# ECCE 2017

IEEE ENERGY CONVERSION CONGRESS & EXPO

Cincinnati OHIO October 1–5

# PROGRAM

**SPONSORED BY THE IEEE POWER ELECTRONICS AND INDUSTRY APPLICATIONS SOCIETIES**

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IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

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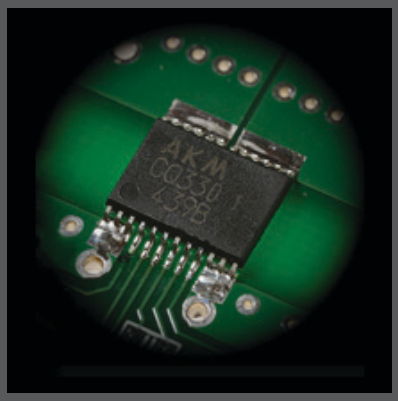
Booth 206

# Current Sensor ICs and Closed-loop Current Transducers for Voltage Isolated DC-AC Current Measurement



## AKM CQ High Frequency, Low Noise Current Sensors

- » Current Ranges: ±4.5A to ±42A
- » Accuracy: < 1.3%
- » Bandwidth (-3dB): dc to 1MHz
- » Response Time: 0.5µsec
- » Supply Voltage: 5V (CQ-33xx) or 3.3V (CQ-32xx)
- » Voltage Isolation: 3kV

## VAC Closed-loop Zero Flux Current Sensors

- » Current Ranges: ±200A to ±1000A
- » Accuracy: < 0.5%
- » Bandwidth (-3dB): dc to 50kHz or dc to 100kHz†
- » Response Time: <1µsec
- » Supply Voltage: ±12V to 15V or +24V†

† *depending on model*


## Danisense DS200LP High Stability, High Precision Closed-loop Fluxgate Current Transducer

- » Current Range: ±300A peak, 200Arms
- » Accuracy, dc to 5kHz: <0.3%
- » Bandwidth (-1dB): dc to 200kHz
- » Response Time: <1µsec
- » Supply Voltage: ±15V

NEW PRODUCT

# Table of Contents

# ECCE 2017 Supporters

ECCE 2017 would like to express our gratitude
for the generous support received from the following:

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# Welcome from General Chair: Andy Knight

It is my pleasure to welcome you to Cincinnati for the 9th Annual IEEE Energy Conversion Congress & Exposition ECCE 2017, sponsored by the IEEE Power Electronics Society (PELS) and the IEEE Industry Applications Society (IAS).

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 the 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.

As we are in Ohio, close to the home of the Wright brothers' pioneering efforts in aviation, ECCE 2017 features an emphasis on the challenges in aerospace electrification. This is highlighted in our plenary keynote speeches from Robert Bayles of UTC Aerospace Systems, Dr. Nateri K. Madavan of NASA and Dr. Huang Hao from GE Aviation Systems. We are extremely fortunate to have these distinguished leaders from industry to share their visions and wisdom with us.

At ECCE 2017, as we build on previous successes in our technical program, we have also made efforts to expand our professional program. This year, the technical program features 864 technical presentations which are selected from over 1500 digests submitted from across the globe. Technical papers are organized in 141 oral sessions across 10 time-slots and 37 poster sessions across 3 poster dialog sessions.

The professional program at ECCE 2017 begins on Sunday, with 11 tutorial sessions that offer an in-depth discussion of important and complex technical topics that combine practical application with theory. After the Monday plenary session, we have expanded our special sessions to offer applied and practical topics throughout the first three days of the conference. Special session topics include: Workforce Development and Careers in Power Electronics from the US Power Electronics Industry Collaborative; a joint session between IAS and KIPE on developments in Energy Conversion in Korea; Advances in Magnetic Materials. Recognizing and taking advantage of our location in Cincinnati, Wednesday features a series of four special sessions on challenges facing aerospace electrification. Wednesday also sees a session on power electronics in low inertia electrical systems, and two joint sessions on the interface between Power Electronics and Power Systems. Smart Grid initiatives are also emphasized by technical tours to the Duke Energy Envision Center. A new focus of the professional program this year is our support of Women in Engineering. There is a WIE function on Monday evening, the traditional PELS WIE breakfast on Wednesday and a family space reserved for any attendees who may be traveling with small children.

We are very pleased to acknowledge the support of Wolong Electric and GE Aviation Systems as Platinum Partners for ECCE 2017. Both our Platinum Partners will join our other exhibitors and partners 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. This year sees the return products and services presentations to the Expo floor, together with the poster sessions and student demonstrations.

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. One of the changes that people may see this year is the co-location of the Industry Applications Society Annual Meeting. ECCE and the IAS AM will operate as separate conferences, with their own technical and professional programs. However, IAS AM attendees will join us at our social functions. We look forward to new networking opportunities with our IAS colleagues at the Welcome Reception, Expo Opening Reception, Industry Night Out, and Awards Luncheon. For those new to ECCE, thank you for joining us and we hope you can come to our first timer session just before the Sunday Welcome Reception event.

ECCE 2017 provides two Creative Digressions Lounges, spaces that do not need a reservation and provide a place for colleagues and friends to brainstorm on a few ideas generated during the conference, with paper boards, markers, and of course coffee and refreshments. Additionally, ECCE 2017 has three rooms that may be booked by industry organizations, exhibitors or alumni groups for private meetings.

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 / SmithBucklin, 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 all our 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 2017,

Andy Knight
*General Chair IEEE ECCE 2017*

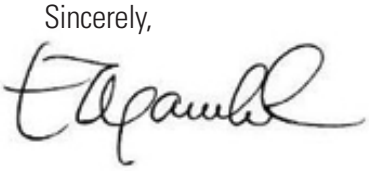
# Welcome from Technical Program Chairs

Electrical energy conversion is driving forward not only the industry, but also our society. We transform solar, wind, wave, heat, fuel energy into electrical energy. We can then store this in batteries, or transform it into mechanical energy through motors, or into light energy via lighting systems, or supply power converters. The whole process represents industrial connections and collaboration at its best. Since the start of the ECCE conference series in 2009, there has been a continuous growth in the numbers of technical papers submitted, the topics covered and worldwide attendance representation. We are pleased that you have selected ECCE to be one of the top events and conferences in the world and greatly appreciate your support as an author and/or attendee. In 2017, for the 9th edition of ECCE, there have been submitted 1504 digests – this is in line with the average achieved in the last three years of the event. Following the peer review process, a total of 864 papers have been accepted and scheduled into 16 parallel oral sessions and 3 poster sessions. An acceptance ratio of 57.5% shows that all research topics and results that will be presented at ECCE 2017, have earned the right to publication through a good competition. As a tradition started few years back, there are 10 presentation-only special sessions that are scheduled throughout the week.

Each submitted digest has been peer reviewed by three to five experts in the field. It is here, that we want to express our appreciation and big thanks for all the experts from around the world, who by volunteering to be part of the review process, make this conference a successful event. On average, we had over 4 reviews per digest. The review process was monitored by the Technical Program Committee (TPC), which is formed by Chairs, Vice Chairs, and Topic Chairs. Based on reviewers' comments/observations, the Topic Chairs responsible for that technical sub-track made a proposal for publication to the corresponding Vice Chairs, which proposed a final recommendation to the TPC Chairs. As per the usual procedure, all accepted digests have been discussed in the TPC meeting. As TPC Chairs, we have tried our best to monitor the whole review process, providing guidelines when and if required. Each of the TPC members has his/her responsibilities and a as group we have worked hard to ensure a uniform acceptance standard across all the tracks. The allocation of an accepted digest to a certain topic session and the mode of presentation, i.e. oral or poster, is the result of creating a balanced program. This should allow the audience to attend presentations that are in the same specific field, but spread on several days in oral sessions, or discuss all technical details and meet the authors in poster sessions. All papers presented at ECCE 2017, will be uploaded to IEEE Xplore Digital Library and made available to the world research community. Please reference this official conference policy if your institution requires conference attendance justification. Following ECCE 2017, depending on the topics, all presented papers are eligible for submission to IEEE Transactions on Industry Applications or Power Electronics. Please contact for more details the specific technical committee covering the scope of your paper.

On behalf of the entire Technical Program Committee, we strongly trust that you will consider 2017 to be one of the best ECCE events yet. We look forward to seeing you in Cincinnati. Once again, we want to give our gratitude to all of you who have contributed to ECCE2017 as an author, reviewer, TPC member or attendee.

Sincerely,



Emmanuel Agamloh
*Advanced Energy, USA*

David Dorrell
*University of KwaZulu-Natal, South Africa*

Ryan Li
*University of Alberta, Canada*

Mircea Popescu
*Motor Design Ltd, UK*

Pat Wheeler
*University of Nottingham, UK*

**ECCE 2017 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 Cincinnati to attend the 9th 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 2017 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. The Society volunteers will be ready to answer any questions you may have.

Many thanks to our ECCE 2017 General Chair Prof. Andy Knight 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 Cincinnati and wish you a pleasant and productive conference!

Tomy Sebastian
*President*
*IEEE Industry Applications Society*

Alan Mantooth
*President*
*IEEE Power Electronics Society*

# Organizing Committee

## Technical Program

### Technical Program Co-Chairs
Emmanuel Agamloh
Dave Dorrell
Ryan Li
Mircea Popescu
Pat Wheeler

### Publication
Xu She

## Professional Program

### Industry Liaison
Uday Deshpanday

### Industry PR
Longya Xu

### Expo & Sponsorship
Jennifer Vining

### Tutorials
Julia Zhang

### Special, Panel and Plenary Sessions
Pete Wung
Ian Brown

### Student Activities
Robert Pilawa - Podgurski

### WIE
Giovanna Oriti
Norma Anglani

## Conference Operations

### Finance
Jin Wang

### Awards
Pericle Zanchetta

### Website
Jennifer Vining

### Publicity
David Morrison
Tiefu Zhao

### Social Media
Vanessa Broccoli
Rudy Wang

### Local Chairs
Yilmaz Sozer
Mark Scott

### Student Awards
Helen Li
Po Tai Cheng

## Renewable and Sustainable Energy Applications

Rathore, Akshay (Vice Chair), Concordia University, Canada
Mazumder, Sudip (Vice Chair), University of Illinois, Chicago, USA
Kumar, Dinesh, Danfoss Drives A/S, Denmark
Weise, Nathan, Marquette, University, USA
Mahanty, Ranjit, Indian Institute of Technology (BHU), India
Ma, Ke, Shanghai Jiao Tong University, China
Liu, Liming, ABB Inc, USA
Akin, Bilal, UT Dallas, USA
Doolla, Suryanarayana, Indian Institute of Technology, Bombay, India
Choi, Jaeho, Chungbuk National University, Korea
Pan, Xuewei, Harbin Institute of Technology, China
Sarkar, Tirthajyoti, ON Semiconductor, USA
Mishra, Santanu, Indian Institute of Technology, Kanpur, India
Khanna, Raghav, University of Toledo, USA
Gao, Fei, University of Technology of Belfort-Montbeliard (UTBM), France

## Smart Grid & Utility Applications

Grainger, Brandon (Vice Chair), University of Pittsburgh, USA
Mirafzal, Behrooz (Vice Chair), Kansas State University, USA
Barater, Davide, University of Parma, Italy
Kish, Gregory, University of Alberta, Canada
Suul, Jon Are, SINTEF Energy Research, Norway
Izadian, Afshin, Purdue School of Engineering and Technology, USA
Bifaretti, Stefano, University of Rome Tor Vergata, Italy
Skorek, Adam, University of Qubec at Trois-Rivieres, Canada
Chen, Nan, ABB Corporate Research, Sweden
Lu, Xiaonan, Argonne National Laboratory, USA
Du, Yu, ABB Inc, USA
Wang, Xiongfei, Aalborg University, Denmark
Vasquez, Juan, Aalborg University, Denmark
Zhao, Tiefu, UNC Charlotte, USA
Garcia, Pablo, University of Oviedo, Spain
Liang, Hao, University of Alberta, Canada
Lee, Tzung-Lin, National Sun Yat-sen University, Taiwan
Garcia, Jorge, University of Oviedo, Spain
Chowdhury, Asif, Halla Mechatronics, USA
She, Xu, GE Global Research, USA

## Datacenters and Telecommunication Applications

Ordonez, Martin (Vice Chair), University of British Columbia, Canada
Garcia, Pablo, University of Oviedo, Spain
Siwakoti, Yam, University of Technology Sydney, Australia
Alzola, Rafael Pena, University of Strathclyde, Scotland
Tan, Nadia, Universiti Tenaga Nasional, Malaysia

## Transportation Electrification Applications

Sarlioglu, Bulent (Vice Chair), University of Wisconsin-Madison
Debnath, Suman, Oak Ridge National Lab, USA
Galigekere, Veda Prakash, Oak Ridge National Lab, USA
Kollmeyer, Phillip, MacMaster University, Canada
Gao, Fei, University of Technology of Belfort-Montbeliard (UTBM), France
Krishnamurthy, Mahesh, Illinois Institute of Technology, USA
Ye, Jin, San Francisco State University, USA
Wang, Mengqi, University of Michigan-Dearborn, USA

## Power Converter Topologies

Zanchetta, Pericle (Vice Chair), University of Nottingham, UK
Sun, Kai (Vice Chair), Tsinghua University, China
Mishra, Santanu, Indian Institute of Technology, Kanpur, India
Lei, Qin, Arizona State University, USA
G. Lamar, Diego, University of Oviedo, Spain
Lee, Tzung-Lin, National Sun Yat-sen University, Taiwan
Solero, Luca, University of Roma Tre, Italy
Grbovic, Petar, Huawei Technologies, Germany
Petrella, Roberto, University of Udine, Italy
Cao, Dong, North Dakota State University
Pucci, Marcello, ISSIA-CNR, Italy
Formentini, Andrea, University of Nottingham, UK
Lidozzi, Alessandro, University of Roma Tre, Italy
Manjrekar, Madhav, UNC Charlotte, USA
Kshirsagar, Parag, UTRC, USA
Itoh, Junichi, Nagaoka University of Technology, Japan
Zarri, Luca, University of Bologna, Italy
Tang, Yi, Nanyang Technological University, Singapore

## Control, Modelling and Optimization of Power Converters

Pitel, Grant (Vice Chair), Magna Power Electronics, USA
Muetze, Annette (Vice Chair), Graz University of Technology, Austria
Preindl, Matthias, Columbia University, USA
Lu, Xiaonan, Argonne National Laboratory, USA
Essakiappan, Somasundaram, UNC Charlotte, USA
Oriti, Giovanna, Naval Postgraduate School, USA
Guerrero, Juan, University of Oviedo
Anglani, Norma, University of Pavia, Italy
Skorek, Adam, University of Qubec at Trois-Rivieres, Canada
Suul, Jon Are, SINTEF Energy Research, Norway
Wang, Ruxi, GE Global Research, USA
Bifaretti, Stefano, University of Rome Tor Vergata, Italy
Wang, Xiongfei, Aalborg University, Denmark
Wei, Lixiang, Rockwell Automation, USA
Monopoli, Vito Giuseppe, Politecnico di Bari, Italy
Chen, Minjie, Princeton Univercity, USA

## Electrical Machines

Chiba, Akira (Vice Chair), Tokyo Institute of Technology, Japan
Wung, Peter (Vice Chair), GE Aviation, USA
Bianchi, Nicola, University of Padova, Italy
Cavagnino, Andrea, Politecnico di Torino, Italy
Gebregergis, Abraham, Halla Mechatronics, USA
Inoue, Yukinori, Osaka Prefecture University, Japan
Islam, Mohammad, Halla Mechatronics, USA
Jia, Shaofeng, Xi'an Jiaotong University, China
De Donato, Giulio, Sapienza-University of Rome
Reigosa, David Diaz, University of Oviedo, Spain
Gyftakis, Konstantinos, Coventry University, UK
Barater, Davide, University of Parma, Italy
Paul, Subhra, Nexteer Automotive, USA
Bird, Jonathan, Portland State University, USA
Xu, Wei, Huazhong University of Science and Technology, China
Rahman, Khwaja, General Motors, USA
Pucci, Marcello, ISSIA-CNR, Italy
Antonino-Daviu, Jose, Polytechnic University of Valencia, Spain
Lyra, Renato, Aerotech Inc, USA
Heins, Greg, Regal Beloit, Australia
Dutta, Rukmi, UNSW, Australia
Pakdelian, Siavash, University of Massachusetts Lowell, USA
Lee, Sang Bin, Korea University, Korea
Prasad, Rashmi, General Motors, USA
Vaschetto, Silvio, Politecnico di Torino, Italy
Qu, Ronghai, Huazhong University of Science and Technology, China

## Electric Drives

Marques Cardoso, Antonio J. (Vice Chair), CISE/
University of Beira Interior, Portugal
Swamy, Mahesh (Vice Chair), Yaskawa America Inc, USA
Bazzi, Ali, University of Connecticut, USA
Scelba, Giacono, University of Catania, Italy
Dutta, Rukmi, UNSW, Australia
Jiang, Dong, Huazhong University of Science and Technology, China
Dazhong, Gu, UTRC, USA
Gebregergis, Abraham, Halla Mechatronics, USA
Paul, Subhra, Nexteer Automotive, USA
Chowdhury, Mazharul, Halla Mechatronics, USA
Bojoi, Radu, Politecnico di Torino, Italy
Yang, Shih-Chin, National Taiwan University, Taiwan
Fatemi, Alireza, General Motors, USA
Neely, John, Eaton Aerospace, USA
He, Jiangbiao, GE Global Research, USA
Su, Gui-Jia, Oak Ridge National Lab, USA
Barater, Davide, University of Parma, Italy
Liu, Jingbo, Rockwell Automation, USA
Pramod, Prerit, Nexteer Automotive, USA
Hinkkanen, Marko , Aalto University, Finland
Reigosa, David Diaz, University of Oviedo, Spain
Zhang, Pinjia, Tsinghua University, China
Mir, Sayeed, Eaton Aerospace, USA
Tallam, Rangarajan, Rockwell Automation, USA
Schroeder, Stefan, GE Global Research, Germany
Guerrero, Juan, University of Oviedo
Wu, Long, John Deere, USA
Zhao, Yue, University of Arkansas, USA
Pucci, Marcello, ISSIA-CNR, Italy
Rajavenkitasubramony, Ramakrishnan, Halla Mechatronics, USA
Petrella, Roberto, University of Udine, Italy

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

Xu, Dehong Mark (Vice Chair), Zhejiang University, China
Krishnamurthy, Shashank (Vice Chair), UTRC, USA
Nawaz, Muhammad, ABB Corporate Research, Sweden
Guo, Ben, UTRC, USA
Costinett, Daniel, University of Tennessee, USA
Dong, Dong, GE Global Research, USA
Wada, Keiji, Tokyo Metropolitan University, Japan
Wang, Ruxi, GE Global Research, USA
Popovic, Jelena, TU Delft, Netherlands

## Energy Efficient Systems Applications and Lighting Technologies

Dalla Costa, Marco (Vice Chair), Federal University of Santa Maria, Brazil
Afridi, Khurram (Vice Chair), University of Colorado Boulder, USA
Alonso, Marcos, University of Oviedo, Spain
Suzuki, Kayo, Acaterial Ltd., Japan
Pascal, Dupuis, Univ. P. Sabatier --Laplace, France
Wang, Yijie, Harbin Institute of Technology, China
Lin, Ray-Lee, National Cheng Kung University, Taiwan
Perreault, David, MIT, USA
Zissis, Georges, University of Toulouse, France

## Emerging Technologies and Applications

Wang, Jin (Vice Chair), Ohio State University, USA
Chen, Yaow-Ming (Vice Chair), National Taiwan University, Taiwan
Luo, Fang, Ohio State University, USA
Chiu, Huang-jen, National Taiwan University of Science
and Technology, Taiwan
Chen, Ching-Jan, National Taiwan University, Taiwan
Wang, Huai, Aalborg University, Denmark
Lucia, Oscar, University of Zaragoza, Spain
Chen, Nan, ABB Corporate Research, Sweden

## Conflict of Interest

Burgos, Rolando (Vice Chair), Virginia Tech, USA

# Notes

# Downtown Map

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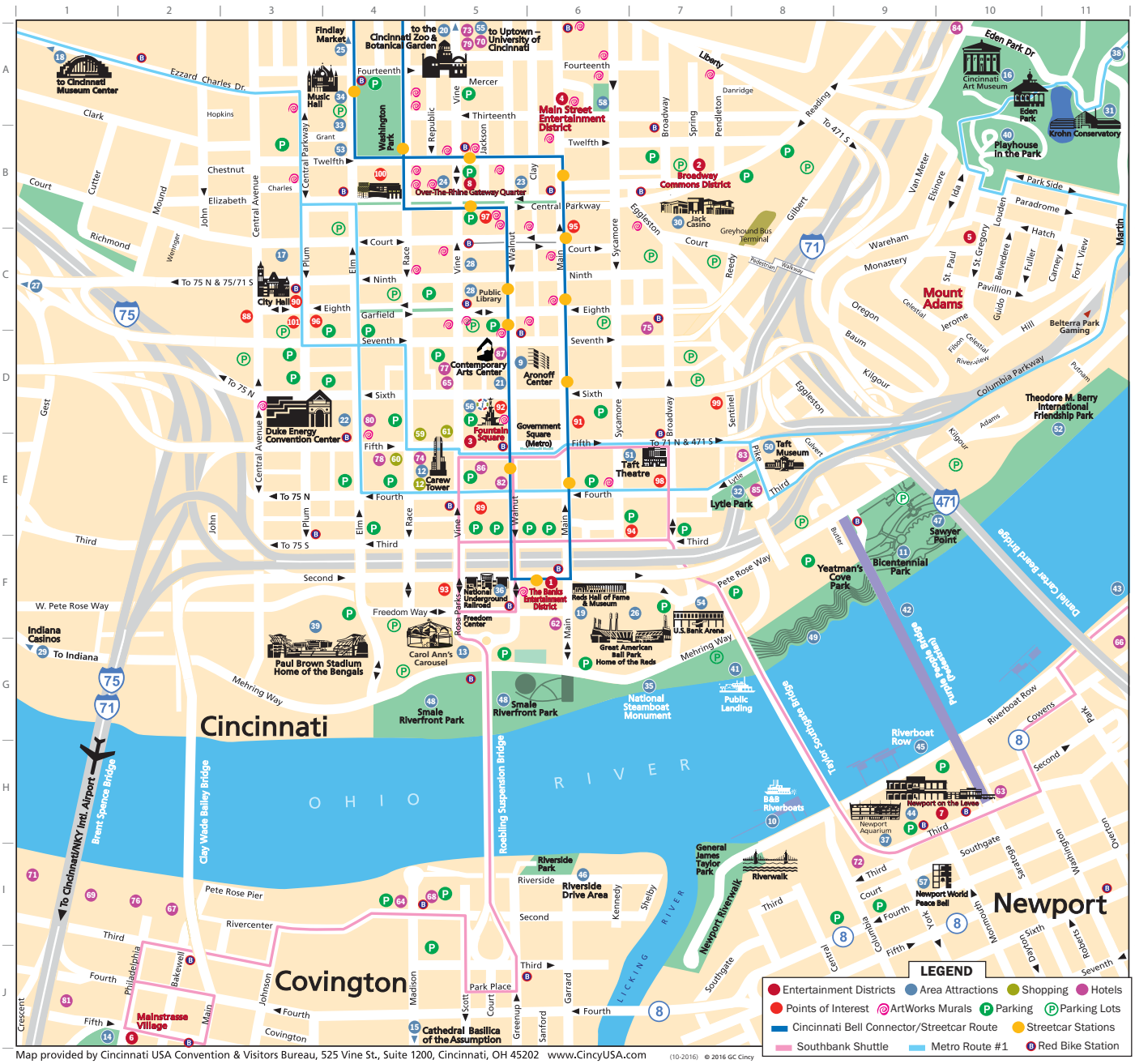



Map provided by Cincinnati USA Convention & Visitors Bureau, 525 Vine St., Suite 1200, Cincinnati, OH 45202 www.CincyUSA.com (10-2016) © 2016 GC Cincy

## Entertainment Districts

1. The Banks (F-6)
2. Broadway Commons (B-7)
3. Fountain Square (D,E-5)
4. Main Street (A,B-6)
5. Mount Adams (B,C-10)
6. Mainstrasse Village (J-2)
7. Newport on the Levee (H-9,10)
8. Over-The-Rhine Gateway Quarter (A,B-4,5,6)

## Area Attractions

9. Aronoff Center for the Arts (D-6)
10. BB Riverboats Inc. (H-8)
11. Bicentennial Park (F-9)
12. Carew Tower Complex Observation Deck (E-5)
13. Carol Ann's Carousel/Anderson Pavilion (G-5)
14. Carroll Chimes Bell Tower (J-1)
15. Cathedral Basilica of the Assumption (J-5)
16. Cincinnati Art Museum (A-10)
17. Cincinnati Fire Museum (C-3)
18. Cincinnati Museum Center at Union Terminal (A-1) Duke Energy Children's Museum, Cincinnati History Museum, Museum of Natural History and Science, Robert D. Linder Family OMNIMAX Theatre, Cincinnati Historical Society Library
19. Cincinnati Reds Hall of Fame and Museum (F-6)
20. Cincinnati Zoo & Botanical Garden (A-5) (See other side)
21. Contemporary Art Center (D-5)
22. Duke Energy Convention Center (D-3,4)
23. Emery Auditorium Theatre (B-5)
24. Ensemble Theatre of Cincinnati (B-5)
25. Findlay Market (A-4)
26. Great American Ball Park (F-7)
27. The Greater Cincinnati Police Historical Society Museum (C-1)
28. Hamilton County Public Library (C-5)
29. Indiana Casinos (See other side) (G-1)
30. Jack Casino (B-7)
31. Krohn Conservatory (A-11)
32. Lytle Park (E-8)
33. Memorial Hall (B-3)
34. Music Hall (A-3)
35. National Steamboat Monument (G-7)
36. National Underground Railroad Freedom Center (F-5)
37. Newport Aquarium (H-9)
38. Overlook Park (A-11)
39. Paul Brown Stadium (F,G-3)
40. Playhouse in the Park (B-10)
41. Public Landing (G-7)
42. Purple People Bridge (H-9)
43. Queen City Riverboats (F-11)
44. Ride the Ducks (H-9)
45. Riverboat Row (H-9)
46. Riverside Drive Area (I-6)
47. Sawyer Point (E-9)
48. Smale Riverfront Park (G-5)
49. Serpentine Wall (F-8)
50. Taft Museum of Art (E-8)
51. Taft Theatre (E-7)
52. Theodore M. Berry International Friendship Park (D-10,11)
53. The Transept (B-4)
54. U.S. Bank Arena (F-7)
55. Uptown – University of Cincinnati (A-5) (See other side)
56. Visitors Center (D-5)
57. World Peace Bell (I-9)
58. Ziegler Park (A-6)

## Shopping

12. Carew Tower Complex/Mabley Place (E-5)
59. Macy's (E-5)
60. Saks Fifth Avenue (E-4)
61. Tiffany & Co. (E-5)

## Hotels

62. AC Hotel Cincinnati at the Banks (F-6)
63. Aloft Newport-Cincinnati (H-10)
64. Cincinnati Marriott at RiverCenter (I-4)
65. Cincinnatian Hotel (D-5)
66. Comfort Suites Newport (G-11)
67. Courtyard by Marriott Covington (I-2)
68. Embassy Suites at RiverCenter (I-5)
69. Extended Stay America – Covington (I-1)
70. Farfield Inn & Suites Cincinnati/Uptown (See other side) (A-5)
71. Hampton Inn Cincinnati Riverfront (I-1)
72. Hampton Inn & Suites Newport/Cincinnati (I-9)
73. Hampton Inn & Suites Uptown (See other side) (A-5)
74. Hilton Cincinnati Netherland Plaza (E-4)
75. Holiday Inn & Suites Downtown Cincinnati (C-7)
76. Holiday Inn Cincinnati Riverfront (I-2)
77. Homewood Suites & Hampton Inn & Suites (D-5)
78. Hyatt Regency Cincinnati (E-4)
79. Marriott Kingsgate Conference Hotel (See other side) (A-5)
80. Millennium Hotel Cincinnati (D-4)
81. Radisson Hotel Cincinnati Riverfront (J-1)
82. Renaissance Cincinnati Downtown (E-5)
83. Residence Inn Downtown (E-8)
84. SpringHill Suites (A-10)
85. The Lytle Park Hotel, Marriott Autograph Collection (E-8)
86. Westin Hotel Cincinnati (E-5)
87. 21c Museum Hotel (D-5)

## Points of Interest

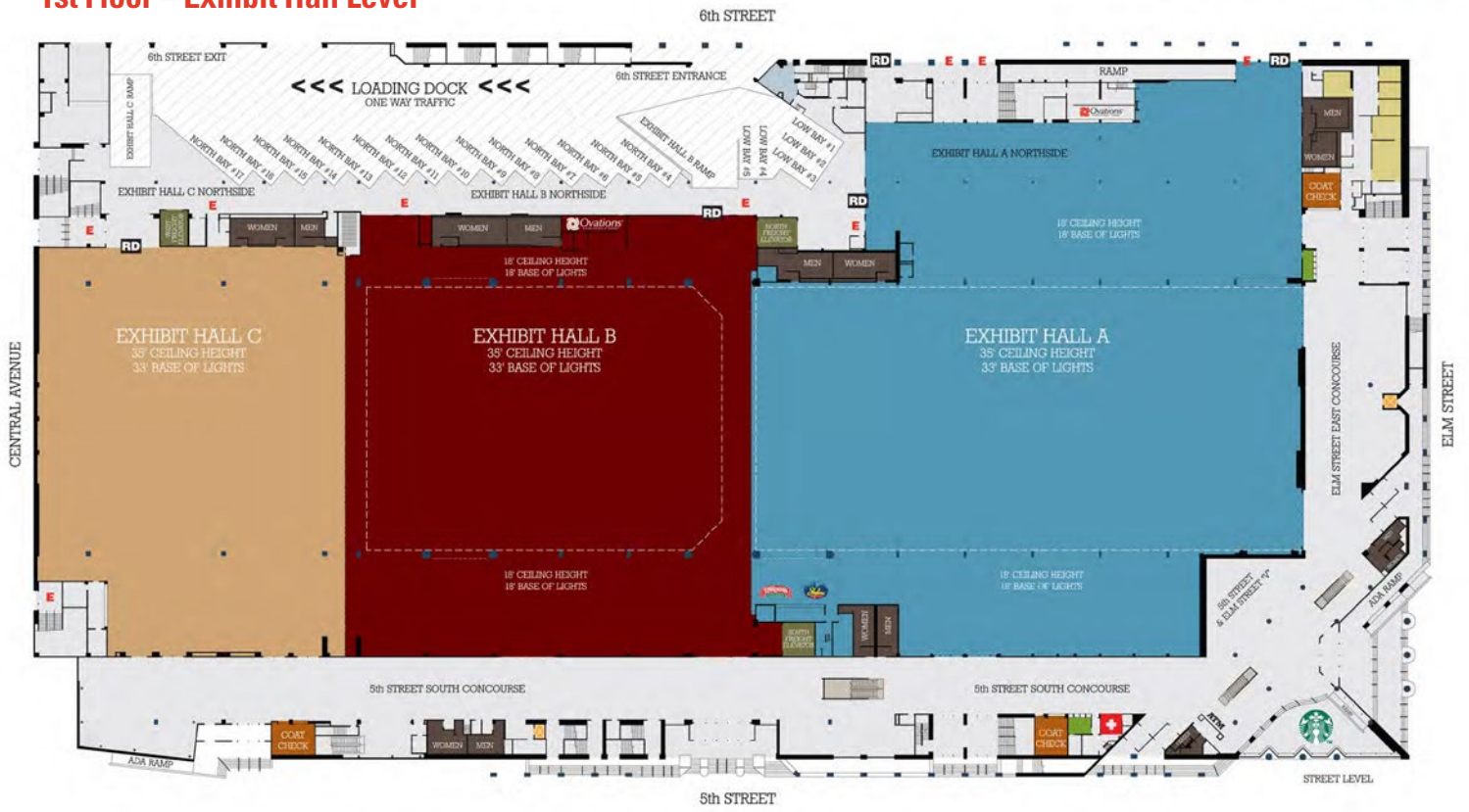
12. Carew Tower Complex (E-5) Observation Deck/Mabley Place
88. Centennial Buildings 1, 2 & 3 (C-3)
89. Cincinnati USA Regional Chamber (E-5)
90. City Hall (C-3)
91. Federal Building (D-6)
92. Fifth Third Building (D-5)
93. GE Building (F-5)
94. Great American Tower at Queen City Square (E-7)
95. Hamilton County Courthouse (B-6)
96. Isaac M. Wise Temple (C-3)
97. Kroger Building (B-5)
98. Masonic Center (E-7)
99. Procter & Gamble Headquarters (D-7)
100. SCPA (School for Creative and Performing Arts) (B-4)
101. St. Peter in Chains Cathedral (C-3)

Locations on grid listed in ( )

**Cincinnati USA Visitor Center**
*Stop by our Visitor Center on Fountain Square for up-to-date information on Cincinnati. Hours are online at: www.cincyusa.com/visitors*

# Duke Energy Convention Center Floor Plan

## 1st Floor – Exhibit Hall Level




## 2nd Floor – Meeting Room Level

# Schedule-at-a-Glance

## Saturday, September 30th

5:00PM – 7:00PM **Registration** . . . . . *2nd Floor "V"*

## Sunday, October 1st

7:00AM – 7:00PM **Registration** . . . . . *2nd Floor "V"*

### AM Tutorials • 8:00AM – 12:00PM

| 262 | 260/261 | 236 | 263 | 264 | 237/238 |
|---|---|---|---|---|---|
| **T1-1:** High Power Medium Frequency Transformer Design Optimization | **T1-2:** Model Predictive Control of High Power Converters and Industrial Drives | **T1-3:** Modeling and Energy Management of Modern Shipboard Power Systems | **T1-4:** DC Arc Fault Detection and Protection in DC Electric Power Systems | **T1-5:** Practical Considerations for the Application of High Power Si and SiC Modules | **T1-6:** Isolated Bi-directional DC/DC Converter Topologies and Control |

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

### PM Tutorials • 1:00PM – 5:00PM

| 263 | 236 | 260/261 | 264 | 237/238 |
|---|---|---|---|---|
| **T2-1:** Using Soft-Switching Technology to Design High-Power, High-Current, Isolated, DC/DC Converters that Achieve Low-Cost, High Reliability, and Electromagnetic Compliance | **T2-2:** SiC Power Device Design and Fabrication, And Insertion In Novel MV Power Conversion Systems | **T2-4:** Electrical Machine Analysis Using Free Software | **T2-5:** EMI Issues and Solutions in PWM Converters | **T2-6:** Wireless Power Transfer for Electric Vehicle and Mobile Applications |

5:00PM – 5:45PM **ECCE Newcomers** . . . . . *Room: 252*

5:30PM – 7:30PM **Welcome Reception** . . . . . *Grand Ballroom Pre-function Lobby*

## Monday, October 2nd

7:00AM – 7:00PM **Registration** . . . . . *2nd Floor "V"*

8:30AM – 10:30AM **Plenary Session** . . . . . *Grand Ballroom B*

10:30AM – 10:50AM **AM Break** . . . . . *Greenhouse Pre-function Lobby & South Concourse Alcove*

### Oral Sessions • 10:50AM – 12:30PM

| 200 | 201 | 203 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S9:** Modeling and Control of Resonant Converters | **S8:** DC/DC Converters I | **S4:** Applications of MMC | **S7:** Multi-Phase DC/AC Converters I | **S10:** Modeling and Control of Power Factor Correction Converters | **S16:** Magnetics I | **S15:** GaN Switching Perfor-mance | **S6:** Single-Phase DC/AC Converters I | **S5:** Inductive Power Transfer for EV Charging | **S3:** Dynamic Performance of Power Converters for Renewable Energy | **S1:** Power Conversion for Solar Photovoltaic Systems I | **S2:** Hybrid AC/DC Microgrids | **S14:** Diagnostics and Fault Tolerant Systems in Drives | **S13:** Control of Electric Drives I | **S12:** Axial Flux Machines | **S11:** Induction Machines I |

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

### Oral Sessions • 2:00PM – 4:05PM

| 200 | 201 | 203 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S24:** Modeling and Control of Multilevel Converters | **SS1:** Workforce Develop-ment and Careers in Power Electronics | **S31:** Wireless Power Transfer I | **S21:** Multi-Phase DC/AC Con-verters II | **S23:** Power Quality Control | **S29:** Magnetics II | **S30:** SiC Converter Applications | **S22:** Single-Phase DC/AC Convert-ers II | **S20:** Control Aspects of Electified Vehicles | **S18:** Power Converter Topologies for Renewable Energy | **S17:** Power Conversion for Solar Photovoltaic Systems II | **S19:** Renewable Impacts in Industrial Microgrids | **S27:** Medium Voltage Drives and High Power Drives | **S28:** Sensorless Drives I | **S25:** Switched Reluctance Machines | **S26:** Induction Machines II |

4:15PM – 7:30PM **Expo Hall Reception** . . . . . *Exhibit Hall B*

### Poster Session 1 • 5:00PM – 7:30PM

#### Exhibit Hall B

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **S32:** Energy Storage Systems | **S33** AC/AC Converters | **S34:** Reliability, Diagnostics and Fault Analysis of Power Electronics | **S35:** AC Electrical Machines: In-novative Design Studies | **S36:** Axial and Transversal Flux Machines | **S37:** Utility Converters and Power Electronics Transformers | **S38:** Motor Drives I | **S39:** Switching Devices I | **S40:** Electric Vehicle Energy Management | **S41:** Sensing and Control for Power Converters | **S42:** Modelling and Control of MMC | **S43:** Control in Microgrids |

# Tuesday, October 3rd

7:30AM– 5:30PM **Registration** ..... *2nd Floor "V"*

## Oral Sessions • 8:30AM – 10:10AM

| 200 | 201 | 203 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S52:** Modeling and Control of Modular Multilevel Converter | **S49:** DC/DC Converters II | **S45:** Power Converters for HVDC Grids | **S48:** Multi-Phase AC/DC Converters | **S51:** Sensorless Methods and State and Parameter Estimation | **S58:** Wide Band Gap Device Reliability | **S57:** GaN Device and Gate Drive | **S50:** Single-Phase Grid Connected Converters | **SS2:** Industry Activities in Korea, Organized in Collaboration with KIPE | **S44:** Harmonic Compensation Techniques for Microgrids | **S47:** Power Conversion for Solar Photovoltaic Systems III | **S46:** Solid State Transformers | **S55:** Sensorless Drives II | **S56:** PM and IPM Motor Drives I | **S53:** Large Synchronous Machines | **S54:** Synchronous Reluctance Machines I |

10:10AM– 10:30AM **AM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove*

## Poster Session 2 • 10:30AM – 1:00PM

### Exhibit Hall B

| S59: | S60: | S61: | S62: | S63: | S64: | S65: | S66: | S67: | S68: | S69: | S70: | S71: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Datacenters and Telecommunication Applications | Applications of Electric Traction and Propulsion | Multilevel Converters | DC/AC Converters | DC/DC Converters | PV Applications | EMI in Power Converters | Advances in Special Electrical Machines | Induction and Permanent Magnet AC Machines | Motor Drives II | Switching Devices II | Wireless Power Transfer | DC and Hydrid AC/DC Systems |

10:30AM– 5:30PM **Exhibit Hall Open** ..... *Exhibit Hall B*

12:15PM – 2:30PM **Exhibit Lunch** ..... *Exhibit Hall B*

## Poster Session 3 • 2:30PM – 5:00PM

### Exhibit Hall B

| S72: | S73: | S74: | S75: | S76: | S77: | S78: | S79: | S80: | S81: | S82: | S83: |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Applications of MMC | Batteries and Wireless EV Charging | AC/DC Converters | Modeling and Control of Multilevel Converters | Modeling and Control of Grid Connected Converters | Power Quality | Stability of Converter Systems | Other Topics in Control, Modeling and Optimization of Power Converters | Analysis Techniques in Electrical Machines | AC Electrical Machines: Performance Estimation | Component Technologies | Renewable Energy and Grid Integration |

# Wednesday, October 4th

7:30AM– 6:00PM **Registration** ..... *2nd Floor "V"*

8:00AM– 9:00AM **Women in PELS (WIPELS) Breakfast** ..... *Room: 211*

## Oral Sessions • 8:30AM – 10:10AM

| 200 | 201 | 203 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S91:** Design Optimization of Power Converters | **S88:** DC/DC Converter Topologies | **S97:** LED Drivers | **S87:** Control and Modulation of Multi-Phase AC/DC Converters | **S90:** Reliability, Diagnostic, and Faults Analysis in Power Converters I | **SS7:** Power Electronic Meets Power Utilities & Systems | **S96:** Packaging I | **S89:** AC-AC Converters I | **SS3:** Electrical Power for Aviation Applications | **S85:** Droop Control in Microgrids | **S84:** Wind Energy Systems | **S86:** Grid Connected Converter Stability | **S94:** Energy Efficient Motor Drives | **S95:** Induction Motor Drives | **S92:** Thermal and Faults of Electric Machines | **S93:** PM Machines and Windings I |

10:10AM– 10:30AM **AM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove*

## Oral Sessions • 10:30AM – 12:10PM

| 200 | 201 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S110:** Wireless Power Transfer II | **S104:** Modulation Techniques I | **S101:** LLC Converters | **S103:** Reliability, Diagnostic, and Faults Analysis in Power Converters II | **SS8:** Power Electronic Meets Power Utilities & Systems | **S109:** Packaging II | **S102:** AC-AC Converters II | **SS4:** IOT and Twin for Aviation | **S99:** Power Sharing Techniques in Microgrids | **S98:** Wind Energy Applications | **S100:** DC Circuit Breaker Design | **S105:** Modeling and Control of Grid Connected Converters I | **S108:** PM and IPM Motor Drives II | **S106:** Synchronous Reluctance Machines II | **S107:** Variable Flux PM Machines |

12:10PM– 2:00PM **Lunch on Your Own**

## Oral Sessions • 2:00PM – 3:40PM

| 200 | 201 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S123:** Wireless Power Transfer III | **S117:** Modulation Techniques II | **S114:** Resonant DC/DC Converters | **S116:** Reliability, Diagnostic, and Faults Analysis for Power Devices | **SS9:** Power Electronics and Control for Low-Inertia Electrical Systems | **S122:** High Voltage Devices | **S115:** Modular Multilevel Converters (MMC) | **SS5:** Advanced Aircraft Electrification beyond MEAs | **S112:** Droop Techniques for Microgrid Operation | **S111:** PV Plants and PV Farms | **S113:** Control in DC Microgrids | **S118:** Modeling and Control of Grid Connected Converters II | **S121:** Drive Applications | **S119:** Linear Machines | **S120:** PM Motor Design, Control and Testing |

# Schedule-at-a-Glance (continued)

## Wednesday, October 4th (continued)

3:40PM – 4:00PM **PM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove*

**Oral Sessions • 4:00PM – 5:40PM**

| 200 | 201 | 204 | 205 | 206 | 207/08 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S136:** Emerging Applications | **S132:** Model Predictive Control of Power Converters I | **S128:** DAB DC/DC Converters | **S131:** Modeling and Control of AC-DC Converters | **SS10:** Magnetic Materials Standards in the Research Environment | **S126:** Datacenters and Telecom-munication Applications | **S129:** MMC Modulation and Control | **SS6:** Wide Band Gap Devices for the Aviation Applications | **S127:** Power Electronics in Electified Vehicles | **S124:** Solar Photovoltaic Technologies | **S125:** Control and Design Techniques for Microgrids I | **S130:** Control of Grid Connected Converter | **S135:** Control of Electric Drives II | **S133:** Thermal Model of Electric Machines | **S134:** PM Machines, Demagne-tization, Eccentricity and Losses |

7:00PM – 9:30PM **Industry Night Out** ..... *Grand Ballroom AB*

## Thursday, October 5th

7:30AM – 12:00PM **Registration** ..... *2nd Floor "V"*

**Oral Sessions • 8:30AM – 10:10AM**

| 200 | 201 | 204 | 205 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S150:** New Device, Circuit and Control Strategies | **S144:** Model Predictive Control of Power Converters II | **S141:** Multilevel Converters Applications | **S143:** Modeling and Control of DC-DC Converters I | **S149:** SiC Switching I | **S142:** MMC New Topologies | **S140:** Wireless Charging for EV | **S138:** Power Quality of Grid Connected Converters I | **S137:** Other Topics in Renewable Energy Applications | **S139:** Control and Design Techniques for Microgrids II | **S145:** Stability in Power Converters | **S148:** ElectricDrives for Wind and Other Renewable Integration | **S146:** High Torque Machines | **S147:** Small PM Motors |

10:10AM – 10:30AM **AM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove*

**Oral Sessions • 10:30AM – 12:10PM**

| 200 | 201 | 204 | 205 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S164:** Wireless Power Transfer IV | **S158:** Modeling and Control of DC-AC Converters I | **S155:** Multilevel Converters I | **S157:** Modeling and Control of DC-DC Converters II | **S163:** SiC Switching II | **S156:** PFC Converters | **S154:** Modeling and Monitoring of Batteries I | **S153:** Power Quality of Grid Connected Converters II | **S151:** Energy Storage Systems | **S152:** Power Conversion Systems for AC and DC Grids | **S159:** EMI in Power Converters | **S162:** Electric Drives for Aerospace and Traction Applications | **S160:** High Speed Machines | **S161:** Noise, Vibration, Short Circuit of Electric Machines |

12:10PM – 2:00PM **Awards Luncheon** ..... *Grand Ballroom AB*

**Oral Sessions • 2:00PM – 3:40PM**

| 200 | 201 | 204 | 205 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S171:** Isolated DC/DC Converters | **S173:** Modeling and Control of DC-AC Converters II | **S170:** Multilevel Converters II | **S172:** Grid Synchroni-zation Techniques | **S178:** Device Self Sensing Techniques | **S169:** Single-Phase AC/DC Converters | **S168:** Modeling and Monitoring of Batteries II | **S167:** Grid Connected Inverters and LCL Filter Design | **S166:** Wave Energy System | **S165:** Hybrid Energy Systems | **S174:** Testing, Measurement, and Validation of Power Converters | **S177:** PM and IPM Motor Drives III | **S176:** General Topics in Electrical Machines | **S175:** Motors for Transportation |

# Conference Highlights

## Plenary Session

The plenary session features a *Welcome to Cincinnati* by the President of GE Aviation Electrical Power Systems, Joe Krisciunas. He will be followed by three keynote speeches on the role of Energy Conversion in aerospace electrification. Dr. Hao Huang, GE Aviation Systems, Mr. Robert Bayles, UTC Aerospace Systems and Dr. Nateri K Madavan, NASA will provide insights into the challenges and opportunities for electrification in aerospace subsystems and propulsion. We welcome these distinguished industry leaders to our conference and look forward to their insights and visions for the future."

## Oral Sessions

The Technical Program Committee organized a rigorous peer review process and has carefully picked around 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.

## Special Sessions

We are pleased to offer 10 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 at the Exhibitor Stage, Tuesday in Exhibit Hall B.

## Exhibit Hall Opening Reception

Join us for the opening of the ECCE 2017 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, October 2nd – 4:15 PM to 7:30 PM in Exhibit Hall B.

## 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 B 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 Duke Energy Convention Center, Industry Night Out Reception, 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 Welcome Reception in the Duke Energy Convention Center, welcoming colleagues from both ECCE and IAS. 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. Join us on Sunday from 5:30 – 7:30 PM.

## Wednesday Industry Night Out Reception

This unique night brings together members from both ECCE and IAS to enjoy games, music, and mingling. Expand your network and knowledge during our first Industry Night Out reception. Food and beverages will be provided. Join us on Wednesday from 7:00 – 9:30 PM in Grand Ballroom AB.

## 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 Grand Ballroom AB.

## 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. Join us on Sunday October 1st from 5:00PM – 5:45PM from in room 252.

# Monday, October 2nd

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|---|---|
| 7:00AM – 7:00PM | **Registration** ..... *2nd Floor "V"* |
| 8:30AM – 10:30AM | **Plenary Session** ..... *Grand Ballroom B* |
| 10:30AM – 10:50AM | **AM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove* |

## Oral Sessions • 10:50AM – 12:30PM

| | 200 | 201 | 203 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S9:** Modeling and Control of Resonant Converters | **S8:** DC/DC Converters I | **S4:** Applications of MMC | **S7:** Multi-Phase DC/AC Converters I | **S10:** Modeling and Control of Power Factor Correction Converters | **S16:** Magnetics I | **S15:** GaN Switching Performance | **S6:** Single-Phase DC/AC Converters I | **S5:** Inductive Power Transfer for EV Charging | **S3:** Dynamic Performance of Power Converters for Renewable Energy | **S1:** Power Conversion for Solar Photovoltaic Systems I | **S2:** Hybrid AC/DC Microgrids | **S14:** Diagnostics and Fault Tolerant Systems in Drives | **S13:** Control of Electric Drives I | **S12:** Axial Flux Machines | **S11:** Induction Machines I |
| 10:50AM – 11:15AM | Resonant LLC Bus Conversion using Homopolarity Width Control | Experimental Verification of a Bidirectional Chopper for Battery Energy Storage Systems Capable of Reduction in Size and Weight of an Inductor | An MMC-based Topology using DHB Power Channels for Load Balancing in 50 Hz Railway Applications | Critical-Mode-based Soft-Switching Modulation for Three-Phase Inverters | A Discontinuous Boost Power Factor Correction Conduction Loss Model | Medium Frequency Transformer Leakage Inductance Modeling and Experimental Verification | Analysis of Oscillation in Bridge Structure based on GaN Devices and Ferrite Bead Suppression Method | Mode Selection Strategy for Multi-Mode Power Converters to Minimize its Differential Power | An Analytical Method to Calculate Winding Resistance for Planar Coil with Ferrite Plate and Litz Wire in Inductive Power Transfer | Robust H∞ DC Link Control Design for High-Power Density Converters with High-Order Filter in PV Systems | Single-Stage Three-Phase Grid-Connected Photovoltaic System with Maximum Power Tracking and Active and Reactive Power Control based on Nonlinear Control | Adaptive Active Power Sharing Techniques for DC and AC Voltage Control in a Hybrid DC/AC Microgrid | Faulted Phase Location Identification for Adjustable Speed Drives in High Resistance Grounding System | Optimal Torque Control of Synchronous Motor Drives: Plug-and-Play Method | An Axial Flux-Focusing Magnetically Geared Motor | Induction Machine Design for Dynamic Loss Minimization along Driving Cycles for Traction Applications |
| 11:15AM – 11:40AM | Dual-Loop Controller for LLC Resonant Converters using an Average Equivalent Circuit | Magnetic Structure of Close-Coupled Inductors to Improve the Thermal Handling Capability in Interleaved DC-DC Converter | Communication Network Latency Compensation in Modular Multilevel Converters | Implementing Synchronous DC Link Voltage Control with Phase Skipping on a Three-Phase Microinverter using Minimum DC Link Capacitance | Digital Control of an Interleaved BCM Boost PFC Converter with Fast Transient Response at Low Input Voltage | Continuum Modeling of Inductor Hysteresis and Eddy Current Loss Effects in Resonant Circuits | Switching Transient Analysis for Normally-Off GaN Transistors with p-GaN Gate in a Phase-Leg Circuit | Investigation of Single-Phase Multilevel Inverter based on Series/Parallel-Connected H-Bridges | Comparative Evaluation of Front and Back End PFC IPT Systems for a Contactless Battery Charger | Grid Voltage Harmonic Damping Method for SPC based Power Converters with Multiple Virtual Admittance Control | A Single Phase Doubly Grounded, PV Inverter using Coupled Inductor with Integrated Magnetics and Active Power Decoupling Technique | Modulation and Control Method for Bidirectional Isolated AC/DC Matrix based Converter in Hybrid AC/DC Microgrid | Fault Analysis in an Inverter-Fed Nine-Phase Induction Machine | Self-Commissioning Technique for High Bandwidth Servo Motor Drives | Design of a Novel Interior Permanent Magnet Axial Flux Machine | Impact of Core Material Grades on Performance of Variable Speed Induction Motors Fed by Inverters |
| 11:40AM – 12:05PM | Modeling Resonant Converters in a Rotating Coordinate | Integrated Switched Coupled-Inductor Boost-Flyback Converter | Analysis and Mitigation of AC Coupling Effects on Overhead Line of Modular Multilevel Converter (MMC) based HVDC Transmission System | Differential-Mode and Zero Sequence Circulating Current Reduction for Paralleled Inverters with Modified Zero-CM PWM Algorithm | New Modulated Carrier Control Method for Power Factor Correction Rectifier | Characterization of Magnetoresistors for Contactless Current Sensing in Power Electronic Applications | Optimization of the Balance between the Gate-Drain Capacitance and the Common Source Inductance for Preventing the Oscillatory False Triggering of Fast Switching GaN-FETs | Design and Implementation of a DC-AC Inverter with Zero-Voltage-Switching | Field Attenuation around Inductive-Power-Transfer Coils with Dual-Side-Controlled Converter | Adaptive Control of Grid-Connected Inverters based on Real-Time Measurements of Grid Impedance: DQ-Domain Approach | A ZVT Cell for High-Frequency Quasi-Resonant Converters in ON-OFF Mode for Solar Applications | Fault Ride-Through Capability of Hybrid AC/DC Microgrids during AC and DC Network Faults | Fault Analysis in an Inverter-Fed Nine-Phase Induction Machine | A Geometrical Linearization Approach for Salient-Pole PMSM Optimal Voltage/Current Constrained Control over Whole Speed Range | A Comparative Study of Coreless and Conventional Axial Flux Permanent Magnet Synchronous Machines Designed for Low and High Speed Operation | Electrical Monitoring of Mechanical Defects in Induction Motor Driven V-Belt-Pulley Speed Reduction Couplings |
| 12:05PM – 12:30PM | Closed-Loop Control of Impedance Control Network Resonant DC-DC Converter | Energy Efficient Visible Light Communication Transmitter based on the Split of the Power | A Novel Pilot Protection Scheme for MMC-HVDC Transmission Lines | MPC-SVM Method with Subdivision Strategy for Current Ripples Reduction and Neutral-Point Voltage Balance in Three-Level Inverter | Efficiency Evaluation of Three-Phase SiC Power Factor Correction Rectifier with Different Controllers | Trapezoidal Characterization of Magnetic Materials with a Novel Dual Voltage Test Circuit | Static and Dynamic Characterization of a GaN-on-GaN 600 V, 2 A Vertical Transistor | A Hybrid Two-Four Leg H-Bridge Inverter | Power Factor Correction Focusing on Magnetic Coupling of Parallel-connected Wires for Inductive Power Transfer System | Improve the Robustness of Digitally-Controlled LCL-Filtered Inverters against Grid Impedance Variation with a Lag Compensator | Sliding Mode Control of a Single Phase Transformer-less PV Inverter with Active Power Decoupling | An Effective DC Microgrid Operation Using a Line Impedance Regulator | Comparison of Open-Phase Fault Detection for Permanent Magnet Machine Drives using Different Fault Signals | Algebraic Weighting Factor Selection for Predictive Torque and Flux Control | Comparison of Dual Structure Axial Flux-Switching Permanent Magnet Machines | A Simple Method for Determining Equivalent Circuit Parameters of Double-Cage Induction Motors from No-Load and Locked-Rotor Tests |

