it for them?
- How do you monetize IoT and communicate the value to your customers and your own organization?
- What are the obstacles from companies for NOT jumping in?

The term Internet of Things has become an ubiquitous and trendy term in the popular media. Consumer Electronics Show (CES) featured the IoT prominently in 2016 in the product offering and we have been inundated by a plethora of articles and press releases trying to describe the IoT. Much of the attention has focused on the consumer market and the remarkable products and gadgets flooding the market.

To a lesser degree, the idea of the Industrial Internet of Things (IIoT) has also been a hot topic, but specifically for the commercial and industrial segments. This is an as yet unexplored part of the story that we, as technologists, must become more familiar with.

This Town Hall meeting brings together four leading experts and visionaries, all actually working on industry based IIoT projects and products. We have paired them with a renowned academic expert in the electric machines and power electronics realm to represent the interest of the general audience, bringing a curious mindset and a lifelong learner's perspectives to the discussion.

This session is not just a recitation of statistics and facts, it is planned to be highly participatory. We invite questions and thought provoking inquiries about the amorphous idea of the IIoT and we foresee this exercise promoting discussions, arguments, rigorous exchange of information, opinions, and ideas. The panelists are all experts, they will be armed with information and data, but they will have worked in the area and bring practical knowledge and a practitioner's perspective and experience to the discussion.

Tuesday, September 20th

5:30PM – 7:30PM

Close to the Edge: The New Frontier of the Grid?

Room: 202C

Moderator:

Johan H Enslin, EPIC, UNC Charlotte

Panelists:

Igor Stamenkovic, EATON

Deepak Divan, Varentec / Georgia Tech

Ryan Kennedy, Atom Power

Chad Eckhardt, GridBridge

TBD, Duke Energy

Abstract:

An integrated grid is developing at the edge of the grid. Traditionally grid operators did not have any visibility or control over the final few meters of the grid close to the customer's premise. With Advanced Metering Infrastructure (AMI), robust communication infrastructure, affordable sensors, solid-state protection and smart converter technology, the grid edge provides the ideal location to integrate distributed renewable energy, demand response technologies, OT-IT implementations and energy storage for the customer-focused utility of the future. The selected panelists will discuss challenges and opportunities to integrate grid-edge modernization technologies and business cases into a legacy and aging grid.



Special Sessions

SIMULATION AND MODELING

SS1: Challenges of Simulating Power Electronic Systems

Tuesday, September 20th, 8:30AM – 11:00AM
Room 103C

The growth of electric vehicles and transportation, development and integration of renewable power, and broader adoption of motor control from industrial equipment to consumer products is driving the use of power electronics. Power electronics-based systems depend on optimized and energy-efficient embedded controls. An important step in developing these controls is system-level simulation.

In this panel discussion, thought leaders from academia and industry define the challenges of simulating power electronics, and experts in simulation technologies & approaches explain how they address these challenges. The session concludes with questions from the audience.

Moderator:

Jim Sember, Executive Director of WEMPEC

Thought Leaders:

Prof. Rob Cuzner, University of Wisconsin-Milwaukee, and Tim Obermann, Chief Engineer, Milwaukee Tool

Simulation Experts:

Christian Dufour (OPAL-RT), Kris Eberle (Plexim), Albert Dunford (Powersim), Kerry Grand (MathWorks), and Dr. Ivan Celanovic (Typhoon HIL)

CYBER SECURITY OF THE GRID I

SS2: Cybersecurity for Energy Delivery Systems

Wednesday, September 21st, 8:30AM – 10:00AM
Room 103C

The Cybersecurity for Energy Delivery Systems (CEDS) program emphasizes collaboration among the government, industry, universities, national laboratories, and end users to advance research and development in cybersecurity that is tailored to the unique performance requirements, design and operational environment of energy delivery systems. The aim of the program is to reduce the risk of energy disruptions due to cyber incidents as well as survive an intentional cyber assault with no loss of critical function. This presentation will describe the CEDS program, and in particular, the alignment of the CEDS program with the energy sector's Roadmap to Achieve Energy Delivery Systems Cybersecurity, www.controlsroadmap.net. The program will be delivered in two sections with section one beginning at 8:30 on Wednesday and section two taking place at 10:30 on Wednesday.

The first talk is an overview of a U.S. Department of Energy cybersecurity program known as CEDS – cybersecurity for energy delivery systems by program director Dr. Carol Hawk. This will be followed by presentations from Dr. Dmitry Ischenko of ABB on a project they are undertaking to harden some of their equipment, and one by Prof. Osama Mohammad on securing smart grids. Prof. Mohammad and the fourth speaker, Dr. Tim Yardley, represent two recently awarded research centers in cybersecurity, SEEDS and CREDC, respectively.



SS3: Cyber Security of the Grid II

Wednesday, September 21st, 10:30AM – 12:00PM
Room 103C

The second session will begin with two talks on cybersecurity for vehicular systems. The first of these will be given by Dr. Stacey Prowell from Oak Ridge National Laboratory. The second will be given by Dr. Ashok Moghe from Cisco Systems. The final talks return to electric energy delivery systems. The third talk in this session is by Dennis Gammel of Schweitzer Engineering on cyber defense methods for industrial control systems. The final talk is provided by Bruno Sinopoli from Carnegie Mellon University on hardening cyber-physical systems.

SiC DEVICES

SS4: Practical Implementation of SiC MOSFETs for Industrial Applications

Wednesday, September 21st, 1:30PM – 3:00PM
Room 103C

SiC devices are now beginning to fulfill their many years of promise and are finding their way into niche industrial applications. This session, hosted by Infineon, GE and ABB will cover several aspects of the practical use of SiC devices from chip concept, thorough module layout, design implementation and applications. There will be four 20 minute presentations and a 15 minute open panel Q&A session with a group of technical experts in the field.

Our goal is to make this session informative and practical, and address some of the very real challenges that system and design engineers face when making decisions concerning the use of SiC MOSFETs.

Presentations.

1) SiC Trench MOSFETs. Design philosophy, performance and future challenges.

Peter Friedrichs (Infineon Germany)

2) SiC MOSFETs and modules for high power industrial applications.

Ljubisa Stevanovic (GE USA)

3) Practical implementation of a buck boost converter using SiC MOSFETs.

Martin Knecht (Infineon Germany) and David Levett (Infineon USA)

4) SiC for MV Applications.

Uwe Badstuebner (ABB Switzerland Ltd.)

SS5: Water Energy Nexus

Wednesday, September 21st, 3:30PM – 5:00PM

Room 103C

The Water Energy Nexus refers to both the use of water in energy production and the use of energy to extract, purify, deliver, heat, cool, treat and dispose of water. A broad range of products, processes, research topics and societal impacts fall under this category, however the intersection between energy conversion, renewable energy and water is resulting in several emerging and relevant technologies associated with achieving net zero energy usage and increased energy efficiency, self-sufficiency and resilience. Relevant products and research areas include real-time condition monitoring; integrated flow sensor technology; use of energy storage and renewables to prevent basement water back-up; alternatives to reverse osmosis systems; efficient, net zero energy waste water treatment; green technology for storm water treatment; low energy sewage inspection; and combined heat and power. Milwaukee is fast becoming a center for research and development in the water-energy area through the leadership of University of Wisconsin-Milwaukee (UWM), Marquette University, Midwest Energy Research Consortium (MWERC), the Milwaukee Water Council, Milwaukee Metropolitan Sewerage District (MMSD) and a host of area companies including AO Smith, Eaton Corp., Rockwell, Bosch Rexroth, ABB, Rexnord Industries, Schneider Electric and others.

This special session will include presentations on new developments in water-energy and future trends.

Moderator:

Bruce Beihoff, Assistant Professor, University of Wisconsin-Milwaukee

Presenters:

Low Energy Consumption Waste Water Treatment Systems

Kevin Shafer, Executive Director of MMSD

Waste Water Treatment and Hydro-Power Technologies

Johan Enslin, Duke Energy Distinguished Chair in Power Engineering Systems at University of North Carolina

Ryoichi Amano, Professor of Mechanical Engineering at UWM specializing in fluid mechanics and heat transfer

Real-Time Water Sensors in Intelligent Water Distribution Systems

Junhong Chen, UWM Distinguished Professor specializing in energy conversion, storage and conservation, water sensors and pollution control

SS6: Advanced Electrical Machines I

Thursday, September 22nd, 8:30AM – 10:00AM

Room 103C

The advent and applications of the electrical machines in industry started in 19th century. Now, in 21st century, there are still strong investments and developments in designing and manufacturing electrical machines with high efficiency – as imposed by international standards – and high torque density – as imposed by modern applications as green aircrafts, electrical vehicles or renewables. Compared to the industry work horse, cheap, robust, reliable, i.e. the induction machines, the brushless permanent magnet machines (BPM) are currently representing the industrial electromagnetic/thermal/mechanical solution with the highest torque density. Superior in performance to any other electric motor topology: induction, reluctance, DC, wound-field synchronous, the large scale development of the BPM machines was possible when two rare-earth based permanent magnets were invented and the power electronics developments lead to cheap and highly efficient components.

While the theoretical aspects are largely analyzed and discussed in research papers coming from academia, the practical implementation and the encountered challenges in industrial environment is less debated and shared within the engineering community.

This two parts special session gathers experts from the industry to present various aspects and approaches in developing, prototyping and moving into mass production of the well established induction motors or the highest torque density solution: BPM machines.

The challenges in automotive, aviation, in building large BPM machines, the selection criteria of the permanent magnet materials, industrial production of induction and BPM machines and their presence in automotive industry to build EV/PHEV is illustrated in this special session.

The intended audience includes: engineers and researches from industry, student and academics, all with a focus on the analysis, development and production of brushless permanent magnet machines.

The session will involve two sessions. The first session will include the following presentations:

Automotive Motors: Recent Accomplishments and Challenges Ahead

Author: Bruno Lequesne, E-Motors Consulting, LLC, USA

More Electric Aircraft (MEA) Path Forward

Author: Hao Huang, Technology Chief, GE Aviation Electrical Power, USA

Induction Motors in the 21st Century

Author: Steven Englebretson, ABB R&D, USA

The Design and Application of Latest Generation Permanent Magnet Machines

Author: Steven Stretz, Regal Beloit, USA

SS7: Advanced Electrical Machines II

Thursday, September 22nd, 10:30AM – 12:00PM

Room 103C

The second portion of the session will include the following presentations:

Design, Manufacturing and Testing of Large Permanent Magnet Generators

Author: Haran Karmaker, TECO-Westinghouse, USA

Rare Earth Based Permanent Magnets for Electric Machines: Material Selection, Failure Risks and Design Considerations

Authors: Melania Jasinski, Heeju Choi and Jinfang Liu, Engineering at Electron Energy Corp., USA

Traction Motor Solutions for Automotive Applications

Authors: Mircea Popescu, James Goss, Dave Staton, Motor Design Ltd., UK

Sunday, September 18th

8:00AM – 12:00PM

AM Tutorials

T1-1 Mechanical, Solid State and Hybrid Circuit Breakers for Protection of DC and AC Grids

Room: 101B

Instructors: Alex Huang, North Carolina State University, NC, USA, Chang Peng, North Carolina State University, NC, USA, Iqbal Husain, North Carolina State University, NC, USA

Mechanical circuit breakers have been the main protective devices in the century old AC grid. Due to the existence of current zero crossing, these devices with proper arc managements have served the function well. However, the fault current clearance time is in the range of several to tens of line cycles. As a consequence of the slow clearance speed, the fault current level is typically very high, resulting in significant challenges in substation design and coordination since all equipment must be rated to handle the high fault current levels. With the increased integration of more and more renewable and distributed generations in the distribution system, the fault current pattern is changing and the fault current level can be even higher. Therefore, faster protection are needed.

Compared to the AC grid, DC grid provides many advantages. At low voltage levels, LVDC such as 380VDC microgrids find more and more applications in renewable energy integrations and commercial buildings because of higher efficiency due to significantly simplified power conversion stages. Various energy sources, loads and storages are easily interconnected; and the power quality and system stability are improved. At high voltage levels, HVDC system has been increasingly used due to its high transmission efficiency very long distance when compared with HVAC system. Medium voltage DC (MVDC) is also actively studied for distribution system implementation and shipboard power. However, one of the most challenging issues for DC grids is their protection and control. Due to the absence of current zero crossing, traditional mechanical circuit breaker cannot be used. Also the protection speed must be significantly improved otherwise the fault current will be too high.

This tutorial's objective is to provide an overview of the circuit breaker technology with an emphasis on the challenges and needs for ultra-fast circuit protection in AC and DC grids. The tutorial is organized in four parts: Part I provides a review of basic functions and technologies of AC circuit breakers in conventional AC systems, the challenges emerging from the protection and control of DC systems and advanced AC systems, as well as various circuit interruption technologies. Part II gives more details regarding the solid state circuit breakers. Part III focuses on the fast acting mechanical switch which is the key component to achieve low-loss high speed protection functions. In the end, Part IV identifies the challenges of high performance circuit breaker. Future research can be focused on high speed actuators, optimized solid state switches for circuit breakers, new topologies and system study for coordinated protection and control.

T1-2 Principles and Applications of Modular Multilevel Converters

Room: 101CD

Instructors: Dianguo Xu, Harbin Institute of Technology, Harbin, China, Lie Xu, University of Strathclyde, Glasgow, UK., Hong Rao, Electric Power Research Institute, China Southern Power Grid, Dengshan Zhang, Siemens Ltd., China

Modular Multilevel Converters (MMC), with distinctive features of modularity, scalability, easy assembly, high quality voltage waveform, outstanding control performance, easy redundancy and high efficiency, are becoming a competitive power conversion topology for medium and high voltage applications. They have already revolutionized voltage sourced converters (VSC) based high voltage direct current (VSC-HVDC) power transmission systems, pushing the voltage and power ratings to an unprecedented high level, and are the key technology for building multi-terminal HVDC systems and future DC grids. At present, MMCs are also being considered in many medium-voltage (MV) applications, such as machine drives, energy storage interface etc.

However, the use of hundreds of sub-modules involving thousands of components and associated control and measurement signals, demands very high requirements for the control, monitoring, and communication of the MMC. Simultaneous management of multiple control objectives, including control of active/reactive power, regulation of the input and output voltages/currents, balancing of the sub-module capacitor voltages, suppression of the circulating current, further increases the control difficulties. In addition, there are significant challenges facing the development of large scale HVDC grid including power flow control, DC fault protection etc. Over the past years, significant research efforts have been made in the academics and industries to tackle these problems. The purpose of this tutorial is to provide a systematic introduction of the MMC on the operating principles, converter models, modulation strategies, control schemes etc, and to give a comprehensive review of the latest achievements, emerging applications, and remaining challenges.

This tutorial will start with an overview of MMC characteristics and operating principles. Detailed MMC control will then be described including the available modulation strategies, capacitor voltage balancing schemes, circulating current control, as well as the capacitor pre-charging and fault tolerant operation. Efficient modeling and simulation techniques for MMC, both off-line and real-time, are then presented. Furthermore, this tutorial will give special emphasis to the applications of MMC: 1) MMC in HVDCs, specifying the design considerations of MMC-HVDC system, the key equipment for future large scale DC grid and its power flow control and challenges in DC fault protection; 2) MMC used as variable speed drives, showing its great feasibility and advantages over other multilevel topologies, but also revealing the disadvantage of the excessive capacitor voltage ripple at low speeds and possible methods for its attenuation; 3) Real project experience of multi-terminal MMC-HVDC system will be presented and finally, the other emerging MMC applications and future research opportunities will be discussed.

T1-3 Linearized Modeling and Stability Analysis of AC Power Electronic Based Power Systems

Room: 102B

Instructors: Frede Blaabjerg, *Aalborg University, Denmark*,
Xiongfei Wang, *Aalborg University, Denmark*

Power electronics technology is changing the way of electricity generation, transmission, and consumption. A vast range of grid applications of power electronics can be found in renewable energy power generations, flexible dc and ac power transmission systems, adjustable speed drives and other energy-efficient power loads. The ac power electronic based power systems are thus evolving into electrical grids at different power levels, ranging from standalone power systems and microgrids to large-scale renewable power plants.

The dynamic variations of switching instants make power electronic converters nonlinear and time-variant, which, together with their wideband control dynamics, tend to cause a number of stability and power quality problems. Besides the high-frequency switching harmonics, the frequency coupling effect of the outer power control and grid synchronization loops of grid-connected converters may lead to non-characteristic harmonic distortions. Moreover, more capacitances are being presented in the power electronic based power systems, due to the parasitic capacitances of power transmission cables and capacitances of converter-filters. The interactions among the ac-dc converters and the weak or resonant power grids may give rise to instability phenomena in a wide frequency range.

There have been many research efforts made for small-signal modeling of grid-connected converters and system stabilization at different frequencies. The state-space averaging method with the dq transformation is widely used for small-signal linearization, which, however, yields a real space vector model requiring the use of multivariable stability criterion. Moreover, the use of state-space averaging filter neglects the effect of switching frequency harmonics, which is merely justified for converters with high switching to fundamental frequency ratio. To overcome these drawbacks, the generalized averaging method, dynamic phasor models, and harmonic state-space modeling based on linear time-periodic systems have been developed.

This tutorial thus gives first a comprehensive review of linearized modeling methods of ac-dc converters for frequency coupling analysis and stability prediction. The principle of harmonic state-space modeling method is exemplified by a grid-connected converter with low switching to fundamental frequency ratio. The use of complex transfer functions to represent the dq-frame converter model is also discussed. The instability phenomena associated with the different control loops, e.g. current control, grid synchronization, and power control, are illustrated. Tools for system-level stability analysis with multiple ac-dc converters are then discussed and implemented with a few examples. Perspectives on the challenges and future trends of modeling and stability analysis of ac power electronic based power systems are finally given.

T1-4 The Origin of Converters

Room: 102C

Instructors: Tsai-Fu Wu, *National Tsing Hua University, Taiwan*

PWM converters have been widely applied for power processing and they are typically the stems of other types of converters, such as quasi-resonant, Z-source and switched-inductor hybrid converters. Development of PWM converters has been spanning over a century, starting from the buck converter. The well-known PWM converters include buck, boost, buck-boost, uk, SEPIC, Zeta, Z-source, quasi-Z source, etc. Many attempts have been proposed to develop these converters based mostly on canonical cell concepts and by introducing extra LC filters to the cells.

Charles Darwin published a book, namely "The Origin of Species". He claimed organic beings were evolved from the original species. Analogously, does there exist the origin of converters? This tutorial lecture presents identification of the original converter, from which the rest of converters can be evolved and derived systematically. The processes of converter evolution and derivation including decoding and synthesizing will be then presented, which bridge transfer gains or codes to converter topologies uniquely. Unlike conventional approaches based on switching cell or LC cell concept, we develop converters from the original converter and its derived. During presentation, the well-known converters will be illustrated with the discussed processes. This tutorial will provide research experts, engineers and students a prospective vision of power converter evolution, derivation and development.

T1-5 Advanced High-Power Industrial Drives

Room: 102D

Instructor: Richard Zhang, *GE Power Conversion, China*, Jie Shen, *GE Global Research*, Stefan Schroeder, *GE Global Research*

This tutorial gives a lecture on high-power medium-voltage converters from industrial point of view. Firstly it introduces the motivations applying high power drives for various applications. Then it introduces devices, topologies and controls that have been applied for industrial drives. Moreover, some GE's customized solutions are presented to serve special applications, including a 35MW O&G drive, a 2x27MVA 4-quadrant motor testbed, a 11MW/590Hz high-speed O&G drive, etc. Finally, the emerging technologies and applications are discussed, including the SiC devices, advanced cooling concepts and subsea drives.

The presenters are from GE Power Conversion and GE Global Research that have been working in this area since years. The authors have made similar topics on European PhD summit and ECCE2014.

T1-6 Power Semiconductors for Vehicle Traction Inverters: From Discretes to Power Modules, from Silicon to Wide Band Gap devices

Room: 103C

Instructors: Andre Christmann, *Infineon Technologies, USA*,
David Levett, *Infineon Technologies, USA*

This tutorial will provide an overview of the use of power semiconductors in vehicle traction inverter applications. It will cover four major aspects of three-phase inverters for DC-AC power conversion in HEVs, PHEVs, and EVs:

- Inverter design principles for high efficiency
- Silicon packaging
- Integration of different package types into an Inverter
- Performance assessment of different families of semiconductors: IGBTs, MOSFETs and SiC

T2-1 Electric Machine Design for Automotive Applications

Room: 101B

Instructors: James Goss, *Motor Design Ltd., UK*, Mircea Popescu, *Motor Design Ltd., UK*

There is currently significant activity in the development of electric machines for automotive applications where a wide variety of possible solutions can be seen. This tutorial aims to evaluate a range of the most common design options in terms of performance, cost and manufacturability. The tutorial will be focussed upon a set of typical electric machine specifications through which the following design variations will be explored:

- **Machine configurations:** A comparison between the permanent magnet motor solutions - with magnetless solutions – induction motors and synchronous reluctance motors is undertaken. In addition, various rotor topologies particularly for the permanent magnet motors are compared for example multi-layer interior PM, surface mounted, outer rotor and simple interior PM.
- **Winding technologies:** The two main winding categories, concentrated and distributed, are compared and within these various technologies evaluated. For concentrated windings, open slot tooth wound, segmented and edge wound. For distributed, bar wound and multistranded. Clearly these winding approaches are linked to various slot/pole combinations and winding connections which are also discussed.
- **Material variations:** Copper and aluminum have interesting trade-offs in terms of cost, conductivity, density and AC loss which is considered in the choice of winding material. In induction motor rotors this choice is also important and contains various trade-offs between cost and performance. Different magnet materials are investigated with ferrite magnets proving an interesting option for low cost designs. Various electrical steel grades are also compared.
- **Cooling approaches:** The common cooling mechanisms found in automotive designs are discussed and their effectiveness with various machine and winding types evaluated. These cooling approaches include stator water jackets, shaft cooling, oil spray cooling and air cooling.

The performance of the design choices will be evaluated using sophisticated electromagnetic and thermal modelling techniques. The modelling will evaluate continuous and peak torque/speed characteristics, performance over duty cycles and efficiency maps as well as accounting for aspects such as AC winding loss, voltage harmonics, demagnetization and complex heat transfer paths.

T2-2 High Power Si & SiC Module Technology & Application Considerations

Room: 101CD

Instructor: John F. Donlon, *Powerex, Inc., PA, USA*, Eric R. Motto, *Powerex, Inc., PA, USA*

High Power Semiconductor modules are the workhorse power switch for industrial applications. This seminar will discuss the issues a designer must deal with in using these devices including interpretation of device ratings, gate drive requirements, and providing device and system protection. The intent of this seminar is to aid the designer in choosing and applying a power module to a new product. Questions and concerns a designer might have will be addressed by the various techniques and circuit examples that will be presented. Chip technology and packaging options will be discussed with special attention to the tradeoffs between silicon and silicon carbide. The practical application of SiC power devices today and in the future will be discussed. The attendee should leave the course with a better understanding of the power module, specifically as a device and how it functions in an application. The goal will be to impart an understanding of desirable features, characteristics, and limitations. This will include the application in power circuits, protection from internal and external disturbances, and an understanding of thermal design, handling, and reliability considerations. The seminar is intended for design engineers having to deal with confusing and conflicting information on device data sheets and should be of interest to anyone who uses, applies, procures, or specifies power electronic products based on high power IGBTs as the power switch.

T2-3 Shipboard DC Microgrids

Room: 102B

Instructors: Josep M. Guerrero, *Aalborg University, Denmark*, Rober Cuzner, *University of Wisconsin - Milwaukee, US*, Giorgio Sulligoi, *Trieste University, Italy*, Shantha Gamini, *Univ. of Tasmania, Australia*

Under normal operating conditions at sea, the ship electrical system can be considered as a typical isolated microgrid. When the ship docks to the seaport and is powered with shore power it makes a grid connected microgrid. Thus, ship microgrids may resemble some analogies to commercial microgrids with similar issues and opportunities. Moreover, with the ever growing demands for emission reduction and fuel efficiency improvement, sustainable energy sources are becoming an integral part of marine electrical power systems. In addition, the intermittency and slow dynamics of these sources together with the presence of pulse loads, such as radar, make energy storage inevitable in future shipboard power systems to achieve faster transient characteristics.

These sources and energy storage elements are predominantly dc and thus onboard dc distribution is often used for integration and thereby improve the energy conversion efficiency. Therefore, future shipboard power systems are predicted to be predominantly dc microgrids.

This tutorial provides an overview of power system architectures of present and future ship microgrids, various sources, loads and their characteristics, control technologies and optimization methods in both islanded and grid connected operations. Protection coordination, multi-zonal architectures and fault isolation in future shipboard dc microgrids are also discussed in detail as the challenges in realization of future MVDC shipboard microgrids. The tutorial session is recommended for audience from both industry and academia with an interest in ship microgrids. In general, any participant who is interested in learning about the latest trends in this area is welcomed.

T2-4 Renewables, Energy Storage and Power Electronics as Enabling Technologies for the Smart Grid

Room: 102C

Instructors: Dr. Haitham Abu-Rub, *Texas A&M University at Qatar Omar, USA*, Dr. Omar Ellabban, *Texas A&M University at Qatar Omar, USA*

The smart grid (SG) as a research area is advancing dealing with a wider range of topics such as power systems, energy generation and telecommunication. The conventional utility grid used to operate in a passive mode absorbing energy from the substations and delivering it to the customers.

This approach is well developed but the needs of the state-of-the-art technology require a bidirectional flow of power and data. Nevertheless, smart grid systems provide more flexible, reliable, sustainable, secure and two-way communication service. Especially, integration of renewable energy sources, electrical vehicles and distributed generations (DG) in to network can be achieved in an efficient way in smart grid system. All these positive aspects of smart grids have been attained by integration of power electronics and telecommunication technologies with the grid. This presentation deals with contributions of power electronics to SG in the context of generation, conversion, and distribution.

T2-5 Modeling and Control of Grid Inverters

Room: 102D

Instructor: Mark Dehong Xu, *Zhejiang University, China*

With the increase of renewable energy penetration to the utility, the requirements to the grid inverter become higher and higher. One aspect of these requirements is that the grid inverter has higher power quality. Therefore, LCL filters have been widely used in the grid inverter. However, the grid inverter with LCL filter is sensitive. The damping control of it is critical to its proper operation.

To analytically design the controller for the grid inverter, dynamical models for either single-phase or three-phase inverters with LCL filter are needed. With the dynamical model, transfer functions in dq rotating frame are able to be derived. Then the control can be designed analytically with traditional control theory.

Since the transfer function of the grid inverter with LCL filter is the 3rd order, the bandwidth of the close loop will become narrower with the conventional PI controller design methodology. In this tutorial, a novel control scheme is introduced, which is known as Weighted Average Current Control (WACC). With WACC, the transfer function is transformed into the 1st order. It can widen the bandwidth significantly and realize damping control at the same time. Extensions of Weighted Average Current Control will be also introduced. DC current injection to the grid, which is caused by the grid inverter, is harmful to devices in the distribution systems. Generally the DC current injection occurs due to the asymmetry of the power device characteristics and control or gating drives in the grid inverter. An active DC current rejection control to the grid is introduced. It is effective for both single phase and three phase grid inverter.

The power quality of the grid inverter is deteriorated when the harmonics of the PCC voltage is poor. It is especially serious for high power grid inverters since the PWM switching frequency is deliberately selected to be lower to satisfy the efficiency requirement. Selective harmonics suppressing control loop may be added to reduce the effect of PCC voltage harmonics influence.

For three phase grid inverter, there exist different PWM methods such as Continuous PWM, Discontinuous PWM, Selective Harmonics Elimination PWM (SHEPWM) etc. The power loss distribution in the components of the grid inverter varies with the changing of the loading. One PWM method, which is good for the heavy load, may

be not ideal for the light load. On the other hand, one PWM method, which is good for static state such as SHEPWM, may be not suitable to Low Voltage Ride Through condition. Hybrid PWM for the grid inverter comprises with the different operating conditions. It can increase the performance of the grid inverter with the regards to the entire loading condition.

T2-6 Predictive Control - A simple and Powerful Method of Control Power Converters and Drives

Room: 103C

Instructors: Ralph Kennel, *Technische Universität München, Germany*, Jose Rodriguez, *Federico Santa María Technical University, Chile*, M. Kazmierkowski, *University of Technology, Poland*

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 carrier-based 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.

Technical Program Schedule

ORAL SESSIONS

Monday, September 19th

1:30PM – 4:00PM

S1 Modular Multi-Level Converters, HVDC, and DC Grids I

Room: 203DE

Chairs: Enrico Santi, Ghanshyamsinh Gohil

1:30PM | The Modular Embedded Multilevel Converter: A Voltage Source Converter with IGBTs and Thyristors

Di Zhang, Rajib Datta, Andrew Rockhill, Qin Lei and Luis Garces, *GE, United States; Eaton, United States; ASU, United States*

1:55PM | Multi-Module-Cascade High-Voltage Composite Switch

Binbin Wang, Yao Lu, Xinnian Sun, Wenxi Yao and Zhengyu Lu, *Zhejiang University, China; Hangzhou D-River Electric Technology Company, China; Hangzhou Silver Lake Electric Equipment Company, China*

2:20PM | Step-Up MMC with Staircase Modulation: Analysis, Control, and Switching Strategy

Younes Sangsefidi and Ali Mehrizi-Sani, *Washington State University, United States*

2:45PM | A High Step-Up Ratio Soft-Switching DC-DC Converter for Interconnection of MVDC and HVDC Grids

Shenghui Cui, Nils Soltan and Rik W. De Doncker, *RWTH Aachen University, Germany*

3:10PM | Fault Tolerant Cell Design for MMC-based Multiport Power Converters

Alberto Zapico, Mario Lopez, Alberto Rodriguez and Fernando Briz, *University of Oviedo, Spain*

3:35PM | HIL Platform Design and Controller Verification for MMC Based HVDC Networks

Luis Herrera, Xiu Yao and Jin Wang, *University of Dayton Research Institute, United States; University at Buffalo, United States; The Ohio State University, United States*

S2 Renewable Energy I

Room: 203C

Chairs: Wei Qiao, Liyan Qu

1:30PM | Energy Storage Opportunities and Capabilities in a Type 3 Wind Turbine Generator

Eduard Muljadi, Vahan Gevorgian and Anderson Hoke, *National Renewable Energy Laboratory, United States*

1:55PM | Assessment of System Frequency Support Effect of a PMSG-WTG Using Torque-Limit Based Inertial Control

Xiao Wang, Wenzhong Gao, Jianhui Wang, Ziping Wu, Weihang Yan, Vahan Gevorgian, Yingchen Zhang, Eduard Muljadi, Moses Kang, Min Hwang and Yong Cheol Kang, *University of Denver, Northeastern Univ., United States; University of Denver, United States; Northeastern Univ., China; National Renewable Energy Laboratory, United States; Chonbuk National Univ., Korea (South)*

2:20PM | Improved Efficiency of Local EPS through Variable Switching Frequency Control of Distributed Resources

Jose M. Cano, Andres Suarez, Angel Navarro-Rodriguez and Pablo Garcia, *University of Oviedo, Spain*

2:45PM | Smart EV Charging System for Maximising Power Delivery from Renewable Sources

Fearghal Kineavy and Maeve Duffy, *NUI Galway, Ireland*

3:10PM | Instantaneous Frequency Regulation of Microgrids via Power Shedding of Smart Load and Power Limiting of Renewable Generation

Shuo Yan, Ming Hao Wang, Tian Bo Yang and S. Y. Ron Hui, *The University of Hong Kong, Hong Kong*

3:35PM | Modeling and Identification of Harmonic Instability Problems in Wind Farms

Esmail Ebrahimzadeh, Frede Blaabjerg, Xiongfei Wang and Claus Leth Bak, *Aalborg University, Denmark*

S3 Modelling, Analysis, and Control of Grid-Connected Converters

Room: 202A

Chairs: Behrooz Mirafzal, Fariba Fateh

1:30PM | A Method for Improving Stability of LCL-Type Grid-Tied Inverters in Weak Grid with Resonant Feed forward Control

Yu Tang, Liulu Huang and Guoshu Zhao, *NUAA, China; Jinling Institute of Technology, China*

1:55PM | Passivity Enhancement in RES Based Power Plant with Paralleled Grid-Connected Inverters

Haofeng Bai, Xiongfei Wang and Frede Blaabjerg, *Aalborg University, Denmark*

2:20PM | Voltage Stability Analysis Using A Complete Model of Grid-Connected Voltage-Source Converters

Zhi-Xiang Zou, Andreas Martin Kettner, Giampaolo Buticchi, Marco Liserre and Mario Paolone, *University of Kiel, Germany; Ecole polytechnique federale de Lausanne, Switzerland*

2:45PM | Resonant Control for Power Converters Connected to Weak and Micro Grid Systems with Variant Frequency

Jaime Rothen, Pedro Melin, Jose Espinoza, Daniel Sbarbaro, Jose Silva and Marcelo Perez, *Bio Bio University, Chile; Concepcion University, Chile; Santa Maria University, Chile*

3:10PM | Extended-Horizon Finite-Control-Set Predictive Control of a Multilevel Inverter for Grid-Tie Photovoltaic Systems

Jose Silva, Jose Espinoza, Jaime Rothen, Luis Moran, Eduardo Espinosa, Carlos Baier and Javier Munoz, *Concepcion University, Chile; Catholic University, Chile; Talca University, Chile*

3:35PM | A Novel Seamless Transfer Control Strategy for Wide Range Load

Kiryong Kim, Dongsul Shin, Jong-Pil Lee, Tae-Jin Kim, Dong-wook Yoo and Heeje Kim, *Pusan National University, Korea, Republic of; LG Electronics, Korea, Republic of; Korea Electrotechnology Research Institute, Korea, Republic of*

S4 DC-DC Converters: Switched Capacitor

Room: 102D

Chairs: Alireza Khaligh, Tiefu Zhao

1:30PM | Hybrid Switched-Capacitor Quadratic Boost Converters with Very High DC Gain and Low Voltage Stress On Their Semiconductor Devices

Manxin Chen, Jiefeng Hu, Li Kerui and Adrian Ioinovici, *Sun Yat-sen University, China; Holon Institute of Technology, Israel*

1:55PM | Mixed Switched-Capacitor Based High Conversion Ratio Converter and Generalization for Renewable Energy Applications

Kerui Li, Manxin Chen, Jiefeng Hu and Adrian Ioinovici, *Sun Yat-sen University, China; Holon Institute of Technology, Israel*

2:20PM | A High Step-Up DC-DC Converter with Switched-Capacitor and ZVS Realization

Zhipeng Zheng and Liangzong He, *Xiamen University, China*

2:45PM | A Flying Capacitor Multilevel Converter with Sampled Valley-Current Detection for Multi-Mode Operation and Capacitor Voltage Balancing

Jan Rentmeister, Christopher Schaef, Benedict Foo and Jason Stauth, *Dartmouth College, United States*

3:10PM | Resonant Switched Capacitor Stacked Topology Enabling High DC-DC Voltage Conversion Ratios and Efficient Wide Range Regulation

Yongjun Li, Jikang Chen, Mervin John, Ricky Liou and Seth Sanders, *UC Berkeley, United States; Texas Instrument, United States*

3:35PM | Bi-Directional Bridge Modular Switched-Capacitor-Based DC-DC Converter with Phase-Shift Control

Ye Ding, Liangzong He and Zhao Liu, *Xiamen University, China; Nanjing University of Science and Technology, China*

S5 Multi-Phase Rectifiers

Room: 202E

Chairs: Luca Zarri, Mahshid Amirabadi

1:30PM | A Review of Electronic Inductor Technique for Power Factor Correction in Three-Phase Adjustable Speed Drives

Pooya Davari, Yongheng Yang, Firuz Zare and Frede Blaabjerg, *Aalborg University, Denmark; The University of Queensland, Australia*

1:55PM | The Power-Loss Analysis and Efficiency Maximization of A Silicon-Carbide MOSFET Based Three-phase 10kW Bi-directional EV Charger Using Variable-DC-Bus Control

Kevin (Hua) Bai, Chenguang Jiang, Hui Teng and Bo Lei, *Kettering University, United States*

2:20PM | Modular Multi-Parallel Rectifiers (MMR) with Two DC Link Current Sensors

Firuz Zare, *Danfoss Drives A/S, Denmark*

2:45PM | Comparison of Three-phase Active Rectifier Solutions for Avionic Applications: Impact of the Avionic Standard DO-160 F and Failure Modes

Uros Borovic, Sisi Zhao, Marcelo Silva, Yann E. Bouvier, Miroslav Vasic, Jesus A. Oliver, Pedro Alou, Jose A. Cobos, Fernando Arevalo, Juan Carlos Garcia-Tembleque, Jorge Carmena, Constantino Garcia and Predrag Pejovic, *Universidad Politecnica de Madrid, Spain; Indra Sistemas, Spain; Fac. of Electr. Eng., Univ. of Belgrade, Serbia and Montenegro*

3:10PM | MultiLevel Asymmetric Single-Phase Current Source Rectifiers

Montie Vitorino, Louelson Costa, Mauricio Correa and Cursino Jacobina, *Federal University of Campina Grande, Brazil*

3:35PM | Three-Phase Unidirectional Rectifiers with Open-End Source and Cascaded Floating Capacitor H-Bridges

Joao Paulo Ramos Agra Mello, Cursino Bradao Jacobina and Mauricio Beltrao Rossiter Correa, *Universidade Federal de Campina Grande, Brazil*

S6 Single-Phase Inverters

Room: 203AB

Chairs: Aaron Cramer, Roberto Petrella

1:30PM | A Generic Topology Derivation Method for Single-phase Converters with Active Capacitive DC-links

Haoran Wang, Huai Wang, Guorong Zhu and Frede Blaabjerg, *Aalborg University, Denmark; Wuhan University of Technology, China*

1:55PM | Power Decoupling Method for Single Phase PV System Using Cuk Derived Micro-Inverter

Anindita Jamatia, Vasav Gautam and Parthasarathi Sensarma, *Indian Institute of Technology, Kanpur, India*

2:20PM | A Multi-port, Isolated PV Microinverter with Low Decoupling Capacitance and Integrated Battery Charger

Shiladri Chakraborty and Souvik Chattopadhyay, *Indian Institute of Technology Kharagpur, India*

2:45PM | A Single Phase Transformerless String Inverter with Large Voltage Swing of Half Bridge Capacitors for Active Power Decoupling

Jinia Roy, Yinglai Xia and Raja Ayyanar, *Arizona State University, United States*

3:10PM | A-Source Impedance Network

Yam Siwakoti, Frede Blaabjerg, Veda Prakash Galigekere and Marian K. Kazimierczuk, *Aalborg University, Denmark; Wright State University, United States*

3:35PM | A Semi-Two-Stage DC-AC Power Conversion System with Improved Efficiency Based on A Dual-input Inverter

Tiantian Mu, Hongfei Wu, Lei Zhu and Wenying Jiang, *Nanjing Univ. of Aeronautics and Astronautics, China*

S7 DC-DC Converters I

Room: 102C

Chairs: Praveen Jain, Liangzong He

1:30PM | Single-Input Multiple-Output Synchronous dc-dc Buck Converter

Bharath Kumar Sabbarapu, Omar Nezamuddin, Andrew McGinnis and Euzeli dos Santos, *Indiana University-Purdue University-Indianapolis, United States*

