IEEE ENERGY CONVERSION CONGRESS & EXPO

Detroit, Michigan, USA Oct. 9-13

PROGRAM

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WELCOME FROM GENERAL CHAIR: EMMANUEL AGAMLOH

It is my distinct pleasure to welcome you to the 14th IEEE Energy Conversion Congress and Expo (ECCE 2022), held in Detroit, Michigan, October 9-13, 2022. ECCE is widely recognized as the world's leading technical conference and exhibition for electrical and electromechanical energy conversion systems and technologies. ECCE places strong emphasis on state-of-the-art topics in the research areas related to energy conversion, offering a unique blend of applied integrated systems research with innovations in energy conversion components. Due to the COVID19 pandemic, the last two editions of ECCE were virtual. We are excited to be back together, in-person in the Motor City of Detroit. Our Plenary Speakers are no strangers to the auto industry. They include Linda Zhang (Ford Motor Company), Tim Grewe (General Motors), Ryan Shaw (Magna Inc), Prof. Deepak Divan (Georgia Tech), and Prith Banerjee (Ansys). We are privileged to have these distinguished industry leaders and scientists to speak at ECCE 2022.

ECCE 2022's Technical Program features 856 peer-reviewed technical papers, and 17 Special Sessions in 14 parallel oral and poster sessions. Among these are two memorial sessions dedicated to Prof. Don Novotny who passed away during the year. I would like to thank our researchers, authors, Technical Program Committee for their hard work and diligence. Recognizing that some of our attendees may face travel restrictions and be unable to attend, we are hosting pre-recorded videos of the technical papers on a Virtual Platform to be accessed by all registered attendees. We have also planned live zoom sessions, from October 17-19, for our remote authors to interact with attendees and answer questions on their papers.

ECCE 2022's professional program starts on Sunday with 24 Tutorials that combine practical applications with theory. This year, we have 3 Tutorials delivered by companies exhibiting at the Expo. The Exhibitor Tutorials are designed to provide practical ready-to-use material for attendees. The Expo in the Exhibition Hall is designed to create a highly interactive networking environment for exhibitors to demonstrate their latest technologies, products and solutions.

ECCE 2022 is co-located with the 2022 IAS Annual Meeting. While these conferences are separate events, ECCE and IAS attendees come together for social functions, such as the Welcome Reception, Expo Opening Reception, Industry Night Out, and Awards Luncheon. The Industry Night out on Wednesday will be held in the iconic Henry Ford Museum.

ECCE Conference is known for its great networking environment for emerging and seasoned specialists in the field. For those who are new to ECCE, we invite you to our ECCE Newcomers session, just after the Sunday Welcome Reception.

I would like to express my utmost gratitude to the outstanding ECCE 2022 Organization Team and RNA Associates, who have worked hard to organize this conference; the ECCE Steering Committee for their guidance; our sponsoring societies (PELS and IAS) and Corporate Sponsors for their generous support; our Exhibitors for partnering with us; and everyone else who has contributed to this conference, whether you are a speaker, paper presenter, paper reviewer, session organizer, an attendee, an exhibitor, a volunteer, or any other supporter of ECCE 2022.

Welcome to ECCE 2022!

Sincerely,

Dr. Emmanuel Agamloh
General Chair IEEE ECCE 2022

WELCOME FROM TECHNICAL PROGRAM CHAIRS

We live in an interesting era, facing new challenges in all aspects of life! In particular, in our power electronics world, the use of electrical energy has expanded into new areas. More than ever, energy from our natural resources are transformed and distributed in the form of electric power and we are witnessing new trends in electrification in different industrial sectors. One can see that energy conversion plays a critical role in this new environment and presents new opportunities for technological advancement and innovation. The ECCE conference offers a unique opportunity by providing an international forum for collaboration between industry and academia presenting the latest technologies, exchanging new ideas, and discussing future challenges.

Over the past couple of years, due to COVID restrictions, the conference was held in a virtual format. We got used to video calls and webinars. But nothing replaces the face-to-face meeting and lively discussions! This is the first in-person conference since 2019 and as such it represents a great opportunity to meet new researchers, as well as renew collaborations with old colleagues and refresh friendships. We are extremely pleased that you have decided to participate in ECCE and greatly appreciate your support as authors, reviewers, session and topic chairs, exhibitors and attendees.

This year, in addition to the in-person format, the conference also offers some sessions in the virtual format. We received 1472 valid digests from authors all around the globe. The Technical Program Committee (TPC), which consists of Chairs, Vice Chairs, and Topic Chairs, organized the review process. Each digest was reviewed by three to five experts in the field. TPC held various virtual meetings in April to collectively make the final decision and develop the program. Issues arising from health concerns, travel restrictions and withdrawals caused additional, last-minute changes to the program. We had numerous meetings and weekly discussions and believe we have managed to fulfill most of the change requests and are proud to present the final program to you.