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

# Monday, October 2nd (continued)

## Oral Sessions • 2:00PM – 4:05PM

| | 200 | 201 | 203 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S24:** Modeling and Control of Multilevel Converters | **SS1:** Workforce Development and Careers in Power Electronics | **S31:** Wireless Power Transfer I | **S21:** Multi-Phase DC/AC Converters II | **S23:** Power Quality Control | **S29:** Magnetics II | **S30:** SiC Converter Applications | **S22:** Single-Phase DC/AC Converters II | **S20:** Control Aspects of Electified Vehicles | **S18:** Power Converter Topologies for Renewable Energy | **S17:** Power Conversion for Solar Photovoltaic Systems II | **S19:** Renewable Impacts in Industrial Microgrids | **S27:** Medium Voltage Drives and High Power Drives | **S28:** Sensorless Drives I | **S25:** Switched Reluctance Machines | **S26:** Induction Machines II |
| 2:00PM – 2:25PM | A Distributed Control Technique for the Multilevel Cascaded Converter | | Tunable Impedance Matching Network based on Phase-Switched Impedance Modulation | A Three-Phase Grid-Connected Inverter Equipped with a Shunt Instantaneous Reactive Power Compensator | Single-Phase AC-DC-AC Topology for Grid Voltage Compensation | A High-Reliable Magnetic Design Method for Three-Phase Coupled Inductor used in Interleaved Multi-Phase Boost Converters | Impact of Next-Generation 1700V SiC MOSFETs in a 125kW PV Converter | Loss Reduction of 13.56 MHz Inverter based on Frequency Multiplying Method | Control Strategies for a High Frequency DC-DC Converter for Electrified Vehicles | Soft-Switching Isolated Tri-Port Converter for Integration of PV, Storage and Single-Phase AC Grid | Three-Phase DC-DC PWM Boost Converter for Renewable Energy Applications | High-Speed Algorithm for Renewable Energy based Microgrid Fault Detection and Protective Coordination | Assessment of Medium Voltage SiC MOSFET Advantages in Medium Voltage Drive Application | Sensorless Speed Measurement for n-Phase Induction Machines under Open-Phase Fault by Means of Rotor Slot Harmonics | A Fast Control-Integrated and Multiphysics-based Multi-Objective Design Optimization of Switched Reluctance Machines | Induction Machine Efficiency Measurement using a Variable Frequency Drive Source |
| 2:25PM – 2:50PM | A Capacitor Voltage Balancing Method for a Three Phase Modular Multilevel DC-DC Converter | | Design 13.56MHz 10 kW Resonant Inverter using GaN HEMT for Wireless Power Transfer Systems | A New Three-Level Three-Phase Boost PWM Inverter | Single-Phase AC-DC-AC Multilevel Converter for Grid Overvoltage based on an H-Bridge Connected in Series to the Five-Leg Converter | Design and Additive Manufacturing of Multi-Permeability Magnetic Cores | Operation of Planar and Trench SiC MOSFETs in a 10kW DC/DC-Converter Analyzing the Impact of the Body Diode | A Bridge Modular Switched-Capacitor-based Multilevel Inverter | Maximum Efficiency Control Strategy of PM Traction Machine Drives in GM Hybrid and Electric Vehicles | Power-Loss Analysis in 3-Level TNPC Inverters: Modulation Effects | Power Command Compensation Structure to Improve the Dynamic Performance for Single Phase Transformer-Less Photovoltaic Inverters with Dynamic Power Decoupling | Increasing the Robustness of Islanded CERTS Microgrids with PV Microsources and Gensets during Dynamic Overload Conditions | High-Speed Medium Voltage (MV) Drive Applications Enabled by Series Connection of 1.7 kV SiC MOSFET Devices | Analysis on the Position Estimation Error in Position-Sensorless Operation using Pulsating Square Wave Signal Injection | Acoustic Noise Mitigation for High Pole Count Switched Reluctance Machines through Skewing Method with Multiphysics FEA Simulations | Frequency, Load, and Flux Impacts on Induction Machine Copper and Core Losses in the qd0-Frame |
| 2:50PM – 3:15PM | Modeling and Suppression of Circulating Currents for Multi-Paralleled Three-Level T-Type Inverters | | An Optimized Frequency and Phase Shift Control Strategy for Constant Current Charging and Zero Voltage Switching Operation in Series-Series Compensated Wireless Power Transmission | A Sine-Like Hysteresis Current Control Method in Application of Three-Phase Voltage Source Converter | Effects of DC-Link Filter on Harmonic and Interharmonic Generation in Three-phase Adjustable Speed Drive Systems | Influence of Switching Frequency and Saturation of the Magnetic Material on the Volume of Common-Mode Inductors used in Power Converter EMI Filters | High Efficiency Power Converter with SiC Power MOSFETs for Pulsed Power Application | Pulse Energy Modulation for a Single-Phase Bridge Inverter with Power Decoupling Capability | Optimal Performance of a Full Scale Li-Ion Battery and Li-Ion Capacitor Hybrid Energy Storage System for a Plug-In Hybrid Vehicle | Modeling and Design for Integrated Coupled Inductors in Interleaved Three-Level DC/DC Converters | A Novel Model Predictive Control for Single-Phase Grid-Connected Photovoltaic Inverters | A Wind Energy Battery Charging System with Dynamic Current Limitation | Integrated Motor Drive Design for Weight Optimization | Enhanced Methodology for Injection-based Real-Time Parameter Estimation to Improve Back-EMF Self-Sensing in Induction Machine Deadbeat-Direct Torque and Flux Control Drives | Investigation of Torque Ripple in Switched Reluctance Machines with Errors in Current and Position Sensing | Induction Machine Rapid Performance Tests |
| 3:15PM – 3:40PM | GA Optimized SHE PWM Hybrid Cascaded H-Bridge Multilevel Inverter with Capacitor Voltage Balancing | | High-Power-Transfer-Density Capacitive Wireless Power Transfer System for Electric Vehicle Charging | Evaluation of Modulation Techniques to Eliminate Neutral Point Oscillation of the Four Pole NPC Converter | Control System for Shunt Active Power Filters with Adaptive Voltage Saturation | Variable Inductor Modeling Revisited: The Analytical Approach | Influence of SiC Technology in a Railway Traction DC-DC Converter Design Evolution | A High Control Bandwidth Design Method for Aalborg Inverter under the Weak Grid Condition | Hybrid Balancing in a Modular Battery Management System for Electric-Drive Vehicles | Design Considerations of a Full-Bridge Modular Multilevel Converter under Variable DC Link Voltage | Power Pulsation Decoupling for a Two-Stage Single-Phase Photovoltaic Inverter with Film Capacitor | A Fast Fault Protection based on Direction of Bus-Side Capacitor Discharge Current for a High-Surety Power Supply | DC Current Balance with Common-Mode Voltage Reduction for Parallel Current Source Converters | Compensation of Position Estimation Error for Precise Position-Sensorless Control of IPMSM based on High-Frequency Pulsating Voltage Injection | Comparison of Current Waveforms for Noise Reduction in Switched Reluctance Motors | Nonintrusive Efficiency Estimation for Large Power and High Voltage Induction Motors |
| 3:40PM – 4:05PM | Resilient Two Dimensional Redundancy based Fault-Tolerant Controller Array for Modular Multi-Level Converters | | Modeling and Analysis of Wireless Power Transfer System with Constant-Voltage Source and Constant-Current Load | Y-Connected Topologies Composed of Three Three-Leg Converters with Two-Level and Three-Level Legs | Research on Improved Hybrid Power Quality Conditioner for VV Co-Phase Railway Power Supply System | Winding and Air Gap Configurations for Power Inductors to Reduce Near Magnetic Field Emission | Design of a 250 kW, 1200 V SiC MOSFET-based Three-Phase Inverter by Considering a Subsystem Level Design Optimization Approach | A Comprehensive Analysis of DC-Link Current for Single Phase H-Bridge Inverter Under Harmonic Output Currents | Development of Compact Power Control Unit for HEVs | Geometry Optimization and Characterization of Three-Phase Medium Frequency Transformer for 10kVA Isolated DC-DC Converter | Differential Power Processing of Photovoltaic Systems for High Energy Capture and Reduced Cost | A First Approach for the Energy Management System in DC Micro-Grids with Integrated RES of Smart Ships | Position Sensorless Control of a Permanent Magnet Linear Motor Connected through a Long Cable | Full Torque-Range Low-Speed Sensorless Drive for Heavily Saturated IPMSMs by Manipulation of Convergence Point | Simultaneous Optimization of Geometry and Firing Angles of In-Wheel Switched Reluctance Motor | Separation of Slip- and High-Frequency Flux Densities and its Application in Rotor Iron Loss Fine Analysis of Induction Motors |
| 4:15PM – 7:30PM | **Expo Hall Reception** ..... *Exhibit Hall B* | | | | | | | | | | | | | | | |

## Poster Session 1 • 5:00PM – 7:30PM

### Exhibit Hall B

| **SS32:** Energy Storage Systems | **SS33:** AC/AC Converters | **SS34:** Reliability, Diagnostics and Fault Analysis of Power Electronics | **SS35:** AC Electrical Machines: Innovative Design Studies | **SS36:** Axial and Transversal Flux Machines | **SS37:** Utility Converters and Power Electronics Transformers | **SS38:** Motor Drives I | **SS39:** Switching Devices I | **SS40:** Electric Vehicle Energy Management | **SS41:** Sensing and Control for Power Converters | **SS42:** Modelling and Control of MMC | **SS43:** Control in Microgrids |
|---|---|---|---|---|---|---|---|---|---|---|---|

# Detailed Schedule (continued)

## Tuesday, October 3rd

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7:30AM – 5:30PM | **Registration** ..... *2nd Floor "V"* | | | | | | | | | | | | | | | |
| | **Oral Sessions • 8:30AM – 10:10AM** | | | | | | | | | | | | | | | |
| | **200** | **201** | **203** | **204** | **205** | **206** | **207/208** | **230/31** | **232** | **233** | **236** | **237/38** | **260/61** | **262** | **263** | **264** |
| | **S52:** Modeling and Control of Modular Multilevel Converter | **S49:** DC/DC Converters II | **S45:** Power Converters for HVDC Grids | **S48:** Multi-Phase AC/DC Converters | **S51:** Sensorless Methods and State and Parameter Estimation | **S58:** Wide Band Gap Device Reliability | **S57:** GaN Device and Gate Drive | **S50:** Single-Phase Grid Connect-ed Converters | **SS2:** Industry Activities in Korea, Organized in Collaboration with KIPE | **S44:** Harmonic Compensation Techniques for Microgrids | **S47:** Power Conversion for Solar Photovoltaic Systems III | **S46:** Solid State Transformers | **S55:** Sensorless Drives II | **S56:** PM and IPM Motor Drives I | **S53:** Large Synchronous Machines | **S54:** Synchronous Reluctance Machines I |
| 8:30AM – 8:55AM | Optimal Submodule Capacitor Sizing for Modular Multilevel Converters with Common Mode Voltage Injection and Circulating Current Control | A High Gain Non-Isolated Soft-Switching Bidirectional DC-DC Converter with PPS Control | Asymmetric Mixed Modular Multilevel Converter Topology in Bipolar HVDC Transmission Systems | Soft-Switching Parameter Design for an Isolated Three-Phase AC/DC Converter | Online Equivalent Series Resistance Estimation Method for Condition Monitoring of DC-Link Capacitors | Ron Increase in GaN HEMTs – Temperature or Trapping Effects | Active Gate Current Control for Non-Insulating-Gate WBG Device | Trapezium Current Mode (TPCM) Boundary Operation for Single Phase Grid-Tied Inverter | | A Unified Selective Harmonic Compensation Strategy using DG-Interfacing Inverter in both Grid-Connected and Islanded Microgrid | A Distributed Active and Reactive Power Control Strategy for Balancing Grid-tied Cascaded H-Bridge PV Inverter System | A Switched-Winding Transformer with Low Quiescent Loss to Meet the Level VI Efficiency Standard at High Power Density | Extending Low Speed Self-Sensing via Flux Tracking with Volt-Second Sensing | Self-Adaptation of MTPA Tracking Controller for IPMSM and SynRM Drives based on On-Line Estimation of Loop Gain | Design of Field-Oriented-Control-based Brushless, Self-Excited Synchronous Field-Winding Machine with Combined Finite Element/ Rectifier Model | The Loss of Self-Excitation Capability in Stand-Alone Synchronous Reluctance Generators |
| 8:55AM – 9:20AM | A New Insertion Index Selection Method to Control Modular Multilevel Converters | An Investigation on Zero-Voltage-Switching Condition in Synchronous-Conduction-Mode Buck Converter | Dynamic Performance and Fault-Tolerant Capability of a TLC-MMC Hybrid DC-DC Converter for Interconnection of MVDC and HVDC Grids | Dynamic and Control Analysis of Modular Multi-Parallel Rectifiers (MMR) | A Novel Current Estimation Technique for Digital Controlled Switching Converters Operating in CCM and DCM | Short-Circuit Ruggedness Assessment of a 1.2 kV/180 A SiC MOSFET Power Module | Crosstalk Suppression in a 650-V GaN FET Bridge-Leg Converter using 6.7-GHz Active Gate Driver | Leakage Current Suppression and Ripple Power Reduction for Transformer-less Single-Phase Photovoltaic Inverters | | Active Suppression of Photovoltaic System Related Harmonics in a DC Micro Grid | Advanced Photovoltaic Inverter Control Development and Validation in a Controller-Hardware-in-the-Loop Test Bed | A Winding Method of High Frequency High Voltage Transformer | Pseudo-Sensorless Control of PMSM with Linear Hall-Effect Sensor | Control Method of PMSM Driving System with Small DC-Link Capacitor | Analysis of Magnetic Forces and Vibration in a Converter-Fed Synchronous Hydrogenerator | Reluctance Synchronous Wind Generator Design Optimisation in the Megawatt, Medium Speed Range |
| 9:20AM –9:45AM | A Modified Circulating Current Suppressing Strategy for Nearest Level Control based Modular Multilevel Converter | Single-Wing Resonant Multilevel Converter Featuring Reduced Number of Resonant Inductors | Efficient Modeling of Hybrid MMCs for HVDC Systems | A Reconfigurable Three- and Single-Phase AC/DC Non-Isolated Bi-Directional Converter for Multiple Worldwide Voltages | Distributed Balancing Control for Modular Multilevel Series/ Parallel Converter with Capability of Sensorless Operation | Prognosis of Enhance Mode Gallium Nitride High Electron Mobility Transistors using On-State Resistance as a Fault Precursor | A 1-MHz Leakage-Compensating Bootstrap Driver for Normally-On Depletion-Mode GaN FET | ZVRT Capability of Minimized-LCL-Filter-based Single-Phase Grid-Tied Inverter with High-Speed Gate-Block | | A Novel Harmonic Current Sharing Control Strategy for Parallel-Connected Inverters | DC Link Side Current Control of Inverters based on Integer Programming | Comparison of Voltage Control Methods of CHB Converters for Power Routing in Smart Transformer | Current Derivative Estimation by Using AMR Current Sensor and its Application in Sensorless Control of an IPMSM Drive | Enabling Driving Cycle Loss Reduction in Variable Flux PMSMs via Closed-Loop Magnetization State Control | Performance Improvement of Simplified Synchronous Generators using an Active Power Filter | Choice of Flux-Barriers Position in Synchronous Reluctance Machines |
| 9:45AM – 10:10AM | Independent Positive- and Negative-Sequence Control for MMC-SAPF with Unbalanced PCC Voltage | Dual Active Bridge with Triple Phase Shift by obtaining Soft Switching in all Operation Range | A New Hybrid Modular Multilevel Converter with Increased Output Voltage Levels | High-Frequency Link AC/ DC Converter using Matrix Converter with Soft-Switching Technique | A Novel Approach to the Grid Inductance Estimation based on Second Order Generalized Integrators | E-Mode GaN HEMT Short Circuit Robustness and Degradation | Applications and Characterization of Four Quadrant GaN Switch | DC to Single-phase AC Grid-Tied Inverter using Buck Type Active Power Decoupling without Additional Magnetic Component | | Harmonic Current Control for LCL-Filtered VSCs Connected to Ultra-Weak Grids | GaN-based High Gain Soft Switching Coupled-Inductor Boost Converter | Generalized Average Modeling of DC Subsystem in Solid State Transformers | Sensorless Commissioning of Synchronous Reluctance Machines Augmented with High Frequency Voltage Injection | Analysis and Design of IPMSM Drive System based on Visualization Technique in Discrete Time Domain | Reducing MMF Harmonics and Core Loss Effect of Non-Overlap Winding Wound Rotor Synchronous Machine (WRSM) | Investigation of Torque Production and Torque Ripple Reduction Method for 6-Stator/7-Rotor-Pole Variable Flux Reluctance Machines |
| 10:10AM – 10:30AM | **AM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove* | | | | | | | | | | | | | | | |
| | **Poster Session 2 • 10:30AM – 1:00PM** | | | | | | | | | | | | | | | |
| | **Exhibit Hall B** | | | | | | | | | | | | | | | |
| | **S59:** Datacenters and Telecommunication Applications | **S60:** Applications of Electric Traction and Propulsion | **S61:** Multilevel Converters | **S62:** DC/AC Converters | **S63:** DC/DC Converters | **S64:** PV Applications | **S65:** EMI in Power Converters | **S66:** Advances in Special Electrical Machines | **S67:** Induction and Permanent Magnet AC Machines | **S68:** Motor Drives II | **S69:** Switching Devices II | **S70:** Wireless Power Transfer | **S71:** DC and Hydrid AC/DC Systems | | | |
| 10:30AM– 5:30PM | **Exhibit Hall Open** ..... *Exhibit Hall B* | | | | | | | | | | | | | | | |
| 12:15PM – 2:30PM | **Exhibit Lunch** ..... *Exhibit Hall B* | | | | | | | | | | | | | | | |
| | **Poster Session 3 • 2:30PM – 5:00PM** | | | | | | | | | | | | | | | |
| | **Exhibit Hall B** | | | | | | | | | | | | | | | |
| | **S72:** Applications of MMC | **S73:** Batteries and Wireless EV Charging | **S74:** AC/DC Converters | **S75:** Modeling and Control of Multilevel Con-verters | **S76:** Modeling and Control of Grid Connected Converters | **S77:** Power Quality | **S78:** Stability of Converter Systems | **S79:** Other Topics in Control, Modeling and Optimization of Power Converters | **S80:** Analysis Techniques in Electrical Machines | **S81:** AC Electrical Machines: Performance Estimation | **S82:** Component Technologies | **S83:** Renewable Energy and Grid Integration | | | | |

# Wednesday, October 4th

7:30AM – 6:00PM **Registration** ..... *2nd Floor "V"*

8:00AM – 9:00AM **Women in PELS (WIPELS) Breakfast** ..... *Room: 211*

## Oral Sessions • 8:30AM – 10:10AM

| | 200 | 201 | 203 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S91:** Design Optimization of Power Converters | **S88:** DC/DC Converter Topologies | **S97:** LED Drivers | **S87:** Control and Modulation of Multi-Phase AC/DC Converters | **S90:** Reliability, Diagnostic, and Faults Analysis in Power Converters I | **SS7:** Power Electronic Meets Power Utilities & Systems | **S96:** Packaging I | **S89:** AC-AC Converters I | **SS3:** Electrical Power for Aviation Applications | **S85:** Droop Control in Microgrids | **S84:** Wind Energy Systems | **S86:** Grid Connected Converter Stability | **S94:** Energy Efficient Motor Drives | **S95:** Induction Motor Drives | **S92:** Thermal and Faults of Electric Machines | **S93:** PM Machines and Windings |
| 8:30AM – 8:55AM | Efficiency Optimization of DC-DC Solid State Transformer based on Modular Multilevel Converters | High Efficiency LC Resonant Boost Topology: Analysis and Design | Application of Artificial Neural-Network to Control the Light of Multi-Color LED System | Direct Power Control of PWM Rectifier with Elimination of DC Voltage Oscillations and Current Harmonics under Unbalanced Network | An Active Capacitor with Self-Power and Internal Feedback Control Signals | | Bonding of Large Substrates by Silver Sintering and Characterization of the Interface Thermal Resistance | A Ride-Through Method using Input-Filter Capacitors for Three-Level Indirect Matrix Converter based Open-End Winding Drive | | Breaking the Boundary: A Droop and Master-Slave Hybrid Control Strategy for Parallel Inverters in Islanded Microgrids | Field Excitation Scheme using a Machine-Side 4-Leg Converter in MW-Range WRSG Wind Turbine Systems | Stabilization of Grid-Connected Inverter System with Feed-Forward Control | Open-Ended Induction Motor Drive with a Floating Capacitor Bridge at Variable DC Link Voltage | A Three-Dimensional Predictive Current Trajectory Control Method for Open-End Winding Induction Motor | An Enhanced Active DC-Flux Injection based Approach for Thermal Monitoring of Induction Machines with Direct Torque Control Schemes | Preliminary Study on Differences in the Performance Characteristics of Concentrated and Distributed Winding IPM Machines with Different Rotor Topologies |
| 8:55AM – 9:20AM | Mission-Profile based Multi-Objective Optimization of Power Electronics Converter for Wind Turbines | A Zero-Voltage Switching, Physically Flexible Multilevel GaN DC-DC Converter | GaN-based High-Power-Density Electrolytic-Free Universal Input LED Driver | Improved SVPWM Schemes for Vienna Rectifiers without Current Distortion | Impacts of Rotor Current Control Targets on DC-Link Capacitor Lifetime in DFIG-based Wind Turbine during Grid Voltage Unbalance | | A High Power-Density and High Efficiency Insulated Metal Substrate based GaN HEMT Power Module | A Family of Highly Reliable and Efficient Inductive-Link Universal Power Converters | | Hybrid Impedance-based Modelling and Stability Analysis of IMG-PICDPS | Modeling and Control of Interconnected Wind Turbine Drivetrains | Impedance-based Stability Criterion for Multiple Offshore Inverters Connected in Parallel with Long Cables | Dynamic Loss Minimization Control of Linear Induction Machine | Comparison of Steady-State Induction Motor-Drive Efficiency Control Schemes | Comparison of Thermal Stresses Developed during Transients on a Damaged Rotor Cage | Shaft-to-Frame Voltage Mitigation Method by Changing Winding-to-Rotor Parasitic Capacitance of IPMSM |
| 9:20AM – 9:45AM | Reducing Reverse Conduction and Switching Losses in GaN HEMT-based High-Speed Permanent Magnet Brushless DC Motor Drives | A Switched-Capacitor based High Conversion Ratio Converter for Renewable Energy Applications: Principle and Generation | Forward-Flyback Converter for LED Driving with Reduced Number of Components | Improved Eight-Segment PWM Scheme with Non-Equally Distributed Zero-Vector Intervals for a Three-Phase Isolated Buck Matrix-Type Rectifier | Aging Assessment of Discrete SiC MOSFETs under High Temperature Cycling Tests | | A High Power Density Multichip Phase-Leg IGBT Module with Void-Free Die Attachment using Nanosilver Paste | Matrix Converter Open Circuit Fault Diagnosis with Asymmetric One Zero SVM | | A Hybrid Adaptive Droop Control Technique with Embedded DC-Bus Voltage Regulation for Single-Phase Microgrids | Medium Voltage Power Conversion Architecture for High Power PMSG based Wind Energy Conversion System (WECS) | DAH-FF Approach to Improve the Current Quality and Stability of the LCL Type Grid-Connected Inverter | Dynamic Loss Minimizing Control of a PM Servomotor Operating Even at the Voltage Limit when using DB-DTFC | Model Predictive Direct Flux Vector Control of Multi Three-Phase Induction Motor Drives | A High-Frequency Torque Injection-Based Rotor Thermal Monitoring Scheme for Direct-Torque-Controlled Interior Permanent Magnet Synchronous Machines | Current Control Strategy for Dynamic Winding Reconfiguration of a Brushless DC Motor |
| 9:45AM – 10:10AM | Design by Optimization Methodology: Application to a Wide Input and Output Voltage Ranges Interleaved Buck Converter | Design of Very-High-Frequency Synchronous Resonant DC-DC Converter for Variable Load Operation | High Frequency DC-DC AC-LED Driver based on ZCS-QRCs | A Modified SVPWM Strategy Applied to a Three-Phase Three-Port Bidirectional AC-DC Rectifier for Efficiency Enhancement | Live Condition Monitoring of Switching Devices using SSTDR Embedded PWM Sequence: A Platform for Intelligent Gate-Driver Architecture | | Paralleling 650 V/ 60 A GaN HEMTs for High Power High Efficiency Applications | A Versatile Inductive-Link Three-Phase Converter Topology | | Enforcing Coherency in Droop-Controlled Inverter Networks through use of Advanced Voltage Regulation and Virtual Impedance | A Universal Multiple-Vector-based Model Predictive Direct Power Control for Doubly Fed Induction Generators | Power Factor Correction Capacitors for Multiple Parallel Three-Phase ASD Systems: Analysis and Resonance Damping | Comparison of Postfault Control Strategies in Terms of Converter Losses for Dual Three-Phase Machines | Open-End Six-Phase Machine Drive System with Six Three-Leg Converters | Evaluation of the Detectability of Rotor Faults and Eccentricities in Induction Motors via Transient Analysis of the Stray Flux | Design and Analysis of a Low Cost and High Power Density PM-Assisted Synchronous Reluctance Machine for Automotive Electric Power Management |

10:10AM – 10:30AM **AM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove*

# Detailed Schedule (continued)

## Wednesday, October 4th (continued)

### Oral Sessions • 10:30AM – 12:10PM

| | 200 | 201 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S110:** Wireless Power Transfer II | **S104:** Modulation Techniques I | **S101:** LLC Converters | **S103:** Reliability, Diagnostic, and Faults Analysis in Power Converters II | **SS8:** Power Electronic Meets Power Utilities & Systems | **S109:** Packaging II | **S102:** AC-AC Converters II | **SS4:** IOT and Twin for Aviation | **S99:** Power Sharing Techniques in Microgrids | **S98:** Wind Energy Applications | **S100:** DC Circuit Breaker Design | **S105:** Modeling and Control of Grid Connected Converters I | **S108:** PM and IPM Motor Drives II | **S106:** Synchronous Reluctance Machines II | **S107:** Variable Flux PM Machines |
| 10:30AM – 10:55AM | Achieving Low Magnetic Flux Density and Low Electric Field Intensity for an Inductive Wireless Power Transfer System | Impact of Carrier Phase Shift PWM on the DC Link Current of Single and Interleaved Three-Phase Voltage Source Converters | Efficiency Improvement of Three-Phase LLC Resonant Converter using Phase Shedding | Thermal Stress Mitigation by Active Thermal Control: Architectures, Models and Specific Hardware | | A Novel Low Inductive 3D SiC Power Module based on Hybrid Packaging and Integration Method | Improvement of the Input-Output Quality of Three-Level NPC Inverters with Small DC-Link | | A Proportional Harmonic Power Sharing Scheme for Hierarchical Controlled Microgrids Considering Unequal Feeder Impedances and Nonlinear Loads | Wind Turbine Bearing Fault Diagnosis based on Sparse Representation of Condition Monitoring Signals | Fault Discrimination using SiC JFET based Self-Powered Solid State Circuit Breakers in a Residential DC Community Microgrid | Improved Resonant Current Controller for Grid-Tied Converters | Permanent Magnet Synchronous Machine Drive Control using Analog Hall-Effect Sensors | Synchronous Reluctance Motor with Concentrated Windings for IE4 Efficiency | Magnet Design Consideration of a Variable-Flux PM Machine |
| 10:55PM – 11:20AM | FOM-rd Plane: An Effective Design and Analysis Methodology for Resonant Energy Link in Inductive Power Transfer | A DPWM-Controlled Three-Level T-Type Inverter for Photovoltaic Generation Considering Unbalanced Neutral-Point Voltage | LLC Synchronous Rectification using Homopolarity Cycle Modulation | Impacts of PV Array Sizing on PV Inverter Lifetime and Reliability | | Design of a Novel, High-Density, High-Speed 10 kV SiC MOSFET Module | Transformer-based Single-Phase AC-DC-AC Topology for Grid Issues Mitigation | | Adaptive Synchronous Reference Frame Virtual Impedance Controller for Accurate Power Sharing in Islanded AC-Microgrids: A Faster Alternative to the Conventional Droop Control | Performance Evaluation of Slip Couplers with Spoke- and Surface-Mounted PM for Wind Energy Applications | Optimization of Operation Temperature of Gate Commutated Thyristors for Hybrid DC Breaker | Filter Capacitor Current Estimation and Grid Current Control in LCL based Grid Connected Inverter | A New Zero-Sequence Current Suppression Control Strategy for Five-Phase Open-Winding FTFSCW-IPM Motor Driving System | Carbon-Fiber Wrapped Synchronous Reluctance Traction Motor | Comparative Study of Variable Flux Memory Machines with Parallel and Series Hybrid Magnets |
| 11:20AM – 11:45AM | Output Voltage Control for Series-Series Compensated Wireless Power Transfer System without Direct Feedback from Measurement or Communication | Over-Modulation Associated to Flash Memory based Multi-Optimal PWM for Three-Phase Inverters | A Lagrangian Dynamics Model of Integrated Transformer Incorporated in a Multi-phase LLC Resonant Converter | Reliability Metrics Extraction for Power Electronics Converter Stressed by Thermal Cycles | | Flexible Epoxy-Resin Substrate based 1.2 kV SiC Half Bridge Module with Ultra-Low Parasitics and High Functionality | Control of Solid-State-Transformer for Minimized Energy Storage Capacitors | | Decentralized Economical-Sharing Scheme for Cascaded AC Microgrids | Small Signal Modeling of Wind Farms | A Topology of the Multi-Port DC Circuit Breaker for Multi-Terminal DC System Fault Protection | A Dual Loop Current Control Structure with Improved Disturbance Rejection for Grid Connected Converters in the Synchronous Rotating Reference Frame | An Effective Voltage Control Loop for a Deep Flux-Weakening in IPM Synchronous Motor Drives | A Novel Fabrication and Assembly Method for Synchronous Reluctance Machines | Design of Variable Magnetization Pattern Machines for Dynamic Changes in the Back-EMF Waveform |
| 11:45AM – 12:10PM | Magnetizable Concrete Composite Materials for Road-Embedded Wireless Power Transfer Pads | Stability Performance of Multi-connected Inverters with Global Synchronous Pulse Width Modulation | DC/DC Fixed Frequency Resonant LLC Full-Bridge Converter with Series-Parallel Transformers for 10kW High Efficiency Aircraft Application | Study of PWM Frequency and its Impact to Adjustable Speed Drive Reliability | | New Industrial Module Package with Matched CTE Materials | Analysis and Design of LC Filters for the 5-Level 3-Phase Back to Back E-Type Converter | | Using Consensus Control for Reactive Power Sharing of Distributed Electric Springs | Battery-Free Power Management Circuit for Impact-Type Micro Wind Piezoelectric Energy Harvester | Optimization of a Z-Source, Ultra-Fast Mechanically Switched, High Efficiency DC Circuit Breaker | Multi-Frequency Current Controller for Grid-Tied Converters | Real-Time Disturbance Compensation Algorithm for the Current Control of PMSM Drives | High Speed Motors: A Comparison between Synchronous PM and Reluctance Machines | Performance Assessment of Ferrite- and Neodymium-Assisted Synchronous Reluctance Machines |
| 12:10PM – 2:00PM | **Lunch on Your Own** | | | | | | | | | | | | | | |

# Wednesday, October 4th (continued)

## Oral Sessions • 2:00PM – 3:40PM

| | 200 | 201 | 204 | 205 | 206 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S123:** Wireless Power Transfer III | **S117:** Modulation Techniques II | **S114:** Resonant DC/DC Converters | **S116:** Reliability, Diagnostic, and Faults Analysis for Power Devices | **SS9:** Power Electronics and Control for Low-Inertia Electrical Systems | **S122:** High Voltage Devices | **S115:** Modular Multilevel Converters (MMC) | **SS5:** Advanced Aircraft Electrification beyond MEAs | **S112:** Droop Techniques for Microgrid Operation | **S111:** PV Plants and PV Farms | **S113:** Control in DC Microgrids | **S118:** Modeling and Control of Grid Connected Converters II | **S121:** Drive Applications | **S119:** Linear Machines | **S120:** PM Motor Design, Control and Testing |
| 2:00PM – 2:25PM | The Effect of Matrix Power Repeaters on Magnetic Field Distribution of IPT Systems | New Constraint in SHE-PWM for Single Phase Inverter Applications | An Improved Voltage Balancing Technique for a Soft-Switched High-Gain Converter with Low Voltage Stress using Duty Ratio Control for Wind Energy Application | Fault Detection Method for IGBT Open-Circuit Faults in the Modular Multilevel Converter based on Predictive Model | | Development of PSpice Modeling Platform for 10kV/100 A SiC MOSFET Power Module | A Fault-Tolerant Operation Scheme for a Modular Multilevel Converter with a Distributed Control Architecture | | Comparison between Inverters based on Virtual Synchronous Generator and Droop Control | AC Impedance Derivation of Utility Scale PV Farm | Admittance-type RC-mode Droop Control to introduce Virtual Inertia in DC Microgrids | Improved Control Strategy of Grid Connected Inverter without Phase Locked Loop on PCC Voltage Disturbance | Over-Voltage Mitigation on SiC based Motor Drives through an Open End Winding Configuration | Comparative Study of Coreless-Type PM Linear Synchronous Machines with Non-Overlapping Windings | Inductance Testing According to the New IEEE Std 1812 – Application and Possible Extensions for IPM Machines |
| 2:25PM – 2:50PM | Soft-Switching Self-Tuning H-Bridge Converter for Inductive Power Transfer Systems | Novel Modulation Schemes and Switching Pattern for Z-Source Ultra-Sparse Matrix Converter | A Power Converter for an Electrostatic Precipitator using SiC MOSFETs | Asymmetric Power Device Rating Selection for Even Temperature Distribution in NPC Inverter | | Continuous Switching Operation of 15 kV FREEDM Super-Cascode | Redistributed Pulse Width Modulation of MMC Battery Energy Storage System under Submodule Fault Condition | | Hybrid Isochronous-Droop Control for Power Management in AC Microgrids | A New Approach for Increasing Energy Harvest in Large Scale PV Plants Employing a Novel Voltage Balancing Topology | Power-based Droop Control Suppressing the Effect of Bus Voltage Harmonics for DC Microgrids | Automated and Scalable Optimal Control of Three-Phase Embedded Power Grids including PLL | A Fault Monitoring System for a Reciprocating Pump Driven by a Linear Motor for Oil Pumping Systems | Comparative Study of Novel Tubular Flux-Reversal Transverse Flux Permanent Magnet Linear Machine | Parametric Design Method for SPM Machines Including Rounded PM Shape |
| 2:50PM – 3:15PM | Load-Independent Transconductance and ZPA Input for Symmetrical Resonant Converter in IPT System | A New Adaptive Switching Frequency Modulation for Optimizing Low Power Cascaded Buck-Boost Converter | A Hybrid Resonant Three-Level Converter for Renewable Energy in MVDC Collection Systems | Impact of Lifetime Model Selections on the Reliability Prediction of IGBT Modules in Modular Multilevel Converters | | Experimental Optical Transistor for All-Optical SiC ETO Thyristor | Compensation Method of Arm Current Sensor Scaling Error in MMC System | | Improved Droop Control Strategy based on Improved PSO Algorithm | On-Line Health Monitoring of PV Plants | Containment-based Distributed Coordination Control to Achieve Both Bounded Voltage and Precise Current Sharing in Reverse-Droop-based DC Microgrid | Optimal Variable Switching Frequency Scheme for Grid Connected Full Bridge Inverters with Bipolar Modulation Scheme | The Impact of Grid Unbalances on the Reliability of DC-Link Capacitors in a Motor Drive | Electrical Losses Minimization of Linear Induction Motors Considering the Dynamic End-Effects | Investigation of Different Servo Motor Designs for Servo Cycle Operations and Loss Minimizing Control Performance |
| 3:15PM – 3:40PM | Design of Wireless Power Transfer System for Devices Carried by a Freely Moving Animal in Cage | An Improved Modulation Strategy for the Three-Phase Z-Source Inverters (ZSIs) | Time Domain Analysis of LLC Resonant Converters in the Boost Mode for Battery Charger Applications | Open-circuit Fault Diagnosis of Switching Devices in a Modular Multilevel Converter with Distributed Control | | Modeling and Power Loss Evaluation of Ultra Wide Band Gap Ga2O3 Device for High Power Applications | A Novel Sub-module Topology for MMC against DC Side Short-Circuit Faults | | A Modified Q–V Droop Control for Accurate Reactive Power Sharing in Distributed Generation Microgrid | Hybrid Solar Plant with Synchronous Power Controllers Contribution to Power System Stability | A High-Efficiency Interleaved Single-Phase AC-DC Converter with Common-Mode Voltage Regulation for 380 V DC Microgrids | Grid-Connected Power Converters with Distributed Virtual Power System Inertia | Achieving Zero Common Mode Voltage Generation in a Balanced Inverter with Neutral-Point Diode-Clamping | Design and Performance Investigation of Doubly Salient Slot Permanent Magnet Linear Machines | Synchronous SVPWM for Field-Oriented Control of PMSM using Phase-Lock Loop |
| 3:40PM – 4:00PM | **PM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove* | | | | | | | | | | | | | | |

## Wednesday, October 4th (continued)

### Oral Sessions • 4:00PM – 5:40PM

| | 200 | 201 | 204 | 205 | 206 | 207/08 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S136:** Emerging Applications | **S132:** Model Predictive Control of Power Converters I | **S128:** DAB DC/DC Converters | **S131:** Modeling and Control of AC-DC Converters | **SS10:** Magnetic Materials Standards in the Research Environment | **S126:** Datacenters and Telecom-munication Applications | **S129:** MMC Modulation and Control | **SS6:** Wide Band Gap Devices for the Aviation Applications | **S127:** Power Electronics in Electified Vehicles | **S124:** Solar Photovoltaic Technologies | **S125:** Control and Design Techniques for Microgrids I | **S130:** Control of Grid Connected Converter | **S135:** Control of Electric Drives II | **S133:** Thermal Model of Electric Machines | **S134:** PM Machines, Demagne-tization, Eccentricity and Losses |
| 4:00PM – 4:25PM | Design of a Linear Permanent Magnet Synchronous Motor for Needle-Free Jet Injection | Modulated Model Predictive Control for Active Split DC-bus 4-leg Power Supply | Wide Range ZVS Operation of Three-Phase Dual Active Bridge Converters using Reduced Coupling Factor Transformers | A Robust Deadbeat Predictive Power Control with Sliding Mode Disturbance Observer for PWM Rectifiers | | A High Efficiency Resonant Switched-Capacitor Converter for Data Center | Lagrange-based Optimization of Cell Voltage and Arm Current with Zero-Sequence Current Injection in Modular Multilevel Converter | | Range Extension of Electric Vehicles by Two Battery HEECS Chopper based Power Train | Subcell Modelling of Partially Shaded Solar Photovoltaic Panels | A Stabilization Method of LC Input Filter in DC Microgrids Feeding Constant Power Loads | An Envelope-based Detection Method for Resonance Damping in Grid-Connected Converters | Robust Control for High Performance Induction Motor Drives based on Partial State-Feedback Linearization | Improved Thermal Model for Predicting End-Windings Heat Transfer | On-Line Detection of Rotor Eccentricity for PMSMs based on Hall-Effect Field Sensor Measurements |
| 4:25PM – 4:25PM | An Energy Harvesting Scheme for Dielectric Elastomer Generators | On the Inherent Relationship between Finite Control Set Model Predictive Control and SVM-based Deadbeat Control for Power Converters | Modelling and Analysis of the Transformer Current Resonance in Dual Active Bridge Converters | A Control Strategy to Compensate for Current and Voltage Measurement Errors in Three-Phase PWM Rectifiers | | A Series-Stacked Architecture with 4-to-1 GaN-based Isolated Converters for High-Efficiency Data Center Power Delivery | Discontinuous PWM Scheme for a Modular Multilevel Converter with Advanced Switching Losses Reduction Ability | | A Delta-Structured Switched-Capacitor Equalizer for Series-Connected Battery Strings | Effect of Water on Parasitic Capacitance of Photovoltaic Panel | Model-Predictive-Control-based Distributed Control Scheme for Bus Voltage Unbalance and Harmonics Compensation in Microgrids | Manitoba Inverter – Single Phase Single-Stage Buck-Boost VSI Topology | The Vector Space Decomposition based Control for Multiple-Channel Indirect Matrix Converter Fed Dual Three-Phase PMSM Drives | Reducing the Complexity of Thermal Models for Electric Machines via Sensitivity Analyses | Detection of Demagnetization in Permanent Magnet Synchronous Machines using Hall-Effect Sensors |
| 4:25PM – 4:50PM | A Bipolar Self-Start up Boost Converter for Thermoelectric Energy Harvesting | Predictive Current Control for Stabilizing Power Electronics based AC Power Systems | A Novel ISOP Current-Fed Modular Dual-Active-Bridge (CF-MDAB) DC-DC Converter with DC Fault Ride-Through Capability for MVDC Application | Carrier based PWM for Reduced Capacitor Voltage Ripple in Three-Phase Three-Switch Buck-Type Rectifier System | | Improved Model Predictive Control for High Voltage Quality in Microgrid Applications | Dynamic Matrix Predictive Control on DC-AC Modular Multilevel Converter: Design, Control and Real-Time Simulation | | An Automatic EMI Filter Design Methodology for Electric Vehicle Application | An Application of Support Vector Machine to PV Power Forecasting under Different Weather Conditions | Smart Inverter Volt-Watt Control Design in High PV Penetrated Distribution Systems | Direct Decoupled Active and Reactive Predictive Power Control of Grid-Tied Quasi-Z-Source Inverter for Photovoltaic Applications | Predictive Current Control for Induction Motor using Online Optimization Algorithm with Constrains | Importance of Thermal Modeling for Design Optimization Scenarios of Induction Motors | Demagnetization Study of an Interior Permanent Magnet Synchronous Machine Considering Transient Peak 3 Phase Short-Circuit Current |
| 4:50PM – 5:15PM | Comparative Analysis and Evaluation of High Voltage Power Generation Architectures | Computationally Efficient Long-Horizon Direct Model Predictive Control for Transient Operation | Design Considerations for a High-Power Dual Active Bridge DC-DC Converter with Galvanically Isolated Transformer | Direct Power Control of PWM Rectifier under Unbalanced Network using Extended Power Theory | | Virtual Resistance-based Control Strategy for DC link Regeneration Protection and Current Sharing in Uninterruptible Power Supply | Capacitor Voltage Ripples Characterization and Reduction of Hybrid Modular Multilevel Converter with Circulating Current Injection | | 1.8MHz Isolated DC-DC Converter with Multi-Transformer Structure for Automotive Applications | High Performance Buck-Boost Converter based PV Characterisation Set-Up | Virtual Resistance Technique for Power Limit Management of Microgrid DG Inverters | Optimal Phase Shifted Method to Reduce Current Ripples for a Parallel Grid-Connected Voltage Source Inverter under Unequal DC-Link Voltage | Implementing Observer-based Design Methodology for Deadbeat-Direct Torque and Flux Control with Back-EMF Self-Sensing using Rapid Control Prototyping | Reduced Lumped Parameter Thermal Model for External Rotor Permanent Magnet Motor Design | Reduction of Inverter Carrier Harmonic Losses in Interior Permanent Magnet Synchronous Motors by Optimizing Rotor and Stator Shapes |
| 7:00PM – 9:30PM | **Industry Night Out** . . . . . *Grand Ballroom AB* | | | | | | | | | | | | | | |

# Thursday, October 5th

7:30AM – 12:00PM **Registration** ..... *2nd Floor "V"*

## Oral Sessions • 8:30AM – 10:10AM

| | 200 | 201 | 204 | 205 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S150:** New Device, Circuit and Control Strategies | **S144:** Model Predictive Control of Power Converters II | **S141:** Multilevel Converters Applications | **S143:** Modeling and Control of DC-DC Converters I | **S149:** SiC Switching I | **S142:** MMC New Topologies | **S140:** Wireless Charging for EV | **S138:** Power Quality of Grid Connected Converters I | **S137:** Other Topics in Renewable Energy Applications | **S139:** Control and Design Techniques for Microgrids II | **S145:** Stability in Power Converters | **S148:** Electric Drives for Wind and Other Renewable Integration | **S146:** High Torque Machines | **S147:** Small PM Motors |
| 8:30AM – 8:55AM | Comparison of 1.7kV, 450A SiC-MOSFET and Si-IGBT based Modular Three Phase Power Block | Long Horizon Linear MPC of Grid-Connected VSIs: Regulation Problems and a Plug-In Solution | Low-Voltage-Ride-Through Control of a Modular Multilevel SDBC Inverter for Utility-Scale Photovoltaic Systems | Seamless Transition of the Operating Zones for the Extended-Duty-Ratio Boost Converter | Low Inductance Switching for SiC MOSFET based Power Circuit | ESBC: An Enhanced Modular Multilevel Converter with H-Bridge Front End | Load Power Agnostic 6.6 kW Wireless EV Charger with LCL Tuned Primary and Secondary Side Regulation | Diversifying the Role of Distributed Generation Grid Side Converters for Improving the Power Quality of Distribution Networks using Advanced Control Techniques | Performance of Anti-Islanding of an Improved Reactive Power Variation Method based on Positive Feedback | Operation Optimization for Multi-microgrids Based on Centralized-Decentralized Hybrid Hierarchical Energy Management | LCL Filter Design based on Non-Minimum-Phase Stability Region for Grid-Connected Inverters in Weak Grid | Power Conversion and Control of a Magnetic Gear Integrated Permanent Magnet Generator for Wave Energy Generation | A New Perspective on the PM Vernier Machine Mechanism | Design Optimization of a Small Single-Phase Motor with Auxiliary Permanent Magnet |
| 8:55AM – 9:20AM | A Fast Dynamic Photovoltaic Simulator with Instantaneous Output Impedance Matching Controller | Voltage Sensorless Improved Model Predictive Direct Power Control for Three-Phase Grid-Connected Converters | Common-Mode Voltage Analysis and Suppression in Five-Level Modular Composited Converter | A Digital Closed-Loop Control Strategy for Maintaining the 180° Phase Shift of an Interleaved BCM Boost Converter for PFC Applications | Self-Supplied Isolated Gate Driver for SiC Power MOSFETs based on Bi-Level Modulation Scheme | Investigation of a New Modular Multilevel Converter with DC Fault Blocking Capability | High Power Factor Z-Source Resonant Wireless Charger with Soft Switching | Circulating Resonant Current Suppression for Current-Controlled Inverters based on Output Impedance Shaping | Shaping of PWM Converter Admittance with Outer Power Control Loop | Coordinated Failure Response and Recovery in a Decentralized Microgrid Architecture | A Way of Increasing Stability Margin of Current Control in VSCs Connected to the Grid through LCL Filters | A Novel Active Damping Scheme for use with Regenerative Converters | Internal Rotor Airgap-Less Electric Motors | Slotless Lightweight Motor for Drone Applications |
| 9:20AM– 9:45AM | High-Frequency Induction Heating for Small-Foreign-Metal Particle Detection using 400 kHz SiC-MOSFETs Inverter | Finite Control Set Model Predictive Control Assisted by a Linear Controller for True Parameter Uncertainty Compensation | Low Voltage Ride through Performance of a STATCOM based on Modular Multilevel Cascade Converters for Offshore Wind Application | Digital Type II Compensation with Forced-Output Control of an Interleaved Two-Phase Coupled-Inductor Boost Converter | Multi-Level Active Gate Driver for SiC MOSFETs | A New Hybrid MMC with Integrated Battery Energy Storage | Bifurcation Phenomenon Limits for Three Phase IPT Systems with Constant Coupling Coefficient | Sensorless Unbalance Correction as an Ancillary Service for LV 4-Wire/3-Phase Power Converters | Hydrokinetic Powered Irrigation Network Automation: A Scalable Architecture for the Enablement of Real-Time Automated Decentralized Control of the Irrigation Water Delivery System in Developing Countries | Analysis and Improvement of Synchronous Stability of Micro-Grids with Parallel Connected Inverters | Small-Signal Modeling of Single-Phase PLLs using Harmonic Signal-Flow Graphs | Model Predictive Power Control of a Brushless Doubly Fed Twin Stator Induction Generator | Design, Construction, and Analysis of a Large Scale Inner Stator Radial Flux Magnetically Geared Generator for Wave Energy Conversion | Novel 4/4 Stator/ Rotor Single-Phase Asymmetric-Stator-Pole Doubly Salient Permanent Magnet Machine |
| 9:45AM – 10:10AM | Compact Integrated Gate Drives and Current Sensing Solution for SiC Power Modules | Model Predictive Control of Dual-Mode Operations Z-Source Inverter: Islanded and Grid-Connected | Asymmetrical Hybrid Unidirectional T-Type Rectifier for High-Speed Gen-Set Applications | Dual-Frequency On-Off Control for a 20 MHz Class E DC-DC Converter | Analytical Investigation on Design Instruction to Avoid Oscillatory False Triggering of Fast Switching SiC-MOSFETs | Enhanced Modular Multilevel Converter based Battery Energy Storage System | A Practical Static Simulator for Dynamic Wireless Charging of Electric Vehicle using Receiver Open Circuit Voltage Equivalent | Convertible Static Transmission Controller Model and Supervisory Vector Control for Operation under Unbalanced Grid Conditions | Wind Farm Grounding System Analysis | Smart Resistor: Trajectory Control of Constant Power Loads in DC Microgrids | Current-Mode Controlled Single-Inductor Dual-Output Buck Converter with Ramp Compensation | A New Rotor Speed Observer for Stand-Alone Brushless Doubly-Fed Induction Generators | Magnetic Gearing Effect in Vernier Permanent Magnet Synchronous Machines | Design Optimization of a Line-start PMSM Considering Transient and Steady-state Performance Objectives |

10:10AM – 10:30AM **AM Break** ..... *Greenhouse Pre-function Lobby & South Concourse Alcove*

# Detailed Schedule (continued)

## Thursday, October 5th (continued)

### Oral Sessions • 10:30AM – 12:10PM

| | 200 | 201 | 204 | 205 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S164:** Wireless Power Transfer IV | **S158:** Modeling and Control of DC-AC Converters I | **S155:** Multilevel Converters I | **S157:** Modeling and Control of DC-DC Converters II | **S163:** SiC Switching II | **S156:** PFC Converters | **S154:** Modeling and Monitoring of Batteries I | **S153:** Power Quality of Grid Connected Converters II | **S151:** Energy Storage Systems | **S152:** Power Conversion Systems for AC and DC Grids | **S159:** EMI in Power Converters | **S162:** Electric Drives for Aerospace and Traction Applications | **S160:** High Speed Machines | **S161:** Noise, Vibration, Short Circuit of Electric Machines |
| 10:30AM – 10:55AM | Optimization of Coils and Control Strategy for a Three-Phase Magnetically Coupled Resonant Wireless Power Transfer System Oriented by the Optimal Output Power Characteristics | IGBT-SiC Dual Fed Ground Power Unit | Interleaved Operation of Paralleled Neutral-Point Clamped Inverters with Reduced Circulating Current | Approximate-Model-based Predictive Current Control for Buck Converter in CCM | Extraction of Parasitic Inductances of SiC MOSFET Power Modules based on Two-Port S-Parameters Measurement | Dynamic Response Optimization for Interleaved Boost PFC Converter with Improved Dual Feedforward Control | On-Board State-of-Health Estimation based on Charging Current Analysis for LiFePO4 Batteries | Four-Wired Dynamic Voltage Restorers based on Cascade Open-End Winding Transformers | Fractional Converter for High Efficiency High Power Battery Energy Storage System | A Modular SCR-based DC-DC Converter for Medium-Voltage Direct-Current (MVDC) Grid Applications | A Symmetrical Resonant Converter and PCB Transformer Structure for Common Mode Noise Reduction | A Current-Fed Quasi Z-Source Inverter with SiC Power Modules for EV/HEV Applications | Design and Rotor Shape Modification of a Multiphase High Speed Permanent Magnet Assisted Synchronous Reluctance Motor for Stress Reduction | Inter-Turn Short Circuit Ratio Estimation in IPMSMs based on a Fault Index Current Observer |
| 10:55AM – 11:20AM | Radiation Noise Reduction using Spread Spectrum for Inductive Power Transfer Systems considering Misalignment of Coils | Multi-Rate Modeling for Low Switching Frequency VSCs Applying Multi-Sampling Control | A New Modulation Method for a Five-Level Hybrid-Clamped Inverter with Reduced Flying Capacitor Size | Stable Output Current Estimation for Switching Power Converter | High Speed dV/dt Control Technology for SiC Power Module for EV/HEV Inverters | Manitoba Rectifier – Bridgeless Buck-Boost PFC | A Compact Unified Methodology via a Recurrent Neural Network for Accurate Modeling of Lithium-Ion Battery Voltage and State-of-Charge | Investigation of CCL Filter for Multilevel Selective Harmonic Compensation (SHC) with Staircase Waveform | Investigation of Hybrid Electrode Optimization for Energy Storage Applications with Varying Energy and Power Requirements using HPPC Cycling | N-Series Modules based on SST for Mobile Power Substations | Aperiodic Pulse-Modulation Technique to Reduce Peak EMI in Impedance-Source DC-DC Converters | High Performance 12 kW Motor and Drive for Modern Aircrafts | Rotor Losses Reduction in High Speed PM Generators for Organic Rankine Cycle Systems | A Review of Condition Monitoring of Induction Motors based on Stray Flux |
| 11:20AM – 11:45AM | Maximum Power Point Tracker for Electromagnetic Energy Harvesting System | H-Infinity Current Control of the LC Coupled Voltage Source Inverter | A Novel Multilevel Converter with Reduced Switch Count for Low and Medium Voltage Applications | Design and Optimization of the High Frequency Transformer for a 800V/1.2MHz SiC LLC Resonant Converter | Switching Performance of a SiC MOSFET Body Diode and SiC Schottky Diodes at Different Temperatures | Low THD Multipliers for BCM Buck and Cascaded Buck-Boost PFC Converters | A Novel Li-Ion Battery Pack Modeling Considering Single Cell Information and Capacity Variation | Power Electronics Intelligence at the Network Edge (PINE) | Modeling and State-Space Feedback Design of the Battery Current Controller for the Energy Stored Quasi-Z-Source Inverter | Re-Synchronization Strategy for the Synchronous Power Controller in HVDC Systems | Integrated Common Mode and Differential Mode Inductors with Low Near Magnetic Field Emission | Temperature Effects Compensation Control Algorithm of IPM Machines Utilizing Current Pulse Injection and Online Multi-Parameter Estimation for Traction Applications | Ripple Compensation of Suspension Force and Torque in a Bearingless SPM Motor with Integrated Winding | Investigation of Design based Solutions to Reduce Vibration in Permanent Magnet Synchronous Machines with Low Order Radial Forces |
| 11:45AM – 12:10PM | Exciting Voltage Control for Transfer Efficiency Maximization for Multiple Wireless Power Transfer Systems | Analytical Averaged Loss Model of Three-Phase T-type STATCOM with Virtual Zero Level Modulation | Five-Level Reduced Hybrid Inverter with Coupled Inductors | Extension of Zero-Voltage-Switching Range in Dual Active Bridge Converter by Switched Auxiliary Inductance | Digital Control based Voltage Balancing for Series Connected SiC MOSFETs under Switching Operations | Multi-Objective Optimisation of a Bidirectional Single-Phase Grid Connected AC/DC Converter (PFC) with Two Different Modulation Principles | A Real-Time Condition Monitoring for Lithium-Ion Batteries using a Low-Priced Microcontroller | Performance Investigation of Hybrid Active Filter During Low Load Condition | A Novel Battery Management System using a Duality of the Adaptive Droop Control Theory | A Design Method of MMC-HVDC Physical Simulation System | Design, Implementation, and Evaluation of a GaN-based Four-Leg Inverter with Minimal Common Mode Voltage Generation | A Versatile Power-Hardware-in-the-Loop based Emulator for Rapid Testing of Electric Drives | Electromagnetic and Thermodynamic Design of a Novel Integrated Flux-Switching Motor-Compressor with Airfoil-Shaped Rotor | Analysis of Vibration of Permanent Magnet Synchronous Motor with Distributed Winding for the PWM Method of Voltage Source Inverters |
| 12:10PM – 2:00PM | **Awards Luncheon** ..... *Grand Ballroom AB* | | | | | | | | | | | | | |

# Thursday, October 5th (continued)

## Oral Sessions • 2:00PM – 3:40PM

| | 200 | 201 | 204 | 205 | 207/208 | 230/31 | 232 | 233 | 236 | 237/38 | 260/61 | 262 | 263 | 264 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S171:** Isolated DC/DC Converters | **S173:** Modeling and Control of DC-AC Converters II | **S170:** Multilevel Converters II | **S172:** Grid Synchronization Techniques | **S178:** Device Self Sensing Techniques | **S169:** Single-Phase AC/DC Converters | **S168:** Modeling and Monitoring of Batteries II | **S167:** Grid Connected Inverters and LCL Filter Design | **S166:** Wave Energy System | **S165:** Hybrid Energy Systems | **S174:** Testing, Measurement, and Validation of Power Converters | **S177:** PM and IPM Motor Drives III | **S176:** General Topics in Electrical Machines | **S175:** Motors for Transportation |
| 2:00PM – 2:25PM | High-gain Soft-switching DC-DC Converter with Voltage-doubler Rectifier Modules | Anti-Windup Control for Stationary Frame Current Regulators using Digital Conditioning Architectures | On-Line Switching Loss Reduction Scheme by General Space Vector PWM for Multilevel NPC Inverter | A Voltage Sensorless Phase Locked Loop Structure for Single Phase Grid Connected Converter System | Elimination of Bus Voltage Impact on Temperature Sensitive Electrical Parameter During Turn-on Transition for Junction Temperature Estimation of High-power IGBT Modules | Half-Wave Class DE Low dv/dt Rectifier using Thinned-Out Method with Delta-Sigma Modulation | An Advanced SOF Estimation Algorithm for LiFePO4 SLI Battery of Vehicle with Online Update of Cranking Resistance | Analysis and Design of LCL Filter based Synchronverter | Electromechanical Design and Experimental Evaluation of a Double-Sided, Dual Airgap Linear Vernier Generator for Wave Energy Conversion | Direct Storage Hybrid (DSH) Inverter: A New Concept of Intelligent Hybrid Inverter | DC Current Determination in Grid-Connected Transformerless Inverter Systems using a DC Link Sensing Technique | Online Stator Resistance Tracking for Reluctance and Interior Permanent Magnet Synchronous Motors | Design and Experimental Evaluation of a Multilayer AC Winding Configuration for Sinusoidal MMF with Shorter End-turn Length | Principle of Variable Leakage Flux IPMSM using Arc-Shaped Magnet Considering Variable Motor Parameter Characteristics Depending on Load Current |
| 2:25PM – 2:50PM | Driving Piezoelectric-Transformer-based DC/DC Converters using Pulse Density Modulation | A Current Sharing Technique for Parallel-Operated Unipolar-PWM Inverters | Three-Level Two-Stage Decoupled Active NPC Converter with Si IGBT and SiC MOSFET | Comparative Analysis about Dynamic Performances of Grid Synchronization Schemes | IGBT Junction Temperature Estimation via Gate Voltage Plateau Sensing | A Single-Stage Asymmetrical Half-Bridge AC/DC Converter with Coupled Inductors | Online Condition Monitoring of Lithium-Ion Batteries using Impedance Spectroscopy | A Common Magnetic Integration Method for Single-Phase LCL Filters and LLCL Filters | Grid-Connected Operation of Direct-Drive Wave Energy Converter by using HVDC Line and Undersea Storage System | New Soft-Switched High Frequency Multi-Input Step-up/down Converters for High Voltage DC-Distributed Hybrid Renewable Systems | Online Measurement of Bus Impedance of Interconnected Power Electronics Systems: Applying Orthogonal Sequences | On-Line Stator Resistance and Permanent Magnet Flux Linkage Identification on Open-end Winding PMSM Drives | Impact of Machine Magnetization State on Permanent Magnet Losses in Permanent Magnet Synchronous Machines | Performance Analysis of Surface Permanent Magnet Synchronous Machine Topologies with Dual-Wound Stators |
| 2:50PM – 3:15PM | Bidirectional DC-DC Converter Utilizing Magnetic and Capacitive Power Transfer – 97.1% Efficiency at 1.2-MHz Switching | Low Frequency Current Ripple Reduction of a Current-Fed Switched Inverter | A Ladder Transistor-Clamped Multilevel Inverter with High-Voltage Variation | A Phase-Locked Loop based on Cascaded Least-Error Squares Filter | On-Line Temperature Estimation of SiC Power MOSFET Modules through On-State Resistance Mapping | A 220-V AC, LUT-Controlled 6-Segmented LED Driver with Background Calibration | A New State of Charge Estimation Method for Lithium-Ion Battery based on Sliding Mode Observer | Investigation of the Sideband Effect for the LCL-type Grid-connected Inverter with High LCL Resonance Frequency | Power Conversion and Control of a Pole-Modulated Permanent Magnet Synchronous Generator for Wave Energy Generation | Optimal Sizing of Photovoltaic-Wind Hybrid System for Community Living Environment and Smart Grid Interaction | Switching Frequency Characterization of Hysteresis Control in a Pump Back Test Configuration | Quick Compensation Method of Motor Phase Current Sensor Offsets without Motor Parameters for PMSM Drive | Operating Limits and Practical Operation of a Brushless Doubly-Fed Reluctance Machine | Breakdown Resistance Analysis of Traction Motor Winding Insulation under Thermal Ageing |
| 3:15PM – 3:40PM | LLC Resonant Converter with Shared Power Switches and Dual Coupled Resonant Tanks to Achieve Automatic Current Sharing | Accuracy Analysis of the Zero-Order Hold Model for Digital Pulsewidth Modulation | Predictive Control of Modular Multilevel Series/Parallel Converter for Battery Systems | New Frequency and Amplitude Estimation Techniques for Grid-Connected DC/AC Inverters | Characterization of SenseGaN Current-Mirroring for PowerGaN with the Virtual Grounding in a Boost Converter | A Moving Pole-Placement Compensation Design Method to Increase the Bandwidth of RC-Damper-based Dual "Buck-Boost" AC/DC Converter | Accelerated Ageing of Lithium-Ion Batteries based on Electric Vehicle Mission Profile | An Improved Active Damping Method with Grid-Side Current Feedback to Maximize Damping Ratio for LCL-Type Grid-Connected Inverter | Competitive Control of Wave Power Plants through Price-Signal Optimum Allocation of Available Resources | Modeling and Control of Brushless DC Motor for Compressor Driving | Capacitance Estimation Algorithm based on DC-Link Voltage Harmonics Using Artificial Neural Network in Three-Phase Motor Drive Systems | Analytical Design and Auto-Tuning of Adaptive Flux-Weakening Voltage Regulation Loop in IPMSM Drives with Accurate Torque Regulation | A Novel Flux-Reversal Hybrid Magnet Memory Machine | High Torque Density PM Motor for Racing Applications |

# General Information

## Registration

**Saturday through Thursday**

*Second Floor "V", Duke Energy Convention Center*

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

| | |
|---|---|
| Saturday, September 30th | 5:00PM – 7:00PM |
| Sunday, October 1st | 7:00AM – 7:00PM |
| Monday, October 2nd | 7:00AM – 7:00PM |
| Tuesday, October 3rd | 7:30AM – 5:30PM |
| Wednesday, October 4th | 7:30AM – 6:00PM |
| Thursday, October 5th | 7:30AM – 12:00PM |

## Full Conference and Tutorial Registration

Full Conference Registration admits one entrance into all technical sessions, plenary sessions, 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, October 1st, 2017. 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.

| | ECCE | Joint | Tutorial |
|---|---|---|---|
| **Society** | $850.00 | $1,300.00 | $400.00 |
| **IEEE Member** | $900.00 | $1,450.00 | $400.00 |
| **Non-Member** | $1,050.00 | $1,800.00 | $400.00 |
| **Life Member** | $400.00 | $400.00 | $350.00 |
| **Student IEEE** | | $400.00 | $350.00 |
| **Student Non-Member** | | $450.00 | $350.00 |

## One-Day Registration

One-Day Registration admits one entrance into that day's technical sessions, the plenary sessions*, 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 2017.