1:55PM | Dual-Input Dual-Output Single-Switch Dc-Dc Converter for Renewable Energy Applications

Aluisio Alves de Melo Bento, Edison Roberto Cabral da Silva and Diego Alberto Acevedo Bueno, *Federal University of Campina Grande, Brazil*

2:20PM | A High Step-Up Interleaved Converter with Coupled Inductor and Voltage-Lift Technique

Atsushi Matsuda and Hirotaka Koizumi, *Tokyo University of Science, Japan*

2:45PM | Single Resonant Cell Based Multilevel Soft-Switching DC-DC Converter for Medium Voltage Conversion

Jiepin Zhang, Trillion Q. Zheng, Xiaofeng Yang and Miao Wang, *Beijing Jiaotong University, China*

3:10PM | Unified Model of High Voltage Gain DC-DC Converter with Multi-cell Diode-Capacitor/Inductor Network

Yan Zhang, Liu Jinjun, Dong Zhuo and Yanfei Liu, *Xi'an Jiaotong University, China; Queen's University, Canada*

3:35PM | Comparative Evaluation of a Triangular Current Mode (TCM) and Clamp-Switch TCM DC-DC Boost Converter

Oliver Knecht, Dominik Bortis and Johann Walter Kolar, *ETH Zurich, Switzerland*

S8 DC-DC: Dual Active Bridge

Room: 102E

Chairs: Regan Zane, Zhiqiang Guo

1:30PM | Analytically Constrained ZVS Operation to Reduce Commutation Losses for High Boost Dual-Active Bridge Converters

Jan Riedel, Donald Grahame Holmes, Brendan Peter McGrath and Carlos Teixeira, *Robert Bosch (SEA) Pte Ltd, Singapore; RMIT University, Australia*

1:55PM | Passive Auxilliary Circuit for ZVS Operation of A Wide-DC-Range Dual-Active-Bridge Bidirectional Converter for Transportation Applications

Alireza Safaee, Praveen Jain and Alireza Bakhshai, *Osram Sylvania, United States; Queen's University, Canada*

2:20PM | Charge-Based ZVS Modulation of a 3-5 Level Bidirectional Dual Active Bridge DC-DC Converter

Georgios Sfakianakis, Jordi Everts, Henk Huisman, Thomas Borrias, Cornelis Wijndands and Elena Lomonova, *Eindhoven University of Technology, Netherlands*

2:45PM | Parallel-Connected Bidirectional Current-Fed Dual Active Bridge DC-DC Converters with Decentralized Control

Deshang Sha, Wenqi Yuan, Guo Xu, Fulin You and Jianliang Chen, *Beijing Institute of Technology, Automation, China*

3:10PM | Asymmetrical Duty-Cycle Control of Three-Phase Dual-Active Bridge Converter for Soft-Switching Range Extension

Jingxin Hu, Nils Soltan and Rik W. De Doncker, *RWTH Aachen University, Germany*

3:35PM | Proposal of Dual Active Bridge Converter with Auxiliary Circuit for Multiple Pulse Width Modulation

Kazuaki Kojima, Yukinori Tsuruta and Atsuo Kawamura, *Yokohama National University, Japan*

S9 Electromagnetic Interference (EMI) in Power Converters

Room: 102A

Chairs: Shuo Wang, Sung Yeul Park

1:30PM | A Simple Low-Cost Common Mode Active EMI Filter Using a push-pull Amplifier

Dongil Shin, Changwoo Son, Seonho Jeon, Bongjin Cho, Jinwook Han and Jinguok Kim, *Ulsan National Institute of Science and Tech, Korea (South); Home Appliance Control Research Division LGE, Korea (South)*

1:55PM | Two-capacitor Transformer Winding Capacitance Models for Common-Mode EMI Noise Analysis in Isolated DC-DC Converters

Huan Zhang and Shuo Wang, *University of Florida, United States*

2:20PM | Performance of Common-Mode-Voltage-Cancellation PWM Strategies with Consideration of Commutation Residues due to Double-Switching Waveforms

Mehdi Messaoudi, Arnaud Videt, Nadir Idir, Hocine Boulharts and Heu Vang, *Schneider Toshiba Inverter, France; Univ. Lille, L2EP, France; Toshiba Schneider Inverter, Japan*

2:45PM | Identification of the Temporal Source of Frequency Domain Characteristics of SiC MOSFET Based Power Converter Waveforms

Samuel Walder, Xibo Yuan, Ian Laird and J. O. Dalton Jeremy, *University of Bristol, United Kingdom*

3:10PM | Resonance Phenomenon Influencing the Conducted-Mode Emission Test

Christian Wolf, *Grundfos A/S, Denmark*

3:35PM | Modeling, Analysis and Design of Differential Mode Active EMI Filters with Feedforward and Feedback Configurations for AC-DC Converters

Rajib Goswami, Shuo Wang and Zhang Yingjie, *University of Texas at San Antonio, United States; University of Florida, United States*

S10 Modeling and Control of DC-AC Converters I

Room: 202D

Chairs: Xu She, Yi Deng

1:30PM | Compensation for Inverter Nonlinearity Considering Voltage Drops and Switching Delays of Each Leg's Switches

Myeong-Chan Kang, Sang-Hoon Lee and Young-Doo Yoon, *Myongji University, Korea (South)*

1:55PM | Small-signal Terminal-Characteristics Modeling of Three-Phase Droop-Controlled Inverters

Zeng Liu, Jinjun Liu, Dushan Boroyevich, Rolando Burgos and Teng Liu, *Xi'an Jiaotong University; Virginia Tech, China; Xi'an Jiaotong University, China; Virginia Tech, United States*

2:20PM | Enhancement of Current and Voltage Controllers Performance by Means of Lead Compensation and Anti-Windup for Islanded Microgrids

Federico de Bosio, Luiz Antonio de Souza Ribeiro, Francisco Freijedo, Josep Guerrero and Michele Pastorelli, *Politecnico di Torino, Italy; Federal University of Maranhao, Brazil; Ecole Polytechnique Federale de Lausanne, Switzerland; Aalborg University, Denmark*

2:45PM | DC-Link Current Ripple Component RMS Value Estimation Considering Anti-Parallel Diode Reverse Recovery in Voltage Source Inverters

Jing Guo and Ali Emadi, *McMaster University, Canada*

3:10PM | Digital Dead-Beat and Repetitive Combined Control for Stand-Alone Four-Leg VSI

Alessandro Lidozzi, Luca Solero, Fabio Crescimbeni, Chao Ji and Pericle Zanchetta, *ROMA TRE University, Italy; The University of Nottingham, United Kingdom*

3:35PM | Modeling, Analysis, and Impedance Design of Battery Energy Stored Single-Phase Quasi-Z-Source Photovoltaic Inverter System

Yushan Liu, Haitham Abu-Rub, Baoming Ge, Robert S. Balog and Yaosuo Xue, *Texas A and M University at Qatar, Qatar; Texas A and M University, United States; Oak Ridge National Laboratory, United States*

S11 Induction Machines

Room: 101A

Chairs: Juan Carlos Balda, Andrea Cavagnino

1:30PM | High Torque Density Induction Motor with Integrated Magnetic Gear

Dalia Abdelhamid and Andrew Knight, *University of Calgary, Canada*

1:55PM | Accurate Determination of Induction Machine Torque and Current Versus Speed Characteristics

Emmanuel Agamloh, Andrea Cavagnino and Silvio Vaschetto, *Advanced Energy, United States; Politecnico di Torino, Italy*

2:20PM | The Novel SLIM Method for the Determination of the Iron Core Saturation Level in Induction Motors

Konstantinos N. Gyftakis, *Coventry University, United Kingdom*

2:45PM | Rotor Design to Reduce Secondary Winding Harmonic Loss for Induction Motor in Hybrid Electric Vehicle Application

Haodong Li and Keith Klontz, *Advanced MotorTech, United States*

3:10PM | A Novel In Situ Efficiency Estimation Algorithm for Three-Phase Induction Motors Operating with Distorted Unbalanced Voltages

Maier Al-Badri, Pragasen Pillay and Pierre Angers, *Concordia University, Canada; Hydro-Quebec, Canada*

3:35PM | Development and Efficiency Estimation of a Regenerative Test Rig for Induction Motor Testing

Jamlick Murimi Kinyua, Mohamed A. Khan and Paul Barendse, *University of Cape Town, South Africa*

S12 Prof. Subhasis Nandi Memorial Session: Diagnostics of Electric Machines

Room: 102B

Chairs: Hamid Toliyat, Sang Bin Lee

1:30PM | A Voltage Based Approach for Fault Detection and Separation in Permanent Magnet Synchronous Machines

Reemon Haddad, Cristian A. Lopez, Shanelle Foster and Elias Strangas, *Michigan State University, United States*

1:55PM | Permanent Magnet Generator Turn Fault Detection Using Kalman Filter Technique

Bo Wang, Jiabin Wang, Antonio Griffo, Vipulkumar I. Patel, Zhigang Sun, Ellis Chong and Riona Smitham, *The University of Sheffield, United Kingdom; Rolls-Royce plc, United Kingdom*

2:20PM | Influence of Blade Pass Frequency Vibrations on MCSA-based Rotor Fault Detection of Induction Motors

Yonghyun Park, Sang Bin Lee, Myung Jeong, Jose Antonino-Daviu and Mike Teska, *Korea University, Korea, Republic of; UNIVERSITAT POLITECNICA DE VALENCIA, Spain; SKF Condition Monitoring Center, United States*

2:45PM | Stator Insulation Quality Assurance Testing for Appliance Motors with Aluminum Windings

Daewoong Choi, Taejune Kang, Sang Bin Lee, Jaegyu Kim and Jihoon Kim, *Samsung Electronics, Korea, Republic of; Korea University, Korea, Republic of*

3:10PM | Robust Detection of Rotor Winding Asymmetries in Wound Rotor Induction Motors via Integral Current Analysis

Jose Antonino-Daviu, Alfredo Quijano-Lopez, Vicente Climente-Alarcon and Carlos Garin Abellan, *Universitat Politecnica De Valencia, Spain; Aalto University, Finland; FYM Italcementi Group, Spain*

3:35PM | Asynchronous Motors Fault Detection Using ANN and Fuzzy Logic Methods

Negin Lashkari, Hamid Fekri Azgomi, Javad Poshtan and Majid Poshtan, *Iran University of Science and Technology, Iran; California Polytechnic State University, United States*

S13 Control of Electric Drives I

Room: 101CD

Chairs: Radu Bojoi, Roberto Petrella

1:30PM | Minimizing Torque Ripple of Highly Saturated Salient Pole Synchronous Machines by Applying DB-DTFC

Michael Saur, Daniel Gaona, Jelena Zdravkovic, Bastian Lehner, Robert Lorenz and Dieter Gerling, *Universitaet der Bundeswehr, Germany; University of Madison, United States*

1:55PM | Using Volt-sec. Sensing to Directly Improve Torque Accuracy and Self-Sensing at Very Low Speeds

Yukai Wang, Naoto Niimura, Ben Rudolph and Robert Lorenz, *University of Wisconsin – Madison, WEMPEC, United States; TMEIC, Fuchu work, Japan; TMEIC Corporation, Roanoke, United States*

2:20PM | Torque Ripple Reduction for 6-stator/4-rotor-pole Variable Flux Reluctance Machines by Using Harmonic Field Current Injection

Beomseok Lee and Zi-Qiang Zhu, *The University of Sheffield, United Kingdom*

2:45PM | Novel On-Line Optimal Bandwidth Search and Auto Tuning Techniques for Servo Motor Drives

Chih-Jung Hsu and Yen-Shin Lai, *Taipei Tech., Taiwan*

3:10PM | Open-loop Control for Permanent Magnet Synchronous Motor Driven by Square-wave Voltage and Stabilization Control

Daisuke Sato and Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

3:35PM | A Robust Current Control Based on Proportional-Integral Observers for Permanent Magnet Synchronous Machines

Milo De Soricellis, Davide Da Ru' and Silverio Bolognani, *BOSCH GmbH, Germany; University of Padova, Italy*

S14 Medium Voltage Drives and High Power Drives

Room: 101B

Chairs: Shih-Chin Yang, Uday Deshpande

1:30PM | A Pumpback Test Bench for IGCT-based 11MW/595Hz Variable-Frequency-Drives with 1.25MW Grid Capability

Jie Shen, Stefan Schroeder, Fan Zhang, Kunlun Chen and Richard Zhang, *GE Global Research, China; GE Global Research, Germany; GE Power Conversion, China*

1:55PM | Grounding Concept and Common-Mode Filter Design Methodology for Transformerless MV Drives

Marius Mechlinski, Stefan Schroeder, Jie Shen and Rik W. De Doncker, *GE Global Research Europe, Munich, Germany; GE Global Research China, Shanghai, China; E.ON ERC, RWTH Aachen University, Germany*

2:20PM | Utilisation of Series Connected Transformers for Multiple Active Rectifier Units

Wim van der Merwe, Mathieu Giroux, Pasi Tallinen and Jonas Wahlstrom, *ABB Switzerland, Switzerland; ABB Finland, Finland*

2:45PM | Common-Mode Voltage Limits for the Transformerless Design of MV Drives to Prevent Bearing Current Issues

Marius Mechlinski, Stefan Schroeder, Jie Shen and Rik W. De Doncker, *GE Global Research Europe, Munich, Germany; GE Global Research China, Shanghai, China; E.ON ERC, RWTH Aachen University, Germany*

3:10PM | A Robust Sensorless Start-up Method using Four Step Sequence for LCI system

Hyunsung An and Hanju Cha, *Chungnam national university, Korea (South); Chungnam National University, Korea (South)*

3:35PM | Virtual Voltage Source Control for 2x27 MVA Machine Test Bench

Jie Shen, Jingkui Shi, Jun Zhu, Yulong Li, Bo Qu and Hongwu She, *GE Global Research, China; GE Power Conversion, China*

S15 Power Modules

Room: 202C

Chairs: Muhammad Nawaz, Douglas C Hopkins

1:30PM | Performance Comparison of 10 kV-15 kV High Voltage SiC Modules and High Voltage Switch using Series Connected LV SiC MOSFET devices

Kasunaidu Vechalapu and Subhashish Bhattacharya, *NC State University, United States*

1:55PM | Development of an Ultra-high Density Power Chip on Bus (PCoB) Module

Yang Xu, Iqbal Husain, Harvey West, Wensong Yu and Douglas Hopkins, *North Carolina State University, United States*

2:20PM | Optimized Power Modules for Silicon Carbide MOSFET

Guillaume Regnat, Pierre-Olivier Jeannin, Jeffrey Ewanchuk, David Frey, Stefan Mollov and Jean-Paul Ferrieux, *G2ELAB, France; Mitsubishi Electric RandD Centre Europe, France*

2:45PM | An Improved Wire-bonded Power Module with Double-End Sourced Structure

Miao Wang, Fang Luo and Longya Xu, *the Ohio State University, United States*

3:10PM | An Initial Consideration of Silicon Carbide Devices in Pressure-Packages

Jose Angel Ortiz Gonzalez, Olayiwola Alatise, Li Ran, Philip Mawby, Pushparajah Rajaguru and Christopher Bailey, *University of Warwick, United Kingdom; University of Greenwich, United Kingdom*

3:35PM | Effect of Junction Temperature Swing Durations on a Lifetime of a Transfer Molded IGBT Module

Choi Ui-Min, Blaabjerg Frede and Jorgensen Soren, *Aalborg University, Denmark; Grundfos Holding A/S, Denmark*

S16 Wireless Power Transfer I

Room: 202B

Chairs: Yaow-Ming Chen, Chris Mi

1:30PM | An Inductive and Capacitive Integrated Coupler and Its LCL Compensation Circuit Design for Wireless Power Transfer

Fei Lu, Hua Zhang, Heath Hofmann and Chris Mi, *University of Michigan, United States; Northwestern Polytechnical University, China; San Diego State University, United States*

1:55PM | Design Procedure of Optimum Self-Inductances of Magnetic Pads in Inductive Power Transfer (IPT) for Electric Vehicles

Minhyuck Kang, Jongeun Byeon, Dong Myoung Joo, Minkook Kim and Byoung Kuk Lee, *Sungkyunkwan University, Korea (South)*

2:20PM | Design High Power and High Efficiency Inverter Operating at 13.56MHz for Wireless Power Transfer Systems

Kien Trung Nguyen and Kan Akatsu, *Shibaura Institute of Technology, Japan*

2:45PM | Improved Design Optimization Approach for High Efficiency Matching Networks

Ashish Kumar, Sreyam Sinha, Alihossein Sepahvand and Khurram Afridi, *University of Colorado Boulder, United States*

3:10PM | Efficiency Optimization Method of Wireless Power Transfer System with Multiple Transmitters and Single Receiver

Cheng Zhang, Deyan Lin and Shu Yuen Ron Hui, *The University of Hong Kong, Hong Kong*

3:35PM | Maximum Efficiency Tracking in Wireless Power Transfer for Battery Charger: Phase Shift and Frequency Control

Devendra Patil, Marco Sirico, Lei Gu and Babak Fahimi, *University of Texas at Dallas, United States; University of Naples Federico II, Italy*

Tuesday, September 20th

8:30AM – 11:00AM

S17 Photovoltaic Converters I

Room: 203AB

Chairs: Francisco Canales, Liming Liu

8:30AM | Low Power Factor Operation of the PV Inverter with Power Decoupling Function

Yusuke Seta and Toshihisa Shimizu, *Tokyo Metropolitan University, Japan*

8:55AM | Stand-Alone Photovoltaic Asymmetrical Cascade Converter

Alan Felinto, Italo da Silva, Cursino Jacobina, Joao Mello, Isaac Freitas and Nustenil Marinus, *Federal University of Campina Grande, Brazil; Federal University of Paraiba, Brazil*

9:20AM | Ground Leakage Current Suppression in a 50 kW 5-level T-type Transformerless PV Inverter

Lu Wang, Yanjun Shi, Yuxiang Shi, Ren Xie and Hui Li, *FSU, United States*

9:45AM | A High Performance T-type Single Phase Double Grounded Transformer-less Photovoltaic Inverter with Active Power Decoupling

Yinglai Xia, Jinia Roy and Raja Ayyanar, *Arizona State University, United States*

10:10AM | Low Leakage Current Transformerless Three-Phase Photovoltaic Inverter

Liwei Zhou, Feng Gao, Guang Shen, Tao Xu and Weiqi Wang, *Shandong University, China; State Grid Rizhao Power Supply Company, China*

10:35AM | Operation of Dual-Input Central Capacitor Photovoltaic Inverter Under Unbalanced Grid Voltage Condition

Mengxing Chen, Feng Gao and Chongsheng Jia, *Shandong University, China*

S18 Modular Multi-Level Converters, HVDC, and DC Grids II

Room: 203DE

Chairs: Rajib Datta, Ali Mehrizi-Sani

8:30AM | Impact on Small-Signal dynamics of Using Circulating Currents Instead of AC-Currents to Control the DC Voltage in MMC HVDC Terminals

Gilbert Bergna, Jon Are Suul and Salvatore D'Arco, *SINTEF Energy Research, Norway; NTNU / SINTEF Energy Research, Norway*

8:55AM | Control of VSC-HVDC with Electromechanical Characteristics and Unified Primary Strategy

Weiyi Zhang, Kumars Rouzbehi, J. Ignacio Candela, Alvaro Luna and Pedro Rodriguez, *Technical University of Catalonia, Spain; Abengoa, Spain*

9:20AM | A Novel Interline DC Power Flow Controller for Meshed HVDC Grids

Guangfu Ning, Wu Chen and Xu Zhu, *Southeast University, China*

9:45AM | Impedance-based and Eigenvalue Based Stability Assessment Compared in VSC-HVDC System

Mohammad Amin, Atle Rygg and Marta Molinas, *Norwegian University of Science and Technology, Norway*

10:10AM | Performance Analysis of a Triple-Active Bridge Converter for Interconnection of Future DC-Grids

Markus Neubert, Anton Gorodnichev, Jan Gottschlich and Rik W. De Doncker, *RWTH Aachen University, ISEA, Germany*

10:35AM | Dc Fault Protection of Multi-Terminal VSC-HVDC System with Hybrid Dc Circuit Breaker

Yalong Li, Jin Liu, Xiaojie Shi, Fred Wang and Leon Tolbert, *University of Tennessee, United States*

S19 Renewable Energy II

Room: 203C

Chairs: Alex.Q Huang, Xueguang Zhang

8:30AM | Partial Power DC-DC Converter for Photovoltaic String Inverters

Alexander Morrison, Jaime Zapata, Samir Kouro, Marcelo Perez, Thierry Meynard and Hugues Renaudineau, *Universidad Tecnica Federico Santa Maria, Chile; University of Toulouse, France*

8:55AM | On Reactive Power Injection Control of Distributed Grid-tied AC-stacked PV Inverter Architecture

Hamidreza Jafarian, Babak Parkhideh, Johan Enslin, Robert Cox and Shibashis Bhowmik, *UNCC, United States; SineWatts, United States*

9:20AM | A Cost-Effective Power Ramp-Rate Control Strategy for Single-Phase Two-Stage Grid-Connected Photovoltaic Systems

Ariya Sangwongwanich, Yongheng Yang and Frede Blaabjerg, *Aalborg University, Denmark*

9:45AM | Delta Power Control Strategy for Multi-String Grid-Connected PV Inverters

Ariya Sangwongwanich, Yongheng Yang, Frede Blaabjerg and Dezso Sera, *Aalborg University, Denmark*

10:10AM | Battery Storage Sizing for a Grid Tied PV System Based on Operating Cost Minimization

Mohamed Badawy, Fatih Cingoz and Yilmaz Sozer, *University of Akron, United States*

8:35AM | Dynamic Braking System of a Tidal Generator

Eduard Muljadi, Alan Wright, Vahan Gevorgian, James Donegan, Cian Marnagh and Jarlath McEntee, *National Renewable Energy Laboratory, United States; Ocean Renewable Power Corporation, United States*

S20 Utility Applications I

Room: 202A

Chairs: Fernando Briz, Rajasekhareddy Chilipi

8:30AM | Multi-frequency Power Routing for Cascaded H-Bridge Inverters in Smart Transformer Application

Youngjong Ko, Markus Andresen, Giampaolo Buticchi, Luca Concari and Marco Liserre, *Christian-Albrechts-University, Germany; University of Parma, Italy*

8:55AM | A High Power Medium Voltage Resonant Dual Active Bridge for DC Distribution Networks

Mohammed Agamy, Dong Dong, Luis J. Garces, Yingqi Zhang, Mark Dame, Ashraf Said Atalla and Yan Pan, *GE Global Research Center, United States; GE Global Research Center, China*

9:20AM | Mu Synthesized Robust Controller for Multi-SST Islanded Smart Grid

Tong Yao, Isaac Leonard, Raja Ayyanar and Konstantinos Tsakalis, *Arizona State University, United States; Florida State University, United States*

9:45AM | Cascaded Open-End Winding Transformer based DVR

Gregory Carlos, Cursino Jacobina, Euzeli Dos Santos Jr. and Joao Mello, *Federal Institute of Alagoas – IFAL, Brazil; Federal University of Campina Grande – UFCG, Brazil; Indiana University-Purdue University Indianapolis, United States*

10:10AM | Modeling and Control of Gan Based Multiport Power Converter

Mohammed Alsolami, Xuan Zhang, Karun Potty and Jin Wang, *King Abdulaziz University, United States; The Ohio State University, United States*

10:35AM | Economic Feasibility Analysis and Operational Testing of a Community Energy Storage System

Ben Knueven, Jim Ostrowski, Ben Ollis, Philip Irminger, Michael Starke, Andrew Herron, Dan King, Bailu Xiao, Yaosuo Xue, Peter Karlson, Christine Labaza, David Maxwell, Seelan Thambiappah, Pablo Valencia and Sebastien Massin, *University of Tennessee – Knoxville (UTK), United States; Oak Ridge National Laboratory (ORNL), United States; General Motors Company, United States; ABB, United States*

S21 Electric Machines for Transportation Electrification

Room: 102D

Chairs: Jason Stauth, Emmanuel Agamloh

8:30AM | Electrical Machine Acoustic Noise Reduction Based on Rotor Surface Modifications

Andreas Andersson and Torbjorn Thiringer, *Volvo Car Group, Sweden; Chalmers University of Technology, Sweden*

8:55AM | Integrated Control of an IPM Motor Drive and Hybrid Energy Storage System for Electric Vehicles

Mohamed Badawy, Tausif Husain and Yilmaz Sozer, *University of Akron, United States*

9:20AM | Investigation and Analysis of Temperature Effects on Interior Permanent Magnet Machines

Silong Li, Bulent Sarlioglu, Sinisa Jurkovic, Nitin Patel and Peter Savagian, *University of Wisconsin-Madison, United States; General Motors Company, United States*

9:45AM | A Novel Flux-Switching Permanent Magnet Motor-Compressor with Integrated Airfoil-Shaped Rotor Design
Yingjie Li, Dheeraj Bobba, Erik Schubert, Hao Ding, Casey Morris and Bulent Sarlioglu, *Electrical and Computer Engineering, UW-Madison, United States*

10:10AM | Novel 6-Slot 4-Pole Dual-Stator Flux-Switching Permanent Magnet Machine Comparison Studies for High-Speed Applications
Yingjie Li, Ju Hyung Kim, Riccardo Leuzzi, Mingda Liu and Bulent Sarlioglu, *Electrical and Computer Engineering, UW-Madison, United States; Elec. and Info. Engineering, Politecnico di Bari, Italy*

10:35AM | High-Specific-Power Electric Machines for Electrified Transportation Applications – Technology Options
Xiaolong Zhang and Kiruba Sivasubramaniam Haran, *University of Illinois, Urbana-Champaign, United States*

S22 Multilevel Converter Applications

Room: 202E

Chairs: Giri Venkataramanan, Qin Lei

8:30AM | A Fully FPGA-Based Real-time Simulator for the Cascaded STATCOM
Jianxin Zhu, Guodong Teng, Yang Qin, Daorong Lu, Haibing Hu and Yan Xing, *Nanjing Univ. of Aeronautics and Astronautics, China*

8:55AM | A Broad Range of Speed Control of a Permanent Magnet Synchronous Motor Driven by a Modular Multilevel TSBC Converter
Wataru Kawamura, Yuto Chiba and Hirofumi Akagi, *Tokyo Institute of Technology, Japan; Komatsu Limited, Japan*

9:20AM | Comparison of SiC and GaN Devices for Front-End Isolation of Quasi-Z-Source Cascaded Multilevel Photovoltaic Inverter
Yushan Liu, Baoming Ge, Haitham Abu-Rub, Haiyu Zhang and Robert S. Balog, *Texas A and M University at Qatar, Qatar; Texas A and M University, United States*

9:45AM | Which is more suitable to a Modular Multilevel SDBC Inverter for Utility-Scale PV Applications, Phase-Shifted PWM or Level-Shifted PWM?
Paul Sochor and Hirofumi Akagi, *Tokyo Institute of Technology, Japan*

10:10AM | A Symmetrical Hybrid Nine-Level Inverter for High Speed Open-Winding Motor Drive System
Kui Wang, Yongdong Li, Zedong Zheng, Dabo Wei and Boran Fan, *Tsinghua University, China*

10:35AM | Control of Neutral-Point Voltage in Three-Phase Four-Wire Three-Level NPC Inverter Based on the Disassembly of Zero Level
Chenchen Wang, Xiahe Si and Hongliang Xin, *Beijing Jiaotong University, China*

S23 Modeling and Control of DC-DC Converters I

Room: 102C

Chairs: Johann Walter Kolar, Juan Rivas-Davila

8:30AM | Observer-based Nonlinear Control for Frequency Modulated Dual-Active-Bridge Converter
Duy-Dinh Nguyen, Manh-Linh Nguyen, Tuyen Nguyen-Duc and Goro Fujita, *Shibaura Institute of Technology, Japan; Tokyo University of Science, Japan*

8:55AM | Novel Control Architecture for Dual Output DC-DC Converter Driving DC-AC Inversion System
Zhi Geng, Dazhong Gu and Dariusz Czarkowski, *NYU Tandon School of Engineering, ECE Department, United States*

9:20AM | Dynamic Bus Voltage Control for Light Load Efficiency Improvement of Two-stage Voltage Regulator
Chao Fei, Mohamed Ahmed, Fred Lee and Qiang Li, *CPES – Virginia Tech, United States*

9:45AM | A Novel Large-Signal Stability Analysis Approach Based on Semi-Tensor Product of Matrices With Lyapunov Stability Theorem Using for DC-DC Converters
Hong Li, Fang Ren, Bo Zhang, Jianing Shang, Jinhu Lv and Hongsheng Qi, *Beijing Jiaotong University, China; South China University of Technology, China; Chinese Academy of Sciences, China*

10:10AM | A Study on the Control Loop Design of Non-Isolated Configurations for Hybrid Storage Systems
Ramy Georgious, Jorge Garcia, Angel Navarro-Rodriguez and Pablo Garcia, *University of Oviedo, Spain*

10:35AM | Effects of Non-Ideal Compensators for the High-Bandwidth Low-Standby-Power Computer V-Core Converter Applications
Ching-Wei Yin, Dan Chen, Sheng-Fu Hsiao, Ching-Jan Chen and Hung-Shou Nien, *EE, National Taiwan University, Taiwan; Richtek Technology Corporation, Taiwan*

S24 Modulation Techniques I

Room: 102E

Chairs: Suman Debnath, Liliana de Lillo

8:30AM | A Unified SVM Algorithm for Lifetime Prolongation of Thermally-Overheated Power Devices in Multi-Level Inverters
Mokhtar Aly, Gamal M. Dousoky, Emad M. Ahmed and Masahito Shoyama, *Kyushu University, Japan; Minia University, Egypt; Aswan University, Egypt*

8:55AM | Pulse-Width Modulation Strategy in Double-Delta Sourced Windings
Yongsoon Park and Seung-Ki Sul, *Samsung Electronics, Korea (South); Seoul National University, Korea (South)*

9:20AM | A Quasi-Periodic Modulation Strategy to Mitigate EMI for a GaN-based Quasi-Z-Source DC-DC Converter
Saad Ul Hasan and Graham E. Town, *Macquarie University, Australia*

9:45AM | A General Space Vector PWM Scheme for Multilevel Inverters
Fa Chen and Wei Qiao, *University of Nebraska-Lincoln, United States*

10:10AM | Suppression of Common Mode Circulating Current for Modular Paralleled Three-phase Converters Based on Interleaved Carrier Phase-shift PWM
Zhongyi Quan and Yun Wei Li, *University of Alberta, Canada*

10:35AM | Modulation Strategies for Three-Phase AC-DC Matrix Converters: a Comparison
Michele Mengoni, Luca Zarri, Angelo Tani, Giovanni Serra, Domenico Casadei and Gabriele Rizzoli, *University of Bologna, Italy*

S25 Model Predictive Control of Power Converters

Room: 202D

Chairs: Po-Tai Cheng, Petros Karamanakos

8:30AM | Constrained Long-Horizon Direct Model Predictive Control for Power Electronics

Petros Karamanakos, Tobias Geyer and Ralph Kennel, *Technical University of Munich, Germany; ABB Switzerland LTD., Corporate Research, Switzerland*

8:55AM | Thermal-based Finite Control Set Model Predictive Control for IGBT Power Electronic Converters

Johannes Falck, Markus Andresen and Marco Liserre, *Kiel University, Germany*

9:20AM | Modulated Model Predictive Control for Active Split DC-bus 4-leg Inverters

Stefano Bifaretti, Luca Tarisciotti, Alessandro Lidozzi, Sabino Pipolo, Luca Solero and Pericle Zanchetta, *University of Rome Tor Vergata, Italy; University of Nottingham, United Kingdom; Roma Tre University, Italy*

9:45AM | Computationally Efficient Sphere Decoding for Long-Horizon Direct Model Predictive Control

Petros Karamanakos, Tobias Geyer, Toit Mouton and Ralph Kennel, *Technical University of Munich, Germany; ABB Switzerland LTD., Corporate Research, Switzerland; Stellenbosch University, South Africa*

10:10AM | Fixed Frequency Finite-State Model Predictive Control for Indirect Matrix Converters with Optimal Switching Pattern

Jiaxing Lei, Luca Tarisciotti, Andrew Trentin, Pericle Zanchetta, Patrick Wheeler and Andrea Formentini, *Nanjing University, China; University of Nottingham, United Kingdom*

10:35AM | Improved Steady State Behavior of Finite Control Set Model Predictive Control applied to a Flying Capacitor Converter

Margarita Norambuena, Pablo Lezana and Jose Rodriguez, *Technische Universitaet Berlin, Germany; Universidad Tecnica Federico Santa Maria, Chile; Universidad Andres Bello, Chile*

S26 Reluctance Machines

Room: 102B

Chairs: Akira Chiba, Yun Wei Li

8:30AM | A New Application and Experimental Validation of Moulding Technology for Ferrite Magnet Assisted Synchronous Reluctance Machine

Qian Wu, Kaiyuan Lu, Keld Folsach Rasmussen and Peter Omand Rasmussen, *Aalborg University, Denmark; Grundfos A/S, Denmark*

8:55AM | Magnetic Field Analytical Computation in Synchronous Reluctance Machines Considering the Iron Saturation

Hanafy Mahmoud, Nicola Chiodetto and Nicola Bianchi, *Padova University, Italy*

9:20AM | Performance Comparison of Short Pitched and Full Pitched Switched Reluctance Machines for Off-Road Vehicle Applications

Tausif Husain, Wasi Uddin and Yilmaz Sozer, *University of Akron, United States*

9:45AM | A Fault Tolerant Machine Drive Based on Permanent Magnet Assisted Synchronous Reluctance Machine

Bo Wang, Jiabin Wang, Antonio Griffo, Zhigang Sun and Ellis Chong, *The University of Sheffield, United Kingdom; Rolls-Royce plc, United Kingdom*

10:10AM | A General Approach for the Analysis and Comparison of Hybrid Synchronous Machines With Single-Axis or Bi-Axial Excitation

Fabio Giulii Capponi, Gabriele Borocci, Ion Boldea, Giulio De Donato and Federico Caricchi, *University of Roma "La Sapienza", Italy; Politeh. Univ. of Timisoara, Romania*

10:35AM | Flux Modulation Principles of DC-Biased Sinusoidal Current Vernier Reluctance Machines

Shaofeng Jia, Ronghai Qu, Dawei Li and Jian Li, *Huazhong University of Science and Technology, China*

S27 Materials and Manufacturing Issues of Electric Machines

Room: 101A

Chairs: Aldo Boglietti, Daniel Ludois

8:30AM | Stator Lamination Geometry Influence on the Building Factor of Synchronous Reluctance Motor Cores

Andrea Cavagnino and Zbigniew Gmyrek, *Politecnico di Torino, Italy; Lodz University of Technology, Poland*

8:55AM | Influence of PM Coating on PM Magnetization State Estimation Methods Based on Magnetoresistance Effect

Daniel Fernandez, David Reigosa, Juan Manuel Guerrero, Zi-Qiang Zhu and Fernando Briz, *University of Oviedo, Spain; University of Sheffield, United Kingdom*

9:20AM | Investigation of the Impact of Production Processes on Iron Losses of Laminated Stator Cores for Electric Machines

Marc Veigel, Alexandra Kraemer, Gisela Lanza and Martin Doppelbauer, *Karlsruhe Institute of Technology, Germany*

9:45AM | Influence of Manufacturing Tolerances on Cogging Torque in Interior Permanent Magnet Machines with Eccentric and Sinusoidal Rotor Contours

Xiao Ge and Z. Q. Zhu, *University of Sheffield, United Kingdom*

10:10AM | A Practical Approach of Electromagnetic Analysis with the Effect of the Residual Strain due to Manufacturing Processes

Hiroyuki Sano, Katsuyuki Narita, Eri Zeze, Takashi Yamada, Kazuki Ueta and Kan Akatsu, *JSOL Corporation, Japan; Shibaura Institute of Technology, Japan*

10:35AM | Investigation of Emerging Magnetic Materials for Application in Axial-Flux PM Machines

Solmaz Kahourzade, Nesimi Ertugrul and Wen Soong, *University of Adelaide, Australia*

S28 Induction Motor Drives

Room: 101B

Chairs: Sertac Bayhan, Di Pan

8:30AM | A Compact Active Filter to Eliminate Common-Mode Voltage in a SiC-based Motor Drive

Kellan Euerle, Kartik Iyer, Eric Severson, Rohit Baranwal, Saurabh Tewari and Ned Mohan, *University of Minnesota, United States; MTS Systems Corporation, United States*

8:55AM | Stator Inter-Turn Fault Detection for Seamless Fault-Tolerant Operation of Five-Phase Induction Motors

Vivek M. Sundaram and Hamid A. Toliyat, *Texas A and M University, United States*

9:20AM | Rotor Temperature Estimation in Doubly-Fed Induction Machines Using Rotating High Frequency Signal Injection

David Reigosa, Juan Manuel Guerrero and Fernando Briz, *University of Oviedo, Spain*

9:45AM | Maximum Torque Output for Volts/Hz Controlled Induction Machines in Flux-weakening Region

Kai Wang, Kevin Lee, Wenxi Yao and Fayi Chen, *Eaton Corporation, China; Eaton Corporation, United States; Zhejiang University, China*

10:10AM | Performance Investigation of Selected Prediction Vectors Based FS-PTC for 3L-NPC Inverter Fed Motor Drive

Md Habibullah, Dylan Dah-Chuan Lu, Dan Xiao and Muhammed Fazlur Rahman, *School of EIE, The University of Sydney, Australia; School of EET, University of New South Wales, Australia*

10:35AM | Inverter-fed Drive Stator Insulation Monitoring Based on Reflection Phenomena Stimulated by Voltage Step Excitation

Clemens Zoeller, Markus Vogelsberger and Thomas Wolbank, *TU Wien, Austria; Bombardier Transportation Austria, Austria*

S29 PM and IPM Motor Drives I

Room: 101CD

Chairs: Alireza Fatemi, Prerit Pramod

8:30AM | maximum torque per ampere control in stator flux linkage synchronous frame for DTC-based PMSM drives without using q-axis inductance

Atsushi Shinohara, Yukinori Inoue, Shigeo Morimoto and Masayuki Sanada, *Osaka Prefecture University, Japan*

8:55AM | A Novel Direct Torque Control Strategy for Interior Permanent Magnet Synchronous Motors Driven by a Three-level Simplified Neutral Point Clamped Inverter

Tung Ngo, Gilbert Foo, Craig Baguley, Deepu Mohan and Xinan Zhang, *Auckland University of Technology, New Zealand; Nanyang Technological University, Singapore; University of New South Wales, Australia*

9:20AM | Fault Tolerant Capability of Deadbeat – Direct Torque and Flux Control for Three-Phase PMSM Drives

Mario Pulvirenti, Giuseppe Scarcella, Giacomo Scelba and Robert D. Lorenz, *University of Catania, Italy; University of Wisconsin-Madison, United States*

9:45AM | Online MTPA Control for Salient-Pole PMSMs Using Square-Wave Current Injection

Yue Zhao, *University of Arkansas, United States*

10:10AM | Automatic MTPA Tracking in IPMSM Drives: Loop Dynamics, Design and Auto-Tuning