The program includes 856 technical papers presented in 107 oral sessions, including 2 memorial sessions for late Dr. Novotny, 25 poster sessions and 30 remote live Q&A sessions (to be held in the week following the conference). The program also includes 17 special "presentation-only" sessions that are scheduled throughout the week.

All papers presented at ECCE 2022, will be uploaded to IEEE Xplore Digital Library and made available to the research community. Please reference this official conference policy if your institution requires conference attendance justification. Following ECCE 2022, depending on the topics, all presented papers are eligible for submission to IEEE Transactions on Industry Applications or Power Electronics. For specific policies about a future submission to each of these journals, please contact its editorial board or the relevant technical committee.

On behalf of the entire Technical Program Committee, we hope that you will enjoy the 2022 ECCE event. We look forward to seeing you in Detroit. Once again, we want to give our gratitude to all of you who have contributed to ECCE2022.

Sincerely,

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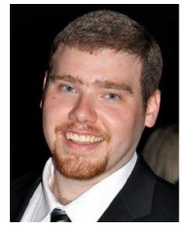

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Room 140A

Sunday, October 9 . . . . . .7:30AM – 7:00PM

Monday, October 10 . . . . . .7:30AM – 6:00PM

Tuesday, October 11 . . . . . .7:30AM – 5:00PM

Wednesday, October 12 . . . . . .7:30AM – 6:00PM

Thursday, October 13 . . . . . .7:30AM – 12:00PM

Expo Hall Hours

Exhibit Hall E

Monday, October 10 . . . . . 4:30PM – 7:30PM

Tuesday, October 11 . . . . . .10:30AM – 5:00PM

Job Fair Hours

Exhibit Hall E

Tuesday, October 11 . . . . . .8:30AM– 10:30AM

Creative Digressions

Monday through Thursday

Room 258

Creative Digression rooms are available to attendees requiring a break from busy conference activities. Rooms will be equipped with large tables, note pads, easels and white boards in order to facilitate one-on-one discussions, idea generation sessions, business meetings, or social interactions. Coffee and tea will also be available.

Family Room

Monday through Thursday

Room 331A

Family rooms are available for use by attendees with young children. These rooms will serve as a safe space for children to rest, enjoy complimentary snacks, watch videos, or create art with crayons and paper during the conference hours. All children must be supervised by a parent or family member at all times. Additionally, a nursing room is available on the 3rd floor of the Convention Center for nursing mothers.

Wi-Fi

Attendees have full access to Wi-Fi in the meeting space, foyer, and exhibit hall.

Network: HuntingtonPlaceFree

Stay Connected with the ECCE Mobile App

Download the ECCE 2022 mobile app to access all things related to the conference, including session information, exhibitors and locations, floor plans, timely notifications, and more! Visit the Apple Store and Google Play Store and search **'ECCE2022'**.

RULES AND REGULATIONS

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.

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.

Distributing Commercial Material at ECCE

Exhibitors: Exhibitors may only distribute commercial materials in their booth. ECCE reserves the right to remove without notice any materials not in compliance with this policy. Active recruiting is prohibited at all times except during the Job Fair Hours.

Non-Exhibitors: Distribution of commercial material in the ECCE 2022 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.

SCHEDULE-AT-A-GLANCE

Sunday, October 9th

7:30AM – 7:00PM	**Registration**	*140A*
7:00AM – 5:00PM	**Speaker Ready Room**	*259*
8:00AM – 6:00PM	**Creative Digressions**	*258*

Tutorials • 8:30AM – 11:45AM

360	359	358	357	356	355	354	353	330B	330A	320	321
T1: Maritime Electrification — State-of-the-Art Hybrid Power Systems for Green Marine Transport	**T2:** Power Semiconductors in Electrified Powertrains – Transitioning from Silicon to Wide Bandgap Devices?	**T4:** Circuit Board Layout for Wide Bandgap Power Transistors	**T5:** Model-Based Control Design and Testing with Embedded Code Generation Using the PLECS Toolchain	**T8:** Virtual Synchronous Machines - Inverters for a Stable and Well-damped Grid	**T9:** Electric Propulsion: Challenges and Opportunities	**T10:** Solid-State Transformers – Fundamentals, Industrial Applications, Challenges	**T14:** Recent Advances on Modular-based Multilevel Voltage-Source Converter (VSC) for MV and HV applications: Pr inciple, Control, and Its competitiveness with MMC	**T18:** Advanced Power Conversion Systems for Next-Generation Wireless Battery Charging	**T19:** Advanced Magnetic Designs Enabling Electrification of High Power Industrial Systems	**T21:** Extend the Lifespan of Electric Vehicle Batteries In Their Second Life For Renewable And Smart Energy Grids	**T24:** Power HIL: Enabling Flexible and Repeatable Testing of Power Electronics Systems in Close-to-reality Environment