## 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, October 3rd. Expo only registrations are complimentary, but you must register with the Registration Desk located in the second floor "V" to be able to access the Expo Hall.

## Guest Tickets

Guests may purchase a registration for $200, 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 | $200.00 |
| Opening Reception Only | $60.00 |
| Industry Night Out 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: 202, 235*

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 2017 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 rooms are 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.

## 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 onsite, please check in at the Registration Desk.

## Distributing Commercial Material at ECCE

### RULES FOR NON-EXHIBITORS

Distribution of commercial material in the ECCE 2017 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

Accommodations for ECCE 2017 include the Hilton Cincinnati Netherland Plaza, and the Hyatt Regency Cincinnati.

**Hilton Cincinnati Netherland Plaza**
35 West 5th Street
Cincinnati, OH 45202

**Hyatt Regency Cincinnati**
151 West 5th Street
Cincinnati, OH 45202

## Internet Access

Guest Room Internet is complimentary in IEEE Guestrooms.

There is complimentary Wi-Fi in the foyer space throughout the Duke Energy Convention Center.

## Local Transportation

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

## Lost & Found

Any lost & found items should be turned into the Public Safety Office at the Duke Energy Convention Center. The Public Safety Office is located on the north side of the building at 750 N 6th Street. Please contact the Security Console (513) 419-7325 to inquire about retrieving lost items.

## Visitor Information Desk

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

## Parking

The Duke Energy Convention Center's main entrance is located at the intersection of Fifth Street and Elm Street in downtown Cincinnati. Over 5,000 parking spaces are located immediately surrounding the Center in metered street spaces, private flat lots and privately managed garages. The garages offer direct entry to the convention center via Cincinnati's Skywalk System. Online booking is available through LAZ Parking (www.lazparking.com).

## Meals & Refreshments

### MORNING REFRESHMENTS

**Monday, Wednesday and Thursday** – *Rooms: 1Greenhouse Pre-Function Lobby (Second Floor), South Concourse Alcove (Second Floor)*
**Tuesday** – *Exhibit Hall B*

Monday, October 2nd . . . . . 10:30AM – 10:50AM
Tuesday, October 3rd . . . . . 10:10AM – 10:30AM
Wednesday, October 4th. . . . . 10:10AM – 10:30AM
Thursday, October5th . . . . . 10:10AM – 10:30AM

### LUNCH

**Tuesday** – *Exhibit Hall B*

Tuesday, October 3rd . . . . . 1:00PM – 2:30PM

### INDUSTRY NIGHT OUT

**Wednesday** – *Grand Ballroom AB*

Wednesday, October 4th . . . . . 7:00PM – 9:30PM

### AWARDS LUNCHEON

**Thursday** – *Grand Ballroom AB*

Thursday, October 5th . . . . . 12:10PM – 2:00PM

### AFTERNOON REFRESHMENTS

**Tuesday** – *Exhibit Hall B*
**Wednesday** – *Greenhouse Pre-Function Lobby (Second Floor), South Concourse Alcove (Second Floor)*

Tuesday, October 3rd. . . . . 3:20PM – 4:00PM
Wednesday, October 4th. . . . . 3:40PM – 4:00PM

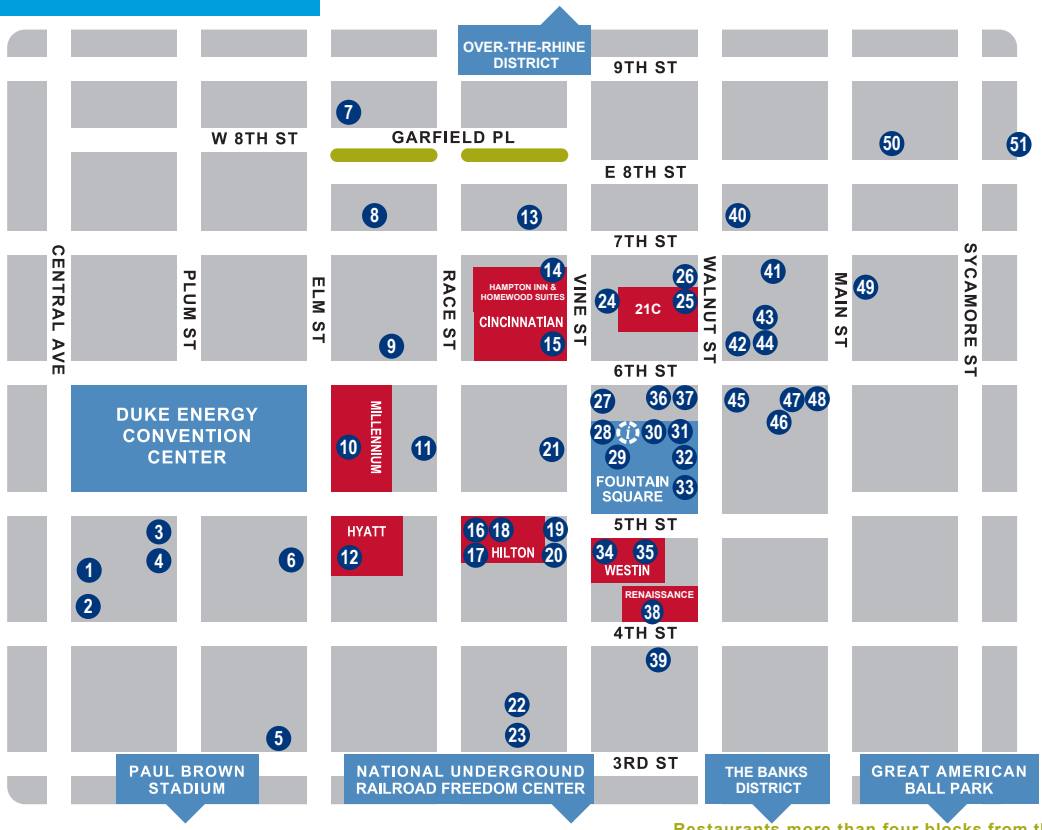
## Spouses and Guest

Spouses and other guests of the conference are welcome to meet in the Creative Digressions in Room 202 and 235 on Monday and Tuesday from 9:00AM– 10:00AM for coffee and light refreshments. Information on things to do in Cincinnati will be provided.

# Downtown Cincinnati

CINCINNATIUSA
CONVENTION & VISITORS BUREAU

DOWNTOWN CINCINNATI RESTAURANTS




1. **Campanello's - $$**
414 Central Ave, 721-9833
2. **Tina's - $**
300 W 4th St, 621-3567
3. **Prvlgd Lounge & Bistro - $$**
301 W 5th St, 846-4060
4. **Plum Street Café - $**
423 Plum St, 651-4341
5. **Kitty's Sports Grill - $$**
218 W 3rd St, 421-8900
6. **Bauer European Farm Kitchen - $$**
435 Elm St, 621-8555
7. **Izzy's - $**
800 Elm St, 721-4241
8. **Papa John's Pizza - $$**
132 W 7th St, 333-0303
9. **Rusconi Pizza- $$**
126 W. 6th St,721-2253
10. **Bistro On Elm - $$**
Millennium: 150 W 5th, 352-2189
11. **Maplewood Kitchen and Bar - $$**
525 Race St, 421-2100
12. **Red Roost Tavern - $$**
Hyatt: 151 W 5th St, 579-1234
13. **Knockback Nats - $$**
812 Race St, 721-2260
14. **Skyline Chili - $**
643 Vine St, 241-2020
15. **The Palace - $$$**
**Cricket Lounge - $$**
Cincinnatian: 601 Vine, 381-3000
16. **Orchids - $$$**
**Grille / Bar at Palm Court - $$**
Hilton: 35 W 5th St, 421-9100
17. **Hathaway's Coffee Shop - $**
Carew Tower: 441 Vine, 621-1332
18. **Abby Girl Sweets Cupcakery - $**
41 W 5th St, 335-0898
19. **Boi Na Braza - $$$**
441 Vine St, 421-7111
20. **Morton's Steakhouse - $$$**
411 Vine St, Ste 2A, 621-3111
21. **Palomino Restaurant & Bar - $$**
505 Vine St (2nd Fl), 381-1300
22. **O'Malley's in the Alley - $**
25 W Ogden Place, 381-3114
23. **Blind Pig - $**
24 W 3rd St, 381-3114
24. **Istanbul Cafe - $$**
628 Vine St, 421-5100
25. **Metropole - $$$**
21c: 609 Walunt St, 578-6660
26. **Nicholson's Tavern - $$**
625 Walnut St, 564-9111
27. **Panera Bread- $**
1 E 6th St, 241-0000
28. **Chipotle - $**
On Fountain Square, 579-9900
29. **Via Vite - $$** (on Fountain Square)
520 Vine St, 721-8483
30. **Rock Bottom Brewery - $$**
On Fountain Square, 621-1588
31. **Jekyll- $$**
On Fountain Square, 621-6968
32. **Potbelly Sandwich Shop - $**
511 Walnut St, 381-5572
33. **Graeter's Ice Cream - $**
511 Walnut St, 381-4191
34. **McCormick & Schmick's $$**
21 E 5th St, 721-9339
35. **Ingredients - $**
Westin: 21 E 5th St, 852-2740
36. **We Olive and Wine Bar - $$**
33 E 6th St, 954-8875
37. **BRU Burger Bar - $$**
41 E 6th St, 463-6003
38. **D. Burnham's - $$** (Renaissance)
36 E 4th St, 333-0000
39. **Cafe de Vine - $$**
41 E 4th St, 241-4448
40. **Jeff Ruby's Steakhouse - $$$**
700 Walnut St, 784-1200
41. **V's Cafe on 7th - $$**
650 Walnut St, 977-4074
42. **Nada - $$**
600 Walnut St, 721-6232
43. **Boca - $$**
114 E. 6th St, 542-2022
44. **Sotto - $$$**
116 E 6th St, 977-6886
45. **Prime Cincinnati - $$$**
580 Walnut St #100, 579-0720
46. **Gourmet Food to Go - $**
580 Walnut St, 954-4231
47. **Silver Ladle - $$**
580 Walnut St, 834-7650
48. **Pi Pizzeria - $**
199 E 6th St, 721-8900
49. **Corkopolis - $$**
640 Main St, 381-3752
50. **Arnold's Bar & Grill - $$**
210 E 8th St, 421-6234
51. **Spoon & Cellar - $$**
Holiday Inn: 701 Broadway St
904-4149

**The Banks Entertainment District starts at 2nd St between Walnut and Main. Restaurants include:**

**Moerlein Lager House - $$**
115 Joe Nuxhall Way, 421-2337

**Ruth's Chris Steakhouse - $$$**
100 E. Freedom Way, #160,
381-0491

**Tin Roof - $$**
160 E. Freedom Way, 381-2176

**Taste of Belgium- $$**
16 West Freedom Way,
396-5800

**Yard House - $$**
95 E. Freedom Way, 381-4071

**Pharmacies & Snack Shops**

**CVS Pharmacy**
604 Race St, 345-3800

**Walgreen's**
601 W 6th St, 929-4316

**Hotels Marked In Red**

**Key**:
Under $8 – **$**
$8 to $25 – **$$**
More than $25 – **$$$**

**The area code for all phone numbers is 513.**

**Restaurants more than four blocks from the Duke Energy Convention Center:**

**A Tavola Pizza Bar & Trattoria - $$**
1220 Vine St, 246-0192

**Below Zero Lounge - $$**
1122 Walnut St., 421-9376

**CHE! Restaurant - $$**
1342 Walnut St, 978-1706

**Holtman's Donuts - $**
1332 Vine St, 381-0903

**Howl at the Moon /**
**Splitsville Luxury Lanes - $$**
145 Second St E, 421-2695

**Jimmy Buffett's Margaritaville - $$**
1000 Broadway St. 250-3318

**Kaze Restaurant - $$**
1400 Vine St, 898-7991

**The Mercer OTR - $$$**
1324 Vine St, 421-5111

**Montgomery Inn Boathouse - $$**
925 Riverside Dr, 721-7427

**Nation Kitchen & Bar - $$**
1200 Broadway St, 381-3794

**Queen City Radio - $$**
222 W 12th Street, 381-0918

**OTR Live - $$**
209 E 12th Street, 421-5483

**Sweet Petit Desserts - $**
1426 Race St, 443-5094

**Taft's Ale House - $$**
1429 Race St, 334-1393

**Taste of Belgium - $$**
1133 Vine St, 381-4607

Cincinnati USA Visitor Center
Open 7 days a week
11 a.m. – 5 p.m.

Vine Street is the dividing location between East and West addresses. Map not to scale. Complete list of restaurants available in Cincinnati USA Official Visitors Guide.

*Updated March 23, 2017*

## IAS Committee Meetings

**IAS-IPCSD - Editorial Meeting**
Sunday, October 1st
3:00PM –4:00PM
*Room: 252*

**IAS-IPCSD Department Meeting**
Sunday, October 1st
7:30PM – 9:30PM
*Room: Buckeye (3rd Floor at Hyatt Regency Cincinnati)*

**IEE-J / IEEE-IAS Meeting**
Monday, October 2nd
2:00PM – 3:30PM
*Room: 252*

**IEMDC Organizing Committee**
Monday, October 2nd
12:00PM – 1:00PM
*Room: 252*

**IAS Industrial Power Converter Committee (IPCC) Meeting**
Monday, October 2nd
7:00PM – 8:00PM
*Room: 236*

**IEMDC Steering Committee** *(By Invitation Only)*
Tuesday, October 3rd
12:00PM – 1:00PM
*Room: 252*

**IAS Renewable and Sustainable Energy Conversion Systems (RESC) Meeting**
Tuesday, October 3rd
2:00PM – 3:00PM
*Room: 236*

IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

**IAS Transportation Systems Committee (TSC) Meeting**
Tuesday, October 3rd
3:00PM – 4:00PM
*Room: 232*

**IAS Power Electronics Devices and Components Committee (PEDCC) Meeting**
Tuesday, October 3rd
5:00PM – 6:00PM
*Room: 236*

**IAS Electrical Machines Committee (EMC) Meeting**
Tuesday, October 3rd
4:30PM – 6:00PM
*Room: 263*

**IAS Industrial Drives Committee (IDC) Meeting**
Tuesday, October 3rd
6:00PM – 7:00PM
*Room: 262*

**KIPE – IEEE/IAS Meeting (By Invitation Only)**
Wednesday, October 3rd
4:30PM – 6:00PM
*Room: 252*

## ECCE Committee Meetings

**ECCE 2017, 2018 & 2019 Organizing Committee Handover**
Tuesday, October 3rd
7:30AM – 8:30AM
*Room: 252*

**ECCE 2018 Organizing Committee Meeting**
Tuesday, October 3rd
8:30AM – 9:30AM
*Room: 252*

**ECCE Steering Committee Meeting**
Tuesday, October 3rd
10:30AM – 12:00PM
*Room: 252*

# PELS Meetings

| | | |
|---|---|---|
| **Sunday, October 1, 2017** | | |
| 3:00PM – 5:00PM | **PELS AdCom Strategy Meeting (Executive Team Only)** | *Room 209* |
| **Monday, October 2, 2017** | | |
| 10:30AM – 11:30AM | **Asian Power Electronics Coordination Committee (APECC)** | *Room 212* |
| 10:30AM – 1:30PM | **International Technology Road Map on Wide Band Gap Semi Conductors ITRW Working Group** | *Room 211* |
| 10:30AM – 11:30AM | **PELS Digital Media/Education Meeting** | *Room 209* |
| 11:30AM – 12:30PM | **ECCE Asia Coordination Committee Meeting** | *Room 212* |
| 1:00PM – 4:00PM | **PELS Membership Committee Meetings** | *Room 212* |
| 1:30PM – 2:30PM | **PELS Bylaws Committee Meeting** | *Room 209* |
| 2:00PM – 4:00PM | **Transportation Electrification Community Meeting** | *Room 211* |
| 3:30PM – 4:30PM | **PELS Industry Advisory Board & Magazine Advisory Meeting (Members Only)** | *Room 209* |
| 4:00PM – 5:00PM | **PELS Chapter Chairs Meeting** | *Room 212* |
| **Tuesday, October 3, 2017** | | |
| 8:00AM – 10:00AM | **IEEE Journal of Emerging and Selected Topics on Power Electronics (JESTPE) Awards and Editorial Board Meeting** | *Room 212* |
| 9:00AM – 10:00AM | **PELS Motor Devices and Actuators Meeting (TC3)** | *Room 211* |
| 9:00AM – 10:00AM | **PELS Southern Conference Steering Committee (SPEC)** | *Room 209* |
| 10:00AM – 12:00PM | **International Future Energy Challenge 2018 (IFEC) Information Session** | *Room 211* |
| 10:00AM – 11:30AM | **PELS Fellows Committee (Members Only)** | *Room 209* |
| 10:00AM – 12:00PM | **PELS TC1 - Power and Control Core Technologies** | *Room 212* |
| 10:300AM – 12:00PM | **ECCE Steering Committee Meeting (America)** | *Room 252* |
| 11:30AM – 12:30PM | **eT&D Steering Committee** | *Room 209* |
| 2:00PM – 3:30PM | **Humanitarian Power Electronics/ Empower a Billion Lives Committee Meeting** | *Room 212* |
| 2:00PM – 3:30PM | **PELS / IAS Joint Vehicle and Transportation Systems Meeting (PELS TC4)** | *Room 209* |
| 2:30PM – 4:00PM | **PELS TC6 - High Performance and Emerging Technologies** | *Room 211* |
| 3:30PM – 5:00PM | **PEDG Steering Committee Meeting** | *Room 209* |
| 3:30PM – 5:00PM | **PELS TC2 - Power Conversion Systems and Components** | *Room 212* |
| 4:00PM – 5:00PM | **International Relations Committee** | *Room 211* |
| 5:00PM – 6:30PM | **PELS TC5 - Sustainable Energy Technical Committee** | *Room 211* |
| 6:30PM – 9:00PM | **IEEE PELS/IEEE IAS Young Professional Reception** | *Offsite* |
| **Wednesday, October 4, 2017** | | |
| 8:00AM – 9:00AM | **Women in PELS (WIPELS) Breakfast** | *Room 211* |
| 9:00AM – 10:30AM | **PELS Products Committee Meeting** | *Room 212* |
| 11:00AM – 12:00PM | **ECCE Global Partnership Coordinating Meeting (Committee Members Only)** | *Room 211* |
| 11:30AM – 1:30PM | **IEEE Transactions on Power Electronics Paper Awards and Editorial Board Meeting** | *Room 212* |
| 11:30AM – 1:30PM | **PELS Nominations Committee (Committee Members Only)** | *Room 209* |
| 1:00PM – 3:30PM | **PELS Technical Operations Committee Meeting** | *Room 211* |
| 2:00PM – 2:30PM | **PELS Standards Committee Meeting** | *Room 209* |
| 2:30PM – 5:00PM | **ITRW Steering Committee Meeting** | *Room 209* |
| 3:30PM – 6:00PM | **PELS Conferences Committee Meeting** | *Room 211* |
| **Thursday, October 5, 2017** | | |
| 2:00PM – 5:30PM | **PELS Administrative Committee MeetingDay 1** | *Room 206* |
| 6:30PM – 9:30PM | **PELS Administrative Committee Dinner (Members Only)** | *Offsite –TBD* |
| **Friday, October 6, 2017** | | |
| 7:00AM – 12:00PM | **PELS Administrative Committee Meeting Day 2** | *Room 206* |

## Newcomers Orientation

**Sunday, October 1st, 5:00PM – 5:45PM**

*Location: Duke Energy Convention Center, Room 252*

Join us in room 252 prior to the Opening Reception for a short session intended to act as a guide for those who are new to ECCE. Join us to learn more about the week ahead with details on the agenda and types of sessions, navigating the Convention Center, and all the excitement Cincinnati has to offer! Light refreshments will be served.


## Meet and Greet with the Fellows and Partners

**Sunday, October 1st, 5:30PM – 7:30PM**

*Location: Duke Energy Convention Center, Grand Ballroom Pre-function Lobby*

Meet and Greet with our IAS and PELS Fellows as well as our conference partners at the Sunday evening Opening Reception. A chance to chat, take photos and congratulate the 2017 IEEE Power Electronics Society Class of Fellows that have chosen to receive their award at ECCE and to also thank our generous conference supporters and partners for their time and investment in ECCE 2017.

## PELS Fellows

**Terry Ericsen**
Ericsen Innovations LLC
Annapolis, MD, USA

*for leadership in power electronics*

**Dianguo Xu**
Harbin Institute of Technology
Harbin, China

*for contribution to control of electrical drives and power electronic converters*

**Laszlo Huber**
Delta Products Corporation
Research Triangle Park, NC, USA

*for contributions to ac-dc power converters for portable electronics equipment*

**Qing-Chang Zhong**
Illinois Institute of Technology
Chicago, IL, USA

*for contributions to power electronic systems control*

**Toshihisa Shimizu**
Tokyo Metropolitan University
Tokyo, Japan

*for development of reliable power converters for industrial and renewable energy applications*

pels
IEEE POWER ELECTRONICS SOCIETY
Powering a Sustainable Future

# Special Events (continued)

## IAS Fellows

**Mark David Kankam**
NASA Glenn Research Center
Cleveland, OH, USA

*for contributions to space and terrestrial power systems control*

**Khwaja Rahman**
General Motors (GM)
Global Propulsion System
Detroit, Michigan, USA

*for contributions to permanent magnet electric machines for electrified vehicles*

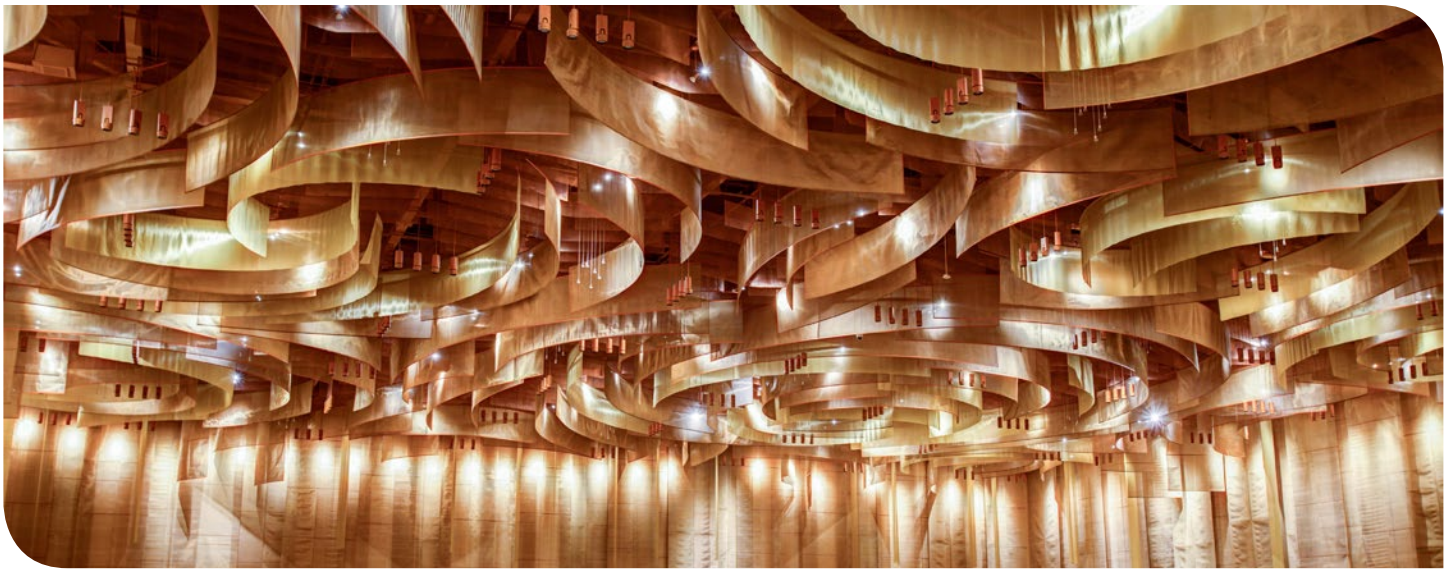
IAS IEEE INDUSTRY APPLICATIONS SOCIETY
Linking Research to Practice

## ECCE on Social Media

**twitter.com/ieee_ecce**

**www.facebook.com/ieee.ecce**

**www.linkedin.com/groups/1876618**



## Opening Reception

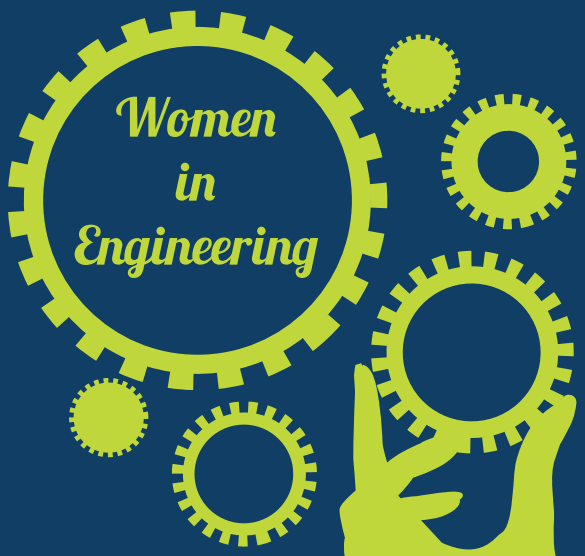
**Sunday, October 1st, 5:30PM – 7:30PM**
*Location: Duke Energy Convention Center, Grand Ballroom Pre-function Lobby*

Join us at the Duke Energy Convention Center to kick off ECCE 2017! Take this time to mingle and network before the exciting week ahead. Light appetizers and beverages will be provided.

## Expo Reception

**Monday, October 19th, 4:15PM – 7:30PM**
*Location: Exhibit Hall B*

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.




## Travel Grant Program

For the first time in the history of ECCE, twenty-two Travel Grants have been awarded to women in engineering who will be traveling from China, Chile, UK, Canada, and USA to attend ECCE 2017.

## Women Event on Monday

All women in engineering attending ECCE 2017 are invited to get together on Monday, October 2nd at 7:30PM, Room 211 to learn more about the ECCE organization and how to become involved.

During the meeting the winners of the best paper awards (authored by at least one woman) will be announced.

## Women in PELS (WIPELS) Breakfast on Wednesday

All women in engineering attending ECCE2017 are invited to have breakfast together on Wednesday, October 4th, 8:00AM – 9:00AM, Room 211 This event is sponsored by the Power Electronics Society.

## Family Room during the conference

The ECCE Family Room will be available for the duration of the conference, to allow conference attendees to bring their children without the stress!

## Duke Energy's Envision Center Tour

**Tuesday, October 3rd**
*Location: Duke Energy Convention Center*
*Tours depart: 9:00AM, 11:30AM, 1:30PM*

Duke Energy's Envision Center provides visitors a dynamic experience that demonstrates the possibilities of modernizing to smart grid and energy efficient technology. Each tour is approximately 2 hours in length. Registration is required. Shuttle buses depart from the Duke Energy Convention Center.

## Industry Night Out Reception

**Wednesday, October 4th, 7:00PM – 9:30PM**
*Location: Duke Energy Convention Center, Grand Ballroom AB*

This unique night brings together members from both ECCE and IAS to enjoy games, music, and mingling. Expand your network and knowledge during our first Industry Night Out reception. Heavy appetizers and beverages will be provided.

## Awards Luncheon

**Thursday, October 5th, 12:10PM – 2:00PM**
*Location: Grand Ballroom AB*

The Awards Luncheon recognizes the 2017 IEEE Awardees accepting their award at ECCE and IAS 2017. 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**
*Location: Exhibit Hall B*

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, recharge their electronics, and exchange ideas.

# Presenter Information

## Oral Presenters

### SPEAKER READY ROOM

**Sunday through Thursday**

*Room: 234*

**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:

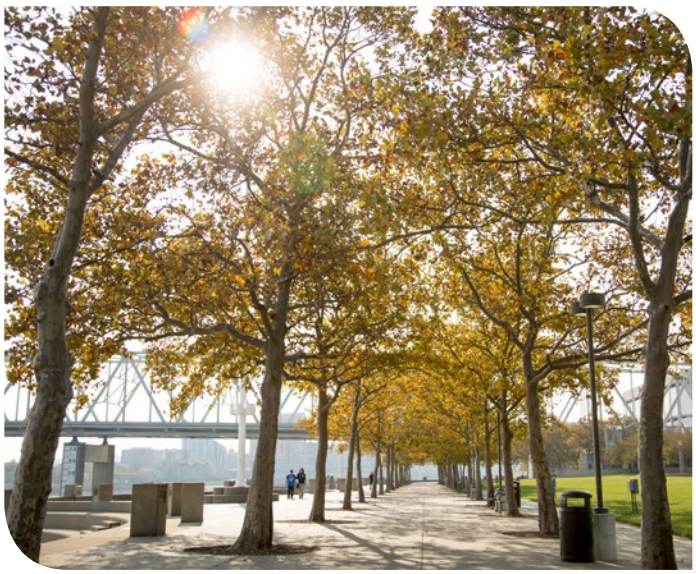
Sunday, October 1st . . . . . .8:30AM – 5:00PM
Monday, October 2nd . . . . . .8:30AM – 5:00PM
Tuesday, October 3rd . . . . . .8:30AM – 12:00PM
Wednesday, October 4th . . . . . .8:30AM – 6:00PM
Thursday, October 5th . . . . . .8:30AM – 12:00PM

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 7:30AM – 8:30AM, Monday through Thursday at the Duke Energy Convention Center. The location for the breakfast each day is Junior Ballroom CD.

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 B*

Poster Session I . . . . . Monday, October 2nd, 5:00PM – 7:30PM
Poster Session II . . . . . Tuesday, October 3rd, 10:30AM – 1:00PM
Poster Session III . . . . . .Tuesday, October 3rd, 2:30PM – 5:00PM

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

Poster Presenters will have access to Exhibit Hall B at the Duke Energy Convention 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, October 2nd, 4:30PM – 5:00PM
Poster Session . . . . . Monday, October 2nd, 5:00PM – 7:30PM
Breakdown . . . . . Monday, October 2nd, 7:30PM – 8:00PM

Presenters for Poster Session I must have their posters set-up no later than 5:00PM. 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, October 3rd, 9:30AM – 10:30AM
Poster Session . . . . . Tuesday, October 3rd, 10:30AM – 1:00PM
Breakdown . . . . . .Tuesday, October 3rd, 1:00PM – 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, October 3rd, 2:00PM – 2:30PM
Poster Session . . . . . .Tuesday, October 3rd, 2:30PM – 5:00PM
Breakdown . . . . . .Tuesday, October 3rd, 5:00PM – 5:30PM

Presenters for Poster Session III 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 Duke Energy Convention Center. The orientation will be located at the back of Exhibit Hall B as follows:

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

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.

The plenary session features a *Welcome to Cincinnati* by the President of GE Aviation Electrical Power Systems, Joe Krisciunas, followed by three keynote speeches.

# Plenary Session

## FUTURE ELECTRIFICATION BEYOND MORE ELECTRIC AIRCRAFT

**Dr. Hao Huang**
Technology Chief of GE Aviation – Electrical Power

ABSTRACT: Aerospace is experiencing its third major technological advancement. The biggest milestone of the first major advancement was the human historic first flight by Wright Brothers in 1903, and the biggest milestone of the second was the introduction of the turbojet in 1939. The third major advancement involves the electrification of aircraft including more electric aircraft (MEA), hybrid electrical propulsion (HEP), etc. Energy conversion plays an important role in this major advancement. With this big wave of change on going, the speaker will first introduce the status, trend, advantages, and limitations of more electric aircraft (MEA), followed by a talk about the status, trend, progress, and limitations of turbo engine based aircraft propulsion. From there, he will lead a discussion on the necessity and benefits of the electrification beyond the MEA including hybrid electric propulsion, the new opportunities associated with, and the technology bricks needed to further this advancement. Finally, the challenges of the electrification beyond MEA and the relationship between HEP and MEA will be explored.

BIOGRAPHY: Dr. Hao Huang is the Technology Chief of GE Aviation—Electrical Power. He is responsible for generating the technical directions, innovation strategies, and multi-generation product roadmaps for the GE aircraft electrical power division. He has been constantly leading and involving innovations and inventions of aircraft electrical power technologies.

Dr. Huang is an IEEE fellow and a SAE fellow. He received his Ph.D. Degree in Electrical Engineering from the University of Colorado at Boulder, Boulder, Colorado, USA in 1987. He has 30 years of experience in aircraft electrical power systems, power generation, engine starting, power electronics and controls, and electric vehicle drives. Dr. Huang has had US 50 patents including pending, and he has multiple technical publications in the above-mentioned areas.

## INTEGRATION OF MORE ELECTRIC AIRPLANES

**Robert Bayles**
Senior Fellow – Electric, Environmental & Engine Systems, UTC Aerospace Systems

ABSTRACT: UTC Aerospace Systems provides a wide variety of subsystems across most commercial and military airplanes. Many of these systems have experienced a growth in the use of electrical power and electrical power conversion in place of traditional hydraulic or pneumatic powered systems. This has led to power rating growth and increased criticality of the electrical power generation and distribution system. It has also generated challenges to manage the size, weight and cooling demands associated with the required power electronics. As we look forward we see the trend of a more electric airplane continuing. Bob will share some experiences and approaches based on the growing need for more electric airplane systems and also discuss the future needs UTAS foresees including systems integration.

BIOGRAPHY: Bob is a Senior Fellow engineer at UTC Aerospace Systems in Rockford, IL. Bob is currently involved in the exploration of more electric systems on airplanes including the opportunities to integrate and optimize various airplane subsystems. Bob holds a bachelors and masters degree in electrical engineering and a masters degree in business administration.

## THE ELECTRIFYING FUTURE OF AIR TRANSPORTATION

**Dr. Nateri K. Madavan**
Associate Manager, Advanced Air Transport Technology Project, NASA

ABSTRACT: This presentation discusses the NASA Aeronautics Advanced Air Transport Technology Project's perspective on electric, hybrid-electric, and related distributed propulsion technologies for future generations of large transport aircraft. Recent system studies commissioned by NASA and other organizations have identified these technologies as promising approaches to dramatically reduce aircraft fuel consumption, noise, and emissions. These technologies are part of the Project's overall research portfolio aimed toward developing ultra-efficient commercial aircraft in conjunction with alternative low-carbon propulsion and energy systems to enable safe and sustainable future growth in global aviation. It is anticipated that both room temperature and cryogenic electrical technologies will be needed in the future. Room temperature electrical systems are likely to impact aviation in the near term by making their way onto smaller aircraft and by augmenting traditional propulsion systems on larger aircraft, while cryogenic technologies will likely be needed in the far term to deliver the several tens of megawatts of propulsive power needed for large transport aircraft. The presentation outlines the opportunities and challenges for electric propulsion technologies for commercial aviation, and describes some of the related concepts and enabling technologies that are currently being developed.

BIOGRAPHY: Nateri Madavan is the Associate Project Manager for Technology for the Advanced Air Transport Technology Project in NASA's Advanced Air Vehicles Program and helps manage the Project's research portfolio to enable revolutionary improvements in the energy efficiency and environmental compatibility of future generations of aircraft. He is based at NASA Ames Research Center in Moffett Field, California, where he is a member of the Computational Aerosciences Branch in the NASA Advanced Supercomputing Division. He obtained his BS degree from the Indian Institute of Technology, MS from Iowa State, and PhD from Penn State, all in Mechanical Engineering, and is an Associate Fellow of the AIAA.

# Special Sessions

## SS1: Workforce Development and Careers in Power Electronics

**Monday, October 2nd, 2:00PM – 4:05PM**
*Room 201*

To ensure America has a great workforce in power electronics, the US Power Electronics Industry Collaborative (PEIC) is focused on industry enablement by attracting & grooming new engineering talent. This comes with reaching out to aspiring minds to help them to understand the many power electronics related challenges and opportunities facing industry, society and government. Do engineers entering the power electronics industry benefit from a deep and relatively narrow education and/or experience in power electronics or an adjacent field, or is it anticipated that hiring companies are placing greater emphasis on broader based skill sets and experiences tying together multiple disciplines of electrical, mechanical and thermal? The answer is that both ends of the spectrum are and will be needed. The intent of this Special Session is to bring together a cross section of the industry involved with applications such as electric vehicle, solar/wind power, energy storage, variable speed motors & solid-state lighting. Several PEIC members from the semiconductor industry, end equipment manufacturers, national laboratories, and universities involved in power electronics R&D will describe some of the key problems and opportunities they face and the types of new talent they seek to add to their organization

**Presenter:**
Dean Henderson, Infineon and PEIC

## SS2: Industry Activities in Korea, Organized in Collaboration with KIPE

**Tuesday, October 3rd, 8:30AM – 10:30AM**
*Room 232*

Join us for the following presentations:

1) LG Electronics: Practical Design Consideration for Automotive Traction Inverter System with High Speed Switching Devices
2) Hyosung Heavy Industry: Hyosung's R&D of Power Electronics in New Business (2MW ESS PCS for Frequency Regulation, Permanent-islanded Microgrid System)
3) Korea Electrotechnology Research Institute: KERI Business and R&D Status (Advanced Power Grid, HVDC Technology, Electric Propulsion, and Testing & Certification Services for Electric Apparatus)
4) Research Institute of Industrial Science and Technology – POSCO (Pohang Steel Company): Electrode Control Technology Delivering Constant Power Control in FeSi Submerged Arc Furnaces

## SS3: Electrical Power for Aviation Applications

**Wednesday, October 4th, 8:30AM – 10:10AM**
*Room 232*

In this subsection, presenters will talk about the progress the aerospace industry is making, the challenges the industry is facing and overcoming, and the trend the industry is experiencing in aerospace electrical power. Audience will gain a great insight of what energy conversion technologies are about in the aerospace electrical power industry.

**Chair:**
Mike Blair

**Panel:**
Mike Blair (GE Aviation), Kevin J. Yost (AFRL), Benjamin P. Rhoads (AFRL), Longya Xu (HPPE/Ohio State University) , Chris Gerada (PEMC/University of Nottingham), Jin Wang (HPPE/Ohio State University)

## SS4: IOT and Twin for Aviation

**Wednesday, October 4th, 10:30AM – 12:10PM**
*Room 232*

Internet of things (IOT) and Digital Twins are having a great impact on the industries, so as for aerospace. The presenters will share their work, results, technologies, visions, and plans. Importantly, the audience will gain a great insight about what IOT and Digital Twins are about, and the associated key technologies, such as icloud computation, real time modeling and simulation, sensors for health monitoring, etc.

**Chair:**
Syed Hossain

**Panel:**
Syed Hossain (GE Aviation), Zhenhua Jiang (University of Dayton Research Institute)

## SS5: Advanced Aircraft Electrification beyond MEA

**Wednesday, October 4th, 2:00PM – 3:40PM**
*Room 232*

Aerospace is experiencing its third major technological advancement. The biggest milestone of the first major advancement was the human historic first flight by Wright Brothers in 1903, and the biggest milestone of the second was the introduction of the turbojet in 1939. The third major advancement involves the electrification of aircraft including more electric aircraft (MEA), hybrid electrical propulsion (HEP), etc. The presenters will talk about this advancement and the associated technology aspects.

**Chair:**
Konrad Weeber

**Panel:**
Konrad Weeber (GE Global Research Center) , Di Zhang (GE Global Research Center), Patrick Wheeler (Nottingham University), Charles Lents (United Technology Research Center)

## SS6: Wide Band Gap Devices for the Aviation Applications

**Wednesday, October 4th, 4:00PM – 5:40PM**
*Room 232*

Wide Band Gap (WBG) devices, such as SiC and GaN, are next generation semiconductor devices beyond Si, providing significantly higher efficiency, lower losses, higher power density, and better reliability. The maturities of such devices are substantially improving, and the mave of their impact has arrived. The presenters will share their progresses, the challenges, the visions, and the plans with the audience with aerospace energy conversion focused.

**Chair:**
Rick Eddins

**Panel:**
Rick Eddins (GE Aviation), Ryo Takeda (Keysight Technologies), Tatsuya Yanagi (Keysight Technologies), Hiroyuki Sakairi (Keysight Technologies), Naotaka Kuroda (Keysight Technologies), Ken Nakahara (Keysight Technologies), Arun Gowda (GE Global Research Center), Siegbet Haumann (Danfoss Silicon Power), Michael Tonnes (Danfoss Silicon Power), Gerald Trant (GE Global Research Center), Ljubisa Stevanovic (GE Global Research Center)

## SS7: Power Electronics Meets Power Utilities & Systems

**Wednesday, October 4th, 8:30AM – 10:10AM**
*Room 206*

This special session will discuss the role of power electronics for Electrical Power Systems at a variety of scales. Each sub-session will have one speaker that discusses the power electronic devices used in each area of the power grid and one speaker that focuses on the application and systems perspective of these devices. The power grid areas range from individual generation, to micro-grids, to distribution systems, to transmission grids.

**Chairs:**
Ben Kroposki, National Renewable Energy Laboratory <Benjamin.kroposki@nrel.gov
Patrick Wheeler, University of Nottingham <Pat.Wheeler@nottingham.ac.uk>

**8:30AM – 9:20AM**

1) Power Electronics in Generation (Focus on new advanced in wind turbines and PV inverters)

   Power Converter Perspective - Fred Wang, University of Tennessee, fred.wang@utk.edu

   System's Perspective - Blake Lundstrom, National Renewable Energy Laboratory, blake.lundstrom@nrel.gov

**9:20AM – 10:10AM**

2) Power Electronics in Micro-grids (Focus on DC micro-grids, static switches, other DER)

   System's Perspective - Alexis Kwasinski, University of Pittsburgh, akwasins@pitt.edu

   Power Converter Perspective - Tomislav Dragicevic, University of Aalborg, tdr@et.aau.dk

## SS8: Power Electronics Meets Power Utilities & Systems

**Wednesday, October 4th, 10:30AM – 12:10PM**
*Room 206*

This second session is a continuation of SS7: Power Electronics meets Power Utilities & Systems.

**10:30AM – 11:20AM**

3) Power Electronics in Distribution Systems (Focus on solid-state transformers and power routers)

   Power Converter Perspective, Maryam Saeedifard, Georgia Institute of Technology - maryam@ece.gatech.edu

   System's Perspective – Deepak Divan, Georgia Institute of Technology ddivan@gatech.edu

**11:20AM – 12:10PM**

4) Power Electronics in Transmission Systems (Focus on HVDC and FACTS advancements)

   System's Perspective – Brian Johnson, University of Idaho <b.k.johnson@ieee.org>

   Power Converter Perspective – Brandon Grainger, University of Pittsburgh, bmg10@pitt.edu and Greg Kish, University of Alberta, gkish@ualberta.ca

## SS9: Power Electronics and Control for Low-Inertia Electrical Systems

**Wednesday, October 4th, 2:00PM – 3:40PM**
*Room 206*

A wide scale deployment of power-electronic-based power sources, transmission/distribution systems, and loads are being envisioned in the near future. Differing from traditional electric machines, the solid-state electronic power converters are rotational-inertia-less, and consequently pose challenges on the transient stability of electric power systems. Moreover, the wideband control dynamics of power converters also bring in new power quality challenges, e.g. unexpected interharmonics and resonances across a wide frequency range. Those stability and power quality issues will in turn impose more stringent requirements and harsh environments on the hardware design and reliability of power converters.

The purpose of this special session is to provide a platform for power electronics and power system engineers to share the latest research progress and upcoming technical challenges with the low-inertia electrical systems.

The session is composed by four invited presentations from ABB Corporate Research, American Electric Power, ENERCON, and Argonne National Lab.

**Chair:**
Xiongfei Wang, Department of Energy Technology, Aalborg University, Denmark

**Co-chair:**
Jing Xu, ABB Corporate Research, NC, USA

## SS10: Magnetic Materials Standards in the Research Environment

**Wednesday, October 4th, 4:00PM – 5.40PM**
*Room 232*

Magnetic materials take a primary role in the design and manufacture of machines and devices used throughout the energy conversion community. This session will present recent developments in material specifications and test methods and and will discuss the role of international standards in establishing a common ground of understanding from which advances in materials, engineering design and manufacturing practices can spring.

**Chair:**
Steve Sprague, Proto Lam, LLC.

## IAS & PELS Young Professionals Reception

**Tuesday, October 3, 2017, 6:30 p.m onwards**
*Location: Bauer Farm Kitchen, 435 Elm Street*

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. As it's IEEE Day, we will have some celebrations too. So make sure you don't miss this wonderful chance to make new friends.

Please register @ https://goo.gl/forms/uxNFMwF7bqcRD4Q32 , to mark your presence for this amazing evening in Cincinnati .

**This event is only for Young Professionals and Students registered for ECCE and the IAS Annual Meeting.**

# Tutorials

*Note: All tutorials are held on October 1, 2017. Pre-registration for each tutorial is required. Please visit the Registration Desk for space availability.*

**Sunday, October 1** **8:00AM – 12:00PM**

**AM Tutorials**

## T1-1 High Power Medium Frequency Transformer Design Optimization

*Room: 262*

**Instructors:** Prof. Drazen Dujic and Mr. Marko Mogorovic, *Power Electronics Laboratory, Swiss Federal Institute of Technology, Switzerland*

With increased interest in Power Electronic Transformers or Solid State Transformers, several technical problems arise related to actual realization of these technologies. Irrespectively of adopted power electronic topologies, these structures are characterized as being modular and having inherently built-in galvanic isolation at medium or high frequency. The implementation of the galvanic isolation can be achieved either with a single transformer or, as often the case, multiple smaller power rated transformers depending on the given design objectives and constraints. However, designing a high-power high-voltage medium frequency transformer is associated with multiple technical challenges related to electrical, magnetic, dielectric and thermal performance limits encountered in the system.

Various technological choices must be carefully considered and selected before being included into a generic multi-objective optimization. Moreover, the quality of the result of the optimization is only as good as the utilized models. Therefore, all relevant phenomena, within physical subsystems of this complex multi-physical system, must be modelled both accurately and precisely in reference to their impact on the given application. Optimization goals will depend on various parameters, such as application requirements regarding weight, volume, form factor, efficiency, thermal constraints, costs, etc.

Tutorial will provide an overview and address challenges coming from the application area, characteristics of involved materials and available design choices, associated modelling of different elements impacting medium frequency transformer design, as well as optimization process as whole. Multiple illustrative design examples will be critically analyzed in terms of their key performance indicators, and supported with practical examples realized by the tutorial instructors themselves.

## T1-2 Model Predictive Control of High Power Converters and Industrial Drives

*Rooms: 260/261*

**Instructor:** Tobias Geyer, *ABB Corporate Research Switzerland*

This tutorial focuses on model predictive control (MPC) schemes for industrial power electronics. The emphasis is put on three-phase ac-dc and dc-ac power conversion systems for high-power applications of one MVA and above. These systems are predominantly based on multilevel voltage source converters that operate at switching frequencies well below one kHz. The tutorial mostly considers medium-voltage (MV) variable speed drive systems and, to a lesser extent, MV grid-connected converters, including modular multilevel converters. The proposed control techniques can also be applied to low-voltage power converters when operated at low pulse number, i.e. at small ratios between the switching frequency and the fundamental frequency. Examples for this include automotive and railway traction converters.

For high-power converters, the pulse number typically ranges between five and 15. As a result, the concept of averaging, which is commonly applied to power electronic systems to conceal the switching aspect from the control problem, leads to a performance deterioration. In general, to achieve the highest possible performance for a high-power converter, averaging is to be avoided and the traditionally used current control loop and modulator should be replaced by one single control entity.

This tutorial proposes and reviews control 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. Long prediction horizons are required for the MPC controllers to achieve excellent steady-state performance. The resulting optimization problem is computationally challenging, but can be solved in real time by branch and bound methods. Alternatively, the optimal switching sequence to be applied during steady-state operation—the so-called optimized pulse pattern (OPP)—can be pre-computed offline and refined online to achieve fast closed-loop control. To this end, the research vision is to combine the benefits of deadbeat control methods (such as direct torque control) with the optimal steady-state performance of OPPs, by resolving the antagonism between the two. Three such MPC methods are presented in detail.

This tutorial follows a book by the instructor, which was published by Wiley in 2016. Some of the proposed MPC methods have been introduced in commercial products. Experimental results from pilot installations will be shown and discussed. The tutorial aims at providing a balanced mix of theory and application-related material. Special care is taken to ensure that the presented material is intuitively accessible to the power electronics practitioner. This is achieved by augmenting the mathematical formulations by illustrations and simple examples.

## T1-3 Modeling and Energy Management of Modern Shipboard Power Systems

*Room: 236*

**Instructors:** Osama A. Mohammed, Christopher R. Lashway, *Florida International University*

This tutorial is geared toward an intermediate-level audience, but will provide an extensive review of shipboard power systems from fundamentals to advanced energy management and design. Beginning with a general overview of the most popular architectures, configurations, and ratings, an extension will be made into a review of applicable standards. Three popular configurations are discussed in the progression to an all-electric ship. The all-electric ship brings with itself a new focus beyond the legacy main and auxiliary turbine generators to the integration of efficient energy storage devices. Current energy storage technologies are no longer limited to battery chemistry and size, but also utility-grade supercapacitors and flywheel energy storage, a combination commonly referred to as hybrid energy storage systems. While introducing these elements improves power delivery capabilities on a ship, hybrid energy storage systems introduce new dynamics making their design and utilization challenging. A number of facets related to their integration and control is discussed from selection to optimization. Combinations of batteries with supercapacitors and flywheel energy storage are tested, optimized, and evaluated for their use in shipboard power applications. An in-depth review of hybrid energy storage systems and how they can be combined to mitigate the impacts of hotel, pulsed, and multi-pulsed loads is also discussed. A discussion over a specialized power system testbed is provided and used as a platform to apply new hybrid microgrid control schemes. A shipboard test bed platform at the Energy Systems Research Laboratory at Florida International University is introduced and used as a comprehensive experimental testing platform to support the evaluation of various hybrid energy storage systems and their associated control topologies.

## T1-4 DC Arc Fault Detection and Protection in DC Electric Power Systems

*Room: 263*

**Instructors:** Xiu Yao, *University at Buffalo,* Jin Wang, *The Ohio State University,* Luis Herrera, *Rochester Institute of Technology*

This professional education seminar will systematically cover various aspects of dc arc fault detection in emerging dc power applications. A comprehensive review of dc arc fault modeling approaches and their applications will be presented in detail. The principles and developments of various dc arc fault detection techniques will be then introduced. The state-of-the-art detection techniques in both literatures and commercial products will be presented. Moreover, the detection of dc arc faults in the context of a modern dc power systems with advanced power electronics interfaces and controllers will be discussed, including the impact of dc arc faults on the control of dc microgrids, as well as hardware-in-the-loop based validation methods.

The goal of this seminar is to introduce the state-of-the-art technologies and to discuss future research and development needs of dc arc fault protection in modern dc networks. It is dedicated to help the audience better understand the issues of dc arc faults and system level protection of dc systems. It will be of direct interest to researchers and engineers who work with dc arc fault interrupters and PV inverters. It should also be of interest to engineers who work with dc mcirogrids, dc distribution systems, and development of dc system protection standards.

The first session is an introduction of dc arc fault and related issues, covering dc electric networks and general aspects on system level protection, dc arc faults: fault mechanisms, fault types, and hazards, and DC arc fault related standards and industry practice. The second session is about the DC arc modeling, covering the external characteristics modeling such as arc V-I equations, development history, derivation procedures, experimental conditions, and limitations, high frequency modeling of arc current signals using probabilistic methods and various types of arc models for system level simulations and analysis. The third session discusses DC arc fault detection techniques: different aspects of dc arc fault detection techniques including signal sensing, fault signature selection and computation, and fault detection algorithms, a comprehensive review of signal sensing and fault signature selections in time, frequency, and time-frequency domains, a review of fault detection algorithms, and commercial products: requirements, principles, and performance evaluation. The fourth session is on DC arc fault in microgrids: basic concepts of dc microgrids, conventional and advanced control methods of dc microgrids, case study on the interaction of dc arc faults with microgrid control and operation, and dc arc fault protection in dc microgrids.

## T1-5 Practical Considerations for the Application of High Power Si and SiC Modules

*Room: 264*

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

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 presentation will include an update of the latest developments in Si and SiC power modules. The intent of this tutorial 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 tutorial 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 or SiC MOSFETs as the power switch.

The high level outline of this tutorial is arranged as the following:

1) Basic Characteristics, Failure Modes, and Reliability: overview, static & dynamic characteristics, thermal resistance, switching SOA, SCSOA; 2) Chip and packaging technology update: trend, vertical structures, high reliability packaging, SiC and Si; 3)Application Considerations: voltage & current ratings, thermal & power cycling, parallel connections; 4) Design Examples: loss calculations, loss simulator, sanity check; 5) Gate Drive Circuit Design: Vge(on), Vge(off) Rg, gate current and power, Vce sensing, desaturation detection, layout, hybrid gate drivers; 6) Power Circuit Design: stray inductance, laminated bus bar, snubbers.

## T1-6 Isolated Bi-directional DC/DC Converter Topologies and Control

*Rooms: 237/238*

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

Isolated Bi-directional DC/DC conversion is key technology for Renewable Power Systems, Battery Energy Storage Systems, bidirectional on-board EV charger, Solid State Transformer etc. In this tutorial firstly basics of bidirectional DC/DC converters is presented. A classification of bi-directional DC/DC converters, and their application are explained. Dual Active Bridge (DAB) converter and its power regulation with phase-shift control is introduced. Soft switching condition with load condition is discussed. Alternative PWM modulations for DAB are investigated with regards to the soft switching condition or conversion efficiency enhancement. Then bidirectional converters with the resonant circuit is introduced. It bidirectional power control method is discussed. It is compared with Dual Active Bridge (DAB) converter. With regards to the Dual Active Bridge (DAB) converter, various modulation methods are discussed and compared.

To further accommodating either input or output terminal voltage variation, PWM plus Phase-Shift control (PPS) is introduced. It combines the advantage of both pulse width modulation and phase-shifting control. Pulse width modulation is more adapted to variation of the terminal voltages with lower current stress and lower conducting loss in power devices while phase-shifting control is more suitable to Zero Voltage Switching condition for power devices in the converter. The novel scheme is explained with stages analysis and ZVS condition derivation. Finally an experiment prototype is described. Systematic synthesis methods for bidirectional converters which can realize PPS control is presented. A family of bidirectional converters with PPS is derived. Bi-directional DC/DC converters with PPS control is MIMO control system. The dynamic model is needed for analytical controller design.

Resonant bidirectional DC/DC converters are introduced. Since the resonant converter is implemented in these bidirectional DC/DC converter, the dynamic loss of the power device is significantly reduced in comparison with PWM controlled bidirectional converters. Therefore high switching frequency may be used and the isolation transformer can be significantly reduced, which is suitable to the application of SST and battery energy systems. Finally examples of applications of bidirectional DC/DC converter are introduced such as V2G on-board EV charger, and DC solid state transformer.

**Sunday, October 1** **1:00PM – 5:00PM**

**PM Tutorials**

## T2-1 Using Soft-Switching Technology to Design High-Power, High-Current, Isolated, DC/DC Converters that Achieve Low-Cost, High Reliability, and Electromagnetic Compliance

*Room: 263*

**Instructors:** Alexander (Sasha) Isurin, *Vanner Inc.,* Mark Scott, *Miami University*

This tutorial presents design strategies for isolated, step-up and step-down, DC-DC converters that utilize soft-switching technology. It focuses on topologies where the low-voltage terminals of the converter conduct several hundred amps at power levels of 2 kW and beyond. The audience learns how to leverage soft-switching technology to create hardware that is low cost, highly reliable, and achieves electromagnetic compatibility (EMC). The discussion includes how to choose a soft-switching topology for a given application, specify its components, and select the topology's commutation frequency. Furthermore, principles for designing high-current, high-frequency transformers are included in the presentation. Experimental results are provided to validate the proposed design strategies. While these results focus on applications in electrified transportation, the concepts that are presented are general, and they can be applied to other fields such as power supplies for data centers and in renewable energy applications.

The four technical components of this seminar are: (1) metrics for evaluating power electronics, (2) a review of soft-switching principles, (3) a survey of isolated DC/DC converters that use soft switching, and (4) guidelines for designing high-current, high-frequency transformers. The first topic demonstrates how *cost, reliability,* and *EMC* drive design decisions in electrified transportation applications. The influence of magnetics and active power devices on these metrics is emphasized in this section. During the second topic, soft-switching technology is covered. First, the pulse width modulation (PWM) strategies that are used to achieve output regulation are presented. Next, an overview of zero voltage switching (ZVS) and zero current switching (ZCS) technologies are discussed. The third topic compares and contrasts the seven types of resonant converters topologies. Basic operating principles for each topology are discussed along with the strengths and weaknesses of each approach. For each topology, recommended applications will be provided along with methods for selecting components and choosing the switching frequency. The fourth topic focuses on the high frequency transformer design and provides guidelines to successfully implement them into high current applications. Finally, the tutorial concludes with a broad summary. To facilitate an open dialogue, questions are encouraged throughout the presentation.

## T2-2 SiC Power Device Design and Fabrication, and Insertion in Novel MV Power Conversion Systems

*Room: 236*

**Instructor:** Subhashish Bhattacharya, Victor Veliadis, *North Carolina State University*

The tutorial will outline the advantages of SiC over other power electronic materials, and will introduce SiC devices currently developed for power electronic applications. ESD, high-voltage testing, and packaging aspects will be covered. The design and properties of SiC JFETs, MOSFETs, BJTs, IGBTs, Thyristors, and Junction Barrier Schottky and PiN diodes will be discussed, with an emphasis on their performance advantages over those of their Si counterparts. Common SiC Edge Termination techniques, which allow SiC devices to exploit their full high-voltage potential, will be rigorously treated and their impact on device performance will be highlighted. Aspects of device fabrication will be taught with an emphasis on the processes that do not carry over from the mature Si manufacturing world and are thus tailored to SiC. In particular, the tutorial will stress in-depth the design and fabrication of SiC MOSFETs, which are being inserted in the majority of SiC based power electronic circuits. Device reliability will be reported through exemplary hard switching and unclamped inductive load results. Exemplary SiC-based power electronics systems will be presented, and their numerous advantages over conventional Si systems will be articulated.

The opportunities for HV SiC devices for MV Power Converters and utility applications and the challenges to apply these HV SiC devices successfully will be presented in-depth with SiC device voltage ranges from 1200 V to 1700 V MOSFETs, and HV 10 kV - 15 kV MOSFETs, JBS diodes, and 15 kV SiC IGBTs. The potential and challenges of the HV 10-15 kV devices to enable MV power conversion systems, including MV motor drives, FACTS and MVDC grids will be explored. Challenges in adopting these HV SiC devices for MV power conversion in terms of magnetics, capacitors, and insulation materials will be discussed.

## T2-3 Electric Energy Storage Systems and Energy Management Solutions for Future Electric Transportation and Mobility

*Room: 263*

**Instructor:** Sheldon S. Williamson, *University of Ontario-Institute of Technology (UOIT), Canada*

It must be noted that this tutorial will be particularly useful for engineers and managers with entry-level and medium-level knowledge of power electronics. The tutorial would also be appropriate f with entry-level knowledge of power electronic rgy storage systems and electric transportation.