Nicola Bedetti, Sandro Calligaro, Christian Olsen and Roberto Petrella, *Gefran s.p.a., Italy; DPIA – University of Udine, Italy*

10:35AM | Reduction of Unbalanced Axial Magnetic Force in Post-fault Operation of a Novel Six-phase Double-stator Axial Flux PM Machine Using Model Predictive Control

Hanxiao Lu, Jian Li, Ronghai Qu, Linyuan Xiao and Donglin Ye, *Huazhong University of Science and Technology, China*

S30 Wide Bandgap Applications: Comparative Studies

Room: 202C

Chairs: Xiu Yao, Robert Pilawa-Podgurski

8:30AM | Comparative Evaluation of 15 kV SiC IGBT and 15 kV SiC MOSFET for 3-Phase Medium Voltage High Power Grid Connected Converter Applications

Sachin Madhusoodhanan, Krishna Mainali, Awneesh Tripathi, Arun Kadavelugu, Kasunaidu Vechalapu, Dhaval Patel and Subhashish Bhattacharya, *North Carolina State University, United States*

8:55AM | Comparison Between SiC and GaN Devices in 6.78 MHz 2.2 kW Resonant Inverters for Wireless Power Transfer

Jungwon Choi, Daisuke Tsukiyama and Juan Rivas, *Stanford University, United States; DAIHEN Advanced Component, Inc, Japan*

9:20AM | Comparison of GaN FET and Si MOSFET Based Vienna Rectifiers

Yutong Zhu and Yehui Han, *University of Wisconsin Madison, United States*

9:45AM | Comparison of GaN and SiC Power Devices in Application to MW-scale Quasi-Z-Source Cascaded Multilevel Inverters

Haiyu Zhang, Baoming Ge, Yushan Liu, Robert S. Balog and Haitham Abu-Rub, *Texas A and M University, United States; Texas A and M University at Qatar, Qatar*

10:10AM | Comparison of Deadtime Effects on the Performance of dc-dc Converters with GaN FETs and Silicon MOSFETs

John Glaser and David Reusch, *Efficient Power Conversion, United States*

10:35AM | Characterization and Comparison of Latest Generation 900-V and 1.2-kV SiC MOSFETs

Alinaghi Marzoughi, Rolando Burgos and Dushan Boroyevich, *CPES – Virginia Tech, United States*

S31 Gate Drive Techniques I

Room: 102A

Chairs: Prasad Enjeti, Daniel Costinett

8:30AM | High Speed Optical Gate Driver for Wide Band Gap Power Transistors

Davy Colin and Nicolas Rouger, *Grenoble Electrical Engineering Laboratory, France*

8:55AM | Reduction of Oscillations in a GaN Bridge Leg Using Active Gate Driving with Sub-ns Resolution, Arbitrary Gate-Impedance Patterns

Harry C. P. Dymond, Dawei Liu, Jianjing Wang, Jeremy J. O. Dalton, Neville McNeill, Dinesh Pamunuwa, Simon J. Hollis and Bernard H. Stark, *University of Bristol, United Kingdom*

9:20AM | Design Considerations and Comparison of High-speed Gate Drivers for Si IGBT and SiC MOSFET Modules

Shan Yin, King Jet Tseng, Pengfei Tu, Rejeki Simanjorang and Amit K. Gupta, *Nanyang Technological University, Singapore; Rolls-Royce Singapore Pte. Ltd., Singapore*

9:45AM | Active Gate Driving Technique for a 1200 V SiC MOSFET to Minimize Detrimental Effects of Parasitic Inductance in the Converter Layout

Parthasarathy Nayak and Kamalesh Hatua, *Indian Institute of Technology Madras, India*

10:10AM | Comprehensive Evaluation of Gate Boost Driver for SiC-MOSFETs

Koji Yamaguchi and Yukihiko Sato, *IHI Corporation, Japan; Chiba University, Japan*

10:35AM | Gate Driver for the Active Thermal Control of a DCDC GaN Based Converter

Pramod Kumar Prasobhu, Giampaolo Buticchi, Stephan Brueske and Marco Liserre, *Kiel University, Germany*

S32 Wireless Power Transfer II

Room: 202B

Chairs: Khurram Afridi, Huai Wang

8:30AM | A Mistuning-Tolerant and Controllable Power Supply for Roadway Wireless Power Systems

Abhilash Kamineni, Grant A. Covic and John T. Boys, *The University of Auckland, New Zealand*

8:55AM | Power Converter with Novel Transformer Structure for Wireless Power Transfer Using a DD2Q Power Receiver Coil Set

Guangjie Ke, Qianhong Chen, Wei Gao, Siu-Chung Wong and Chi.K. Tse, *Nanjing University of Aero. and Astro., China; Hong Kong Polytechnic University, Hong Kong*

9:20AM | A Wireless Power Transfer System with a Double Current Rectifier for EVs

Toshiyuki Fujita, Tomio Yasuda and Hirofumi Akagi, *Technova.inc, Japan; Tokyo Institute of Technology, Japan*

9:45AM | Hybrid Control of Inductive Power Transfer Charger for Electric Vehicles using LCCL-S Resonant Network in Limited Operating Frequency Range

Jongeun Byeon, Minhyuck Kang, Minkook Kim, Dong-Myoung Joo and Byoung Kuk Lee, *Sungkyunkwan University, Korea (South)*

10:10AM | Research on Seamless Transfer from CC to CV Modes for IPT EV Charging System Based on Double-sided LCC Compensation Network

Lu Jiang-Hua, Zhu Guo-rong, Lin Peng, Li Xiao-Kun, Li Wen-jing, Wong Siu-Chung and Jiang Jing, *Wuhan University of Technology, China; Hong Kong Polytechnic University, Hong Kong; University of Western Ontario, Canada*

10:35AM | Closed-Loop Control Design for WPT System Using Power and Data Frequency Division Multiplexing Technique

Zhongnan Qian, Ruichi Wang, Zhikun Wang, Jin Du, Jiande Wu and Xiangning He, *Zhejiang University, China*

Wednesday, September 21st

8:30AM – 10:10AM

S33 Photovoltaic Converters II

Room: 203AB

Chairs: Nathan Weise, Jaeho Choi

8:30AM | A 50kW High Power Density Paralleled-five-level PV Converter based on SiC T-type MOSFET Modules

YanJun Shi, Yuxiang Shi, Lu Wang, Ren Xie and Hui Li, *FSU, United States*

8:55AM | PV Array Voltage Range Extension for Photovoltaic Inverters Using a Mini-Boost

Emanuel Serban, Francisco Paz and Ordonez Martin, *ECE Department, Univ. of British Columbia, Canada*

9:20AM | Submodule Integrated Boost DC-DC Converters With No External Input Capacitor or Input Inductor for Low Power Photovoltaic Applications

Jen-Hung Huang, Brad Lehman and Ting Qian, *Northeastern University, United States; Tongji University, China*

9:45AM | Effective Control Approach for Multi-PVs Based Resonant Converter through Cross-switched Structure

Ali Elrayyah, Amr Ibrahim and Yilmaz Sozer, *Qatar Environmental and Energy Research Inst, Qatar; University of Akron, United States*

S34 Converter Applications for Alternative Energy Systems

Room: 203C

Chairs: Andrew Hintz, Shaojun Xie

8:30AM | Control Scheme for the Wide Operation Range of Induction Generator with a Vienna Rectifier in Wind Turbine Systems

Jin-Hyuk Park, June-Seok Lee and Kyo-Beum Lee, *Ajou University, Korea (South); KRRI, Korea (South)*

8:55AM | GaN Based High Gain Non-Isolated DC-DC Stage of Microinverter with Extended-Duty-Ratio Boost

Jinia Roy and Raja Ayyanar, *Arizona State University, United States*

9:20AM | High-Efficiency Three-Level SEPIC for Grid-Tied PV Systems

Min-Kwon Yang, Seung-Jae Lee, Jun Heo and Woo-Young Choi, *Chonbuk National University, Korea (South)*

9:45AM | A Novel Zero-voltage-switched Multi-resonant DC-DC Converter

Ling Gu and Ke Jin, *Nanjing University of Aero. and Astro., China*

S35 Modeling, Analysis, and Control of Grid-Connected Converters I

Room: 202D

Chairs: Fred Wang, Paolo Mattavelli

8:30AM | Seamless Transfer Strategy Considering Power Balance in Parallel Operation

Chee Seung-Jun, Lee Younggi, Son Young-Kwang, Sul Seung-Ki, Lim Changjin and Huh Sungjae, *Seoul National University, Korea (South); LG Electronics, Korea (South)*

8:55AM | Robust Control for Parallel Operated L-Inverters with Uncertainty and Disturbance Estimator

Yeqin Wang, Qing-Chang Zhong and Beibei Ren, *Texas Tech University, United States; Illinois Institute of Technology, United States*

9:20AM | Active and Reactive Power Operational Region for Grid-Interactive Cascaded H-Bridge Multilevel Converters

Jacob Lamb and Mirafzal Behrooz, *Kansas State University, United States*

9:45AM | Harmonic Stability Analysis and Controller Parameter Design of Three-Phase Inverter-Based Multi-Bus Ac Systems Based on Sequence Impedances

Wenchao Cao, Yiwei Ma and Fred Wang, *The University of Tennessee, Knoxville, United States*

S36 Utility Applications II

Room: 202A

Chairs: Deepak Divan, Alireza Nami

8:30AM | Full-ZVS Modulation for All-SiC ISOP-Type Isolated Front End (IFE) Solid-State Transformer

Jonas E. Huber, Daniel Rothmund, Li Wang and Johann W. Kolar, *Power Electronic Systems Lab, ETH Zurich, Switzerland; FREEDM Systems Center, NC State University, United States*

8:55AM | Stability issues in reverse power flow limitation in a Smart Transformer-fed distribution grid

Giovanni De Carne, Giampaolo Buticchi and Marco Liserre, *Christian-Albrechts University of Kiel, Germany*

9:20AM | Smart Transformer-Based Hybrid Grid Loads Support in Partial Disconnection of MV/HV Power System

Chandan Kumar, Zhixiang Zou and Liserre Marco, *Indian Institute of Technology Guwahati, India; Christian-Albrechts-University of Kiel, Germany*

9:45AM | Soft-Switching Solid State Transformer (S4T)

Hao Chen and Deepak Divan, *Georgia Institute of Technology, United States*

S37 DC Microgrids I

Room: 203DE

Chairs: Giovanna Oriti, Babak Parkhideh

8:30AM | Hierarchical Coordination of a Hybrid AC/DC SmartGrid with Central/Distributed Energy Storage

Pablo Arboleya, Cristina Gonzalez-Moran, Pablo Garcia, Jorge Garcia and Bassam Mohamed, *University of Oviedo, Spain*

8:55AM | Dynamic Optimal Power Flow for DC Microgrids with Distributed Battery Energy Storage Systems

Thomas Morstyn, Branislav Hredzak and Vassilios Agelidis, *University of New South Wales, Australia*

9:20AM | DC Electric Springs with Modified Droop Control for Storage Reduction in DC Microgrids

Ming Hao Wang, Shuo Yan, Siew Chong Tan and Shu Yuen Ron Hui, *The University of Hong Kong, Hong Kong*

9:45AM | Optimal Droop Surface Control of Dc Microgrids Based on Battery State of Charge

Arthur Jones and Wayne Weaver, *Michigan Technological University, United States*

S38 Transportation Electrification I

Room: 102D

Chairs: Bulent Sarlioglu, Tim Burress

8:30AM | A Modified Z-source Converter based Single Phase PV/Grid Inter-connected DC Charging Converter for Future Transportation Electrification

Siddhartha A. Singh, Giampaolo Carli, Najath A. Azeez and Sheldon S. Williamson, *University of Ontario Institute of Technology, Canada; EMD Technologies – Heico Corporation., Canada*

8:55AM | Comprehensive design comparison of using different order harmonics as the power carrier in wireless power transfer for PHEV and EV Wireless Charging

Hulong Zeng and Fang Z. Peng, *Michigan State University, United States*

9:20AM | A New Inductive Wireless Power Transfer Topology Using Current-Fed Half-Bridge CLC Transmitter LC Receiver Configuration

Akshay Rathore and Suvendu Samanta, *Concordia University, Montreal, Canada*

9:45AM | Reduction on Radiation Noise Level for Inductive Power Transfer Systems with Spread Spectrum focusing on Combined Impedance of Coils and Capacitors

Kent Inoue, Keisuke Kusaka and Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

S39 Modeling and Control of DC-DC Converters II

Room: 102C

Chairs: Reza Sabzehgar, Liuchen Chang

8:30AM | A New High-Frequency Simulation Model for Multi-Winding Transformers used in Switched-Mode Power Supplies

Ripunjay Phukan, Lakshmi Ravi, Amirhossein Shahirinia and Rangarajan Tallam, *Georgia Institute of Technology, Atlanta GA, United States; Rockwell Automation, Mequon WI, United States; Alfred University, Alfred NY, United State*

8:55AM | Multi-Phase Sliding Mode Control for Chattering Suppression in a DC-DC Converter

Woonki Na, Pengyuan Chen, Harkamal Singh and Jonghoon Kim, *Cal St Univ-Fresno, United States; Chosun University, Korea (South)*

9:20AM | Gradient-reference-current Control of Tri-state Buck Converter to Improve Dynamic Response over Wide Load Range

Shuhan Liao, Xiaoming Zha, Fei Liu, Wenjun Liu and Kun Feng, *Wuhan University, China*

9:45AM | A Control Strategy for Paralleled Bi-Directional DC-DC Converters Used in Energy Storage Systems

Zhenya Zhang, Zhao Zhang, Shaojun Xie and Chen Yang, *Nanjing University of Aero. and Astronautics, China*

S40 Modulation Techniques II

Room: 102E

Chairs: Madhu Sudhan Chinthavali, Sufei Li

8:30AM | Steady-State Analysis of the Phase Shift Modulated LLC Resonant Converter

Wei Liu, Binbin Wang, Wenxi Yao, Zhengyu Lu and Xiaoyi Xu, *Zhejiang University, China; State Grid Nantong Supply Company, China*

8:55AM | Practical Implementation of Global Synchronous Pulse Width Modulation with Time Delay Compensation and Distributed Calculation Capabilities

Tao Xu, Feng Gao and Liwei Zhou, *Shandong University, China*

9:20AM | Research on Zero-Sequence Circulating Currents in Parallel Three-Level Grid-Tied Photovoltaic Inverters

Yang Li, Xu Yang, Wenjie Chen and Zhang Feng, *Xi'an Jiaotong University, EE, China*

9:45AM | Modified Pulse Energy Modulation Technique of a Three-Switch Buck-Boost Inverter

Shuang Xu, Riming Shao, Liuchen Chang and Shuying Yang, *University of New Brunswick, Canada; Hefei University of Technology, China*

S41 Modeling, Control and Stability of Modular Multilevel Converters

Room: 202E

Chairs: Rik De Doncker, Pragasen Pillay

8:30AM | MMC-HVDC: Simulation and Control Strategy

Suman Debnath and Madhusudhan Chinthavali, *Oak Ridge National Laboratory, United States*

8:55AM | Hybrid Railway Power Conditioner Based on Half-Bridge Modular Multilevel Converter

Li Liu and NingYi Dai, *University of Macau, Macau*

9:20AM | A PWM Method Reducing Harmonics of Two Interleaved Converters

Jaejin Han, Younggi Lee and Seung-Ki Sul, *Seoul National University, Korea (South)*

9:45AM | DC Impedance Modeling and Stability Analysis of Modular Multilevel Converter for MVDC Application

Ran Mo, Qing Ye and Hui Li, *Florida State University, United States*

S42 Reluctance Machines II

Room: 102B

Chairs: Babak Fahimi, Sufei Li

8:30AM | Segmented Rotor Design of Concentrated Wound Switched Reluctance Motor (SRM) for Torque Ripple Minimization

Md Ashfanor Kabir and Iqbal Husain, *North Carolina State University, United States; North Carolina State Univervsity, United States*

8:55AM | Extending the Speed Range of A Switched Reluctance Motor Using a Fast Demagnetizing Technique

Mohamad Abd Elmutalab, Elrayyah Ali, Tausif Husain and Yilmaz Sozer, *University of Akron, United States; Qatar Environmental and Energy Research Inst, Qatar*

9:20AM | Development and Analysis of U-core Switched Reluctance Machine

Rasmus Jaeger, Simon Staal Nielsen, Kristian Kongerslev and Peter Omand Rasmussen, *Aalborg University, Denmark; Hydratech Industries, Denmark*

9:45AM | Torque Ripple and Acoustic Noise of Current Modulations of a Pseudo-Sinusoidal Switched Reluctance Motor

Qingqing Ma, Lanhua Zhang, Xiaonan Zhao, Xuesen Cui and Jih-Sheng Lai, *Virginia Tech, United States; North China Electric Power University, China*

S43 PM Machines I

Room: 101A

Chairs: Ayman El-Refaie, Ali Bazzi

8:30AM | Proposal of Electrically Reversal Magnetic Pole Type Variable Magnetic Flux PM Motor

Masahiro Aoyama, Kazukiyo Nakajima and Toshihiko Noguchi, *SUZUKI Motor Corporation, Japan; Shizuoka University, Japan*

8:55AM | Torque and Core Loss Characterization of a Variable-Flux Permanent-Magnet Machine

Chirag Desai and Pragasen Pillay, *Concordia University, Canada*

9:20AM | Examination to Enhance Efficiency of V-shaped IPMSM Using Concentrated Winding Structure at High Speed and High Torque Area

Ayato Nihonyanagi, Takemoto Takemoto, Satoshi Ogasawara, Naohiko Aoki and Kwansu Lee, *Hokkaido University, Japan; LG Electronics JAPAN Lab. Inc., Japan*

9:45AM | Advanced High Torque Density Non-overlapping Winding PM Vernier Machines

Tianjie Zou, Dawei Li, Ronghai Qu, Jian Li and Dong Jiang, *Huazhong University of Science and Technology, China*

S44 Drive/Utility Interface

Room: 101B

Chairs: Nabeel Demerdash, Shih-Chin Yang

8:30AM | Synchronous Switching of Non-Line-Start Permanent Magnet Synchronous Machines between Inverter and Grid Drives

Ronggang Ni, Dianguo Xu, Frede Blaabjerg, Gaolin Wang, Binbin Li and Kaiyuan Lu, *Harbin Institute of Technology, China; Aalborg University, Denmark*

8:55AM | Instability Detection and Protection Scheme for Efficiency Optimized V/f Driven Synchronous Reluctance Motors (SynRM)

Sara Ahmed, Gholamreza Jalali, Zach Pan and Hongrae Kim, *Virginia Polytechnic Institute and State University, United States; North Carolina State University, United States; ABB Inc., United States*

9:20AM | Power-Quality-Oriented Optimization in Multiple Three-Phase Adjustable Speed Drives

Yongheng Yang, Pooya Davari, Frede Blaabjerg and Firuz Zare, *Aalborg University, Denmark; The University of Queensland, Australia*

9:45AM | A Four-Quadrant Permanent Magnet Synchronous Machine Drive with a Tiny DC Link Capacitor

Mahima Gupta and Giri Venkataramanan, *University of Wisconsin – Madison, United States*

S45 PM and IPM Motor Drives II

Room: 101CD

Chairs: Omer Onar, Rakib Islam

8:30AM | Effect of Position Sensor Error on the Performance of IPMSM drives

Ramakrishnan Raja, Tomy Sebastian, Mengqi Wang, Mohammad Islam and Abraham Gebregergis, *Halla Mechatronics, Bay City, Michigan, United States; University of Michigan – Dearborn, Michigan, United States*

8:55AM | Signal-Injection-Aided Position and Speed Estimation for PMSM Drives with Low-Resolution Position Sensors

Giulio De Donato, Giacomo Scelba, Mario Pulvirenti, Giuseppe Scarcella and Fabio Giulii Capponi, *University of Rome – La Sapienza, Italy; University of Catania, Italy; University of Catania, Italy; university of Rome – La Sapienza, Italy*

9:20AM | Integrated Switch Current Sensor for Shortcircuit Protection and Current Control of 1.7-kV SiC MOSFET Modules

Jun Wang, Zhiyu Shen, Rolando Burgos and Dushan Boroyevich, *Center for Power Electronics Systems (CPES), United States*

9:45AM | Current Reconstruction Method for PMSM Drive System with a DC Link Shunt Resistor

Han-Beom Yeom, Hyun-Keun Ku and Jang-Mok Kim, *LG Electronics, Korea (South); Pusan National University, Korea (South)*

S46 Modeling of WBG Devices and Modules

Room: 202C

Chairs: Enrico Santi, Robert Pilawa-Podgurski

8:30AM | PSpice Modeling Platform for SiC Power MOSFET Modules with Extensive Experimental Validation

Lorenzo Ceccarelli, Muhammad Nawaz and Francesco Iannuzzo, *Aalborg University, Denmark; ABB Corporate Research Center, Sweden*

8:55AM | Development of Simulink-Based SiC MOSFET Modeling Platform for Series Connected Devices

Georgios Tsolaridis, Kalle Ilves, Paula Diaz Reigoza, Muhammad Nawaz and Francesco Iannuzzo, *ABB Corporate Research Center, Sweden; Aalborg University, Denmark*

9:20AM | An Accurate Subcircuit Model of SiC Half Bridge Module for Switching Loss Optimization

Pengfei Tu, Shan Yin, Peng Wang, King Jet Tseng, Chen Qi, Xiaolei Hu, Michael Adam Zagrodnik and Rejeki Simanjorang, *Nanyang Technological University, Singapore; Rolls-Royce Singapore Pte Ltd, Singapore*

9:45AM | Spatial Electro-Thermal Modeling and Simulation of Power Electronic Modules

Christoph van der Broeck, Lukas Ruppert and Rik De Doncker, *ISEA, RWTH Aachen University, Germany*

S47 Gate Drive Techniques II

Room: 102A

Chairs: Daniel Costinett, Pradeep S. Shenoy

8:30AM | Automatic Optimization of IGBT Gate Driving Waveform Using Simulated Annealing for Programmable Gate Driver IC

Koutarou Miyazaki, Makoto Takamiya and Takayasu Sakurai, *The University of Tokyo, Japan*

8:55AM | Active dv/dt Control of 600V GaN Transistors

Bingyao Sun, Rolando Burgos, Xuning Zhang and Dushan Boroyevich, *CPES-Virginia Tech, United States*

9:20AM | Commutation Strategies for Single-Chip Dual-Gate Bidirectional IGBTs in Matrix Converters

Daming Wang, Sai Tang, Jun Wang, Zhengbin Xiong, Shanglin Mo, Xin Yin, Zhikang Shuai and Z. John Shen, *Hunan University, China*

9:45AM | Two Comparison-Alternative High Temperature PCB-Embedded Transformer Designs for a 2 W Gate Driver Power Supply

Bingyao Sun, Remi Perrin, Cyril Buttay, Bruno Allard, Nicolas Quentin, Rolando Burgos, Dushan Boroyevich and Marwan Ali, *CPES-Virginia Tech, United States; Ampere lab – INSA Lyon, Univ. Lyon, France; Labinal Power Systems-SAFRAN, France*

S48 Wireless Power Transfer III

Room: 202B

Chairs: Tsorng-Juu Liang, Khurram Afridi

8:30AM | Performance Analysis of Magnetic Power Pads for Inductive Power Transfer Systems with Ferrite Structure Variation

Minkook Kim, Jongeun Byeon, Jae-Woo Lee and Byoung Kuk Lee, *Sungkyunkwan University, Korea (South); LG Electronics, Korea (South)*

8:55AM | Analysis of Mutually Decoupled Primary Coils for IPT Systems for EV Charging

Seho Kim, Abiezer Tejeda, Grant Anthony Covic and John Talbot Boys, *The University of Auckland, New Zealand*

9:20AM | Dynamic Matching System for Radio-Frequency Plasma Generation

Anas Al Bastami, Alexander Jurkov, Parker Gould, Mitchell Hsing, Martin Schmidt and David Perreault, *Massachusetts Institute of Technology, United States*

9:45AM | A Loosely Coupled Capacitive Power Transfer System with LC Compensation Circuit Topology

Hua Zhang, Fei Lu, Heath Hofmann, Weiguo Liu and Chris Mi, *Northwestern Polytechnical University, China; University of Michigan, United States; San Diego State University, United States*

Wednesday, September 21st

10:30AM – 12:10PM

S49 Control for Photovoltaic Applications

Room: 203AB

Chairs: Martin Ordonez, Dezso Sera

10:30AM | A Variable Step-Size MPPT for Sensorless Current Model Predictive Control for Photovoltaic Systems

Morcos Metry, Mohammad B. Shadmand, Robert S. Balog and Haitham Abu-Rub, *Texas A and M University, United States; Texas A and M University at Qatar, Qatar*

10:55AM | Study on the Unbalanced Current Injection Capability of Grid-Connected Photovoltaic Neutral-Point-Clamped Inverter

Hossein Dehghani Tafti, Ali Iftekhhar Maswood, Karthik Kandasamy, Ziyu Lim, Gabriel Ooi Heo Peng, Georgios Konstantinou and Josep Pou, *Nanyang Technological University, Singapore; University of New South Wales, Australia*

11:20AM | Adaptive Dc Link Voltage Control Scheme for Single Phase Inverters with Dynamic Power Decoupling

Yinglai Xia and Raja Ayyanar, *Arizona State University, United States*

11:45AM | ZVS Analysis and Power Flow Control for Three Limb Transformer Enabled SiC Mosfet Based Three Port DAB Integrating PV and Energy Storage(ES)

Ritwik Chattopadhyay and Subhashish Bhattacharya, *NCSU, United States*

S50 Photovoltaic Characterization and Modeling

Room: 203C

Chairs: Tirthajyoti Sarkar, Ahmed Elasser

10:30AM | A Rapid I-V Curve Generation for PV Model-based Solar Array Simulators

Young-Tae Seo, Jun-Young Park and Sung-Jin Choi, *University of Ulsan, Korea, Republic of*

10:55AM | Photovoltaic Panel Simulation Based on Individual Cell Condition

Eduardo Abdon Sarquis Filho, Antonio Cezar de Castro Lima, Fabiano Fragoso Costa and Andre Pires Nobrega Tahim, *Universidade Federal da Bahia, Brazil*

11:20AM | Development and Implementation of a PV Performance Monitoring System Based On Inverter Measurements

Sergiu Spataru, Anamaria Gavrilita, Lars Maaloe, Dezso Sera and Ole Winther, *Aalborg University, Denmark; Technical University of Denmark, Denmark*

11:45AM | Characterization of Silicon Based Photovoltaic Cells Using Broadband Impedance Spectroscopy

Olufemi Olayiwola and Paul Barendse, *University of Cape Town, South Africa*

S51 Utility Applications III

Room: 202A

Chairs: Srdjan Lukic, Deepak Divan

10:30AM | DC Solid State Transformer Based on Input-Series-Output-Parallel Dual-Active-Bridge for MVDC Power Distribution

Biao Zhao, Qiang Song, Jianguo Li and Wenhua Liu, *Tsinghua University, China; Tsinghua University, China*

10:55AM | Six-Leg Single-Phase to Three-Phase Converter

Nayara Brandao de Freitas, Cursino Brandao Jacobina, Ayslan Caissón Noroês Maia and Alexandre Cunha Oliveira, *Federal University of Campina Grande, Brazil*

11:20AM | Flexible Transformers for Distribution Grid Control

Hao Chen, Prasad Kandula, Anish Prasai, Joe Schatz and Deepak Divan, *Georgia institute of technology, United States; Georgia Institute of Technology, United States; Varentec, Inc., United States; Southern Company, United States*

11:45AM | Comparative Analysis of Modular Multiport Power Electronic Transformer Topologies

Mario Lopez, Fernando Briz, Mariam Saeed, Manuel Arias and Alberto Rodriguez, *University of Oviedo, Spain*

S52 Modeling, Analysis, and Control of Grid-Connected Converters II

Room: 202D

Chairs: Frede Blaabjerg, Gilbert Bergna-Diaz

10:30AM | Advanced Control of a High Power Converter Connected to Weak Grids

Shahparasti Mahdi, Catalan Pedro, Luna Alvaro, Candela Jose Ignacio and Rodriguez Pedro, *Technical University of Catalonia, Spain; Ingeteam Power Technology, Spain*

10:55AM | A Power Density Optimization Method for a Power Pulsation Decoupling Buffer in Single-Phase DC-AC Converters

Shibin Qin and Robert Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States*

11:20AM | Control Design in \mathcal{H}_∞ -Synthesis Framework for Grid-Connected Inverters with Higher Order Filters

Nima Amouzegar Ashtiani, Mohsen Azizi and Sayed Ali Khajehoddin, *University of Alberta, Canada; Michigan Technological University, United States*

11:45AM | Sensorless Current Model Predictive Control for Maximum Power Point Tracking of Single-Phase subMultilevel Inverter for Photovoltaic Systems

Morcos Metry, Sertac Bayhan, Mohammad B. Shadmand, Robert S. Balog and Haitham Abu-Rub, *Texas A and M University, United States; Texas A and M University at Qatar, Qatar*

S53 DC Microgrids II

Room: 203DE

Chairs: Josep M. Guerrero, Ali Davoudi

10:30AM | An Adaptive Power Distributed Control Method to Ensure Proportional Load Power Sharing in DC Microgrid Considering Equivalent Line Impedances

Duy-Hung Dam and Hong-Hee Lee, *University of Ulsan, Korea (South)*

10:55AM | The Performance of Polytopic Models in Smart DC Microgrids

Airan Frances, Rafael Asensi, Oscar Garcia, Roberto Prieto and Javier Uceda, *Universidad Politecnica de Madrid, Spain*

11:20AM | Study on DC Arc Faults in Ring-Bus DC Microgrids with Constant Power Loads

Xiu Yao, *University at Buffalo, SUNY, United State*

11:45AM | Stability Analysis and Improvement of a Dual Active Bridge (DAB) Converter Enabled DC Microgrid based on a Reduced-order Low Frequency Model

Qing Ye, Ran Mo and Hui Li, *Florida State University, United States*

S54 Datacenters and Telecommunication Applications

Room: 102E

Chairs: Philip Krein, Johan Enslin

10:30AM | Soft-Switching Operation of Edge-Resonant Output-Inductor-Less Full-Bridge Converter

Kazuhide Domoto, Yoichi Ishizuka, Seiya Abe and Tamotsu Ninomiya, *Nagasaki University, Japan; Kyushu Institute of Technology, Japan; Green Electronics Research Institute, Kitakyushu, Japan*

10:55AM | High Efficiency Two-Stage 48V VRM with PCB Winding Matrix Transformer

Mohamed Ahmed, Chao Fei, Fred C. Lee and Qiang Li, *CPES – Virginia Tech, United States*

11:20AM | Hierarchical Protection Architecture for 380V DC Data Center Application

Kai Tan, Xiaoqing Song, Chang Peng, Pengkun Liu and Alex Huang, *North Carolina State University, United States; North Carolina State University, United States*

11:45AM | Device Loss Comparison of GaN Device Based LLC, Dual Active Bridge and Phase Shift Quasi Switched Capacitor Circuit

Boxue Hu, Xuan Zhang, Lixing Fu, He Li, Yousef M. Abdullah, Yafeng Wang, Lurao Liu and Jin Wang, *The Ohio State University, United States*

S55 Transportation Electrification II

Room: 102D

Chairs: Sinisa Jurkovic, Bruno Lequesne

10:30AM | Loss Optimizing Control of a Multiphase Interleaving DC-DC Converter for Use in a Hybrid Electric Vehicle Drivetrain

Rashidreza Karimi, Dennis Kaczorowski, Alexander Zlotnik and Mertens Axel, *Leibniz University of Hannover, Germany*

10:55AM | Traction Inverter Evaluation Method Based on Driving Cycles for Electric and Hybrid Electric Vehicles

Fan Xu and Lihua Chen, *Ford Motor Company, United States*

11:20AM | Model Predictive Control based Field-weakening Strategy for Traction EV used Induction Motor

Jianyong Su, Rui Gao and Iqbal Husain, *Harbin Institute of Technology, China; North Carolina State University, United States*

11:45AM | Design Optimization and Development of Electric Traction Machines for Cadillac CT6 PHEV

Sinisa Jurkovic, Khwaja Rahman and Peter Savagian, *General Motors, United States*

S56 PFC Rectifiers

Room: 202E

Chairs: Ned Mohan, Alessandro Costabeber

10:30AM | Active Virtual Ground – Bridgeless PFC Topology

Carl Ngai-Man Ho, River Tin-Ho Li and Ken King-Man Siu, *University of Manitoba, Canada; ABB (China) Ltd., China*

10:55AM | A 500 kHz, 3 kW Power Factor Correction Circuit with Low Loss Auxiliary ZVT Circuit

Siddharth Kulasekaran and Raja Ayyanar, *Arizona State University, United States*

11:20AM | A Two-Switch Buck-Boost PFC Rectifier With Automatic AC Power Decoupling Capability

Wenlong Qi, Sinan Li, Siew Chong Tan and Shu Yuen Ron Hui, *The University of Hong Kong, Hong Kong*

11:45AM | High Efficiency Bridgeless Power Factor Correction Buck Converter for High Frequency AC Systems

Zhe Yang, Sitthisak Kiratipongvoot and Chi Kwan Lee, *The University of Hong Kong, Hong Kong*

S57 Modeling and Control of Multilevel Converters

Room: 202B

Chairs: Mengqi Wang, Marcello Pucci

10:30AM | An Improved Proportional Pulse Compensation Strategy for DC Voltage Balance of Cascaded H-Bridge Rectifier

Xiang Li, Jian Wang, Xiaojie You and Kun Wang, *Beijing Jiaotong University, China*

10:55AM | Cost effective Capacitor Voltage Balancing Control for Five-level Grid-tied Inverters

Mingchen Gu, Li Zhang, Kai Sun, Yan Xing and Peng Xu, *Nanjing Univ. of Aeronautics and Astronautics, China; Hohai University, China; Tsinghua University, China*

11:20AM | A Single Phase T-type Inverter Operating in Boundary Conduction Mode

Zhen Zhang, Junming Zhang and Xinke Wu, *Zhejiang university, China; Zhejiang University, China*

11:45AM | Three-Phase Four-Wire AC-DC-AC Multilevel Topologies Obtained from an Interconnection of Three-leg Converters

Ayslan Caisson Noroes Maia, Cursino Brandao Jacobina, Nayara Brandao de Freitas, Antonio de Paula Dias Queiroz and Edison Roberto Cabral da Silva, *Federal University of Campina Grande, Brazil*

S58 Modeling and Control of Resonant Converters

Room: 102C

Chairs: Rolando Burgos, Marko Hinkkanen

10:30AM | Extreme Start-Up Response of LLC Converters Using Average Geometric Control

Mehdi Mohammadi and Martin Ordonez, *University of British Columbia, Canada*

10:55AM | Optimized Resonant Pulsed Power Supplies with Deadbeat – Repetitive Regulation

Chao Ji, Jon Clare and Pericle Zanchetta, *University of Nottingham, United Kingdom*

11:20AM | Control and Operation of Medium-voltage High-power Bi-directional Resonant DC-DC Converters in Shipboard DC Distribution Systems

Dong Dong, Luis Garces, Mohammed Agamy, Yan Pan, Xinhui Wu, He Xu, Hongwu She, Xiaohong Li and Jian Dai, *GE Global Research, United States; GE Global Research, United States; GE Global Research, China; GE Global Research, China*

11:45AM | Inductance Cancellation in RF Resonant Power Converters

Max Praglin, Luke Raymond and Juan Rivas, *Stanford University, United States*

S59 Electric Machines for Automotive Applications I

Room: 102B

Chairs: Thomas Jahns, Sinisa Jurkovic

10:30AM | Retrospective of Electric Machines for EV and HEV Traction Applications at General Motors

Khawaja Rahman, Sinisa Jurkovic, Peter Savagian, Nitinkumar Patel and Robert Dawsey, *General Motors, United States*

10:55AM | High-Performance Partitioned-Stator Switched Flux Memory Machines with Hybrid Magnets on External Stator for Automotive Traction Applications

Hui Yang, Z. Q. Zhu, Heyun Lin, Shuhua Fang and Yunkai Huang, *Southeast University, China; University of Sheffield, United Kingdom*

11:20AM | Test Results for a High Temperature Non-Permanent Magnet Traction Motor

Tsarafidy Raminosoa, Ayman El-Refaie, David Torrey, Kevin Grace, Di Pan, Stefan Grubic, Karthik Bodla and Kum-Kang Huh, *GE Global Research, United States; Faraday and Future, United States*

11:45AM | Vehicular Suspension and Propulsion Using Double Sided Linear Induction Machines

Tom Cox, Fred Eastham and Matt Dickinson, *The University of Nottingham, United Kingdom; The University of Bath, United Kingdom; Force Engineering Ltd., United Kingdom*

S60 PM Machines II

Room: 101A

Chairs: Siavash Pakdelian, Nicola Bianchi

10:30AM | Experimental Verification of Rotor Demagnetization in a Fractional-Slot Concentrated-Winding PM Synchronous Machine under Drive Fault Conditions

Gilsu Choi, Yichao Zhang and Thomas Jahns, *University of Wisconsin – Madison, United States*

10:55AM | Influence of Stator Configuration on High Frequency Signal Injection Based Permanent Magnet Temperature Estimation in PMSMs

Daniel Fernandez, David Reigosa, Devraj Dutt, Zi-Qiang Zhu and Fernando Briz, *University of Oviedo, Spain; University of Sheffield, United Kingdom*

11:20AM | Analysis and Design Guidelines to Mitigate Demagnetization Vulnerability in PM Synchronous Machines

Gilsu Choi and Thomas Jahns, *University of Wisconsin – Madison, United States*

11:45AM | The Nature of the Torque Ripple in Fractional-slot Synchronous PMAREL Machines

Nicola Bianchi, Alessandro Castagnini, Giulio Secondo and Pietro Savio Termini, *University of Padova, Italy; ABB, Discrete Automation and Motion Division, Italy*

S61 Multilevel Motor Drives

Room: 101B

Chairs: Luca Zarri, Yi Deng

10:30AM | A Fault-Tolerant T-Type Multilevel Inverter Topology with Soft-Switching Capability Based on Si and SiC Hybrid Phase Legs

Jiangbiao He, Nathan Weise, Ramin Katebi, Lixiang Wei and Nabeel Demerdash, *GE Global Research, United States; Marquette University, United States; Rockwell Automation, United States*

10:55AM | An On-Line Diagnostic Method for Open-Circuit Switch Faults in NPC Multilevel Converters

Jiangbiao He and Nabeel Demerdash, *GE Global Research, United States; Marquette University, United States*

11:20AM | Analysis of Neutral Point Deviation in 3-level NPC Converter under Unbalanced 3-phase AC Grid

Kyungsub Jung and Yongsug Suh, *Elec. Eng. Chonbuk Nat'l Univ., Korea (South)*

11:45AM | A Modulation Technique of Neutral Point Clamped Converters with Common-Mode Voltage Reduction and Neutral-Point Potential Balance

Meng-Jiang Tsai, Hsin-Chih Chen, Po-Tai Cheng, Meng-Ru Tsai and Yao-Bang Wang, *National Tsing Hua University, Taiwan*