11:45AM – 1:00PM	**Lunch On Your Own**	

Tutorials • 1:00PM – 4:15PM

360	359	358	357	356	355	354	353	330B	330A	320	321
T3: Practical Application of Silicon Carbide(SiC) in the E-Mobility Ecosystem	**T6:** Power Electronics Modeling for Real-Time Simulation	**T7:** Advanced Control of Power Electronics Systems	**T11:** Design and Control of Solid-State DC Transformers for DC Transmission and Distribution Grids	**T12:** Motor Drive Design And Evaluation Using Multi-domain Tool Suite for Faster Development Process	**T13:** Electric Vehicle Batteries and Charging Systems: A Primer	**T15:** Best Practices for Low-Power (IoT/ IIoT) Designs: Separating the Source-Side & Load-Side Analyses	**T16:** Design Strategies for High-Power, High-Current, Isolated DC/ DC Converters using Soft-Switching Technology and Silicon Carbide Transistors	**T17:** Emerging Cybersecurity Challenges in Modern Energy Systems – Assessment and Solutions	**T20:** Development of DER Inverter Topologies and Pulse Width Modulation	**T22:** The Benefits of Infrared Thermography Testing For The Thermal Management in Energy Storage and Conversion	**T23:** Factors Influencing Active Torque Ripple Cancellation in PMSM/IPMSM Drives

6:00PM – 8:00PM	**Welcome Reception**	*Grand Ballroom A/B*
8:00PM – 8:30PM	**ECCE Newcomers Reception**	*250A*

Monday, October 10th

7:30AM – 6:00PM	**Registration**	*140A*
7:30AM – 8:30AM	**Oral Presenters Breakfast**	*260*
8:30AM – 11:15AM	**Keynotes**	*Grand Ballroom B*
11:15AM – 12:30PM	**Lunch On Your Own**	*Available for Purchase in the Cafeteria*

Oral Sessions • 12:30PM – 2:10PM

140B	140C	140D	140E	140F	140G	142A/B	250A	250B	250C	251A	251B/C	252A/B
S1: Axial Flux Machines I	**S2:** Control of Electric Drives	**S3:** Induction Machines	**S4:** EV Powertrain I	**S5:** Grid-Forming Inverters	**S6:** Energy Storage: Converter and Control		**S7:** Converter Topologies for Industrial Applications	**S8:** Modeling and Control Considerations of Power Converters I	**S9:** Measure-ments, Testing and Standards I	**S10:** Control Strategies for Multi-level Converters	**S11:** AC-DC Converters	**S12:** GaN Power Devices and Characteri-zation

Special Sessions • 12:30PM – 2:10PM

141	142A/B
SP1: SiC and GaN Applications in Electric Vehicles: Current Issues	**SP2:** Energy Access and Off-Grid Systems: Technology Innovation for Scalable, Affordable and Sustainable Energy Access Solutions to Provide Energy Access to Anybody and At Any Part of the World

2:10PM – 2:20PM	**Coffee Break**	*Pre-function 100's and Pre-function 200's*

Monday, October 10th (continued)

Oral Sessions • 2:20PM – 4:25PM

140B	140C	140D	140E	140F	140G	142A/B	250A	250B	250C	251A	251B/C	252A/B
S14: Electric Machines for Transportation	**S15:** PM and IPM Motor Drives	**S16:** Diagnostics, Noise and Vibration in Electric Machines I	**S17:** Transportation Electrification Applications	**S18:** Stability and Control of Grid-Following Inverters	**S19:** Grid-forming Converters and Technologies	**S13:** Design Automation, Digital Twins and Autonomous Power Electronic Applications	**S20:** DC-DC Converters with Wide Conversion Ratios	**S21:** Power Converter Common Mode Voltage and EMI I	**S22:** Wireless Power Transfer I	**S23:** Control of Power Converters I	**S24:** Modular Multi-Level Converters	**S25:** SiC Characteri-zation

Special Sessions • 2:20PM – 4:25PM

141

SP3:
High Efficiency, High Power Density, and Fault-Tolerant Motor and Drives for Electric Vehicles and Electric Airplanes – Similarities and Differences

4:30PM – 7:30PM **Expo Hall Reception** ..... *Hall E*

Plenary Poster Sessions • 5:00PM – 7:30PM

Hall E

S26: Renewable System Designs: Solar, Wave, and Converter Testing	**S27:** DC and Renewable Power Systems	**S28:** Stability Aspects in Power Electronics Systems	**S29:** Selected Topics in Modeling and Diagnostics	**S30:** Capacitors and Power Electronic Thermal Design	**S31:** Permanent Magnet Machines	**S32:** Materials, Losses, Thermal and Manufacturing Issues