WITHDRAWN

Enhancing the life of Lithium-ion (Li-ion) battery packs has been the topic of much interest in the auto industry. In this framework, the role of on-board cell voltage balancing of Li-ion batteries will be highlighted in this tutorial. This is a very important topic in the context of battery energy storage cost and life/state-of-charge, SOC/state-of-health, SOH monitoring. Li-ion batteries, although popularly proposed for electric transport, have been highly uneconomic for energy storage, overshooting cost requirements by a large margin. Li-ion batteries provide a reasonable solution; however, the main issues include: Cycle life (range anxiety), calendar life, energy density, power density, and safety. These issues can be addressed effectively by using a simple practical approach: a power electronics based dynamic cell voltage equalizer. The design and implementation of both inductor-based as well as switched capacitor DC/DC converters for Li-ion battery cell-equalization will be discussed. Fundamental topologies of power electronic converters, specifically utilized for bidirectional current flow in cell balancing applications, will be discussed. The design, implementation, and testing/validation of an active cell equalization circuit for a traction Li-ion battery pack will be presented.

This tutorial will also look at power and energy storage issues related to future e-autonomous mobility as well as urban mass transit applications, such as heavy-duty buses, trucks, trains, and trams – systems which depict frequent start/stop duty cycles. Some of the burning issues and opportunities of using power-packed ultracapacitor (UC) banks on-board heavy-duty transit propulsion systems, with frequent start-stop driving patterns, will be presented. Bidirectional DC/DC converter topologies, designed specifically to recover large amounts of regenerative currents (around 200A), will be presented. Another critical aspect of this tutorial will focus on the design of an innovative DC/DC power electronic converter for UC-bank switching – in order to meet energy demands, rather than just power bursts. A simple and effective technique will be presented to achieve fair amounts of energy storage from UCs, by maintaining the UC bank voltage within a certain threshold. The presented techniques in this tutorial will help overcome the unpopular lower energy densities of UCs and their linear voltage-charge relationship. This technique will increase the energy utilization of UCs, thereby downsizing the number of UCs required for an e-traction application. Modeling, analysis, simulations, and experimental verification will be presented.

## T2-4 Electrical Machine Analysis Using Free Software

*Rooms: 260/261*

**Instructor:** Nicola Bianchi, *University of Padova,* David Meeker, *QinetiQ North America,* Johan Gyselinck , *Université Libre de Bruxelles,* Ruth V. Sabariego, *KU Leuven,* Luigi Alberti, *Free University of Bozen,* Gianmario Pellegrino, *Politecnico di Torino,* Francesco Cupertino, *Politecnico di Bari*

The design of competitive and efficient electrical machines is to date an open and fascinating engineering challenge. Electrical machines involve a variety of transversal aspects including multiple physical fields, cost and availability of materials and ease of manufacturing. Design goals are also numerous: efficiency, cost, minimum weight, safe operation at high temperature. The rocketing growth of computational power has revolutionized the field of electrical machine design and opened new opportunities for improvement. This tutorial brings together a team of researchers actively involved in developing open-source software dedicated to design and in particular the design of electrical machines.

SOFTWARE 1: Finite Element Method Magnetics (FEMM) is an open-source magnetic finite element program that is widely used for analyzing electric machines. This presentation will provide an overview of the program, where to obtain it and get support; and how to set up and solve basic problems. Options for scripting interfaces to other commonly used numerical analysis tools (*e.g.* Matlab, Mathematica) will also be described. The FEMM software tool is applied to the analysis of a PM machine.

SOFTWARE 2: GetDP is an open-source finite-element solver for electromagnetic, thermal, mechanical and acoustic problems, as well as their coupling. These problems are 1D, 2D or 3D, and the resolution is done either statically, in the time domain (time stepping) or in the frequency domain (with one or more frequencies). GetDP does not have its own graphical interface; instead the complete problem, including the partial-differential equation, is transcribed into text data files.

SOFTWARE 3: Gmsh is an open-source 3D mesh generator with built-in pre- and post-processing facilities. Its design goal is to provide a fast, light and user-friendly meshing tool with parametric input and advanced visualization capabilities. Gmsh is built around four modules: geometry, mesh, solver and post-processing. The specification of any input to these modules is done either interactively using the graphical user interface or in text data files using Gmsh own scripting language.

SOFTWARE 4: ONELAB (Open Numerical Engineering LABoratory) is an open-source, lightweight interface to finite-element software. The default ONELAB bundle is built on Gmsh GUI, with direct access to all its mesh features, and integrates the finite-element software GetDP. However many other codes (free or not) can be easily interfaced as well.

SOFTWARE 5: *Koil* is an open source software to design the windings of rotating electrical machinery. It is written in C++ using cross-platform technology. *Koil* manages both the synthesis (design) and the analysis of the windings. Standard symmetrical windings are automatically generated starting from the number of phases, poles and slots. Custom windings (including non-symmetrical ones) can be introduced using a scripting environment.

SOFTWARE 6: SyR-e is an open-source design tool running in Octave / Matlab and based on FEMM. Initially made for the automatic design of synchronous reluctance machines, SyR-e now covers PM synchronous machines more in general. Besides magnetic design, thermal and structural aspects are included into SyR-e in the form of simplified models with seamless execution time.

## T2-5 EMI Issues and Solutions in PWM Converters

*Room: 264*

**Instructors:** Ruxi (Rudy) Wang, *GE Global Research Center,* Dong Jiang, *Huazhong University of Science and Technology*

Over the past few decades, the goals of power electronics converter design have been to reduce the size, weight, and maintenance, while increasing overall energy efficiency, safety, and reliability especially for modern transportation applications. Electromagnetic interference (EMI) caused by the converter with pulse width modulation (PWM) method has been a big concern for safety and reliability and therefore EMI filter should be designed with the converter to meet the EMI standard. This tutorial provides a fundamental understanding of EMI issues related with PWM converters. The tutorial begins with an introduction of EMI noise source, transition path and EMI load. Power electronics devices and components will be introduced to better understanding the EMI issue from the fundamental layer.

Differential-mode (DM) and common mode (CM) noise definition is derived, with measurement techniques presented. Different noise reduction techniques are presented using multiple PWM converters as example. Compact EMI filter design will be presented considering the filter structure and components coupling. Several practical EMI reduction techniques and construction methods including the modification of PWM method are provided through this tutorial.

The tutorial will cover the following detailed topics: 1) EMI definitions and influence, Noise path with lowest impedance, Circuit equivalents, EMI standard; 2) Fast dv/dt influence to the frequency domain spectrum (challenge for the wideband gap devices), Active device/module equivalent model, Passive component modeling (L, C, cables, stray capacitors, stray inductance, provide few rule of thumb examples); 3) CM, DM Noise Source Definition, Noise Source Calculation and Measurement (Including EMI test setup, LISN, etc); 4) Noise source reduction, Variable switching frequency PWM for EMI Reduction, EMI reduction through noise loop shaping, EMI noise reduction through shielding; 5) Common-mode EMI filter, PWM methods' impact on CM voltage, CM current reduction consideration, CM voltage elimination methods; 6) Passive EMI filter design, Advantages of using active EMI Filter.

## T2-6 Wireless Power Transfer for Electric Vehicle and Mobile Applications

*Rooms: 237/238*

**Instructors:** Chris Mi, *San Diego State University*

Electric vehicles and plug-in hybrid electric vehicles (PEVs) have attracted worldwide attentions because their capabilities to displace petroleum usage and improve energy and environment sustainability. One of the key constraints for the mass market penetration of PEVs is the inconvenience and safety concerns associated with charging. Wireless charging using wireless power transfer (WPT) technology, as an alternative to conductive charging or battery-swapping, can provide the convenience and safety requirements. Recently, EV battery wireless chargers have been realized at large power levels (>100kW) with reasonable sizes, distance in excess of 200 mm, DC-to-battery efficiency of 96.5%, and a misalignment of up to 600 mm, using inductive power transfer technology. This breakthrough will have strong impact on PEVs and a variety of other applications, including consumer electronics, home appliances, medical implant devices, and some industry applications.

This tutorial focuses on the principle and key technical challenges of WPT. It will contain five modules. In module 1, we will provide an overview of wireless power transfer technology and its application in electric vehicle charging. Different terminologies in wireless power transfer will be explained. Various methods for wireless power transfer will be discussed. Magnetic resonance and compensation methods will be introduced. In module 2, we will discuss the principle, theory, analysis methods, and applications of inductive wireless power transfer technology. Various types of coil design for maximum coupling coefficient, including circular, rectangular, flux pipe, double D, and DDQ coils. Measurements of coil inductance will be discussed. It will be aimed at novel designs that considerably reduce size and cost while increase coupling coefficient and system efficiency. A double sided LCC resonant converter topology for the resonant will be discussed in detail. In module 3, the presentation discusses capacitive power transfer (CPT) for EV charging applications. A double-sided LCLC compensated topology and its design process will be discussed in detail. The design of a 2.4kW CPT system with four 610mm × 610mm copper plates and an air gap distance of 150mm will be shown with a 90.8% efficiency. Module 4 briefly discuss the power electronics circuits for WPT systems, such as AC-DC, DC-DC, and DC-AC. The last module will discuss other aspects of wireless chargers, such as safety issues, switching frequency band requirement, SAE WPT J2954 standard, object detection methods, communication methods between transmitter and receiver, some testing results of foreign object inserted between the transmitter and receiver exist.

**Monday, October 2** **10:50AM – 12:30PM**

## S1 Power Conversion for Solar Photovoltaic Systems I

*Room: 236*
**Chairs:** Ranjit Mahanty, Yongheng Yang

**10:50AM | Single-Stage Three-Phase Grid-Connected Photovoltaic System with Maximum Power Tracking and Active and Reactive Power Control based on Nonlinear Control**
Pablo R. Rivera, Michael L. McIntyre, Mohammad Mohebbi and Joseph Latham, *University of Louisville, United States*

**11:15AM | A Single Phase Doubly Grounded, PV Inverter using Coupled Inductor with Integrated Magnetics and Active Power Decoupling Technique**
Yinglai Xia, Jinia Roy and Raja Ayyanar, *Texas Instruments, United States; Arizona State University, United States*

**11:40AM | A ZVT Cell for High-Frequency Quasi-Resonant Converters in ON-OFF Mode for Solar Applications**
Hossein Mousavian, Alireza Bakhshai and Praveen Jain, *Queen's University, Canada*

**12:05PM | Sliding Mode Control of a Single Phase Transformer-less PV Inverter with Active Power Decoupling**
Jinia Roy, Yinglai Xia and Raja Ayyanar, *Arizona State University, United States; Texas Instruments, United States*

## S2 Hybrid AC/DC Microgrids

*Room: 237/38*
**Chairs:** Jinjun Liu, Meiqin Mao

**10:50AM | Adaptive Active Power Sharing Techniques for DC and AC Voltage Control in a Hybrid DC/AC Microgrid**
Ángel Navarro-Rodríguez, Pablo García, Ramy Georgious and Jorge García, *University of Oviedo, Spain*

**11:15AM | Modulation and Control Method for Bidirectional Isolated AC/DC Matrix based Converter in Hybrid AC/DC Microgrid**
Fanxiu Fang and Yun Wei Li, *University of Alberta, Canada*

**11:40AM | Fault Ride-Through Capability of Hybrid AC/DC Microgrids during AC and DC Network Faults**
Lasantha Meegahapola, Inam Ullah Nutkani, Brendan McGrath and Donald Grahame Holmes, *RMIT University, Australia*

**12:05PM | An Effective DC Microgrid Operation Using a Line Impedance Regulator**
Fatih Cingoz, Awab Ali, Ali Elrayyah, Yilmaz Sozer and J. Alexis De Abreu-Garcia, *University of Akron, United States; Qatar Environment Research Institute, Qatar*

## S3 Dynamic Performance of Power Converters for Renewable Energy

*Room: 233*
**Chairs:** Hui Li, Adel Nasiri

**10:55AM | Robust H∞ DC Link Control Design for High-Power Density Converters with High-Order Filter in PV Systems**
Nima Amouzegar Ashtiani, S. Mohsen Azizi and S. Ali Khajehoddin, *University of Alberta, Canada; Michigan Technological University, United States; Concordia University, Canada*

**11:15AM | Grid Voltage Harmonic Damping Method for SPC based Power Converters with Multiple Virtual Admittance Control**
Andres Tarrasó, Jose Ignacio Candela, Joan Rocabert and Pedro Rodriguez, *Technical University of Catalonia, Spain; Universidad de Loyola, Spain*

**11:40AM | Adaptive Control of Grid-Connected Inverters based on Real-Time Measurements of Grid Impedance: DQ-Domain Approach**
R. Luhtala, T. Messo, T. Reinikka, J. Sihvo, T. Roinila and M. Vilkko, *Tampere University of Technology, Finland*

**12:05PM | Improve the Robustness of Digitally-Controlled LCL-Filtered Inverters against Grid Impedance Variation with a Lag Compensator**
Yuying He, Xuehua Wang and Xinbo Ruan. *Huazhong University of Science and Technology, China*

## S4 Applications of MMC

*Room: 203*
**Chairs:** Maryam Saeedifard, Vito Giuseppe Monopoli

**10:50AM | An MMC-based Topology using DHB Power Channels for Load Balancing in 50 Hz Railway Applications**
Andreas Zafeiropoulos, Antonios Antonopoulos and Jan R. Svensson, *ABB Corporate Research, Sweden*

**11:15AM | Communication Network Latency Compensation in Modular Multilevel Converters**
Tomás P. Corrêa, Emilio J. Bueno and Francisco J. Rodriguez, *University of Alcalá, Spain*

**11:40AM | Analysis and Mitigation of AC Coupling Effects on Overhead Line of Modular Multilevel Converter (MMC) based HVDC Transmission System**
Joon-Hee Lee, Jae-Jung Jung and Seung-Ki Sul, *Seoul National University, Korea*

**12:05PM | A Novel Pilot Protection Scheme for MMC-HVDC Transmission Lines**
Lianying Ning, Xiaodong Zheng, Nengling Tai, Wentao Huang, Jinyi Chen and Zhongyu Wu, *Shanghai Jiao Tong University, China; Shanghai Pudong Electric Power Corporation, China; MISO, United States*

## S5 Inductive Power Transfer for EV Charging

*Room: 232*
**Chairs:** Suman Debnath, Daniel Ludois

**10:50AM | An Analytical Method to Calculate Winding Resistance for Planar Coil with Ferrite Plate and Litz Wire in Inductive Power Transfer**
Ming Lu and Khai D.T. Ngo, *Virginia Polytechnic Institute and State University, United States*

**11:15AM | Comparative Evaluation of Front and Back End PFC IPT Systems for a Contactless Battery Charger**
Ander Avila, Asier Garcia-Bediaga, Ugaitz Iruretagoyena, Irma Villar and Alejandro Rujas, *IK4-Ikerlan Technology Research Centre, Spain*

**11:40AM | Field Attenuation around Inductive-Power-Transfer Coils with Dual-Side-Controlled Converter**
Ming Lu and Khai D.T. Ngo, *Virginia Polytechnic Institute and State University, United States*

**12:05PM | Power Factor Correction Focusing on Magnetic Coupling of Parallel-connected Wires for Inductive Power Transfer System**
Keita Furukawa, Keisuke Kusaka and Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

## S6 Single-Phase DC/AC Converters I

*Room: 230/31*
**Chairs:** Adam Skorek, Feng Gao

**10:50AM | Mode Selection Strategy for Multi-Mode Power Converters to Minimize its Differential Power**
R. Ramos, I. Zubitur, D. Serrano, J.A. Oliver, P. Alou and J.A. Cobos, *Universidad Politécnica de Madrid, Spain*

**11:15AM | Investigation of Single-Phase Multilevel Inverter based on Series/Parallel-Connected H-Bridges**
Antonio de P.D. Queiroz, Cursino B. Jacobina, Ayslan C.N. Maia, Victor F.M.B. Melo and Ivan da Silva, *Federal University of Campina Grande, Brazil; Federal Institute of Paraíba, Brazil; Federal Institute of Alagoas, Brazil; Federal Institute of Pernambuco, Brazil*

**11:40AM | Design and Implementation of a DC-AC Inverter with Zero-Voltage-Switching**
Hsin-Ju Liu, Tsorng-Juu Liang, Kuan-Ho Liu and Kai-Hui Chen, *National Cheng Kung University, Taiwan*

**12:05PM | A Hybrid Two-Four Leg H-Bridge Inverter**
Abinadabe S. Andrade and Edison R.C. da Silva, *Federal Institute of Paraiba, Brazil*

## S7 Multi-Phase DC/AC Converters I

*Room: 204*
**Chairs:** David Diaz Reigosa, Marcello Pucci

**10:50AM | Critical-Mode-based Soft-Switching Modulation for Three-Phase Inverters**
Zhengrong Huang, Zhengyang Liu, Fred C. Lee, Qiang Li and Furong Xiao, *Virginia Polytechnic Institute and State University, United States; Beijing Institute of Technology, China*

**11:15AM | Implementing Synchronous DC Link Voltage Control with Phase Skipping on a Three-Phase Microinverter using Minimum DC Link Capacitance**
S. Milad Tayebi, Siddhesh Shinde, Michael Pepper, Haibing Hu and Issa Batarseh, *University of Central Florida, United States*

**11:40AM | Differential-Mode and Zero Sequence Circulating Current Reduction for Paralleled Inverters with Modified Zero-CM PWM Algorithm**
Zewei Shen, Dong Jiang, Jianan Chen and Ronghai Qu, *Huazhong University of Science and Technology, China*

**12:05PM | MPC-SVM Method with Subdivision Strategy for Current Ripples Reduction and Neutral-Point Voltage Balance in Three-Level Inverter**
Hyun-Cheol Moon, June-Seok Lee, June-Hee Lee and Kyo-Beum Lee, *Ajou University, Korea; Korea Railroad Research Institute, Korea*

## S8 DC/DC Converters I

*Room: 201*
**Chairs:** Philip Krein, Santanu Mishra

**10:50AM | Experimental Verification of a Bidirectional Chopper for Battery Energy Storage Systems Capable of Reduction in Size and Weight of an Inductor**
Haruna Ohnishi and Makoto Hagiwara, *Tokyo Institute of Technology, Japan*

**11:15AM | Magnetic Structure of Close-Coupled Inductors to Improve the Thermal Handling Capability in Interleaved DC-DC Converter**
Thai Hoang Chuong, Shota Kimura, Daigoro Ebisumoto, Mostafa Noah, Masataka Ishihara, Masayoshi Yamamoto, Jun Imaoka and Wilmar Martinez, *Shimane University, Japan; Okayama University, Japan; Nagoya University, Japan; Kyushu University, Japan; Toyota Technological Institute, Japan*

**11:40AM | Integrated Switched Coupled-Inductor Boost-Flyback Converter**
Xinping Ding, Dailing Yu, Yingjie Song and Bicui Xue, *Qingdao University of Technology, China; Jinan University, China*

**12:05PM | Energy Efficient Visible Light Communication Transmitter based on the Split of the Power**
Juan Rodriguez, Daniel G. Aller, Diego G. Lamar and Javier Sebastian, *University of Oviedo, Spain*

## S9 Modeling and Control of Resonant Converters

*Room: 200*
**Chairs:** Gerry Moschopoulos, Rivas-davila Juan

**10:50AM | Resonant LLC Bus Conversion using Homopolarity Width Control**
Mehdi Mohammadi and Martin Ordonez, *University of British Columbia, Canada*

**11:15AM | Dual-Loop Controller for LLC Resonant Converters using an Average Equivalent Circuit**
Franco Degioanni, Ignacio Galiano Zurbriggen and Martin Ordonez, *University of British Columbia, Canada*

**11:40AM | Modeling Resonant Converters in a Rotating Coordinate**
Yi-Hsun Hsieh and Fred C. Lee, *Virginia Polytechnic Institute and State University, United States*

**12:05PM | Closed-Loop Control of Impedance Control Network Resonant DC-DC Converter**
Jie Lu, Ashish Kumar and Khurram K. Afridi, *University of Colorado-Boulder, United States*

## S10 Modeling and Control of Power Factor Correction Converters

*Room: 205*
**Chairs:** Aleksandar Prodic, Huai Wang

**10:50AM | A Discontinuous Boost Power Factor Correction Conduction Loss Model**
Yanqi Yu, Wilson Eberle and Fariborz Musavi, *University of British Columbia, Canada; Washington State University, United States*

**11:15AM | Digital Control of an Interleaved BCM Boost PFC Converter with Fast Transient Response at Low Input Voltage**
Robert T. Ryan, John G. Hayes, Richard Morrison and Diarmuid Hogan, *University College Cork, Ireland; Excelsys Technologies, Ireland*

**11:40AM | New Modulated Carrier Control Method for Power Factor Correction Rectifier**
Jintae Kim, Dong-Wook Yoo and Chung-Yuen Won, *Sungkyunkwan University, Korea; Korea Electrotechnology Research Institute, Korea*

**12:05PM | Efficiency Evaluation of Three-Phase SiC Power Factor Correction Rectifier with Different Controllers**
Alireza Kouchaki and Morten Nymand, *University of Southern Denmark, Denmark*

## S11 Induction Machines I

*Room: 264*
**Chairs:** Andrea Cavagnino, Renato Lyra

**10:50AM | Induction Machine Design for Dynamic Loss Minimization along Driving Cycles for Traction Applications**
Yuying Shi and Robert D. Lorenz, *University of Wisconsin-Madison, United States*

**11:15AM | Impact of Core Material Grades on Performance of Variable Speed Induction Motors Fed by Inverters**
Katsumi Yamazaki, Koki Tanaka and Motomichi Ohto, *Chiba Institute of Technology, Japan; Yaskawa Motor Corp., Japan*

**11:40AM | Electrical Monitoring of Mechanical Defects in Induction Motor Driven V-Belt-Pulley Speed Reduction Couplings**
Tae-June Kang, Chanseung Yang, Yonghyun Park, Sang Bin Lee and Mike Teska, *Korea University, Korea; SKF Condition Monitoring Center, United States*

**12:05PM | A Simple Method for Determining Equivalent Circuit Parameters of Double-Cage Induction Motors from No-Load and Locked-Rotor Tests**
Shu Yamamoto, Hideaki Hirahara, Akira Tanaka and Takahiro Ara, *Polytechnic University, Japan*

## S12: Axial Flux Machines

*Room: 263*
**Chairs:** Akira Chiba, Giulio De Donato

**10:50AM | An Axial Flux-Focusing Magnetically Geared Motor**
M. Bahrami Kouhshahi, J.Z. Bird, V. Acharya, K. Li, M. Calvin and W. Williams, *Portland State University, United States; University of North Carolina at Charlotte, United States*

**11:15AM | Design of a Novel Interior Permanent Magnet Axial Flux Machine**
Burak Tekgun, Tausif Husain, Shuvajit Das, Yilmaz Sozer and Marv Hamdan, *University of Akron, United States; Bendix Commercial Vehicle Systems, United States*

**11:40AM | A Comparative Study of Coreless and Conventional Axial Flux Permanent Magnet Synchronous Machines Designed for Low and High Speed Operation**
Narges Taran, Vandana Rallabandi, Dan M. Ionel and Greg Heins, *University of Kentucky, United States; Regal Beloit Corporation, Australia*

**12:05PM | Comparison of Dual Structure Axial Flux-Switching Permanent Magnet Machines**
Ju Hyung Kim, Mingda Liu, Hao Ding and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

## S13 Control of Electric Drives I

*Room: 262*
**Chairs:** Roberto Petrella, Hinkkanen Marko

**10:50AM | Optimal Torque Control of Synchronous Motor Drives: Plug-and-Play Method**
Hafiz Asad Ali Awan, Zhanfeng Song, Seppo E. Saarakkala and Marko Hinkkanen, *Aalto University, Finland; Tianjin University School of Electrical and Information Engineering, China*

**11:15AM | Self-Commissioning Technique for High Bandwidth Servo Motor Drives**
Yen-Shin Lai and Min-Hsien Ho, *National Taipei University of Technology, Taiwan*

**11:40AM | A Geometrical Linearization Approach for Salient-Pole PMSM Optimal Voltage/Current Constrained Control over Whole Speed Range**
Li Yang, Rui Gao, Wensong Yu and Iqbal Husain, *North Carolina State University, United States*

**12:05PM | Algebraic Weighting Factor Selection for Predictive Torque and Flux Control**
Tobias Geyer, *ABB Corporate Research, Switzerland*

## S14 Diagnostics and Fault Tolerant Systems in Drives

*Room: 260/61*
**Chairs:** Giacomo Scelba, Antonio J. Marques Cardoso

**10:50AM | Faulted Phase Location Identification for Adjustable Speed Drives in High Resistance Grounding System**
Jiangang Hu, Lixiang Wei, Jeffrey McGuire and Zhijun Liu, *Rockwell Automation Inc., United States*

**11:15AM | Fault Analysis in an Inverter-Fed Nine-Phase Induction Machine**
Tamires Santos de Souza, Rodrigo Rodrigues Bastos and Braz J. Cardoso Filho, *Federal University of Minas Gerais, Brazil*

**11:40AM | Fault Detection and Tolerant Capability of Parallel Connected Permanent Magnet Machines under Stator Turn Fault**
Shih-Chin Yang, Yu-Liang Hsu, Po-Huan Chou, Cheng-Xin Liu, Guan-Ren Chen and Kang Li, *National Taiwan University, Taiwan; Feng Chia University, Taiwan; Industrial Technology Research Institute, Taiwan*

**12:05PM | Comparison of Open-Phase Fault Detection for Permanent Magnet Machine Drives using Different Fault Signals**
Shih-Chin Yang, Yu-Liang Hsu, Po-Huan Chou, Da-Ren Jian and Guan-Ren Chen, *National Taiwan University, Taiwan; Feng Chia University, Taiwan; Industrial Technology Research Institute, Taiwan*

## S15 GaN Switching Performance

*Room: 207/208*
**Chairs:** Enrico Santi, Muhammad Nawaz

**10:50AM | Analysis of Oscillation in Bridge Structure Based on GaN Devices and Ferrite Bead Suppression Method**
Fangwei Zhao, Yan Li, Qing Tang and Lu Wang, *Beijing Jiaotong University, China*

**11:15AM | Switching Transient Analysis for Normally-Off GaN Transistors with p-GaN Gate in a Phase-Leg Circuit**
Ruiliang Xie, Guangzhao Xu, Xu Yang, Hanxing Wang, Mofan Tian, Yidong Tian, Feng Zhang, Wenjie Chen, Laili Wang and Kevin J. Chen, *Xi'an Jiaotong University, China; Hong Kong University of Science and Technology, Hong Kong*

**11:40AM | Optimization of the Balance between the Gate-Drain Capacitance and the Common Source Inductance for Preventing the Oscillatory False Triggering of Fast Switching GaN-FETs**
Ryunosuke Matsumoto, Kazuhiro Umetani and Eiji Hiraki, *Okayama University, Japan*

**12:05PM | Static and Dynamic Characterization of a GaN-on-GaN 600 V, 2 A Vertical Transistor**
Amy Romero, Christina DiMarino, Rolando Burgos, Ray Li, Mary Chen, Yu Cao and Rongming Chu, *Virginia Polytechnic Institute and State University, United States; HRL Laboratories LLC, United States*

## S16 Magnetics I

*Room: 206*
**Chairs:** David Perreault, Ruxi Wang

**10:50AM | Medium Frequency Transformer Leakage Inductance Modeling and Experimental Verification**
Marko Mogorovic and Drazen Dujic, *EPFL, Switzerland*

**11:15AM | Continuum Modeling of Inductor Hysteresis and Eddy Current Loss Effects in Resonant Circuits**
Jason Pries, Lixin Tang and Tim Burress, *Oak Ridge National Laboratory, United States*

**11:40AM | Characterization of Magnetoresistors for Contactless Current Sensing in Power Electronic Applications**
Shahriar Jalal Nibir, Hossein Niakan and Babak Parkhideh, *University of North Carolina at Charlotte, United States*

**12:05PM | Trapezoidal Characterization of Magnetic Materials with a Novel Dual Voltage Test Circuit**
Richard Beddingfield, Paras Vora, David Storelli and Subhashish Bhattacharya, *North Carolina State University, United States*

**Monday, October 2 2:00PM – 4:05PM**

## S17 Power Conversion for Solar Photovoltaic Systems II

*Room: 236*
**Chairs:** Pedro Rodriguez, Lixiang Wei

**2:00PM | Three-Phase DC-DC PWM Boost Converter for Renewable Energy Applications**
Adel Ali Abosnina and Gerry Moschopoulos, *Western University, Canada*

**2:25PM | Power Command Compensation Structure to Improve the Dynamic Performance for Single Phase Transformer-Less Photovoltaic Inverters with Dynamic Power Decoupling**
Yinglai Xia, Ziwei Yu and Raja Ayyanar, *Texas Instruments, United States; Arizona State University, United States*

**2:50PM | A Novel Model Predictive Control for Single-Phase Grid-Connected Photovoltaic Inverters**
Esmaeil Zangeneh Bighash, Seyed Mohammad Sadeghzadeh, Esmaeil Ebrahimzadeh, Yongheng Yang and Frede Blaabjerg, *Shahed University, Iran; Aalborg University, Denmark*

**3:15PM | Power Pulsation Decoupling for a Two-Stage Single-Phase Photovoltaic Inverter with Film Capacitor**
Jianwu Zeng, Meixian Zhuo, Hao Cheng, Taesic Kim, Vincent Winstead and Liangcai Wu, *Minnesota State University, United States; Growatt New Energy Technology Co. Ltd., China; Texas A&M University-Kingsville, United States*

**3:40PM | Differential Power Processing of Photovoltaic Systems for High Energy Capture and Reduced Cost**
Mohamed Badawy and Yilmaz Sozer, *San Jose State University, United States; University of Akron, United States*

## S18 Power Converter Topologies for Renewable Energy

*Room: 233*
**Chairs:** Mohammad B. Shadmand, Tiefu Zhao

**2:00PM | Soft-Switching Isolated Tri-Port Converter for Integration of PV, Storage and Single-Phase AC Grid**
Nishant Bilakanti, Liran Zheng, Rajendra Prasad Kandula, Karthik Kandasamy and Deepak Divan, *Georgia Institute of Technology, United States*

**2:25PM | Power-Loss Analysis in 3-Level TNPC Inverters: Modulation Effects**
Emanuel Serban, Cosmin Pondiche and Martin Ordonez, *Schneider Electric, Canada; University of British Columbia, Canada*

**2:50PM | Modeling and Design for Integrated Coupled Inductors in Interleaved Three-Level DC/DC Converters**
Ruiyang Qin and Fred C. Lee, *Delta Products Corporation, United States; Virginia Polytechnic Institute and State University, United States*

**3:15PM | Design Considerations of a Full-Bridge Modular Multilevel Converter under Variable DC Link Voltage**
Ahmed Allu, Milijana Odavic and Kais Atallah, *University of Sheffield, United Kingdom*

**3:40PM | Geometry Optimization and Characterization of Three-Phase Medium Frequency Transformer for 10kVA Isolated DC-DC Converter**
Youngsil Lee, Gaurang Vakil, Alan J. Watson and Patrick W. Wheeler, *University of Nottingham, United Kingdom*

## S19 Renewable Impacts in Industrial Microgrids

*Room: 237/38*
**Chairs:** Marco Liserre, Giovanna Oriti

**2:00PM | High-Speed Algorithm for Renewable Energy based Microgrid Fault Detection and Protective Coordination**
Hashim A. Al Hassan, Qiang Fu, Vijay Bhavaraju, Yi Yang and Brandon M. Grainger, *University of Pittsburgh, United States; Eaton, United States*

**2:25PM | Increasing the Robustness of Islanded CERTS Microgrids with PV Microsources and Gensets during Dynamic Overload Conditions**
Zhe Chen, Mitch Marks and T.M. Jahns, *University of Wisconsin-Madison, United States*

**2:50PM | A Wind Energy Battery Charging System with Dynamic Current Limitation**
Guilherme de C. Farias, João V.M. Caracas, José G. de Matos and Luiz A. de S. Ribeiro, *Enova Energia, Brazil; Universidade Federal do Maranhão, Brazil*

**3:15PM | A Fast Fault Protection based on Direction of Bus-Side Capacitor Discharge Current for a High-Surety Power Supply**
Haijin Li, Min Chen, Boping Yang, Frede Blaabjerg and Dehong Xu, *Zhejiang University, China; Aalborg University, Denmark*

**3:40PM | A First Approach for the Energy Management System in DC Micro-Grids with Integrated RES of Smart Ships**
Angelo Accetta and Marcello Pucci, *ISSIA-CNR, Italy*

## S20 Control Aspects of Electified Vehicles

*Room: 232*
**Chairs:** Jin Ye, Ian Brown

**2:00PM | Control Strategies for a High Frequency DC-DC Converter for Electrified Vehicles**
Xin Jing, Brian A. Welchko, Constantin Stancu and Peter J. Savagian, *General Motors Company, United States*

**2:25PM | Maximum Efficiency Control Strategy of PM Traction Machine Drives in GM Hybrid and Electric Vehicles**
Brian Gallert, Gilsu Choi, Kibok Lee, Xin Jing and Yochan Son, *General Motors Company, United States*

**2:50PM | Optimal Performance of a Full Scale Li-Ion Battery and Li-Ion Capacitor Hybrid Energy Storage System for a Plug-In Hybrid Vehicle**
Phillip Kollmeyer, Mackenzie Wootton, John Reimers, Tyler Stiene, Ephrem Chemali, Megan Wood and Ali Emadi, *McMaster University, Canada*

**3:15PM | Hybrid Balancing in a Modular Battery Management System for Electric-Drive Vehicles**
Fan Zhang, M. Muneeb Ur Rehman, Regan Zane and Dragan Maksimovic, *University of Colorado-Boulder, United States; Utah State University, United States*

**3:40PM | Development of Compact Power Control Unit for HEVs**
Shinya Yano, Yasushi Nakayama, Hiroshi Kobayashi, Seiki Hiramatsu, Motoru Yoshida, Kohei Onda, Komei Hayashi and Koji Yamazaki, *Mitsubishi Electric Corp., Japan*

## S21 Multi-Phase DC/AC Converters II

*Room: 204*
**Chairs:** Parag Kshirsagar, Grahame Holmes

**2:00PM | A Three-Phase Grid-Connected Inverter Equipped with a Shunt Instantaneous Reactive Power Compensator**
Kazuto Takagi and Hideaki Fujita, *Tokyo Institute of Technology, Japan*

**2:25PM | A New Three-Level Three-Phase Boost PWM Inverter**
Yam P. Siwakoti, Stephan Liese, Jian Guo Zhu and Frede Blaabjerg, *University of Technology Sydney, Australia; Fraunhofer-Institute for Solar Energy Systems, Germany; Aalborg University, Denmark*

**2:50PM | A Sine-Like Hysteresis Current Control Method in Application of Three-Phase Voltage Source Converter**
Hongyan Zhao, Yan Li, Trillion Q. Zheng, Xianjin Huang, Fangwei Zhao, Haobo Guo and Zhenning Zi, *Beijing Jiaotong University, China; State Grid Electric Power Research Institute, China*

**3:15PM | Evaluation of Modulation Techniques to Eliminate Neutral Point Oscillation of the Four Pole NPC Converter**
Meng-jiang Tsai and Po-tai Cheng, *National Tsing Hua University, Taiwan*

**3:40PM | Y-Connected Topologies Composed of Three Three-Leg Converters with Two-Level and Three-Level Legs**
Rodrigo P. de Lacerda, Edgard L.L. Fabricio, Cursino B. Jacobina, Marício B.R. Correa and Ivan da Silva, *Federal University of Campina Grande, Brazil; Federal Institute of Paraíba, Brazil*

## S22 Single-Phase DC/AC Converters II

*230/31*
**Chairs:** Madhav Manjrekar, Vladimir Blasko

**2:00PM | Loss Reduction of 13.56 MHz Inverter based on Frequency Multiplying Method**
Koji Orikawa, Satoshi Ogasawara and Jun-ichi Itoh, *Hokkaido University, Japan; Nagaoka University of Technology, Japan*

**2:25PM | A Bridge Modular Switched-Capacitor-based Multilevel Inverter**
Liangzong He, Chen Cheng, Jixiao Nai and Wenxiang Chen, *Xiamen University, China*

**2:50PM | Pulse Energy Modulation for a Single-Phase Bridge Inverter with Power Decoupling Capability**
Shuang Xu, Liuchen Chang and Riming Shao, *University of New Brunswick, Canada*

**3:15PM | A High Control Bandwidth Design Method for Aalborg Inverter under the Weak Grid Condition**
Weimin Wu, Cong Zou, Houqing Wang, Min Huang, Frede Blaabjerg and Henry Shu-Hung Chung, *Shanghai Maritime University, China; Aalborg University, Denmark; City University of Hong Kong, Hong Kong*

**3:40PM | A Comprehensive Analysis of DC-Link Current for Single Phase H-Bridge Inverter Under Harmonic Output Currents**
Tao Wang and Shuai Lu, *Chongqing University, China*

## S23 Power Quality Control

*Room: 205*
**Chairs:** Zheng Wang, Tsorng-Juu Liang

**2:00PM | Single-Phase AC-DC-AC Topology for Grid Voltage Compensation**
Nayara B. de Freitas, Cursino B. Jacobina and Rodrigo P. de Lacerda, *Federal University of Campina Grande, Brazil*

**2:25PM | Single-Phase AC-DC-AC Multilevel Converter for Grid Overvoltage based on an H-Bridge Connected in Series to the Five-Leg Converter**
Antonio de P.D. Queiroz, Cursino B. Jacobina, Ayslan C.N. Maia, Victor F.M.B. Melo, Nayara B. de Freitas and Gregory A. de A. Carlos, *Federal University of Campina Grande, Brazil; Federal Institute of Paraíba, Brazil; Federal Institute of Alagoas, Brazil; Federal Institute of Pernambuco, Brazil*

**2:50PM | Effects of DC-Link Filter on Harmonic and Interharmonic Generation in Three-phase Adjustable Speed Drive Systems**
Hamid Soltani, Pooya Davari, Dinesh Kumar, Firuz Zare and Frede Blaabjerg, *Aalborg University, Denmark; Danfoss Drives A/S, Denmark; University of Queensland, Australia*

**3:15PM | Control System for Shunt Active Power Filters with Adaptive Voltage Saturation**
Albino Amerise, Michele Mengoni, Luca Zarri, Angelo Tani, Giovanni Serra and Domenico Casadei, *University of Bologna, Italy*

**3:40PM | Research on Improved Hybrid Power Quality Conditioner for VV Co-Phase Railway Power Supply System**
Chenmeng Zhang, Jianming Li, Xishan Wen, Baichao Chen, Jiaxin Yuan, Wenli Fei and Mangmang Chen, *State Grid Sichuan Electric Power Research Institute, China; Wuhan University, China; Southwest Electric Power Design Institute, China*

## S24 Modeling and Control of Multilevel Converters

*Room: 200*
**Chairs:** Yongdong Li, Vito Giuseppe Monopoli

**2:00PM | A Distributed Control Technique for the Multilevel Cascaded Converter**
Ping-heng Wu, Yu-chen Su and Po-tai Cheng, *National Tsing Hua University, Taiwan*

**2:25PM | A Capacitor Voltage Balancing Method for a Three Phase Modular Multilevel DC-DC Converter**
Mingming Jiang, Shuai Shao, Kuang Sheng and Junming Zhang, *Zhejiang University, China*

**2:50PM | Modeling and Suppression of Circulating Currents for Multi-Paralleled Three-Level T-Type Inverters**
Zicheng Zhang, Alian Chen, Xiangyang Xing, Ke Li, Chunshui Du and Chenghui Zhang, *Shandong University, China*

**3:15PM | GA Optimized SHE PWM Hybrid Cascaded H-Bridge Multilevel Inverter with Capacitor Voltage Balancing**
Abhinandan Routray, R.K. Singh and R. Mahanty, *Indian Institute of Technology, India*

**3:40PM | Resilient Two Dimensional Redundancy based Fault-Tolerant Controller Array for Modular Multi-Level Converters**
Ali Azidehak, Rajat Agarwal, Nima Yousefpoor, Alexander G. Dean and Subhashish Bhattacharya, *North Carolina State University, United States*

## S25 Switched Reluctance Machines

*Room: 263*
**Chairs:** Davide Barater, Iqbal Husain

**2:00PM | A Fast Control-Integrated and Multiphysics-based Multi-Objective Design Optimization of Switched Reluctance Machines**
Sufei Li, Shen Zhang, Chen Jiang, J. Rhett Mayor, Thomas G. Habetler and Ronald G. Harley, *Georgia Institute of Technology, United States; University of KwaZulu-Natal, South Africa*

**2:25PM | Acoustic Noise Mitigation for High Pole Count Switched Reluctance Machines through Skewing Method with Multiphysics FEA Simulations**
Yusuf Yasa, Mohammed Elamin, Yilmaz Sozer, John Kutz, Joshua S. Tylenda and Ronnie L. Wright, *University of Akron, United States; DCS Corporation, United States; US Army, United States*

**2:50PM | Investigation of Torque Ripple in Switched Reluctance Machines with Errors in Current and Position Sensing**
Cong Ma, Rakesh Mitra, Prerit Pramod and Rakib Islam, *Nexteer Automotive Corp., United States*

**3:15PM | Comparison of Current Waveforms for Noise Reduction in Switched Reluctance Motors**
Jihad Furqani, Masachika Kawa, Kyohei Kiyota, and Akira Chiba, *Tokyo Institute of Technology, Japan*

**3:40PM | Simultaneous Optimization of Geometry and Firing Angles of In-Wheel Switched Reluctance Motor**
Bahareh Anvari and Hamid A. Toliyat, *Texas A&M University, United States*

## S26 Induction Machines II

*Room: 264*
**Chairs:** Renato Lyra, Nicola Bianchi

**2:00PM | Induction Machine Efficiency Measurement using a Variable Frequency Drive Source**
Emmanuel Agamloh, Andrea Cavagnino and Silvio Vaschetto, *Advanced Energy Corp., United States; Politecnico di Torino, Italy*

**2:25PM | Frequency, Load, and Flux Impacts on Induction Machine Copper and Core Losses in the qd0-Frame**
Yiqi Liu and Ali M. Bazzi, *University of Connecticut, United States*

**2:50PM | Induction Machine Rapid Performance Tests**
Maher Al-Badri, Pragasen Pillay and Pierre Angers, *Concordia University, Canada; Hydro-Quebec, Canada*

**3:15PM | Nonintrusive Efficiency Estimation for Large Power and High Voltage Induction Motors**
Haisen Zhao, Pengyu Li, Geng Chen, Yilong Wang, Yang Zhan, Guorui Xu and Xiaofang Liu, *North China Electric Power University, China*

**3:40PM | Separation of Slip- and High-Frequency Flux Densities and its Application in Rotor Iron Loss Fine Analysis of Induction Motors**
Haisen Zhao, Bing Li, Wang Yilong Yang Zhan, Guorui Xu and Dong Dong Zhang, *North China Electric Power University, China; Xian Jiaotong University, China*

## S27 Medium Voltage Drives and High Power Drives

*Room: 260/61*
**Chairs:** Navid Zargari, Shih-Chin Yang

**2:00PM | Assessment of Medium Voltage SiC MOSFET Advantages in Medium Voltage Drive Application**
Hanning Tang and Alex Q. Huang, *North Carolina State University, United States*

**2:25PM | High-Speed Medium Voltage (MV) Drive Applications Enabled by Series Connection of 1.7 kV SiC MOSFET Devices**
Kasunaidu Vechalapu, Samir Hazra, Utkarsh Raheja, Abhay Negi and Subhashish Bhattacharya, *North Carolina State University, United States*

**2:50PM | Integrated Motor Drive Design for Weight Optimization**
Benjamin Cheong, Paolo Giangrande, Michael Galea, Pericle Zanchetta and Patrick Wheeler, *University of Nottingham, United Kingdom*

**3:15PM | DC Current Balance with Common-Mode Voltage Reduction for Parallel Current Source Converters**
Li Ding and Yun Wei Li, *University of Alberta, Canada*

**3:40PM | Position Sensorless Control of a Permanent Magnet Linear Motor Connected through a Long Cable**
Hussain A. Hussain and Hamid A. Toliyat, *Texas A&M University, United States*

## S28 Sensorless Drives I

*Room: 262*
**Chairs:** Fernando Briz, Abraham Gebregergis

**2:00PM | Sensorless Speed Measurement for n-Phase Induction Machines under Open-Phase Fault by Means of Rotor Slot Harmonics**
Alejandro G. Yepes, Jesús Doval-Gandoy, Fernando Baneira and Hamid Toliyat, *University of Vigo, Spain; Texas A&M University, United States*

**2:25PM | Analysis on the Position Estimation Error in Position-Sensorless Operation using Pulsating Square Wave Signal Injection**
Chae-Eun Hwang, Younggi Lee and Seung-Ki Sul, *Seoul National University, Korea*

**2:50PM | Enhanced Methodology for Injection-based Real-Time Parameter Estimation to Improve Back-EMF Self-Sensing in Induction Machine Deadbeat-Direct Torque and Flux Control Drives**
Kang Wang, Robert D. Lorenz and Noor Aamir Baloch, *University of Wisconsin-Madison, United States; Yaskawa Electric Corporation, Japan*

**3:15PM | Compensation of Position Estimation Error for Precise Position-Sensorless Control of IPMSM based on High-Frequency Pulsating Voltage Injection**
Younggi Lee, Yong-Cheol Kwon, Seung-Ki Sul, Noor Aamir Baloch and Shinya Morimoto, *Seoul National University, Korea; Yaskawa Electric Corporation, Japan*

**3:40PM | Full Torque-Range Low-Speed Sensorless Drive for Heavily Saturated IPMSMs by Manipulation of Convergence Point**
Yong-Cheol Kwon, Joohyun Lee and Seung-Ki Sul, *Seoul National University, Korea*

## S29 Magnetics II

*Room: 206*
**Chairs:** Shashank Krishnamurthy, Shuo Wang

**2:00PM | A High-Reliable Magnetic Design Method for Three-Phase Coupled Inductor used in Interleaved Multi-Phase Boost Converters**
Jun Imaoka, Kenkichiro Okamoto, Masahito Shoyama, Mostafa Noah, Shota Kimura and Masayoshi Yamamoto, *Kyushu University, Japan; Shimane University, Japan*

**2:25PM | Design and Additive Manufacturing of Multi-Permeability Magnetic Cores**
L. Liu, C. Ding, S. Lu, T. Ge, Y. Yan, Y. Mei, K.D.T. Ngo and G-Q. Lu, *Virginia Polytechnic Institute and State University, United States; Tianjin University, China*

**2:50PM | Influence of Switching Frequency and Saturation of the Magnetic Material on the Volume of Common-Mode Inductors used in Power Converter EMI Filters**
Bilel Zaidi, Arnaud Videt and Nadir Idir, *University of Lille, France*

**3:15PM | Variable Inductor Modeling Revisited: The Analytical Approach**
J. Marcos Alonso, Marina Perdigão, Marco A. Dalla Costa, Shu Zhang and Yijie Wang, *University of Oviedo, Spain; University of Coimbra, Portugal; Federal University of Santa Maria, Brazil; Harbin Institute of Technology, China*

**3:40PM | Winding and Air Gap Configurations for Power Inductors to Reduce Near Magnetic Field Emission**
Huan Zhang, Shuo Wang and Qinghai Wang, *University of Florida, United States; Huawei Technologies Co., Ltd., China*

## S30 SiC Converter Applications

*Room: 207/208*
**Chairs:** Jean-Luc Schanen, Yuxiang Shi

**2:00PM | Impact of Next-Generation 1700V SiC MOSFETs in a 125kW PV Converter**
Jon Zhang, Fenton L. Rees, Brett Hull, Jeffrey B. Casady, Scott Allen and John W. Palmour, *Wolfspeed, a Cree Company, United States; F.L. Rees and Associates, United States*

**2:25PM | Operation of Planar and Trench SiC MOSFETs in a 10kW DC/DC-Converter Analyzing the Impact of the Body Diode**
Abdullah Eial Awwad and Sibylle Dieckerhoff, *Technical University of Berlin, Germany*

**2:50PM | High Efficiency Power Converter with SiC Power MOSFETs for Pulsed Power Application**
Ruxi Wang, Juan Sabate, Xiaohu Liu and Krishna Mainali, *GE Global Research Center, United States; Busek Co., Inc., United States*

**3:15PM | Influence of SiC Technology in a Railway Traction DC-DC Converter Design Evolution**
Alejandro Rujas, Víctor M. López, Asier García-Bediaga, Aloña Berasategi and Txomin Nieva, *IK4-Ikerlan. Power Electronics Area, Spain; CAF Power and Automotion, Spain*

**3:40PM | Design of a 250 kW, 1Room: 200 V SiC MOSFET-based Three-Phase Inverter by Considering a Subsystem Level Design Optimization Approach**
Ajith H. Wijenayake, Kraig J. Olejniczak, David Simco, Stephen Minden, Matthew Feurtado, Brandon Passmore, Ty McNutt, Alex Lostetter and Daniel Martin, *Wolfspeed, A Cree Company, United States*

## S31 Wireless Power Transfer I

*Room: 203*
**Chairs:** Huang-jen Chiu, Yaow-Ming Chen

**2:00PM | Tunable Impedance Matching Network based on Phase-Switched Impedance Modulation**
Alexander S. Jurkov, Aaron Radomski and David J. Perreault, *Massachusetts Institute of Technology, United States; MKS Instruments Inc., United States*

**2:25PM | Design 13.56MHz 10 kW Resonant Inverter using GaN HEMT for Wireless Power Transfer Systems**
Nguyen Kien Trung and Kan Akatsu, *Shibaura Institute of Technology, Japan*

**2:50PM | An Optimized Frequency and Phase Shift Control Strategy for Constant Current Charging and Zero Voltage Switching Operation in Series-Series Compensated Wireless Power Transmission**
Yongbin Jiang, Junwen Liu, Xiufang Hu, Laili Wang, Yue Wang and Gaidi Ning, *Xi'an Jiaotong University, China*

**3:15PM | High-Power-Transfer-Density Capacitive Wireless Power Transfer System for Electric Vehicle Charging**
Sreyam Sinha, Brandon Regensburger, Kate Doubleday, Ashish Kumar, Saad Pervaiz and Khurram K. Afridi, *University of Colorado-Boulder, United States*

**3:40PM | Modeling and Analysis of Wireless Power Transfer System with Constant-Voltage Source and Constant-Current Load**
Yiming Zhang, Zhengming Zhao and Ye Jiang, *Missouri University of Science and Technology, United States; Tsinghua University, China*

**Tuesday, October 3 8:30AM – 10:10AM**

## S44 Harmonic Compensation Techniques for Microgrids

*Room: 233*
**Chairs:** Dehong Mark Xu, Frede Blaabjerg

**8:30AM | A Unified Selective Harmonic Compensation Strategy using DG-Interfacing Inverter in both Grid-Connected and Islanded Microgrid**
Qicheng Huang and Kaushik Rajashekara, *University of Houston, United States*

**8:55AM | Active Suppression of Photovoltaic System Related Harmonics in a DC Micro Grid**
R. Alsharif , M. Odavic and K. Atallah, *University of Sheffield, United Kingdom*

**9:20AM | A Novel Harmonic Current Sharing Control Strategy for Parallel-Connected Inverters**
Yajuan Guan, Josep M. Guerrero, Mehdi Savaghebi, Juan C. Vasquez and Wei Feng, *Aalborg University, Denmark; Tsinghua University, China*

**9:45AM | Harmonic Current Control for LCL-Filtered VSCs Connected to Ultra-Weak Grids**
Xiongfei Wang, Dongsheng Yang and Frede Blaabjerg, *Aalborg University, Denmark*

## S45 Power Converters for HVDC Grids

*Room: 203*
**Chairs:** Dianguo Xu, Brandon Grainger

**8:30AM | Asymmetric Mixed Modular Multilevel Converter Topology in Bipolar HVDC Transmission Systems**
Jae-Jung Jung, Joon-Hee Lee and Seung-Ki Sul, *Seoul National University, Korea*

**8:55AM | Dynamic Performance and Fault-Tolerant Capability of a TLC-MMC Hybrid DC-DC Converter for Interconnection of MVDC and HVDC Grids**
Shenghui Cui, Nils Soltau and Rik W. De Doncker, *RWTH Aachen University, Germany*

**9:20AM | Efficient Modeling of Hybrid MMCs for HVDC Systems**
Lei Zhang, Jiangchao Qin, Di Shi and Zhiwei Wang, *Arizona State University, United States; GEIRI North America, United States*

**9:45AM | A New Hybrid Modular Multilevel Converter with Increased Output Voltage Levels**
Mahendra B. Ghat, Anshuman Shukla and Ebin Cherian Mathew, *Indian Institute of Technology Bombay, India; Power Grid Corporation of India Ltd., India*

## S46 Solid State Transformers

*Room: 237/38*
**Chairs:** Alex Huang, Rolando Burgos

**8:30AM | A Switched-Winding Transformer with Low Quiescent Loss to Meet the Level VI Efficiency Standard at High Power Density**
Weston D. Braun, Minjie Chen and David J. Perreault, *Massachusetts Institute of Technology, United States; Princeton University, United States*

**8:55AM | A Winding Method of High Frequency High Voltage Transformer**
Junpeng Ji, Xingxia Zhang, Wenjie Chen, Shaoliang An and Xu Yang, *Xi'an University of Technology, China; Xi'an Jiaotong University, China*

**9:20AM | Comparison of Voltage Control Methods of CHB Converters for Power Routing in Smart Transformer**
Vivek Raveendran, Giampaolo Buticchi, Marco Liserre and Alessandro Mercante, *Christian-Albrechts-Universität zu Kiel, Germany; Wärtsilä Italia S.p.A, Italy*

**9:45AM | Generalized Average Modeling of DC Subsystem in Solid State Transformers**
Jacob A. Mueller and Jonathan W. Kimball, *Missouri University of Science and Technology, United States*

## S47 Power Conversion for Solar Photovoltaic Systems III

*Room: 236*
**Chairs:** Wuhua Li, Rajeev Kumar Singh

**8:30AM | A Distributed Active and Reactive Power Control Strategy for Balancing Grid-tied Cascaded H-Bridge PV Inverter System**
Hamidreza Jafarian, Namwon Kim and Babak Parkhideh, *University of North Carolina at Charlotte, United States*

**8:55AM | Advanced Photovoltaic Inverter Control Development and Validation in a Controller-Hardware-in-the-Loop Test Bed**
Kumaraguru Prabakar, Mariko Shirazi, Akanksha Singh and Sudipta Chakraborty, *National Renewable Energy Laboratory, United States*

**9:20AM | DC Link Side Current Control of Inverters based on Integer Programming**
O. Salari, A. Nazemi, A. Bakhshai, K. Hashtrudi Zaad and P. Jain, *Queen's University, Canada*

**9:45AM | GaN-based High Gain Soft Switching Coupled-Inductor Boost Converter**
Jinia Roy, Yinglai Xia and Raja Ayyanar, *Arizona State University, United States; Texas Instruments, United States*

## S48 Multi-Phase AC/DC Converters

*Room: 204*
**Chairs:** Fernando Briz, Norma Anglani

**8:30AM | Soft-Switching Parameter Design for an Isolated Three-Phase AC/DC Converter**
Kazuma Suzuki, Wataru Kitagawa and Takaharu Takeshita, *Nagoya Institute of Technology, Japan*

**8:55AM | Dynamic and Control Analysis of Modular Multi-Parallel Rectifiers (MMR)**
Firuz Zare, Arindam Ghosh, Pooya Davari and Frede Blaabjerg, *University of Queensland, Australia; Curtin University, Australia; Aalborg University, Denmark*

**9:20AM | A Reconfigurable Three- and Single-Phase AC/DC Non-Isolated Bi-Directional Converter for Multiple Worldwide Voltages**
Daniel F. Opila, Eun Oh, Keith Kintzley and Jedediah Lomax, *United States Naval Academy, United States*

**9:45AM | High-Frequency Link AC/DC Converter using Matrix Converter with Soft-Switching Technique**
Yuto Matsui, Kazuma Suzuki and Takaharu Takeshita, *Nagoya Institute of Technology, Japan*

## S49 DC/DC Converters II

*Room: 201*
**Chairs:** Dushan Borojevic, Grant Pitel

**8:30AM | A High Gain Non-Isolated Soft-Switching Bidirectional DC-DC Converter with PPS Control**
Hyeonju Jeong, Minho Kwon and Sewan Choi, *Seoul National University of Science and Technology, Korea*

**8:55AM | An Investigation on Zero-Voltage-Switching Condition in Synchronous-Conduction-Mode Buck Converter**
Chih-Shen Yeh, Xiaonan Zhao and Jih-Sheng Lai, *Virginia Polytechnic Institute and State University, United States*

**9:20AM | Single-Wing Resonant Multilevel Converter Featuring Reduced Number of Resonant Inductors**
Boris Curuvija, Yanchao Li, Xiaofeng Lyu and Dong Cao, *North Dakota State University, United States*

**9:45AM | Dual Active Bridge with Triple Phase Shift by obtaining Soft Switching in all Operation Range**
C. Calderon, A. Barrado, A. Rodriguez, A. Lazaro, C. Fernandez and P. Zumel, *Universidad Carlos III de Madrid, Spain*

## S50 Single-Phase Grid Connected Converters

*230/31*
**Chairs:** Diego G. Lamar, Andrea Formentini

**8:30AM | Trapezium Current Mode (TPCM) Boundary Operation for Single Phase Grid-Tied Inverter**
JianTao Zhang, Rene A. Barrera-Cardenas, Takanori Isobe and Hiroshi Tadano, *University of Tsukuba, Japan*

**8:55AM | Leakage Current Suppression and Ripple Power Reduction for Transformer-less Single-Phase Photovoltaic Inverters**
Xin Li, Zhongting Tang, Mei Su, Qi Zhu, Yonglu Liu and Yao Sun, *Central South University, China*

**9:20AM | ZVRT Capability of Minimized-LCL-Filter-based Single-Phase Grid-Tied Inverter with High-Speed Gate-Block**
Satoshi Nagai, Keisuke Kusaka and Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

**9:45AM | DC to Single-phase AC Grid-Tied Inverter using Buck Type Active Power Decoupling without Additional Magnetic Component**
Jun-ichi Itoh, Tomokazu Sakuraba, Hiroki Watanabe and Nagisa Takaoka, *Nagaoka University of Technology, Japan*

## S51 Sensorless Methods and State and Parameter Estimation

*Room: 205*
**Chairs:** Yongsug Su, Maurizio Cirrincione

**8:30AM | Online Equivalent Series Resistance Estimation Method for Condition Monitoring of DC-Link Capacitors**
Sundararajan Prasanth, Mohamed Halick Mohamed, Sathik, Firman Sasongko, Tan Chuan Seng, Mohd Tariq and Rejeki Simanjorang, *Nanyang Technological University, Singapore; Rolls-Royce Singapore Pte. Ltd., Singapore*

**8:55AM | A Novel Current Estimation Technique for Digital Controlled Switching Converters Operating in CCM and DCM**
Rajat Channappanavar and Santanu Mishra, *Indian Institute of Technology Kanpur, India*

**9:20AM | Distributed Balancing Control for Modular Multilevel Series/Parallel Converter with Capability of Sensorless Operation**
Zhongxi Li, Ricardo Lizana, Angel V. Peterchev and Stefan M. Goetz, *Duke University, United States; Universidad Católica de la Santisima Concepcion, Chile*