S62 PM and IPM Motor Drives III

Room: 101CD

Chairs: Takahiro Suzuki, Nicola Bianchi

10:30AM | Magnet Temperature Effects on the Useful Properties of Variable Flux PM Synchronous Machines and a Mitigating Method for Magnetization Changes

Brent Gagas, Kensuke Sasaki, Apoorva Athavale, Takashi Kato and Robert Lorenz, *University of Wisconsin-Madison, WEMPEC, United States; Nissan Motor Co., Ltd., Japan*

10:55AM | Nonintrusive Online Rotor Permanent Magnet Temperature Tracking for Permanent Magnet Synchronous Machine Based on Third Harmonic Voltage

Hanlin Zhan and Z.Q. Zhu, *The University of Sheffield, United Kingdom*

11:20AM | Permanent Magnet Temperature Estimation in PMSM Using Low Cost Hall Effect Sensors

Daniel Fernandez, Doosoo Hyun, Yonghyun Park, David Reigosa, Sang Bin Lee, Dong Myung Lee and Fernando Briz, *University of Oviedo, Spain; Dept. of Elec. Eng., Korea University, Seoul, Korea (South); Dept. of Elec. Eng., Hongik University, Seoul, Korea (South)*

11:45AM | Analysis and Suppression of Zero Sequence Circulating Current in Open Winding Permanent Magnet Synchronous Machine Drives with Common DC Bus

Hanlin Zhan, Z.Q. Zhu and Milijana Odavic, *The University of Sheffield, United Kingdom*

S63 Wide Bandgap Applications: SiC

Room: 202C

Chairs: Ruxi Wang, Jerry Hudgins

10:30AM | A Compact 100-A, 850-V, Silicon Carbide Solid-State DC Circuit Breaker

Damian Urciuoli, Oladimeji Ibitayo, Gail Koebke, Gregory Ovrebø and Ronald Green, *U.S. Army Research Laboratory, United States*

10:55AM | Matrix Converter with Sinusoidal Input-Output Filter and Filter Downsizing Using SiC Devices

Yasunori Furukawa, Takeshi Kinomae, Hidenori Hara, Masato Higuchi, Ryoji Tomonaga, Kohei Shirabe and Tsuneo Kume, *Yaskawa Electric Corporation, Japan*

11:20AM | H-Bridge Building Block with SiC Power MOSFETs for Pulsed Power Application

Ruxi Wang, Juan Sabate, Fengfeng Tao, Cong Li, Xiaohu Liu and Fei Xu, *GE Global Research Center, United States; GE Global Research Center, China*

11:45AM | Three-phase Active Front-end Rectifier Efficiency Improvement with Silicon Carbide Power Semiconductor Devices

Mao Saijun, Wu Tao, Lu Xi, Popovic Jelena and Ferreira Jan Abraham, *GE Global Research, China; TU Delft, Netherlands*

S64 LED Drivers

Room: 102A

Chairs: Huai Wang, David Perreault

10:30AM | Precise and Full-Range Dimming Control for An Off-Line Single-Inductor-Multiple-Output LED Driver

Sinan Li, Yue Guo, Ting Leung Albert Lee, Siew Chong Tan and Shu Yuen Ron Hui, *The University of Hong Kong, Hong Kong*

10:55AM | Design and Implementation of a Retrofit LED Lamp for AC Mains and Ballasts

Tsornng-Juu Liang, Huan-Hao Chang, Kai-Hui Chen and Li-An Hsu, *National Cheng Kung University, Taiwan*

11:20AM | A Current Compensator for Mitigating the Influence of Long Cable Inductance between the LED Driver and the Light Source

Rui Zhou, Ryan Shun-Cheung Yeung, Henry Shu-Hung Chung, John Yau-Chung Chan and Norman Chung-fai Tse, *City University of Hong Kong, Hong Kong*

11:45AM | Investigation into the Use of Single Inductor for Driving Multiple Series-Connected LED Channels

Xiaoqing Zhan, Henry Shu-Hung Chung and Ruihong Zhang, *City University of Hong Kong, Hong Kong; Northwestern Polytechnical University, China*

Wednesday, September 21st

1:30PM – 3:10PM

S65 Modeling and Control of Alternative Energy Applications

Room: 203C

Chairs: Eduard Muljadi, Ranjit Mahanty

1:30PM | Using Markov Switching Model for Solar Irradiance Forecasting in Remote Microgrids

Ayush Shakya, Semhar Michael, Christopher Saunders, Douglas Armstrong, Prakash Pandey, Santosh Chalise and Reinaldo Tonkoski, *South Dakota State University, United States*

1:55PM | Determining Maximum MPP-Tracking Sampling Frequency for Input-Voltage-Controlled PV-Interfacing Converter

Jyri Kivimäki, Moshe Sitbon, Sergei Kolesnik, Alon Kuperman and Teuvo Suntio, *Tampere University of Technology, Finland; Ariel University, Israel*

2:20PM | Real-time Emulation of a Pressure Retarded Osmosis Power Generation System

Sudharshan Kaarthik, Jonathan Maisonneuve and Pragasen Pillay, *Concordia University, Canada*

2:45PM | Efficient FCTV Provision considering DWT and DWPT-based Noise Suppression for Overcoming the Noise-Induced Voltage Loss in PEM Fuel Cell

Jonghoon Kim, Woonki Na and Yongsug Tak, *Chosun University, Korea (South); California State University, Fresno, United States; Inha University, Korea (South)*

S66 Utility Applications IV

Room: 202A

Chairs: Fariba Fateh, Xu She

1:30PM | Field Test Results for a 12.47 kV 3-Phase 1 MVA Power Router

Rajendra Prasad Kandula, Hao Chen, Anish Prasai, Frank Lambert, Joe Schatz, Thomas Powell, Timothy Heidel, Colin Schauder and Deepak Divan, *Georgia Institute of Technology, United States; Varentec, United States; Southerncompany, United States; Georgia Power, United States; Advanced Research Projects Agency-Energy, United States; Booz Allen Hamilton, United States*

1:55PM | DC Capacitor Voltage Balancing Control for Delta-Connected Cascaded H-Bridge STATCOM Considering the Unbalanced Grid and Load Conditions

Jae-Jung Jung, Joon-Hee Lee, Seung-Ki Sul, Gum Tae Son and Young-Ho Chung, *Seoul National University, Korea (South); LS Industrial Systems Co. Ltd, Korea (South)*

2:20PM | Advanced Grid Simulator for Multi-Megawatt Power Converter Testing and Certification

Przemyslaw Koralewicz, Vahan Gevorgian, Pieder Joerg, Wim van der Merwe and Robb Wallen, *ABB, Poland; NREL, United States; ABB, Switzerland*

2:45PM | Experimental Verification of Capacitance Reduction in MMC-Based STATCOM

Takanori Isobe, Long Zhang, Ryuji Iijima, Hiroshi Tadano, Yasuhiko Kawanami and Katsushi Terazono, *University of Tsukuba, Japan; Yaskawa Electric Corp., Japan*

S67 Modeling, Analysis, and Control of Grid-Connected Converters III

Room: 202D

Chairs: Ali Davoudi, Edison da Silva

1:30PM | A Comparative Study of Methods for Estimating Virtual Flux at the Point of Common Coupling in Grid Connected Voltage Source Converters With LCL Filter

Nurul Fazlin Roslan, Jon Are Suul, Alvaro Luna, Joan Rocabert, Ignacio Candela and Pedro Rodriguez, *Universitat Politecnica de Catalunya, Terrassa, Spain; SINTEF Energy Research, Trondheim, Norway; Abengoa Research Centre, Seville, Spain*

1:55PM | A Novel Model Predictive Sliding Mode Control for AC/DC Converters with Output Voltage and Load Resistance Variations

Tingting He, Li Li, Jianguo Zhu and Zheng Linfeng, *FEIT, University of Technology, Sydney, Australia*

2:20PM | A Novel Virtual Synchronous Generator Control Strategy Based on Improved Swing Equation Emulating and Power Decoupling Method

Mingxuan Li, Yue Wang, Ningyi Xu, Yonghui Liu, Wenti Wang, Hao Wang and Wanjun Lei, *Xi'an Jiaotong University, China*

2:45PM | Virtual Impedance-Based Active Damping for LCL Resonance in Grid-Connected Voltage Source Inverters with Grid Current Feedback

Teng Liu, Zeng Liu, Jinjun Liu and Zipeng Liu, *Xi'an Jiaotong University, China*

S68 WBG in Traction Application

Room: 102D

Chairs: Burak Ozpineci, Anand Sathyan

1:30PM | Component Design and Implementation of a 60 kW Full SiC Traction Inverter with Boost Converter

Arvid Merkert, Jan-Kaspar Mueller and Axel Mertens, *Leibniz Universitaet Hannover, Germany*

1:55PM | Design Methodology for a Planarized High Power Density EV/HEV Traction Drive using SiC Power Modules

Dhrubo Rahman, Adam Morgan, Yang Xu, Rui Gao, Wensong Yu, Douglas C. Hopkins and Iqbal Husain, *North Carolina State University, United States*

2:20PM | A SiC-Based High-Performance Medium-Voltage Fast Charger for Plug-in Electric Vehicles

Srdjan Srdic, Xinyu Liang, Chi Zhang, Wensong Yu and Srdjan Lukic, *North Carolina State University, United States*

2:45PM | An Integrated Onboard Charger and Accessory Power Converter for Traction Drive Systems with a Boost Converter

Gui-Jia Su and Lixin Tang, *Oak Ridge National Lab, United States*

S69 Single Phase Rectifiers

Room: 202E

Chairs: Adam Skorek, Stefan Schroeder

1:30PM | Current-stress Reduction of the Neutral Inductor in a Rectifier with Two Outputs

Wen-Long Ming and Qing-Chang Zhong, *The University of Sheffield, United Kingdom; Illinois Institute of Technology, United States*

1:55PM | Single-stage AC/DC Dual Inductor BCM Current-Fed Push-Pull for HB-LED lighting applications

Ignacio Castro, Kevin Martin, Manuel Arias, Diego G. Lamar, Marta M. Hernando and Javier Sebastian, *University of Oviedo, Spain*

2:20PM | Asymmetric Single-Phase Current Source Rectifiers

Louelson Costa, Montie Vitorino, Mauricio Correa, Darlan Fernandes and Oliveira Marcus, *Federal University of Campina Grande, Brazil; Federal University of Paraiba, Brazil; Tocantins Federal Institute of Technology, Brazil*

2:45PM | A Bridgeless Controlled Rectifier for Single Split-Phase Systems

Nustenil S de M. L. Marinus, Cursino B Jacobina, Euzeli C dos Santos Jr., Nady Rocha and Nayara B. Freitas, *Federal University of Campina Grande, Brazil; Indiana University Purdue University Indianapo, United States*

S70 Multilevel Converters

Room: 202B

Chairs: NingYi Dai, Marcello Pucci

1:30PM | Modulation Method for Single-Phase Six-Switch Five-Level ANPC Inverter

Lei Kou, Hongliang Wang, Yan-fei Liu, Paresh C. Sen and Yan Zhang, *Queen's University, Canada*

1:55PM | Modified SVPWM to Eliminate Common-Mode Voltages for Five-Level ANPC Inverters

Quoc Anh Le and Dong-Choon Lee, *Yeungnam University, Korea, Republic of*

2:20PM | THD and Efficiency improvement in Multi-Level Inverters Through an Open End Winding Configuration

Salvatore De Caro, Salvatore Foti, Tommaso Scimone, Antonio Testa, Mario Cacciato, Giuseppe Scarcella and Giacomo Scelba, *University of Messina, Italy; University of Catania, Italy; University of Catania, Italy*

2:45PM | A Source-Type Harmonic Energy Unbalance Suppression Method Based on Carrier Frequency Optimization for Cascaded Multilevel APF

Ze Zhou Yang, Shangshen Li, Xiaoming Zha, Jianjun Sun and Wang Yi, *School of Electrical Engineering, Wuhan University, China*

S71 DC-DC Converters II

Room: 102C

Chairs: Yan-Fei Liu, Lixiang Wei

1:30PM | Small-Signal Model and Control of the Interleaved Two-Phase Coupled-Inductor Boost Converter

Brendan C. Barry, John G. Hayes, Marek S. Rylko, Robert Stala, Adam Penczek, Andrzej Mondzik and Robert T. Ryan, *University College Cork, Ireland; dtw Sp. z o.o., Poland*

1:55PM | A Robust Design Framework for Stable Digital Peak Current-Mode Control Under Uniform Sampling

Amit Singha, Santanu Kapat and Jayanta Pal, *Indian Institute of Technology Kharagpur, India; Indian Institute of Technology Bhubaneswar, India*

2:20PM | Modeling and Decoupled Control of a Non-isolated High Step-up/down Bidirectional DC-DC Converter

Haixu Shi, Xi Xiao, Hongfei Wu and Kai Sun, *Tsinghua University, China; Nanjing University of Aeronautics and Astronautics, China*

2:45PM | Non-Isolated High-Gain Three-Port Converter for Hybrid Storage Systems

Jorge Garcia, Ramy Georgious, Pablo Garcia and Angel Navarro-Rodriguez, *University of Oviedo, Spain*

S72 Reliability, Diagnostic and Faults Analysis in Power Converters I

Room: 102E

Chairs: Jiangchao Qin, Martin Ordonez

1:30PM | System-level Reliability Assessment of Power Stage in Fuel Cell Application

Dao Zhou, Huai Wang, Frede Blaabjerg, Soeren Kundsén Kaer and Daniel Blom Hansen, *Aalborg University, Denmark; Dantherm Power A/S, Denmark*

1:55PM | A Novel Online ESR and C Identification Method for Output Capacitor of Flyback Converter

Hui Li, Kai Yao, Xufeng Zhou, Fei Yang and Junfang Zhang, *Nanjing University of Science and Technology, China; Nanjing University of Science and Technology, China*

2:20PM | Fault Ride-Through Capability for Grid-Supporting Inverters

Prasanna Piya, Masoud Karimi-Ghartemani and Ali S. Khajehodini, *Mississippi State University, United States; University of Alberta, Canada*

2:45PM | Analysis of Hybrid Energy Storage Systems with DC Link Fault Ride-Through Capability

Ramy Georgious, Mark Sumner, Jorge Garcia and Pablo Garcia, *University of Oviedo, Spain; University of Nottingham, England*

S73 Electric Machines for Automotive Applications II

Room: 102B

Chairs: Heath Hofmann, Jing Xue

1:30PM | Optimisation of the Torque Quality of a Combined Phase Transverse Flux Machine for Traction Applications

Jamie Washington, Cristofaro Pompermaier and Glynn Atkinson, *Hoganas Great Britain Ltd., United Kingdom; Hoganas AB, Sweden; Newcastle University, United Kingdom*

1:55PM | An Examination for Improvement of Constant Output Characteristics at High-Speed Region in a Spoke-Type IPMSM Using Ferrite Permanent Magnet by Changing the Shape of Rotor Surface

Shoya Nagano, Masatsugu Takemoto and Satoshi Ogasawara, *Hokkaido University, Japan*

2:20PM | Variable Flux Permanent Magnet Synchronous Machine (VF-PMSM) Design to Meet Electric Vehicle Traction Requirements with Reduced Losses

Apoorva Athavale, Kensuke Sasaki, Brent Gagas, Takashi Kato and Robert Lorenz, *University of Wisconsin-Madison, WEMPEC, United States; Nissan Motor Co., Ltd, Japan*

2:45PM | Comparison of Traction Motors that Reduce or Eliminate Rare-Earth Materials

Ayman El-Refaie, Tsarafidy Raminosa, Patel Reddy, Steven Galimoto, Di Pan, Kevin Grace, James Alexander and Kum-Kang Huh, *GE Global Research, United States; GE Global Research, United States*

S74 PM Machines III

Room: 101A

Chairs: Hamid A. Toliyat, Jie Shen

1:30PM | Active Voltage Regulation of Partitioned Stator Switched Flux Permanent Magnet Generator Supplying Isolated Passive Load

Hanlin Zhan, Z.Q. Zhu and Zhongze Wu, *The University of Sheffield, United Kingdom*

1:55PM | Coupled and Simplified Model of the Symmetrical and Asymmetrical Triple Star Nine-Phase Interior Permanent Magnet Machines

Olorunfemi Ojo, *Tennessee Tech University, United States*

2:20PM | Design and Analysis of a Novel Three-phase Flux Reversal Machine

Yuting Gao, Ronghai Qu, Dawei Li, Jian Li and Yongsheng Huo, *Huazhong University of Science and Technology, China*

2:45PM | Design, Control and Implementation of a Non-Rare-Earth Flux Switching Permanent Magnet Machine

Chandan Sikder, Iqbal Husain and Wen Ouyang, *NC State University, United States; ABB US Corporate Research Center, United States*

S75 Drive Applications

Room: 101B

Chairs: Leon Tolbert, Uday Deshpande

1:30PM | A New Normal Mode dv/dt Filter With Resistor Failure Detection Circuit

Mark Baumgardner and Mahesh Swamy, *Yaskawa America, Inc., United States*

1:55PM | Simulation of Cable Charging Current and Its Effects on Operation of Low Power AC Drives

Helen Lewis-Rzesutek, Ripunjoy Phukan, Rangarajan Tallam, Mark Solveson and Timothy Clancy, *Rockwell Automation, United States; Georgia Institute of Technology, United States; Ansys, United States; General Cable, United States*

2:20PM | Systematic Modeling for a Three Phase Inverter with Motor and Long Cable using Optimization Method

Hui Zhao, Shuo Wang, Jianjun Min and Zhi Yongjian, *University of Florida, United States; China South Railway, China*

2:45PM | Performance Evaluation of SiC MOSFETs with Long Power Cable and Induction Motor

Peizhong Yi, Puneeth Kumar Srikanta Murthy and Lixiang Wei, *Rockwell Automation, United States*

S76 Sensorless Drives I

Room: 101CD

Chairs: Giacomo Scelba, Ramakrishnan Raja

1:30PM | Design Consideration of Interior Permanent Magnet Machine Position Sensorless Drive Using Square-wave Voltage Injection

Shih-Chin Yang, Sheng-Ming Yang and Jing-Hui Hu, *National Taiwan University, Taiwan; National Taipei University of Technology, Taiwan*

1:55PM | A Synchro-Perspective-Based High-Frequency Signal Injection Method for Position-Sensorless Vector Control of Doubly-Fed Induction Machines

Anuwat Srivorakul and Surapong Suwankawin, *Chulalongkorn University, Thailand*

2:20PM | Enhancing Estimation Accuracy by Applying Cross-Correlation Image Tracking to Self-Sensing Including Evaluation on a Low Saliency Ratio Machine

Timothy Slininger, Yinghan Xu and Robert Lorenz, *University of Wisconsin, Madison, United States*

2:45PM | The Crowded Axis of the Frequency: Optimal Pole/Zero Allocation for a Full Speed Sensorless Synchronous Motor Drives

Virginia Manzolini, Mattia Morandin and Silverio Bolognani, *University of Padova, Italy*

S77 Junction Temperature Sensing and Monitoring

Room: 102A

Chairs: Adam Skorek, Tanya Gachovska

1:30PM | An IGBT Junction Temperature Measurement Method via Combined TSEPs For Eliminating Impact of Collector Current

Xiang Wang, Chong Zhu, Haoze Luo, Zhou Lu, Wuhua Li, Xiangning He, Jun Ma, Guodong Chen, Ye Tian and Enxing Yang, *Zhejiang University, China; Aalborg University, China; Shanghai Electric, China*

1:55PM | DeltaT_j Control of Switching Power Devices at Thermal Boundaries via Physics-Based Loss Manipulation

Timothy Polom, Boru Wang and Robert Lorenz, *University of Wisconsin-Madison, United States*

2:20PM | Online Junction Temperature Monitoring Using Turn-Off Delay Time for Silicon Carbide Power Devices

Zheyu Zhang, Xuanlyu Wu, Fred Wang, Daniel Costinett, Leon Tolbert and Blalock Benjamin, *The University of Tennessee, United States; Xi'an Jiaotong University, China*

2:45PM | Simple Analog Detection of Turn-off Delay Time for IGBT Junction Temperature Estimation

Simon Weber, Michael Schlueter, Daniel Borowski and Axel Mertens, *Leibniz University of Hanover, Germany*

S78 Wide Bandgap Applications: GaN

Room: 202C

Chairs: Filippo Chimento, Jean-Luc Schanen

1:30PM | Design of a 10 kW GaN-based High Power Density Three Phase Inverter

He Li, Xuan Zhang, Zhengda Zhang, Chengcheng Yao, Feng Qi, Boxue Hu, Liming Liu and Jin Wang, *The Ohio State University, United States; ABB Corporate Research, United States*

1:55PM | High-frequency DC-DC Converter in Electric Vehicle Based on GaN Transistors

Zhenjin Pang, Xiaoyong Ren, Junlin Xiang, Qianhong Chen, Xinbo Ruan and Wu Chen, *Nanjing Univ. of Aeronautics and Astronautics, China; Southeast University, China*

2:20PM | A GaN-based Flying-Capacitor Multilevel Boost Converter for High Step-up Conversion

Zitao Liao, Yutian Lei and Robert Pilawa-Podgurski, *University of Illinois, United States*

2:45PM | A GaN based High Frequency Active-clamp Buck Converter for Automotive Applications

Chenhao Nan, Raja Ayyanar and Youhao Xi, *Arizona State University, United States; Texas Instruments Inc., United States*

S79 Applications of Droop Control

Room: 203AB

Chairs: Tsorng-Juu Liang, Keyue Smedley

1:30PM | Energy Storage Size and Fuel Consumption Reduction in a Microgrid Using Virtual Droop Control Framework

Ashish Solanki and Adel Nasiri, *SandC Electric, United States; UW-Milwaukee, United States*

1:55PM | Seamless Black Start and Reconnection of LCL-filtered Solid State Transformer Based On Droop Control

Yonghwan Cho, Yongsu Han, Richard Byron Beddingfield, Jung-Ik Ha and Subhashish Bhattacharya, *North Carolina State University, United States; Seoul National University, Korea (South)*

2:20PM | A Circulating Current Suppression Method for Parallel Connected Voltage-Source-Inverters (VSI) with Common DC and AC Buses

Baoze Wei, Xiaoqiang Guo, Josep M. Guerrero and Juan C. Vasquez, *Aalborg University, Denmark; Yanshan University, China*

2:45PM | Decentralized Method for Load Sharing and Power Management in a Hybrid Single/Three-Phase Islanded Microgrid Consisting of Hybrid Source PV/Battery Units

Yaser Karimi, Josep M. Guerrero and Hashem Oraee, *Sharif University of Technology, Iran; Aalborg University, Denmark*

S80 DC Microgrids III

Room: 203DE

Chairs: Norma Anglani, Tsorng-Juu Liang

1:30PM | A New Secondary Control Approach for Voltage Regulation in DC Microgrids

Saeed Peyghami-Akhuleh, Hossein Mokhtari, Pooya Davari, Poh Chiang Loh and Frede Blaabjerg, *Sharif University of Technology, Iran; Aalborg University, Denmark*

1:55PM | CERTS Microgrids with Photovoltaic Microsources and Feeder Flow Control

Zhe Chen, Dinesh Pattabiraman, Robert H. Lasseter and Thomas M. Jahns, *University of Wisconsin Madison, United States*

2:20PM | Combined Optimization of SSCB Snubber and Freewheeling Path for Surgeless and Quick Bus Fault Interruption In Low-Voltage DC Microgrid

Wenjun Liu, Xiaoqi Xiong, Hua Yang, Kun Feng, Si Zhang and Fei Liu, *Wuhan University, China*

2:45PM | Symmetric Droop Control for Improved Hybrid AC/DC Microgrid Transient Performance

Philip Hart, Robert Lasseter and Thomas Jahns, *University of Wisconsin-Madison, United States*

Wednesday, September 21st

3:30PM – 5:10PM

S81 Wind Energy Control and Operations

Room: 203AB

Chairs: Eduard Muljadi, Pedro Rodriguez

3:30PM | Small Scale Reluctance Synchronous Generator Wind-Turbine System with DC Transmission Linked Inverters

Joshua Cole Mitchell, Maarten Jan Kamper and Christoph M. Hackl, *Stellenbosch University, South Africa; Munich University, Germany*

3:55PM | Short-Term Forecasting of Inertial Response from a Wind Power Plant

Eduard Muljadi, Vahan Gevorgian and Anderson Hoke, *National Renewable Energy Laboratory, United States*

4:20PM | A 3.0MW Case Study of the Influence of PM Cost on Wind Turbine Cost of Energy

Matthew Henriksen, Bogi Bech Jensen, Nenad Mijatovic and Holboell Joachim, *ABB Corporate Research, United States; University of the Faroe Islands, Faroe Islands; Technical University of Denmark, Denmark*

4:45PM | Direct Power Control of a Doubly Fed Induction Generator Wind Power System in Stand-Alone and Grid-Connected Modes with Seamless Transition

Sam Mahmodicherati, Malik Elbuluk and Yilmaz Sozer, *The University of Akron, United States; The University of Akron, United States*

S82 Energy Harvesting Systems

Room: 203C

Chairs: Mohamed Badawy, Xiongfei Wang

3:30PM | Temperature Dependence of Efficiency in Renewable Magnetohydrodynamic Power Generation Systems

Eva Cosoroaba and Babak Fahimi, *The University of Texas at Dallas, United States*

3:55PM | Modeling, Analysis and Design of An Undersea Storage System

Seyyedmahdi Jafarishiadeh, Mehdi Farasat and Amir Masoud Bozorgi, *Louisiana State University, United States; Louisiana State University, United States*

4:20PM | The Joint Design of a Compressed Air and Wind Energy System for Mechanical Spillage Recovery

Jie Cheng and Fred Choobineh, *University of Nebraska-Lincoln, United States*

4:45PM | Experimental Control of a Hydraulic Wind Power Transfer System under Wind and Load Disturbances

Masoud Vaezi and Afshin Izadian, *Purdue School of Engineering and Technology, United States*

S83 Utility Applications V

Room: 202A

Chairs: Olivier Trescases,, Srdjan Lukic

3:30PM | Field Upgradeable Transformer: A Fractionally-Rated Voltage Regulator for the Distribution System

Rajendra Prasad Kandula, Hao Chen, Anish Prasai, Joe Schatz and Deepak Divan, *Georgia Institute of Technology, United States; Varentec, Inc., United States; Southern Company, United States*

3:55PM | New Configuration of Multi-Functional Grid-Connected Inverter to Improve Both Current-Based and Voltage-Based Power Quality

Wooyoung Choi, Woongkul Lee, Di Han and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

4:20PM | Model Predictive Control of A Matrix-Converter Based Solid State Transformer for Utility Grid Interaction

Yushan Liu, Haitham Abu-Rub, Baoming Ge, Robert S. Balog and Yaosuo Xue, *Texas A and M University at Qatar, Qatar; Texas A and M University, United States; Oak Ridge National Laboratory, United States*

4:45PM | A Triple Port Active Bridge Converter based Power Electronic Transformer

Venkat Nag Someswar Rao Jakka and Anshuman Shukla, *Department of Electrical Engineering, IIT Bombay, India*

S84 Modeling, Analysis, and Control of Grid-Connected Converters IV

Room: 202D

Chairs: Paolo Mattavelli, John Lam

3:30PM | Evaluation of Active Islanding Detection Based Methods Under Non-Liner-loads Scenarios

David Reigosa, Cristian Blanco, Juan Manuel Guerrero and Fernando Briz, *University of Oviedo, Spain*

3:55PM | Decentralized Adaptive Control for Interconnected Boost Converters based on backstepping approach

Arturo Hernandez-Mendez, Jesus Linares-Flores and Hebertt Sira-Ramirez, *Universidad Tecnologica de la Mixteca, Mexico; Centro de Investigacion y de Estudios Avanzados, Mexico*

4:20PM | Impedance Synthesis by Inverter Control for Active Loads in Anti-Islanding Testbenches

Tommaso Caldognetto, Luca Dalla Santa, Paolo Magnone and Paolo Mattavelli, *University of Padova, Italy*

4:45PM | A Unified Impedance Model of Voltage-Source Converters with Phase-Locked Loop Effect

Xiongfei Wang, Lennart Harnefors, Frede Blaabjerg and Poh Chiang Loh, *Aalborg University, Denmark; ABB Corporate Research Center, Sweden*

S85 More Electric Aircraft

Room: 102D

Chairs: Pat Wheeler, Bulent Sarlioglu

3:30PM | An Induction Generator based Auxiliary Power Unit for Power Generation and Management System for More Electric Aircraft

Yijiang Jia and Kaushik Rajashekara, *University of Texas at Dallas, United States*

3:55PM | Design and Optimization of a High Performance Isolated Three Phase AC/DC Converter for Aircraft Applications

Qiong Wang, Xuning Zhang, Rolando Burgos, Dushan Boroyevich, Adam White and Mustansir Kheraluwala, *CPES, Virginia Tech, United States; UTC Aerospace Systems, United States*

4:20PM | Taking Into Account Interactions Between Converters in the Design of Aircraft Power Networks

Qian Li, Andrea Formentini, Arnaud Baraston, Xuning Zhang, Pericle Zanchetta, Jean-Luc Schanen and Dushan Boroyevich, *CPES Virginia Tech, United States; University of Nottingham, United Kingdom; G2ELab – University Grenoble Alps, France*

4:45PM | Stability Assessment of A Droop-Controlled Multi-Generator System in the More Electric Aircraft Using Parameter Space Approach

Fei Gao, Xiancheng Zheng and Serhiy Bozhko *The University of Nottingham, United Kingdom; Northwestern Polytechnical University, China*

S86 DC-DC Converters: High Frequency

Room: 102C

Chairs: Seth Sanders, Juan Rivas-Davila

3:30PM | A GaN-Based Partial Power Converter with MHz Reconfigurable Switched-Capacitor and RF SEPIC

Junjian Zhao and Yehui Han, *University of Wisconsin-Madison, United States*

3:55PM | Monolithic Multilevel GaN Converter for Envelope Tracking in RF Power Amplifiers

Alihossein Sepahvand, Parisa Momen Roodaki, Yuanzhe Zhang, Zoya Popovic and Dragan Maksimovic, *University of Colorado at Boulder, United States*

4:20PM | An Improved PDM Control Method for a High Frequency Quasi-Resonant Converter

Hossein Mousavian, Alireza Bakhshai and Praveen Jain, *Queen's University, Canada*

4:45PM | Automotive LED Driver Based On High Frequency Zero Voltage Switching Integrated Magnetics Cuk Converter

Alihossein Sepahvand, Montu Doshi, James Patterson, Vahid Yousefzadeh, Khurram Afridi and Dragan Maksimovic, *Vahid Yousefzadeh, Khurram Afridi and Dragan Maksimovic, University of Colorado at Boulder, United States; Texas Instruments, United States*

S87 Modeling and Control of AC-DC Converters

Room: 202E

Chairs: Pragasen Pillay, Lixiang Wei

3:30PM | Dynamic Response Optimization for Three-phase VIENNA Rectifier with Load Feedforward Control

Xudong Chen, Xiaoyong Ren, Zhiliang Zhang, Qianhong Chen and Xinbo Ruan, *Nanjing Univ. of Aeronautics and Astronautics, China*

3:55PM | A Compensation Scheme to Reduce Input Current Distortion in GaN Based 450 kHz Three-Phase Vienna Type PFC

Bo Liu, Ren Ren, Edward Andrew Jones, Fred Wang, Daniel Jes Costinett and Zheyu Zhang, *The University of Tennessee, United States*

4:20PM | Modeling and Analysis for Input Characteristics of Line-Frequency Rectifiers

Xiaolong Yue, Dushan Boroyevich, Rolando Burgos and Fang Zhuo, *Xi'an Jiaotong University, Virginia Tech, China; Virginia Tech, United States; Xi'an Jiaotong University, China*

4:45PM | Hybrid Damping for Active Front End Converter

Yogesh Patel, Sayed Ahmed Ahmed and Lixiang Wei, *Rockwell Automation, United States*

S88 Converter Control in Microgrids and Distributed Generation

Room: 203DE

Chairs: Leon M Tolbert, Shu-hung Chung

3:30PM | A Feed-forward Based Harmonic Compensation Approach for Low Switching Frequency Grid Interfacing VSI

Hao Tian and Yun Wei Li, *University of Alberta, Canada*

3:55PM | An Embedded Voltage Harmonic Compensation Strategy for Current-Controlled DG Interfacing Converters

Xin Zhao, Lexuan Meng, Chuan Xie, Josep Guerrero, Mehdi Savaghebi, Juan Vasquez and Xiaohua Wu, *Aalborg University, Denmark; Aalborg University, Denmark; University of Electronic Science and Technology, China; Northwestern Polytechnical University, China*

4:20PM | Analysis and Damping of harmonic propagation in DG-Penetrated distribution networks

Jinghang Lu, Mehdi Savaghebi and Josep Guerrero, *Aalborg University, Denmark*

4:45PM | Voltage and Current Regulators Design of Power Converters in Islanded Microgrids based on State Feedback Decoupling

Federico de Bosio, Luiz Antonio de Souza Ribeiro, Francisco Freijedo, Josep Guerrero and Michele Pastorelli, *Politecnico di Torino, Italy; Federal University of Maranhao, Brazil; Ecole Polytechnique Federale de Lausanne, Switzerland; Aalborg University, Denmark*

S89 Reliability, Diagnostic and Faults Analysis in Power Converters II

Room: 102E

Chairs: Marco Liserre, Lee Empringham

3:30PM | Computation and Analysis of Dielectric Losses in MV Power Electronic Converter Insulation

Thomas Guillod, Raphael Faerber, Florian Krismer, Christian M. Franck and Johann W. Kolar, *Power Electronic Systems Laboratory (PES), ETH Z, Switzerland; High Voltage Laboratory, ETH Zurich, Switzerland*

3:55PM | Computational Light Junction Temperature Estimator for Active Thermal Control

Markus Andresen, Mike Schloh, Giampaolo Buticchi and Marco Liserre, *Christian-Albrechts-University Kiel, Germany*

4:20PM | Fast Fault Diagnosis and identification Method for Boost Converter Based on Inductor Current Emulator

Elham Pozouki, Alexis De Abreu-Garcia and Yilmaz Sozer, *University of Akron, United States*

4:45PM | Modeling and Improvement of Thermal Cycling in Power Electronics for Motor Drive Applications

Ionut Vernica, Ke Ma and Frede Blaabjerg, *Aalborg University, Denmark*

S90 Reliability and Fault Tolerance in Multilevel Converters

Room: 202B

Chairs: Sheldon Williamson, Christian Klumpner

3:30PM | Highly Reliable Transformerless Neutral Point Clamped Inverter with Separated Inductors

Liwei Zhou, Feng Gao, Guang Shen and Mengxing Chen, *Shandong University, China; State Grid Rizhao Power Supply Company, China*

3:55PM | Fault Detection and Tolerant Control of Open-circuit Failure in MMC with Full-bridge Sub-modules

Kai Li, Zhengming Zhao, Liqiang Yuan, Sizhao Lu and Ye Jiang, *Dept. Electrical Engineering, Tsinghua Univ., China*

4:20PM | Control Strategy of Single Phase Back-to-back Converter for Medium Voltage Drive under Cell Fault Condition

Yoon-Ro Lee, Jeong-Mock Yoo, Hyun-Sam Jung and Seung-Ki Sul, *Seoul National University, Korea (South)*

4:45PM | Fault Tolerance Analysis for the 5-Level Unidirectional T-Rectifier

Alessandro Lidozzi, Marco Di Benedetto, Luca Solero, Fabio Crescimbeni and Petar Grbovic, *ROMA TRE University, Italy; Huawei Technologies, Germany*

S91 Electric Machines for Automotive Applications III

Room: 102B

Chairs: Julia Zhang, Jie Shen

3:30PM | Design of a Wound Field Synchronous Machine for Electric Vehicle Traction with Brushless Capacitive Field Excitation

Antonio Di Gioia, Ian P. Brown, Ryan Knippel, Daniel C. Ludois, Yue Nie, Jiejian Dai, Skyler Hagen and Christian Alteheld, *Illinois Institute of Technology, United States; University of Wisconsin-Madison, United States; Duesseldorf University of Applied Sciences, Germany*

3:55PM | Design and Development of a MLS Based Compact Active Suspension System, Featuring Air Spring and Energy Harvesting Capabilities

Nick Ilsoe Berg, Rasmus Koldborg Holm and Peter Omand Rasmussen, *Aalborg University, Denmark*

4:20PM | A Simple Design Method for Surface-mounted PM Machines for Traction Application

Chao Lu and Gianmario Pellegrino, *Politecnico di Torino, Italy*

4:45PM | Design Optimization of Spoke-Type PM Motors for Formula E Racing Cars

Alireza Fatemi, Dan Ionel, Mircea Popescu and Nabeel Demerdash, *Marquette University, United States; University of Kentucky, United States; Motor Design Ltd, United Kingdom*

S92 PM Machines IV

Room: 101A

Chairs: Leila Parsa, Radu Bojoi

3:30PM | Tolerance Study to Forecast Performances of Permanent Magnet Synchronous Machines Using Segmented Stator for Mass Production

TaeSik Kim, Mazharul Chowdhury, Mohammad Islam, Abraham Gebregergis and Tomy Sebastian, *Halla Mechatronics, United States*

3:55PM | Permanent Magnet Material and Pulsating Torque Minimization in Spoke Type Interior PM Machines

Zhentao Stephen Du and Thomas Anthony Lipo, *Dept. of ECE Wisconsin-Madison, United States*

4:20PM | Mechanical Design Method for a High-Speed Surface Permanent Magnet Rotor

Erik Schubert and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

4:45PM | Analysis and Design of Triple-Rotor Axial-Flux Spoke-Array Vernier Permanent Magnet Machines

Rui Zhang, Jian Li, Ronghai Qu and Dawei Li, *Huazhong University of Science and Technology, China*

S93 Energy Efficient Motor Drives

Room: 101B

Chairs: Francisco Canales, Dong Jiang

3:30PM | Electrical Loss Minimization Technique for Wind Generators based on a Comprehensive Dynamic Modelling of Induction Machines

Maria Carmela Di Piazza, Massimiliano Luna and Marcello Pucci, *ISSIA-CNR, Italy*

3:55PM | Maximum Efficiency Control Method in 7-phase BLDC Motor by Changing the Number of the Excited Phase Windings

Sang-Woo Park, Hyung-Seok Park, Jong-Joo Moon, Won-Sang Im and Jang-Mok Kim, *LG Electronics, Korea (South); Pusan National University, Korea (South); Lehigh University, United States*

4:20PM | Control Strategy for Dual Three-Phase PMSMs With Minimum Losses in the Full Torque Operation Range Under Single Open-Phase Fault

Fernando Baneira, Jesus Doval-Gandoy, Alejandro Yepes, Oscar Lopez and Diego Perez-Estevez, *University of Vigo, Spain*

4:45PM | A Multi-Pulse Front-End Rectifier System with Electronic Phase-Shifting for Harmonic Mitigation in Motor Drive Applications

Firuz Zare, Pooya Davari and Frede Blaabjerg, *The University of Queensland, Australia; Aalborg University, Denmark*

S94 Sensorless Drives II

Room: 101CD

Chairs: Robert Lorenz, Giacomo Scelba

3:30PM | A Robust Magnetic Polarity Self-Sensing Method for Start-Up of PM Synchronous Machine in Fan-Like System