**9:45AM | A Novel Approach to the Grid Inductance Estimation based on Second Order Generalized Integrators**
Javier Moriano, Victor Bermejo, Emilio Bueno, Mario Rizo and Ana Rodriguez, *University of Alcalá, Spain; Gamesa Electric, Spain*

## S52 Modeling and Control of Modular Multilevel Converter

*Room: 200*
**Chairs:** Hirofumi Akagi, Navid Zargari

**8:30AM | Optimal Submodule Capacitor Sizing for Modular Multilevel Converters with Common Mode Voltage Injection and Circulating Current Control**
Ziwei Ke, Jianyu Pan, Karun Potty, William Perdikakis, Arvind Shanmuganaatham, Muneer Al Sabbagh, Julia Zhang, Fang Luo, Jin Wang and Longya Xu, *Ohio State University, United States*

**8:55AM | A New Insertion Index Selection Method to Control Modular Multilevel Converters**
Mohammad Sleiman, Luc-André Gregoire, Handy Fortin-Blanchette, Hadi Kanaan and Kamal Al-Haddad, *École de Technologie Supérieure, Canada; OPAL-RT Technologies Inc., Canada; Saint-Joseph University, Lebanon*

**9:20AM | A Modified Circulating Current Suppressing Strategy for Nearest Level Control based Modular Multilevel Converter**
Xingxing Chen, Jinjun Liu, Shaodi Ouyang, Shuguang Song and Hongda Wu, *Xi'an Jiaotong University, China*

**9:45AM | Independent Positive- and Negative-Sequence Control for MMC-SAPF with Unbalanced PCC Voltage**
Chengjing Li, Ke Dai, Derong Lin, Chen Xu, Cai Chen and Ziwei Dai*Huazhong University of Science and Technology, China; Rensselaer Polytechnic Institute, United States*

## S53 Large Synchronous Machines

*Room: 263*
**Chairs:** Ayman El-Refaie, Mohammad Islam

**8:30AM | Design of Field-Oriented-Control-based Brushless, Self-Excited Synchronous Field-Winding Machine with Combined Finite Element/Rectifier Model**
Abdi Zeynu and Heath Hofmann, *University of Michigan, United States*

**8:55AM | Analysis of Magnetic Forces and Vibration in a Converter-Fed Synchronous Hydrogenerator**
Mostafa Valavi, Arne Nysveen, Roy Nilsen, Jean Le Besnerais and Emile Devillers, *Norwegian University of Science and Technology, Norway; EOMYS Engineering, France*

**9:20AM | Performance Improvement of Simplified Synchronous Generators using an Active Power Filter**
Al-Hussein Abu-Jalala, Tom Cox, Chris Gerada, Mohamed Rashed, Tahar Hamiti and Neil Brown, *University of Nottingham, United Kingdom; VEDECOM Institute, France; Cummins Power Generation, United Kingdom*

**9:45AM | Reducing MMF Harmonics and Core Loss Effect of Non-Overlap Winding Wound Rotor Synchronous Machine (WRSM)**
Karen S. Garner and Maarten J. Kamper, *Stellenbosch University, South Africa*

## S54 Synchronous Reluctance Machines I

*Room: 264*
**Chairs:** Robert D. Lorenz, Dan Ionel

**8:30AM | The Loss of Self-Excitation Capability in Stand-Alone Synchronous Reluctance Generators**
Maged Ibrahim and Pragasen Pillay, *Concordia University, Canada*

**8:55AM | Reluctance Synchronous Wind Generator Design Optimisation in the Megawatt, Medium Speed Range**
Eduan Howard and Maarten J. Kamper, *Stellenbosch University, South Africa*

**9:20AM | Choice of Flux-Barriers Position in Synchronous Reluctance Machines**
Giacomo Bacco and Nicola Bianchi, *University of Padova, Italy*

**9:45AM | Investigation of Torque Production and Torque Ripple Reduction Method for 6-Stator/7-Rotor-Pole Variable Flux Reluctance Machines**
Beomseok Lee, Z.Q. Zhu and L.R. Huang, *University of Sheffield, United Kingdom*

## S55 Sensorless Drives II

*Room: 260/61*
**Chairs:** Fabio Giulii Capponi, David Diaz Reigosa

**8:30AM | Extending Low Speed Self-Sensing via Flux Tracking with Volt-Second Sensing**
Yang Xu, Yukai Wang, Ryo Iida and Robert D. Lorenz, *University of Wisconsin-Madison, United States; Toshiba Mitsubishi-Electric Industrial, Japan*

**8:55AM | Pseudo-Sensorless Control of PMSM with Linear Hall-Effect Sensor**
Seung-Tae Lee, Young-Kyoun Kim and Jin Hur, *Incheon National University, Korea; Osan University, Korea*

**9:20AM | Current Derivative Estimation by Using AMR Current Sensor and its Application in Sensorless Control of an IPMSM Drive**
D.Q. Guan, D. Xiao, M.X. Bui and M.F. Rahman, *University of New South Wales, Australia*

**9:45AM | Sensorless Commissioning of Synchronous Reluctance Machines Augmented with High Frequency Voltage Injection**
Paolo Pescetto and Gianmario Pellegrino, *Politecnico di Torino, Italy*

## S56 PM and IPM Motor Drives I

*Room: 262*
**Chairs:** Ramakrishnan Rajavenkitasubramony, Davide Barater

**8:30AM | Self-Adaptation of MTPA Tracking Controller for IPMSM and SynRM Drives based on On-Line Estimation of Loop Gain**
Nicola Bedetti, Sandro Calligaro and Roberto Petrella, *Gefran S.p.A., Italy; Free University of Bozen, Italy; University of Udine, Italy*

**8:55AM | Control Method of PMSM Driving System with Small DC-Link Capacitor**
Xi Xiao, Shubei Zhang, Youshuang Ding and Yuyang Song, *Tsinghua University, China*

**9:20AM | Enabling Driving Cycle Loss Reduction in Variable Flux PMSMs via Closed-Loop Magnetization State Control**
Apoorva Athavale, Daniel J. Erato and Robert D. Lorenz, *University of Wisconsin-Madison, United States*

**9:45AM | Analysis and Design of IPMSM Drive System based on Visualization Technique in Discrete Time Domain**
Haoyuan Li, Xing Zhang, Shuying Yang, Fei Li, Jian Yang and Pengpeng Cao, *Hefei University of Technology, China*

## S57 GaN Device and Gate Drive

*Room: 207/208*
**Chairs:** Daniel Costinett, Chenhao Nan

**8:30AM | Active Gate Current Control for Non-Insulating-Gate WBG Device**
He Li, Yousef M. Abdullah, Chengcheng Yao, Xiaodan Wang and Jin Wang, *Ohio State University, United States*

**8:55AM | Crosstalk Suppression in a 650-V GaN FET Bridge-Leg Converter using 6.7-GHz Active Gate Driver**
Jianjing Wang, Dawei Liu, Harry C.P. Dymond, Jeremy J.O. Dalton and Bernard H. Stark, *University of Bristol, United Kingdom*

**9:20AM | A 1-MHz Leakage-Compensating Bootstrap Driver for Normally-On Depletion-Mode GaN FET**
Yoontaek Lee, Sangwoo Han and Jaeha Kim, *Seoul National University, Korea; Hongik University, Korea*

**9:45AM | Applications and Characterization of Four Quadrant GaN Switch**
Utkarsh Raheja, Ghanshyamsinh Gohil, Kijeong Han, Sayan Acharya, B. Jayant Baliga, Subhashish Bhattacharya, Michelle Labreque, Peter Smith and Rakesh Lal, *North Carolina State University, United States; Transphorm Inc., United States*

## S58 Wide Band Gap Device Reliability

*Room: 206*
**Chairs:** Jerry Hudgins, Tanya Gachovska

**8:30AM | Ron Increase in GaN HEMTs – Temperature or Trapping Effects**
Jan Böcker, Carsten Kuring, Marvin Tannhäuser and Sibylle Dieckerhoff, *Technische Universität Berlin, Germany; Siemens AG, Germany*

**8:55AM | Short-Circuit Ruggedness Assessment of a 1.2 kV/180 A SiC MOSFET Power Module**
Claudiu Ionita, Muhammad Nawaz, Kalle Ilves, and Francesco Iannuzzo, *ABB Corporate Research, Sweden; Aalborg University, Denmark*

**9:20AM | Prognosis of Enhance Mode Gallium Nitride High Electron Mobility Transistors using On-State Resistance as a Fault Precursor**
Moinul Shahidul Haque and Seungdeog Choi, *University of Akron, United States*

**9:45AM | E-Mode GaN HEMT Short Circuit Robustness and Degradation**
He Li, Xiao Li, Xiaodan Wang, Jin Wang, Yazan Alsmadi, Liming Liu and Sandeep Bala, *Ohio State University, United States; Jordan University of Science and Technology, Jordan; ABB Corporate Research, United States*

# Wednesday, October 4 — 8:30AM – 10:10AM

## S84 Wind Energy Systems

*Room: 236*
Dinesh Kumar, Wei Qiao

**8:30AM | Field Excitation Scheme using a Machine-Side 4-Leg Converter in MW-Range WRSG Wind Turbine Systems**
Yongsug Suh and Thomas A. Lipo, *Chonbuk National University, Korea; University of Wisconsin-Madison, United States*

**8:55AM | Modeling and Control of Interconnected Wind Turbine Drivetrains**
Mohsen Farbood, Elaheh Taheran Fard, Mokhtar Sha-Sadeghi, Afshin Izadian and Taher Niknam, *Shiraz University of Technology, Iran; Purdue School of Engineering and Technology, United States*

**9:20AM | Medium Voltage Power Conversion Architecture for High Power PMSG based Wind Energy Conversion System (WECS)**
Sayan Acharya, Samir Hazra, Kasunaidu Vechalapu and Subhashish Bhattacharya, *North Carolina State University, United States*

**9:45AM | A Universal Multiple-Vector-based Model Predictive Direct Power Control for Doubly Fed Induction Generators**
Yongchang Zhang, Donglin Xu and Dong Jiang, *North China University of Technology, China; Huazhong University of Science and Technology, China*

## S85 Droop Control in Microgrids

*Room: 233*
Sara Ahmed, Amir Yaznadi

**8:30AM | Breaking the Boundary: A Droop and Master-Slave Hybrid Control Strategy for Parallel Inverters in Islanded Microgrids**
Shike Wang, Zeng Liu, Jinjun Liu, Ronghui An and Meng Xin, *Xi'an Jiaotong University, China*

**8:55AM | Hybrid Impedance-based Modelling and Stability Analysis of IMG-PICDPS**
Meiqin Mao, Yong Ding, Yatao Shen and Liuchen Chang, *Hefei University of Technology, China*

**9:20AM | A Hybrid Adaptive Droop Control Technique with Embedded DC-Bus Voltage Regulation for Single-Phase Microgrids**
Sajjad M. Kaviri, Hadis Hajebrahimi, Majid Pahlevani, Praveen Jain and Alireza Bakhshai, *Queen's University, Canada; University of Calgary, Canada*

**9:45AM | Enforcing Coherency in Droop-Controlled Inverter Networks through use of Advanced Voltage Regulation and Virtual Impedance**
Philip J. Hart, R.H. Lasseter and T.M. Jahns, *University of Wisconsin-Madison, United States*

## S86 Grid Connected Converter Stability

*Room: 237/38*
Johan HR Enslin, Suryanarayana Doolla

**8:30AM | Stabilization of Grid-Connected Inverter System with Feed-Forward Control**
Toshiji Kato, Kaoru Inoue and Yusuke Nakajima, *Doshisha University, Japan*

**8:55AM | Impedance-based Stability Criterion for Multiple Offshore Inverters Connected in Parallel with Long Cables**
Xin Zhang, Henry Shu-Hung Chung, Ling Ling Cao, Jeff Po Wa Chow and Weimin Wu, *Nanyang Technological University, Singapore; City University of Hong Kong, Hong Kong; Hong Kong Polytechnic University, Hong Kong; Shanghai Maritime University, China*

**9:20AM | DAH-FF Approach to Improve the Current Quality and Stability of the LCL Type Grid-Connected Inverter**
Xin Zhang, Henry Shu-hung Chung, Yuan-Bin He, Chun-Tak Lai and Weimin Wu, *Nanyang Technological University, Singapore; City University of Hong Kong, Hong Kong; Hangzhou Dianzi University, China; Shanghai Maritime University, China*

**9:45AM | Power Factor Correction Capacitors for Multiple Parallel Three-Phase ASD Systems: Analysis and Resonance Damping**
Yongheng Yang and Frede Blaabjerg, *Aalborg University, Denmark*

## S87 Control and Modulation of Multi-Phase AC/DC Converters

*Room: 204*
Adam Skorek, Dong Cao

**8:30AM | Direct Power Control of PWM Rectifier with Elimination of DC Voltage Oscillations and Current Harmonics under Unbalanced Network**
Yongchang Zhang, Jie Liu, Jihao Gao and Haitao Yang, *North China University of Technology, China; University of Technology Sydney, Australia*

**8:55AM | Improved SVPWM Schemes for Vienna Rectifiers without Current Distortion**
Houjian Xu, Wenxi Yao and Shuai Shao, *Zhejiang University, China*

**9:20AM | Improved Eight-Segment PWM Scheme with Non-Equally Distributed Zero-Vector Intervals for a Three-Phase Isolated Buck Matrix-Type Rectifier**
Jahangir Afsharian, Dewei Xu, Bin Wu, Bing Gong and Zhihua Yang, *Ryerson University, Canada; Murata Power Solution, Canada*

**9:45AM | A Modified SVPWM Strategy Applied to a Three-Phase Three-Port Bidirectional AC-DC Rectifier for Efficiency Enhancement**
Hongfei Wu, Tingting Liu, Tianyu Yang, Jiangfeng Wang, Shun Ding and Yan Xing, *Nanjing University of Aeronautics and Astronautics, China*

## S88 DC/DC Converter Topologies

*Room: 201*
Regan Zane, Wilson Eberle

**8:30AM | High Efficiency LC Resonant Boost Topology: Analysis and Design**
Hamed Valipour and Martin Ordonez, *University of British Columbia, Canada*

**8:55AM | A Zero-Voltage Switching, Physically Flexible Multilevel GaN DC-DC Converter**
Derek Chou, Yutian Lei and Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States*

**9:20AM | A Switched-Capacitor based High Conversion Ratio Converter for Renewable Energy Applications: Principle and Generation**
Kerui Li, Zhijian Yin, Yongheng Yang Huai Wang and Frede Blaabjerg, *Aalborg University, Denmark*

**9:45AM | Design of Very-High-Frequency Synchronous Resonant DC-DC Converter for Variable Load Operation**
Lei Gu, Wei Liang and Juan Rivas Davila, *Stanford University, United States*

## S89 AC-AC Converters I

*230/31*
Junichi Itoh, Lee Empringham

**8:30AM | A Ride-Through Method using Input-Filter Capacitors for Three-Level Indirect Matrix Converter based Open-End Winding Drive**
Santhosh Krishnamoorthi, Saurabh Tewari, Siddharth Raju, Abhijit Kshirsagar, Daniel Opila and Ned Mohan, *University of Minnesota, United States; MTS Systems Corporation, United States; United States Naval Academy, United States*

**8:55AM | A Family of Highly Reliable and Efficient Inductive-Link Universal Power Converters**
Khalegh Mozaffari and Mahshid Amirabadi, *Northeastern University, United States*

**9:20AM | Matrix Converter Open Circuit Fault Diagnosis with Asymmetric One Zero SVM**
Jiawei Zhang, Lee Empringham, Liliana De Lillo, Hanbing Dan and Patrick Wheeler, *University of Nottingham, United Kingdom*

**9:45AM | A Versatile Inductive-Link Three-Phase Converter Topology**
Khalegh Mozaffari and Mahshid Amirabadi, *Northeastern University, United States*

## S90 Reliability, Diagnostic, and Faults Analysis in Power Converters I

*Room: 205*
Ke Ma, Marco Liserre

**8:30AM | An Active Capacitor with Self-Power and Internal Feedback Control Signals**
Haoran Wang and Huai Wang, *Aalborg University, Denmark*

**8:55AM | Impacts of Rotor Current Control Targets on DC-Link Capacitor Lifetime in DFIG-based Wind Turbine during Grid Voltage Unbalance**
Holger Jedtberg, Marius Langwasser, Rongwu Zhu, Giampaolo Buticchi and Marco Liserre, *Christian-Albrechts-Universität zu Kiel, Germany*

**9:20AM | Aging Assessment of Discrete SiC MOSFETs under High Temperature Cycling Tests**
Enes Ugur and Bilal Akin, *University of Texas at Dallas, United States*

**9:45AM | Live Condition Monitoring of Switching Devices using SSTDR Embedded PWM Sequence: A Platform for Intelligent Gate-Driver Architecture**
Sourov Roy and Faisal Khan, *University of Missouri-Kansas City, United States*

## S91 Design Optimization of Power Converters

*Room: 200*
Fred Wang, Arijit Banerjee

**8:30AM | Efficiency Optimization of DC-DC Solid State Transformer based on Modular Multilevel Converters**
Lei Zhang, Zhe Zhao and Jiangchao Qin, *Arizona State University, United States*

**8:55AM | Mission-Profile based Multi-Objective Optimization of Power Electronics Converter for Wind Turbines**
Ghanshyamsinh Gohil, Remus Teodorescu, Tamas Kerekes, Frede Blaabjerg and Subhashish Bhattacharya, *North Carolina State University, United States; Aalborg University, Denmark*

**9:20AM | Reducing Reverse Conduction and Switching Losses in GaN HEMT-based High-Speed Permanent Magnet Brushless DC Motor Drives**
Woongkul Lee, Di Han, Wooyoung Choi and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

**9:45AM | Design by Optimization Methodology: Application to a Wide Input and Output Voltage Ranges Interleaved Buck Converter**
Mylène Delhommais, Jean-Luc Schanen, Frédéric Wurtz, Cécile Rigaud and Sylvain Chardon, *Université Grenoble Alpes, France; TRONICO-ALCEN, France*

## S92 Thermal and Faults of Electric Machines

*Room: 263*
Yilmaz Sozer, Sang Bin Lee

**8:30AM | An Enhanced Active DC-Flux Injection based Approach for Thermal Monitoring of Induction Machines with Direct Torque Control Schemes**
Sufei Li, Shen Zhang, Chen Jiang, Lijun He and Ronald G. Harley, *Georgia Institute of Technology, United States; General Electric, United States; University of KwaZulu-Natal, South Africa*

**8:55AM | Comparison of Thermal Stresses Developed during Transients on a Damaged Rotor Cage**
Vicente Climente-Alarcon, Antero Arkkio and Jose A. Antonino-Daviu, *Aalto University, Finland; Universitat Politecnica de Valencia, Spain*

**9:20AM | A High-Frequency Torque Injection-Based Rotor Thermal Monitoring Scheme for Direct-Torque- Controlled Interior Permanent Magnet Synchronous Machines**
Shen Zhang, Sufei Li, Lijun He, José A. Restrepo and Thomas G. Habetler, *Georgia Institute of Technology, United States; GE Global Research, United States; Universidad Simón Bolívar, Venezuela*

**9:45AM | Evaluation of the Detectability of Rotor Faults and Eccentricities in Induction Motors via Transient Analysis of the Stray Flux**
Jose Antonino-Daviu, Alfredo Quijano-Lopez, Vicente Climente-Alarcon and Hubert Razik, *Universitat Politecnica de Valencia, Spain; Aalto University, Finland; Université Claude Bernard Lyon 1, France*

## S93 PM Machines and Windings

*Room: 264*
Abraham Gebregergis, Greg Heins

**8:30AM | Preliminary Study on Differences in the Performance Characteristics of Concentrated and Distributed Winding IPM Machines with Different Rotor Topologies**
Alireza Pouramin, Rukmi Dutta and M.F. Rahman, *University of New South Wales, Australia*

**8:55AM | Shaft-to-Frame Voltage Mitigation Method by Changing Winding-to-Rotor Parasitic Capacitance of IPMSM**
Jun-Kyu Park, Se-Hyun Rhyu and Jin Hur, *Korea Electronics Technology Institute (KETI), Korea; Incheon National University, Korea*

**9:20AM | Current Control Strategy for Dynamic Winding Reconfiguration of a Brushless DC Motor**
Florian Copt, Douglas Martins Araujo, Christian Koechli and Yves Perriard, *EPFL, Switzerland*

**9:45AM | Design and Analysis of a Low Cost and High Power Density PM-Assisted Synchronous Reluctance Machine for Automotive Electric Power Management**
Lei Hao, Murali Pandi, Chandra Mavuru, Chandra Namuduri, Avoki Omekanda and Thomas Nehl, *General Motors R&D Center, United States; General Motors India Technical Center, India*

## S94 Energy Efficient Motor Drives

*Room: 260/61*
Sayeed Mir, Gui-Jia Su

**8:30AM | Open-Ended Induction Motor Drive with a Floating Capacitor Bridge at Variable DC Link Voltage**
Albino Amerise, Michele Mengoni, Luca Zarri, Angelo Tani, Sandro Rubino and Radu Bojoi, *University of Bologna, Italy; Politecnico di Torino, Italy*

**8:55AM | Dynamic Loss Minimization Control of Linear Induction Machine**
Dong Hu, Wei Xu, Renjun Dian, Yi Liu and Jianguo Zhu, *Huazhong University of Science and Technology, China; University of Technology Sydney, Australia*

**9:20AM | Dynamic Loss Minimizing Control of a PM Servomotor Operating Even at the Voltage Limit when using DB-DTFC**
Huthaifa Flieh, Robert D. Lorenz, Eigo Totoki, Shinichi Yamaguchi and Yuichiro Nakamura, *University of Wisconsin-Madison, United States; Mitsubishi Electric Corp., Japan*

**9:45AM | Comparison of Postfault Control Strategies in Terms of Converter Losses for Dual Three-Phase Machines**
Fernando Baneira, Jesús Doval-Gandoy, Alejandro G. Yepes, Óscar López and Diego Pérez-Estévez, *University of Vigo, Spain*

## S95 Induction Motor Drives

*Room: 262*
Marcello Pucci, Jingbo Liu

**8:30AM | A Three-Dimensional Predictive Current Trajectory Control Method for Open-End Winding Induction Motor**
Bohang Zhu and Kaushik Rajashekara, *University of Texas at Dallas, United States; University of Houston, United States*

**8:55AM | Comparison of Steady-State Induction Motor-Drive Efficiency Control Schemes**
Andrew Strandt and Lixiang Wei, *Rockwell Automation, United States*

**9:20AM | Model Predictive Direct Flux Vector Control of Multi Three-Phase Induction Motor Drives**
S. Rubino, R. Bojoi, S.A. Odhano and P. Zanchetta, *Politecnico di Torino, Italy; University of Nottingham, United Kingdom*

**9:45AM | Open-End Six-Phase Machine Drive System with Six Three-Leg Converters**
Nayara B. de Freitas, Cursino B. Jacobina, Victor F.M.B. Melo, Bruna S. Gehrke and Louelson A.L. de A.C. Costa, *Federal University of Campina Grande, Brazil; Federal Institute of Pernambuco, Brazil*

## S96 Packaging I

*Room: 207/208*
Jelena Popovic, Zhuxian Xu

**8:30AM | Bonding of Large Substrates by Silver Sintering and Characterization of the Interface Thermal Resistance**
Shan Gao, Zhenwen Yang, Yansong Tan, Xin Li, Xu Chen, Zhan Sun and Guo-Quan Lu, *Virginia Polytechnic Institute and State University, United States; Tianjin University, China; Harbin Institute of Technology, China*

**8:55AM | A High Power-Density and High Efficiency Insulated Metal Substrate based GaN HEMT Power Module**
Juncheng Lu, Di Chen and Lyubov Yushyna, *GaN Systems Inc., Canada*

**9:20AM | A High Power Density Multichip Phase-Leg IGBT Module with Void-Free Die Attachment using Nanosilver Paste**
Shancan Fu, Yunhui Mei, Xin Li and Guo-Quan Lu, *Tianjin University, China; Virginia Polytechnic Institute and State University, United States*

**9:45AM | Paralleling 650 V/ 60 A GaN HEMTs for High Power High Efficiency Applications**
Nidhi Haryani, Jun Wang and Rolando Burgos, *Virginia Polytechnic Institute and State University, United States*

## S97 LED Drivers

*Room: 203*
S. Ali Khajehoddin, Marcos Alonso

**8:30AM | Application of Artificial Neural-Network to Control the Light of Multi-Color LED System**
Xiaoqing Zhan, Wenguan Wang and Henry Shu-hung Chung, *City University of Hong Kong, Hong Kong*

**8:55AM | GaN-based High-Power-Density Electrolytic-Free Universal Input LED Driver**
Saad Pervaiz, Ashish Kumar and Khurram K. Afridi, *University of Colorado-Boulder, United States*

**9:20AM | Forward-Flyback Converter for LED Driving with Reduced Number of Components**
Jong-Woo Kim, Jung-Muk Choe and Jih-Sheng Lai, *Virginia Polytechnic Institute and State University, United States*

**9:45AM | High Frequency DC-DC AC-LED Driver based on ZCS-QRCs**
Ignacio Castro, Sergio Lopez, Kevin Martin, Manuel Arias, Diego G. Lamar and Javier Sebastian, *University of Oviedo, Spain*

**Wednesday, October 4 10:30AM – 12:10PM**

## S98 Wind Energy Applications

*Room: 236*
Nathan Weise, Eduard Muljadi

**10:30AM | Wind Turbine Bearing Fault Diagnosis based on Sparse Representation of Condition Monitoring Signals**
Jun Wang, Wei Qiao and Liyan Qu, *University of Nebraska-Lincoln, United States*

**10:55AM | Performance Evaluation of Slip Couplers with Spoke- and Surface-Mounted PM for Wind Energy Applications**
N. Dumakude and M.J. Kamper, *Stellenbosch University, South Africa*

**11:20AM | Small Signal Modeling of Wind Farms**
Esmaeil Ebrahimzadeh, Frede Blaabjerg, Xiongfei Wang, Claus Leth Bak, Torsten Lund, Gert K. Andersen, Carlos Gómez Suárez and Jens-Jacob Berg, *Aalborg University, Denmark; Vestas Wind Systems A/S, Denmark*

**11:45AM | Battery-Free Power Management Circuit for Impact-Type Micro Wind Piezoelectric Energy Harvester**
Nan Chen and Tingcun Wei, *Northwestern Polytechnical University, China*

## S99 Power Sharing Techniques in Microgrids

*Room: 233*
Koji Orikawa, Josep M. Guerrero

**10:30AM | A Proportional Harmonic Power Sharing Scheme for Hierarchical Controlled Microgrids Considering Unequal Feeder Impedances and Nonlinear Loads**
Hong Li, Yang Han, Ping Yang, Jingqi Xiong, Congling Wang and Josep M. Guerrero, *University of Electronic Science and Technology of China, China; Aalborg University, Denmark*

**10:55AM | Adaptive Synchronous Reference Frame Virtual Impedance Controller for Accurate Power Sharing in Islanded AC-Microgrids: A Faster Alternative to the Conventional Droop Control**
Carlos Andres Macana and Hemanshu R. Pota, *University of New South Wales, Australia*

**11:20AM | Decentralized Economical-Sharing Scheme for Cascaded AC Microgrids**
Lang Li, Huawen Ye, Zhangjie Liu, Hua Han, Yao Sun and Mei Su, *Central South University, China*

**11:45AM | Using Consensus Control for Reactive Power Sharing of Distributed Electric Springs**
Jie Chen, Shuo Yan and S.Y. Ron Hui, *University of Hong Kong, Hong Kong; Imperial College London, United Kingdom*

## S100 DC Circuit Breaker Design

*Room: 237/38*
Ty McNutt, Rob Cuzner

**10:30AM | Fault Discrimination using SiC JFET based Self-Powered Solid State Circuit Breakers in a Residential DC Community Microgrid**
Karthik Palaniappan, Willy Sedano, Nicholas Hoeft, Robert Cuzner and Z. John Shen, *University of Wisconsin-Milwaukee, United States; Illinois Institute of Technology, United States*

**10:55AM | Optimization of Operation Temperature of Gate Commutated Thyristors for Hybrid DC Breaker**
Gang Lyu, Jiapeng Liu, Wenpeng Zhou, Rong Zeng, Xueqiang Zhang and Patrick Palmer, *Tsinghua University, China; University of Cambridge, United Kingdom*

**11:20AM | A Topology of the Multi-Port DC Circuit Breaker for Multi-Terminal DC System Fault Protection**
Wenjun Liu, Fei Liu, Xiaoming Zha, Chao Chen and Tianyi Yu, *Wuhan University, China*

**11:45AM | Optimization of a Z-Source, Ultra-Fast Mechanically Switched, High Efficiency DC Circuit Breaker**
Landon Mackey, Md Rifat Kaisar Rachi, Chang Peng and Iqbal Husain, *North Carolina State University, United States*

## S101 LLC Converters

*Room: 204*
Regan Zane, Juan Rivas-Davila

**10:30AM | Efficiency Improvement of Three-Phase LLC Resonant Converter using Phase Shedding**
Sayed Abbas Arshadi, Martin Ordonez, Mehdi Mohammadi and Wilson Eberle, *University of British Columbia, Canada*

**10:55AM | LLC Synchronous Rectification using Homopolarity Cycle Modulation**
Mehdi Mohammadi and Martin Ordonez, *University of British Columbia, Canada*

**11:20AM | A Lagrangian Dynamics Model of Integrated Transformer Incorporated in a Multi-phase LLC Resonant Converter**
Mostafa Noah, Kazuhiro Umetani, Shun Endo, Hiraki Ishibashi, Jun Imaoka and Masayoshi Yamamoto, *Shimane University, Japan; Okayama University, Japan; Kyushu University, Japan; Nagoya University, Japan*

**11:45AM | DC/DC Fixed Frequency Resonant LLC Full-Bridge Converter with Series-Parallel Transformers for 10kW High Efficiency Aircraft Application**
Y.E. Bouvier, U. Borović, M. Vasić, J.A. Oliver, P. Alou, J.A. Cobos, F. Árevalo, J.C. García-Tembleque and J. Carmena, *Universidad Politecnica de Madrid, Spain; Indra Sistemas S.A., Spain*

## S102 AC-AC Converters II

*230/31*
Patrick Wheeler, Luca Zarri

**10:30AM | Improvement of the Input-Output Quality of Three-Level NPC Inverters with Small DC-Link**
Hyo-Chul In, Seok-Min Kim and Kyo-Beum Lee, *Ajou University, Korea*

**10:55AM | Transformer-based Single-Phase AC-DC-AC Topology for Grid Issues Mitigation**
Nayara B. de Freitas, Cursino B. Jacobina and Bruna S. Gehrke, *Federal University of Campina Grande, Brazil*

**11:20AM | Control of Solid-State-Transformer for Minimized Energy Storage Capacitors**
Takanori Isobe, Hiroshi Tadano, Zijin He and Yang Zou, *University of Tsukuba, Japan*

**11:45AM | Analysis and Design of LC Filters for the 5-Level 3-Phase Back to Back E-Type Converter**
Marco Di Benedetto, Alessandro Lidozzi, Luca Solero, Fabio Crescimbini and Petar J. Grbovic, *Roma Tre University, Italy; Huawei Technologies Dusseldorf GmbH, Germany*

## S103 Reliability, Diagnostic, and Faults Analysis in Power Converters II

*Room: 205*
Yilmaz Sozer, Mario Pacas

**10:30AM | Thermal Stress Mitigation by Active Thermal Control: Architectures, Models and Specific Hardware**
Alessandro Soldati, Fabrizio Dossena, Giorgio Pietrini, Davide Barater, Carlo Concari and Francesco Iannuzzo, *University of Parma, Italy; Aalborg University, Denmark*

**10:55AM | Impacts of PV Array Sizing on PV Inverter Lifetime and Reliability**
Ariya Sangwongwanich, Yongheng Yang, Dezso Sera and Frede Blaabjerg, *Aalborg University, Denmark*

**11:20AM | Reliability Metrics Extraction for Power Electronics Converter Stressed by Thermal Cycles**
Ke Ma, Ui-Min Choi and Frede Blaabjerg, *Shanghai Jiao Tong University, China; Aalborg University, Denmark*

**11:45AM | Study of PWM Frequency and its Impact to Adjustable Speed Drive Reliability**
Lixiang Wei, Jeffrey McGuire and Jiangang Hu, *Rockwell Automation, United States*

## S104 Modulation Techniques I

*Room: 201*
Babak Parkhideh, Minjie Chen

**10:30AM | Impact of Carrier Phase Shift PWM on the DC Link Current of Single and Interleaved Three-Phase Voltage Source Converters**
Zhongyi Quan and Yunwei Li, *University of Alberta, Canada*

**10:55AM | A DPWM-Controlled Three-Level T-Type Inverter for Photovoltaic Generation Considering Unbalanced Neutral-Point Voltage**
Mohammad M. Hashempour, Meng-Ying Yang and Tzung-Lin Lee, *National Sun Yat-sen University, Taiwan*

**11:20AM | Over-Modulation Associated to Flash Memory based Multi-Optimal PWM for Three-Phase Inverters**
Dorin O. Neacşu and Brad Lehman, *Northeastern University, United States; Technical University of Iasi, Romania*

**11:45AM | Stability Performance of Multi-connected Inverters with Global Synchronous Pulse Width Modulation**
Tao Xu and Feng Gao, *Shandong University, China*

## S105 Modeling and Control of Grid Connected Converters I

*Room: 260/61*
Paolo Mattavelli, Carl Ho

**10:30AM | Improved Resonant Current Controller for Grid-Tied Converters**
Diego Pérez-Estévez, Jesús Doval-Gandoy, Alejandro G. Yepes, Óscar López and Fernando Baneira, *University of Vigo, Spain*

**10:55AM | Filter Capacitor Current Estimation and Grid Current Control in LCL based Grid Connected Inverter**
Subhajyoti Mukherjee, Vikram Roy Chowdhury, Pourya Shamsi and Mehdi Ferdowsi, *Missouri University of Science and Technology, United States*

**11:20AM | A Dual Loop Current Control Structure with Improved Disturbance Rejection for Grid Connected Converters in the Synchronous Rotating Reference Frame**
Srinivas Gulur, Vishnu Mahadeva Iyer and Subhashish Bhattacharya, *North Carolina State University, United States*

**11:45AM | Multi-Frequency Current Controller for Grid-Tied Converters**
Diego Pérez-Estévez, Jesús Doval-Gandoy, Alejandro G. Yepes, Óscar López and Fernando Baneira, *University of Vigo, Spain*

## S106 Synchronous Reluctance Machines II

*Room: 263*
Ziaur Rahman, David Dorrell

**10:30AM | Synchronous Reluctance Motor with Concentrated Windings for IE4 Efficiency**
Matteo Gamba, Gianmario Pellegrino, Eric Armando and Simone Ferrari, *Politecnico di Torino, Italy*

**10:55AM | Carbon-Fiber Wrapped Synchronous Reluctance Traction Motor**
Kevin Grace, Steven Galioto, Karthik Bodla and Ayman El-Refaie, *General Electric, United States*

**11:20AM | A Novel Fabrication and Assembly Method for Synchronous Reluctance Machines**
Chirag Desai, Hetal Mehta and Pragasen Pillay, *Concordia University, Canada; Happy Engineering, India*

**11:45AM | High Speed Motors: A Comparison between Synchronous PM and Reluctance Machines**
Cristian Babetto, Giacomo Bacco, Grazia Berardi and Nicola Bianchi, *University of Padova, Italy*

## S107 Variable Flux PM Machines

*Room: 264*
Sang Bin Lee, Zi-Qiang Zhu

**10:30AM | Magnet Design Consideration of a Variable-Flux PM Machine**
Amirmasoud Takbash and Pragasen Pillay, *Concordia University, Canada*

**10:55AM | Comparative Study of Variable Flux Memory Machines with Parallel and Series Hybrid Magnets**
Hao Hua, Z.Q. Zhu, Adam Pride, Rajesh Deodhar and Toshinori Sasaki, *University of Sheffield, United Kingdom; IMRA Europe SAS, United Kingdom*

**11:20AM | Design of Variable Magnetization Pattern Machines for Dynamic Changes in the Back-EMF Waveform**
Ryoko Imamura, Teng Wu and Robert D. Lorenz, *University of Wisconsin-Madison, United States*

**11:45AM | Performance Assessment of Ferrite- and Neodymium-Assisted Synchronous Reluctance Machines**
Riccardo Leuzzi, Paolo Cagnetta, Francesco Cupertino, Simone Ferrari and Gianmario Pellegrino, *Politecnico di Bari, Italy; Politecnico di Torino, Italy*

## S108 PM and IPM Motor Drives II

*Room: 262*
Ali Bazzi, Prerit Pramod

**10:30AM | Permanent Magnet Synchronous Machine Drive Control using Analog Hall-Effect Sensors**
David Reigosa, Daniel Fernandez, Cristina Gonzalez, Sang Bin Lee and Fernando Briz, *University of Oviedo, Spain*

**10:55AM | A New Zero-Sequence Current Suppression Control Strategy for Five-Phase Open-Winding FTFSCW-IPM Motor Driving System**
Ronghua Cui, Ying Fan and Ming Cheng, *Southeast University, China*

**11:20AM | An Effective Voltage Control Loop for a Deep Flux-Weakening in IPM Synchronous Motor Drives**
Virginia Manzolini, Davide Da Ru and Silverio Bolognani, *University of Padova, Italy*

**11:45AM | Real-Time Disturbance Compensation Algorithm for the Current Control of PMSM Drives**
Milo De Soricellis, Davide Da Rù and Silverio Bolognani, *University of Padova, Italy; Robert Bosch GmbH, Germany*

## S109 Packaging II

*Room: 207/208*
Zhuxian Xu, Muhammad Nawaz

**10:30AM | A Novel Low Inductive 3D SiC Power Module based on Hybrid Packaging and Integration Method**
Zhizhao Huang, Yuxiong Li, Lichuan Chen, Yifan Tan, Cai Chen, Yong Kang and Fang Luo, *Huazhong University of Science and Technology, China; University of Arkansas, United States*

**10:55AM | Design of a Novel, High-Density, High-Speed 10 kV SiC MOSFET Module**
Christina DiMarino, Mark Johnson, Bassem Mouawad, Jianfeng Li, Dushan Boroyevich, Rolando Burgos, Guo-Quan Lu and Meiyu Wang, *Virginia Polytechnic Institute and State University, United States; University of Nottingham, United Kingdom*

**11:20AM | Flexible Epoxy-Resin Substrate based 1.2 kV SiC Half Bridge Module with Ultra-Low Parasitics and High Functionality**
Xin Zhao, Bo Gao, Yifan Jiang, Liqi Zhang, Sizhen Wang, Yang Xu, Kenji Nishiguchi, Yoshi Fukawa and Douglas C. Hopkins, *North Carolina State University, United States; Risho Kogyo Co,. Ltd, Japan; TOYOTech LLC, United States*

**11:45AM | New Industrial Module Package with Matched CTE Materials**
Mark Steiner, Eric Motto and John Donlon, *Powerex, Inc., United States*

## S110 Wireless Power Transfer II

*Room: 200*
ChunTaek Rim, Shuo Wang

**10:30AM | Achieving Low Magnetic Flux Density and Low Electric Field Intensity for an Inductive Wireless Power Transfer System**
Guangqi Zhu and Robert D. Lorenz, *University of Wisconsin-Madison, United States*

**10:55AM | FOM-rd Plane: An Effective Design and Analysis Methodology for Resonant Energy Link in Inductive Power Transfer**
Chae-Ho Jeong, Hee-Su Choi and Sung-Jin Choi, *University of Ulsan, Korea*

**11:20AM | Output Voltage Control for Series-Series Compensated Wireless Power Transfer System without Direct Feedback from Measurement or Communication**
Euihoon Chung, Gyu Cheol Lim, Jung-Ik Ha and Ki Young Kim, *Seoul National University, Korea; Samsung Electronics Co., Ltd., Korea*

**11:45AM | Magnetizable Concrete Composite Materials for Road-Embedded Wireless Power Transfer Pads**
Reza Tavakoli, A. Echols, U. Pratik, Zeljko Pantic, Fray Pozo, Amir Malakooti and Marc Maguire, *Utah State University, United States*

## S111 PV Plants and PV Farms

*Room: 236*
Rajapandian Ayyanar, Fei Gao

**2:00PM | AC Impedance Derivation of Utility Scale PV Farm**
Ye Tang, Rolando Burgos, Chi Li and Dushan Boroyevich, *Virginia Polytechnic Institute and State University, United States*

**2:25PM | A New Approach for Increasing Energy Harvest in Large Scale PV Plants Employing a Novel Voltage Balancing Topology**
Ahmed Salah Morsy, Sinan A. Sabeeh Al-Obaidi and Prasad Enjeti, *Texas A&M University, United States*

**2:50PM | On-Line Health Monitoring of PV Plants**
Matam Manjunath, B. Venugopal Reddy, Y. Zhao and Brad Lehman, *National Institute of Technology Goa, India; Northeastern University, United States*

**3:15PM | Hybrid Solar Plant with Synchronous Power Controllers Contribution to Power System Stability**
Daniel Remon, Antoni M. Cantarellas, Jorge Martinez-Garcia, Juan M. Escano and Pedro Rodriguez, *Technical University of Catalonia, Spain; Abengoa, Spain; Loyola University Andalusia, Spain*

## S112 Droop Techniques for Microgrid Operation

*Room: 233*
Rolando Burgos, Hui Li

**2:00PM | Comparison between Inverters based on Virtual Synchronous Generator and Droop Control**
Xin Meng, Zeng Liu, Jinjun Liu, Shike Wang, Baojin Liu and Ronghui An, *Xi'an Jiaotong University, China*

**2:25PM | Hybrid Isochronous-Droop Control for Power Management in AC Microgrids**
Inam Ullah Nutkani, Lasantha Meegahapola, Donald Grahame Holmes and Chee Shen Lim, *RMIT University, Australia; University of Southampton, Malaysia*

**2:50PM | Improved Droop Control Strategy based on Improved PSO Algorithm**
Zishun Peng, Jun Wang, Daqiang Bi, Z. John Shen, Yuxing Dai and Yeting Wen, *Hunan University, China; Tsinghua University, China*

**3:15PM | A Modified Q–V Droop Control for Accurate Reactive Power Sharing in Distributed Generation Microgrid**
Jiuyang Zhou and Po-Tai Cheng, *National Tsing Hua University, Taiwan*

## S113 Control in DC Microgrids

*Room: 237/38*
Tomislav Dragicevic, Xiaonan Lu

**2:00PM | Admittance-type RC-mode Droop Control to introduce Virtual Inertia in DC Microgrids**
Zheming Jin, Lexuan Meng, Renke Han, Josep M. Guerrero and Juan C. Vasquez, *Aalborg University, Denmark*

**2:25PM | Power-based Droop Control Suppressing the Effect of Bus Voltage Harmonics for DC Microgrids**
Guangyuan Liu, Tommaso Caldognetto, Paolo Mattavelli and Paolo Magnone, *University of Padova, Italy*

**2:50PM | Containment-based Distributed Coordination Control to Achieve Both Bounded Voltage and Precise Current Sharing in Reverse-Droop-based DC Microgrid**
Renke Han, Haojie Wang, Zheming Jin, Lexuan Meng and Josep M. Guerrero, *Aalborg University, Denmark; North China Electric Power University, China*

**3:15PM | A High-Efficiency Interleaved Single-Phase AC-DC Converter with Common-Mode Voltage Regulation for 380 V DC Microgrids**
Fang Chen, Rolando Burgos and Dushan Boroyevich, *Virginia Polytechnic Institute and State University, United States*

## S114 Resonant DC/DC Converters

*Room: 204*
Hongliang Wang, Aleksandar Prodic

**2:00PM | An Improved Voltage Balancing Technique for a Soft-Switched High-Gain Converter with Low Voltage Stress using Duty Ratio Control for Wind Energy Application**
Mehdi Abbasi and John Lam, *York University, Canada*

**2:25PM | A Power Converter for an Electrostatic Precipitator using SiC MOSFETs**
Pedro J. Villegas, Juan A. Martin Ramos, Juan Diaz Gonzalez and Juan A. Martinez Esteban, *University of Oviedo, Spain*

**2:50PM | A Hybrid Resonant Three-Level Converter for Renewable Energy in MVDC Collection Systems**
Guangfu Ning, Xiaopeng Cao, Liangcai Shu, Wu Chen and Baojian Ji, *Southeast University, China; Nanjing University of Technology, China*

**3:15PM | Time Domain Analysis of LLC Resonant Converters in the Boost Mode for Battery Charger Applications**
Navid Shafiei, Mohammad Ali Saket and Martin Ordonez, *University of British Columbia, Canada*

## S115 Modular Multilevel Converters (MMC)

*230/31*
Luca Solero, Rostan Rodrigues

**2:00PM | A Fault-Tolerant Operation Scheme for a Modular Multilevel Converter with a Distributed Control Architecture**
Shunfeng Yang, Yi Tang, Pengfei Tu and Peng Wang, *Nanyang Technological University, Singapore*

**2:25PM | Redistributed Pulse Width Modulation of MMC Battery Energy Storage System under Submodule Fault Condition**
Xin Gu, Feng Gao, Farooq Aamir, Xifeng Liu and Jing Xiao, *Shandong University, China; Shandong Electric Power Maintenance Company, China*

**2:50PM | Compensation Method of Arm Current Sensor Scaling Error in MMC System**
Belete Belayneh Negesse, Chang-Hwan Park and Jang-Mok Kim, *Pusan National University, Korea*

**3:15PM | A Novel Sub-module Topology for MMC against DC Side Short-Circuit Faults**
Yao Xue, Xiaofeng Yang, Trillion Q. Zheng, Bowei Chen and Yan Li, *Beijing Jiaotong University, China; Electric Power Research Institute, China*

## S116 Reliability, Diagnostic, and Faults Analysis for Power Devices

*Room: 205*
Behrooz Mirafzal, Jun Wang

**2:00PM | Fault Detection Method for IGBT Open-Circuit Faults in the Modular Multilevel Converter based on Predictive Model**
Kunshan Xu, Shaojun Xie, Ye Yan, Zhao Zhang, Binfeng Zhang and Qiang Qian, *Nanjing University of Aeronautics and Astronautics, China*

**2:25PM | Asymmetric Power Device Rating Selection for Even Temperature Distribution in NPC Inverter**
Ui-Min Choi and Frede Blaabjerg, *Aalborg University, Denmark*

**2:50PM | Impact of Lifetime Model Selections on the Reliability Prediction of IGBT Modules in Modular Multilevel Converters**
Yi Zhang, Huai Wang, Zhongxu Wang, Yongheng Yang and Frede Blaabjerg, *Aalborg University, Denmark*

**3:15PM | Open-circuit Fault Diagnosis of Switching Devices in a Modular Multilevel Converter with Distributed Control**
Shunfeng Yang, Yi Tang and Peng Wang, *Nanyang Technological University, Singapore*

## S117 Modulation Techniques II

*Room: 201*
Jason Lai, Martin Ordonez

**2:00PM | New Constraint in SHE-PWM for Single Phase Inverter Applications**
Mohammad Sharifzadeh, Hani Vahedi and Kamal Al-Haddad, *University du Quebec, Canada; Ossiaco Inc., Canada*

**2:25PM | Novel Modulation Schemes and Switching Pattern for Z-Source Ultra-Sparse Matrix Converter**
Amir Masoud Bozorgi, Mehdi Farasat and Ekrem Karaman, *Louisiana State University, United States; Warner Power LLC, United States*

**2:50PM | A New Adaptive Switching Frequency Modulation for Optimizing Low Power Cascaded Buck-Boost Converter**
Xi Chen, Anirudh Pise, Issa Batarseh and John Elmes, *University of Central Florida, United States; Advanced Power Electronics Corporation, United States*

**3:15PM | An Improved Modulation Strategy for the Three-Phase Z-Source Inverters (ZSIs)**
Ahmed Abdelhakim, Pooya Davari, Frede Blaabjerg and Paolo Mattavelli, *University of Padova, Italy; Aalborg University, Denmark*

## S118 Modeling and Control of Grid Connected Converters II

*Room: 260/61*
Jian Sun, Mahshid Amirabadi

**2:00PM | Improved Control Strategy of Grid Connected Inverter without Phase Locked Loop on PCC Voltage Disturbance**
Liang Chen, Heng Nian, Boliang Lou and HongYang Huang, *Zhejiang University, China; State Grid Zhejiang Electric Power Company, China*

**2:25PM | Automated and Scalable Optimal Control of Three-Phase Embedded Power Grids including PLL**
David Dewar, Andrea Formentini and Pericle Zanchetta, *University of Nottingham, United Kingdom*

**2:50PM | Optimal Variable Switching Frequency Scheme for Grid Connected Full Bridge Inverters with Bipolar Modulation Scheme**
Yinglai Xia, Jinia Roy and Raja Ayyanar, *Texas Instruments, United States; Arizona State University, United States*

**3:15PM | Grid-Connected Power Converters with Distributed Virtual Power System Inertia**
Jingyang Fang, Xiaoqiang Li and Yi Tang, *Nanyang Technological University, Singapore*

## S119 Linear Machines

*Room: 263*
Siavash Pakdelian, David Diaz Reigosa

**2:00PM | Comparative Study of Coreless-Type PM Linear Synchronous Machines with Non-Overlapping Windings**
Seun Guy Min and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

**2:25PM | Comparative Study of Novel Tubular Flux-Reversal Transverse Flux Permanent Magnet Linear Machine**
Shaohong Zhu, Tom Cox and Chris Gerada, *University of Nottingham, United Kingdom*

**2:50PM | Electrical Losses Minimization of Linear Induction Motors Considering the Dynamic End-Effects**
A. Accetta, M.C. Di Piazza, M. Luna and M. Pucci, *ISSIA-CNR, Italy*

**3:15PM | Design and Performance Investigation of Doubly Salient Slot Permanent Magnet Linear Machines**
Yiming Shen, Qinfen Lu and Lijian Wu, *Zhejiang University, China*

## S120 PM Motor Design, Control and Testing

*Room: 264*
Junichi Asama, Andrea Cavagnino

**2:00PM | Inductance Testing According to the New IEEE Std 1812 – Application and Possible Extensions for IPM Machines**
Vandana Rallabandi, Narges Taran, Dan M. Ionel and Ping Zhou, *University of Kentucky, United States; ANSYS, Inc., United States*

**2:25PM | Parametric Design Method for SPM Machines Including Rounded PM Shape**
Chao Lu, Simone Ferrari, Gianmario Pellegrino, Claudio Bianchini and Matteo Davoli, *Politecnico di Torino, Italy; University of Modena and Reggio Emilia, Italy*

**2:50PM | Investigation of Different Servo Motor Designs for Servo Cycle Operations and Loss Minimizing Control Performance**
Huthaifa Flieh, Robert D. Lorenz, Eigo Totoki, Shinichi Yamaguchi and Yuichiro Nakamura, *University of Wisconsin-Madison, United States; Mitsubishi Electric Corp., Japan*

**3:15PM | Synchronous SVPWM for Field-Oriented Control of PMSM using Phase-Lock Loop**
Lifan Xiao, Jian Li, Junhua Chen, Ronghai Qu and Yongqian Xiong, *Huazhong University of Science and Technology, China*

## S121 Drive Applications

*Room: 262*
Mazharul Chowdhury, Annette Muetze

**2:00PM | Over-Voltage Mitigation on SiC based Motor Drives through an Open End Winding Configuration**
S. De Caro, S. Foti, T. Scimone, A. Testa, G. Scelba, M. Pulvirenti and S. Russo, *University of Messina, Italy; University of Catania, Italy; STMicroelectronics, Italy*

**2:25PM | A Fault Monitoring System for a Reciprocating Pump Driven by a Linear Motor for Oil Pumping Systems**
Hussain A. Hussain and Hamid A. Toliyat, *Texas A&M University, United States*

**2:50PM | The Impact of Grid Unbalances on the Reliability of DC-Link Capacitors in a Motor Drive**
Huai Wang, Pooya Davari, Dinesh Kumar, Firuz Zare and Frede Blaabjerg, *Aalborg University, Denmark; Danfoss Drives A/S, Denmark; University of Queensland, Australia*

**3:15PM | Achieving Zero Common Mode Voltage Generation in a Balanced Inverter with Neutral-Point Diode-Clamping**
Di Han, Silong Li, Woongkul Lee and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

## S122 High Voltage Devices

*Room: 207/208*
Daniel Costinett, Ruxi Wang

**2:00PM | Development of PSpice Modeling Platform for 10kV/100 A SiC MOSFET Power Module**
João Martins, Muhammad Nawaz, Kalle Ilves and Francesco Iannuzzo, *ABB Corporate Research, Sweden; Aalborg University, Denmark*

**2:25PM | Continuous Switching Operation of 15 kV FREEDM Super-Cascode**
Soumik Sen, Xiaoqing Song, Liqi Zhang and Alex Q. Huang, *North Carolina State University, United States; ABB Corporate Research Center, United States*

**2:50PM | Experimental Optical Transistor for All-Optical SiC ETO Thyristor**
Alireza Mojab and Sudip K. Mazumder, *University of Illinois at Chicago, United States*

**3:15PM | Modeling and Power Loss Evaluation of Ultra Wide Band Gap Ga2O3 Device for High Power Applications**
Inhwan Lee, Avinash Kumar, Ke Zeng, Uttam Singisetti and Xiu Yao, *State University of New York at Buffalo, United States*

## S123 Wireless Power Transfer III

*Room: 200*
Xu She, Alireza Safaee

**2:00PM | The Effect of Matrix Power Repeaters on Magnetic Field Distribution of IPT Systems**
Rong Hua, Aiguo Patrick Hu and Ho Fai Leung, *University of Auckland, New Zealand*

**2:25PM | Soft-Switching Self-Tuning H-Bridge Converter for Inductive Power Transfer Systems**
Masood Moghaddami, Andres Cavada and Arif I. Sarwat, *Florida International University, United States*

**2:50PM | Load-Independent Transconductance and ZPA Input for Symmetrical Resonant Converter in IPT System**
Jiang-Hua Lu, Guo-Rong Zhu, Jin Jiang, Wen-Jing Li and Bo Li, *Wuhan University of Technology, China; University of Western Ontario, Canada*

**3:15PM | Design of Wireless Power Transfer System for Devices Carried by a Freely Moving Animal in Cage**
Jeff Po Wa Chow, Henry Shu Hung Chung, Leanne Lai Hang Chan, Nathan Judson McDannold and Sai Chun Tang, *City University of Hong Kong, Hong Kong; Brigham and Women's Hospital, United States*

**Wednesday, October 4 400PM – 5:40PM**

## S124 Solar Photovoltaic Technologies

*Room: 236*
Afshin Izadian, Yongheng Yang

**4:00PM | Subcell Modelling of Partially Shaded Solar Photovoltaic Panels**
Pallavi Bharadwaj and Vinod John, *Indian Institute of Science, India*

**4:25PM | Effect of Water on Parasitic Capacitance of Photovoltaic Panel**
Shaolin Yu, Jianing Wang and Xing Zhang, *Hefei University of Technology, China*

**4:50PM | An Application of Support Vector Machine to PV Power Forecasting under Different Weather Conditions**
Utpal Kumar Das, Kok Soon Tey, Mohd Yamani Idna Idris, Saad Mekhilef and Mutsuo Nakaoka, *University of Malaya, Malaysia*

**5:15PM | High Performance Buck-Boost Converter based PV Characterisation Set-Up**
Pallavi Bharadwaj and Vinod John, *Indian Institute of Science, India*

## S125 Control and Design Techniques for Microgrids I

*Room: 237/38*
Josep M. Guerrero, Mohammad B.Shadmand

**4:00PM | A Stabilization Method of LC Input Filter in DC Microgrids Feeding Constant Power Loads**
Hao Wang, Hua Han, Zhangjie Liu, Yao Sun, Mei Su, Xiaochao Hou and Peng Yang, *Central South University, China*

**4:25PM | Model-Predictive-Control-based Distributed Control Scheme for Bus Voltage Unbalance and Harmonics Compensation in Microgrids**
Jia Liu, Yushi Miura and Toshifumi Ise, *Osaka University, Japan*

**4:50PM | Smart Inverter Volt-Watt Control Design in High PV Penetrated Distribution Systems**
Mahsa Ghapandar Kashani, Maziar Mobarrez and Subhashish Bhattacharya, *North Carolina State University, United States*

**5:15PM | Virtual Resistance Technique for Power Limit Management of Microgrid DG Inverters**
Siddhesh Shinde, S. Milad Tayebi, Hu Haibing, Nasser Kutkut and Issa Batarseh, *University of Central Florida, United States; Nanjing University of Aeronautics & Astronautics, China*

## S126 Datacenters and Telecommunication Applications

*Room: 207/208*
Al-Thaddeus Avestruz, Ashish Kumar

**4:00PM | A High Efficiency Resonant Switched-Capacitor Converter for Data Center**
Yanchao Li, Xiaofeng Lyu, Dong Cao, Shuai Jiang and Chenhao Nan, *North Dakota State University, United States; Google Inc., United States*

**4:25PM | A Series-Stacked Architecture with 4-to-1 GaN-based Isolated Converters for High-Efficiency Data Center Power Delivery**
Yizhe Zhang, Enver Candan and Robert C.N. Pilawa-Podgurski, *University of Illinois at Urbana-Champaign, United States*

**4:50PM | Improved Model Predictive Control for High Voltage Quality in Microgrid Applications**
T. Dragicevic, M. Alhasheem, M. Lu, and F. Blaabjerg, *Aalborg University, Denmark; Arab Academy for Science, Technology and Maritime Transport, Egypt*

**5:15PM | Virtual Resistance-based Control Strategy for DC link Regeneration Protection and Current Sharing in Uninterruptible Power Supply**
Jinghang Lu, Yajuan Guan, Mehdi Savaghebi and Josep Guerrero, *Aalborg University, Denmark*

## S127 Power Electronics in Electified Vehicles

*Room: 233*
Matthias Preindl, Gui-Jia Su

**4:00PM | Range Extension of Electric Vehicles by Two Battery HEECS Chopper based Power Train**
Ayataro Tamura, Koji Kobayashi, Yukinori Tsuruta, Kazuaki Kojima, Hidemine Obara and Atsuo Kawamura, *Yokohama National University, Japan*

**4:25PM | A Delta-Structured Switched-Capacitor Equalizer for Series-Connected Battery Strings**
Yunlong Shang, Bing Xia, Jufeng Yang, Chenghui Zhang, Naxin Cui and Chris Mi, *Shandong University, China; San Diego State University, United States; University of California-San Diego, United States; Nanjing University of Aeronautics and Astronautics, China*

**4:50PM | An Automatic EMI Filter Design Methodology for Electric Vehicle Application**
Dong Zhang, Tao Fan, Puqi Ning and Xuhui Wen*China Academy of Sciences, China*

**5:15PM | 1.8MHz Isolated DC-DC Converter with Multi-Transformer Structure for Automotive Applications**
Goh Teck Chiang, Shuji Tomura and Takahide Sugiyama*Toyota Central R&D Labs., Inc., Japan*

## S128 DAB DC/DC Converters

*Room: 204*
Alessandro Costabeber, Madhav Manjrekar

**4:00PM | Wide Range ZVS Operation of Three-Phase Dual Active Bridge Converters using Reduced Coupling Factor Transformers**
Carlos Teixeira, Jan Riedel, Brendan McGrath and Donald Grahame Holmes, *RMIT University, Australia*