Wei Sun, Jian-Xin Shen, Meng-Jia Jin and He Hao, *Zhejiang University, China*

3:55PM | Universal Sensorless Vector Control Applicable to Line-Start Permanent Magnet Synchronous Motors with Damper Winding

Shu Yamamoto, Hideaki Hirahara, Akira Tanaka and Takahiro Ara, *Polytechnic University, Japan; Kanto Polytechnic College, Japan*

4:20PM | Improvement of Back-EMF Self-Sensing for Induction Machines when using Deadbeat-Direct Torque and Flux Control (DB-DTFC)

Kang Wang, Noor Baloch and Robert Lorenz, *University of Wisconsin – Madison, United States; Yaskawa Electric Corporation, Japan*

4:45PM | Sensorless Position Control of PMSM Operating at Low Switching Frequency for High Efficiency Climate Control Systems

Parag Kshirsagar and R. Krishnan, *United Technologies Research Center, United States; Virginia Polytechnic and State University, United States*

S95 Silicon and WBG Devices

Room: 202C

Chairs: Jerry Hudgins, Enrico Santi

3:30PM | SuperJunction Cascode, a Configuration to Break the Silicon Switching Frequency Limit

Juan Rodriguez, Jaume Roig, Alberto Rodriguez, Ignacio Castro, Diego G. Lamar and Filip Bauwens, *Power Supply System Group, University of Oviedo, Spain; Power Technology Centre, ON Semiconductor, Belgium*

3:55PM | Maximizing the Performance of 650 V p-GaN Gate HEMTs: Dynamic Ron Characterization and Gate-Drive Design Considerations

Hanxing Wang, Ruiliang Xie, Cheng Liu, Jin Wei, Gaofei Tang and Kevin. J Chen, *Hong Kong University of Science and Technology, Hong Kong*

4:20PM | 15kV/40A FREEDM Super-Cascode: A Cost Effective SiC High Voltage and High Frequency Power Switch

Xiaoqing Song, Alex Huang, Zhang Liqi, Liu Pengkun and Xijun Ni, *North Carolina State University, United States; North Carolina State University, United States; Nanjing Institute of Technology, China*

4:45PM | A Study of Dynamic High Voltage Output Charge Measurement for 15 kV SiC MOSFET

Li Wang, Qianlai Zhu, Wensong Yu and Alex.Q Huang, *FREEDM Systems Center, NC State University, United States*

S96 Distribution-System Utility Interface Topics

Room: 102A

Chairs: Tsorng-Juu Liang, Deepak Divan

3:30PM | Unbalanced Voltage Compensation in LV Residential AC Grids

Ionut Trintis, Philip Douglass and Stig Munk-Nielsen, *Aalborg University, Denmark; Danish Energy Association, Denmark*

3:55PM | The Hierarchical Energy Management Control for Residential Energy Harvesting System

Shuang Zhao, Yuzhi Zhang, Joe Moquin and Alan Mantooth, *University of Arkansas, United States*

4:20PM | Reactive Power Distribution Strategy using Power Factor Correction Converters for Smart Home Application

S M Rakiul Islam, Shawn Maxwell, Md. Kamal Hossain, Sung-Yeul Park and Sungmin Park, *University of Connecticut, United States; Hongik University, Korea (South)*

4:45PM | Active Voltage Balancing Control for Multi HV-IGBTs in Series Connection

Shiqi Ji, Zhengming Zhao, Ting Lu, Fred Wang, Leon Tolbert and Hualong Yu, *University of Tennessee, United States; Tsinghua University, China*

Thursday, September 22nd

8:30AM – 10:10AM

S97 Converter Topologies for Wind Power Systems

Room: 203AB

Chairs: Akshay Kumar Rathore, Yilmaz Sozer

8:30AM | The DOE Next-Generation Drivetrain for Wind Turbine Applications: Gearbox, Generator, and Advanced Si/SiC Hybrid Inverter System

William Erdman and Jonathan Keller, *Cinch, Inc., United States; National Renewable Energy Laboratory, United States*

8:55AM | Inductorless Boost Rectifier for Small Power Wind Energy Converters

Carlos Lumbreras, Juan Manuel Guerrero, David Reigosa, Daniel Fernandez and Fernando Briz, *AST Ingenieria, Spain; University of Oviedo, Spain; Universidad de Oviedo, Spain*

9:20AM | High-frequency Isolated DC-DC Converter for Offshore Wind Energy Systems

Kumar Modepalli, Rohit Suryadevara and Leila Parsa, *Rensselaer Polytechnic Institute, United States*

9:45AM | A New Three-phase AC/DC High Power Factor Soft-switched Step-up Converter with High Gain Rectifier Modules for Medium Voltage Grid in Wind Systems

Mehdi Abbasi and John Lam, *York University, Canada*

S98 Energy Storage Systems

Room: 203C

Chairs: Adel Nasiri, Tsai-Fu Wu

8:30AM | A Comparison of Broadband Impedance Measurement Techniques for Lithium-Ion Batteries

Alfred Waligo and Paul Barendse, *University of Cape Town, South Africa*

8:55AM | Evaluation of Lithium-ion Battery Second Life Performance and Degradation

Egoitz Martinez-Laserna, Elixabet Sarasketa-Zabala, Daniel-Ioan Stroe, Maciej Swierczynski, Alexander Warnecke, Jean-Marc Timmermans, Shovon Goutam and Pedro Rodriguez, *Ik4-Ikerlan, Spain; Aalborg University, Denmark; ISEA, RWTH Aachen University, Germany; MOBI research group, Vrije Universiteit Brussel, Belgium; Abengoa Research, Tech. University of Catalonia, Spain*

9:20AM | A Distributed ESO based Cooperative Current-Sharing Strategy for Parallel Charging Systems Under Disturbances

Zhou Yanhui, Huang Zhiwu, Liu Weirong, Li Heng and Hongtao Liao, *Central South University, Changsha, China*

9:45AM | A Comprehensive Study on the Degradation of Lithium-Ion Batteries during Calendar Ageing: The Internal Resistance Increase

Daniel Stroe, Maciej Swierczynski, Soren Kaer and Remus Teodorescu, *Aalborg University, Dpt. of Energy Technology, Denmark*

S99 Power Quality I

Room: 101B

Chairs: Jonathan Kimball, Dao Zhou

8:30AM | Enhanced Power Quality and Minimized Peak Current Control in An Inverter based Microgrid under Unbalanced Grid Faults

Wenzhao Liu, Xiaoqiang Guo, Giorgio Sulligoi, Yajuan Guan, Xin Zhao, Baoze Wei, Mehdi Savaghebi and Josep M Guerrero, *Aalborg University, Denmark; Yanshan University, China; University of Trieste, Italy*

8:55AM | Parallel Interfacing Converters under Unbalanced Voltage: Active Power Oscillation Cancellation with Peak Current Sharing

Farzam Nejabatkhah and Yunwei (Ryan) Li, *University of Alberta, Canada*

9:20AM | The Reverse Zero-Sequence Current Compensation Strategy for Back-to-Back Active Power Conditioners

Tung Yueh, Teng-Wei Tsai, Yaow-Ming Chen, Yih-Der Lee and Yung-Ruei Chang, *National Taiwan University, Taiwan; Institute of Nuclear Energy Research, Taiwan*

9:45AM | Harmonic Mitigation in Interphase Power Controllers Using Passive Filter-Based Phase Shifting Transformer

Mohammad Amin Chitsazan and Andrzej M Trzynadlowski, *University of Nevada, Reno, United States*

S100 AC Microgrids I: Modelling and Stability

Room: 203DE

Chairs: Adel Nasiri, Pedro Rodriguez

8:30AM | Modeling and Stability Analysis of the Small-AC-Signal Droop Based Secondary Control for Islanded Microgrids

Teng Wu, Zeng Liu, Jinjun Liu, Baojin Liu and Shike Wang, *Xian Jiaotong University, China*

8:55AM | A Small-AC-Signal Injection Based Harmonic Power Sharing Method for Islanded Microgrids

Baojin Liu, Zeng Liu, Jinjun Liu, Teng Wu, Shike Wang and Xin Meng, *Xi'an Jiaotong University, China*

9:20AM | Improvement of Transient Stability in Inverter-Based AC Microgrid via Adaptive Virtual Inertia

XiaoChao Hou, Hua Han, Chaolu Zhong, Wenbin Yuan, Meijie Yi and Ying Chen, *Central South University, China; Central South University, China*

9:45AM | Frequency Support Properties of the Synchronous Power Control for Grid-Connected Converters

Weiyi Zhang, Daniel Remon, Joan Rocabert, J. Ignacio Candela, Alvaro Luna and Pedro Rodriguez, *Technical University of Catalonia, Spain; Abengoa, Spain*

S101 Battery Management for Transportation Electrification I

Room: 102D

Chairs: Yilmaz Sozer, James W. Jiang

8:30AM | A Pack-to-Cell-to-Pack Battery Equalizer with Soft-Switching Based on Buck-Boost and Bidirectional LC Resonant Converters

Zeyuan Li, Yunlong Shang, Bin Duan and Chenghui Zhang, *Shandong University, China*

8:55AM | A New Perspective on Battery Cell Balancing: Thermal Balancing and Relative Temperature Control

Ye Li and Yehui Han, *University of Wisconsin-Madison, United States*

9:20AM | Advanced Cell-level Control for Extending Electric Vehicle Battery Pack Lifetime

Muhammad Muneeb Ur Rehman, Fan Zhang, Michael Evzelman, Regan Zane, Kandler Smith and Dragan Maksimovic, *Utah State University, United States; University of Colorado, United States; National Renewable Energy Laboratory, United States*

9:45AM | A Battery Cell Balancing Control Scheme with Minimum Charge Transfer

Zhiyuan Shen, Handong Gui and Leon Tolbert, *Silergy Corp., China; The University of Tennessee, Knoxville, United States*

S102 Grid Connected Single-Phase Inverters

Room: 202A

Chairs: Mahshid Amirabadi, Fernando Briz

8:30AM | Double Line Frequency Ripple Cancelling for Single-Phase Quasi-Z-Source Inverter

Yuan Li, Wenqiang Gao, Jiayi Li, Rui Zhang and Fan Fang, *Sichuan University, China*

8:55AM | Hybrid Control Scheme for the Current Loop of a Grid Connected Inverter Operating with Highly Distorted Grid Voltage

Julio Cesar Viola, Jose Restrepo, Jose Manuel Aller and Flavio Quizhpi, *Universidad Politecnica Salesiana/Prometeo Proj., Ecuador; Universidad Simon Bolivar, Venezuela; Universidad Simon Bolivar/Prometeo Project, Venezuela; Universidad Politecnica Salesiana, Ecuador*

9:20AM | Single-Phase LLCL-Filter-based Grid-Tied Inverter with Low-Pass Filter Based Capacitor Current Feedback Active Damper

Liu Yuan, Wu Weimin, He Yuanbin, Chung Shu-Hung and Blaabjerg Frede, *Shanghai Maritime Univ., China; City Univ. of Hong Kong, Hong Kong; Aalborg Univ., Denmark*

9:45AM | A single-phase tri-state integrated Buck-Boost inverter suitable to operate in grid-connected and island modes

Jose Carlos Pena, Cindy Paola Guzman and Carlos Alberto Canesin, *Universidade Estadual Paulista, Peru; Universidade Estadual Paulista, Colombia; Universidade Estadual Paulista, Brazil*

S103 Modular Multilevel Converters (MMC) I

Room: 202B

Chairs: Jiangchao Qin, Wim van der Merwe

8:30AM | DC Fault Ride Through of Multilevel Converters

Geraint Chaffey, Paul Judge, Michael Merlin, Philip Clemow and Tim Green, *Imperial College London, United Kingdom*

8:55AM | Reverse Blocking Sub-Module Based Modular Multilevel Converter with DC Fault Ride-Through Capability

Xiaofeng Yang, Yao Xue, Bowei Chen, Zhiqin Lin, Yajie Mu, Trillion Q. Zheng and Seiki Igarshi, *Beijing Jiaotong University, China; Fuji Electric Co., Ltd., Japan*

9:20AM | Closed-loop Control of the DC-DC Modular Multilevel Converter

Heng Yang and Maryam Saeedifard, *Georgia Institute of Technology, United States*

9:45AM | New MMC Capacitor Voltage Balancing using Sorting-less Strategy in Nearest Level Control

Mattia Ricco, Laszlo Mathe and Remus Teodorescu, *Aalborg University, Denmark*

S104 DC-DC Isolated: LLC

Room: 102C

Chairs: Grant Pitel, Vladimir Blasko

8:30AM | A New Tightly Regulated Dual Output LLC Resonant Converter with PFM plus Phase-shift Control

Xun Gao, Hongfei Wu, Yan Xing, Haibing Hu and Yu Zhang, *Nanjing Univ. of Aeronautics and Astronautics, China; Shanghai Institute of Space Power-Sources, China*

8:55AM | Analytical Model for LLC Resonant Converter with Variable Duty-Cycle Control

Yanfeng Shen, Huai Wang, Frede Blaabjerg, Xiaofeng Sun and Xiaohua Li, *Aalborg University, Denmark; Yanshan University, China*

9:20AM | Three-Phase LLC Resonant Converter with Integrated Magnetics

Wilmar Martinez, Noah Mostafa, Yuki Itoh, Masayoshi Yamamoto, Jun Imaoka, Kazuhiro Umetani, Kimura Shota, Nanamori Kimihiro and Endo Shun, *Shimane University, Japan; Kyushu University, Japan; Okayama University, Japan*

9:45AM | Accurate ZVS Boundary in High Switching Frequency LLC Converter

Ren Ren, Liu Bo, Jones Edward Andrew, Wang Fred, Costinett Daniel Jes and Zhang Zheyu, *The University of Tennessee, United States*

S105 Modeling and Control of Grid Connected Converter I

Room: 202D

Chairs: Sung Yeul Park, Fernando Briz

8:30AM | A Unified Control of Back-to-Back Converter

Alberto Rodriguez-Cabero, Francisco Huerta Sanchez and Milan Prodanovic, *IMDEA Energy Institute, Spain*

8:55AM | Control of an Islanded Power-Electronic Converter as an Oscillator

Ricardo Perez, Cesar Silva and Amirnaser Yazdani, *Universidad Tecnica Federico Santa Maria, Chile; Ryerson University, Canada*

9:20AM | Power control for Grid-connected Converter to Comply with Safety Operation Limits during Grid Faults

Shida Gu, Xiong Du, Ying Shi, Yue Wu, Pengju Sun and Heng-Ming Tai, *Chongqing University, China; University of Tulsa, United States*

9:45AM | An Online Measurement Method for Common-mode Impedance in Three-phase Grid-connected Converters

Tuomas Messo, Tomi Roinila, Jukka Viinamaki and Teuvo Suntio, *Tampere University of Technology, Finland*

S106 Fault Prognosis for Power Devices

Room: 102E

Chairs: Marco Liserre, Juan Rivas-Davila

8:30AM | Remaining Useful Lifetime Estimation For Thermally Aged Power Mosfets With Ransac Denoising Algorithm

Serkan Dusmez, Mehrdad Heydarzadeh, Mehrdad Nourani and Bilal Akin, *University of Texas at Dallas, United States*

8:55AM | An Analytical Model for False Turn-On Evaluation of GaN Transistor in Bridge-Leg Configuration

Ruiliang Xie, Hanxing Wang, Gaofei Tang, Xu Yang and Kevin. J Chen, *Hong Kong University of Science and Technology, Hong Kong; Xi'an Jiaotong University, China*

9:20AM | Advanced Condition Monitoring System Based on On-Line Semiconductor Loss Measurements

Tobias Krone, Lan Dang Hung, Marco Jung and Axel Mertens, *Leibniz Universitaet Hannover, Germany; Fraunhofer IWES, Germany*

9:45AM | A Comprehensive Study on Variations of Discrete IGBT Characteristics Due to Package Degradation Triggered by Thermal Stress

Syed Huzaif Ali, Serkan Dusmez and Bilal Akin, *University of Texas at Dallas, United States*

S107 Thermal Analyses of Electric Machines

Room: 102B

Chairs: Bulent Sarlioglu, Patel Bhageerath Reddy

8:30AM | Experimental Calibration in Thermal Analysis of PM Electrical Machines

Sabrina Ayat, Rafal Wrobel, James Goss and David Drury, *University of Bristol, Motor Design Ltd, United Kingdom; Motor Design Ltd, United Kingdom; University of Bristol, United Kingdom*

8:55AM | Thermal Conductivity Evaluation of Fractional-Slot Concentrated-Winding Machines

Aldo Boglietti, Silvio Vaschetto, Marco Cossale and Thiago Dutra, *Politecnico di Torino, Italy; University of Santa Caterina, Brazil*

9:20AM | Thermal Performance Modeling of Foil Wound Concentrated Coils in Electric Machines

Michael Rios, Giri Venkataramanan, Annette Muetze and Heinrich Eickhoff, *University of Wisconsin – Madison, United States; Graz University of Technology, Austria*

9:45AM | Experimental Validation in Operative Conditions of Winding Thermal Model for Short-Time Transient

Aldo Boglietti, Silvio Vaschetto, Marco Cossale and Thiago Dutra, *Politecnico di Torino, Italy; University of Santa Caterina, Brazil*

S108 Transverse Flux Machines

Room: 101A

Chairs: Keith Corzine, Daniel Ludois

8:30AM | A Hybrid-Excited Axial Transverse Flux Permanent Magnet Machine

Emrullah Aydin, Ju Hyung Kim, Emin Yildiriz, Mehmet Timur Aydemir and Bulent Sarlioglu, *Electrical-Electronic Engineering, Gazi Univ., Turkey; Electrical and Computer Engineering, UW-Madison, United States; Electrical-Electronic Engineering, Duzce Univ., Turkey*

8:55AM | Reduction of Cogging Torque in Transverse Flux Machines by Stator and Rotor Pole Shaping

Cristofaro Pompermaier, Jamie Washington, Lars Sjöberg and Nabeel Ahmed, *Hoganas AB, Sweden; Hoganas Great Britian Ltd., United Kingdom; Newcastle University, United Kingdom*

9:20AM | Design Considerations of a Transverse Flux Machine for Direct Drive Wind Turbine Applications

Tausif Husain, Iftekhar Hasan, Yilmaz Sozer, Iqbal Husain and Eduard Muljadi, *University of Akron, United States; North Carolina State University, United States; National Renewable Energy Lab, United States*

9:45AM | Analytical Model Based Design Optimization of a Transverse Flux Machine

Iftekhar Hasan, Tausif Husain, Yilmaz Sozer, Iqbal Husain and Eduard Muljadi, *University of Akron, United States; North Carolina State University, United States; National Renewable Energy Lab, United States*

S109 Control of Electric Drives II

Room: 101CD

Chairs: Marko Hinkkanen, Pinjia Zhang

8:30AM | A Novel Six-Phase Inverter System for High-Power Synchronous Motor Drives

Yumei Song, Xiaojie You, Xizheng Guo and Jian Wang, *Beijing Jiaotong University, China*

8:55AM | State-Space Flux-Linkage Control of Bearingless Synchronous Reluctance Motors

Seppo Saarakkala, Maksim Sokolov, Marko Hinkkanen, Jari Kataja and Kari Tammi, *Aalto University School of Electrical Eng., Finland; VTT Technical Research Centre of Finland, Finland; Aalto University School of Engineering, Finland*

9:20AM | Current Harmonic Compensation for n-Phase Machines With Asymmetrical Winding Arrangement

Alejandro G. Yepes, Jesus Doval-Gandoy, Fernando Baneira, Diego Perez-Estevéz and Oscar Lopez, *University of Vigo, Spain, Spain*

9:45AM | Post-fault Operation Strategy for Single Switch Open Circuit Faults in Electric Drives

Heinrich T. Eickhoff, Roland Seebacher, Annette Muetze and Elias G. Strangas, *Graz University of Technology, Austria; Michigan State University, East Lansing, MI, United States*

S110 Power Packaging

Room: 202C

Chairs: Douglas C Hopkins, Giuseppe Chimento

8:30AM | A Quasi-online Method of Thermal Network Parameter Identification of IGBT Module

Tengfeng Li, Xiong Du, Cheng Zeng, Pengju Sun and Heng-Ming Tai, *Chongqing University, China; University of Tulsa, United States*

8:55AM | Direct-cooled Power Module with a Thick Cu Heat Spreader Featuring a Stress-suppressed Structure for EV/HEV Inverters

Keiichiro Numakura, Kenta Emori, Yusuke Yoshino, Yasuaki Hayami and Tetsuya Hayashi, *Nissan Motor Co., Ltd., Japan*

9:20AM | Impact of Poly-Crystalline Diamond within Power Semiconductor Device Modules in a Converter

Mark Robert Sweet, Kalyani Menon and Ekanath Madathil Sankar Narayanan, *University of Sheffield, United Kingdom; Rolls-Royce, United Kingdom*

9:45AM | A Novel 3D Structure for Synchronous Buck Converter Based on Nitride Gallium Transistors

Clement Fita, Pierre-Olivier Jeannin, Pierre Lefranc, Edith Clavel and Johan Delaine, *G2ELAB, France; G2ELAB, France*

S111 Magnetics I

Room: 102A

Chairs: John Siefken, Charles Sullivan

8:30AM | NiCuZn Ferrite Cores by Gelcasting: Processing and Properties

Langbing Liu, Yi Yan, Khai Ngo and Guo-Quan Lu, *Virginia Tech, United States*

8:55AM | Low-Capacitance Planar Spiral Windings Employing Inverse Track-Width-Ratio

Samuel Robert Cove and Martin Ordonez, *University of British Columbia, Canada*

9:20AM | On-Chip Transformers with Shielding Structures for High dV/dt Immunity Isolated Gate Drive

Rongxiang Wu, Julong Chen, Niteng Liao and Xiangming Fang, *Univ of Electron Sci and Tech of China, China; Shenzhen CoilEasy Technologies, Co. Ltd., China*

9:45AM | Additive Manufacturing of Toroid Inductor for Power Electronics Applications

Yi Yan, Khai Ngo, Yunhui Mei, Guo-Quan Lu and Jim Moss, *Virginia Tech, United States; Tianjin University, China; Texas Instruments, United States*

S112 Grid Synchronization

Room: 202E

Chairs: Behrooz Mirafzal, Tsorng-Juu Liang

8:30AM | A New Phase-Locked Loop Method for Three-Phase System

Hongyan Zhao, Trillion Q. Zheng, Yan Li, Hong Li and Shi Pu, *Beijing Jiaotong University, China*

8:55AM | A New Second-Order Generalized Integrator Based Quadrature Signal Generator With Enhanced Performance

Zhen Xin, Zian Qin, Minghui Lu, Poh Chiang Loh and Frede Blaabjerg, *Aalborg University, Denmark*

9:20AM | A Modified SRF-PLL for Phase and Frequency Measurement of Single-Phase Systems

Md. Rasheduzzaman, Sami Khorbotly and Jonathan Kimball, *Missouri University of Science and Technology, United States; Valparaíso University, United States*

9:45AM | Influence Of Double-Line Frequency Power Oscillation In Photovoltaic Generator Efficiency And H-Bridge VSI Performance

Luciano Alves, Montie Vitorino, Marcus Oliveira, Mauricio Correa and Gutemberg Goncalves, *Federal University of Campina Grande, Brazil; Tocantins Federal Institute of Technology, Brazil*

S113 Electric Machines for Wind Power Systems

Room: 203AB

Chairs: Wei Qiao, Pragasen Pillay

10:30AM | Comparison Analysis of PM Transverse Flux Outer Rotor Machines with and without Magnetic Shunts

Oleksandr Dobzhanskyi, Gouws Rupert and Amiri Ebrahim, *Doctor, Ukraine; Professor, South Africa; Ass. Professor, United States*

10:55AM | A Generator-Converter Design for Direct Drive Wind Turbines

Akanksha Singh and Behrooz Mirafzal, *Kansas State University, United States*

11:20AM | Gearbox Fault Diagnosis Using Vibration and Current Information Fusion

Yayu Peng, Wei Qiao, Liyan Qu and Jun Wang, *University of Nebraska-Lincoln, United States*

11:45AM | Bearing Fault Diagnosis of Direct-Drive Wind Turbines Using Multiscale Filtering Spectrum

Jun Wang, Yayu Peng and Wei Qiao, *University of Nebraska-Lincoln, United States*

S114 Converter Topologies for Energy Storage Systems

Room: 203C

Chairs: Behrooz Mirafzal, Hui Li

10:30AM | Design Considerations of an Isolated GaN Bidirectional DC-DC Converter

Fei Xue, Ruiyang Yu and Alex Q. Huang, *North Carolina State University, United States*

10:55AM | Flexbattery – Merging Multilevel Power Conversion and Energy Storage

Erik Lemmen, Jorge L. Duarte and Elena A. Lomonova, *Eindhoven University of Technology, Netherlands*

11:20AM | A Novel Modular Dual Active Bridge (DAB) DC-DC Converter with DC Fault Ride-Through Capability for Battery Energy Storage Systems

Yuxiang Shi and Hui Li, *Florida State University, United States*

11:45AM | A High Current Bidirectional DC-DC Converter for Concept Demonstration of Grid-Scale SMES Systems

Yu Du, Eddy Aeloiza and VR V. Ramanan, *ABB Inc., United States*

S115 AC Microgrids II: Sharing and Coordination

Room: 203DE

Chairs: Pedro Rodriguez, Aaron Ayu

10:30AM | Harmonic power sharing with Voltage Distortion Compensation of Droop Controlled Islanded Microgrids

Hassan Moussa, Jean-Philippe Martin, Serge Pierfederici and Nazih Moubayed, *Lorraine University, France; Lebanese University, Lebanon*

10:55AM | Novel Active Synchronization Strategy for Multi-Bus Microgrid with Distributed Cooperation Control

Chaolu Zhong, Yao Sun, Ying Chen, Mi Dong, Ming Liu and Xiaochao Hou, *Central South University, China*

11:20AM | An Inverter-Current-Feedback based Reactive Power Sharing Method for Parallel Inverters in Microgrid

Qicheng Huang and Kaushik Rajashekara, *University of Texas at Dallas, United States*

11:45AM | Distributed Voltage Control and Load Sharing for Inverter-Interfaced Microgrid with Resistive Lines

Mohammad S. Golsorkhi, Qobad Shafiee, Dylan D.C. Lu and Josep M. Guerrero, *School of Electrical and Information Engineering, Australia; Department of Electrical and Computer Engineering, Iran; The Institute of Energy Technology, Aalborg Univ, Denmark*

S116 Batteries and Battery Management for Transportation Electrification II

Room: 102D

Chairs: Juan Carlos Balda, Omer Onar

10:30AM | Accurate Battery Parameter Estimation with Improved Continuous Time System Identification Methods

Bing Xia, Xin Zhao, Raymond de Callafon, Hugues Garnier, Truong Nguyen and Chris Mi, *San Diego State University, United States; University of California San Diego, United States; University of Lorraine, France*

10:55AM | A Real World Technology Testbed for Electric Vehicle Smart Charging Systems and PEV-EVSE Interoperability Evaluation

Theodore Bohn and Hal Glenn, *Argonne National Laboratory, United States; 2G Engineering, United States*

11:20AM | Modeling of Low-Temperature Operation of a Hybrid Energy Storage System with a Butler-Volmer Equation Based Battery Model

Phillip Kollmeyer, Anantharaghavan Sridhar and Thomas Jahns, *University of Wisconsin-Madison, United States*

11:45AM | Voltage and Current Signals De-noising with Wavelet Transform Matrix for Improved SOC Estimation of Lithium-ion Battery

Xiang Cheng, Zhouyu Lu, Zhiliang Zhang, Dongjie Gu and Yang Yang, *Nanjing University of Aeronautics and Astronautics, China*

S117 Multi-Phase Inverter

Room: 202A

Chairs: Babak Parkhideh, Raja Ayyanar

10:30AM | Improved r-Z-Source Inverter

Zeeshan Aleem and Moin Hanif, *University of Cape Town, South Africa; University of Cape Town, South Africa*

10:55AM | High-Frequency Six Pulse DC Link Based Bidirectional Three-Phase Inverter without Intermediate Decoupling Capacitor

Vatta Kkuni Kanakesh, Anirban Ghoshal, Dorai Babu Yelaverty, Akshay Kumar Rathore and Ranjit Mahanty, *National University of Singapore, Singapore; Concordia University, Montreal, Canada; Indian Institute of Technology, BHU, Varanasi, India*

11:20AM | Closed-Form Equations for Analytical Exploration and Comparison of Switching Power Losses in Flying Capacitor Multicell and Active Neutral-Point-Clamped Multilevel Converters

Vahid Dargahi, Arash Khoshkbar Sadigh and Keith Corzine, *Clemson University, United States; Extron Electronics, United States*

11:45AM | Advanced Three Level Active Neutral Point Converter with Fault Tolerant Capabilities

Ramin Katebi, Weise Nathan, Stark Andrew and He Jiangbiao, *Marquette University, United States*

S118 AC-AC Converters I

Room: 202E

Chairs: Pat Wheeler, Mattia Ricco

10:30AM | A Novel Highly Reliable Three Phase Buck-Boost AC-AC Converter

Ashraf Ali Khan and Honnyong Cha, *Kyungpook National University, Korea (South)*

10:55AM | Hybrid Bidirectional AC/AC Multilevel Converter

Ramiar Alaei, S. Ali Khajehoddin and Wilsun Xu, *University of Alberta, Canada*

11:20AM | A Reliable Cascaded AC-AC Converter

Ashraf Ali Khan, Honnyong Cha, Sanghoon Kim and Hafiz Furqan Ahmed, *Kyungpook National University, Korea (South)*

11:45AM | Parallel AC-AC Three-Phase with Shared-Leg Converters

Edgard Fabricio, Cursino Jacobina, Nady Rocha, Rodolpho Cavalcante and Mauricio Correa, *IFPB, Brazil; UFCG, Brazil; UFPB, Brazil*

S119 Modular Multilevel Converters (MMC) II

Room: 202B

Chairs: Ahmed Sayed-Ahmed, Grain Adam

10:30AM | A Series HVDC Power Tapping Using Modular Multilevel Converters

Binbin Li, Mingxu Guan, Dianguo Xu, Rui Li, Grain Philip Adam and Barry Williams, *Harbin Institute of Technology, China; University of Strathclyde, United Kingdom*

10:55AM | A Zero-sequence Voltage Injection Control Scheme for Modular Multilevel Converter Under Submodule Failure

Jinke Li, Xuezhi Wu, Xiuyuan Yao, Long Jing, Xinmin Jin, Wen Wu, Xiaoxing Wang and Shuai Wang, *Beijing Jiaotong University, China; China Electric Power Research Institute, China*

11:20AM | An Interconnected Observer for Modular Multilevel Converter

Mohamed Trabelsi, Malek Ghanes, Omar Ellabban, Haitham Abu-Rub and Lazhar Ben-Brahim, *Texas A and M University at Qatar, Qatar; ENSEA, France; Qatar University, Qatar*

11:45AM | DC Bus Balancing Control Techniques for the Cascaded Neutral Point Clamped Modular Converter

Meng-Jiang Tsai, Wei-Lun Huang, Hsin-Chih Chen, Ping-Heng Wu and Po-Tai Cheng, *National Tsing Hua University, Taiwan*

S120 DC-DC Isolated: Resonant

Room: 102C

Chairs: Ali Mehrizi-Sani, Yan-Fei Liu

10:30AM | Step-Down Impedance Control Network Resonant DC-DC Converter Utilizing an Enhanced Phase-Shift Control for Wide-Input-Range Operation

Jie Lu, Ashish Kumar and Khurram Afridi, *University of Colorado Boulder, United States*

10:55AM | Soft-Switching Push-Pull Converter with Parallel Resonant Link and Buck-Boost Capability

Morteza Moosavi and Hamid A. Toliyat, *Texas A and M University, United States*

11:20AM | Bidirectional Series-Resonant DC-DC Converter with Fault-Tolerance Capability for Smart Transformer

Levy Costa, Giampaolo Buticchi and Marco Liserre, *University of Kiel, Germany*

11:45AM | Analysis and Design of Planar Inductor and Transformer for Resonant Converter

Yueshi Guan, Na Qi, Yijie Wang, Xiangjun Zhang, Dianguo Xu and Wei Wang, *Harbin Institute of Technology, China*

S121 Modeling and Control of Grid Connected Converter II

Room: 202D

Chairs: Jonathan Bird, Matthias Preindl

10:30AM | Combined DC Voltage Control Scheme for Three-port Energy Router Based on Instantaneous Energy Balance

Gaohui Feng, Zhengming Zhao, Liqiang Yuan and Kai Li, *Tsinghua University, China*

10:55AM | Grid-Voltage Sensorless Control of a Converter Under Unbalanced Conditions: On the Design of a State Observer

Jarno Kukkola and Marko Hinkkanen, *Aalto University, Finland*

11:20AM | Current-Mode Boundary Controller with Reduced Number of Current Sensors for a Three-Phase Inverter

He Yuanbin, Chung Shu-hung, Ho Ngai-man and Wu Weimin, *City University of Hong Kong, Hong Kong; University of Manitoba, Canada; Shanghai Maritime University, China*

11:45AM | Positive- and Negative-Sequence Current Controller for Grid-Tied Converters With LCL Filters

Diego Perez-Estevéz, Jesus Doval-Gandoy, Alejandro Yepes, Oscar Lopez and Fernando Baneira, *University of Vigo, Spain*

S122 Power Quality II

Room: 101B

Chairs: Luca Solero, Maurizio Cirrincione

10:30AM | Realization of Quadrature Signal Generator Using Accurate Magnitude Integrator

Zhen Xin, Changwoo Yoon, Rende Zhao, Poh Chiang Loh and Frede Blaabjerg, *Aalborg University, Denmark; China University of Petroleum (Hua dong), China*

10:55AM | A New Instantaneous Point on Wave Voltage Sag Detection Algorithm and Validation

Yujia Cui, Ahmed Sayed-Ahmed, Prathamesh Vadhavkar, Brian Seibel and Russel Kerkman, *Rockwell Automation, United States*

11:20AM | Voltage Quality Enhancement with Minimum Power Injection

Darlan Fernandes, Fabiano Costa, Joao Martins, Alberto Lock, Edison da Silva and Montie Vitorino, *Federal University of Paraiba, Brazil; Federal University of Bahia, Brazil; Federal University of Campina Grande, Brazil*

11:45AM | A Universal Variable On-time Compensation to improve THD of High-frequency CRM Boost PFC Converter

Zhehui Guo, Xiaoyong Ren, Handong Gui, Yu Wu, Zhiliang Zhang and Qianhong Chen, *Nanjing Univ. of Aeronautics and Astronautics, China; The University of Tennessee, United States*

S123 Stability in Power Converters I

Room: 102E

Chairs: Jian Sun, Andrea Formentini

10:30AM | On Impedance Modeling of Single-Phase Voltage Source Converters

Shahil Shah and Leila Parsa, *Rensselaer Polytechnic Institute, United States*

10:55AM | Design Consideration of Volt-VAR Controllers in Distribution Systems with Multiple PV Inverters

Mahsa Ghapandar Kashani, Yonghwan Cho and Subhashish Bhattacharya, *North Carolina State University, United States*

11:20AM | Extended Stable Boundary of LCL-Filtered Grid-Connected Inverter Based on Grid-Voltage Feedforward Control

Minghui Lu, Zhen Xin, Xiongfei Wang, Remus Beres and Frede Blaabjerg, *Aalborg University, Denmark, Denmark*

11:45AM | Allowable Bus Impedance Region for MVDC Distribution Systems and Stabilizing Controller Design Using Positive Feed-Forward Control

Jonathan Siegers, Silvia Arrua and Enrico Santi, *University of South Carolina, United States*

S124 Non-Conventional Machine Configurations I

Room: 101A

Chairs: obert D. Lorenz, Ronghai Qu

10:30AM | A Novel Stator-Consequent-Pole Memory Machine

Yang Hui, Lin Heyun, Zhu Z. Q., Fang Shuhua and Huang Yunkai, *Southeast University, China; University of Sheffield, United Kingdom*

10:55AM | A Novel Variable Flux Memory Machine with Series Hybrid Magnets

Hao Hua, Z.Q. Zhu, Adam Pride, Rajesh Deodhar and Toshinori Sasaki, *University of Sheffield, United Kingdom; IMRA Europe SAS, UK Research Centre, United Kingdom*

11:20AM | On the Feasibility of Carbon Nanotube Windings for Electrical Machines – Case Study for a Coreless Axial Flux Motor

Vandana Rallabandi, Narges Taran, Dan M. Ionel and John F. Eastham, *University of Kentucky, United States; University of Bath, United Kingdom*

11:45AM | A Novel Simplified Structure for Single-Drive Bearingless Motor

Hiroya Sugimoto, Itsuki Shimura and Akira Chiba, *Tokyo Institute of Technology, Japan*

S125 Noise and Vibration Issues in Electric Machines

Room: 102B

Chairs: Junichi Itoh, Ali Bazzi

10:30AM | Stator Vibration and Acoustic Noise Analysis of FSPM for a Low-Noise Design

Chandan Sikder and Iqbal Husain, *NC State University, United States*

10:55AM | Current Waveform for Noise Reduction of Switched Reluctance Motor in Magnetically Saturated Condition

Jihad Furqani, Masachika Kawa, Kyohei Kiyota and Akira Chiba, *Tokyo Institute of Technology, Indonesia; Tokyo Institute of Technology, Japan*

11:20AM | Torque Ripple Reduction Techniques for Stator DC Winding Excited Vernier Reluctance Machines

Mengxuan Lin, Ronghai Qu, Jian Li, Shaofeng Jia and Yang Lu, *Huazhong University of Science and Technology, China*

11:45AM | On the Cross Coupling Effects in Structural Response of Switched Reluctance Motor Drives

Shiliang Wang, Lei Gu, Babak Fahimi and Mehdi Moallem, *University of Texas at Dallas, United States; Isfahan University of Technology, Iran*

S126 Electrical Drives for Aerospace and Traction Applications

Room: 101CD

Chairs: Gianmario Pellegrino, John Lam

10:30AM | Asymmetrical Twelve-Phase Induction Starter/Generator for More Electric Engine in Aircraft

Radu Bojoi, Sandro Rubino, Andrea Cavagnino and Silvio Vaschetto, *Politecnico di Torino, Italy*

10:55AM | Axial Position Estimation of Conical Shaped Motor for Green Taxiing Application

Sara Roggia, Francesco Cupertino, Michael Galea and Chris Gerada, *University of Nottingham, United Kingdom; Politecnico di Bari, Italy*

11:20AM | Closed-form Approach for Predicting Overvoltage Transients in Cable-fed PWM Motor Drives for MEA

Giorgio Pietrini, Davide Barater, Carlo Concar, Michael Galea and Chris Gerada, *University of Parma, Italy; The University of Nottingham, United Kingdom*

11:45AM | An Open Problem for More Electrical Aircraft (MEA): How Insulation Systems of Actuators Can Be Qualified?

Giorgio Pietrini, Davide Barater, Giovanni Franceschini, Paolo Mancinelli and Andrea Cavallini, *University of Parma, Italy; University of Bologna, Italy*

S127 Magnetics II

Room: 102A

Chairs: Shuo Wang, Gerard Hurley

10:30AM | High Power Density Impedance Control Network DC-DC Converter Utilizing an Integrated Magnetic Structure

Ashish Kumar, Jie Lu, Saad Pervaiz, Alihossein Sepahvand and Khurram Afridi, *University of Colorado Boulder, United States*

10:55AM | Time-Domain Homogenization of Litz-Wire Bundles in FE Calculations

Korawich Niyomsatian, Jeroen Van den Keybus, Ruth Sabariego and Johan Gyselinck, *Triphase, ULB, Belgium; Triphase, Belgium; KU Leuven, Belgium; ULB, Belgium*

11:20AM | High Frequency Core Coefficient for Transformer Size Selection

Lukas Mueller and Jonathan Kimball, *Missouri University of Science and Technology, United States*

11:45AM | Very High Frequency Integrated Voltage Regulator for Small Portable Devices

Dongbin Hou, Fred Lee and Qiang Li, *CPES, Virginia Tech, United States*

S128 Device Short Circuit Capability

Room: 202C

Chairs: Yi Deng,, Ty McNutt

10:30AM | Robustness in Short-Circuit Mode: Benchmarking of 600V GaN HEMTs with Power Si and SiC MOSFETs

Nasser Badawi, Abdullah Eial Awwad and Sibylle Dieckerhoff, *Technical University of Berlin, Germany*

10:55AM | Investigation on the Short Circuit Safe Operation Area of SiC MOSFET Power Modules

Paula Diaz Reigosa, Francesco Iannuzzo, Haoze Luo and Frede Blaabjerg, *Aalborg University, Denmark; Aalborg University, Denmark*

11:20AM | Short-Circuit Protection of 1200V SiC MOSFET T-type Module in PV Inverter Application

Yuxiang Shi, Ren Xie, Lu Wang, Yanjun Shi and Hui Li, *FSU, United States*

11:45AM | Prediction of Short-Circuit-Related Thermal Stress in Aged IGBT Modules

Amir Sajjad Bahman, Francesco Iannuzzo, Christian Uhrenfeldt, Frede Blaabjerg and Stig Munk-Nielsen, *Aalborg University, Denmark*

Thursday, September 22nd

2:00PM – 3:40PM

S129 DFIG Based Wind Power Systems

Room: 203AB

Chairs: Wei Qiao, Behrooz Mirafzal

2:00PM | Flexible PCC Voltage Unbalance Compensation Strategy for Autonomous Operation of Parallel DFIGs

Tao Wang and Heng Nian, *Zhejiang University, China*

2:25PM | Analysis and Comparison of Super- Synchronous Resonance in Small and Large Scale DFIG System

Yipeng Song, Frede Blaabjerg and Xiongfei Wang, *Aalborg University, Denmark*

2:50PM | A Super-synchronous Doubly Fed Induction Generator Option for Wind Turbine Applications

Kee Shin and Thomas Lipo, *ABB, United States; University of Wisconsin – Madison (WEMPEC), United States*

3:15PM | Fault Diagnosis of Wind Turbine Gearbox Using DFIG Stator Current Analysis

Fangzhou Cheng, Chun Wei, Liyan Qu and Wei Qiao, *University of Nebraska-Lincoln, United States*

S130 Utility Scale Battery Systems

Room: 203C

Chairs: Daniel-Ioan Stroe, Frede Blaabjerg

2:00PM | Controller for Combined Peak-Load Shaving and Capacity Firming Utilizing Multiple Energy Storage Units in a Microgrid

Andrew Hintz, Kaushik Rajashekara and Prasanna Rajagopal, *The University of Texas at Dallas, United States*

2:25PM | Energy Storage Configuration Strategy for Virtual Synchronous Machine

Chang Yuan, Chang Liu, Tianyang Zhao, Niang Tang and Xiangning Xiao, *North China Electric Power University, China; Electric Power Research Institute of Guangdong, China*

2:50PM | Control of Energy Storage System Integrating Electrochemical Batteries and SC for Grid-connected Applications

Ruben Capo-Misut, Raul Santiago Munoz-Aguilar, Joan Rocabert, Jose Ignacio Candela and Pedro Rodriguez, *Universitat Politecnica de Catalunya, Spain; Abengoa Research S.L., Spain*

3:15PM | A Novel Approach towards Energy Storage System Sizing Considering Battery Degradation

Yuhua Du, Rishabh Jain and Srdjan M. Lukic, *North Carolina State University, United States*

S131 AC Microgrids III: Operation, Control and Energy Management

Room: 203DE

Chairs: Sayed Ali Khajehaddini, Juan Manuel Guerrero

2:00PM | Robust Decentralized Voltage and Frequency Control of Generators in Islanded Microgrids Using \mathcal{H}_∞ -Synthesis

Mohsen Azizi and Sayed Ali Khajehoddini, *Michigan Technological University, United States; University of Alberta, Canada*

2:25PM | Thyristor Based Short Circuit Current Injection in Isolated Grids

Bjarte Hoff, Pawan Sharma and Trond Ostrem, *UiT The Arctic University of Norway, Norway*

2:50PM | Optimized Energy Management System to Reduce Fuel Consumption in Remote Military Microgrids

Norma Anglani, Michele Colombini and Giovanna Oriti, *University of Pavia, Italy; Generac Mobile Products, Italy; Naval Postgraduate School, United States*

3:15PM | Analysis and Improvement of the Energy Management of an Isolated Microgrid in Lencois Island based on a Linear Optimization Approach

Federico de Bosio, Adriana Carolina Luna, Luiz Antonio de Souza Ribeiro, Moises Graells, Osvaldo Ronald Saavedra and Josep Maria Guerrero, *Politecnico di Torino, Italy; Aalborg University, Denmark; Federal University of Maranhao, Brazil; Universitat Politecnica de Catalunya, Spain*

S132 Battery Charging for Transportation Electrification

Room: 102D

Chairs: Theodore Bohn, Alireza Khaligh

2:00PM | A Primary Full-Integrated Active Filter Auxiliary Power Module in Electrified Vehicle Applications with Single-Phase Onboard Chargers

Ruoyu Hou and Ali Emadi, *McMaster University, Canada*

2:25PM | Sensitivity Analysis of a Wireless Power Transfer (WPT) System for Electric Vehicle Application

Madhu sudhan Chinthavali and Zhiqiang Wang, *ORNL, United States*

2:50PM | Design of a Dual-Loop Controller for In-motion Wireless Charging of an Electric Bus

Reza Tavakoli, Aleksandar Jovicic, Niranjan Chandrappa, Ryan Bohm and Zeljko Pantic, *Utah State University, United States*

3:15PM | Design of CRM AC/DC Converter for Very High-Frequency High-Density WBG-Based 6.6kW Bidirectional On-Board Battery Charger

Zhengyang Liu, Bin Li, Fred Lee and Qiang Li, *CPES_Virginia Tech, United States*

S133 Three-Phase Inverter PWM

Room: 202A

Chairs: Subhashish Bhattacharya, Giacomo Scelba

2:00PM | SiC MOSFET Zero-Voltage-Switching SVM Controlled Three-phase Grid Inverter

Ning He, Yawen Li, Chengrui Du, Chao Liu, Changsheng Hu and Dehong Xu, *Zhejiang University, China, China*

2:25PM | A Novel Soft-switching Modulation Scheme for Isolated DC-to-three-phase-AC Matrix-based Converter Using SiC Device

Xiaohang Yu, Fanning Jin and Mengqi Wang, *University of Michigan-Dearborn, United States*

2:50PM | New PWM Technique for Grid-Tie Isolated Bidirectional DC-AC Inverter Based High Frequency Transformer

Mahmoud Sayed, Suzuki Kazuma, Takeshita Takaharu and Kitagawa Wataru, *Nagoya Institute of Technology, Japan*

3:15PM | Reduction of Input Current Harmonics based on Space Vector Modulation for Three-phase VSI with varied Power Factor

Koroku Nishizawa, Jun-ichi Itoh, Akihiro Odaka, Akio Toba and Hidetoshi Umida, *Nagaoka University of Technology, Japan; Fuji Electric Co., Ltd., Japan*

S134 AC-AC Converters II

Room: 202E

Chairs: Hirofumi Akagi, Matthias Preindl

2:00PM | A Comparison of Indirect Matrix Converter Based Open-End Winding Drives Against State-of-the-Art

Saurabh Tewari and Ned Mohan, *MTS Systems Corporation, United States; University of Minnesota, United States*

2:25PM | Common Mode Voltage Reduction in Open-End Multi-phase Load System fed Through Matrix Converter

Khaliquir Rahman, Atif Iqbal, Nasser A. Al-Emadi, Rashid M Alammari, Lazhar Ben Brahim and Hossein Dehghani Tafti, *Qatar University, Qatar; Nanyang Technological University, Singapore*

2:50PM | Experimental Comparison of Devices Thermal Cycling in Direct Matrix Converters (DMC) and Indirect Matrix Converters (IMC) using SiC MOSFETs

Andrew Trentin, Liliana de Lillo, Lee Empringham, Pericle Zanchetta, Pat Wheeler and Jon Clare, *The University of Nottingham, United Kingdom*

3:15PM | A Carrier-based Modulation Strategy for Multi-modular Matrix Converters with Zero Common-mode Voltage

Wenjing Xiong, Yao Sun, Mei Su, Jian Yang and Chunsheng Wang, *Central South University, China; Central South University, Jiangxi Kangcheng Co., China*

S135 Modular Multilevel Converters (MMC) III

Room: 202B

Chairs: Di Zhang, Jiangchao Qin

2:00PM | Design and Implementation of Finite State Machine Decoders for Phase Disposition Pulse Width Modulation of Modular Multilevel Converters

Carlos Teixeira, Yichao Sun, Grahame Holmes and Brendan McGrath, *RMIT University, Australia; Southeast University, China*

2:25PM | Control of the AC-AC Modular Multilevel Converter Under Submodule Failure

Yang Qichen and Saeedifard Maryam, *Georgia Institute of Technology, United States*

2:50PM | Control of a Modular Multilevel Converter with Pulsed DC Load

Marija Jankovic, Alan Watson, Alessandro Costabeber and Jon Clare, *University of Nottingham, United Kingdom*

3:15PM | Short circuit output protection of MMC in Voltage Source Control Mode

Manfred Winkelnkemper, Lukas Schwager, Pawel Blaszczyk, Mischa Steurer and Dionne Soto, *ABB Switzerland Ltd., Switzerland; ABB Poland Sp. z o.o., Poland; CAPS Florida State University, United States*

S136 DC-DC: Isolated Converters

Room: 102C

Chairs: Sudip Mazumder, Yilmaz Sozer

2:00PM | An Isolated Three-Port DC-DC Converter with High Power Density in 10 cm X 5 cm X 0.8 cm Card Size for Flexible Automotive Systems

Shuntaro Inoue, Kenichi Itoh, Masanori Ishigaki, Takahide Sugiyama and Masaru Sugai, *TOYOTA CENTRAL R and D LABS., INC., Japan*

2:25PM | Auxiliary power supply based on a modular ISOP Flyback configuration with very high input voltage

Alberto Rodriguez, Maria R. Rogina, Mariam Saeed, Diego G. Lamar, Manuel Arias, Mario Lopez and Fernando Briz, *University of Oviedo, Spain*

2:50PM | Design Considerations for Series Resonant Converters with Constant Current Input

Hongjie Wang, Tarak Saha and Regan Zane, *Utah State University, United States*

3:15PM | Galvanically Isolated Switched-Boost-Based DC-DC Converter

Saman A. Gorji, Mehran Ektesabi, Trung N. Nguyen and Jinchuan Zheng, *Swinburne University of Technology, Australia*

S137 Modeling and Control of DC-AC converters II

Room: 202D

Chairs: Thomas Jahns, Jon Are Suul

2:00PM | A Triangle Phase-Shift Control Strategy for Interleaved Critical-Mode Power Converters

Lanhua Zhang, Rachael Born, Qingqing Ma, Yu Wei, Xiaonan Zhao and Jih-Sheng Lai, *Virginia Polytechnic Institute and State University, United States*

2:25PM | Seamless Transition Control between Motoring and Generating Modes of a Bidirectional Multi-Port Power Converter Used in Automotive SRM Drive

Fan Yi, Wen Cai and Babak Fahimi, *The University of Texas at Dallas, United States*

2:50PM | Three-Phase Inverter Modeling using Multifrequency Averaging with Third Harmonic Injection

Xiao Liu and Aaron Cramer, *University of Kentucky, United States*

3:15PM | Transformation Based Tracking Controller for a GaN Microinverter

Ankit Gupta, Harshit Soni, Sudip Mazumder, Shirish Raizada, Debanjan Chatterjee, Paromita Mazumder and Parijat Bhattacharjee, *University of Illinois, United States; Tagore Tech, United States; NextWatt LLC, United States*

S138 Stability in Power Converters II

Room: 102E

Chairs: Dusan Borojevic, Leila Parsa

2:00PM | Source-side Series-virtual-impedance Control Strategy to Stabilize the Cascaded System with Improved Performance

Xin Zhang, Qing-Chang Zhong and Wen-Long Ming, *The University of Sheffield, United Kingdom; Illinois Institute of Technology, United States*

2:25PM | Bifurcation Analysis of Photovoltaic-Battery Hybrid Power System with Constant Power Load

Meng Huang, Lijun Wei, Yi Liu, Jianjun Sun and Xiaoming Zha, *Wuhan University, China*

2:50PM | Measurement Technique to Determine the Impedance of Automotive Energy Nets for Stability Analysis Purpose Based On a Floating Capacitor H-bridge Converter

Matthias Hiermeier, Michael Muerken, Thomas Hackner and Johannes Pforr, *Technische Hochschule Ingolstadt, Germany; Audi AG Ingolstadt, Germany*

3:15PM | Harmonic Suppression and Stability Improvement for Aggregated Current-Controlled Inverters

Qiang Qian, Shaojun Xie, Jinming Xu and Lin Ji, *Nanjing University of Aero. and Astronautics, China*

S139 Design Optimization of Power Converters

Room: 202C

Chairs: Yan-hei Liu, Pericle Zanchetta

2:00PM | Efficiency-wise Optimal Design Methodology of LCLC Converter for Wide Input Voltage Range Applications

Yang Chen, Hongliang Wang, Zhiyuan Hu, Yan-fei Liu, Jahangir Afsharian and Zhihua (Alex) Yang, *Queen's University, Canada; Murata Power Solutions, Canada*

2:25PM | Reliability-Oriented Design of LC Filter in Buck DC-DC Converter with Multi-Objective Optimization

Yi Liu, Meng Huang, Yuxia Liu and Xiaoming Zha, *School of Electrical Engineering, Wuhan University, China*

2:50PM | Optimal Design of Output LC Filter and Cooling for Three-Phase Voltage-Source Inverters Using Teaching-Learning-Based Optimization

Hamzeh Jamal, Saher Albatran and Issam Smadi, *Jordan University of Science and Technology, Jordan*

3:15PM | Using Design by Optimization for Reducing the Weight of a SiC Switching Cell

Mylene Delhommais, Gnimdu Dadanema, Yvan Avenas, Jean-Luc Schanen, Francois Costa and Christian Voltaire, *G2ELab, France; Satie, France; Ampere, France*

S140 Active Power Filters

Room: 101B

Chairs: Luis Moran, Suman Debnath

2:00PM | Multilevel Nine-Leg Converter Universal Active Power Filter

Phelipe Leal Serafim Rodrigues, Cursino Brandao Jacobina and Mauricio Beltrao de Rossiter Correa, *DEE UFCG, Brazil*

2:25PM | Central Control and Distributed Protection of the DSBC and DSCC Modular Multilevel Converters

Andre Hillers, Hao Tu and Juergen Biela, *Laboratory for High Power Electronic Systems, Switzerland; North Carolina State University, United States*

2:50PM | Mitigating the Effect of Series Capacitance Unbalance on the Voltage Reduction Capability of an Auxiliary CSI used as Switching Ripple Active Filter

Savvas Papadopoulos, Mohamed Rashed, Christian Klumpner and Pat Wheeler, *University of Nottingham, United Kingdom*

3:15PM | A New Control Method of Suppressing DC-Capacitor Voltage Ripples Caused by Third-Order Harmonic Compensation in Three-Phase Active Power Filters

Tomoyuki Mannen, Issei Fukasawa and Hideaki Fujita, *Tokyo Institute of Technology, Japan*

S141 Non-Conventional Machine Configurations II

Room: 101A

Chairs: Guan-Ren Chen, Nicola Bianchi

2:00PM | Design of Dual Purpose No Voltage Combined Windings for Bearingless Motors

Eric Severson, Robert Nilssen, Tore Undeland and Ned Mohan, *University of Minnesota, United States; NTNU, Norway*

2:25PM | Synchronous Generator Field Excitation Via Capacitive Coupling Through a Journal Bearing

Jiejian Dai Dai, Skyler Hagen, Daniel Ludois and Ian Brown, *University of Wisconsin -Madison, United States; Illinois Institute of Technology, United States*

2:50PM | Development of Stator-Magnetless Linear Synchronous Motor for Sensorless Control

Makino Shogo, Kakihara Masanobu, Takase Yoshiyasu, Takaki Mamoru, Shikayama Toru, Ohto Motomichi, Higuchi Tsuyoshi and Abe Takashi, *Yaskawa Electric Corporation, Japan; Nagasaki University, Japan*

3:15PM | Ultralightweight Motor Design Using Electromagnetic Resonance Coupling

Kazuto Sakai and Yuta Sugasawa, *Toyo University, Japan*

S142 Magnetic Gears

Room: 102B

Chairs: Siavash Pakdelian, Kan Akatsu

2:00PM | A Novel Reluctance Magnetic Gear for High Speed Motor

Kohei Aiso and Kan Akatsu, *Shibaura institute of technology, Japan; Shibaura Institute of Technology, Japan*

2:25PM | Analysis of a Magnetically Geared Lead Screw

Mojtaba Bahrami Kouhshahi and Jonathan Bird, *Portland State University, United States*

2:50PM | Design Comparison of NdFeB and Ferrite Radial Flux Magnetic Gears

Matthew Johnson, Matthew C. Gardner and Hamid A. Toliyat, *Texas A and M University, United States*

3:15PM | Power Transferring of Magnetic-Geared Permanent Magnet Machines

Leilei Wu, Ronghai Qu, Dawei Li and Yuting Gao, *Huazhong University of Science and Technology, China*

S143 High Speed and Direct Drives

Room: 101CD

Chairs: Mazharul Chowdhury, Rukmi Dutta

2:00PM | Robust Control of an Open-Ended Induction Motor Drive With a Floating Capacitor Bridge over a Wide Speed Range

Michele Mengoni, Albino Amerise, Luca Zarri, Angelo Tani, Giovanni Serra and Domenico Casadei, *University of Bologna, Italy*

2:25PM | High Speed Operation of Permanent Magnet Machine Position Sensorless Drive Using Discretized EMF Estimator

Shih-Chin Yang and Guan-Ren Chen, *National Taiwan University, Taiwan*

2:50PM | DC Voltage Regulated PWM Inverter for High-Speed Electrical Drives

Vito Giuseppe Monopoli, Maria Concetta Poliseo, Maria Chiara Stomati and Francesco Cupertino, *Politecnico di Bari, Italy; GE Avio srl, Italy*

3:15PM | Variable Time Step Control with Synchronous PWM in Low Frequency Modulation Index for AC Machine Drive

Sungho Jung, Jaeyong Park, Euihoon Chung and Jung-Ik Ha, *Seoul National University, Korea (South)*

S144 Power Assemblies

Room: 102A

Chairs: Jelena Popovic, Yvan Avenas

2:00PM | Implementation and Performance of a Current Sensor for Laminated Bus Bar

Yoshikazu Kuwabara, Keiji Wada, Jean-Michel Guichon, Jean-Luc Schanen and James Roudet, *Tokyo Metropolitan University, Japan; G2Elab, Univ. Grenoble Alps, France*

2:25PM | Busbar Design for SiC-Based H-Bridge PEBB using 1.7 kV, 400 A SiC MOSFETs Operating at 100 kHz

Niloofar Rashidi Mehrabadi, Igor Cvetkovic, Jun Wang, Rolando Burgos and Dushan Boroyevich, *CPES- Virginia Tech, United States*

2:50PM | Ultra-low Inductance Design for a GaN HEMT Based 3L-ANPC Inverter

Emre Gurpinar, Francesco Iannuzzo, Yongheng Yang, Alberto Castellazzi and Frede Blaabjerg, *University of Nottingham, United Kingdom; Aalborg University, Denmark*

3:15PM | Layout Study of Contactless Magnetoresistor Current Sensor for High Frequency Converters

Mehrdad Biglarbegan, Shahriar Jalal Nibir, Hamidreza Jafarian, Johan Enslin and Babak Parkhideh, *University of North Carolina at Charlotte, United States; Energy Production and Infrastructure Center, United States*



Technical Program Schedule

POSTER SESSIONS

Monday, September 19th

5:30PM – 7:00PM

Renewable and Sustainable Energy Applications

N

Room: Exhibit Hall A

Chairs: Euzeli Santos Jr., Johan Enslin

P101 | Modeling, Parameterization, and Benchmarking of a Lithium Ion Electric Bicycle Battery

Weizhong Wang, Pawel Malysz, Khalid Khan, Lucia Gauchia and Ali Emadi, *ECE Department, McMaster University, Canada; ECE Department, Michigan Tech University, United States*

P102 | Performance Evaluation of a Hybrid Thermal-Photovoltaic Panel

Cristina Moscatiello, Chiara Boccaletti, Aderito Neto Alcaso, Carlos A. Figueiredo Ramos and Antonio J. Marques Cardoso, *Sapienza University of Rome, CISE, Italy; Politechnic Institute of Guarda, CISE, Portugal; University of Beira Interior, CISE, Portugal*

P103 | On-line Wind Speed Estimation in IM Wind Generation Systems by Using Adaptive Direct and Inverse Modelling of the Wind Turbine

Angelo Accetta, Maurizio Cirrincione, Giansalvo Cirrincione and Marcello Pucci, *ISSIA-CNR, Italy; University of South Pacific (USP), Fiji, University of Picardie, Jules Verne, France*

P104 | Passivity-Based and Standard PI Controls Application to Wind Energy Conversion System [#1701]

Rui Gao, Rafael Cisneros, Iqbal Husain and Romeo Ortega, *North Carolina State University, United States; Laboratoire des Signaux et Systèmes, France*

P105 | Evaluation of Circulating Current Suppression Methods for Parallel Interleaved Inverters [#760]

Ghanshyamsinh Gohil, Lorand Bede, Remus Teodorescu, Tamas Kerekes and Frede Blaabjerg, *Aalborg University, Denmark*

Smart Grid & Utility Applications

N

Room: Exhibit Hall

Chairs: Johan Enslin, Martin Ordonez

P301 | A Fast Dynamic Unipolar Switching Control Scheme for Single Phase Inverters in DC Microgrids

Nicolai Hildebrandt, Mandip Pokharel, Carl Ngai-Man Ho and Yuanbin He, *Fraunhofer-Institut für Solare Energiesysteme, Germany; University of Manitoba, Canada; City University of Hong Kong, Hong Kong*

P302 | A Novel Method of Optimizing Efficiency in Hybrid Photovoltaic-Grid Power System

Liangliang Ren, Ke Jin, Ling Gu and Zhengshuo Wang, *Nanjing University of Aeronautics and Astronaut, China*

P303 | A Novel Autonomous Control Scheme for Parallel, LCL-Based UPS Systems

Mohammad Bani Shamseh, Atsuo Kawamura and Teruo Yoshino, *Yokohama National University, Japan; Toshiba Mitsubishi-Electric Industrial Systems, Japan*

P304 | Harmonic Components Based Protection Strategy for Inverter-Interfaced AC Microgrid

Chen Zhi, Pei Xuejun and Peng Li, *Huazhong University of Science and Technology, China*

P305 | Adaptive Virtual Inertia Control of Distributed Generator for Dynamic Frequency Support in Microgrid

Jianhui Meng, Yi Wang, Chao Fu and Hui Wang, *North China Electric Power University, China*

P306 | Interleaved Hybrid Boost Converter with Simultaneous AC and DC Outputs for Microsource Applications

Amrita Sharma, Pramod Bura, R. K. Singh and Ranjit Mahanty, *Indian Institute of Technology (BHU), India*

P307 | Robust Inverter Control Design in Islanded Microgrids Using \$\$-Synthesis

Mohsen Azizi and S. Ali Khajehoddin, *Michigan Technological University, United States; University of Alberta, Canada*

P308 | Economic Analysis of a Regional Coordinated Microgrids System Considering Optimal PEVs Allocation

Liang Xiao, Changsong Chen, Shanxu Duan, Hua Lin, Yawei Wang and Guozhen Hu, *Huazhong University of Science and Technology, China; Hubei Polytechnic University, China*

P309 | Design of a Cooperative Voltage Harmonic Compensation Strategy for Islanded Microgrids Combining Virtual Admittances and Repetitive Controllers

Cristian Blanco, Francesco Tardelli, David Diaz, Pericle Zanchetta and Fernando Briz, *University of Oviedo, Spain; University of Nottingham, United Kingdom*

Transportation Electrification Applications

N

Room: Exhibit Hall

Chairs: Jin Wang, Yaosuo "Sonny" Xue

P501 | EMI Reduction Technology in 85 kHz Band 44 kW Wireless Power Transfer System for Rapid Contactless Charging of Electric Bus

Tetsu Shijo, Kenichirou Ogawa, Masatoshi Suzuki, Yasuhiro Kanekiyo, Masaaki Ishida and Shuichi Obayashi, *Toshiba Corporation, Japan*

P502 | Design and Characterization of a Meander Type Dynamic Inductively Coupled Power Transfer Coil

Ugaitz Iruretagoyena, Irma Villar, Haritza Camblong, Asier Garcia-Bediaga and Luis Mir, *IK4-Ikerlan, Spain; University of the Basque Country, Spain*

P503 | Design of S/P Compensated IPT System Considering Parameter Variations in Consideration of ZVS Achievement

Yusheng Zhang, Qianhong Chen, Xiaoyong Ren, Siu-Chung Wong, Zhiliang Zhang and Wei Hua, *Nanjing University of Aero. and Astro., China; Hong Kong Polytechnic University, Hong Kong; Southeast University, China*

P504 | Coasting Control of EV Motor Considering Cross Coupling Inductance

Heekwang Lee, Bonkil Koo and Kwanghee Nam, *POSTECH, Korea (South)*

P505 | Analysis and Comparison of Single Inverter Driven Series Hybrid System

Yongjae Lee, Kahyun Lee and Jung-Ik Ha, *Seoul National University, Korea (South)*

P506 | Control Strategy for a Modified Cascade Multilevel Inverter with Dual DC Source for Enhanced Drivetrain Operation

Maciej Bendyk and Patrick Chi Kwong Luk, *Cranfield University, United Kingdom*

P507 | An Investigation of DC-Link Voltage and Temperature Variations on EV Traction System Design

Nan Zhao, Rong Yang, Nigel Schofield and Ran Gu, *McMaster University, Canada*

P508 | Compact and High Power Inverter for the Cadillac CT6 Rear Wheel Drive PHEV

Mohammad Anwar, Mehrdad Teimor, Peter Savagian, Ryuichi Saito and Takeshi Matsuo, *General Motors, United States; Retired from General Motors, United States; Hitachi Automotive, Japan*

Power Converter Topologies

E

Room: Exhibit Hall

Chairs: Pradeep S. Shenoy, Leon M Tolbert

P701 | Quadratic Boost A-Source Impedance Network

Yam Siwakoti, Andrii Chub, Frede Blaabjerg and Dmitri Vinnikov, *Aalborg University, Denmark; Tallinn University of Technology, Estonia*

P702 | Analysis and Design of a Switched-Capacitor Step-Up Converter for Renewable Energy Applications

Ricardo Mota-Varona, Ma. Guadalupe Ortiz-Lopez, Jesus Leyva-Ramos and Diego Langerica-Cordoba, *Instituto Potosino de Inv Cient y Tec, Mexico; Universidad Politecnica de SLP, Mexico*

P703 | Non-Isolated High-Step-Up Resonant DC/DC Converter

Ying Huang, Chun-Yuen Lai, Song Xiong, Siew-Chong Tan and Shu Yuen (Ron) Hui, *The University of Hong Kong, Hong Kong*

P704 | Three Level DC-DC Converter Based on Cascaded Dual Half-Bridge Converter for Circulating Loss Reduction

Zhiqiang Guo and Kai Sun, *Tsinghua University, Beijing, China*

P705 | Current-Fed Converters with Switching Cells

Zeeshan Aleem and Moin Hanif, *University of Cape town, South Africa; University of Cape Town, South Africa*

P706 | Analysis of LCLC Resonant Converters for High-Voltage High-Frequency Applications

Bin Zhao, Gang Wang and Gerard Hurely, *University of Chinese Academy of Sciences, China; Space Travelling-wave Tube Research Center, China; Power Electronics Research Center, NUI, Ireland*

P707 | A Novel Constant Voltage Primary-side Regulator Topology to Eliminate Auxiliary Winding

Yongjiang Bai, Wenjie Chen, Xiaoyu Yang, Xu Yang and Guangzhao Xu, *Xi'an Jiaotong University, China; Silergy Corp., China*

P708 | Single-Phase/-Switch Voltage-Doubler DCM SEPIC Rectifier with High Power Factor and Reduced Voltage Stress on the Semiconductors

Paulo Junior Silva Costa, Carlos Henrique Illa Font and Telles Brunelli Lazzarin, *Federal University of Santa Catarina, Brazil; Federal University of Technology – Parana, Brazil*

P709 | Z-Source Resonant Converter with Power Factor Correction for Wireless Power Transfer Applications

Nomar S. Gonzalez-Santini, Hulong Zeng, Yaodong Yu and Fang Zheng Peng, *Michigan State University, United States*

P710 | A High-Power-Density Single-Phase Inverter with Pulse Current Injection Power Decoupling Method

Xiaofeng Lyu, Yanchao Li, Ngoc Dung Nguyen, Ze Ni and Dong Cao, *North Dakota State University, United States*

P711 | Hybrid Multilevel Converter Based on Flying Capacitor and Extended Commutation Cell

Sjef Settels, Gabriel Tibola and Erik Lemmen, *Eindhoven University of Technology, Netherlands*

P712 | A Novel Hybrid Five-Level Voltage Source Converter Based on T-Type Topology for High-Efficiency Applications

Shuai Xu, Jianzhong Zhang, Xing Hu and Yongjiang Jiang, *Southeast University, China*

P713 | Flying-Capacitor-Clamped Five-Level Inverter Based on Switched-Capacitor Topology

Chen Cheng and Liangzong He, *Xiamen University, China*

P714 | Cascaded Three-phase Quasi-Z Source Photovoltaic Inverter

Zhiyong Li, Weiwei Zhang, Yougen Chen and Xingyao He, *Central South University, China*

P715 | Hybrid Three-Phase Four-Wire Inverters Based on Modular Multilevel Cascade Converter

Filipe Bahia, Cursino Jacobina, Italo Silva, Nady Rocha, Bruno Luna and Phelipe Rodrigues, *DEE UFCG, Brazil; DEE UFPB, Brazil*

P716 | Hybrid Nine-Level Single-Phase Inverter Based on Modular Multilevel Cascade Converter

Filipe Bahia, Cursino Jacobina, Italo Silva, Nady Rocha, Bruno Luna and Phelipe Rodrigues, *DEE UFCG, Brazil; DEE UFPB, Brazil*

P717 | Multilevel Converter Based on Cascaded Three-Leg Converters With Reduced Voltage and Current

Edgard Fabricio, Cursino Jacobina, Nady Rocha, Lacerda Rodrigo and Correa Mauricio, *IFPB, Brazil; UFCG, Brazil; UFPB, Brazil*

P718 | Operation of Modular Matrix Converter with Hierarchical Control System Under Cell Failure Condition

Yushi Miura, Tomoaki Yoshida, Takuya Fujikawa, Takuma Miura and Toshifumi Ise, *Osaka University, Japan*

P719 | The Delta-Connected Cascaded H-Bridge Converter Application in Distributed Energy Resources and Fault Ride Through Capability Analysis

Ping-Heng Wu, Yuh-Tyng Chen and Po-Tai Cheng, *National Tsing Hua University, Taiwan*

Control, Modelling and Optimization of Power Converters

E

Room: Exhibit Hall

Chairs: Pericle Zanchetta, Luca Solero

P901 | Dual Sequence Current Control Scheme Implemented in DSRF with Decoupling Terms Based on Reference Current Feed-Forward

Sizhan Zhou, Jinjun Liu and Zhang Yan, *Xi'an Jiaotong University, China*

P902 | Injecting 3rd Harmonic into the Input Current to Improve the Power Factor of DCM Buck PFC Converter

Xufeng Zhou, Kai Yao, Hui Li, Fei Yang and Mingcai Kang, *Nanjing University of Science and Technology, China; Nanjing University of Science and Technology, China*

P903 | Investigation of Reducing the Influence of Digital Control Delay to LCL-Type Grid-Connected Inverter

Guoshu Zhao, Junyang Ma, Liulu Huang and Yu Tang, *Jinling Institute of Technology, China; NUAA, China*

P904 | Repetitive Control for Grid Connected Inverters with LCL Filter Under Stationary Frame

Yi Xiao, Gan Wei, Xueguang Zhang, Qiang Gao and Dianguo Xu, *Harbin Institute of Technology, China*

P905 | Direct Instantaneous Ripple Power Predictive Control for Active Ripple Decoupling of Single-Phase Inverter

Baoming Ge, Xiao Li, Haiyu Zhang, Yushan Liu, Robert S. Balog and Haitham Abu-Rub, *Texas A and M University, United States; Texas A and M University at Qatar, Qatar*

P906 | Input-Output Feedback Linearization Based Control for Quasi-Z-Source Inverter in Photovoltaic Application

Hong Gong, Yuan Li, Yuhong Wang and Rui Zhang, *Sichuan University, China*

P907 | A Novel Neutral Point Potential Control for the Three-Level Neutral-Point-Clamped Converter

Hsin-Chih Chen, Meng-Jiang Tsai, Yao-Bang Wang and Po-Tai Cheng, *National Tsing Hua University, Taiwan*

P908 | Phase Leading Input Current Compensation for CRM Boost PFC Converter

Chengdong Zhao, Junming Zhang and Xinke Wu, *Zhejiang University, China; Zhejiang University, China*

P909 | Paralleled Inverters with Zero Common-Mode Voltage

Dong Jiang and Zewei Shen, *Huazhong University of Science and Technology, China*

P910 | A Voltage Clamp Circuit for the Real-Time Measurement of the On-State Voltage of Power Transistors

Lei Ren, Qian Shen and Chunying Gong, *College of Automation Engineering Nanjing Univer, China*

P911 | Error-Voltage Based Open-Switch Fault Diagnosis Strategy for Matrix Converters with Model Predictive Control Method

Hui Deng, Tao Peng, Hanbing Dan, Mei Su and Jingrong Yu, *Central South University, Jiangxi Kangcheng Co., China*

P912 | Instrumented Diode Dedicated to Semiconductor Temperature Measurement in Power Electronic Converters

Ibrahima Ka, Yvan Avenas, Laurent Dupont, Mickael Petit, Raha Vafaei, Benoit Thollin and Jean-Christophe Crebier, *Univ. Grenoble Alpes, G2Elab, F-38000 Grenoble, France; CNRS UMR 8029, SATIE, ENS, 94230 Cachan, France*

P913 | Reliability Odometer of Power Semiconductor Device Used for High Performance High Power Amplifiers

Fei Xu, Juan Antonio Sabate, Xi Lu, Ruxi Wang, Louis Martin Frigo, Margaret Ann Wiza, Syedsaad Asif Ali and Melissa Jean Freeman, *GE Global Research, China; GE Global Research, United States; GE Healthcare Systems, United States*

P914 | Energy and Computational Efficient Estimation of Battery Intrinsic Parameters

Chun Sing Cheng, Ricky Wing Hong Lau, Henry Shu Hung Chung and N.K. Rath, *City University of Hong Kong, Hong Kong; Premier Technologies Ltd, Hong Kong*

P915 | Snubber Capacitors Optimization for Super-Junction MOSFET in the ZVS Full-Bridge Inverter

Yenan Chen, Guangyuan Liu, Changsheng Hu and Dehong Xu, *Zhejiang University, China*

Electrical Machines



Room: Exhibit Hall

Chairs: Bruno Lequesne, Mohammad Islam

P1101 | A Computational Technique for Iron Losses in Electrical Machines

Omar Bottesi, Luigi Alberti, Ruth V. Sabariego and Johan Gyselinck, *Free University of Bozen-Bolzano, Italy; Katholieke Universiteit Leuven (KU Leuven), Belgium; Universite Libre de Bruxelles (ULB), Belgium*

P1102 | Saliency Harmonic Induction Motor Speed Estimation Using Artificial Neural Networks

Abdullah Alkhoraif and Donald Zinger, *Northern Illinois University, United States*

P1103 | Reclosing Transients in Standard and Premium Efficiency Induction Machines in the Presence of Voltage Unbalance

Tumelo Gabaraane, Paul Barendse and Azeem Khan, *Masters Student, South Africa; Supervisor, South Africa; Co-supervisor, South Africa*

P1104 | Parameter Sensitivity of Large Electric Machines

Jemimah Akiror, Pragasen Pillay and Arezki Merkhout, *Concordia University, Canada; Hydro Quebec, Canada*

P1105 | Optimal Winding Arrangement of a Surface-Mounted Permanent Magnet Motor for Torque Ripple Reduction

Junichi Asama, Yamamoto Yo, Oiwa Takaaki and Chiba Akira, *Shizuoka University, Japan; Tokyo Institute of Technology, Japan*

P1106 | Numerical Study of Convective Heat Transfer in the End Region of A Totally Enclosed Permanent Magnet Synchronous Machine

Ayoub Ben Nachouane, Abdenour Abdelli, Guy Friedrich and Stephane Vivier, *IFP Energies nouvelles, France; Sorbonne Universites UTC, France*

P1107 | Torque Improvement of Wound Field Synchronous Motor for Electric Vehicle by PM-assist

Sung-Woo Hwang, Jae-Han Sim, Jung-Pyo Hong, Jiyoung Lee and Jongmoo Kim, *Hanyang University, Korea, Republic of; Korea Electrotechnology Research Institute, Korea, Republic of*

P1108 | Torque Ripple Reduction of a Variable Flux Motor

Amirmasoud Takbash, Maged Ibrahim and Pragasen Pillay, *Concordia University, Canada; Pharos University, Egypt*

P1109 | An Analytical Model for a Spoke Type Variable Flux Permanent Magnet Motor on No-load Condition

Amirmasoud Takbash and Pragasen Pillay, *Concordia University, Canada*

P1110 | Sensitivity of Manufacturing Tolerances on Cogging Torque in Interior Permanent Magnet Machines with Different Slot/Pole Number

Xiao Ge and Z. Q. Zhu, *University of Sheffield, United Kingdom*

P1111 | Cogging Torque Minimization in Flux-Switching Permanent Magnet Machines by Tooth Chamfering

Xiaofeng Zhu, Wei Hua and Ming Cheng, *Southeast University, China*

P1112 | Experimental Research on the Oil Cooling of the End Winding of The Motor

Ye Li, Tao Fan, Wei Sun, XuHui Wen and Qi Li, *Institute of Electrical Engineering of Chinese A, China*

P1113 | A Computationally Efficient Method for Calculation of Strand Eddy Current Losses in Electric Machines

Alireza Fatemi, Dan Ionel, Nabeel Demerdash, David Staton, Rafal Wrobel and Chong Yew Chuan, *Marquette University, United States; University of Kentucky, United States; Motor Design Limited, United Kingdom; University of Bristol, United Kingdom*

P1114 | Core Loss Estimation in Electric Machines with Flux Controlled Core Loss Tester

Burak Tekgun, Yilmaz Sozer, Igor Tsukerman, Parag Upadhyay and Steven Englebertson, *University of Akron, United States; ABB, United States*

P1115 | Thermal Analysis of a Three-Phase 24/16 Switched Reluctance Machine Used in HEVs

Michael Kasprzak, James W. Jiang, Berker Bilgin and Ali Emadi, *McMaster Automotive Resource Centre (MARC), Canada*

P1116 | Pre-Drive Test of an Implemented Novel Radial-Gap Helical ROTLIN Machine

Christophe Cyusa, Simba and Yasutaka Fujimoto, *Yokohama National University, Japan*

P1117 | Hybrid Excitation Topologies of Synchronous Generator for Direct Drive Wind Turbine

Maxime Ployard, Ammar Aymen, Gillon Frederic, Vldo Lionel and Laloy Daniel, *Ecole Centrale de Lille, France; JEUMONT Electric, France; Universite de Cergy Pontoise, France; EC Lille, France*

P1118 | Resonant Based Backstepping Direct Power Control Strategy for DFIG Under Both Balanced and Unbalanced Grid Conditions

Xiaohu Wang, Dan Sun and Ziqiang Zhu, *Zhejiang University, China; University of Sheffield, England*

P1119 | Design and Analysis of a New Five-Phase Brushless Hybrid-Excitation Fault-Tolerant Motor for Electric Vehicles

Li Zhang, Ying Fan, Ronghua Cui, ChenXue Li and Ming Cheng, *Southeast University, China*

P1120 | Multi-objective Design Optimisation and Pareto Front Visualisation of Radial-flux Eddy Current Coupler for Wind Generator Drive Train.