**4:25PM | Modelling and Analysis of the Transformer Current Resonance in Dual Active Bridge Converters**
Zian Qin, Zhan Shen and Frede Blaabjerg, *Aalborg University, Denmark*

**4:50PM | A Novel ISOP Current-Fed Modular Dual-Active-Bridge (CF-MDAB) DC-DC Converter with DC Fault Ride-Through Capability for MVDC Application**
Yuxiang Shi, Ran Mo, Hui Li and Zhiguo Pan, *ABB Inc., United States; Florida State University, United States*

**5:15PM | Design Considerations for a High-Power Dual Active Bridge DC-DC Converter with Galvanically Isolated Transformer**
Youngsil Lee, Alan. J. Watson, Gaurang Vakil and Patrick W. Wheeler, *University of Nottingham, United Kingdom*

## S129 MMC Modulation and Control

*230/31*
Pericle Zanchetta, Jean-Luc Schanen

**4:00PM | Lagrange-based Optimization of Cell Voltage and Arm Current with Zero-Sequence Current Injection in Modular Multilevel Converter**
Tsai-Fu Wu, Chun-Wei Huang and Tzu-Chieh Chou, *National Tsing Hua University, Taiwan*

**4:25PM | Discontinuous PWM Scheme for a Modular Multilevel Converter with Advanced Switching Losses Reduction Ability**
Min-Gyo Jeong, Seok-Min Kim and Kyo-Beum Lee, *Ajou University, Korea*

**4:50PM | Dynamic Matrix Predictive Control on DC-AC Modular Multilevel Converter: Design, Control and Real-Time Simulation**
Isaac Gonzalez-Torres, Homero Miranda, Cesar Mendez-Barrios, Victor Cardenas, Jose Espinoza, Marcos I. Gonzalez and Marcelo Perez, *Universidad Autónoma de San Luis Potosí, Mexico; Concepcion University, Chile; Universidad Tecnica Federico Santa Maria, Chile*

**5:15PM | Capacitor Voltage Ripples Characterization and Reduction of Hybrid Modular Multilevel Converter with Circulating Current Injection**
Cong Zhao, Yaohua Li, Fei Xu, Zixin Li, Ping Wang and Ming Lei, *Chinese Academy of Sciences, China; University of Chinese Academy of Sciences, China*

## S130 Control of Grid Connected Converter

*Room: 260/61*
Joseph Olorunfemi Ojo, Xiongfei Wang

**4:00PM | An Envelope-based Detection Method for Resonance Damping in Grid-Connected Converters**
Chia-Tse Lee, Akira Kikuchi and Tomomichi Ito, *Hitachi, Ltd., Japan*

**4:25PM | Manitoba Inverter – Single Phase Single-Stage Buck-Boost VSI Topology**
Carl Ngai Man Ho and Ken King Man Siu, *University of Manitoba, Canada*

**4:50PM | Direct Decoupled Active and Reactive Predictive Power Control of Grid-Tied Quasi-Z-Source Inverter for Photovoltaic Applications**
Sarthak Jain, Sivasai Praneeth Nanduri, Mohammad B. Shadmand, Robert S. Balog and Haitham Abu-Rub, *Texas A&M University, United States; Kansas State University; United States; Texas A&M University at Qatar, Qatar*

**5:15PM | Optimal Phase Shifted Method to Reduce Current Ripples for a Parallel Grid-Connected Voltage Source Inverter under Unequal DC-Link Voltage**
June-Hee Lee and Kyo-Beum Lee, *Ajou University, Korea*

## S131 Modeling and Control of AC-DC Converters

*Room: 205*
Frede Blaabjerg, Marco Dalla Costa

**4:00PM | A Robust Deadbeat Predictive Power Control with Sliding Mode Disturbance Observer for PWM Rectifiers**
Haitao Yang, Yongchang Zhang, Jiejunyi Liang, Nong Zhang and Paul Walker, *University of Technology, Sydney, Australia; North China University of Technology, China*

**4:25PM | A Control Strategy to Compensate for Current and Voltage Measurement Errors in Three-Phase PWM Rectifiers**
Trinh Quoc Nam, Choo Fook Hoong, Tang Yi and Wang Peng, *Nanyang Technological University, Singapore*

**4:50PM | Carrier based PWM for Reduced Capacitor Voltage Ripple in Three-Phase Three-Switch Buck-Type Rectifier System**
Beomseok Chae, Yongsug Suh and Tahyun Kang, *Chonbuk National University, Korea; Milimsyscon Co., Korea*

**5:15PM | Direct Power Control of PWM Rectifier under Unbalanced Network using Extended Power Theory**
Yongchang Zhang, Jie Liu and Jihao Gao, *North China University of Technology, China*

## S132 Model Predictive Control of Power Converters I

*Room: 201*
Ralph Kennel, Tobias Geyer

**4:00PM | Modulated Model Predictive Control for Active Split DC-bus 4-leg Power Supply**
S. Bifaretti, S. Pipolo, A. Lidozzi, L. Solero, L. Tarisciotti and P. Zanchetta, *University of Rome Tor Vergata, Italy; Roma Tre University, Italy; University of Nottingham, United Kingdom*

**4:25PM | On the Inherent Relationship between Finite Control Set Model Predictive Control and SVM-based Deadbeat Control for Power Converters**
Yongchang Zhang, Jie Liu and Shengwen Fan, *North China University of Technology, China*

**4:50PM | Predictive Current Control for Stabilizing Power Electronics based AC Power Systems**
M.A. Awal, Iqbal Husain and Wensong Yu, *North Carolina State University, United States*

**5:15PM | Computationally Efficient Long-Horizon Direct Model Predictive Control for Transient Operation**
Petros Karamanakos, Tobias Geyer and Ricardo P. Aguilera, *Tampere University of Technology, Finland; ABB Corporate Research, Switzerland; University of Technology Sydney, Australia*

## S133 Thermal Model of Electric Machines

*Room: 263*
Davide Barater, Rashmi Prasad

**4:00PM | Improved Thermal Model for Predicting End-Windings Heat Transfer**
Gabriele Luca Basso, Yew Chuan Chong, James Goss and Dave Staton, *Royal Institute of Technology, Sweden; Motor Design Ltd, United Kingdom*

**4:25PM | Reducing the Complexity of Thermal Models for Electric Machines via Sensitivity Analyses**
B. Assaad, K. El kadri Benkara, G. Friedrich, S. Vivier and A. Michon, *Renault SAS, France; Université de technologie de Compiègne, France; CETIM, France*

**4:50PM | Importance of Thermal Modeling for Design Optimization Scenarios of Induction Motors**
Gerd Bramerdorfer, Andrea Cavagnino and Silvio Vaschetto, *Johannes Kepler University Linz, Austria; Politecnico di Torino, Italy*

**5:15PM | Reduced Lumped Parameter Thermal Model for External Rotor Permanent Magnet Motor Design**
Aitor Tovar-Barranco, Fernando Briz, Amaia López-de-Heredia and Irma Villar, *IK4-Ikerlan, Spain; Universidad de Oviedo, Spain*

## S134 PM Machines, Demagnetization, Eccentricity and Losses

*Room: 264*
Gianmario Pellegrino, Bulent Sarliglu

**4:00PM | On-Line Detection of Rotor Eccentricity for PMSMs based on Hall-Effect Field Sensor Measurements**
Yonghyun Park, Daniel Fernandez, Sang Bin Lee, Doosoo Hyun, Myung Jeong, Suneel Kumar Kommuri, Changhee Cho, David Reigosa and Fernando Briz, *Korea University, Korea; University of Oviedo, Spain; Gyeonggi College of Science & Technology, Korea*

**4:25PM | Detection of Demagnetization in Permanent Magnet Synchronous Machines using Hall-Effect Sensors**
David Reigosa, Daniel Fernandez, Yonghyun Park, Alberto B. Diez, Sang Bin Lee and Fernando Briz, *University of Oviedo, Spain*

**4:50PM | Demagnetization Study of an Interior Permanent Magnet Synchronous Machine Considering Transient Peak 3 Phase Short-Circuit Current**
Seong Taek Lee, *BorgWarner, United States*

**5:15PM | Reduction of Inverter Carrier Harmonic Losses in Interior Permanent Magnet Synchronous Motors by Optimizing Rotor and Stator Shapes**
Katsumi Yamazaki, Yusuke Togashi, Takeshi Ikemi, Shunji Ohki and Ryoichi Mizokami, *Chiba Institute of Technology, Japan; Nissan Motor Co., Ltd., Japan*

## S135 Control of Electric Drives II

*Room: 262*
Michael Harke, Alireza Fatemi

**4:00PM | Robust Control for High Performance Induction Motor Drives based on Partial State-Feedback Linearization**
A. Accetta, F. Alonge, M. Cirrincione, F. D'Ippolito, M. Pucci, R. Rabbeni and A. Sferlazza, *University of Palermo, Italy; University of the South Pacific, Fiji; ISSIA CNR, Italy; CNRS, LAAS, France*

**4:25PM | The Vector Space Decomposition based Control for Multiple-Channel Indirect Matrix Converter Fed Dual Three-Phase PMSM Drives**
Yang Xiao and Zheng Wang, *Southeast University, China*

**4:50PM | Predictive Current Control for Induction Motor using Online Optimization Algorithm with Constrains**
Zhiguo Wang, Zedong Zheng, Yongdong Li, Boran Fan and Guibin Li, *Tsinghua University Beijing, China; Xinjiang University, China*

**5:15PM | Implementing Observer-based Design Methodology for Deadbeat-Direct Torque and Flux Control with Back-EMF Self-Sensing using Rapid Control Prototyping**
Shang-Chuan Lee and Robert D. Lorenz, *University of Wisconsin-Madison, United States*

## S136 Emerging Applications

*Room: 200*
Jin Wang, Mark J Scott

**4:00PM | Design of a Linear Permanent Magnet Synchronous Motor for Needle-Free Jet Injection**
Nick N.L. Do, Andrew J. Taberner and Bryan P. Ruddy, *University of Auckland, New Zealand*

**4:25PM | An Energy Harvesting Scheme for Dielectric Elastomer Generators**
Ramanuja Panigrahi, Santanu Mishra, Arpit Kumar Srivastava and Sumit Basu, *Indian Institute of Technology Kanpur, India*

**4:50PM | A Bipolar Self-Start up Boost Converter for Thermoelectric Energy Harvesting**
Keita Taeda and Hirotaka Koizumi, *Tokyo University of Science, Japan*

**5:15PM | Comparative Analysis and Evaluation of High Voltage Power Generation Architectures**
Saijun Mao, Jelena Popovic, Jan Abraham Ferreira, Chengmin Li and Wuhua Li, *Delft University of Technology, Netherlands; Zhejiang University, China*

**Thursday, October 5 8:30AM – 10:10AM**

## S137 Other Topics in Renewable Energy Applications

*Room: 236*
Fei Gao, John Lam

**8:30AM | Performance of Anti-Islanding of an Improved Reactive Power Variation Method based on Positive Feedback**
Jongmin Jo and Hanju Cha, *Chungnam National University, Korea*

**8:55AM | Shaping of PWM Converter Admittance with Outer Power Control Loop**
Byeong-Heon Kim and Seung-Ki Sul, *North Carolina State University, United States; Seoul National University, Korea*

**9:20AM | Hydrokinetic Powered Irrigation Network Automation: A Scalable Architecture for the Enablement of Real-Time Automated Decentralized Control of the Irrigation Water Delivery System in Developing Countries**
Mohammad A. Bharmal, Syeda Q. Akbar, Sana Noor, Rabiya Farooq and Nauman A. Zaffar, *Lahore University of Management Sciences, Pakistan*

**9:45AM | Wind Farm Grounding System Analysis**
Massood Keshavarz Siahpoosh, Li Li and David G. Dorrell, *University of Technology Sydney, Australia; University of KwaZulu-Natal, South Africa*

## S138 Power Quality of Grid Connected Converters I

*Room: 233*
Brandon Grainger, Stefano Bifaretti

**8:30AM | Diversifying the Role of Distributed Generation Grid Side Converters for Improving the Power Quality of Distribution Networks using Advanced Control Techniques**
Zunaib Ali, Nicholas Christofides, Lenos Hadjidemetriou and Elias Kyriakides, *Frederick University, Cyprus; University of Cyprus, Cyprus*

**8:55AM | Circulating Resonant Current Suppression for Current-Controlled Inverters based on Output Impedance Shaping**
Qiang Qian, Binfeng Zhang, Zhaohui Ni, Shaojun Xie, Jinming Xu and Kunshan Xu, *Nanjing University of Aeronautics and Astronautics, China*

**9:20AM | Sensorless Unbalance Correction as an Ancillary Service for LV 4-Wire/3-Phase Power Converters**
Andres Suárez-González, Pablo García, Ángel Navarro-Rodríguez, Geber Villa and Jose M. Cano, *University of Oviedo, Spain*

**9:45AM | Convertible Static Transmission Controller Model and Supervisory Vector Control for Operation under Unbalanced Grid Conditions**
Faris E. Alfaris and Subhashish Bhattacharya, *North Carolina State University, United States*

## S139 Control and Design Techniques for Microgrids II

*Room: 237/38*
Ron Hui, Tsai-Fu Wu

**8:30AM | Operation Optimization for Multi-microgrids Based on Centralized-Decentralized Hybrid Hierarchical Energy Management**
Meiqin Mao, Yangyang Wang, Liuchen Chang and Yan Du, *Hefei University of Technology, China*

**8:55AM | Coordinated Failure Response and Recovery in a Decentralized Microgrid Architecture**
Abedalsalam Bani-Ahmed, Mohammad Rashidi and Adel Nasiri, *University of Wisconsin-Milwaukee, United States*

**9:20AM | Analysis and Improvement of Synchronous Stability of Micro-Grids with Parallel Connected Inverters**
Vikram Roy Chowdhury, Subhajyoti Mukherjee, Pourya Shamsi and Mehdi Ferdowsi, *Missouri University of Science and Technology, United States*

**9:45AM | Smart Resistor: Trajectory Control of Constant Power Loads in DC Microgrids**
Eric Bauer, Karun Arjun Potty, He Li and Jin Wang, *Ohio State University, United States*

## S140 Wireless Charging for EV

*Room: 232*
ChunTaek Rim, Dong Dong

**8:30AM | Load Power Agnostic 6.6 kW Wireless EV Charger with LCL Tuned Primary and Secondary Side Regulation**
Veda P. Galigekere, Omer C. Onar, Madhu Chinthavali, and Zhiqiang Wang, *Oak Ridge National Laboratory, United States*

**8:55AM | High Power Factor Z-Source Resonant Wireless Charger with Soft Switching**
Hulong Zeng and Fang Zheng Peng, *Michigan State University, United States*

**9:20AM | Bifurcation Phenomenon Limits for Three Phase IPT Systems with Constant Coupling Coefficient**
Ugaitz Iruretagoyena, Asier Garcia-Bediaga, Luis Mir, Haritza Camblong and Irma Villar, *IK4-Ikerlan Technology Research Centre, Spain; University of the Basque Country, Spain; École Supérieure des Technologies Industrielles Avances, France*

**9:45AM | A Practical Static Simulator for Dynamic Wireless Charging of Electric Vehicle using Receiver Open Circuit Voltage Equivalent**
Shuangcheng Song, Qianfan Zhang, Chunbo Zhu and Diri Wang, *Harbin Institute of Technology, China*

## S141 Multilevel Converters Applications

*Room: 204*
Sheldon Williamson, Liliana De Lillo

**8:30AM | Low-Voltage-Ride-Through Control of a Modular Multilevel SDBC Inverter for Utility-Scale Photovoltaic Systems**
Paul Sochor, Hirofumi Akagi and Nadia M.L. Tan, *Tokyo Institute of Technology, Japan; Universiti Tenaga Nasional, Malaysia*

**8:55AM | Common-Mode Voltage Analysis and Suppression in Five-Level Modular Composited Converter**
Jiawei Hu, Junsong Tang, Ye Mei, Senjun Hu, Wuhua Li and Xiangning He, *Zhejiang University, China*

**9:20AM | Low Voltage Ride through Performance of a STATCOM based on Modular Multilevel Cascade Converters for Offshore Wind Application**
Takaaki Tanaka, Huai Wang, Ke Ma and Frede Blaabjerg, *Aalborg University, Denmark; Fuji Electric Co., Ltd., Japan; Shanghai Jiao Tong University, China*

**9:45AM | Asymmetrical Hybrid Unidirectional T-Type Rectifier for High-Speed Gen-Set Applications**
S. Foti, A. Testa, G. Scelba, V. Sabatini, A. Lidozzi and L. Solero, *University of Messina, Italy; University of Catania, Italy; Roma Tre University, Italy*

## S142 MMC New Topologies

*230/31*
Andrea Formentini, Marcello Pucci

**8:30AM | ESBC: An Enhanced Modular Multilevel Converter with H-Bridge Front End**
Emmanuel Amankwah, Alessandro Costabeber, Omar Jasim, David Trainer and Jon Clare, *The University of Nottingham, United Kingdom; GE Energy Connections, United Kingdom*

**8:55AM | Investigation of a New Modular Multilevel Converter with DC Fault Blocking Capability**
Xing Hu, Jianzhong Zhang, Shuai Xu and Yongjiang Jiang, *Southeast University, China*

**9:20AM | A New Hybrid MMC with Integrated Battery Energy Storage**
Ping Wang, Tao Zhang and Rui Li,*Shanghai Jiao Tong University, China*

**9:45AM | Enhanced Modular Multilevel Converter based Battery Energy Storage System**
Xiaofeng Yang, Yao Xue, Bowei Chen, Fan Yang, Trillion Q. Zheng and Youyun Wang, *Beijing Jiaotong University, China; Tianshui Electric Drive Research Institute Co. Ltd., China*

## S143 Modeling and Control of DC-DC Converters I

*Room: 205*
Praveen Jain, Petros Karamanakos

**8:30AM | Seamless Transition of the Operating Zones for the Extended-Duty-Ratio Boost Converter**
Jinia Roy and Raja Ayyanar, *Arizona State University, United States*

**8:55AM | A Digital Closed-Loop Control Strategy for Maintaining the 180° Phase Shift of an Interleaved BCM Boost Converter for PFC Applications**
Robert T. Ryan, John G. Hayes, Richard Morrison and Diarmuid Hogan, *University College Cork, Ireland; Excelsys Technologies, Ireland*

**9:20AM | Digital Type II Compensation with Forced-Output Control of an Interleaved Two-Phase Coupled-Inductor Boost Converter**
Brendan C. Barry, John G. Hayes, Robert T. Ryan, Marek S. Rylko, Robert Stala, Adam Penczek and Andrzej Mondzik, *University College Cork, Ireland; SMA Magnetics Sp. z.o.o. R&D, Poland*

**9:45AM | Dual-Frequency On-Off Control for a 20 MHz Class E DC-DC Converter**
Ying Li, Xinbo Ruan, Jiandong Dai and Zhihong Ye, *Nanjing University of Aeronautics and Astronautics, China; Lite-On Technology, China*

## S144 Model Predictive Control of Power Converters II

*Room: 201*
Jian Guo Zhu, Jose Rodriguez

**8:30AM | Long Horizon Linear MPC of Grid-Connected VSIs: Regulation Problems and a Plug-In Solution**
Chee Shen Lim, Sze Sing Lee, Xin Kong and Inam Ullah Nutkani, *University of Southampton Malaysia Campus, Malaysia; Agency for Science Technology and Research, Singapore; Royal Melbourne Institute of Technology, Australia*

**8:55AM | Voltage Sensorless Improved Model Predictive Direct Power Control for Three-Phase Grid-Connected Converters**
Amir Masoud Bozorgi, Hosein Gholami-Khesht, Mehdi Farasat, Shahab Mehraeen and Mohammad Monfared, *Louisiana State University, United States; Ferdowsi University of Mashhad, Iran*

**9:20AM | Finite Control Set Model Predictive Control Assisted by a Linear Controller for True Parameter Uncertainty Compensation**
Rodrigo Mendez, Daniel Sbarbaro, Jose Espinoza and Christian Rojas, *Concepcion University, Chile*

**9:45AM | Model Predictive Control of Dual-Mode Operations Z-Source Inverter: Islanded and Grid-Connected**
Sally Sajadian and Reza Ahmadi, *University of Kansas, United States*

## S145 Stability in Power Converters

*Room: 260/61*
Yam Siwakoti, Jiangchao Qin

**8:30AM | LCL Filter Design based on Non-Minimum-Phase Stability Region for Grid-Connected Inverters in Weak Grid**
Fang Liu, Jie Zhang, Haizhen Xu, Xing Zhang, Wenguang Zhao and Meng Wang, *Hefei University of Technology, China*

**8:55AM | A Way of Increasing Stability Margin of Current Control in VSCs Connected to the Grid through LCL Filters**
Leonardo Marin, Pedro Rodriguez, Ignacio Candela and Joan Rocabert, *Polytechnic University of Catalonia, Spain*

**9:20AM | Small-Signal Modeling of Single-Phase PLLs using Harmonic Signal-Flow Graphs**
Shahil Shah and Leila Parsa, *Rensselaer Polytechnic Institute, United States; University of California-Santa Cruz, United States*

**9:45AM | Current-Mode Controlled Single-Inductor Dual-Output Buck Converter with Ramp Compensation**
Yao Wang, Jianping Xu, Shuhan Zhou, Tianyang Zhao and Kai Liao, *Southwest Jiaotong University, China; Southwest Minzu University, China; Nanyang Technological University, Singapore*

## S146 High Torque Machines

*Room: 263*
Hamid A. Toliyat, Wei Xu

**8:30AM | A New Perspective on the PM Vernier Machine Mechanism**
Kangfu Xie, Dawei Li, Ronghai Qu, Xiang Ren and Yuan Pan, *Huazhong University of Science and Technology, China*

**8:55AM | Internal Rotor Airgap-Less Electric Motors**
Omar Nezamuddin, Maryam Alibeik, Rishikesh Bagwe, Matthew Rubin and Euzeli dos Santos Jr., *Purdue University-Indianapolis, United States; Indiana University, United States*

**9:20AM | Design, Construction, and Analysis of a Large Scale Inner Stator Radial Flux Magnetically Geared Generator for Wave Energy Conversion**
Matthew Johnson, Matthew C. Gardner, Hamid A. Toliyat, Steven Englebretson, Wen Ouyang and Colin Tschida, *Texas A&M University, United States; ABB Inc., United States*

**9:45AM | Magnetic Gearing Effect in Vernier Permanent Magnet Synchronous Machines**
Yue Liu and Z.Q. Zhu , *University of Sheffield, United Kingdom*

## S147 Small PM Motors

*Room: 264*
Akira Chiba, Rajib Mikail

**8:30AM | Design Optimization of a Small Single-Phase Motor with Auxiliary Permanent Magnet**
Mauro Andriollo, Andrea Tortella and Stefano Trubian, *University of Padova, Italy*

**8:55AM | Slotless Lightweight Motor for Drone Applications**
Md Sariful Islam, Iqbal Husain and Rajib Mikail, *North Carolina State University, United States; ABB Inc., United States*

**9:20AM | Novel 4/4 Stator/Rotor Single-Phase Asymmetric-Stator-Pole Doubly Salient Permanent Magnet Machine**
Mingjie He, Wei Xu and Caiyong Ye, *Huazhong University of Science and Technology, China*

**9:45AM | Design Optimization of a Line-start PMSM Considering Transient and Steady-state Performance Objectives**
Alber J. Sorgdrager, Rong-Jie Wang and Andre J. Grobler, *Stellenbosch University, South Africa; North-West University, South Africa*

## S148 Electric Drives for Wind and Other Renewable Integration

*Room: 262*
Jiangbiao He, Yue Zhao

**8:30AM | Power Conversion and Control of a Magnetic Gear Integrated Permanent Magnet Generator for Wave Energy Generation**
Samir Hazra, Prathamesh Kamat, Subhashish Bhattacharya, Wen Ouyang and Steven Englebretson, *North Carolina State University, United States; ABB Corporate Research Center, United States*

**8:55AM | A Novel Active Damping Scheme for use with Regenerative Converters**
Mahesh Swamy, *Yaskawa America, Inc., United States*

**9:20AM | Model Predictive Power Control of a Brushless Doubly Fed Twin Stator Induction Generator**
Xinchi Wei, Ming Cheng, Wei Hua, Jianguo Zhu and Haitao Yang, *Southeast University, China; University of Technology Sydney, Australia*

**9:45AM | A New Rotor Speed Observer for Stand-Alone Brushless Doubly-Fed Induction Generators**
Yi Liu, Wei Xu, Teng Long and Frede Blaabjerg, *Huanggang Normal University, China; Huazhong University of Science and Technology, China; University of Cambridge, United Kingdom; Aalborg University, Denmark*

## S149 SiC Switching I

*Room: 207/208*
Francesco Iannuzzo, Shashank Krishnamurthy

**8:30AM | Low Inductance Switching for SiC MOSFET based Power Circuit**
Edward Shelton, Xueqiang Zhang, Tianqi Zhang, Nikita Hari and Patrick Palmer, *University of Cambridge, United Kingdom*

**8:55AM | Self-Supplied Isolated Gate Driver for SiC Power MOSFETs based on Bi-Level Modulation Scheme**
Jorge Garcia, Emre Gurpinar, Alberto Castellazzi and Pablo Garcia, *University of Oviedo, Spain; University of Nottingham, United Kingdom*

**9:20AM | Multi-Level Active Gate Driver for SiC MOSFETs**
Harry C.P. Dymond, Dawei Liu, Jianjing Wang, Jeremy J.O. Dalton and Bernard H. Stark, *University of Bristol, United Kingdom*

**9:45AM | Analytical Investigation on Design Instruction to Avoid Oscillatory False Triggering of Fast Switching SiC-MOSFETs**
Yusuke Sugihara, Kimihiro Nanamori, Seiya Ishiwaki, Yuma Hayashi, Kyota Aikawa, Kazuhiro Umetani, Eiji Hiraki and Masayoshi Yamamoto, *Shimane University, Japan; Okayama University, Japan; Nagoya University, Japan*

## S150 New Device, Circuit and Control Strategies

*Room: 200*
Xiu Yao, Lihua Chen

**8:30AM | Comparison of 1.7kV, 450A SiC-MOSFET and Si-IGBT based Modular Three Phase Power Block**
Sayan Acharya, Xu She, Rajib Datta, Maja Harfman Todorovic and Gary Mandrusiak, *North Carolina State University, United States; GE Global Research, United States*

**8:55AM | A Fast Dynamic Photovoltaic Simulator with Instantaneous Output Impedance Matching Controller**
Isuru D.G. Jayawardana, Carl Ngai Man Ho, Mandip Pokharel and Gerardo Escobar, *University of Manitoba, Canada; Universidad Autonoma del Carmen, Mexico*

**9:20AM | High-Frequency Induction Heating for Small-Foreign-Metal Particle Detection using 400 kHz SiC-MOSFETs Inverter**
Takuya Shijo, Shinya Kurachi, Yuki Uchino, Yujiro Noda, Hiroaki Yamada and Toshihiko Tanaka, *Yamaguchi University, Japan*

**9:45AM | Compact Integrated Gate Drives and Current Sensing Solution for SiC Power Modules**
Dazhong Gu and Parag Kshirsagar, *United Technologies Research Center, United States*

## S151 Energy Storage Systems

*Room: 236*
Jae-Do Park, Bilal Akin

**10:30AM | Fractional Converter for High Efficiency High Power Battery Energy Storage System**
Fei Xue, Ruiyang Yu and Alex Huang, *North Carolina State University, United States*

**10:55AM | Investigation of Hybrid Electrode Optimization for Energy Storage Applications with Varying Energy and Power Requirements using HPPC Cycling**
Kevin J. Frankforter, M. Isabel Tejedor-Tejedor, Marc A. Anderson and Thomas M. Jahns, *University of Wisconsin-Madison, United States; IMDEA Energy Institute, Spain*

**11:20AM | Modeling and State-Space Feedback Design of the Battery Current Controller for the Energy Stored Quasi-Z-Source Inverter**
Dongqi Fan, Yujie Wang, Sideng Hu, Min Chen and Xiangning He, *Zhejiang University, China*

**11:45AM | A Novel Battery Management System using a Duality of the Adaptive Droop Control Theory**
Sifat M. Chowdhury, Mohamed Badawy, Yilmaz Sozer and J. Alexis De Abreu-Garcia, *University of Akron, United States; San Jose State University, United States*

## S152 Power Conversion Systems for AC and DC Grids

*Room: 237/38*
Yazan Alsmadi, Srdjan Lukic

**10:30AM | A Modular SCR-based DC-DC Converter for Medium-Voltage Direct-Current (MVDC) Grid Applications**
Abdulgafor Alfares, Ehsan Afshari, Mahshid Amirabadi and Brad Lehman, *Northeastern University, United States*

**10:55AM | N-Series Modules based on SST for Mobile Power Substations**
Cheng Deng, Tao Yang and Juan Carlos Balda, *University of Arkansas, United States; Xiangtan University, China*

**11:20AM | Re-Synchronization Strategy for the Synchronous Power Controller in HVDC Systems**
Cristian Verdugo, Jose Ignacio Candela and Pedro Rodriguez, *Polytechnic University of Catalonia, Spain; Loyola Andalucía University, Spain*

**11:45AM | A Design Method of MMC-HVDC Physical Simulation System**
Liu Dong, He Zhiyuan, Gao Lu and Kou Longze, *Global Energy Interconnection Research Institute, China*

## S153 Power Quality of Grid Connected Converters II

*Room: 233*
Liuchen Chang, Jonathan Kimball

**10:30AM | Four-Wired Dynamic Voltage Restorers based on Cascade Open-End Winding Transformers**
Gregory A.A. Carlos, Cursino B. Jacobina, Joao P.R.A. Mello and Alexandre C. Oliveira, *Federal Institute of Alagoas, Brazil; Federal University of Campina Grande, Brazil*

**10:55AM | Investigation of CCL Filter for Multilevel Selective Harmonic Compensation (SHC) with Staircase Waveform**
Hui Zhao, Shuo Wang, Amirhossein Moeini and Le Yang, *University of Florida, United States*

**11:20AM | Power Electronics Intelligence at the Network Edge (PINE)**
Hung-Ming Chou, Le Xie, Prasad Enjeti and P.R. Kumar, *Dominion Energy, United States; Texas A&M University, United States*

**11:45AM | Performance Investigation of Hybrid Active Filter During Low Load Condition**
Richard Beddingfield, David Storelli, Hesam Mirzaee and Subhashish Bhattacharya, *North Carolina State University, United States; Quanta Technology, United States*

## S154 Modeling and Monitoring of Batteries I

*Room: 232*
Veda Prakash Galigekere, Fei Gao

**10:30AM | On-Board State-of-Health Estimation based on Charging Current Analysis for LiFePO4 Batteries**
Jufeng Yang, Bing Xia, Wenxin Huang and Chris Mi, *Nanjing University of Aeronautics and Astronautics, China; San Diego State University, United States; University of California-San Diego, United States*

**10:55AM | A Compact Unified Methodology via a Recurrent Neural Network for Accurate Modeling of Lithium-Ion Battery Voltage and State-of-Charge**
Ruxiu Zhao, Phillip J. Kollmeyer, Robert D. Lorenz and Thomas M. Jahns, *University of Wisconsin-Madison, United States*

**11:20AM | A Novel Li-Ion Battery Pack Modeling Considering Single Cell Information and Capacity Variation**
Jaehyung Lee, Jung-Hoon Ahn and Byoung Kuk Lee, *Sungkyunkwan University, Korea*

**11:45AM | A Real-Time Condition Monitoring for Lithium-Ion Batteries using a Low-Priced Microcontroller**
Taesic Kim, Amit Adhikaree, Daewook Kang, Myoungho Kim, Chang-Yeol Oh and Juwon Baek, *Texas A&M University-Kingsville, United States; Korea Electrotechnology Research Institute, Korea*

## S155 Multilevel Converters I

*Room: 204*
Pericle Zanchetta, Luca Solero

**10:30AM | Interleaved Operation of Paralleled Neutral-Point Clamped Inverters with Reduced Circulating Current**
Zhi-Xiang Zou, Frederik Hahn, Sebastian Brueske, Sandro Guenter, Giampaolo Buticchi, Marco Liserre and Friedrich W. Fuchs, *Christian-Albrechts-Universität zu Kiel, Germany*

**10:55am**
**A New Modulation Method for a Five-Level Hybrid-Clamped Inverter with Reduced Flying Capacitor Size**
Boran Fan, Kui Wang, Zedong Zheng, Lie Xu and Yongdong Li, *Tsinghua University, China*

**11:20AM | A Novel Multilevel Converter with Reduced Switch Count for Low and Medium Voltage Applications**
Margarita Norambuena, Jose Rodriguez, Samir Kouro and Akshay Rathore, *Universidad Tecnica Federico Santa Maria, Chile; Universidad Andres Bello, Chile; Concordia University, Canada*

**11:45AM | Five-Level Reduced Hybrid Inverter with Coupled Inductors**
Diego A. Acevedo-Bueno, Juliano C. Leal da Silva, Edison Roberto C. da Silva and Montie A. Vitorino, *UFCG, Brazil; UFPB, Brazil*

## S156 PFC Converters

*230/31*
Gerry Moschopoulos, Giacomo Scelba

**10:30AM | Dynamic Response Optimization for Interleaved Boost PFC Converter with Improved Dual Feedforward Control**
Lei Bai, Xiaoyong Ren, Qi Hui, Yu Wu, Kunqi Li, Zhehui Guo and Yue Zhang,, *Nanjing University of Aeronautics and Astronautics, China; State Grid Nanjing Power Supply Company, China*

**10:55AM | Manitoba Rectifier – Bridgeless Buck-Boost PFC**
Ken King Man Siu and Carl Ngai Man Ho, *University of Manitoba, Canada*

**11:20AM | Low THD Multipliers for BCM Buck and Cascaded Buck-Boost PFC Converters**
Ramanujam Ramabhadran, Yehuda Levy, Bruce Roberts and Pradeep V., *GE Global Research, United States*

**11:45AM | Multi-Objective Optimisation of a Bidirectional Single-Phase Grid Connected AC/DC Converter (PFC) with Two Different Modulation Principles**
Johan Le Leslé, Rémy Caillaud, Florent Morel, Nicolas Degrenne, Cyril Buttay, Roberto Mrad, Christian Vollaire and Stefan Mollov, *Mitsubishi Electric R&D Centre Europe, France; Université de Lyon, France*

## S157 Modeling and Control of DC-DC Converters II

*Room: 205*
Xinbo Ruan, Khurram Afridi

**10:30AM | Approximate-Model-based Predictive Current Control for Buck Converter in CCM**
Benfei Wang, Liang Xian, Abhisek Ukil and Hoay Beng Gooi, *Nanyang Technological University, Singapore*

**10:55AM | Stable Output Current Estimation for Switching Power Converter**
Hidenori Maruta, Shingo Watanabe, Nobumasa Matsui, Fujio Kurokawa and Ilhami Colak, *Nagasaki University, Japan; Nagasaki Institute of Applied Science, Japan; Nisantasi University, Japan*

**11:20AM | Design and Optimization of the High Frequency Transformer for a 800V/1.2MHz SiC LLC Resonant Converter**
Suxuan Guo, Pengkun Liu, Liqi Zhang and Alex Q. Huang, *North Carolina State University, United States; Texas Instruments Inc., United States*

**11:45AM | Extension of Zero-Voltage-Switching Range in Dual Active Bridge Converter by Switched Auxiliary Inductance**
Hayato Higa and Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

## S158 Modeling and Control of DC-AC Converters I

*Room: 201*
Luca Zarri, Yi Tang

**10:30AM | IGBT-SiC Dual Fed Ground Power Unit**
Luca Rovere, Andrea Formentini, Giovanni Lo Calzo, Pericle Zanchetta, Andrea Cassia and Mario Marchesoni, *University of Nottingham, United Kingdom; University of Genova, Italy*

**10:55AM | Multi-Rate Modeling for Low Switching Frequency VSCs Applying Multi-Sampling Control**
Hao Tian, Yun Wei Li and Qing Zhao, *University of Alberta, Canada*

**11:20AM | H-Infinity Current Control of the LC Coupled Voltage Source Inverter**
Lucas Koleff, Lourenco Matakas Jr., Diego Colon and Eduardo Pellini, *University of Sao Paulo, Brazil*

**11:45AM | Analytical Averaged Loss Model of Three-Phase T-type STATCOM with Virtual Zero Level Modulation**
Jun Wang, Xibo Yuan, Yonglei Zhang, Kfir J. Dagan, Xu Liu, David Drury, Phil Mellor and Andrew Bloor, *University of Bristol, United Kingdom; Safran Electrical and Power UK, United Kingdom*

## S159 EMI in Power Converters

*Room: 260/61*
Jason Lai, Lixiang Wei

**10:30AM | A Symmetrical Resonant Converter and PCB Transformer Structure for Common Mode Noise Reduction**
Bin Li, Qiang Li, Fred C. Lee and Yuchen Yang, *Virginia Polytechnic Institute and State University, United States*

**10:55AM | Aperiodic Pulse-Modulation Technique to Reduce Peak EMI in Impedance-Source DC-DC Converters**
Saad Ul Hasan, Yuba Raj Kafle and Graham E. Town, *Macquarie University, Australia*

**11:20AM | Integrated Common Mode and Differential Mode Inductors with Low Near Magnetic Field Emission**
Huan Zhang, Boyi Zhang and Shuo Wang, *University of Florida, United States*

**11:45AM | Design, Implementation, and Evaluation of a GaN-based Four-Leg Inverter with Minimal Common Mode Voltage Generation**
Di Han, Silong Li, Wooyoung Choi and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

## S160 High Speed Machines

*Room: 263*
Jonathan Bird, Ronghai Qu

**10:30AM | Design and Rotor Shape Modification of a Multiphase High Speed Permanent Magnet Assisted Synchronous Reluctance Motor for Stress Reduction**
Md Tawhid Bin Tarek and Seungdeog Choi, *University of Akron, United States*

**10:55AM | Rotor Losses Reduction in High Speed PM Generators for Organic Rankine Cycle Systems**
Grazia Berardi and Nicola Bianchi, *University of Padova, Italy*

**11:20AM | Ripple Compensation of Suspension Force and Torque in a Bearingless SPM Motor with Integrated Winding**
Junichi Asama, Kenta Sasaki, Takaaki Oiwa and Akira Chiba, *Shizuoka University, Japan; Tokyo Institute of Technology, Japan*

**11:45AM | Electromagnetic and Thermodynamic Design of a Novel Integrated Flux-Switching Motor-Compressor with Airfoil-Shaped Rotor**
Hao Ding, Yingjie Li, Seun Guy Min and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

## S161 Noise, Vibration, Short Circuit of Electric Machines

*Room: 264*
Konstantinos Gyftakis, Rashmi Prasad

**10:30AM | Inter-Turn Short Circuit Ratio Estimation in IPMSMs based on a Fault Index Current Observer**
Pablo Castro Palavicino, Dheeraj Bobba and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

**10:55AM | A Review of Condition Monitoring of Induction Motors based on Stray Flux**
Chen Jiang, Sufei Li and Thomas G. Habetler, *Georgia Institute of Technology, United States*

**11:20AM | Investigation of Design based Solutions to Reduce Vibration in Permanent Magnet Synchronous Machines with Low Order Radial Forces**
Iftekhar Hasan, Yilmaz Sozer, Alejandro Piña Ortega, Subhra Paul and Rakib Islam, *University of Akron, United States; Nexteer Automotive, United States*

**11:45AM | Analysis of Vibration of Permanent Magnet Synchronous Motor with Distributed Winding for the PWM Method of Voltage Source Inverters**
Takafumi Hara, Toshiyuki Ajima, Yousuke Tanabe, Masanori Watanabe, Katsuhiro Hoshino and Kazuto Oyama, *Hitachi, Ltd., Japan; Hitachi Automotive Systems Ltd., Japan*

## S162 Electric Drives for Aerospace and Traction Applications

*Room: 262*
John Neely, Long Wu

**10:30AM | A Current-Fed Quasi Z-Source Inverter with SiC Power Modules for EV/HEV Applications**
Faris E. Alfaris and Subhashish Bhattacharya, *North Carolina State University, United States*

**10:55AM | High Performance 12 kW Motor and Drive for Modern Aircrafts**
Sayeed Mir, John Neely and Stan Seely, *Eaton Aerospace, United States*

**11:20AM | Temperature Effects Compensation Control Algorithm of IPM Machines Utilizing Current Pulse Injection and Online Multi-Parameter Estimation for Traction Applications**
Silong Li, Di Han and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

**11:45AM | A Versatile Power-Hardware-in-the-Loop based Emulator for Rapid Testing of Electric Drives**
Amitkumar K.S., R. Sudharshan Kaarthik and Pragasen Pillay, *Concordia University, Canada; Indian Institute of Space Science and Technology, India*

## S163 SiC Switching II

*Room: 207/208*
Keiji Wada, Ben Guo

**10:30AM | Extraction of Parasitic Inductances of SiC MOSFET Power Modules based on Two-Port S-Parameters Measurement**
Tianjiao Liu, Yanjun Feng, Runtao Ning, Wendi Wang, Thomas T.Y. Wong and Z. John Shen, *Illinois Institute of Technology, United States*

**10:55AM | High Speed dV/dt Control Technology for SiC Power Module for EV/HEV Inverters**
Taku Shimomura, Takayuki Ikari, Akinori Okubo, Ryusei Yamada and Tetsuya Hayashi, *Nissan Motor Co., Ltd., Japan*

**11:20AM | Switching Performance of a SiC MOSFET Body Diode and SiC Schottky Diodes at Different Temperatures**
M.R. Ahmed, R. Todd and A.J. Forsyth, *University of Manchester, United Kingdom*

**11:45AM | Digital Control based Voltage Balancing for Series Connected SiC MOSFETs under Switching Operations**
Katsuya Shingu and Keiji Wada, *Tokyo Metropolitan University, Japan*

## S164 Wireless Power Transfer IV

*Room: 200*
Huang-jen Chiu, Luis Herrera

**10:30AM | Optimization of Coils and Control Strategy for a Three-Phase Magnetically Coupled Resonant Wireless Power Transfer System Oriented by the Optimal Output Power Characteristics**
Xiewei Fu, Fuxin Liu and Xuling Chen, *Nanjing University of Aeronautics and Astronautics, China*

**10:55AM | Radiation Noise Reduction using Spread Spectrum for Inductive Power Transfer Systems considering Misalignment of Coils**
Keisuke Kusaka, Kent Inoue and Jun-ichi Itoh, *Nagaoka University of Technology, Japan*

**11:20AM | Maximum Power Point Tracker for Electromagnetic Energy Harvesting System**
Kimberley Hiu Kwan Tse and Henry Shu Hung Chung, *City University of Hong Kong, Hong Kong*

**11:45AM | Exciting Voltage Control for Transfer Efficiency Maximization for Multiple Wireless Power Transfer Systems**
Masato Sasaki and Masayoshi Yamamoto, *Sharp Corporation, Japan; Shimane University, Japan*

## S165 Hybrid Energy Systems

*Room: 237/38*
Jiacheng Wang, Jorge Garcia Garcia

**2:00PM | Direct Storage Hybrid (DSH) Inverter: A New Concept of Intelligent Hybrid Inverter**
Ha Pham, *University of Technology Sydney, Australia*

**2:25PM | New Soft-Switched High Frequency Multi-Input Step-up/down Converters for High Voltage DC-Distributed Hybrid Renewable Systems**
Sanjida Moury and John Lam, *York University, Canada*

**2:50PM | Optimal Sizing of Photovoltaic-Wind Hybrid System for Community Living Environment and Smart Grid Interaction**
Mohammad B. Shadmand, Mehran Mirjafari and Robert S. Balog, *Kansas State University, United States; Dell Inc., United States; Texas A&M University, United States*

**3:15PM | Modeling and Control of Brushless DC Motor for Compressor Driving**
Zhiguang Hua, Dongdong Zhao, Manfeng Dou, Liming Yan and Haitao Zhang, *Northwestern Polytechnical University, China*

## S166 Wave Energy System

*Room: 236*
Martin Ordonez, Mazharul Chowdhury

**2:00PM | Electromechanical Design and Experimental Evaluation of a Double-Sided, Dual Airgap Linear Vernier Generator for Wave Energy Conversion**
Jennifer Vining, Tim Mundon and Balky Nair, *Oscilla Power, United States*

**2:25PM | Grid-Connected Operation of Direct-Drive Wave Energy Converter by using HVDC Line and Undersea Storage System**
Seyyedmahdi Jafarishiadeh, Mehdi Farasat and Shahab Mehraeen, *Louisiana State University, United States*

**2:50PM | Power Conversion and Control of a Pole-Modulated Permanent Magnet Synchronous Generator for Wave Energy Generation**
Samir Hazra, Prathamesh Kamat, Subhashish Bhattacharya, Wen Ouyang and Steven Englebretson, *North Carolina State University, United States; ABB Corporate Research Center, United States*

**3:15PM | Competitive Control of Wave Power Plants through Price-Signal Optimum Allocation of Available Resources**
Antoni M. Cantarellas, Daniel Remon, Jorge M. Garcia and Pedro Rodriguez, *Abengoa, Spain; Technical University of Catalonia, Spain; Loyola Andalucía University, Spain*

## S167 Grid Connected Inverters and LCL Filter Design

*Room: 233*
Edison da Silva, Mahshid Amirabadi

**2:00PM | Analysis and Design of LCL Filter based Synchronverter**
Roberto Rosso, Jair Cassoli, Soenke Engelken, Giampaolo Buticchi and Marco Liserre, *WRD GmbH, Germany; Christian-Albrechts-University of Kiel, Germany*

**2:25PM | A Common Magnetic Integration Method for Single-Phase LCL Filters and LLCL Filters**
Xiaoqiang Li, Jingyang Fang, Pengfeng Lin and Yi Tang, *Nanyang Technological University, Singapore*

**2:50PM | Investigation of the Sideband Effect for the LCL-type Grid-connected Inverter with High LCL Resonance Frequency**
Dongsheng Yang, Xiongfei Wang and Frede Blaabjerg, *Aalborg University, Denmark*

**3:15PM | An Improved Active Damping Method with Grid-Side Current Feedback to Maximize Damping Ratio for LCL-Type Grid-Connected Inverter**
Weibiao Wu, Li Peng, Yu Qi, Qian Liu, Zeyi Huang, Fangming Dong, Manlin Chen and Bowen Wang, *Huazhong University of Science and Technology, China; CRRC Zhuzhou institute Co., Ltd., China; Commercial Aircraft Corporation of China, Ltd., China; Shenzhen Hopewind Electric Co., Ltd., China*

## S168 Modeling and Monitoring of Batteries II

*Room: 232*
Phillip Kollmeyer, Mohammad Anwar

**2:00PM | An Advanced SOF Estimation Algorithm for LiFePO4 SLI Battery of Vehicle with Online Update of Cranking Resistance**
Tae-Won Noh, Jung-Hoon Ahn and Byoung Kuk Lee, *Sungkyunkwan University, Korea*

**2:25PM | Online Condition Monitoring of Lithium-Ion Batteries using Impedance Spectroscopy**
Sean Moore and Paul Barendse, *University of Cape Town, South Africa*

**2:50PM | A New State of Charge Estimation Method for Lithium-Ion Battery based on Sliding Mode Observer**
Chunyu Wang, Naxin Cui, Miao Liu and Chenghui Zhang, *Shandong University, China*

**3:15PM | Accelerated Ageing of Lithium-Ion Batteries based on Electric Vehicle Mission Profile**
Daniel-Ioan Stroe, Maciej Swierczynski, Søren Knudesn Kær, Egoitz Martinez Laserna and Elixabet Sarasketa Zabala, *Aalborg University, Denmark; IK4-Ikerlan, Spain*

## S169 Single-Phase AC/DC Converters

*230/31*
Hongliang Wang, Petar Grbovic

**2:00PM | Half-Wave Class DE Low dv/dt Rectifier using Thinned-Out Method with Delta-Sigma Modulation**
Akinobu Shigeno and Hirotaka Koizumi, *Tokyo University of Science, Japan*

**2:25PM | A Single-Stage Asymmetrical Half-Bridge AC/DC Converter with Coupled Inductors**
Chia-Hao Li, Ying-Ting Huang, Yaow-Ming Chen and Yung-Ping Tong, *National Taiwan University, Taiwan; Lite-On Technology Corporation, Taiwan*

**2:50PM | A 220-V AC, LUT-Controlled 6-Segmented LED Driver with Background Calibration**
Hyunseung Lee, Eunseo Kim and Jaeha Kim, *Seoul National University, Korea*

**3:15PM | A Moving Pole-Placement Compensation Design Method to Increase the Bandwidth of RC-Damper-based Dual "Buck-Boost" AC/DC Converter**
Weimin Wu, Weibo Qin, Houqing Wang, Min Huang, Frede Blaabjerg and Marco Liserre, *Shanghai Maritime University, China; Aalborg University, Denmark; Kiel University, Germany*

## S170 Multilevel Converters II

*Room: 204*
Alessandro Costabeber, Yi Tang

**2:00PM | On-Line Switching Loss Reduction Scheme by General Space Vector PWM for Multilevel NPC Inverter**
Toshiji Kato, Kaoru Inoue and Takumi Sono, *Doshisha University, Japan*

**2:25PM | Three-Level Two-Stage Decoupled Active NPC Converter with Si IGBT and SiC MOSFET**
Di Zhang, Jiangbiao He and Sachin Madhusoodhanan, *GE Global Research Center, United States*

**2:50PM | A Ladder Transistor-Clamped Multilevel Inverter with High-Voltage Variation**
Eshet T. Wodajo, Malik Elbuluk, Seungdeog Choi and Haitham Abu Rub, *University of Akron, United States; Texas A&M University at Qatar, Qatar*

**3:15PM | Predictive Control of Modular Multilevel Series/Parallel Converter for Battery Systems**
Zhongxi Li, Ricardo Lizana, Angel V. Peterchev and Stefan M. Goetz, *Duke University, United States; Universidad Católica de la Santisima Concepcion, Chile*

## S171 Isolated DC/DC Converters

*Room: 200*
Luca Tarisciotti, Alireza Safaee

**2:00PM | High-gain Soft-switching DC-DC Converter with Voltage-doubler Rectifier Modules**
Rohit Suryadevara, Tao Li, Kumar Modepalli and Leila Parsa, *Rensselaer Polytechnic Institute, United States; Dialog Semiconductor, United States; FINsix Corporation, United States; University of California Santa Cruz, United States*

**2:25PM | Driving Piezoelectric-Transformer-based DC/DC Converters using Pulse Density Modulation**
Juan Diaz, Miguel J. Prieto, Fernando Nuno, Juan A. Martin-Ramos and Juan A. Martinez, *University of Oviedo, Spain*

**2:50PM | Bidirectional DC-DC Converter Utilizing Magnetic and Capacitive Power Transfer – 97.1% Efficiency at 1.2-MHz Switching**
Jong-Won Shin, Masanori Ishigaki, Ercan M. Dede and Jae Seung Lee, *Toyota Research Institute of North America, United States; Toyota Central RD Labs., Inc., Japan*

**3:15PM | LLC Resonant Converter with Shared Power Switches and Dual Coupled Resonant Tanks to Achieve Automatic Current Sharing**
Hongliang Wang, Yang Chen, Yan-Fei Liu, Zhihua Yang, Jahangir Afsharian and Bing Gong, *Queen's University, Canada; Murata Power Solutions, Canada*

## S172 Grid Synchronization Techniques

*Room: 205*
Zheng Wang, Alireza Bakhshai

**2:00PM | A Voltage Sensorless Phase Locked Loop Structure for Single Phase Grid Connected Converter System**
Subhajyoti Mukherjee, Vikram Roy Chowdhury, Pourya Shamsi and Mehdi Ferdowsi, *Missouri University of Science and Technology, United States*

**2:25PM | Comparative Analysis about Dynamic Performances of Grid Synchronization Schemes**
Hao Yi, Xiongfei Wang, Frede Blaabjerg and Fang Zhuo, *Xi'an Jiaotong University, China; Aalborg University, Denmark*

**2:50PM | A Phase-Locked Loop based on Cascaded Least-Error Squares Filter**
Bowen Wang, Li Peng, Manlin Chen, Weibiao Wu and Yuntao Xiao, *Huazhong University of Science and Technology, China*

**3:15PM | New Frequency and Amplitude Estimation Techniques for Grid-Connected DC/AC Inverters**
Iman Askarian, Suzan Eren, Majid Pahlevani and Andy Knight, *University of Calgary, Canada; Queen's University, Canada*

## S173 Modeling and Control of DC-AC Converters II

*Room: 201*
Leon M Tolbert, Dong Dong

**2:00PM | Anti-Windup Control for Stationary Frame Current Regulators using Digital Conditioning Architectures**
B.P. McGrath and D.G. Holmes, *RMIT University, Australia*

**2:25PM | A Current Sharing Technique for Parallel-Operated Unipolar-PWM Inverters**
Dong Li, Carl Ngai Man Ho and Ken King Man Siu, *University of Manitoba, Canada*

**2:50PM | Low Frequency Current Ripple Reduction of a Current-Fed Switched Inverter**
Anil Gambhir and Santanu Mishra, *Indian Institute of Technology Kanpur, India*

**3:15PM | Accuracy Analysis of the Zero-Order Hold Model for Digital Pulsewidth Modulation**
Junpeng Ma, Xiongfei Wang, Frede Blaabjerg, Lennart Harnefors and Wensheng Song, *Southwest Jiaotong University, China; Aalborg University, Denmark; ABB Corporate Research Center, Sweden*

## S174 Testing, Measurement, and Validation of Power Converters

*Room: 260/61*
Vladimir Blasko, Qin Lei

**2:00PM | DC Current Determination in Grid-Connected Transformerless Inverter Systems using a DC Link Sensing Technique**
Weichi Zhang, Matthew Armstrong and Mohammed Elgendy, *Newcastle University, United Kingdom*

**2:25PM | Online Measurement of Bus Impedance of Interconnected Power Electronics Systems: Applying Orthogonal Sequences**
Tomi Roinila, Hessamaldin Abdollahim, Silvia Arrua and Enrico Santi, *University of South Carolina, United States*

**2:50PM | Switching Frequency Characterization of Hysteresis Control in a Pump Back Test Configuration**
Xu She, Tony Frangieh and Rajib Datta, *GE Global Research, United States*

**3:15PM | Capacitance Estimation Algorithm based on DC-Link Voltage Harmonics Using Artificial Neural Network in Three-Phase Motor Drive Systems**
Hammam Soliman, Pooya Davari, Huai Wang and Frede Blaabjerg, *Aalborg University, Denmark; Arab Academy for Science and Technology, Egypt*

## S175 Motors for Transportation

*Room: 264*
Ronghai Qu, Khwaja Rahman

**2:00PM | Principle of Variable Leakage Flux IPMSM using Arc-Shaped Magnet Considering Variable Motor Parameter Characteristics Depending on Load Current**
Takashi Kato, Toru Matsuura, Kensuke Sasaki and Tsutomu Tanimoto, *Nissan Motor Co., Ltd., Japan*

**2:25PM | Performance Analysis of Surface Permanent Magnet Synchronous Machine Topologies with Dual-Wound Stators**
Subhra Paul, Alejandro Piña Ortega, Cong Ma, Rakesh Mitra, Prerit Pramod and Rakib Islam, *Nexteer Automotive Corp., United States*

**2:50PM | Breakdown Resistance Analysis of Traction Motor Winding Insulation under Thermal Ageing**
K.N. Gyftakis, P.A. Panagiotou, N. Lophitis, D.A. Howey and M.D. McCulloch, *Coventry University, United Kingdom; University of Oxford, United Kingdom*

**3:15PM | High Torque Density PM Motor for Racing Applications**
Marco Munaro, Nicola Bianchi and Giovanni Meneghetti, *University of Padova, Italy*

## S176 General Topics in Electrical Machines

*Room: 263*
Jose Antonino-Daviu, Dong Jiang

**2:00PM | Design and Experimental Evaluation of a Multilayer AC Winding Configuration for Sinusoidal MMF with Shorter End-turn Length**
Md Ashfanoor Kabir, Mohamed Zubair M. Jaffar, Zhao Wan and Iqbal Husain, *North Carolina State University, United States*

**2:25PM | Impact of Machine Magnetization State on Permanent Magnet Losses in Permanent Magnet Synchronous Machines**
Daniel Fernández Alonso, David Reigosa, Juan Guerrero, Carlos Suarez and Fernando Briz, *University of Oviedo, Spain*

**2:50PM | Operating Limits and Practical Operation of a Brushless Doubly-Fed Reluctance Machine**
William K. Song, David G. Dorrell, Andrew M. Knight, Robert E. Betz and David Gay, *University of Technology Sydney, Australia; University of KwaZulu-Natal, South Africa; University of Calgary, Canada; University of Newcastle, Australia*

**3:15PM | A Novel Flux-Reversal Hybrid Magnet Memory Machine**
Hui Yang, Heyun Lin, Z.Q. Zhu, Haitao Wang, Shuhua Fang and Yunkai Huang, *Southeast University, China; University of Sheffield, United Kingdom*

## S177 PM and IPM Motor Drives III

*Room: 262*
Bilal Akin, Annette Muetze

**2:00PM | Online Stator Resistance Tracking for Reluctance and Interior Permanent Magnet Synchronous Motors**
R. Antonello, L. Ortombina, F. Tinazzi and M. Zigliotto, *University of Padova, Italy*

**2:25PM | On-Line Stator Resistance and Permanent Magnet Flux Linkage Identification on Open-end Winding PMSM Drives**
M. Pulvirenti, G. Scarcella, G. Scelba, A. Testa and M.M. Harbaugh, *University of Catania, Italy; University of Messina, Italy; Rockwell Automation, United States*

**2:50PM | Quick Compensation Method of Motor Phase Current Sensor Offsets without Motor Parameters for PMSM Drive**
Koroku Nishizawa, Jun-ichi Itoh and Yoshinobu Nishizawa, *Nagaoka University of Technology, Japan*

**3:15PM | Analytical Design and Auto-Tuning of Adaptive Flux-Weakening Voltage Regulation Loop in IPMSM Drives with Accurate Torque Regulation**
Nicola Bedetti, Sandro Calligaro and Roberto Petrella, *Gefran S.p.A., Italy; Free University of Bozen, Italy; University of Udine, Italy*

## S178 Device Self Sensing Techniques

*Room: 207/208*
Adam Skorek, Jing Xu

**2:00PM | Elimination of Bus Voltage Impact on Temperature Sensitive Electrical Parameter During Turn-on Transition for Junction Temperature Estimation of High-power IGBT Modules**
Haoze Luo, Francesco Iannuzzo, Frede Blaabjerg, Xiang Wang, Wuhua Li and Xiangning He, *Aalborg University, Denmark; University of Cassino and Southern Lazio, Italy; Zhejiang University, China*

**2:25PM | IGBT Junction Temperature Estimation via Gate Voltage Plateau Sensing**
Christoph H. van der Broeck, Alexander Gospodinov and Rik W. De Doncker, *RWTH Aachen University, Germany*

**2:50PM | On-Line Temperature Estimation of SiC Power MOSFET Modules through On-State Resistance Mapping**
Fausto Stella, Gianmario Pellegrino, Eric Armando and Davide Daprà, *Politecnico di Torino, Italy; Vishay Semiconductor Italiana S.p.A., Italy*

**3:15PM | Characterization of SenseGaN Current-Mirroring for PowerGaN with the Virtual Grounding in a Boost Converter**
Mehrdad Biglarbegian and Babak Parkhideh, *University of North Carolina at Charlotte, United States*

E = East W = West

# Technical Program Schedule

## POSTER SESSIONS

**Monday, October 2** **5:00PM – 7:30PM**

## S32 Energy Storage Systems

E

*Room: Exhibit Hall B*
**Chairs:** Rlashmi Prasad, Dazhong Gu

**P101 | An Online LiFePO4 Battery Impedance Estimation Method for Grid-Tied Residential Energy Storage Systems**
Andres Salazar, Carlos Restrepo, Yabiao Gao, Javad Mohammadpour Velni and Antonio Ginart, *Sonnen Inc., United States; University of Georgia, United States; Smart Wires, Inc., United States*

**P102 | An Improved Voltage Balance Strategy for Renewable Generation Energy Storage System**
Muxin Han, Fu Jiang, Heng Li, Rong Zhou, Zhiwu Huang and Jun Peng, *Central South University, China*

**P103 | Design Recommendations for Energy Systems: A UK Domestic Study**
Konstantina Panagiotou, Christian Klumpner, Mark Sumner and Pat Wheeler, *University of Nottingham, United Kingdom*

**P104 | A Decentralized SOC Balancing Method in Cascaded H-Bridge based Storage Modules**
Guangze Shi, Yao Sun, Wenbin Yuan, Hua Han, Mei Su and Xiaochao Hou, *Central South University, China*

**P105 | Cloud-based Battery Condition Monitoring Platform for Large-Scale Lithium-Ion Battery Energy Storage Systems using Internet-of-Things (IoT)**
Amit Adhikaree, Taesic Kim, Jitendra Vagdoda, Ason Ochoa, Patrick J. Hernandez and Young Lee, *Texas A&M University-Kingsville, United States*

**P106 | Environmental Tests and Evaluations of Variable 18650 Cylindrical Li-Ion Cells for Space Cell's Qualification Establishment**
Jonghoon Kim, P.-Y. Lee, C.-O Youn, Woonki Na and Minho Jang, *Chungnam National University, Korea; California State University-Fresno, United States; Korea Aerospace Research Institute, Korea*

**P107 | A Hybrid Vanadium Redox/Lithium-Ion Energy Storage System for Off-Grid Renewable Power**
Leong Kit Gan, Jorn Reniers and David Howey, *University of Oxford, United Kingdom*

**P108 | Electrical Circuit Modeling of Lithium-Sulfur Batteries during Discharging State**
Daniel-Ioan Stroe, Vaclav Knap, Maciej Swierczynski and Erik Schaltz, *Aalborg University, Denmark*

**P109 | Supercapacitor to Provide Ancillary Services to the Grid**
V. Gevorgian, E. Muljadi, Yusheng Luo, M. Mohanpurkar, R. Hovsapian and V. Koritarov, *National Renewable Energy Laboratory, United States; Idaho National Laboratory, United States; Argonne National Laboratory, United States*

**P110 | Cascaded Multilevel qZSI Powered Single-Phase Induction Motor for Water Pump Application**
Syed Rahman, Mohammad Meraj, Atif Iqbal, Mohd Tariq, Ali I. Maswood, Lazhar Ben-Brahim and Rashid Alammari, *Qatar University, Qatar; Nanyang Technological University, Singapore; Aligarh Muslim University, India*

## S33 AC/AC Converters

E

*Room: Exhibit Hall B*
**Chairs:** Yam Siwakoti, Luca Zarri

**P301 | Single-Phase Trans-Z-Source AC-AC Converter with Safe-Commutation Strategy**
Jixiao Nai, Liangzong He and Yuzi Lin, *Xiamen University, China*

**P302 | A Post-Fault Strategy to Control the AC-AC Modular Multilevel Converter under Input-Side Line-to-Ground Fault**
Qichen Yang and Maryam Saeedifard, *Georgia Institute of Technology, United States*

**P303 | Single-Phase Universal Active Power Filter with Five-Leg AC/DC/AC Converter**
Phelipe L.S. Rodrigues, Cursino B. Jacobina, Nayara B. de Freitas and Mauricio B.R. Correa, *Federal University of Campina Grande, Brazil*

**P304 | Modulation and Control Strategy for a Single-Phase to Three-Phase Indirect Matrix Converter Drives**
Yeongsu Bak, June-Seok Lee and Kyo-Beum Lee, *Ajou University, Korea; Korea Railroad Research Institute, Korea*

**P305 | Switched Capacitor Impedance Matrix Converter**
M. Raghuram, Avneet K. Chauhan and Santosh K. Singh, *Indian Institute of Technology, India*

**P306 | A Modular Three-Phase AC-AC Converter with Small Number of Film Capacitors for High-Voltage High-Current Applications**
Ehsan Afshari and Mahshid Amirabadi, *Northeastern University, United States*

**P307 | Control Scheme of the Modular Multilevel Matrix Converter using Space Vector Modulation for Wide Frequency Range Operation**
Yushi Miura, Takuya Fujikawa, Tomoaki Yoshida and Toshifumi Ise, *Osaka University, Japan*

**P308 | Investigations on the Family of Center-Point-Clamped AC-AC Direct Power Converters**
Pankaj Kumar Bhowmik and Madhav Manjrekar, *University of North Carolina-Charlotte, United States*

## S34 Reliability, Diagnostics and Fault Analysis of Power Electronics

E

*Room: Exhibit Hall B*
**Chairs:** Wei Qiao, Huai Wang

**P501 | Diagnosis of Open-Circuit Faults for Six-Level Hybrid Inverters**
Quoc Anh Le, Ngoc Dat Dao and Dong-Choon Lee, *Can Tho University, Viet Nam; Yeungnam University, Korea*

**P502 | Design of Power Converter in DFIG Wind Turbine with Enhanced System-Level Reliability**
Dao Zhou, Guanguan Zhang and Frede Blaabjerg, *Aalborg University, Denmark; Central South University, China*

**P503 | Comparative Study on the Crowbar Protection Topologies for a DFIG Wind Turbine**
Andreas Giannakis, Efthymios Koroniotis and Athanasios Karlis, *Democritus University of Thrace, Greece*

**P504 | Photovoltaic Condition Monitoring using Real-Time Adaptive Parameter Identification**
Jason Poon, Palak Jain, Costas Spanos, Sanjib Kumar Panda and Seth R. Sanders, *University of California-Berkeley, United States; National University of Singapore, Singapore*

**P505 | A Fast Fault Diagnosis Method for Submodule Failures in Modular Multilevel Converters**
Kunshan Xu, Shaojun Xie, Ye Yan, Zhao Zhang, Binfeng Zhang and Qiang Qian, *Nanjing University of Aeronautics and Astronautics, China*

**P506 | On Self-Healing of Grid-Tied PV Inverters Considering Current Sensor Inaccuracy and Aging Degradation**
Mehrdad Biglarbegian, Hamidreza Jafarian and Babak Parkhideh, *University of North Carolina at Charlotte, United States*

**P507 | Fault Tolerant Control Method for Interleaved DC-DC Converters under Open and Short Circuit Switch Faults**
Elham Pazouki, Jose Alexis De Abreu-Garcia and Yilmaz Sozer, *University of Akron, United States*

**P508 | A General Fault Diagnosis Strategy for Modular DC-DC Converter System**
Hanyu Wang, Xuejun Pei, Yuhuan Wu and Yong Kang, *Huazhong University of Science and Technology, China*

**P509 | Monitoring Transistor Degradation in Power Electronic Converters using Saturation-Region Resistance**
Lei Ren, Chunying Gong and Xin Chen, *Nanjing University of Aeronautics and Astronautics, China*

## S35 AC Electrical Machines: Innovative Design Studies

E

*Room: Exhibit Hall B*
**Chairs:** Phillip Kollmeyer, Zi-Qiang Zhu

**P701 | Principles and Characteristics of an Ultralightweight Electromagnetic Resonance Coupling Machine With a Cage Rotor**
Kazuto Sakai, Kenta Takijima and Kazuki Nihei, *Toyo University, Japan*

**P702 | Investigation on the Frequency Effects on Iron Losses in Laminations**
Omar Bottesi, Sandro Calligaro and Luigi Alberti, *Free University of Bozen-Bolzano, Italy; University of Padova, Italy*

**P703 | The Effect of Modulating Ring Design on Induction Machine with Integrated Magnetic Gear Torque**
Dalia Zaky Abdelhamid and Andrew M. Knight, *University of Calgary, Canada*

**P704 | Practical Considerations on the Off-Line Measurements of PMSM and SyRM Inductances**
Andrea Cavagnino, Silvio Vaschetto and Emmanuel Agamloh, *Politecnico di Torino, Italy; Advanced Energy, United States*

**P705 | Decoupled Current Control with Novel Anti-Windup for PMSM Drives**
Kahyun Lee, Jung-Ik Ha and Dwarakanath Simili, *Seoul National University, Korea; General Motors, United States*

**P706 | Foil Conductor Concentrated Coil Windings for Modular Permanent Magnet AC Machines**
Michael Rios, Giri Venkataramanan and Annette Muetze, *University of Wisconsin-Madison, United States; Graz University of Technology, Austria*

**P707 | Synchronous Machine Field Excitation Utilizing a Single Phase Matrix Converter Excited Rotary Transformer**
Jianyang Liu and Thomas A. Lipo, *University of Wisconsin-Madison, United States*

## S36 Axial and Transversal Flux Machines

E

*Room: Exhibit Hall B*
**Chairs:** Akira Chiba, Ayman El-Refaie

**P901 | Mechanical and Thermal Performance of Transverse Flux Machines**
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 Laboratory, United States*

**P902 | Maximum Torque Output Control of Hybrid Permanent Magnet Axial Field Flux-Switching Memory Machine**
Gongde Yang, Mingyao Lin, Nian Li, Xinghe Fu and Kai Liu, *Southeast University, China*

**P903 | Design Considerations and Performance Improvement of a Dual-Stator PM Vernier Motor with Axial-Flux Loop**
Fei Zhao, Liyi Li, Chunhua Liu and Byung-il Kwon, *Harbin Institute of Technology, China; City University of Hong Kong, Hong Kong; Hanyang University, Korea*

**P904 | Design, Analysis and Prototyping of a Flux Switching Transverse Flux Machine with Ferrite Magnets**
Zhao Wan and Iqbal Husain, *North Carolina State University, United States*

**P905 | MAGNUS – An Ultra-high Specific Torque PM Axial Flux Type Motor with Flux Focusing and Modulation**
Vandana Rallabandi, Narges Taran, Dan M. Ionel and Ion G. Boldea, *University of Kentucky, United States; Univerisitatea Politecnica Timisoara, Romania*

**P906 | Three-Part Hybrid Rotor PM Machine with Variable Magnetization State**
Dheeraj Bobba, Timothy A. Burress, Jason Pries and Bulent Sarlioglu, *University of Wisconsin-Madison, United States; Oak Ridge National Laboratory, United States*

**P907 | Designing the First Stage of a Series Connected Multistage Coaxial Magnetic Gearbox for a Wind Turbine Demonstrator**
K. Li, J. Wright, S. Modaresahmadi, D. Som, W. Williams and J.Z. Bird*University of North Carolina at Charlotte, United States; Portland State University, United States*

**P908 | A Comprehensive Review of Permanent Magnet Transverse Flux Machines for Direct Drive 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 Laboratory, United States*

## S37 Utility Converters and Power Electronics Transformers

W

*Room: Exhibit Hall B*
**Chairs:** Fred Wang, Jinwei He

**P1101 | A Novel Current Control Strategy for a Back-to-Back HVDC Applications under Unbalanced Operation Conditions**
Mohammed Alharbi, Faris E. Alfaris and Subhashish Bhattacharya, *North Carolina State University, United States*

**P1102 | Voltage Balancing of Modular Smart Transformers based on Dual Active Bridges**
Sante Pugliese, Markus Andresen, Rosa Mastromauro, Giampaolo Buticchi, Silvio Stasi and Marco Liserre, *Polytechnic of Bari, Italy; Christian-Albrechts-Universität zu Kiel, Germany; University of Florence, Italy*

**P1103 | Three-Port Energy Router for Universal and Flexible Power Management in Future Smart Distribution Grids**
L. Tarisciotti, P. Zanchetta, S. Pipolo and S. Bifaretti, *University of Nottingham, United Kingdom; University of Rome Tor Vergata, Italy*

**P1104 | Design and Implementation of a Series Resonant Solid State Transformer**
Mohammad Rashidi, Mohamad Sabbah, Abedalsalam Bani-Ahmed, Adel Nasiri and Mohammad Hasan Balali, *University of Wisconsin-Milwaukee, United States*

**P1105 | Design and Implementation of a 7.2kV Single Stage AC-AC Solid State Transformer based on Current Source Series Resonant Converter and 15 kV SiC MOSFET**
Qianlai Zhu, Li Wang, Dong Chen, Liqi Zhang and Alex Q. Huang, *North Carolina State University, United States*

**P1106 | Research on an Improved Hybrid Unified Power Flow Controller**
Baichao Chen, Wenli Fei, Jiaxin Yuan and Cuihua Tian, *Wuhan University, China*

## S38 Motor Drives I

W

*Room: Exhibit Hall B*
**Chairs:** Fabio Giulii Capponi, Radu Bojoi

**P1301 | Two-Phase Open-End Winding Induction Motor Drive using Improved Current Source Inverter**
Louelson A.L. de A.C. Costa, Montiê A. Vitorino, Edgar R. Braga-Filho, Maurício B.R. Corrêa and Darlan A. Fernandes, *Federal University of Campina Grande, Brazil; Federal University of Paraiba, Brazil*

**P1302 | An Extended Analytical Approach for Obtaining the Steady-State Periodic Solutions of SPWM Single-Phase Inverters**
Xu Cheng, Yanfeng Chen, Xi Chen, Bo Zhang and Dongyuan Qiu, *South China University of Technology, China*

**P1303 | Reliability Analysis and Life Testing of Semiconductor Devices for In-Wheel Motor Drive System**
Chao Ji, Geoffrey Owen, Simon T.M. Brockway and Chris Hilton, *Protean Electric Ltd., United Kingdom*

**P1304 | Comparison of Operating Modes for a Brushless Doubly Fed Reluctance Motor Drive**
Ronald S. Rebeiro and Andrew M. Knight, *University of Calgary, Canada*

**P1305 | Sensorless Direct Torque Control of Induction Motors with Fault-Tolerant Extended Kalman Filtering**
Xin Wang, *Southern Illinois University, United States*

**P1306 | A Modulated Model Predictive Control Scheme for the Brushless Doubly-Fed Induction Machine**
Xuan Li, Tao Peng, Hanbing Dan, Guanguan Zhang, Weiyi Tang and Pat Wheeler, *Central South University, China; University of Nottingham, United Kingdom*

## S39 Switching Devices I

W

*Room: Exhibit Hall B*
**Chairs:** Tanya Gachovska, Jun Wang

**P1501 | Comparative Assessment of 3.3kV/400A SiC MOSFET and Si IGBT Power Modules**
Claudiu Ionita, Muhammad Nawaz, Kalle Ilves, and Francesco Iannuzzo, *ABB Corporate Research, Sweden; Aalborg University, Denmark*

**P1502 | Characterization and Performance Evaluation of State-of-the-Art 3.3 kV 30 A Full-SiC MOSFETs**
Alinaghi Marzoughi, Rolando Burgos and Dushan Boroyevich, *Virginia Polytechnic Institute and State University, United States*

**P1503 | Research on an Improved DC-Side Snubber for Suppressing the Turn-Off Overvoltage and Oscillation in High Speed SiC MOSFET Application**
Mei Liang, Yan Li, Qian Chen, Yi Lu, Haihong Yu, Trillion Q. Zheng, Haobo Guo and Fangwei Zhao, *Beijing Jiaotong University, China; State Grid Zhejiang Electric Power Corporation, China*

**P1504 | A Modified Equivalent Circuit based Electro-Thermal Model for Integrated POL Power Modules**
Wenbo Liu, Sam Webb, Yan-Fei Liu, Laili Wang and Doug Malcolm, *Queen's University, Canada; Sumida Technologies Inc., Canada*

**P1505 | Investigation of Cascode Structure GaN Devices in ZCS Region of LLC Resonant Converter**
Junlin Xiang, Xiaoyong Ren, Yakun Wang and Yue Zhang, *Nanjing University of Aeronautics and Astronautics, China*

**P1506 | Design of High-Speed H-Bridge Converter using Discrete SiC MOSFETs for Solid-State Transformer Applications**
Dong Dong, Mohammed Agamy, Gary Mandrusiak and Qin Chen, *GE Global Research, United States*

**P1507 | Role of Parasitic Capacitances in Power MOSFET Turn-On Switching Speed Limits: A SiC Case Study**
Davide Cittanti, Francesco Iannuzzo, Eckart Hoene and Kirill Klein, *Politecnico di Torino, Italy; Aalborg University, Denmark; Fraunhofer IZM, Germany*

**P1508 | Analysis of False Turn-On Phenomenon of GaN HEMT with Parasitic Inductances for Propose Novel Design Method Focusing on Peak Gate Voltage**
Seiya Ishiwaki, Toshihiro Iwaki, Yusuke Sugihara and Kimihiro Nanamori and Masayoshi Yamamoto, *Shimane University, Japan; Nagoya University, Japan*

**P1509 | Gate Driver Design Considerations for Silicon Carbide MOSFETs including Series Connected Devices**
Samir Hazra, Kasunaidu Vechalapu, Sachin Madhusoodhanan, Subhashish Bhattacharya and Kamalesh Hatua, *North Carolina State University, United States; Indian Institute of Technology Madras, United States*

## S40 Electric Vehicle Energy Management

W

*Room: Exhibit Hall B*
**Chairs:** Kevin Bai, Anand Sathyan

**P1701 | A Novel Dynamic Demand Control of an Electric Vehicle Integrated in a Solar Nanogrid with Energy Storage**
Adamantios Bampoulas and Athanasios Karlis, *Democritus University of Thrace, Greece*

**P1702 | Stackelberg Game based Energy and Reserve Management for a Fast Electric Vehicle Charging Station**
Tianyang Zhao, Xuewei Pan, Shuhan Yao and Peng Wang, *Nanyang Technology University, Singapore; Harbin Institute of Technology, China*

**P1703 | Multi-Time Scale Forecast for Schedulable Capacity of EVs based on Big Data and Machine Learning**
Meiqin Mao, Yangyang Wang, You Yue and Liuchen Chang, *Hefei University of Technology, China*

**P1704 | Three-Port Bidirectional CLLC Resonant Converter based Onboard Charger for PEV Hybrid Energy Management System**
Xiaoying Lu and Haoyu Wang, *ShanghaiTech University, China*

**P1705 | V2G Bi-directional Battery Charger with Flexible AC/DC Converter**
Yaguang Liu, Wenxing Zhong, Haoyuan Weng, Zheqing Li, Min Chen, Changsheng Hu and Dehong Xu, *Zhejiang University, China*

## S41 Sensing and Control for Power Converters

W

*Room: Exhibit Hall B*
**Chairs:** Tsai-Fu Wu, Amir Yaznadi

**P1901 | An Experimental Method for Extracting Stray Inductance of Bus Bars without High Bandwidth Current Measurement**
Ye Jiang, Liqiang Yuan, Zhengming Zhao, Haitao Zhang, Rong Yi, Yali Ding and Wei Gu, *Tsinghua University, China; Rongxin Huiko Electric Technology Co., Ltd., China; Anshan Information Engineering School, China*

**P1902 | Comparative Evaluations on Three High Resolution Sampling Schemes for Digital Boundary Control**
Yuanbin He, Chun-tak Lai, Shu-hung Chung and Weimin Wu, *Hangzhou Dianzi University, China; City University of Hong Kong, Hong Kong; Shanghai Maritime University, China*

**P1903 | Closed-Loop Control of a Capacitive-Link Universal Converter with Minimum Number of Voltage Sensors**
Masih Khodabandeh and Mahshid Amirabadi, *Northeastern University, United States*

**P1904 | Wavelet-based Prognostic-Oriented Temperature Sensing with Sigma-Delta ADCs in Power Applications**
Giorgio Pietrini, Alessandro Soldati, Davide Barater and Carlo Concari, *University of Parma, Italy*

## S42 Modelling and Control of MMC

W

*Room: Exhibit Hall B*
**Chairs:** Yongdong Li, Tzung-Lin Lee

**P2101 | Delta-Sigma Modulators for Modular Multilevel Converters**
Hao Jiang and Giri Venkataramanan, *University of Wisconsin-Madison, United States*

**P2102 | Hybrid Asymmetric Cascaded Multilevel Inverters based on Three- and Nine-Level H-Bridges**
Filipe A. da C. Bahia, Cursino B. Jacobina, Nady Rocha, Italo Roger F.M.P. da Silva, Reuben P.R. de Sousa, *Federal University of Campina Grande, Brazil; Federal University of the Paraíba, Brazil; Federal Rural University of Pernambuco, Brazil*

**P2103 | Comparative Study of PES Net and SyCCo Bus: Communication Protocols for Modular Multilevel Converter**
Hao Tu and Srdjan Lukic, *North Carolina State University, United States*

**P2104 | Asymmetric Cascaded H-Bridge Topology with 25-Level Output Voltage based on Modular Multilevel DSCC Inverters**
Filipe A. da C. Bahia, Cursino B. Jacobina, Nady Rocha, Italo Roger F.M.P. da Silva, *Federal University of Campina Grande, Brazil; Federal University of the Paraíba, Brazil; Federal Rural University of Pernambuco, Brazil*

**P2105 | System-on-Chip Implementation of Embedded Real-Time Simulator for Modular Multilevel Converters**
Mattia Ricco, Marius Gheorghe, Laszlo Mathe and Remus Teodorescu, *Aalborg University, Denmark*

**P2106 | A Novel Frequency Domain Control Method for Modular Multilevel Converters under Non-Sinusoidal Supply Conditions**
Rostan Rodrigues, Jun Li and Herbert L. Ginn III, *ABB Inc., United States; University of South Carolina, United States*

**P2107 | Modeling and Design of the Modular Multilevel Converter with Parametric and Model-Form Uncertainty Quantification**
Niloofar Rashidi Mehrabadi, Rolando Burgos, Dushan Boroyevich and Christopher Roy, *Virginia Polytechnic Institute and State University, United States*

**P2108 | Decoupled$\alpha\beta$ Model of Modular Multilevel Converter (MMCs)**
Yi-Hsun Hsieh and Fred C. Lee, *Virginia Polytechnic Institute and State University, United States*

**P2109 | Damping Analysis for Transients of Modular Multilevel Converter**
Haihao Jiang and Boon-Teck Ooi, *McGill University, Canada*

## S43 Control in Microgrids

W

*Room: Exhibit Hall B*
**Chairs:** Xiaonan Lu, Thomas Podlesak

**P2301 | Variable Structure Robust Voltage Regulator Design for Microgrid Master-Slave Control**
Tong Yao and Raja Ayyanar, *Arizona State University, United States*

**P2302 | Stability Improvement of Current Control by Voltage Feedforward considering a Large Synchronous Inductance of Diesel Generator**
Jongmin Jo and Hanju Cha, *Chungnam National University, Korea*

**P2303 | Method to Reduce the Circulating Current of Paralleled Inverters with Different Capacities**
Xiang Li, Jiawei Chen and Jie Chen, *Chongqing University, China; Nanjing University of Aeronautics and Astronautics, China*

**P2304 | Novel Hybrid Energy Storage Control for a Single Phase Energy Management System in a Remote Islanded Microgrid**
Giovanna Oriti, Alexander L. Julian, Norma Anglani and Gabriel D. Hernandez, *Naval Postgraduate School, United States; Power Engineering, United States; University of Pavia, Italy; United States Navy, United States*

**P2305 | Dynamic Composite Load Signature Detection and Classification using Supervised Learning over Disturbance Data**
Kelly Tray, Phylicia Cicilio, Ted Brekken and Eduardo Cotilla-Sanchez, *Oregon State University, United States*

**P2306 | A Highly Reconfigurable System Emulator for Testing AC Microgrids**
Vijay A.S., Suryanarayana Doolla and Mukul C. Chandorkar, *Indian Institute of Technology Bombay, India*

**P2307 | An Unsupervised Approach for Disaggregating Major Loads in Small Commercial Buildings**
Saman Mostafavi, John Troxler and Robert W. Cox, *University of North Carolina at Charlotte, United States*

**P2308 | Autonomous Control of Active Power Electronics Loads for Frequency Control of Islanded Microgrid**
Guangqian Ding, Song Zhang, Jing Shan, Feng Gao and Xin Gu, *University of Jinan, China; State Grid of China Technology College, China; State Grid Zaozhuang Power Supply Company, China; Shandong University, China*

## Tuesday, October 3 10:30AM –1:00PM

## S59 Datacenters and Telecommunication Applications

E *Room: Exhibit Hall B*
**Chairs:** Xinke Wu, Al-Thaddeus Avestruz

**P2501 | Single-Stage Isolated 48V-to-1.8V Point-of-Load Converter Utilizing an Impedance Control Network for Wide Input Range Operation**
Ashish Kumar and Khurram K. Afridi, *University of Colorado-Boulder, United States*

**P2502 | Startup and Control of High Efficiency 48/1V Sigma Converter**
Mohamed H. Ahmed, Chao Fei, Virginia Li, Fred C. Lee and Qiang Li, *Virginia Polytechnic Institute and State University, United States*

**P2503 | A Hybrid AC and DC Distribution Architecture in Data Centers**
Alexander Barthelme, Xiwen Xu and Tiefu Zhao, *University of North Carolina at Charlotte, United States*

**P2504 | Unidirectional Single-Phase AC-DC-AC Three-Level and Two-Level Three-Leg Converters**
Nustenil S.M.L. Marinus, Cursino B. Jacobina, Nady Rocha and Reuben P.R. de Sousa, *Federal University of Campina Grande, Brazil; Federal Institute of Ceara, Brazil; Federal University of Paraiba, Brazil*

**P2505 | Data Center Power Distribution System Reliability Analysis Tool based on Monte Carlo Next Event Simulation Method**
Yang Lei and Alex Q. Huang, *North Carolina State University, United States*

**P2506 | Resonant Filter based Buck Converters with Tunable Capacitor**
Ben Guo, Suman Dwari, Lee Yongduk, Joseph Mantese, Brian McCabe, Andy Ritter, Craig Nies, Shashank Priya, Khai Ngo, Lujie Zhang and Rolando Burgos, *United Technologies Research Center, United States; AVX Corp., United States; Virginia Polytechnic Institute and State University, United States*

**P2507 | An Enhanced Control Scheme for Uninterruptible Power Supply**
Jinghang Lu, Mehdi Savaghebi, Baoze Wei and Josep Guerrero, *Aalborg University, Denmark*

## S60 Applications of Electric Traction and Propulsion

E *Room: Exhibit Hall B*
**Chairs:** Bulent Sarlioglu, Suman Debnath

**P2701 | An Accurate Modeling Method for Electric Parameters Prediction of Contactless Slip Ring**
Guangming He, Qianhong Chen, Xin Chen and Pingping Xin, *Nanjing University of Aeronautics and Astronautics, China*

**P2702 | High Power Medium Frequency Power Electronic Traction Transformer based on Bidirectional Z-Source-Alike Impedance Network**
Hongbo Li, Zhixue Zhang and Jing Shang, *CRRC Zhuzhou Institute Co., Ltd., China*

**P2703 | Investigation of the RC-IGBT Application in High Speed Railway Converters**
Xianjin Huang, Dengwei Chang, and Trillion Q. Zheng, *Beijing Jiaotong University, China*

**P2704 | Battery Energy Storage System Integration to the More Electric Aircraft 270 V DC Power Distribution Bus using Peak Current Controlled Dual Active Bridge Converter**
Mohd Tariq, Ali I. Maswood, Chandana J. Gajanayake, Amit K. Gupta and Firman Sasongko, *Nanyang Technological University, Singapore; Rolls-Royce Singapore Pte. Ltd, Singapore*

**P2705 | Research on Excitation Control Method for the Three-Phase Brushless Asynchronous Excitation System of Wound-Field Synchronous Starter/Generators**
Zan Zhang, Weiguo Liu, Shuai Mao, Jichang Peng, Chenghao Sun, Tao Meng and Ningfei Jiao, *Northwestern Polytechnical University, China*

**P2706 | Optimal Gear Ratios Selection for a Nissan Leaf: A Case Study of InGear Transmission System**
Ahmed S. Abdelrahman, Khalil S. Algarny and Mohamed Z. Youssef, *University of Ontario Institute of Technology, Canada*

**P2707 | A Novel Hybrid Approach towards Drive-Cycle based Design and Optimization of a Fractional Slot Concentrated Winding SPMSM for BEVs**
Philip Korta, Lakshmi Varaha Iyer, Chunyan Lai, Kaushik Mukherjee, Jimi Tjong and Narayan C. Kar, *University of Windsor, Canada*

## S61 Multilevel Converters

E *Room: Exhibit Hall B*
**Chairs:** Sheldon Williamson, Pericle Zanchetta

**P2901 | A Novel Voltage Balance Circuit for Three-Level Diode-Clamped Inverter with Small Inductor**
Dongdong Cui, Zhida Zhou, Bo Yang, Qiongxuan Ge and Cong Zhao, *Institute of Electrical Engineering, CAS, China; University of Chinese Academy of Sciences, China*

**P2902 | An Improved Phase-Shifted PWM Method for a Three-Phase Cascaded H-Bridge Multi-Level Inverter**
June-Seok Lee, Kyo-Beum Lee and Youngjong Ko, *Korea Railroad Research Institute, Korea; Ajou University, Korea; University of Kiel, Germany*

**P2903 | Performance Assessment of the 5-Level 3-Phase Back to Back E-Type Converter**
Marco Di Benedetto, Alessandro Lidozzi, Luca Solero, Fabio Crescimbini and Petar J. Grbovic, *Roma Tre University, Italy; Huawei Technologies Dusseldorf GmbH, Germany*

**P2904 | Modeling and Voltage Balancing Control for a Hybrid Stacked Five-Level Converter**
Shuai Xu, Jianzhong Zhang and Xing Hu, *Southeast University, China*

**P2905 | Flying Capacitor Resonant Pole Inverter Applying Five Voltage Levels**
Sjef J. Settels, Jeroen van Duivenbode, Jorge L. Duarte and Elena A. Lomonova, *Eindhoven University of Technology, Netherlands*

**P2906 | Single-Phase AC-DC-AC Multilevel Converter based on H-Bridges and Three-Leg Converters Connected in Series**
Antonio de P.D. Queiroz, Cursino B. Jacobina, Nayara B. de Freitas, Ayslan C.N. Maia and Victor F.M.B. Melo, *Federal University of Campina Grande, Brazil; Federal Institute of Paraíba, Brazil; Federal Institute of Alagoas, Brazil; Federal Institute of Pernambuco, Brazil*

**P2907 | Control Strategy for Modular Multilevel Matrix Converters at High Output Frequencies**
Dennis Braeckle, Patrick Himmelmann, Mathias Schnarrenberger and Marc Hiller, *Karlsruhe Institute of Technology, Germany*

**P2908 | Low-Voltage DC Input, High-Voltage Pulse Generator using Nano-Crystalline Transformer and Sequentially Charged MMC Sub-Modules, for Water Treatment Applications**
M.A. Elgenedy, A.M. Massoud, D. Holliday, S. Ahmed and B. Williams, *University of Strathclyde, United Kingdom; Qatar University, Qatar; Texas A&M University at Qatar, Qatar*

**P2909 | Analysis of a Three Phase Five-Level Dual Tapped Inductor Quasi Impedance Source-Nested Neutral Point Clamped Converter**
Akinola A. Ajayi-Obe and Azeem Khan, *University of Cape Town, South Africa*

## S62 DC/AC Converters

E

*Room: Exhibit Hall B*
**Chairs:** Sewan Choi, Carl Ho

**P3101 | A Novel Wireless Control Strategy for Input-Series Output-Parallel Inverter System**
Xiaojian Jiang, Xiaopeng Cao, Liangcai Shu, Guangfu Ning and Wu Chen, *Southeast University, China*

**P3102 | Comparative Analysis of Cascaded Inverters based on 5-Level and 3-Level H-Bridges**
Reuben P.R. Sousa, Cursino B. Jacobina, Filipe A.C. Bahia and Luciano M. Barros, *Universidade Federal de Campina Grande, Brazil; Universidade Federal de Sergipe, Brazil*

**P3103 | Differential Power as a Metric to Optimize Power Converters and Architectures**
José A. Cobos, Helena Cristóbal, Diego Serrano, Regina Ramos, Jesús A. Oliver and Pedro Alou, *Universidad Politécnica de Madrid, Spain*

**P3104 | The Phase-Controlled Class-D ZVS Inverter with Current Protection**
Yudai Nagata, Yuta Yamada, Yoshiki Fukumoto, Tatsuya Ikenari, Xiuqin Wei, Tadashi Suetsugu and Hiroo Sekiya, *Chiba University, Japan; DAIHEN Corp., Japan; Chiba Institute of Technology, Japan; Fukuoka University, Japan*

**P3105 | Hybrid Open-End Multilevel Six-Phase Machine Drive System with Reduced Harmonic Distortion**
Ivan da Silva, Cursino B. Jacobina, Ayslan C.N. Maia, Isaac S. de Freitas and Reuben P.R. Sousa, *Federal University of Campina Grande, Brazil; Federal Institute of Alagoas, Brazil; Federal University of Paraiba, Brazil*

**P3106 | DVR based on Three-Phase Converter Cascaded by Transformers with Only Two Pairs of Windings**
Joao Paulo R.A. Mello and Cursino B. Jacobina, *Federal University of Campina Grande, Brazil*

**P3107 | Coupled Inductor Implementation Improves Performance of Output Feedback ZVT in Full Bridge Inverters**
Yinglai Xia, Chenhao Nan, Siddharth Kulasekaran and Raja Ayyanar, *Texas Instruments, United States; Google Inc., United States; Intel Corp., United States; Arizona State University, United States*

**P3108 | Hybrid Single-Phase Multilevel Inverter with DC Bypass**
Liming Liu, *ABB Corporate Research Center, United States*

## S63 DC/DC Converters

E

*Room: Exhibit Hall B*
**Chairs:** Wilson Eberle, Sudip Mazumder

**P3301 | Isolated and Wide Input Ranged Boost Full Bridge DC-DC Converter with Low Loss Active Snubber**
Satoshi Ikeda and Fujio Kurokawa, *Panasonic Co. Ltd., Japan; Nagasaki Institute of Applied Science, Japan*

**P3302 | Multi-Port Isolated LLC Resonant Converter for Distributed Energy Generation with Energy Storage**
Kevin Tomas-Manez, Zhe Zhang and Ziwei Ouyang, *Technical University of Denmark, Denmark*

**P3303 | A New PWM Shoot-through Control Technique to Reduce Switching Losses in Impendance Source DC/DC Converters**
Yuba Raj Kafle, Saad Ul Hasan and Graham E. Town, *Macquarie University, Australia*

**P3304 | An Isolated High-Voltage High-Frequency Pulsed Power Converter for Non-Thermal Plasma Ozone Generation**
Changqi You, Mengqi Wang and Jin Ye, *University of Michigan-Dearborn, United States; San Francisco State University, United States*

**P3305 | Evaluation of Isolated DC/DC Converter Topologies for Future HVDC Aerospace Microgrids**
Luca Tarisciotti, Alessandro Costabeber, Chen Linglin, Adam Walker and Mikiel Galea, *University of Nottingham, United Kingdom*

**P3306 | High-Efficiency High-Bandwidth Switch-Linear Hybrid Envelope-Tracking Power Supply with Slew Rate Split-Band Method**
Yang Leng, Xinbo Ruan, Qian Jin and Yazhou Wang, *Nanjing University of Aeronautics and Astronautics, China*

**P3307 | Quadratic Gain Converter with Output Voltage Ripple Mitigation**
Pedro Martin Garcia-Vite, Jesus Elias Valdez-Resendiz, Jonathan Carlos Mayo-Maldonado, Julio Cesar Rosas-Caro, Maria del Rosario Rivera-Espinosa and Antonio Valderrabano-Gonzalez, *Instituto Tecnológico de Ciudad Madero, Mexico; Tecnológico de Monterrey, Mexico; Universidad Panamericana Guadalajara, Mexico*

**P3308 | High Efficient Multiple-Input Positive Buck-Boost Converter**
Jeongtae Kim and Sungwoo Bae, *Yeungnam University, Korea; Hanyang University, Korea*

**P3309 | Dual Bridge LLC Resonant Converter with Frequency Adaptive Phase-Shift Modulation Control for Wide Voltage Gain Range**
S.M. Showybul Islam Shakib, Saad Mekhilef and Mutsuo Nakaoka, *University of Malaya, Malaysia*

**P3310 | Multiple-input Soft-switching Ćuk Converter**
Zhuoya Sun and Sungwoo Bae, *Yeungnam University, Korea; Hanyang University, Korea*

## S64 PV Applications

E

*Room: Exhibit Hall B*
**Chairs:** Sonny Xue, Qin Lei

**P3501 | Powerline Communications Strategy Enabling Fully Decentralized Control of AC-Stacked PV Inverters**
Daniel Evans and Robert Cox, *University of North Carolina at Charlotte, United States*

**P3502 | A Simultaneous Voltage and Frequency Control Scheme for Photovoltaic Distributed Generation Units in Small-Scale Power Systems**
Hossein Saberi and Shahab Mehraeen, *Louisiana State University, United States*

**P3503 | Performance and Mitigation Strategy of Distributed AC-Stacked PV Inverter Architecture under Grid Background Harmonics**
Namwon Kim, Hamidreza Jafarian, Babak Parkhideh and Johan Enslin, *University of North Carolina at Charlotte, United States; Clemson University, South Africa*

**P3504 | An Analog MPPT Controller without Multiplier for PV Applications based on Improved P&O Method**
Chenxi Wang, Min Chen, Xinghua Zhang and Mingzhi Gao, *Zhejiang University, China*

**P3505 | An Integrated Single Inductor-Single Sensor based Photovoltaic Optimizer with an Optimal Current Point Tracking Strategy**
Tianhua Zhu, Xinlu He, Tong Guan, Feng Wang, Hao Yi and Fang Zhuo, *Xi'an Jiaotong University, China*

**P3506 | A Regulated Incremental Conductance (r-INC) MPPT Algorithm for Photovoltaic System**
Thusitha Randima Wellawatta, Young-Tae Seo, Hong-Hee Lee and Sung-Jin Choi, *University of Ulsan, Korea*

**P3507 | Dynamic Equivalent Circuit Modelling of Polycrystalline Silicon Photovoltaic Cells**
Olufemi I. Olayiwola and Paul S. Barendse, *University of Cape Town, South Africa*

**P3509 | Modular Cascaded Converter for MVDC-Connected Photovoltaic Systems**
Zheng Fan, Guangyao Qiao, Guangfu Ning and Liangcai Shu, *Global Energy Interconnection Research Institute, China; Southeast University, China*

**P3510 | An Efficient Ramp Rate and State of Charge Control for PV-Battery System Capacity Firming**
Amit Kumar Bhattacharjee, Issa Batarseh, Haibing Hu and Nasser Kutkut, *University of Central Florida, United States; Advanced Charging Technologies, United States*

**P3511 | Analysis of an Interleaved Current-Fed Capacitor-Less DC/AC Converter for PV Systems**
Yue Zhang, Zheng Wang and Ming Cheng, *Southeast University, China*

## S65 EMI in Power Converters

W

*Room: Exhibit Hall B*
**Chairs:** Khurram Afridi, Yaow-Ming Chen

**P3701 | A Galvanic Isolated Voltage Probe for Noise Sources Identification in EMI / EMC Applications**
Zhuxian Xu, Chingchi Chen and Richard Kautz, *Ford Motor Company, United States*

**P3702 | Common Mode EMI Reduction Structure of EV/HEV Inverters for High-Speed Switching**
Akinori Okubo, Kraisorn Throngnumchai and Tetsuya Hayashi, *Nissan Motor Co., Ltd., Japan*

**P3703 | A Layout Method of Passive EMI Filter**
Junpeng Ji, Wenjie Chen, Xu Yang, Xingxia Zhang and Na Zhi, *Xi'an Jiaotong University, China; Xi'an University of Technology, China*

**P3704 | Magnetic Material Selection for EMI Filters**
Marcin Kacki, Marek S. Rylko, John G. Hayes and Charles R. Sullivan, *SMA Magnetics Sp. z o.o., Poland; University College Cork, Ireland; Dartmouth College, United States*

## S66 Advances in Special Electrical Machines

W

*Room: Exhibit Hall B*
**Chairs:** Greg Heins, Dan Ionel

**P3901 | A High Voltage Pulsed Power Supply with Reduced Device Voltage Stress for Industrial Electrostatic Precipitators**
Ming Tang, Liangcai Shu, Guangyao Qiao, Guangfu Ning, Wu Chen, Xiaohui Qu and Baojian Ji, *Southeast University, China; Global Energy Interconnection Research Institute, China; Nanjing University of Technology, China*

**P3902 | Novel Reluctance Axis Shifted Machines with Hybrid Rotors**
Hui Yang, Ya Li, Heyun Lin, Z.Q. Zhu, Shukang Lyu, Haitao Wang, Shuhua Fang and Yunkai Huang, *Southeast University, China; University of Sheffield, United Kingdom*

**P3903 | Electromagnetic Design of an Ultra-High Speed Switched Reluctance Machine over 1 Million RPM**
Cheng Gong and Thomas Habetler, *Georgia Institute of Technology, United States*

**P3904 | Research on the Influence of Rotor Poles Number on Performances of Rotor Permanent-Magnet Flux-Switching Machines**
Peng Su, Wei Hua, Chuang Hou and Mingjin Hu, *Southeast University, China*

**P3905 | Wirelessly Powered Coil-Type Robot with 1D Self-Actuation Capability**
Jun Lee and Jung-Ik Ha, *Seoul National University, Korea*

**P3906 | A Switched Elastance Electrostatic Machine Constructed from Sustainable Elements for Rotational Actuators**
Graham Reitz, Bill Butrymowicz, Justin Reed, Baoyun Ge and Daniel C. Ludois, *C-Motive Technologies Inc., United States; University of Wisconsin-Madison, United States*

**P3907 | A dq-Axis Framework for Electrostatic Synchronous Machines and Charge Oriented Control**
Baoyun Ge, Aditya N. Ghule and Daniel C. Ludois*University of Wisconsin-Madison, United States*

## S67 Induction and Permanent Magnet AC Machines

W

*Room: Exhibit Hall B*
**Chairs:** Dong Jiang, Kyo-Beum Lee

**P4101 | State-Space Space-Vector Model of the Induction Motor Including Magnetic Saturation and Iron Losses**
Marcello Pucci, *ISSIA-CNR, Italy*

**P4102 | The Rotor Copper and Iron Loss Analysis of the Inverter-Fed Induction Motor Considering Rotor Slip Frequency**
Dongdong Zhang, Haisen Zhao and Thomas Wu, *Xian Jiaotong University, China; North China Electric Power University, China; University of Central Florida, United States*

**P4103 | GA-based Off-Line Parameter Estimation of the Induction Motor Model Including Magnetic Saturation and Iron Losses**
Angelo Accetta, Francesco Alonge, Maurizio Cirrincione, Filippo D'Ippolito, Marcello Pucci and Antonino Sferlazza, *ISSIA-CNR, Italy; University of Palermo, Italy; University of South Pacific, Fiji; CNRS, LAAS, France*

**P4104 | Simplified Equivalent Model of PMSM with Inter-Turn Fault**
Seung-Tae Lee and Jin Hur, *Incheon National University, Korea*

**P4105 | Analysis of Cogging Torque and Torque Ripple according to Unevenly Magnetized Permanent Magnets Pattern in PMSM**
Dong-ho Lee, Chae-lim Jeong and Jin Hur, *Incheon National University, Korea*

**P4106 | Optimized Design of PMSM with Hybrid Type Permanent Magnet for Improving Performance and Reliability**
Chae-Lim Jeong, Young-Kyoun Kim and Jin Hur, *Incheon National University, Korea; Osan University, Korea*

**P4107 | Reluctance Magnetic Gear and Flux Switching Magnetic Gear for High Speed Motor System**
Kohei Aiso, Kan Akatsu and Yasuaki Aoyama, *Shibaura Institute of Technology, Japan; Hitachi, Ltd., Japan*

**P4108 | Influence of Gear Ratio on Electromagnetic Performance and Geometries of Vernier Permanent Magnet Synchronous Machines**
Yue Liu and Z.Q. Zhu, *University of Sheffield, United Kingdom*

**P4109 | A Family of Vernier Permanent Magnet Machines Utilizing an Alternating Rotor Leakage Flux Blocking Design**
Wenbo Liu and Thomas A. Lipo, *University of Wisconsin-Madison, United States*

## S68 Motor Drives II

W

*Room: Exhibit Hall B*
**Chairs:** Giovanna Oriti, Ziaur Rahman

**P4301 | A Novel Active Common-Noise Canceler Combining Feedforward and Feedback Control**
Shunsuke Ohara, Satoshi Ogasawara, Takemoto Masatsugu, Koji Orikawa and Yushin Yamamoto, *Hokkaido University, Japan; Toshiba Mitsubishi-Electric Industrial Systems Corporation, Japan*

**P4302 | Harmonics Performance and System Stability Evaluation between 18-Pulse and LCL Filter Based Active Front End Converters under Weak Grid Condition**
Kevin Lee, Wenxi Yao, Daniel Carnovale and Yuxi Huang, *Eaton Corporation, United States; Zhejiang University, China*

**P4303 | Harmonic Analysis of a Regulated DC Voltage Space Vector Modulation Technique for High Speed Electrical Drives**
Vito Giuseppe Monopoli, Pierluigi Sidella and Francesco Cupertino, *Politecnico di Bari, Italy*

**P4304 | Distributed Speed Control for Multi-Three Phase Electrical Motors with Improved Power Sharing Capability**
A. Galassini, A. Costabeber, C. Gerada and A. Tessarolo, *University of Nottingham, United Kingdom; University of Trieste, Italy*

**P4305 | Single-Stage Soft-Switching Solid-State Transformer for Bidirectional Motor Drives**
Liran Zheng, Rajendra Prasad Kandula, Karthik Kandasamy and Deepak Divan, *Georgia Institute of Technology, United States*

## S69 Switching Devices II

W

*Room: Exhibit Hall B*
**Chairs:** Ruxi Wang, Xiaoqing Song

**P4501 | Aging Precursors and Degradation Effects of SiC-MOSFET Module under Highly Accelerated Power Cycling Conditions**
Haoze Luo, Francesco Iannuzzo, Frede Blaabjerg, Marcello Turnaturi and Emilio Mattiuzzo, *Aalborg University, Denmark; Vishay Semiconductor Italiana, Italy*

**P4502 | A Measurement Method to Extract the Transient Junction Temperature Profile of Power Semiconductors at Surge Conditions**
Yu Du, Rostan Rodrigues and Taosha Jiang, *ABB Inc., United States*

**P4503 | Lifetime Extension of a Multi-Die SiC Power Module using Selective Gate Driving with Temperature Feed-Forward Compensation**
Jeffrey Ewanchuk, Julio Brandelero and Stefan Mollov, *Mitsubishi Electric Research Centre Europe, France*

**P4504 | Degradation of SiC MOSFETs with Gate Oxide Breakdown under Short Circuit and High Temperature Operation**
Vamsi Mulpuri and Seungdeog Choi, *University of Akron, United States*

**P4505 | The Effect of Load Properties on the Reliability of Machine Drives – The Temperature and Stress Analysis of Power Module Bond Wires**
He Niu, *General Motors Co., United States*

**P4506 | Power Cycling Test of a 650 V Discrete GaN-on-Si Power Device with a Laminated Packaging Embedding Technology**
Sungyoung Song, Stig Munk-Nielsen, Christian Uhrenfeldt and Kjeld Pedersen, *Aalborg University, Denmark*

**P4507 | Gate Driver Design for a High Power Density EV/HEV Traction Drive using Silicon Carbide MOSFET Six-Pack Power Modules**
Rui Gao, Li Yang, Wensong Yu and Iqbal Husain, *North Carolina State University, United States*

**P4508 | Isolation Design Considerations for Power Supply of Medium Voltage Silicon Carbide Gate Drivers**
Tushar Batra, Ghanshyam Gohil, Arun Kumar Sesham, Nicholas Rodriguez and Subhashish Bhattacharya, *North Carolina State University, United States*

**P4509 | An Intelligent Medium Voltage Gate Driver with Enhanced Short Circuit Protection Scheme for 10kV 4H-SiC MOSFETs**
Ashish Kumar, Aishwarya Ravichandran, Shrishti Singh, Suyash Shah and Subhashish Bhattacharya, *North Carolina State University, United States*

**P4510 | Impact of Gate Control on Short-Circuit Capability of SiC/Si based Hybrid Switch**
Xi Jiang, Jun Wang, Zongjian Li, Linfeng Deng, Jiwu Lu, Xiaohao Wang, Cheng Zeng and Z. John Shen, *Hunan University, China*

## S70 Wireless Power Transfer

W

*Room: Exhibit Hall B*
**Chairs:** Mark J Scott, Jin Wang

**P4701 | A Phase-Shift Soft-Switching Control Strategy for Dual Active Wireless Power Transfer System**
Fenghua Liu, Wanjun Lei, Tengbo Wang, Cheng Nie and Yue Wang, *Xi'an Jiaotong University, China*

**P4702 | Modeling and Experimentation of Multi-Coil Switching Coupler for Wireless Power Transfer Systems**
Pingan Tan, Chunxia Liu, Liangwei Ye and Tao Peng, *Xiangtan University, China*

**P4703 | Analysis and Optimization of 3-Coil Magnetically Coupled Resonant Wireless Power Transfer System for Stable Power Transmission**
Weiwei Ye, Lu Chen, Fuxin Liu, Xuling Chen and Xuehua Wang, *Nanjing University of Aeronautics and Astronautics, China; Huazhong University of Science and Technology, China*

**P4704 | A Double-Frequency Superposition Methodology for High Efficiency and Oriented Power Distribution of MCR WPT System with Two Receivers**
Yong Yang, Ze Ding, Fuxin Liu and Xuling Chen, *Nanjing University of Aeronautics and Astronautics, China*

**P4705 | Resonant Converter with Coupling and Load Independent Resonance for Omnidirectional Wireless Power Transfer Application**
Junjie Feng, Minfan Fu, Qiang Li and Fred C. Lee, *Virginia Polytechnic Institute and State University, United States*

**P4706 | ANN-based Algorithm for Estimation and Compensation of Lateral Misalignment in Dynamic Wireless Power Transfer Systems for EV Charging**
Reza Tavakoli and Zeljko Pantic, *Utah State University, United States*

**P4707 | Comparative Evaluation of Secondary-Side ZVS-PWM Controlled GaN-HFET Resonant Converters for Inductive Power Transfer**
Tomokazu Mishima and Eitaro Morita, *Kobe University, Japan*

## S71 DC and Hydrid AC/DC Systems

W

*Room: Exhibit Hall B*
**Chairs:** Meiqin Mao, Adel Nasiri

**P4901 | Coordinated Control and Optimization of DC Power Systems**
Bhanu Babaiahgari, Md. Habib Ullah and Jae-Do Park, *University of Colorado-Denver, United States*

**P4902 | Controller Design of DC Microgrids with Multiple Sources and Constant Power Loads**
Luis Herrera, Benjamin Palmer, Xiu Yao and Bang-Hung Tsao, *Rochester Institute of Technology, United States; University of Cincinnati, United States; University at Buffalo, United States; University of Dayton Research Institute, United States*

**P4903 | A Study on High-Efficiency Floating Multi-Terminal Power Flow Controller for Next-Generation DC Power Networks**
Kenji Natori, Toru Tanaka, Yoshinori Takahashi and Yukihiko Sato, *Chiba University, Japan*

**P4904 | Operational Cost Reduction Based on Distributed Adaptive Droop Control Technique in DC Microgrids**
Mohamed Zaery, Emad M. Ahmed, Mohamed Orabi and Mohamed Youssef, *Aswan University, Egypt; University of Ontario Institute of Technology, Canada*

**P4905 | Hurst Room: Exhibit Hall Bnent-based Adaptive Detection of DC Arc Faults**
Yousef Abdullah, Boxue Hu, Wei Zhou, Yafeng Wang, Jin Wang and Amin Emrani, *Ohio State University, United States; Ford Motor Company, United States*

**Tuesday, October 3** **2:30PM – 5:00PM**

## S72 Applications of MMC

E

*Room: Exhibit Hall B*
Dianguo Xu, Maryam Saeedifard

**P5101 | Impact of DC Fault in Multi-Terminal DC Grid on Connected AC System Stability**
Shuoting Zhang, Yalong Li and Fred Wang, *University of Tennessee, United States*

**P5102 | Analysis of Single-Phase-to-Ground Faults at the Valve-Side of HB-MMCs in Bipolar HVDC Systems**
Gen Li, Jun Liang, Fan Ma, Carlos E. Ugalde-Loo, Haifeng Liang and Hui Li, *Cardiff University, United Kingdom; Naval University of Engineering, China; North China Electric Power University, China; Beijing Information Science & Technology University, China*

**P5103 | Feedback Linearization Applicable to the State-Space Modelling of an HVDC Terminal based on Modular Multilevel Converter**
Diego A. Montoya-Acevedo, Julian C. Buitrago-Herrera and Andres Escobar-Mejia, *Universidad Tecnológica de Pereira, Columbia*

**P5104 | Simulation of Modular Multilevel Converter and DC Grids on FPGA with Sub-Microsecond Time-Step**
Hui Pang, Fei Zhang, Hailong Bao, Géza Joós, Weihua Wang, Wei Li, Luc-Andre Gregoire and Xuebing Zhai, *Global Energy Interconnection Research Institute, China; McGill University, Canada; State Grid Shanghai Municipal Electric Power Co., China; OPAL-RT Technologies Inc., Canada*

**P5105 | Interactions between Bandwidth Limited CPLs and MMC based MVDC Supply**
Uzair Javaid, Alexandre Christe, Francisco D. Freijedo and Drazen Dujic, *EPFL, Switzerland*

**P5106 | Medium-Voltage DC Grid Connection using Modular Multilevel Converter**
Seyyedmahdi Jafarishiadeh, Mehdi Farasat and Arash Khoshkbar Sadigh, *Louisiana State University, United States; Extron Electronics, United States*

**P5107 | A Power Hardware-in-the-Loop-Simulation (P-HILS) System using Two Modular Multilevel DSCC Converters for a Synchronous-Motor Drive**
Kenichiro Saito and Hirofumi Akagi, *Tokyo Institute of Technology, Japan*

**P5108 | Switching Function based Analysis of the Modular Multilevel Converter for Low/Medium Voltage Applications**
Josiah O. Haruna, Olorunfemi Ojo and Rere Fatumbi, *Tennessee Technological University, United States*

**P5109 | Fast Control of a Modular Multilevel Converter STATCOM using Optimized Pulse Patterns**
Vedrana Spudić and Tobias Geyer, *ABB Corporate Research Center, Switzerland*

**P5110 | A Modular Multilevel Converter with Isolated Energy-Balancing Modules for MV Drives Incorporating Symmetrical Six-Phase Machines**
Mohamed S. Diab, B.W. Williams, Derrick Holiday, Ahmed M. Massoud and Shehab Ahmed, *University of Strathclyde, United Kingdom; Qatar University, Qatar; Texas A&M University at Qatar, Qatar*

## S73 Batteries and Wireless EV Charging

E

*Room: Exhibit Hall B*
Veda Prakash Galigekere, Jin Ye

**P5301 | A Star-Structured Switched-Capacitor Equalizer for Series-Connected Battery Strings**
Yunlong Shang, Bing Xia, Fei Lu, Chenghui Zhang, Naxin Cui, Chunyu Wang and Chris Mi, *Shandong University, China; San Diego State University, United States; University of California-San Diego, United States*

**P5302 | A Multiplexing LCL Module using Individual Transmitters for Dynamic Wireless Charging of Electric Vehicles**
Shaocong Zhou, Chunbo Zhu, Chunlai Yu and C.C. Chan, *Harbin Institute of Technology, China; Heilongjiang Electric Power Research Institute, China*

**P5303 | Robust Double D Topology for Roadway IPT Applications**
Matthew G.S. Pearce, Hanyu Gao, Amrit Ramadugu, Grant A. Covic and John T. Boys, *University of Auckland, New Zealand*

**P5304 | A Sorting Balance Control for Battery Sources in a Single Phase Multilevel Inverter**
Chun-Yu Yang, Yaow-Ming Chen and Kai-Cheung Juang, *National Taiwan University, Taiwan; Industrial Technology Research Institute, Taiwan*

**P5305 | Active Cell Balancing Algorithm for Serially Connected Li-Ion Batteries based on Power to Energy Ratio**
Geon-Hong Min and Jung-Ik Ha, *Seoul National University, Korea*

**P5306 | Battery Impedance Measurement using Sinusoidal Ripple Current Emulator**
Md. Kamal Hossain, S.M. Rakiul Islam and Sung-Yeul Park, *University of Connecticut, United States*

**P5307 | A New Magnetic Coupler for EVs Chargers based on Plug-In and IPT Technologies**
Emanuel G. Marques, Sandra V. da Silva and A.M.S. Mendes, *University of Coimbra/Instituto de Telecomunicações, Portugal*

**P5308 | Sensorless Estimation of Coupling Coefficient based on Current and Voltage Harmonics Analysis for Wireless Charging System**
Mostak Mohammad and Seungdeog Choi, *University of Akron, United States*

**P5309 | High Power Density Z-Source Resonant Wireless Charger with Line Frequency Sinusoidal Charging**
Hulong Zeng, Xiaorui Wang and Fang Zheng Peng, *Michigan State University, United States*

## S74 AC/DC Converters

E

*Room: Exhibit Hall B*
Wuhua Li, Praveen Jain

**P5501 | Investigation of Power Rectifier under Non-Sinusoidal Input based on Hybrid Multilevel Converter**
Alan Felinto, Cursino B. Jacobina, Edgard L.L. Fabricio, Victor F.M.B. Melo and João P.R.A. Mello, *Federal University of Campina Grande, Brazil; Federal Institute of Paraiba, Brazil; Federal Institute of Pernambuco, Brazil*

**P5502 | Series Connected Three-Phase AC-DC Power Converters**
Reuben P.R. Sousa, Cursino B. Jacobina and Luciano M. Barros, *Universidade Federal de Campina Grande, Brazil; Universidade Federal de Sergipe, Brazil*

**P5503 | A Novel Filter Structure to Suppress Harmonic Currents based on the Sequence of Sideband Harmonics**
Sungjae Ohn, Hyun-Sam Jung and Seung-Ki Sul, *Virginia Polytechnic Institute and State University, United States; Seoul National University, Korea*

**P5504 | Asymmetrical Cascaded Three-Phase AC-DC Converters with Injection Transformers**
Joao Paulo R.A. Mello and Cursino B. Jacobina, *Federal University of Campina Grande, Brazil*

**P5505 | Voltage Independence Control of Split-DC Bus for a Three-Phase/Level T-Type Converter with Unbalanced Loads**
Wenlong Ding, Jiajun Liu, Bin Duan, Xiangyang Xing and Chenghui Zhang, *Shandong University, China*

**P5506 | Single-Stage AC-DC Converters Operating with a Resonant Network and Discrete Switching Frequency**
Javad Khodabakhsh and Gerry Moschopoulos, *Western University, Canada*

**P5507 | Capacitor-Isolated Structure with Brightness and Color Controlling for Multicolor LED Strings**
Ruihong Zhang, Henry Shu-hung Chung, Xuanlyu Wu, Xiaohua Wu, Xiaobin Zhang and Jinrong Wang, *Northwestern Polytechnical University, China; City University of Hong Kong, Hong Kong*