Abram Stephanus Erasmus and Maarten Kamper, *Stellenbosch University, South Africa*

P1121 | Reducing Estimated Parameters of a Synchronous Generator for Microgrid Applications

Mohammad Rasouli and Reza Sabzehgar, *Penn State Behrend, United States; San Diego State University, United States*

P1122 | Brushless Dual-Electrical-Port, Dual Mechanical Port Machines Based on the Flux Modulation Principle

Dawei Li, Ronghai Qu, Jian Li, Dong Jiang, Xiang Ren and Yuting Gao, *Huazhong University of Science and Technology, China*

Electric Drives



Room: Exhibit Hall

Chairs: Uday Deshpande, Gianmario Pellegrino

P1301 | An Equivalent Dual Three-Phase SVPWM Realization of the Modified 24-Sector SVPWM Strategy for Asymmetrical Dual Stator Induction Machine

Kun Wang, Xiaojie You, Chenchen Wang and Minglei Zhou, *Beijing Jiaotong University, China*

P1302 | A Speed Estimation Method for Free-Running Induction Motor with High Inertia Load in the Low Speed Range

Toshie Kikuchi, Yasushi Matsumoto and Akira Chiba, *Fuji Electric, Japan; Tokyo Institute of Technology, Japan*

P1303 | Design Optimization and Performance Investigation of Novel Linear Switched Flux PM Machines [#20]

Qinfen Lu, Yihua Yao, Jiameng Shi, Xiaoyan Huang, Youtong Fang, Yunyue Ye and Wei Xu, *Zhejiang University, China; Huazhong University of Science and Technology, China*

P1304 | A Coordinated SVPWM Without Sector Identification for Dual Inverter Fed Open Winding IPMSM System

Min Chen and Dan Sun, *Zhejiang University, China*

P1305 | Finite-Control-Set Model Predictive Current Control for PMSM Using Grey Prediction

Wencong Tu, Guangzhao Luo, Rong Zhang, Zhe Chen and Ralph Kennel, *Northwestern Polytechnical University (NPU), China; Technical University of Munich (TUM), Germany*

Power Semiconductor Devices, Passive Components, Packaging, Integration, and Materials



Room: Exhibit Hall

Chairs: Giovanna Oriti, Enrico Santi

P1501 | The Impact of Triangular Defects on Electrical Characteristics and Switching Performance of 4H-SiC PiN Diodes

Yeganeh Bonyadi, Peter Gammon, Roozbeh Bonyadi, Olayiwola Alatise, Ji Hu, Steven Hindmarsh and Philip Mawby, *University of Warwick, United Kingdom*

P1502 | Performance Evaluation of Series Connected 15 kV SiC IGBT Devices for MV Power Conversion Systems

Kasunaidu Vechalapu, Abhay Negi and Subhashish Bhattacharya, *North Carolina State University, United States*

P1503 | Comparative Performance Evaluation of Series Connected 15 kV SiC IGBT Devices and 15 kV SiC MOSFET Devices for MV Power Conversion Systems

Kasunaidu Vechalapu, Abhay Negi and Subhashish Bhattacharya, *North Carolina State University, United States*

P1504 | Equivalent Circuit Models and Model Validation of SiC MOSFET Oscillation Phenomenon

Tianjiao Liu, Runtao Ning, Thomas Wong and Z. John Shen, *Illinois Institute of Technology, United States*

P1505 | Enabling DC Microgrids with MV DAB Converter Based on 15 kV SiC IGBT and 15 kV SiC MOSFET

Awneesh Tripathi, Krishna Mainali, Sachin Madhusoodhanan, Kasunaidu Vechalapu, Ritwik Chattopadhyay and Subhashish Bhattacharya, *North Carolina State University, United States*

Emerging Technologies and Applications



Room: Exhibit Hall

Chairs: Xiaonan Lu, Pericle Zanchetta

P1701 | An LC Compensated Electric Field Repeater for Long Distance Capacitive Power Transfer

Hua Zhang, Fei Lu, Heath Hofmann, Weiguo Liu and Chris Mi, *Northwestern Polytechnical University, China; University of Michigan, United States; San Diego State University, United States*

P1702 | A Selection Method of Mutual Inductance Identification Models Based on Sensitivity Analysis for Wireless Electric Vehicle Charging

Fang Liu, Zhengming Zhao, Yiming Zhang, Kainan Chen, Fanbo He and Liqiang Yuan, *Tsinghua University, China*

P1703 | Short-Circuit Protection of Power Converters Using SiC Current Limiters

Mahmood Alwash, Mark Sweet, Ekkanath Madathil Sankara Narayanan and Graham Bruce, *University of Sheffield, United Kingdom; Rolls-Royce plc, United Kingdom*

P1704 | Impedance Measurement of Three-Phase Grid-Connected Systems in DQ-Domain: Applying MIMO-Identification Techniques

Tomi Roinila, Tuomas Messo and Aapo Aapro, *Tampere University of Technology, Finland*

P1705 | A New Design Methodology for a 1-Meter Distance, 6.78MHz Wireless Power Supply System for Telemetries

Lee Seung-Hwan, Lee Jun-Ho and Yi Kyong-Pyo, *University of Seoul, Korea (South); Korea Railroad Research Institute, Korea (South)*

P1706 | Modeling and Investigation of 4-Coil Wireless Power Transfer System with Varying Spatial Scales

Lu Chen, Fuxin Liu, Xinbo Ruan and Xuling Chen, *Nanjing Univ. of Aeronautics and Astronautics, China*

P1707 | Vehicular Integration of Wireless Power Transfer Systems and Hardware Interoperability Case Studies

Omer Onar, Steven Campbell, Larry Seiber, Cliff White and Madhu Chinthavali, *Oak Ridge National Laboratory, United States*

Tuesday, September 20th

11:00AM – 12:30PM

Renewable and Sustainable Energy Applications

N

Room: Exhibit Hall

Chairs: Narid Zargari, Rajendra Prasad Kandula

P1901 | Power Balance Control and Circulating Current Suppression for MMC based EV Integration System Considering Users Requirement

Meiqin Mao, Tinghuan Tao, Yong Ding, Liuchen Chang and Nikos Hatzilargyriou, *Hefei University of Technology, China; University of New Brunswick, Canada; National Technical University of Athens, Greece*

P1902 | Optimal Sizing of Energy Storage for PV Power Ramp Rate Regulation

Qian Zhao, Kunna Wu and Ashwin M Khambadkone, *Experimental Power Grid Centre, Singapore*

P1903 | Model-Based Adaptive Control of a Hydraulic Wind Power System

Masoud Vaezi and Afshin Izadian, *Purdue School of Engineering and Technology, United States*

P1904 | Sensorless Speed Control of a Small Wind Turbine Using the Rectifier Voltage Ripple

Juan Manuel Guerrero, Carlos Lumberras, David Reigosa, Cristian Blanco and Fernando Briz, *University of Oviedo, Spain; AST Ingenieria, Spain; Universidad de Oviedo, Spain*

P1905 | Maximum Power Point Tracking (MPPT) of Sensorless PMSG Wind Power System

Yu Zou and Jiangbiao He, *Saginaw Valley State University, United States; GE Global Research, United States*

P1906 | Current/Voltage Sensor Fault Detection and Isolation in Wind Energy Conversion Systems Based on Power Balance

Haibo Li, Liyan Qu, Wei Qiao and Chun Wei, *University of Nebraska-Lincoln, United States*

P1907 | Quasi-Z-Source-Based Multilevel Inverter for Single-Phase Photo Voltaic Applications

Aida Gorgani, Malik Elbuluk, Yilmaz Sozer and Haitham Abu-Rub, *The University of Akron, United States; Texas A and M University at Qatar, Qatar*

P1908 | Dual Buck Based Power Decoupling Circuit for Single Phase Inverter/Rectifier

Xiao Li, Shunlong Xiao, Haiyu Zhang, Robert S. Balog and Baoming Ge, *Texas A and M University, United States*

Smart Grid & Utility Applications

N

Room: Exhibit Hall

Chairs: Johan Enslin, Narid Zargari

P2101 | Design and Development of a True Decentralized Control Architecture for Microgrid

Abedalsalam Bani-Ahmed, Adel Nasiri and Hosseini Hossein, *UW-Milwaukee, United States*

P2102 | Modeling and Control of a Synchronous Generator in an AC Microgrid Environment

Luke Weber, David Hyypio, William Dittman and Adel Nasiri, *University of Wisconsin Milwaukee, United States; Regal Beloit Marathon, United States*

P2103 | State Estimation of Power Systems with Interphase Power Controllers Using the WLS Algorithm

Mohammad Amin Chitsazan and Andrzej M Trzynadlowski, *University of Nevada, Reno, United States*

P2104 | A Novel T-Type Half-Bridge Cell for Modular Multilevel Converter with DC Fault Blocking Capability

Fangzhou Zhao, Guochun Xiao, Daoshu Yang, Min Liu, Xiaoli Han and Baojin Liu, *Xi An Jiaotong University, China*

P2105 | A Distributed Control Method for Power Module Voltage Balancing of Modular Multilevel Converters

Yongjie Luo, YaoHua Li, Zixin Li and Ping Wang, *State Grid Si Chuan Electric Power Research Institute, China; Key Laboratory of Power Electronics and Electric, China*

P2106 | Control Method of Single-Phase Inverter Based Grounding System in Distribution Networks

Wen Wang, Yan Lingjie, Xiangjun Zeng, Zhao Xin, Wei Baoze and Guerrero Josep M., *Changsha University of Science and Technology, China; Aalborg University, Denmark*

Transportation Electrification Applications

N

Room: Exhibit Hall

Chairs: Jin Wang, Yaosuo "Sonny" Xue

P2301 | A Novel Energy Balanced Variable Frequency Control for Input-Series-Output-Parallel Modular EV Fast Charging Stations

Qi Tian, Hua Bai, Huang Alex, Teng Hui and Lu Juncheng, *North Carolina State University, United States; Kettering University, United States*

P2302 | An Adaptive Charging Control Strategy For Ultracapacitor Light Rail Vehicles

Zhou Rong, Huang Zhiwu, Li Heng, Wu Zhihui and Peng Jun, *Central South University, China*

P2303 | A High Power Density Drivetrain-Integrated Electric Vehicle Charger

Usama Anwar, Hyeokjin Kim, Hua Chen, Robert Erickson, Dragan Maksimovic and Khurram Afridi, *University of Colorado Boulder, United States*

P2304 | Railway Power Conditioner Based on Delta-Connected Modular Multilevel Converter

Jiao Shang, NingYi Dai, BaoAn Wang and Hao Chen, *Southeast University Chengxian College, China; University of Macau, Macau; Southeast University, China; Weihai Power Supply Company, China*

P2305 | Dynamic Study of Electromechanical Interaction in Marine Propulsion

Jishnu Kavit Kambrath, Aaron Alexander Ayu, Youyi Wang, Yong-Jin Yoon, Xiong Liu, Chandana Jayampathi Gajanayake and Amit Kumar Gupta, *Rolls-Royce NTU Corporate Lab, Singapore; Nanyang Technological University, Singapore; Rolls-Royce Singapore Pte. Ltd, Singapore*

P2306 | Model-based Control Design for a Battery/Ultracapacitor DC-DC Converter System

Anantharaghavan Sridhar, Phil Kollmeyer and Thomas Jahns, *University of Wisconsin-Madison, United States*

P2307 | Sliding Model Control Based On Estimation Of Optimal Slip Ratio For Railway Wheel Slide Protection Using Extremum Seeking

Qing Peng, Jianfeng Liu, Zhiwu Huang, Weirong Liu and Heng Li, *Central South University, China*

P2308 | Evaluation of Negative-Sequence-Current Compensators for High-Speed Electric Railways

Antonios Antonopoulos and Jan Svensson, *ABB Corporate Research, Sweden*

Power Converter Topologies

E

Room: Exhibit Hall

Chairs: Pradeep S. Shenoy, Leon M Tolbert

P2501 | A ZVS Integrated Single-Input-Dual-Output DC/DC Converter for High Step-up Applications

Ming Shang and Wang Haoyu, *ShanghaiTech University, China*

P2502 | A Survey on Voltage Boosting Techniques for Step-Up DC-DC Converters

Mojtaba Forouzesh, Yam P. Siwakoti, Saman A. Gorji, Frede Blaabjerg and Brad Lehman, *University of Guilan, Iran; Aalborg University, Denmark; Swinburne University of Technology, Australia; Northeastern University, United States*

P2503 | Analysis and Design of a Current fed Non-isolated Buck-Boost DC-DC Converter

Ashok Kumar, Roja Peri and Parthasarathi Sensarma, *Indian Institute of Technology, Kanpur, India*

P2504 | Impulse Commutated Current-fed Three-phase Modular DC/DC Converter for Low Voltage High Current Applications

Akshay Rathore and Radha Sree Krishna Moorthy, *Concordia University, Montreal, Canada; National University of Singapore, Singapore*

P2505 | Comparative Evaluation of Capacitor-coupled and Transformer-coupled Dual Active Bridge Converters

Parikshith Channegowda and Giri Venkataramanan, *University of Wisconsin-Madison, United States*

P2506 | Planar Transformer Winding Technique for Reduced Capacitance in LLC Power Converters

Mohammad Ali Saket Tokaldani, Navid Shafiei and Martin Ordóñez, *University of British Columbia, Canada*

P2507 | Topology and Controller of an Isolated Bi-Directional AC-DC Converter for Electric Vehicle

Beham Koushki, Praveen Jain and Alireza Bekkshai, *Queen's University, Canada*

P2508 | High Efficiency LLC DCX Battery Chargers with Sinusoidal Power Decoupling Control

Dong-Jie Gu, Zhiliang Zhang, Yaqi Wu, Dong Wang, Handong Gui and Li Wang, *Nanjing Univ. of Aeronautics and Astronautics, China; The University of Tennessee, United States*

P2509 | PWM Strategies with Duality between Current and Voltage Source AC/DC Converters for Suppressing AC Harmonics or DC Ripples

Junpei Isozaki, Kazuma Suzuki, Wataru Kitagawa and Takaharu Takeshita, *Nagoya Institute of Technology, Japan*

P2510 | Analytical Expression for Harmonic Spectrum of Regular Sampled Space Vector Modulated Rectifier Connected to IPM Generator

Jian Zhang, XuHui Wen, JinLong Li, Youlong Wang and WenShan Li, *Institute of Electrical Engineering, CAS, China*

P2511 | A Systematic Topology Generation Method for Dual-Buck Inverters

Li Zhang, Tao Zhu, Lin Chen and Kai Sun, *Hohai University, China; Tsinghua University, China*

P2512 | Analysis and Control of Decentralized PV Cascaded Multilevel Modular Integrated Converters

David Scholten, Nesimi Ertugrul and Wen Soong, *The University of Adelaide, Australia*

P2513 | Experimental Study of a SiC MOSFET Based Single Phase Inverter in UPS Applications

Cheng Luo, Xinyu Wang, Tianyang Jiang, Richard Feng, Huiting Xin and Han Li, *Eaton Corporate Research and Technology, China*

P2514 | Performance Analysis of a Flexible Multi-level Converter for High Voltage Photovoltaic Grid-connected Power System

Lu Zhou, Li Wuhua, Hu Senjun, Luo Haoze, He Xiangning, Cao Fengwen, Zhang Chaoshan and Du Jiuyan, *Zhejiang University, China; Aalborg University, Denmark; Suzhou Vocational University, China; XiAn Kai Tian Power Electronics Technical Co, China*

P2515 | Circulating Current Control for Carrier-Based Discontinuous Modulation in Inverters with Parallel Legs

Andre Nicolini, Antonio Ricciotti, Fernanda Carnielutti and Humberto Pinheiro, *Federal University of Santa Maria, Brazil; Federal University of Rondonia, Brazil*

P2516 | A Phase-Shift PWM-Controlled ZVS Boost Full-Bridge AC-AC Converter for High-Frequency Induction Heating Applications

Shuichi Sakamoto, Tomokazu Mishima and Chiaki Ide, *Kobe University, Japan; Fuji Electronics Industry Company, Japan*

P2517 | Paper not in the database

P2518 | Control Approach for a Class of Modular Multilevel Converter Topologies

Dennis Karwatzki and Axel Mertens, *Leibniz Universitaet Hannover, Germany*

P2519 | Maximum Boost Space Vector Modulated Three-Phase Three-Level Neutral-Point-Clamped Quasi-Z-Source Inverter

Prasanth Sundarajan, Mohamed Sathik Mohamed Halick, Aaron Alexander Ayu, Tan Chuan Seng and Suresh Kumar K. S., *Nanyang Technological University, Singapore; National Institute of Technology, India*

Control, Modelling and Optimization of Power Converters

E Room: Exhibit Hall
Chairs: Pericle Zanchetta, Luca Solero

P2701 | Digital Autotuning Controller for Point-of-Load Converter Based on Non-Intrusive Start-up Transient Observer

M. Ali, K. H. Loo and Y. M. Lai, *The Hong Kong Polytechnic University, Hong Kong*

P2702 | Control of D-STATCOM During Unbalanced Grid Faults Based on DC Voltage Oscillation and Peak Current Limitations

Arash Khoshooei, Javad Moghani, Jafar Milimonfared, Alvaro Luna, Ignacio Candela and Pedro Rodriguez, *Amirkabir University of Technology, Iran; Technical University of Catalonia, Spain; Technical University of Catalonia / Abengoa Rese, Spain*

P2703 | Staircase Modulation of Modular Multilevel Converters with Minimal Total Harmonic Distortion and Maximal Number of Output Voltage Levels

Sufei Li, Yi Deng and Ronald Harley, *Georgia Institute of Technology, United States*

P2704 | FPGA Implementation of Model Predictive Direct Current Control

Joel Vallone, Tobias Geyer and Eduardo Rath Rohr, *EPFL, Switzerland; ABB Corporate Research, Switzerland*

P2705 | Active Damping of LC Resonance for Paralleled Indirect Matrix Converter Based on Cascaded Control

Yang Xiao, Zheng Wang, Shuai You, Ming Cheng and Liang Xu, *Southeast University, China; Aviation Key Laboratory of Science and Technology, China*

P2706 | Virtual Circuit Design of Grid-Connected Half-Bridge Converters with Higher-Order Filters

Korawich Niyomsatian, Piet Vanassche, Bruno Hendrickx, Peter Tant, Jeroen Van den Keybus and Johan Gyselinck, *Triphase, Universite libre de Bruxelles, Belgium; Triphase, Belgium; Universite Libre de Bruxelles, Belgium*

P2707 | Commutation Technique for High Frequency Link Inverter without Operational Limitations and Dead Time

Minjeong Kim and Robert S. Balog, *Texas A and M University, United States*

P2708 | Research on the Current Control method of N-paralleled Converter System for the High-Power Inductor Tester

Cheng Nie, Wanjun Lei, Huajia Wang, Mingfeng Chen and Yue Wang, *Xian Jiaotong University, China; STATE GRID Electric Power Research Institute, China*

P2709 | Modeling and Bifurcation Analysis of Converters with Power Semiconductor Filter

Wing-to Fan and Shu-hung Chung, *City University of Hong Kong, Hong Kong*

P2710 | Suppression of Circulating Current in Paralleled Inverters with Isolated DC-link

Hyun-Sam Jung, Jeong-Mock Yoo, Seung-Ki Sul, Hak-Jun Lee and Chanook Hong, *Seoul National University, Korea (South); LSIS Co., Ltd., Korea (South)*

P2711 | Small-Signal Model for the ISOP DC-DC Converters in the 5-Level T-Rectifier

Marco Di Benedetto, Alessandro Lidozzi, Luca Solero, Fabio Crescimbinì and Petar Grbovic, *ROMA TRE University, Dept. of Engineering, Italy; Roma TRE University, Dept. of Engineering, Italy; Huawei Energy Competence Center Europe (HECCE), Germany*

P2712 | DC Bus Splitting Voltage Feedforward Injection Method for Virtually-Grounded Three-Phase Inverter

He Yuanbin, Chung Shu-hung, Ho Ngai-man, Wu Weimin and Fan Wing-to, *City University of Hong Kong, Hong Kong; University of Manitoba, Canada; Shanghai Maritime University, China*

P2713 | High Performance SiC Power Block for Industry Applications

Xu She, Rajib Datta, Maja Harfman Todorovic, Gary Mandrusiak, Jian Dai, Tony Frangieh, Philip Cioffi, Brian Rowden and Frank Mueller, *GE Global Research, United States*

P2714 | Switching Angles Generation for Selective Harmonic Elimination by Using Artificial Neural Networks and Quasi-Newton Algorithm

Kehu Yang, Jun Hao and Yubo Wang, *China Univ. of Mining and Tech., Beijing, China*

P2715 | Minimum RMS Current Operation of the Dual-Active Half-Bridge Converter using Three Degree of Freedom Control

Shiladri Chakraborty, Shailesh Tripathy and Souvik Chattopadhyay, *Electrical Engineering Department, IIT Kharagpur, India; Electrical Engineering Department, NIT Rourkela, India*

Electrical Machines

S Room: Exhibit Hall
Chairs: Bruno Lequesne, Mohammad Islam

P2901 | Comparison of Torque Characteristics in Permanent Magnet Synchronous Machine with Conventional and Herringbone Rotor Step Skewing Techniques

Weizhong Fei, Patrick Chi Kwong Luk and Wenyi Liang, *Cranfield University, United Kingdom*

P2902 | Six-Leg Dc-Link Rectifier/Inverter for Two-Phase Machines

Nayara Brandao de Freitas, Cursino Brandao Jacobina and Alexandre Cunha Oliveira, *Federal University of Campina Grande, Brazil*

P2903 | RSM-DE-ANN Method for Sensitivity Analysis of Active Material Cost in PM Motors

Alireza Fatemi, Dan Ionel, Nabeel Demerdash, Steve Stretz and Thomas Jahns, *Marquette University, United States; University of Kentucky, United States; Regal Beloit Corporation, United States; University of Wisconsin-Madison, United States*

P2904 | Modeling, Simulation and Performance Evaluation of Caged Permanent Magnet Motors Fed by Variable Speed Drives (VSDs)

Sara Ahmed, Darren Tremelling, Zi-Ang (John) Zhang, Nicolas Frank, Robert McElveen and Kim Hongrae, *Virginia Polytechnic Institute and State University, United States; ABB Inc., United States; Binghamton University-SUNY, United States; Baldor Electric company, United States*

2905 | An Improved Conformal Mapping Aided Field Reconstruction Method for Modeling of Interior Permanent Magnet Synchronous Machines

Lei Gu, Mehdi Moallem, Shiliang Wang, Devendra Patil and Babak Fahimi, *University of Texas at Dallas, United States; Isfahan University of Technology, Iran*

P2906 | Hybrid Excited Vernier PM Machines with Novel DC-Biased Sinusoidal Armature Current

Shaofeng Jia, Ronghai Qu, Jian Li, Dawei Li and Haiyang Fang, *Huazhong University of Science and Technology, China*

P2907 | Calculating the Electromagnetic Field and Losses in the End Region of Large Synchronous Generators under Different Operating Conditions with Three-Dimensional Transient Finite Element Analysis
Sufei Li, Noris Gallandat, J. Rhett Mayor and Ronald Harley, *Georgia Institute of Technology, United States*

P2908 | Electrical Propulsion System Design of Chevrolet Bolt Battery Electric Vehicle
Faizul Momen, Khwaja Rahman, Yochan Son, Bonho Bae and Peter Savagian, *General Motors Corporation, United States*

P2909 | Optimizing PM Coverage Ratio in Flux Concentrating Axial Flux Machine
Minhyeok Lee, Kwanghee Nam and Jaehong Kim, *POSTECH, Korea, Republic of; Chosun University, Korea, Republic of*

P2910 | Detailed Analytical Modelling of Fractional-Slot Concentrated-Wound Interior Permanent Magnet Machines for Prediction of Torque Ripple
Mohammad Farshadnia, Muhammad Ali Masood Cheema, Rukmi Dutta, John Fletcher and Muhammed Fazlur Rahman, *University of New South Wales, Australia*

P2911 | A Compact And Light-weight Generator for Backpack Energy Harvesting
Siavash Pakdelian, *University of Massachusetts Lowell, United States*

P2912 | Suspension Loss Measurement and its Reduction in Single-Drive Bearingless Motor
Itsuki Shimura, Hiroya Sugimoto and Akira Chiba, *Tokyo Institute of Technology, Japan*

P2913 | A Compact Single-Phase Adjustable-Voltage-Ratio Magnetoelectric Transformer
Haosen Wang, Liya Qu and Wei Qiao, *University of Nebraska-Lincoln, United States*

P2914 | Analysis of Common Mode Circuit of BDFG-Based Ship Shaft Power Generation System
Hongbin Yang, Hua Lin, Xingwei Wang and Guangzhi Yao, *Huazhong University of Science and Technology, China*

P2915 | Replacing SPM by PMARel Machines in Low-speed High-torque Applications
Nicola Bianchi, Alessandro Castagnini, Giulio Secondo and Pietro Savio Termini, *Dept of Industrial Eng., University of Padova, Italy; ABB, Discrete Automation and Motion Division, Italy*

P2916 | Rotor Eddy-Current Loss Minimization in High-Speed PMSMs
Haiyang Fang, Ronghai Qu, Jian Li and Bao Song, *Huazhong University of Science and Technology, China*

P2917 | Design and Analysis of Rotating Diode Rectifier for Wound-Rotor Synchronous Starter/Generator
Pang Ji, Weiguo Liu, Chenghao Sun, Jixiang Wang, Zan Zhang and Yu Jiang, *Northwestern Polytechnical University, China; AVIC SHAANXI AERO ELECTRIC CO.,LTD, China*

P2918 | Stator Tooth and Rotor Pole Shaping for Low Pole Flux Switching Permanent Magnet Machines to Reduce Even Order Harmonics in Flux linkage
Dheeraj Bobba, Gerd Bramerdorfer, Yingjie Li, Timothy A. Burress and Bulent Sarlioglu, *University of Wisconsin-Madison, United States; Johannes Kepler University Linz, Austria; Oak Ridge National Laboratory, United States*

P2919 | Optimization of PM Volume in a PM-assisted Claw-Pole Motor for ISG Applications
Bonkil Koo, Jeongki Kwon and Kwanghee Nam, *POSTECH, Korea (South); Hyundai MOBIS, Korea (South)*

Electric Drives

S Room: Exhibit Hall
Chairs: Uday Deshpande, Gianmario Pellegrino

P3101 | Improved Model Predictive Current Control of Permanent Magnet Synchronous Machines with Fuzzy Based Duty Cycle Control
Amir Masoud Bozorgi, Mehdi Farasat and Seyyedmahdi Jafarishadeh, *Louisiana State University, United States*

P3102 | A Universal Restart Strategy for Induction Machines
Kibok Lee, Sara Ahmed and Srdjan Lukic, *North Carolina State University, United States; ABB, United States*

P3103 | Active Disturbance Rejection Control of Linear Induction Motor
Francesco Alonge, Maurizio Cirrincione, Filippo D'Ippolito, Marcello Pucci and Antonino Sferlazza, *DEIM – University of Palermo, Italy; University of South Pacific, Fiji, ISSIA-CNR, Italy*

P3104 | Super-Twisting Algorithm Based Sliding-Mode Observer with Online Parameter Estimation for Sensorless Control of Permanent Magnet Synchronous Machine
Donglai Liang, Jian Li and Ronghai Qu, *Huazhong University of Science and Technology, China*

P3105 | High Dynamic Sensorless Control for PMSMs Based on Decoupling Adaptive Observer
Yongle Mao, Jiaqiang Yang, Tao Wang, Dejun Yin and Yangsheng Chen, *Zhejiang University, China; Nanjing University of Science and Technology, China*

P3106 | Position Sensorless Control of Switched Reluctance Motor Based on a Numerical Method
Fei Peng, Jin Ye and Ali Emadi, *McMaster University, Canada; San Francisco State University, United States*

P3107 | Operating-Envelop-Expandable Control Strategy for Switched Flux Hybrid Magnet Memory Machine
Hui Yang, Heyun Lin, Z. Q. Zhu, Erxing Zhuang, Shuhua Fang and Yunkai Huang, *Southeast University, China; University of Sheffield, United Kingdom*

Power Semiconductor Devices, Passive Components, Packaging, Integration, and Materials

S Room: Exhibit Hall
Chairs: Giovanna Oriti, Enrico Santi

P3301 | Modelling the Closely Coupled Cascode Switching Process
Pablo F. Miaja, Sheng Jiang, Kean-Boon Lee, Peter A. Houston, Ivor Guiney, David J. Wallis, Colin J. Humphreys and Andrew J. Forsyth, *University of Manchester, United Kingdom; University of Sheffield, United Kingdom; University of Cambridge, United Kingdom*

P3302 | A 700-V Class Reverse-Blocking IGBT for Large Capacity Power Supply Applications
David Hongfei Lu, Hiromu Takubo, Hiroki Wakimoto, Toru Muramatsu and Haruo Nakazawa, *Fuji Electric Co., Ltd., Japan*

P3303 | Efficiency and Electromagnetic Interference Analysis of Wireless Power Transfer for High Voltage Gate Driver Application
Jianyu Pan, Feng Qi, Haiwei Cai and Longya Xu, *The Ohio State University, United States*

P3304 | Single Chip Enabled High Frequency Link Based Isolated Bias Supply for Silicon Carbide MOSFET Six-Pack Power Module Gate Drives

Rui Gao, Li Yang, Wensong Yu and Iqbal Husain, *North Carolina State University, United States*

P3305 | Reliability Assessment of SiC Power MOSFETs From The End Users Perspective

Vasilios Dimitris Karaventzas, Muhammad Nawaz and Francesco Iannuzzo, *Dept. of Energy Technology, Aalborg University, Denmark; ABB Corporate Research, Sweden*

P3306 | Investigation of Collector Emitter Voltage Characteristics in Thermally Stressed Discrete IGBT Devices

Syed Huzaif Ali, Serkan Dusmez and Bilal Akin, *University of Texas at Dallas, United States*

Emerging Technologies and Applications

S

Room: Exhibit Hall

Chairs: Jin Wang, Yaosuo "Sonny" Xue

P3501 | Transmission Characteristics Analysis of a Three-Phase Magnetically Coupled Resonant Wireless Power Transfer System

Jiang Chong, Liu Fuxin, Ruan Xinbo and Chen Xuling, *Nanjing Univ. of Aeronautics and Astronautics, China*

P3502 | Synthesis of Buck Converter Based Current Sources

Soumya Shubhra Nag and Santanu Mishra, *Indian Institute of Technology Kanpur, India*

P3503 | A Model for Coupling Under Coil Misalignment for DD Pads and Circular Pads of WPT Systems

Guangjie Ke, Qianhong Chen, Ligang Xu, Siu-Chung Wong and Chi.K. Tse, *Nanjing University of Aeron. and Astro., China; Nanjing University of Aero. and Astro., China; Hong Kong Polytechnic University, Hong Kong*

P3504 | Comprehensive Dynamic Modeling of a Solid-state Transformer Based Power Distribution System

Md Tanvir Arafat Khan, Alireza Afiat Milani, Aranya Chakraborty and Iqbal Husain, *North Carolina State University, United States*

P3505 | Capability, Compatibility, and Usability Evaluation of Hardware-in-the-Loop Platforms for DC-DC Converter

Shawn Maxwell, S M Rakiul Islam, Md. Kamal Hossain and Sung Yeul Park, *University of Connecticut, United States*

P3506 | A Single Stage AC/DC Converter for Low Voltage Energy Harvesting

Liang Yu and Haoyu Wang, *ShanghaiTech University, China*

Tuesday, September 20th

3:00PM – 4:30PM

Renewable and Sustainable Energy Applications

N

Room: Exhibit Hall

Chairs: Euzeli Santos Jr., Johan Enslin

P3701 | Dynamic Battery Operational Cost Modeling for Energy Dispatch

Qian Zhao, Aniq Ahsan, Ashwin M. Kambadkone and Meng Hwee Chia, *Experimental Power Grid Center, Singapore; Oxford University, United Kingdom; National University of Singapore, Singapore*

P3702 | A Low Voltage Ride Through Control Strategy for Energy Storage Systems

Yeongsu Bak, June-Seok Lee and Kyo-Beum Lee, *Ajou University, Korea (South); KRRI, Korea (South)*

P3703 | Experimental Validation of the Solid State Substation with Embedded Energy Storage Concept

Christian Klumpner, Mohamed Rashed, Dipankar De, Chintan Patel, Ponggorn Kulsangcharoen and Greg Asher, *University of Nottingham, United Kingdom*

P3704 | Understanding Dynamic Model Validation of a Wind Turbine Generator and a Wind Power Plant

Eduard Muljadi, Yingchen Zhang, Vahan Gevorgian and Dmitry Kosterev, *National Renewable Energy Laboratory, United States*

P3705 | A Brushless Doubly-fed Generator Based on Permanent Magnet Field Modulation for Wind Power Generation

Yongjiang Jiang, Jianzhong Zhang, Shuai Xu and Xing Hu, *Southeast University, China*

P3706 | Robust Sliding Mode Control for Permanent Magnet Synchronous Generator-Based Wind Energy Conversion Systems

Patrick Gu, Xin Wang and Max Reitz, *Southern Illinois University Edwardsville, United States*

P3707 | A Partially-Rated Active Filter Enabled Power Architecture to Generate Oscillating Power from Wave Energy Converter

Samir Hazra, Prathamesh Kamat and Subhashish Bhattacharya, *North Carolina State University, United States*

P3708 | Hybrid Energy Storage System Comprising of Battery and Ultra-capacitor For Smoothing of Oscillating Wave Energy

Samir Hazra and Subhashish Bhattacharya, *North Carolina State University, United States*

Smart Grid & Utility Applications

N

Room: Exhibit Hall

Chairs: Johan H Enslin, Euzeli Santos Jr.