## S75 Modeling and Control of Multilevel Converters

E

*Room: Exhibit Hall B*
S. Ali Khajehoddin, Rostan Rodrigues

**P5701 | An Optimized Neutral-Point Potential Balancing Algorithm for Seven-Level ANPC Inverters**
Weihui Sheng and Qiongxuan Ge, *University of Chinese Academy of Sciences, China; Institute of Electrical Engineering, CAS, China*

**P5702 | A Model Predictive Control based Fault-Tolerant Control Strategy for T-Type Three-Level Inverters**
Jie Chen, Alian Chen, Chenghui Zhang and Ke Li, *Shandong University, China*

**P5703 | A Repetitive Control Scheme for Circulating Current Suppression in Parallel Three-Level T-Type Inverters under Unbalanced Conditions**
Changwei Qin, Alian Chen, Xiangyang Xing, Chunshui Du, Guangxian Zhang, Chenghui Zhang and Wenlong Ding, *Shandong University, China*

**P5704 | Low Frequency Operation and Comparison Study of 4-Level Hybrid Clamped Converter with Modular Multilevel Converter**
Jianyu Pan, Risha Na and Longya Xu, *Ohio State University, United States*

**P5705 | Control of the Hybrid Cascaded Converter under Unbalanced Conditions**
Yu-chen Su, Ping-heng Wu and Po-tai Cheng, *National Tsing Hua University, Taiwan*

**P5706 | Active Neutral-Point Clamped Five-Level Inverter General Modulation based on Phase-Disposition**
Fusheng Wang, Zhen Li, Yilin Lyu, Hang Fu, Fei Li and Hieu Thanh Do, *Hefei University of Technology, China; Hung Yen University of Technology and Education, Viet Nam*

**P5707 | Mixed Single-Phase Three-Level NPC Inverter with Hybrid Modulation Technology**
Liming Liu, *ABB Corporate Research Center, United States*

## S76 Modeling and Control of Grid Connected Converters

E

*Room: Exhibit Hall B*
Jiacheng Wang, Kyo-Beum Lee

**P5901 | Flexible Power Control of Virtual Synchronous Generators under Unbalanced Grid Voltage Conditions**
Meng Chen, Xiangning Xiao, Chang Yuan and Shun Tao, *North China Electric Power University, China*

**P5902 | Visualization Analysis of Grid-Connected Inverter System based on Z-Domain D-Partition Method**
Fei Li, Jizhong Xi, Haoyuan Li, Mingyao Ma, Wenxiang Zhou, Peng Liu and Fan Wu, *Hefei University of Technology, China*

**P5903 | Systematic Control Design for Half-Bridge Converters with LCL Output Filters through Virtual Circuit Similarity Transformations**
Korawich Niyomsatian, Piet Vanassche, Ruth V. Sabariego and Johan Gyselinck, *KU Leuven, Belgium; Université libre de Bruxelles, Belgium; Triphase NV, Belgium*

**P5904 | State Estimation of IEEE 14 Bus with Unified Interphase Power Controller (UIPC) using WLS Method**
Mohammad Amin Chitsazan, Mohammad Sami Fadali and Andrzej M. Trzynadlowski, *University of Nevada, United States*

**P5905 | Control of a Three-Phase Inverter under Unbalanced Grid Conditions**
Vikram Roy Chowdhury, Subhajyoti Mukherjee, Pourya Shamsi and Mehdi Ferdowsi, *Missouri University of Science and Technology, United States*

**P5906 | Three-Phase Short-Circuit Fault Implementation in Converter based Transmission Line Emulator**
Shuoting Zhang, Bo Liu, Sheng Zheng, Yiwei Ma, Fred Wang and Leon M. Tolbert, *University of Tennessee, United States*

**P5907 | Impedance-Phase Reshaping of LCL-filtered Grid-Connected Inverters to improve the Stability in a Weak Grid**
Yan Du, Linbo Cui, Xiangzhen Yang, Jianhui Su and Fei Wang, *Hefei University of Technology, China; Shanghai University, China*

**P5908 | A Control Method to Mimic Synchronous Generator Characteristics for Two-Stage Converters**
Jun Zhu, Feng Gao, Xifeng Liu and Jing Xiao, *Shandong University, China; Shandong Electric Power Maintenance Company, China*

**P5909 | Study on the Inertia Optimization of Grid-friendly Single-Phase Synchronverter**
Hong Li, Xiaochao Zhang, Tiancong Shao and Trillion Q. Zheng, *Beijing Jiaotong University, China*

**P5910 | Predictive Frequency-based Sequence Estimator for Control of Grid-Tied Converters under Highly Distorted Conditions**
Cristian Blanco, Pablo García, Ángel Navarro-Rodríguez and Mark Sumnery, *University of Oviedo, Spain; University of Nottingham, United Kingdom*

**P5911 | Single-Loop All-Pass-Filter-based Active Damping for VSCs with LCL Filters Connected to the Grid**
Javier Roldán-Pérez , Emilio Buenoy, R. Peña-Alzolaz, and Alberto Rodríguez-Cabero, *IMDEA Energy Institute, Spain; Alcala de Henares University, Spain; University of Strathclyde, United Kingdom*

## S77 Power Quality

E

*Room: Exhibit Hall B*
Xiaoqiang Guo, Feng Gao

**P6101 | Single-Phase Universal Active Power Filter based on Four-Leg AC/DC/AC Converters**
Phelipe L.S. Rodrigues, Cursino B. Jacobina, Mauricio B.R. Correa and Italo Roger F.M.P. da Silva, *Federal University of Campina Grande, Brazil; Federal Rural University of Pernambuco, Brazil*

**P6102 | A Transformer-Less Unified Power Quality Conditioner having Fast Dynamic Control**
Sui-pung Cheung, Shun-cheung Yeung, Shu-hung Chung, Wai-lun Lo and Weimin Wu, *City University of Hong Kong, Hong Kong; Chu Hai College of Higher Education, Hong Kong; Shanghai Maritime University, China*

**P6103 | Application of Singular Value Sensitivity on Harmonic Resonance Analysis for Inverter-based Power Systems**
Zhikang Shuai, Yang Li, John Shen and Yi Hong, *Hunan University, China; Illinois Institute of Technology, United States*

**P6104 | Harmonics Compensation with Constant DC-Capacitor Voltage-Control-based Strategy of Smart Charger for Electric Vehicles in Single-Phase Three-Wire Distribution Feeders under Distorted Source Voltages and Load Currents Conditions**
Fuka Ikeda, Kei Nishikawa, Yuki Okamoto, Hiroaki Yamada, Toshihiko Tanaka and Masayuki Okamoto, *Yamaguchi University, Japan; Ube College, Japan*

**P6105 | Power Quality Improvement Utilizing Photovoltaic Generation Connected to a Weak Grid**
Hanny H. Tumbelaka, Eduard Muljadi and Wenzhong Gao, *Petra Christian University, Indonesia; National Renewable Energy Laboratory (NREL), United States; University of Denver, United States*

**P6106 | A New Control Scheme based on R-APF for Harmonic Power Sharing in Islanded Microgrids**
Zhirong Zeng, Hao Yi, Fang Zhuo and Zhenxiong Wang, *Xi'an Jiaotong University, China*

**P6107 | Performance Evaluation of Shunt-Series Switched Multi-Functional Grid-Connected Inverter for Voltage Regulation**
Wooyoung Choi, Woongkul Lee and Bulent Sarlioglu, *University of Wisconsin-Madison, United States*

**P6108 | A Grid-Voltage-Sensorless Resistive Active Power Filter with Series LC-Filter**
Haofeng Bai, Xiongfei Wang and Frede Blaabjerg, *Aalborg University, Denmark*

## S78 Stability of Converter Systems

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Jian Sun, Xiongfei Wang

**P6301 | A Comprehensive Study on the Gate-Loop Stability of the SiC MOSFET**
Xudong Wang, Zhengming Zhao, Yicheng Zhu, Kainan Chen and Liqiang Yuan, *Tsinghua University, China*

**P6302 | Flexible PFC Control Featuring Adaptive Gain, Mode Estimation, and Dual Feedforward Compensation**
Joshua Ivaldi and Sung-Yeul Park, *University of Connecticut, United States*

**P6303 | A Stability Analysis Method based on Floquet Theory for Multi-stage DC-DC Converters System**
Hong Li, Zhongya Guo, Fang Ren, Xiaochao Zhang and Bo Zhang, *Beijing Jiaotong University, China; South China University of Technology, China*

**P6304 | Stability Enhancement of Single-Loop Inverter-Side Current Feedback Controlled Grid-Connected Inverters with LCL Filters**
Teng Liu, Zeng Liu, Jinjun Liu, Yiming Tu and Zipeng Liu, *Xi'an Jiaotong University, China*

**P6305 | Design of Online Supplementary Adaptive Dynamic Programming for Current Control in Power Electronic Systems**
Ujjwol Tamrakar, Naresh Malla, Dipesh Shrestha, Zhen Ni and Reinaldo Tonkoski, *South Dakota State University, United States*

**P6306 | A Comparative Benchmark of Digital Delay Compensation Techniques based on a Graphical Approach**
Minghui Lu, Xiongfei Wang, Poh Chiang Loh, Tomislav Dragicevic and Frede Blaabjerg, *Aalborg University, Denmark*

## S79 Other Topics in Control, Modeling and Optimization of Power Converters

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Luca Solero, Grant Pitel

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R. Ramos, D. Serrano, J.A. Oliver and J.A. Cobos, *Universidad Politecnica de Madrid, Spain*

**P6502 | Derivation of Transfer Function of LLC Current Resonant Converter using Numerical Calculation**
Masahito Shoyama, Takuma Sagara, Yusuke Yamashita, Jun Imaoka, Yu Yonezawa and Yoshiyasu Nakashima, *Kyushu University, Japan; Fujitsu Laboratories Ltd., Japan*

**P6503 | FPGA-based Direct Repetitive Control for High Performance Ground Power Units**
Alessandro Lidozzi, Luca Solero, Fabio Crescimbini, Chao Ji, Stefano Bifaretti and Pericle Zanchetta, *Roma Tre University, Italy; Protean Electric Ltd., United Kingdom; University of Roma Tor Vergata, Italy; University of Nottingham, United Kingdom*

**P6504 | Interleaved Hybrid Control Concept for Multiphase DC-DC Converters**
Georgios Tsolaridis and Juergen Biela, *ETH Zurich, Switzerland*

**P6505 | Active Damping of Power Converters with Modular Basic Crossover Correction Cells**
V. Spinu, R.B. Dai, M. Lazar, J.L. Duarte, *Eindhoven University of Technology, Netherlands*

**P6506 | Training Neural-Network-based Controller on Distributed Machine Learning Platform for Power Electronics Systems**
Wenguan Wang, Henry Shu-hung Chung, Ralph Cheng, C.S. Leung, Xiaoqing Zhan, Alan Wai-lun Lo, J. Kwok, Chun Jason Xue and Jun Zhang, *City University of Hong Kong, Hong Kong; Chu Hai College of Higher Education, Hong Kong; Hong Kong University of Science and Technology, Hong Kong; South China University of Technology, China*

**P6507 | FPGA Implementation of a Real-Time Model Predictive Controller for Hybrid Power Systems**
Seyed Ata Raziei and Zhenhua Jiang, *University of Dayton, United States*

**P6508 | Equivalent Circuit Model for Modular High Voltage Power Generation Architectures**
Saijun Mao, Jelena Popovic, Jan Abraham Ferreira, Chengmin Li and Wuhua Li, *Delft University of Technology, Netherlands; Zhejiang University, China*

**P6509 | Improved Delayed Signal Cancellation-based SRF-PLL for Unbalanced Grid**
Tuomas Messo, Jussi Sihvo, Dongsheng Yang, Xiongfei Wang and Frede Blaabjerg, *Tampere University of Technology, Finland; Aalborg University, Denmark*

## S80 Analysis Techniques in Electrical Machines

W *Room: Exhibit Hall B*
Peter Wung, Wei Xu

**P6701 | Numerical and Experimental Evaluation of Magnetostriction and Magnetic Forces on Transformer Stacks and Joints for the Assessment of Core Vibrations**
Jan Rens, Sigrid Jacobs, Maarten Van Poucke and Emmanuel Attrazic, *ArcelorMittal Global R&D, Belgium; ArcelorMittal Saint Chely d Apcher, France*

**P6702 | Reliability Analysis of an Adaptive Third-Harmonic Differential Voltage Stator Ground Fault Protection Scheme using a Lab-Scale Generating Station**
Amir Negahdari, Khaled Al Jaafari, Hamid A. Toliyat, Nader Safari-Shad and Russ Franklin, *Texas A&M University, United States; Petroleum Institute, United Arab Emirates; University of Wisconsin-Platteville, United States; Alliant Energy, United States*

**P6703 | An Improved Core-Loss Calculation Method for Doubly Salient Electromagnetic Motor**
Wanying Jia, Lan Xiao, Hongfei Wu and Deming Zhu, *Nanjing University of Aeronautics and Astronautics, China; Electronic Technology Institute, China*

**P6704 | Damper Current Analysis of Hydro-Generators Considering Interbar Currents**
Yang Zhan, Kangkang Kong, Guorui Xu and Haisen Zhao, *North China Electric Power University, China*

**P6705 | Active Cooling for On-Machine Device**
Xikai Sun, Paul J. Grosskreuz and Mark R. Cooper, *Rockwell Automation, China; Rockwell Automation, United States*

**P6706 | Improved Analytical Modeling of High Frequency Conductive Losses in Isolated Rectangular Conductor**
Xiaohui Wang, Li Wang, Ling Mao and Yaojia Zhang, *Nanjing University of Aeronautics and Astronautics, China*

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Hilmi Gurleyen, Erkan Mese, Ju Hyung Kim and Bulent Sarlioglu, *Yildiz Technical University, Turkey; Ege University, Turkey; University of Wisconsin-Madison, United States*

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Avoki Omekanda, Ronghai Qu

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Jun Hang, Shichuan Ding, Hao Li and Qunjing Wang, *Anhui University, China*

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Mehrdad Heydarzadeh, Mohsen Zafarani, Enes Ugur, Bilal Akin and Mehrdad Nourani, *University of Texas at Dallas, United States*

**P6903 | Separation of Induction Motor Rotor Faults and Low Frequency Load Oscillations through the Radial Leakage Flux**
Taner Goktas, Muslum Arkan, M. Salih Mamis and Bilal Akin, *Inonu University, Turkey; University of Texas at Dallas, United States*

**P6904 | Efficiency Estimation of Induction Machines using Nonintrusive No-Load Low Voltage Test**
M. Aminu, P. Barendse and A. Khan, *University of Cape Town, South Africa*

**P6905 | Assembly Effects on Stator Cores of Small Synchronous Reluctance Motors**
Zbigniew Gmyrek and Andrea Cavagnino, *Lodz University of Technology, Poland; Politecnico di Torino, Italy*

**P6906 | Analysis of Stator/Rotor Pole Combinations in Variable Flux Reluctance Machines using Magnetic Gearing Effect**
L.R. Huang, Z.Q. Zhu, J.H. Feng, S.Y. Guo, J.X. Shi and W.Q. Chu, *Sheffield University, United Kingdom; CRRC Zhuzhou Institute Co. Ltd., China*

**P6907 | Methods for d-/q-Axis Saturation Stator-to-Rotor Mutual inductance of Salient-Pole Synchronous Machine**
Hongyu Wang, *Ohio State University, United States*

**P6908 | Influence of Magnetoresistance and Temperature on Permanent Magnet Condition Estimation Methods using High Frequency Signal Injection**
Daniel Fernandez Alonso, David Reigosa, Maria Martinez, Juan Guerrero and Fernando Briz, *University of Oviedo, Spain*

**P6909 | Stator Inductance Estimation for Permanent Magnet Motors Using the PWM Excitation**
Ramakrishnan Raja, Tomy Sebastian, Mengqi Wang and Mazharul Chowdhury, *Halla Mechatronics, United States; University of Michigan-Dearborn, United States*

## S82 Component Technologies

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Ben Guo, Tsorng-Juu Liang

**P7101 | Reduction of the Parasitic Capacitance of a Power Inductor through Conductors Placement**
Shushu Zhu, Xibo Yuan and Phil Mellor, *Nanjing University of Aeronautics and Astronautics, China; University of Bristol, United Kingdom*

**P7102 | A Half-Turn Winding for Compact, High-Current, High-Turns-Ratio, Low-Leakage-Inductance Transformer**
K.V. Iyer, M. Cai, D. Murthy-Bellur, B. Palmer and N. Mohan, *Cummins Inc., United States; University of Minnesota, United States; Purdue University, United States*

**P7103 | Power Loss Evaluation for Active and Magnetic Components in a SiC MOSFET-based Power Electronic System**
Yi Deng, Zach Pan, Harish Suryanarayana, Arun Kadavelugu, Liming Liu, Christopher Belcastro and Esa-Kai Paatero, *ABB Corporate Research Center, United States; ABB Power Solutions, United States; ABB Oy, Finland*

**P7104 | A Method for Hotspot Temperature Estimation of Aluminum Electrolytic Capacitors**
Holger Jedtberg, Giampaolo Buticchi, Marco Liserre and Huai Wang, *Kiel University, Germany; Aalborg University, Denmark*

**P7105 | Effect of Conductive Magnetic Field Concentrators on the Performance of Anisotropic Magnetoresistors in High Frequency Contactless Current Sensing**
Shahriar Jalal Nibir and Babak Parkhideh, *University of North Carolina at Charlotte, United States*

**P7106 | Optimized Design for Three Port Transformer Considering Leakage Inductance and Parasitic Capacitance**
Ritwik Chattopadhyay, Mark A. Juds, Ghanshyamsinh Gohil, Srinivas Gulur, Paul R. Ohodnicki and Subhashish Bhattacharya, *North Carolina State University, United States; Eaton Corporate Research and Technology, United States; National Energy Technology Laboratory, United States*

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Junwei Cui, Haosen Wang, Liyan Qu and Wei Qiao, *University of Nebraska-Lincoln, United States*

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Dehong Mark Xu, Yilmaz Sozer

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Rong Zeng, Zhiqiang Wang and Madhu Sudhan Chinthavali, *Oak Ridge National Laboratory, United States*

**P7302 | Phase Stability Enhancement in big Power Networks using Renewable Generation Units Controlled by SPC**
Mostafa Abdollahi, Jose Ignacio Candela, Joan Rocabert, Raul Santiago Munoz Aguilar and Juan Ramon Hermoso, *Technical University of Catalonia, Spain*

**P7303 | Single-Phase to Three-Phase Generation System based on Doubly-Fed Induction Generator**
Nady Rocha, Ítalo A. Cavalcanti de Oliveira, Edison Roberto Cabral da Silva and Cursino Brandao Jacobina, *Federal University of Paraíba, Brazil; Federal University of Campina Grande, Brazil*

**P7304 | Wind Energy Conversion System based on DFIG with Series Grid Side Converter without Transformer**
Italo A. Cavalcanti de Oliveira, Nady Rocha, Edison Roberto Cabral da Silva, Luanna M. Silva de Siqueira, Ely Cavalcanti de Menezes and Cursino Brandao Jacobina, *Federal University of Paraíba, Brazil; Federal University of Campina Grande, Brazil*

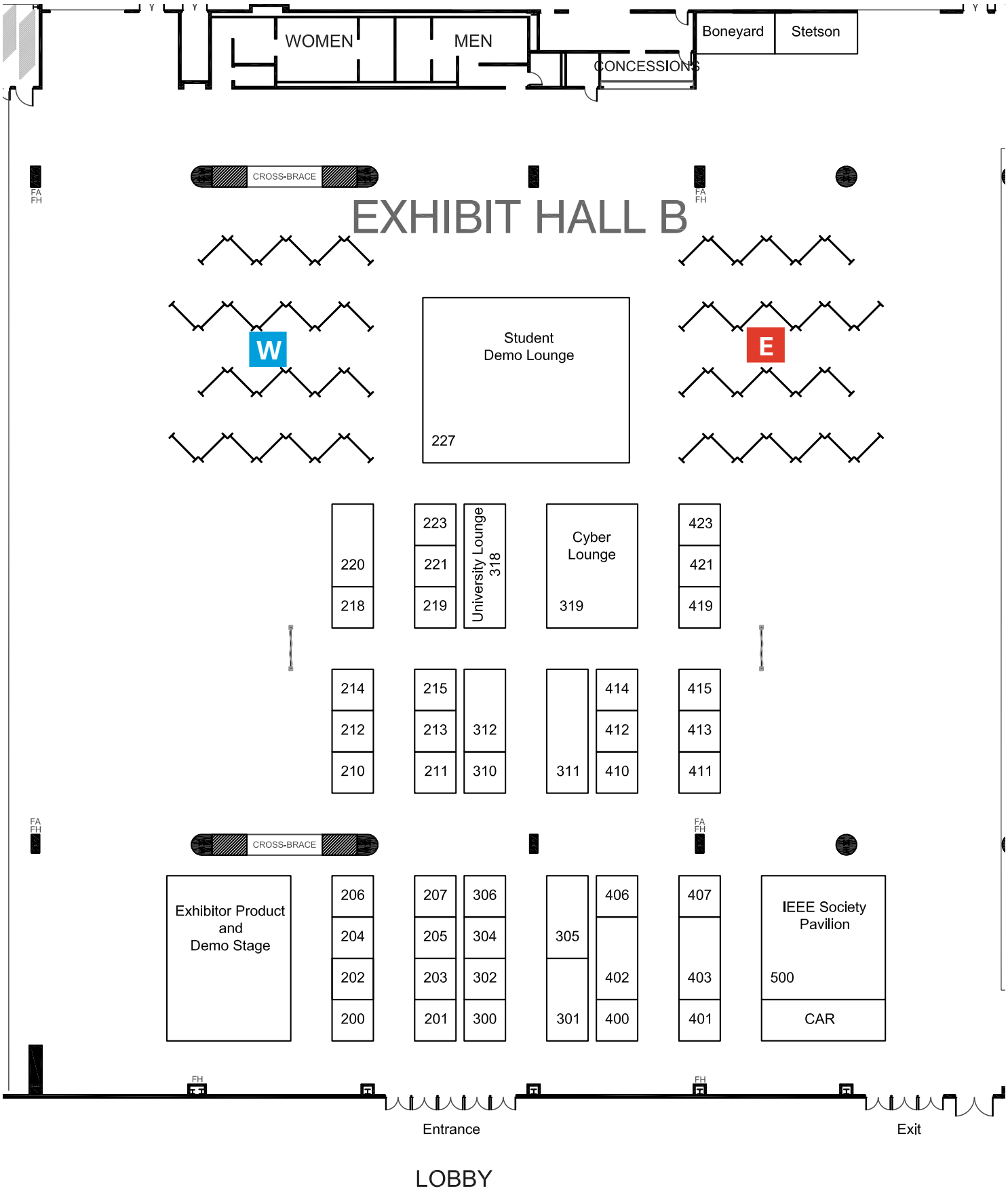
**P7305 | Sensorless HCS MPPT Based Control Strategy for the DPF-WECS**
Ying Zhu, Jun Hang, Haixiang Zang and Jingtao Zhao, *Hohai University, China; Anhui University, China; NARI Technology Development Co., Ltd., China*

**P7306 | Impedance Modeling and Control of STATCOM for Damping Renewable Energy System Resonance**
Yang Zhang, Xin Chen and Jian Sun, *Nanjing University of Aeronautics and Astronautics, China; Rensselaer Polytechnic Institute, United States*

**P7307 | Modeling, Analysis and Parameters Design of Rotor Current Control in DFIG-based Wind Turbines for Dynamic Performance Optimizing**
Yuanzhu Chang and Jiabing Hu, *Huazhong University of Science and Technology, China*

**P7308 | Predictive Voltage Control of Direct Matrix Converter with Reduced Number of Sensors for the Renewable Energy and Microgrid Applications**
Jianwei Zhang, Li Li, Zahra Malekjamshidi and David G. Dorrell, *University of Technology Sydney, Australia; University of KwaZulu-Natal, South Africa*

# Exhibit Hall Floor Plan



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# Exhibitor Directory

## 5S Components Inc. — BOOTH 312

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San Carlos, CA 94070
USA
650-802-8292
Contact: Ben Hartzell
ben@gmw.com
www.gmw.com

GMW will show a range of Current Sensors and Transducers for the isolated measurement of electric current, for example: Sensors for pcb mounting with current ranges to 135A peak and dc to 1MHz (-3dB) frequency response. Very high accuracy and stability Current Transducers with up to 10kA peak current and dc to 100kHz frequency response are appropriate for battery and motor test stands or large dynamic range battery charge-discharge current measurement. Clip-Around Rogowski Coil AC Current Probes with current ranges from 30A to 1MA peak and ac frequency response to 30MHz (-3dB).

## HBM Test and Measurement

BOOTH 214

19 Bartlett Street
Marlborough, MA 1752
USA
608-443-9785
Contact: Mike Hoyer
mike.hoyer@hbm.com
www.hbm.com

HBM Test and Measurement offers an advanced power analyzer designed specifically for electric drive train testing recording all data and producing results in seconds rather than hours or days. Perform any custom real time power analysis for optimizing electric machines and inverters including rapid motor mapping and Clarke and Park Transformations. HBM is a leading global supplier of high-performance torque meters, data acquisition systems, sensors, transducers, amplifiers, plus structural and data analysis software.

## Hioki USA

BOOTH 210

6 Corporate Drive
Cranbury, NJ 08512
USA
248-310-3622
Contact: Bill Paden
bpaden@hiokiusa.com
www.hiokiusa.com

Established in 1935, Hioki has grown to be a respected developer and manufacturer of innovative test and measurement instruments. Hioki, as a company, is committed to their corporate philosophy. This philosophy is founded on Respect for Humanity and its Contribution to Society. Hioki develops its business from the customer's perspective.

Our product list includes: Power Quality Analyzers (PQA); Insulation Testing; Data Acquisition Recorders; Power Demand Meters; Data Loggers; AM Meters; Volt Meters; Clamp-Ons; Digital Multimeters; Meters; Testers; Field Use Measurement Instruments; Electronic Measurement Instruments; Recorders and Automatic Test Equipment.

## How2Power.com

BOOTH 412

P.O Box 755
Smithtown, NY 11787
USA
631-269-4540
Contact: David Morrison
david@how2power.com
www.how2power.com

HOW2POWER.COM. • A free power electronics website for engineers, students, and instructors. Great source of practical power design information. Sign up for our free monthly newsletter, How2Power Today, which presents in-depth articles on power supply topologies, control methods, circuits, magnetics, SiC & GaN developments, and much more.

## HVR Advanced Power Components Inc.

BOOTH 410

2090 Old Union Rd.
Cheektowaga, NY 14227
USA
716-693-4700
Contact: Erik Althoff
erik.althoff@hvrapc.com
www.hvrapc.com

HVR provides cost-effective engineered solutions for high-stress resistor applications. Application areas include: Industrial, T&D, High Voltage Pulsed Power, Research, Transportation, and Medical. Our solid composition resistors provide a solution for high voltage, non-inductive and high peak power resistive applications. We utilize our decades of experience and unique materials approach to engineer a low-cost application-specific solution.

## IEEE 2018 Energy Conversion Congress and Exposition (ECCE)

BOOTH 500

Contact: Avoki Omekanda
www.ieee-ecce.org/2018

ECCE is the foremost IEEE conference in the field of electrical and electromechanical energy conversion, co-sponsored by the IEEE Power Electronics Society (PELS) and the IEEE Industrial Applications Society (IAS). ECCE has steadily grown in scope, quality, and number of technical papers, attendance, and involvement of the industry. It provides engineers, researchers, and professionals a perfect blend of state of the art, technical prowess and commercial opportunities in one attractive location. ECCE 2018 in Portland, Oregon, will mark the 10 year anniversary of ECCCE. We hope to see you there!

## IEEE Industry Applications Society (IAS)

BOOTH 500

445 Hoes Lane
Piscataway, NJ 08854
USA
732-465-5804
ias-administrator@ieee.org
www.ias.ieee.org

The Industry Applications Society supports the advancement of the theory and practice of electrical and electronic engineering in the development, design, manufacture and application of electrical systems, apparatuses, devices and controls to the processes and equipment of industry and commerce; the promotion of safe, reliable and economical installations; industry leadership in energy conservation and environmental health and safety issues; the creation of voluntary engineering standards and recommended practices; and the professional development of its membership.

## IEEE Power Electronics Society (PELS)

**BOOTH 500**

445 Hoes Lane
Piscataway, NJ 08854
USA
732-465-6480
pels-staff@ieee.org
www.ieee-pels.org

The Power Electronics Society is one of the fastest growing technical societies of the Institute of Electrical and Electronics Engineers (IEEE). For over 20 years, PELS has facilitated and guided the development and innovation in power electronics technology. This technology encompasses the effective use of electronic components, the application of circuit theory and design techniques, and the development of analytical tools toward efficient conversion, control and condition of electric power. Our 7,000 members include preeminent researchers, practitioners, and distinguished award winners. IEEE PELS Publishes the IEEE Transactions on Power Electronics, a top referenced journal among all IEEE publications.

The Power Electronics Society is dedicated to:

- Upholding the vital scientific and educational aspects of power electronics and its applications.
- Keeping its members around the globe up to date on state-of-the-art technological developments and advances in power electronics research.

In striving to build knowledge and awareness of the latest technologies and other advances in power electronics, the Power Electronics Society's goal is to keep members current and competitive in the workplace, and provide them with the tools necessary to help them grow both personally and professionally. We invite you to join us, and benefit from a world of invaluable information and support.

## IEEE PELS Empower A Billion Lives

**BOOTH 219**

445 Hoes Lane
Piscataway, NJ 08854
USA
732-562-6056
Contact: Jane Celusak
j.celusak@ieee.org
www.ieee-pels.org

Empower a Billion Lives, is an IEEE-PELS sponsored global competition to develop and demonstrate sustainable, technically and economically viable solutions that can scale to impact greater than one billion people who live in extreme energy poverty. Empower a Billion Lives is calling on volunteers to become engaged with competition committees and on solution teams to enter the competition. Express your interest at billionlives@ieee.org.

## imperix

**BOOTH 400**

Rue de L'Industrie 17
Sion, VS 1950
Switzerland
Contact: Nicolas Cherix
nicolas.cherix@imperix.ch
www.imperix.ch

imperix is a technology provider of advanced power conversion solutions.

Developing modular control and power conversion systems, imperix is a key technological partner, providing customers with high-end devices and know-how, which are crucial elements towards the implementation of tomorrow's electrical grids.

## Infineon Technologies

**BOOTH 220**

101 N. Sepulveda Blvd
El Segundo , CA 90245
USA
310-726-8149
Contact: Maria Guardiola
maria.guardiola@infineon.com
www.infineon.com

Infineon modules are the premier choice for industrial/general purpose drives, high-voltage transmission systems, uninterruptible power supplies and renewable energy applications. A recognized technology leader in IGBT products, Infineon offers a comprehensive portfolio in different voltage and current classes; offered as bare dies, discretes components, power modules and complete stack solutions.

## Infolytica

**BOOTH 306**

300 Leo-Panseau
Suite 2222
Montreal, QC H2X4B3
Canada
514-849-8752 x318
Contact: Nadia Forghani
nadia@infolytica.com
www.infolytica.com

Infolytica Corporation is the developer of MagNet 2D/3D, the leading electromagnetic field simulation software, and ElecNet 2D/3D for electric fields. Some typical design applications include transformers, motors, DC-DC converters, sensors/NDT and much more.

## Keysight Technologies

**BOOTH 311**

550 Clark Drive
Budd Lake, NJ 07052
Contact: Steve Mango
steve-mango@keysight.com
www.keysight.com

Keysight solutions cover your needs for selecting the right power components, designing for efficient power conversion, validating power conversion device performance, and final device test.

## LEM USA Inc.

**BOOTH 215**

11665 W. Bradley Rd.
Milwaukee, WI 53224
USA
Contact: Cassandra Backus
cab@lem.com
www.lem.com

LEM is an innovative global leader in the design and manufacture of Current and Voltage Transducers. With their unique ability to design custom ASIC's, LEM has upgraded their Open Loop and Closed Loop transducer portfolio for maximum performance.

## Magneforce Software Systems Inc — BOOTH 411

5655 South Park Ave
Hamburg, NY 14075
USA
716-646-8577
Contact: Peter Baldassari
pbaldassari@magneforcess.com
www.magneforcess.com

Software for design and simulation of rotating electric machinery. MagneForce products combine Finite Element techniques together with various time based circuit models to provide a total electric machine design environment. Analysis of both the machine and the drive/load circuitry allows MagneForce to compute directly all machine performance parameters.

## MathWorks — BOOTH 302

3 Apple Hill Drive
Natick, MA 01760
USA
508-647-7941
Contact: Jennifer Rose
jennifer.rose@mathworks.com
www.mathworks.com

The MATLAB and Simulink product families are fundamental applied math and computational tools adopted by more than 5000 universities and colleges. MathWorks products help prepare students for careers in industry, where the tools are widely used for data analysis, mathematical modeling, and algorithm development in collaborative research and new product development.

## Mersen — BOOTH 201

6220 Kestrel Rd
Mississoga, LSTIY9
Canada
519-654-0658
Contact: Amhmed Zaghlol
ahmed-zaghlol@mersen.com
ep.mersen.com

Mersen integrates its extensive expertise in cooling and heatsink technology, laminated bus bar design and semiconductor fuses in your power electronics applications to make them safe, reliable and profitable. With industrial operations in major economic regions of the globe, Mersen's engineering teams provide local customer support with innovative best-fit solutions!

## Mesago PCIM GmbH — BOOTH 212

Rotebuhlstr 83-85
Stuttgart, 70178
Germany
49-711-61946-257
Contact: Annika Koenig
annika.koenig@mesago.com
www.mesago.de

pcim EUROPE

International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management
Nuremberg, 5 – 7 June 2018

PCIM Europe is the international leading exhibition and conference for power electronics and its fields of application. Industry experts amongst others from industrial and automotive electronics, focus on this specialist field. The exhibition covers the entire supply chain: from the component up to drive electronics, packaging and the final intelli¬gent system.

## Methode Power Solution Group — BOOTH 413

1700 Hicks Road
Rolling Meadows, IL 60008
USA
847-577-9545
Contact: Jennifer Hybl
jhybl@methode.com
methode.com/power

As a global power distribution and thermal management solutions provider, Methode designs and manufactures innovative products that meet the requirements of a variety of high-demand applications. Our teams collaborate with customers to develop robust systems that meet their electrical and thermal performance, weight and cost needs. With vertically integrated manufacturing facilities on three continents, Methode maintains a record of single-digit PPM quality and on-time delivery.

## Motor Design Limited — BOOTH 423

4 Scotland St
Ellesmere, SY12 OEG
United Kingdon
937-999-7536
Contact: Heide Lewis
heide.lewis@motor-design.com
www.motor-design.com

Motor Design Ltd (MDL) is a world leader in developing advanced software and tools for electric machine design. We have been developing electric motor design software since 1998.

Our software, Motor-CAD, is recognised worldwide as class-leading motor design software. We use our expert knowledge of designing electric motors to provide software support to electric machine designers at some of the most prestigious aerospace, automotive and industrial companies worldwide.

The design consulting services we offer cover all aspects of motor design from concept, performance optimisation, through to test and prototype development. Our customers benefit from our years of experience in designing electric motors and in-depth knowledge of simulation techniques.

Research and innovation is at the heart of what we do. We are active on several international research funded projects and have developed advanced motor solutions for the automotive and aerospace markets.

## OPAL-RT — BOOTH 305

1751 Richardson #2525
Montreal, QC H3K1G6
Canada
514-935-2323
Contact: Vanessa Broccoli
vanessa.broccoli@opal-rt.com
www.opal-rt.com

Real-Time Simulation is enabling the world's visionaries to make innovative ideas a reality. OPAL-RT empowers engineers and researchers with accessible, cutting-edge, Real-Time Simulation technology to accelerate the development of better products and more reliable energy transmission.

Since 1997, industries including automotive, aerospace, power electronics and power generation have increasingly turned to OPAL-RT, transforming the company into a world leader in Real-Time Simulation and Hardware-in-the-Loop (HIL) testing equipment for electrical, electro-mechanical and power electronics systems.

## Payton America Inc

BOOTH 310

1805 S. Powerline Road
Suite 109
Deerfield Beach, FL 33442
USA
954-428-3326
Contact: Jim Marinos
jim@paytongroup.com
www.paytongroup.com

Payton is the world leader in the design and manufacturing of planar magnetics for SMPS's. Designs in 24 hours and samples in few weeks from few watts to over 100kW, from 20kHz to 5MHz. Production and designs centers in US, Israel, UK, China & Philippines.

## Plexim, Inc

BOOTH 304

5 Upland Rd
Suite 4
Cambridge, MA 02140
USA
617-209-2121
Contact: Kristofer Eberle
eberle@plexim.com
www.plexim.com

Plexim provides solutions for the design and test of power electronic systems and their associated controls. The modeling software PLECS, available in the MATLAB/Simulink environment and as an independent platform, includes a comprehensive component library comprising thermal, magnetic, and mechanical domains. The RT Box is a real-time simulation platform designed for Hardware-in-the-Loop (HIL) testing and Rapid Control Prototyping (RCP). PLECS processor-in-the-loop (PIL) allows co-simulation of embedded code with an offline plant model.

## Powersim Inc.

BOOTH 301

2275 Research Blvd.
Suite 500
Rockville, MD 20850
USA
301-841-7451
Contact: Shannon Chesley
schesleyr@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 211

2000 Town Center
Suite 1900
Southfield, MI 48075
USA
(778) 929-0800
Contact: Pauline Fontanaud
p.fontanaud@powersys-solutions.com
www.powersys-solutions.com

POWERSYS is a consulting and software company providing global solutions of engineering software and services for industry, research and education in the field of Electrical & Electromechanical Power Systems.

We will present two software: JMAG is a FEA Software solution for electromechanical equipment design and development and SABER software is a proven platform for modeling and simulating physical systems, enabling full-system virtual prototyping for applications in analog/power electronics, electric power generation/conversion/distribution and mechatronics.

## Proto Laminations, Inc.

BOOTH 419

13666 East Bora Drive
Santa Fe Springs, CA 90670
USA
909-338-3744
Contact: Steve Sprague
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.

## Teledyne LeCroy

BOOTH 207

700 Chestnut Ridge Rd
Chestnut Ridge, NY 10977
USA
845-578-6120/845-578-4401
Contact: Hilary Lustig/Ken Johnson
hilary.lustig@teledynelecroy.com
www.teledynelecroy.com

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 406

35 Medford St.
#305
Somerville, MA 02143
USA
617-909-9705
Contact: Sarah Lynch
sarah.lynch@typhoon-hil.com
www.typhoon-hil.com

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.

## Wiley

BOOTH 205

111 River Street
Hoboken, NJ 07030
USA
201-748-5851
Contact: Claire Kelly
clkelly@wiley.com
www.wiley.com

Wiley, a global company, helps people and organizations develop the skills and knowledge they need to succeed. Our online scientific, technical, medical, and scholarly journals, combined with our digital learning, assessment and certification solutions help universities, societies, businesses, governments, and individuals increase the academic and professional impact of their work.

## Wolfspeed

BOOTH 421

3028 E Cornwallis Road
RTP, NC 27709
USA
919-407-5459
Contact: Susan Knowles
susan.knowles@wolfspeed.com
www.wolfspeed.com

Wolfspeed, A Cree Company, is leading the innovation and commercialization of silicon carbide and gallium nitride, liberating designers to invent power and wireless systems for a responsible, energy-efficient future.

Wolfspeed's wide bandgap semiconductor products for power and radio-frequency (RF) applications deliver new levels of performance through increased efficiency, higher switching frequency and reduced system size and weight for the transportation, industrial, energy and communications markets.

## Brook Crompton (Subsidiary of Wolong Electric Group)

BOOTH 403

264 Attwell Drive
Toronto, ONM9W 5B2
Canada
416-675-3846
Contact: Ramzi Mallouk
ramzi.mallouk@brookcroptonna.com
www.brookcromptonna.com

Brook Crompton is a leading manufacturer of electric motors for the global industrial market. Colonel Crompton, a pioneer in the development of d.c. motors, formed R.E.B. Crompton & Co in 1878 and Ernest Brook made his first a.c. motor in Huddersfield, UK in 1904 forming Brook Motors. The two organisations came together in the late 1960s and the company that is now BROOK CROMPTON has come a long way since then. With our 9 main distribution warehouses and a network of distributors, Brook Crompton provides motors where you need them.

## Yokogawa

BOOTH 407

2 Dart Road
Newnan, GA 30265
USA
770-254-0400 x5656
Contact: Kristin Porche
kristin.porche@us.yokogawa.com
www.yokogawa.com

Yokogawa is a leading provider of Industrial Automation and Test and Measurement solutions. Combining superior technology with engineering services, project management, and maintenance, Yokogawa delivers field proven operational efficiency, safety, quality, and reliability.

## ZES ZIMMER Inc.

BOOTH 415

2850 Thornhills Ave #117
Grand Rapids, MI 49546
USA
760-550-9371
Contact: Robert Emerson
usa@zes.com
www.zes.com

ZES ZIMMER Electronic Systems GmbH is the sole high-tech company world-wide exclusively dedicated to high-precision power analysis. For more than three decades, power analyzers have been devised, developed, manufactured and sold to customers around the globe from ZES ZIMMER's corporate headquarter in Oberursel (Frankfurt)/Germany.

ZES ZIMMER's focus lies on broadband single-/three-phase precision power analyzers. The electric and electronics industry uses them in R&D and for quality assurance, test labs employ them to guarantee compliance with standards, and universities rely on them to train future generations of engineers and scientists.

## Concordia University

TABLE 3

31455 De Maisonneuve Blvd. West
SGW-EV05.11
Montreal QB H3G1M8
Canada
Contact: Dr. Pragasen Pillay
514-848-2423 x108
pragasen.pillay@concordia.ca
explore.concordia.ca

The Power Electronics and Energy Research Group (PEER), formerly the Power Electronics Research Group (PERG), was initiated at Concordia University in 1986. The activities of the group are supported by grants from Federal and Provincial Granting Agencies, as well as industry. The Power Electronics and Energy Research Group (PEER), formerly the Power Electronics Research Group (PERG), was initiated at Concordia University in 1986. The activities of the group are supported by grants from Federal and Provincial Granting Agencies, as well as industry. PEER offers a curriculum in static power converters and electric machines and drives that serves students at the university as well as engineers already established in industry. The courses are offered on the Sir George Williams campus of Concordia University in downtown Montreal. PEER carries on all activities in an established teaching and research laboratory located in the EV building. Further, PEER is associated with the Hydro-Quebec sponsored Institute for Electrical Power Engineering.

## FREEDM Systems Center

TABLE 2

1791 Varsity Drive
Suite 100
Raleigh, NC 27606
USA
Contact: Rbecca McLennan
919 513-4176
rhmclenn@ncsu.edu www.freedm.ncsu.edu

The Future Renewable Electric Energy Delivery Management (FREEDM) Systems Center is an NSF Engineering Research Center that includes five universities and multiple corporate members. Our faculty and students are developing technologies including solid state transformers and distributed grid controls that will enable widespread adoption of distributed energy resources.

## Ohio State University

TABLE 1

205 Dreese Lab
2015 Neil Ave
Columbus, OH 43210
USA
Contact: Dr. Longya Xu
614-688-4041
xu.12@osu.edu
chppe.osu.edu

The Center for High Performance Power Electronics (CHPPE) at The Ohio State University is geared to exploit the high temperature, high frequency and high efficiency of wide bandgap devices to realize landscape changes in power electronics based applications. The center is sponsored by the National Science Foundation, Department of Energy, Air Force Research Laboratory, PowerAmerica Institute, the State of Ohio, Ohio Federal Research Network, Ohio Space Grant Consortium, and leading companies including ABB, AEP, Caterpillar, Duke, FirstEnergy, Ford, GE Aviation, TI, and Toshiba.

## Seoul National University, Power Electronics Lab

TABLE 4

ECE Dept. Engineering College
Seoul 8826
South Korea
Contact: Professor Seung-Ki Sul
sulsk@plaza.smu.ac.kr

Our group is a research group included in Electrical and Computer Engineering Department of Seoul National University. Our group includes over 30 graduate students and a post-doc. led by 3 professors, Prof. Bo Cho, Prof. Seung-Ki Sul, and Prof. Jung-Ik Ha, . Among three professors, two of them are IEEE fellow. Especially, Prof. Sul is the recipient of 2017 IEEE Newell award. The group is focusing on power electronic related research covering electric machine drive, integration of renewal energy to grid, design of novel power supply, HVDC transmission and FACTS, and etc.

In this exhibition, we will show our recent research results such as sensorless drive of IPMSM, real time IPMSM emulator based on power electronics circuit and SiC based converter/inverter for elevator drive.

## UNC Charlotte – EPIC

TABLE 5

9201 University City Blvd.
Charlotte, NC 28223
USA
Contact: Julia Martin
704-687-5614
jstuart5@uncc.edu

EPIC is the Energy Production and Infrastructure Center at The University of North Carolina at Charlotte. The Lee College of Engineering is expanding its energy-related curriculum, research and laboratory facilities through industry collaboration to meet the demands in the energy field. EPIC will bring together industry, students, faculty and research experts in disciplines of electrical and computer, civil and environmental, and mechanical engineering, all under one group. This synergy will drive new advancements in the energy fields as it educates a new generation of engineering professionals.

# Notes

**Tuesday, October 3rd | Exhibitor Stage, Hall B** **11:40AM – 4:50PM**

## Empower a Billion Lives

**Speaker:** Deepak Divan

**11:00AM – 11:30PM |** See the full page advertisement on Page 97 for further details.

## Motor Design Ltd.

**Speaker:** James Gross and Mircea Popescu

**11:40AM – 12:10PM | Comparative Design Analysis for Various Electric Machine Technologies Used for EV Traction using Motor-CAD .**This session will be focused around three design studies for a range of electric and hybrid vehicles. Three design variations will be considered for these studies and will be evaluated and quantified in terms of performance, cost and manufacturability. The motor design analysis is done with Motor-CAD software will be structured as follows:

(I) A traction motor design for a BEV

(II) A transmission integrated electric motor for a PHEV

(III) A low cost 48V integrated starter/generator for a MHEV

The session is mainly addressed to Engineers and Technical Professionals who have an interest in Electric Machines for automotive applications.

## ECCE 2017 Exhibitor Spotlight Panel

**Moderator:** David Morrison, How2Power.com

**12:20PM – 12:50PM |** Moderated by David Morrison (How2Power.com), representatives from Payton Planar, Plexim Inc. and Proto Lam LLC will discuss the newest products and services offered by their companies.

## Wolfspeed Gen3 MOSFET Best in Class

**Speaker:** Edgar Ayerbe

**3:00PM – 3:30PM |** Wolfspeed is the market leader in power devices based on wide-bandgap technology. This session will provide an update on the latest Gen3 SiC MOSFETs products with an overview of the various markets and applications.

## Yokogawa

**Speaker:** Sam Shearman, Product Manager

**3:40PM – 4:10PM | Making Accurate Power Measurements despite Harmonics and other Distortion.** Yokogawa Corporation of America is a leading provider of Test and Measurement solutions including the Power Analyzers. This session will discuss the robust measurement approaches taken by Yokogawa power analyzers that enable accuracy despite harmonics and other waveform distortion.

## HBM

**Speaker:** Mike Hoyer, Applications/Marketing Engineer

**4:20PM – 4:50PM | Accelerate Efficiency Motor Mapping & Analysis.** Characterizing electric motors to optimize efficiency can be done in a matter of minutes instead of hours or days. See a simple cost effective solution designed for electric multi-phase motor/inverter testing, quick efficiency motor mapping and reliable custom real-time motor analysis, resulting in major increases in productivity, capability and R&D.

Objectives in the presentation include:

- Identify issues with complex and slow test methods
- How to reduce test complexity while improving speed and reliability
- Demonstrate quick efficiency motor mapping and analysis performed in minutes not hours/days

# Student Demonstrations

## ECCE 2017 Student Project Demonstration on Emerging Technology Dinner *(by Invitation)*

**Monday, October 2nd** **8:00PM – 10:00PM**

*Location: Moerlein Lager House (Beer Baron Hall)*

The dinner is sponsored by IEEE Power Electronics Society Technical Committee on High-Performance and Emerging Technologies (TC6).

### Simple Control Method for Modular Multilevel Converters

**Demonstrator:** Mohammad Sleiman
*Ecole de Technologie Supérieure, Canada*
**Advisor:** Kamal Al-Haddad

### 1 kW High Power Density SWitched Capacitor DC-DC Converter

**Demonstrator:** Boris Curuvija
*North Dakota State University, USA*
**Advisor:** Dong Cao

### A High Efficiency Resonant Switched-Capacitor Converter for Data Center

**Demonstrator:** Yanchao Li
*North Dakota State University, USA*
**Advisor:** Dong Cao

### Real-Time Control Implementation of the Matrix Converter using MATLAB/Simulink and DSP Hardware Support Packages

**Demonstrator:** Jianwei Zhang
*University of Technology Sydney (UTS), Sydney*
**Advisors:** Li Li, David Dorrell

### Needle Free Jet Injection Using a Slotless Linear Permanent Magnet Synchronous Motor

**Demonstrator:** Nick N. L. Do
*The University of Auckland, Newzland*
**Advisors:** Bryan P. Ruddy, Andrew Taberner

### Long Distance Capacitive Power Transfer with One Pair of Metal Plates

**Demonstrator:** Fei Lu & Hua Zhang
*San Diego State University, USA*
**Advisor:** Chris Mi

### Wideband Isolated Current Sensor for High Frequency Power Electronic Application

**Demonstrator:** Shahriar Nibir
*University of North Carolina at Charlotte, USA*
**Advisor:** Babak Parkhideh

### Controller Hardware-in-the-loop Experiment of Distributed Drid-tied AC-stacked PV Inverter under Grid Background Harmonics

**Demonstrator:** Namwon Kim
*University of North Carolina at Charlotte, USA*
**Advisor:** Babak Parkhideh

### Powerline Communications Strategy Enabling Fully Decentralized Control of AC-Stacked PV Inverters

**Demonstrator:** Daniel Evans
*University of North Carolina at Charlotte, USA*
**Advisor:** Robert Cox

### Manitoba Rectifier – Bridgeless Buck-Boost PFC

**Demonstrator:** King Man Siu
*University of Manitoba, Canada*
**Advisor:** Carl Ho

### A Current Sharing Technique for Parallel Operated Unipolar-PWM Inverters

**Demonstrator:** Dong Li
*University of Manitoba, Canada*
**Advisor:** Carl Ho

### A High-Power-Density Low-Profile DC-DC Converter for Cellphone Battery Charging Applications

**Demonstrator:** Yushi Liu
*University of Colorado Boulder, USA*
**Advisor:** Khurram K. Afridi

### A Two-terminal Active Capacitor

**Demonstrator:** Haoran Wang
*Aalborg University, Denmark*
**Advisor:** Huai Wang

### Reliability Testing Bench for the Modular Multilevel Converter

**Demonstrator:** Yi Zhang
*Aalborg University, Denmark*
**Advisors:** Frede Blaabjerg, Huai Wang

### Transformerless Isolated Electric Vehicle Charger with SiC Based Switched Capacitor Cells

**Demonstrator:** Yue Zhang
*The Ohio State University, US*
**Advisor:** Jin Wang

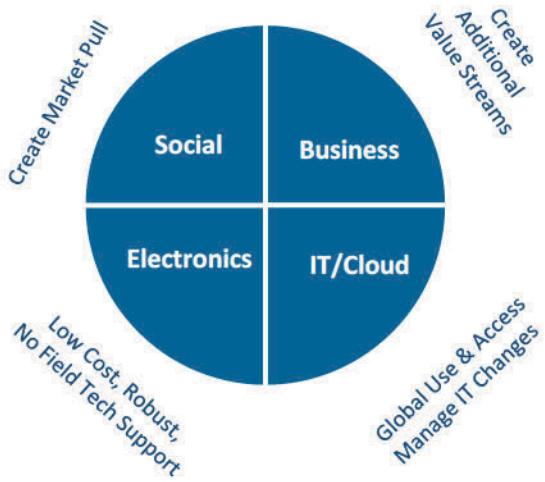
# EMPOWER A BILLION LIVES

An IEEE Sponsored Competition to Develop Scalable Solutions to Extreme Energy Poverty

- **1.2 BILLION** people live without access to electricity
- An additional **2 BILLION** people cannot earn a livelihood because of energy poverty
- Global philanthropic and entrepreneurial initiatives have brought light to 40 million people – but that is not enough!
- We need to scale by **~100X** to reach the electrification goals set out in the Sustainable Development Goals.

In 2016 attendees at the IEEE-PELS workshop included the World Bank, USAID, GOGLA, EPRI, NGOs, academia, and industry recommended a global competition as a means to unleash innovation,

## Holistic Approach




### Overarching consensus from workshop includes:

- Photovoltaic/battery/LED costs are decreasing **EXPONENTIALLY**, and are not the primary limitation
- Traditional business models not viable for markets with poor earning capacity – **NEW BUSINESS MODELS** are needed
- **ADDITIONAL COMMERCIAL VALUE STREAMS** can reduce the cost of providing and sustaining the ecosystem
- Critical need includes an **ULTRA-LOW COST COMMUNICATIONS /CONTROL LAYER** and market growth driven by market-pull (not technology-push)
- Solutions that are **DESIGNED TO SCALE** by anticipating key technology, finance, manufacturing & distribution issues.
- There is a need for **COMMON METRICS** to align the creativity and efforts of all the organizations in this sector

**The goal of the IEEE-PELS `EMPOWER A BILLION LIVES` Competition is to create and demonstrate sustainable, technically and economically viable solutions for energy access that can scale to impact >1 Billion people who live in extreme energy poverty.**

### COMPETING TEAMS

- University/student teams
- Small companies or start-ups
- Research labs
- Large companies

### COMPETITION CATEGORIES

- Appliances
- Solar Home Systems
- Interconnected Systems
- Advanced Concepts

## Organized By: IEEE Power Electronics Society

**IEEE-PELS Members who want to participate in the Competition and for Teams who would like to enter the competition please contact billionlives@ieee.org**

# ECCE 2018

IEEE ENERGY CONVERSION CONGRESS & EXPO Portland, Oregon | Sept. 23-27

## IMPORTANT DATES

**January 15, 2018**
Digest submission

**May 1, 2018**
Author notification

**June 30, 2018**
Final papers with IEEE copyright forms

# Call for Papers

IEEE

IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

pels IEEE POWER ELECTRONICS SOCIETY Powering a Sustainable Future

**General Chair**
Avoki M. Omekanda
*General Motors – Global R&D Center, USA*

**ECCE 2018 Technical Program Co-Chairs**
Giovanna Oriti
*Naval Postgraduate School, USA*

Pericle Zanchetta
*University of Nottingham, UK*

Rolando Burgos
*Virginia Tech, USA*

Mircea Popescu
*Motor Design Ltd, UK*

Jean-Luc Schanen
*Grenoble Institute of Technology, France*

Maryam Saeedifard
*Georgia Tech, USA*

**Special Session Chair**
Peter Wung
*General Electric, USA*

The Tenth Annual IEEE Energy Conversion Congress and Exposition (ECCE 2018) will be held in Portland, Oregon, USA on September 23 - 27, 2018. ECCE 2018 is the pivotal international conference and exposition event on electrical and electromechanical energy conversion field. ECCE 2018 will feature both industry-driven and application-oriented technical sessions, as expositions. ECCE 2018 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.

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
- Modeling of energy conversion components, converters and systems
- Reliability, diagnostics, prognostics, and health management
- Measurement techniques and EMC

**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.

**www.ieee-ecce.org/2018**



**Portland, OR, USA – September 23-27, 2018**

# ECCE 2018

IEEE ENERGY CONVERSION CONGRESS & EXPO Portland, Oregon | Sept. 23-27

## IMPORTANT DATES

**Feburary 17, 2018**
Submission of completed one-page Tutorial Proposal Form

**March 27, 2018**
Notification of acceptance.

**June 30, 2018**
Full Tutorial materials due

# Call for Tutorials

IEEE

IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

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Avoki M. Omekanda
*General Motors – Global R&D Center, USA*

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*Motor Design Ltd, UK*
Jean-Luc Schanen
*Grenoble Institute of Technology, France*
Maryam Saeedifard
*Georgia Tech, USA*

**Tutorial Chair**
Po-Tai Cheng
*National Tsung Hua University, Taiwan*


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The ECCE organizing committee invites proposals for half-day tutorials to be presented on Sunday, September 23, 2018. 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 grid, micro grids, and utility applications
- Electrical energy storage systems
- Energy conversion systems for Information Technologies (IT), and communication systems
- Technologies and systems for energy harvesting
- Energy efficiency for residential, commercial and industrial applications
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- Passive components and associated material technology
- Power electronic packaging and integration
- Modeling of energy conversion components, converters and systems
- Reliability, diagnostics, prognostics, and health management
- Measurement techniques and EMC

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. **Please submit the Tutorial proposal directly to the Tutorial Chair at ptcheng@ieee.org.**

**www.ieee-ecce.org/2018**

**Portland, OR, USA – September 23-27, 2018**

IEEE ENERGY CONVERSION CONGRESS & EXPO 2018 Portland, Oregon | Sept. 23-27

# Tutorial Proposal Form

## 1. Title of Tutorial

## 2. Abstract

*(No more than 500 words. If the tutorial is accepted, this abstract will be published on the conference website, program, and proceedings)*

## 3. Outline of Tutorial

*(Outline would only define the topics and the subtopics that would be covered. No detailed descriptions should be included in the proposal)*

## 4. Lead Instructor

*(Name, affiliation, and contact information)*

**Name** **Affiliation**

**Email** **Phone**

## 5. Other Instructor(s) if applicable

*(Name, affiliation, and contact information)*

**Name** **Affiliation**

**Email** **Phone**

## 6. Instructor Bios: ~150 Words

*(Please provide a brief biography for each instructor, describing the qualifications for presenting the proposed tutorial, including the work and publications that are most relevant to the proposal)*

# ECCE 2018

IEEE ENERGY CONVERSION CONGRESS & EXPO Portland, Oregon | Sept. 23-27

## IMPORTANT DATES

**March 31, 2018**
Proposal submissions deadline

**May 1, 2018**
Notification of session acceptance

# Call for Special Session Organizers

IEEE

IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

pels IEEE POWER ELECTRONICS SOCIETY Powering a Sustainable Future


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Avoki M. Omekanda
*General Motors – Global R&D Center, USA*

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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 of a more commercial nature than those related to the papers in the standard technical session, and the organization of the sessions are more malleable and could be in the form of panel discussions. Audience participation and open source brainstorming session 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 http://ecceconferences.org/2018). 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.

**Proposal Submission Guidelines:** Special Session organizers are requested to submit a maximum five page proposal summarizing the proposed Special Session with 4 or 8 presentations. The proposal should contain the session title, session organizer, title of each presentation, presenter for each presentation (with a short biography) and a summary of each presentation. **Please submit the proposal directly to ECCE 2018 Technical Program Committee Chairs via email at ecce2018tpc@gmail.com.**

**www.ieee-ecce.org/2018**

**Portland, OR, USA – September 23-27, 2018**

# Notes

# Save the Date

# 2018

Portland, Oregon | Sept. 23-27

# ECCE

IEEE ENERGY CONVERSION CONGRESS & EXPO

http://www.ieee-ecce.org/2018

# ECCE 2017

IEEE ENERGY CONVERSION CONGRESS & EXPO

Cincinnati OHIO October 1–5

2025 M Street NW, Suite 800, Washington, DC 20036
202-973-8744 | ecce@courtesyassoc.com