P3901 | A Series-LC-Filtered Active Trap Filter for High Power Voltage Source Inverter

Haofeng Bai, Xiongfei Wang, Poh Chiang Loh and Frede Blaabjerg, *Aalborg University, Denmark*

P3902 | Constant DC-Capacitor Voltage-Control-Based Strategy for Harmonics Compensation of Smart Charger for Electric Vehicles in Single-Phase Three-Wire Distribution Feeders with Reactive Power Control

Fuka Ikeda, Kei Nishikawa, Hiroaki Yamada, Toshihiko Tanaka and Masayuki Okamoto, *Yamaguchi University, Japan; National Institute of Technology, Ube College, Japan*

P3903 | A Series Active Damper with Closed-loop Control for Stabilizing Single-phase Power-Electronics-Based Power System

Dapeng Lu, Xiongfei Wang, Haofeng Bai and Frede Blaabjerg, *Aalborg University, Denmark*

P3904 | A Grid-Interfaced Test System for Modeling of NiMH Batteries in a Battery-Buffered Smart Load Application

Ahmed Zurf and Jing Zhang, *University of Arkansas at Little Rock, United States*

P3905 | Impedance-Based Stability Analysis of DFIG

Tianyi Wang, Yi Xiao, Xueguang Zhang and Dianguo Xu, *Harbin Institute of Technology, China*

P3906 | Online Variation of Wind Turbine Controller Parameters for Mitigation of SSR in DFIG based Wind Farms

Selam Chernet, Massimo Bongiorno, Gert Karmisholt Andersen, Torsten Lund and Philip Carne Kjaer, *Chalmers University of Technology, Sweden; Vestas Wind Systems A/S, Denmark*

P3907 | Three-Phase Single Stage Boost Inverter for Direct Drive Wind Turbines

Akanksha Singh and Behrooz Mirafzal, *Kansas State University, United States*

P3908 | Secondary Side Modulation of a Single-stage Isolated High-frequency Link Microinverter with a Regenerative Flyback Snubber

Nareshkumar Kummari, Shiladri Chakraborty and Souvik Chattopadhyay, *Electrical Engineering Department, IIT Kharagpur, India*

P3909 | Frequency Characterization of Type-IV Wind Turbine Systems

Nicolas Espinoza, Bongiorno Massimo and Carlson Ola, *Chalmers University of Technology, Sweden*

Datacenters and Telecommunication Applications

N Room: Exhibit Hall
Chairs: Jin Wang, Yaosuo "Sonny" Xue

P4101 | Reliability Assessment of Fuel Cell System – A Framework for Quantitative Approach

Shinae Lee, Dao Zhou and Huai Wang, *Norwegian University of Science and Technology, Norway; Aalborg University, Denmark*

P4102 | New Soft-Switched Multi-Input Converters with Integrated Active Power Factor Correction for Hybrid Renewable Energy Applications

Sanjida Moury, John Lam, Vineet Srivastava and Church Ron, *York University, Canada; Cistel Technology Inc., Canada*

P4103 | FPGA Based Implementation of Control for Series Input Boost Pre-regulator Under Unequal Loading

Anwesha Mukhopadhyay and Santanu Mishra, *Indian Institute of Technology, Kanpur, India*

Transportation Electrification Applications

N Room: Exhibit Hall
Chairs: Jin Wang, Yaosuo "Sonny" Xue

P4301 | Separating Key Less Well-Known Properties of Drive Profiles that Affect Lithium-ion Battery Aging by Applying the Statistical Design of Experiments

Ruxiu Zhao, Larry Juang, Robert Lorenz and Thomas Jahns, *University of Wisconsin-Madison, United States; Undisclosed, United States*

P4302 | Performance Degradation of Thermal Parameters during Cycle Ageing of NMC-based Lithium Ion Battery Cells

Tiberiu Stanciu, Daniel Stroe, Maciej Swierczynski, Nerea Nieto, Jon Gastelurrutia Roteta, Jean-Marc Tiemmermans and Remus Teodorescu, *Aalborg University, Denmark; IK4-Ikerlan, Spain; Vrije Universiteit Brussel, Belgium*

P4303 | Investigation of Current Sharing and Heat Dissipation in Parallel-Connected Lithium-Ion Battery Packs

Yichao Zhang, Ruxiu Zhao, Jacob Dubie, Larry Juang and Thomas Jahns, *University of Wisconsin Madison, United States; Undisclosed, United States*

P4304 | A Cooperative Charging Strategy for Onboard Supercapacitors of Catenary-Free Trams

Heng Li, Jun Peng, Rong Zhou, Zhihui Wu, Zhiwu Huang and Jianping Pan, *Central South University, China; University of Victoria, Canada*

P4305 | A High Frequency Zero-Voltage-Transition (ZVT) Synchronous Buck Converter for Automotive Applications

Chenhao Nan and Raja Ayyanar, *Arizona State University, United States*

P4306 | The Dual-Channel Magnetically Integrated Chargers for Plug-in Electric Vehicles

Bochen Liu, Zheng Wang, Yue Zhang, Ming Cheng and Liang Xu, *Southeast University, China; Aviation Key Laboratory, China*

P4307 | Power-Line Impedance Modeling of Tractor-Trailer System

Iftekhar Hasan, Aparna Saha, Mohamad Abd Elmutalab, Ibrahim Amr, Philip Kasper, Yilmaz Sozer and Marv Hamdan, *University of Akron, United States; Bendix CVS, United States*

Power Converter Topologies

E Room: Exhibit Hall
Chairs: Pradeep S. Shenoy, Leon M Tolbert

P4501 | An Interleaved 1-to-6 Step-Up Resonant Switched-Capacitor Converter Utilizing Split-Phase Control

Andrew Stillwell, Derek Heeger, Christopher Meyer, Sarah Bedair and Robert Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States; Army Research Laboratory, United States*

P4502 | Boost Composite Converter Design Based On Drive Cycle Weighted Losses in Electric Vehicle Powertrain Applications

Hyeokjin Kim, Hua Chen, Robert Erickson and Maksimovic Dragan, *University of Colorado at Boulder, United States*

P4503 | Design of a Four-Phase Interleaved Boost Circuit with Closed-Coupled Inductors

Daigoro Ebisumoto, Masataka Ishihara, Shota Kimura, Wilmar Martinez, Noah Mostafa, Masayoshi Yamamoto and Jun Imaoka, *Shimane University, Japan; Shimane University, Colombia; Kyushu University, Japan*

P4504 | Hybrid DC-DC Buck Converter with Active Switched Capacitor Cell and Low Voltage Gain

Mauricio Dalla Vecchia and Telles Lazzarin, *Federal University of Santa Catarina – UFSC, Brazil*

P4505 | High Gain Resonant Boost Converter For PV Micro-Converter System

Sachin Jain, Swami Satish Betha and Jih-Sheng (Jason) Lai, *NIT Warangal, India; Virginia Polytechnic Institute, United States*

P4506 | Design of Two-Switch Flyback Power Supply Using 1.7 kV SiC Devices for Ultra-Wide Input-Voltage Range Applications

Gabriele Rizzoli, Jun Wang, Zhiyu Shen, Rolando Burgos, Dushan Boroyevich and Luca Zarri, *University of Bologna, Italy; CPES-Virginia Tech, United States*

P4507 | A Single-Stage Interleaved LLC PFC Converter

Raed Saasaa, Wilson Eberle and Mohammed Agamy, *The University of British Columbia, Canada; GE Global Research Center, United States*

P4508 | Medium Voltage AC-DC Rectifier for Solid State Transformer (SST) Based on an Improved Rectifier Topology

Qianlai Zhu, Li Wang, Xijun Ni, Liqi Zhang, Wensong Yu and Alex Q. Huang, *North Carolina State University, United States; Nanjing Institute of Technology, China*

P4509 | Microcontroller-Based MHz Totem-Pole PFC with Critical Mode Control

Zhengrong Huang, Zhengyang Liu, Qiang Li and Fred Lee, *CPES, Virginia Tech, United States*

P4510 | Three-Phase Isolated DCM SEPIC Converter for High Voltage Applications

Gabriel Tibola, Erik Lemmen and Ivo Barbi, *Eindhoven University of Technology, Netherlands; Federal University of Santa Catarina, Brazil*

P4511 | Single Phase Precharge Control Method for Active Front End Rectifier

Lixiang Wei, Zeljko Jankovic, Yogesh Patel and Jiangang Hu, *Rockwell Automation, United States*

P4512 | Adaptive Controlled-type Zero-voltage-switching Inverters with Bandwidth Limitation

Dehua Zhang, Jiali Wang and Zhengyu Lv, *Zhejiang University, China*

P4513 | Half Bridge NPC Inverter and Its Three Phase Application with Constant Common Mode Voltage

Liwei Zhou, Feng Gao, Chongsheng Jia and Tao Xu, *Shandong University, China; State Grid Jinan Li Cheng Power Supply Company, China*

P4514 | Interleaved Auxiliary Resonant Snubber for High-Power, High-Density Applications

Rachael Born, Lanhua Zhang, Yu Wei, Qingqing Ma and Jason (Jih-Sheng) Lai, *Virginia Tech Future Energy Electronics Center, United States*

P4515 | Three-Phase Four-Wire Inverters Based on Cascaded Three-Phase Converters with Four and Three Legs

Joao Paulo Ramos Agra Mello, Cursino Bradao Jacobina and Mauricio Beltrao Rossiter Correa, *Universidade Federal de Campina Grande, Brazil*

P4516 | Optimal Switching Counts Modulation of H7 Current Source Inverter

Weiqi Wang, Feng Gao, Lei Zhang, Chen Mengxing and Liwei Zhou, *Shandong University, China; Shandong Electric Power Research Institute, China*

P4517 | Cuk-Based Universal Converters in Discontinuous Conduction Mode of Operation

Mahshid Amirabadi, *Northeastern University, United States*

P4518 | Neutral Points Voltage Balancing Control of a Four-level pi-type Converter

Bosen Jin and Xibo Yuan, *University of Bristol, United Kingdom*

P4519 | A Novel Three-Phase Multilevel Diode-Clamped Inverter Topology with Reduced Device Count

Aparna Saha, Ali Elrayah and Yilmaz Sozer, *University of Akron, United States; Qatar Environmental and Energy Research Inst, Qatar*

P4520 | Maximum Boost Space Vector Modulated Three-Phase Three-Level Neutral-Point-Clamped Quasi-Z-Source Inverter

Prasanth Sundararajan, Mohamed Sathik Mohamed Halick, Aaron Alexander Ayu, Tan Chuan Seng and Suresh Kumar K. S., *Nanyang Technological University, Singapore; National Institute of Technology, India*

Control, Modelling and Optimization of Power Converters

E

Room: Exhibit Hall

Chairs: Pericle Zanchetta, Luca Solero

P4701 | High Dynamic and Static Performance FCS-MPC Strategy for Static Power Converters

Rodrigo Mendez, Daniel Sbarbaro and Jose Espinoza, *Concepcion University, Chile*

P4702 | New Logic-Form-Equation Based Active Voltage Control for Four-Level Flying Capacitor Multicell (FCM) Converter

Arash Khoshkbar Sadigh, Vahid Dargahi and Keith Corzine, *Extron Electronics, United States; Clemson University, United States*

P4703 | Minimum RMS Current Operation of the Dual-Active Half-Bridge Converter using Three Degree of Freedom Control

Shiladri Chakraborty, Shailesh Tripathy and Souvik Chattopadhyay, *Electrical Engineering Department, IIT Kharagpur, India; Electrical Engineering Department, NIT Rourkela, India*

P4704 | Experimental Evaluations of Thinned-Out and PDM Controlled Class-E Rectifier

Akane Iwasaki, Tomoharu Nagashima and Hiroo Sekiya, *Chiba University, Japan*

P4705 | Variable Slope External Ramp to Improve the Transient Performance in Constant On-Time Current Mode Control

Syed Bari, Brian Cheng, Qiang Li and Fred Lee, *CPES, Virginia Tech, United States; Texas Instruments, United States*

P4706 | PWM Methods for High Frequency Voltage Link Inverter Commutation

Minjeong Kim, Mostafa Mosa and Robert S. Balog, *Texas A and M University, United States*

P4707 | Switching Pattern of a Modular Voltage Balancing Circuit for Battery Cells

Atrin Tavakoli, Sayed Ali Khajehoddin and John Salmon, *University of Alberta, Canada*

P4708 | Steady State Impedance Estimation of a Weak Grid to Assist Optimal Current Injection for Minimal Power Losses

Akrama Khan, Azeem Khan and Michel Malengret, *University of Cape Town, South Africa; University of Cape Town, South Africa*

P4709 | A Single-phase Unified Power Quality Conditioner with An Enhanced Repetitive Controller

Dang-Minh Phan, Cong-Long Nguyen and Hong-Hee Lee, *University of Ulsan, Korea (South)*

P4710 | Single-Phase Universal Active Power Filter Based on AC/AC Converters

Phelipe Leal Serafim Rodrigues, Cursino Brandao Jacobina and Mauricio Beltrao de Rossiter Correa, *DEE UFCG, Brazil*

P4711 | Circulating Resonant Current Between Integrated Half-Bridge Modules with Capacitor for Inverter Circuit Using SiC-MOSFET

Takashi Hirao, Keiji Wada and Toshihisa Shimizu, *Tokyo Metropolitan University, Japan*

P4712 | Computationally Efficient Event-Based Simulation of Switched Power Systems and AC Machinery

Christopher Wolf and Michael Degner, *Ford Motor Company, United States*

P4713 | Design Optimisation and Trade-offs in Multi-kW DC-DC Converters

James Scoltock, Gerardo Calderon-Lopez, Yiren Wang and Andrew Forsyth, *University of Manchester, United Kingdom*

P4714 | Switching frequency optimization for a Solid State Transformer with Energy Storage Capabilities

Pablo Garcia, Sarah Saeed, Hannes Schneider, Angel Navarro-Rodriguez and Jorge Garcia, *University of Oviedo, Spain; University of Stuttgart, Germany*

P4715 | Lag-Free Terminal Voltage Sensing in Low-Pass Filtered PWM Converters

Adam Shea and Thomas Jahns, *University of Wisconsin – Madison, United States*

Electrical Machines

S

Room: Exhibit Hall

Chairs: Bruno Lequesne, Mohammad Islam

P4901 | Cogging Torque Minimization with Rotor Tooth Shaping in Axial Flux-Switching Permanent Magnet Machine

Ju Hyung Kim, Yingjie Li, Emrah Cetin and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

P4902 | A 3D Printed Fluid Filled Variable Elastance Electrostatic Machine Optimized with Conformal Mapping

Baoyun Ge, Daniel Ludois and Ghule Aditya, *University of Wisconsin -Madison, United States*

P4903 | Effects of External Field Orientation on Permanent Magnet Demagnetization

Peng Peng, Han Xiong, Julia Zhang, Wanfeng Li, Franco Leonardi, Michael Degner, Chuanbing Rong, Feng Liang and Leyi Zhu, *Oregon State University, United States; Ford Motor Company, United States*

P4904 | Analytical Approach for Determining Inductance Matrix, Harmonic Voltage and Torque Ripple of Slotted PM Motors

Kahyun Lee and Jung-Ik Ha, *Seoul National University, Korea (South)*

P4905 | Cogging Torque Minimization in Transverse Flux Machines

Tausif Husain, Iftekhhar Hasan, Yilmaz Sozer, Iqbal Husain and Eduard Muljadi, *University of Akron, United States; North Carolina State University, United States; National Renewable Energy Lab, United States*

P4906 | Torque Ripple Reduction in a Flux-Switching Permanent Magnet Machine Targeted at Elevator Door Applications by Minimizing Space Harmonics

Hongsik Hwang, Dongjae Kim, Jin Hur and Cheewoo Lee, *Pusan National University, Korea (South); Incheon National University, Korea (South)*

P4907 | On Saliency Enhancement of Salient Pole Wound Field Synchronous Machines

Wenbo Liu and Thomas.A Lipo, *University of Wisconsin Madison, United States*

P4908 | Fast and Accurate Analytical Calculation of the Unsaturated Phase Inductance Profile of 6/4 Switched Reluctance Machines

Sufei Li, Shen Zhang, Thomas Habetler and Ronald Harley, *Georgia Institute of Technology, United States*

P4909 | An Analytical Approach for Determining Harmonic Cusps and Torque Dips in Line Start Synchronous Reluctance Motors

Amir Negahdari, Vivek M. Sundaram and Hamid A. Toliyat, *Texas A&M University, United States*

P4910 | Multi-Objective Design and Optimization of Generalized Switched Reluctance Machines with Particle Swarm Intelligence

Shen Zhang, Sufei Li, Jie Dang, Ronald G. Harley and Thomas G. Habetler, *Georgia Institute of Technology, United States; Faraday Future, Inc., United States*

P4911 | Design and Comparison of Concentrated and Distributed Winding Synchronous Reluctance Machines

Bastian Lehner and Dieter Gerling, *Universitaet der der Bundeswehr Muenchen, Germany*

P4912 | Reduction in Torque and Suspension Force Ripples of an Axial-Gap Single-Drive Bearingless Motor

Junichi Asama, Kazumasa Takahashi, Takaaki Oiwa and Akira Chiba, *Shizuoka University, Japan; Tokyo Institute of Technology, Japan*

P4913 | Advancements in High Power High Frequency Transformer Design for Resonant Converter Circuits

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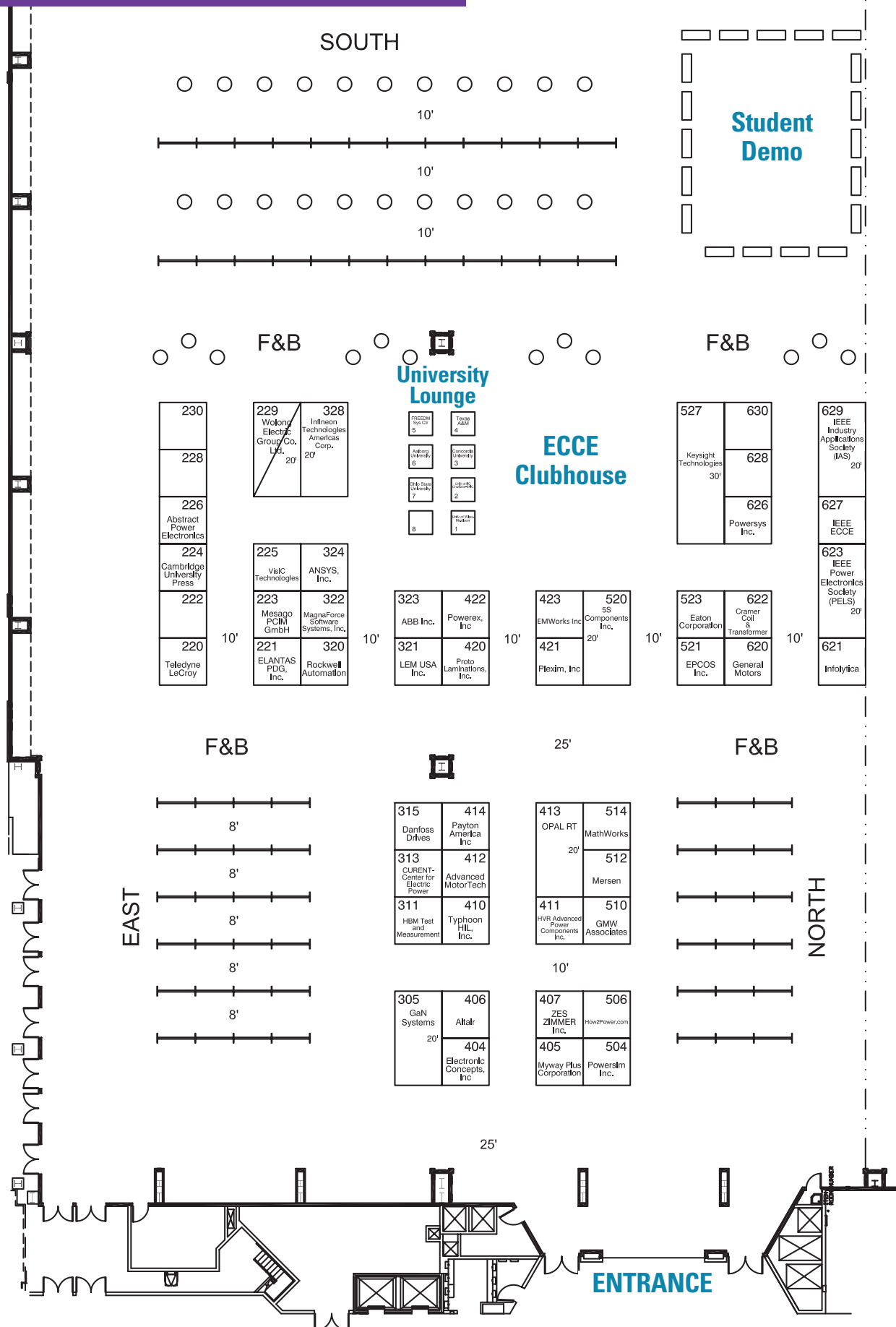
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Rockville, MD 20850
USA
301-841-7445
schesley@powersimtech.com
www.powersimtech.com



PSIM is a power electronics simulation tool that empowers engineers to accelerate the pace of innovation with the fastest, most reliable and easy-to-use solution. PSIM provides expert technical support and delivers systems-level solutions that integrate smoothly with other popular engineering platforms. PSIM is trusted by academics and professionals alike in over 70 countries to test hypotheses early and easily, and get from design to implementation accurately and quickly.

Powersys Inc.

BOOTH 626

2000 Town Center, Suite #1900
Southfield, MI 48075
USA
778-929-0800
p.fontanaud@powersys-solutions.com
www.powersys-solutions.com

Proto Laminations, Inc.

BOOTH 420

13666 East Bora Drive
Santa Fe Springs, CA 90670
USA
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.

Rockwell Automation

BOOTH 320

6400 Enterprise Drive
Mequon, WI 53012
USA
262-512-2369
sawinterhalter@ra.rockwell.com
www.rockwellautomation.com

Rockwell Automation

Rockwell Automation, the world's largest company dedicated to industrial automation and information, makes its customers more productive and the world more sustainable. Throughout the world, our flagship Allen-Bradley® and Rockwell Software® product brands are recognized for innovation and excellence. Headquartered in Milwaukee, Wis., Rockwell Automation employs about 22,000 people serving customers in more than 80 countries.

Teledyne LeCroy

BOOTH 220

700 Chestnut Ridge Rd
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845-578-6120
hilary.lustig@teledynelecroy.com
www.teledynelecroy.com



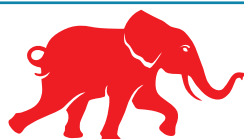
TELEDYNE LECROY
Everywhere you look™

Teledyne LeCroy is a leading manufacturer of advanced oscilloscopes, protocol analyzers, and other test instruments that verify performance, validate compliance, and debug complex electronic systems quickly and thoroughly. Since its founding in 1964, the Company has focused on incorporating powerful tools into innovative products that enhance "Time-to-Insight". Faster time to insight enables users to rapidly find and fix defects in complex electronic systems, dramatically improving time-to-market for a wide variety of applications and end markets. Teledyne LeCroy is based in Chestnut Ridge, N.Y. For more information, visit Teledyne LeCroy's website at teledynelecroy.com.

Typhoon HIL, Inc.

BOOTH 410

35 Medford St., #305
Somerville, MA 02143
USA
617-909-9705
bozica.kovacevic@typhoon-hil.ch
www.typhoon-hil.com



Typhoon HIL

Typhoon HIL, Inc. is the market and technology leader in the rapidly-growing ultra-high-fidelity controller-Hardware-in-the-Loop (cHIL) for power electronics, microgrids, and distribution networks which provides industry-proven, vertically integrated test solutions along with the highest-quality customer support. The company was founded in 2008 and since then has been creating products distinguished by the ultimate ease of use, unrivaled performance, leading-edge technology, 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.

VisIC Technologies

BOOTH 225

Golda Meir 7
Nes Ziona 7403650
Israel
+972-54-2296641
eliz@visic-tech.com
www.visic-tech.com



VisIC was established in 2010 to be a provider of high-voltage (650V and above), high-volume GaN transistors and switches to the ever-growing and rapidly changing power conversion market. VisIC's technical team had over 20 years of cumulative experience in design, manufacture and application of GaN-based RF devices when they incorporated VisIC. Applying their in-depth understanding of the core materials and associated physics of GaN-based devices, they have created a true GaN Metal-Insulator-Semiconductor High Electron Mobility Transistor (MISHEMT) that is normally-OFF in its native mode. VisIC Technologies has demonstrated worldwide record with performance of its Half Bridge demonstration board, achieving better than 99, 3 % peak efficiency at 200 kHz in a hard-switched topology providing 2.5KW output.

Wolong Electric Group Co. Ltd.

BOOTH 229

No. 1801, West Remnin Road
Shangyu District
Shaoxing City, Zhejiang
China
0086-152-67556008
amy.li@wolong.com
www.wolong.com



Wolong Electric is one of the largest motor and drive manufacturers in the world. It focuses on innovation and new technology development. Our products are widely used in various of industries, such as home appliances, HVACs, industrial drives, oil and gas, mining, nuclear and power generation, etc. Through strategic acquisitions, Wolong Group includes some of the most valuable and experienced motor manufactures and brands in the world, such as ATB, Brook Crompton, Schorch, Laurence Scott, Morley, CNE (China Nanyang Explosion-Proof Motors), Haier Motor, Rongxing Drive, QJEM etc. We are proud of our heritage and confidence in our product quality to service our global customers.

ZES ZIMMER Inc.

BOOTH 407

2850 Thornhills Ave, #117
Grand Rapids, MI 49546
USA
760-550-9371
usa@zes.com
www.zes.com



ZES ZIMMER is a German maker of precision power analyzers and accessories, with proprietary and invaluable advantages for measuring inverters, frequency converters and other PWM applications. DC - 10MHz, advanced filtering, easy waveform display/export, automated CE harmonics/flicker test and intuitive UI. Up to 8 channels (elements) and speed/torque inputs.

Product and Services Sessions

Monday, September 19th | Room 103C

12:30PM – 3:30PM

HBM Test and Measurement

Speaker: Mike Hoyer, Applications/Marketing Engineer
mike.hoyer@hbm.com

12:30PM | Rapid Electric Motor and Drive Efficiency Mapping, Going Beyond A Typical Power Analyzer. Motor efficiency testing has become extremely important. Testing with a typical power analyser only offers inadequate numerical results. Instead, all electrical and mechanical signals must be acquired and analysed simultaneously at high sample rates with fast transfer to automation systems for accurate and rapid electric motor and drive efficiency mapping.

VisIC Technologies

Speaker: Dr. Tamara Baksht, CEO
anna@visic-tech.com

1:00PM | GaN HEMT: Design for Efficiency. VisIC Technologies will present its GaN components enabling a new generation of power conversion systems to deliver the Long standing GaN promise of high efficiency and low system cost.

Based on novel GaN die design and attention to the requirements for system integration, VisIC's ALL-Switch components switch at high speed without oscillation using readily available off-the-shelf drivers with a minimum of external components. VisIC has demonstrated greater than 99% efficiency on power system building blocks in hard switching at 200kHz; and will demonstrate switching on multiple building blocks at ECCE.

The VisIC's GaN devices are optimized to deliver high efficiency switching on high and low loads, making these devices especially attractive for data servers power supplies and other applications working on partial load most of the time.



MathWorks

Speaker: Tony Lennon, Motor & Power Applications
jennifer.rose@mathworks.com

1:30PM | Model-Based Design for Motor and Power Control Applications. Simulation helps engineers apply power electronics and advance control design to electric vehicles, renewable energy, and motor control. Model-Based Design with MATLAB and Simulink offers an environment that enables developers to explore advanced control concepts, capture requirements, design and validate using simulation, and implement ideas for production. This session will examine the scope of MathWorks solution for Model-Based Design.

EPCOS Inc.

Speaker: Matt Reynolds, Field Applications Engineering Manager,
Industrial Market
debbie.martin@epcos.com

2:00PM | CeraLink™ Compact Solution for Fast-Switching and Snubber Applications . To achieve the goal of higher efficiencies, smaller size and lower cost, power electronics continue to demand capacitor technologies with much higher resonant frequencies. Paramount is a requirement for both very low inductance and low effective series resistance for the purposes of integration into semiconductor modules that require higher temperature stability, unwavering reliability and overall longer useful life. CeraLink™, is offered as a solution for these new technical requirements. Join our 30-min seminar as we demonstrate the high-performance benefits of this new technology.

Keysight Technologies

Speaker: Monika Little, Application Engineer
monika.little@keysight.com

2:30PM | KNOW THY POWER: Power Analysis for Energy Conversion Devices. Proper evaluation of a product's efficiency depends on accurate power measurements. There are a variety of ways to measure power. Since some are more accurate than others, choosing the right method to characterize and evaluate any power conversion device design, whether it is DC or AC, single or three phase system, is critical for success of the design project.

Eaton Corporation

3:00PM

Wolong Electric Group Co. Ltd.

Speaker: Zheng Zhang Ph.D., Fellow IEEE
zhangzheng@wolong.com

3:30PM | Wolong Electric – A dynamic company growing with innovation and global operation. In the past decade, through the global acquisition, Wolong rapidly becomes a multiple national company, the fourth largest electrical machine manufacturer in the world. This presentation will be an opportunity to introduce the company's core products, manufacturing capability and the strategies how to grow our business with innovation and the synergy in global operation.

Notes

Student Demonstrations

In this event, 17 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 A during the following times:

Monday, September 19th

4:10PM – 6:30PM

Smart Battery Condition Monitoring and Diagnostics System

Demonstrator: Ralph Chang
City University of Hongkong
Advisor: Henry Chung

Advanced Cell-level Control for Extending Electric Vehicle Battery Pack Lifetime

Demonstrator: Muneeb Rehman
Utah State University
Advisor: Regan Zane

SA Compact Capacitive Power Transfer System for Electric Vehicle Charging Application

Demonstrator: Fei Lu
University of Michigan
Advisor: Heath Hoffman

Product Oriented Design of Open Winding PMSM Drives for E-Bike

Demonstrator: Hanlin Zhan
The University of Sheffield
Advisor: Z.Q. Zhu

Ultra-high Power Density GaN Inverters

Demonstrator: He Li
The Ohio State University
Advisor: Jin Wang

Comparing Common Mode Noise and the Impact of Transformers in Both GaN and Si Photovoltaic Inverters

Demonstrator: Bailey Hall
Miami University
Advisor: Mark Scott

2-kVA High Power Density and High Efficiency Inverter for Google Little Box Challenge

Demonstrator: Xiaonan Zhao
Virginia Tech
Advisor: Jason Lai

Novel SiC Power Device and Power Module for High Frequency, High Voltage Application

Demonstrator: Xiaoqing Song
North Carolina State University
Advisor: Alex Huang

On Reactive Power Injection Control of Distributed Grid-tied AC-Stacked PV Inverter Architecture

Demonstrator: R Hamid Jafarian
University of North Carolina at Charlotte
Advisor: Babak Parkhideh

Dynamic Matching System for Radio-Frequency Plasma Generation

Demonstrator: Anas Al Bastami
MIT
Advisor: Dave Perreault

High Power Density Impedance Control Network DC-DC Converter Utilizing an Integrated Magnetic Structure

Demonstrator: Ashish Kumar
University of Colorado Boulder
Advisor: Khurram Afridi

Development and Investigation of a Battery-Buffered Smart Load

Demonstrator: Ahmed Zurfi
University of Arkansas at Little Rock
Advisor: Jing Zhang

A 2kW Single-Phase Inverter with a Power Density of 216 W/in³ for the Google Little Box Challenge

Demonstrator: Shibin Qin
University of Illinois Urbana-Champaign
Advisor: Robert Pilawa

An 800 V GaN-based, 3.1 kW, 13-Level Inverter for Electric Aircrafts with a 1.4 MHz Effective Ripple Frequency

Demonstrator: Thomas Foulkes
University of Illinois Urbana-Champaign
Advisor: Robert Pilawa

Synchronous Generator Field Excitation Via Capacitive Coupling Through a Journal Bearing

Demonstrator: Jiejian Dai
University of Wisconsin
Advisor: Dan Ludois

A 3D Printed Fluid Filled Variable Elastance Electrostatic Machine Optimized with Conformal Mapping

Demonstrator: Baoyun Ge
University of Wisconsin
Advisor: Dan Ludois



IMPORTANT DATES

January 15, 2017
Digest submitted
via the website

May 1, 2017
Notification of acceptance
or rejection

June 30, 2017
Final papers with IEEE
copyright forms



ECCE 2017 Technical Program Chairs

Emmanuel Agamloh
Advanced Energy, USA

David Dorrell
*University of Kwazulu Natal,
South Africa*

Ryan Li
University of Alberta, Canada

Mircea Popescu
Motor Design Ltd., U.K

Pat Wheeler
University of Nottingham, U.K

The Ninth Annual IEEE Energy Conversion Congress and Exposition (ECCE 2017) will be held in Cincinnati, OH, on October 1 - 5, 2017. ECCE 2017 is the pivotal international conference and exposition event on electrical and electromechanical energy conversion field. ECCE 2017 will feature both industry-driven and application-oriented technical sessions and seminars, as well as exhibitions. ECCE 2017 will bring together practicing engineers, researchers and industry professionals for interactive and multidisciplinary discussions on the latest advances in various areas related to energy conversion.

Technical papers are solicited on any subject pertaining to the scope of the conference that includes, but is not limited to, the following major topics:

Energy Conversion Systems and Technologies

- ▶ Renewable and alternative energy systems
- ▶ Smart grids, micro grids and utility applications
- ▶ Electrical energy storage systems.
- ▶ Energy conversion systems for Information Technology and communication systems
- ▶ Technologies and systems for energy harvesting
- ▶ Energy efficiency for residential, commercial and industrial applications
- ▶ Wireless power transfer (WPT)
- ▶ Systems for Transportation Electrification
- ▶ High power/voltage power converters and applications
- ▶ High voltage isolation and lightning strike protection
- ▶ Lighting Applications and Displays

Components and Subsystems for Energy Conversion

- ▶ Power electronic devices (Si and Wide band-gap) and applications
- ▶ Power conversion topologies, modulation, and control
- ▶ Rotating/linear electro-mechanical devices and drive systems
- ▶ Passive components and associated material technology
- ▶ Power electronic packaging and integration
- ▶ Modelling of energy conversion components, converters and systems
- ▶ Reliability, diagnostics, prognostics, and health management
- ▶ Measurement techniques and EMC

ABOUT CINCINNATI

Located on the Ohio River, Cincinnati is a unique blend of a vibrant, fun, sophisticated and business oriented city with rich culture, exquisite architecture, entertainment, cuisine and shopping. The city is located in the southwestern corner of Ohio with its environs spreading towards two neighboring states - Kentucky and Indiana. Cincinnati is home to major companies involved in manufacturing, energy, information technology and finance. The city proudly serves as the headquarters for several international Fortune 500 companies. Cincy is easily accessible with direct flights from major cities worldwide. ECCE 2017 will be held in the Duke Energy Convention Centre, known for its ultramodern facilities and award-winning environmental sustainability performance through its STEP UP plan.



Paper Submission Guideline: Prospective authors are requested to submit a digest no longer than five (5) pages, single column, single spaced, summarizing the proposed paper. The digest should include key equations, figures, tables and references as appropriate, but no author names or affiliations.

Deviations from these essential requirements will be grounds for immediate rejection. The digests must clearly state the objectives of the work, its significance in advancing engineering or science, and the methods and specific results in sufficient detail. The digests will be reviewed using a double-blind peer review process to ensure confidentiality and fair review. Please refer to the conference website for a detailed list of technical topics and the digest submission method.

Please visit <http://www.ieee-ecce.org/2017> for more information
or contact the ECCE 2017 Technical Program Chairs at ecce2017tpc@gmail.com.

For exhibiting at ECCE 2017, please contact Exhibition Chair, Jennifer Vining at ecce2017expo@gmail.com

For more about Cincinnati and its surrounding areas, please visit <http://www.cincyusa.com>

IMPORTANT DATES

February 17, 2017

Submission of completed one-page Tutorial Proposal Form

March 27, 2017

Notification of acceptance. Accepted tutorials will be advertised by the committee after this date.

June 30, 2017

Full tutorial materials must be submitted for publication in the tutorials book

The Ninth Annual IEEE Energy Conversion Congress and Exposition (ECCE 2017) will be held in Cincinnati, OH, on October 1 – 5, 2017. The conference will bring together practicing engineers, researchers and other professionals for interactive discussions on the latest advances in various areas related to energy conversion. ECCE is the foremost technical conference and exposition for people looking for energy conversion solutions; solutions that are timely, practical, customer focused, market sensitive, and cost effective. Engineers from throughout the energy conversion industry's broad spectrum come to ECCE specifically to take advantage of the concentrated brain trust assembled annually in one very special location to do business in a convivial and innovative atmosphere, a perfect blend of state of the art technical prowess and commercial opportunities under one roof.

The ECCE organizing committee invites proposals for half-day tutorials to be presented on Sunday October 1, 2017. The organizing committee is particularly interested in tutorials that are of value to the practicing engineer, with an emphasis on solutions to practical problems. Tutorials are solicited on any subject pertaining to the scope of the conference that includes, but is not limited to, the major topics listed below.

Energy Conversion Systems and Technologies

- ▶ Renewable and alternative energy systems
- ▶ Smart grids, micro grids and utility applications
- ▶ Electrical energy storage systems.
- ▶ Energy conversion systems for Information Technology and communication systems
- ▶ Technologies and systems for energy harvesting
- ▶ Energy efficiency for residential, commercial and industrial applications
- ▶ Wireless power transfer (WPT)
- ▶ Systems for Transportation Electrification
- ▶ High power/voltage power converters and applications
- ▶ High voltage isolation and lightning strike protection
- ▶ Lighting Applications and Displays

Components and Subsystems for Energy Conversion

- ▶ Power electronic devices (Si and Wide band-gap) and applications
- ▶ Power conversion topologies, modulation, and control
- ▶ Rotating/linear electro-mechanical devices and drive systems
- ▶ Passive components and associated material technology
- ▶ Power electronic packaging and integration
- ▶ Modelling of energy conversion components, converters and systems
- ▶ Reliability, diagnostics, prognostics, and health management
- ▶ Measurement techniques and EMC

Please submit the completed Tutorial Proposal Form and any questions regarding this call directly to the Tutorials Chair, Julia Zhang via email at zhangjul@eecs.orst.edu

Tutorials accepted for presentation will receive one conference registration together with an honorarium for \$1000. Note that publication of a technical paper at the conference will still require a full paid registration.

Tutorial Proposal Submission Guidelines: Tutorial proposals should be submitted as a digest summarizing the content of the tutorial. Please follow the attached tutorial proposal form as the tutorial submission guideline.



**ECCE 2017
Tutorials Chair**
Julia Zhang
Oregon State University

FOR MORE CONFERENCE INFORMATION, PLEASE VISIT
<http://www.ieee-ecce.org/2017>

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

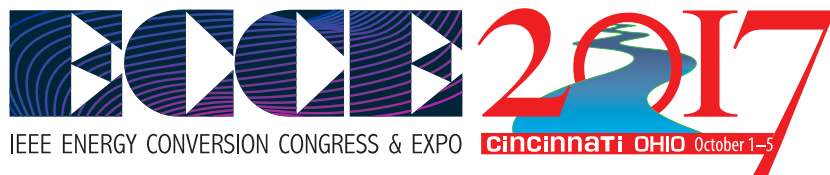
5. Other Instructor(s) if applicable

(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)



CALL FOR SPECIAL SESSION ORGANIZERS

IMPORTANT DATES

March 31, 2017
Special Session proposal
submissions deadline
(maximum five pages)

May 1, 2017
Notification of
session acceptance

The Ninth Annual IEEE Energy Conversion Congress and Exposition (ECCE 2017) will be held in Cincinnati, OH, on October 1 – 5, 2017. ECCE 2017 is the pivotal international conference and exposition event on electrical and electromechanical energy conversion field. ECCE 2017 will feature both industry-driven and application-oriented technical sessions, as well as industry expositions and seminars. ECCE 2017 will bring together practicing engineers, researchers and other professionals for interactive and multidisciplinary discussions on the latest advances in various areas related to energy conversion. ECCE has grown to become the foremost technical conference and exposition around electrical and electromechanical energy conversion. It focuses on solutions that are industrially oriented. People from a broad spectrum of the energy conversion industry and academia gather yearly at ECCE to interact in a convivial and innovative atmosphere, a perfect blend of state of the art, technical prowess and commercial opportunities in one attractive location.

The ECCE organizing committee invites organizers interested in organizing Special Sessions. Such sessions consist of oral presentations only, without written papers and are strongly oriented towards the latest industrial interest as well as the latest collaboration opportunities between industry and academia. Presentations may be a more commercial nature than those related to the papers in the standard technical sessions, and the organization of the sessions are more malleable and could be in the form of panel discussions. Audience participation and open source brainstorming sessions on focused topics are welcomed. Papers presented in special sessions are not subject to peer review and will not be made available in the conference proceedings. Presenters are encouraged to distribute their presentations through the conference mobile app.



Presentations are solicited on any subject pertaining to the scope of the conference described in its Call for Papers (obtainable from www.ieee-ecce.org/2017). Those that will address the following aspects of growing interest and innovation are encouraged:

- ▶ Standard development for power electronics systems / products
- ▶ Power Supply on Chip (PwrSoC) and related technology
- ▶ High Efficiency, flicker free LED light fixtures
- ▶ DC Microgrid: trend, requirement, and technologies
- ▶ Innovative materials for improved components and/or systems in electrical and electromechanical energy conversion
- ▶ Components and systems for electrical applications in the oil & gas and mining sectors.
- ▶ Technologies and systems for large, cycle-efficient and cycle-intensive energy storage.
- ▶ Modelling of materials oriented to improve the estimation of the energy efficiency in the components and systems using them.
- ▶ Reliability, diagnostics and prognostics of components and modular systems.

For more about Cincinnati and its surrounding areas, please visit

<http://cincyusa.com>

For submission and information regarding the ECCE 2017 Special Sessions, please contact the ECCE Special Session Chair

peter.wung@ge.com

**ECCE 2017
Special Session Chair**
Pete Wung
GE, USA

FOR MORE CONFERENCE INFORMATION, PLEASE VISIT
<http://www.ieee-ecce.org/2017>

Notes

save_{the}DATE



IEEE ENERGY CONVERSION CONGRESS & EXPO

CONFERENCE
October 1-5, 2017

2017
cincinnati OHIO

EXPOSITION
October 2-3, 2017



<http://www.ieee-ecce.org/2017>



Sept. 18-22
Milwaukee, WI



400 W Wisconsin Ave, Milwaukee ,WI 53203
202-973-8744 | ecce@courtesyassoc.com