7:30PM – 8:30PM **Women in Engineering Reception** *250C*

Tuesday, October 11th

7:00AM – 6:00PM **Creative Digressions** *258*

7:30AM – 5:00PM **Registration** *140A*

7:30AM – 8:30AM **Oral Presenters Breakfast** *260*

8:30AM – 10:30AM **Student Job Fair** ..... *Hall E*

Oral Sessions • 8:30AM – 10:10AM

140B	140C	140D	140E	140F	140G	250A	250B	250C	251A	251B/C	252A/B
S34: Thermal Issues in Electric Machines	**S35:** General Electric Drives	**S36:** Actuators and Non-Conventional Machines	**S37:** Cybersecurity In Power Electronic Systems	**S38:** Converters for Microgrid I	**S39:** High Power Converter Topologies for Photovoltaic Systems	**S40:** Isolated DC-DC Resonant Converters	**S41:** Reliability, Diagnostics and Fault Analysis of Power Converters I	**S42:** Measurements, Testing And Standards II	**S43:** Control, Model-ing and Stability of Grid-Forming Converters	**S44:** Multi-Level Converter Topologies I	**S45:** Wide Bandgap Device Packaging

Special Sessions • 8:30AM – 10:10AM

141	142A/B
SP4: Challenges and Opportunities for Lunar Surface Microgrids	**SP5:** New Developments in Wide-Bandgap Bidirectional Switches and Applications

Plenary Poster Sessions • 10:30AM – 1:00PM

Hall E

S46: Power Converter Design and Modelling of Energy Systems	**S47:** Automated Design Considerations in Power Electronics and Batteries/ UPS Systems	**S48:** Electrified Transportation Systems	**S49:** Multi-Level Converters	**S50:** Modeling and Control Considerations of Power Converters II	**S51:** WBG Design and Applications	**S52:** Switched Reluctance and Flux Switching Machines	**S53:** Materials, Losses and Thermal Issues	**S54:** Electric Drives I

11:30AM–1:00PM **Lunch Provided** ..... *Hall E*

1:30PM–3:00PM **Student Demonstrations** ..... *Hall E*

Plenary Poster Sessions • 2:30PM – 5:00PM

Hall E

S55: Energy Storage and Harvesting	**S56:** Data analytics for Accelerated Simulation/Energy Forecasting and Smart Protection Algorithms	**S57:** Selected Topics in Emerging Technologies	**S58:** Power Electronic Converter Topologies	**S59:** Modeling and Control Considerations of Power Converters III	**S60:** Magnetics and Packaging	**S61:** Diagnostics, Noise and Vibration in Electric Machines	**S62:** Modelling and Analysis of Electric Machines in Specialized Applications	**S63:** Electric Drives II

SCHEDULE-AT-A-GLANCE (continued)

Wednesday, October 12th

7:30AM – 6:00PM **Registration** *140A*

7:30AM – 8:30AM **Oral Presenters Breakfast** *260*

8:00AM – 6:00PM **Creative Digressions** *258*

Oral Sessions • 8:30AM – 10:10AM

140B	140C	140D	140E	140F	140G	250A	250B	250C	251A	251B/C	252A/B
S64: Prof. Donald W. Novotny Memorial Session I	**S65:** Sensorless Drives	**S66:** Additive Manufacturing in Electric Machines	**S67:** EV Charging	**S68:** Solid State Transformers and Applications	**S69:** Advanced Power Converter Control Routines for Photovoltaic Systems	**S70:** Multi-Level Converter Topologies II	**S71:** Modeling of Power Converters	**S72:** Wireless Power Transfer II	**S73:** Nonlinear Control Techniques for Power Electronics Applications	**S74:** Multi-Level Converters	**S75:** Silicon Carbide Switching Performance

Special Sessions • 8:30AM – 10:10AM

141	142A/B
SP6: Future Trends and Challenges in Vehicle Electrification –- Part I Power Electronics and Motors	**SP7:** Reliability of Power-Electronic Systems for Solar Energy

10:10AM – 10:30AM **Coffee Break** ..... *Pre-function 100's and Pre-function 200's*

Oral Sessions • 10:30AM – 12:10PM

140B	140C	140D	140E	140F	140G	250A	250B	250C	251A	251B/C	252A/B
S76: Axial Flux Machines II	**S77:** Prof. Donald W. Novotny Memorial Session II	**S78:** Bearingless and High-Speed Machines	**S79:** EV Powertrain II	**S80:** Control of High Penetration Renewable Grid	**S81:** Energy Storage and Harvesting	**S82:** DC-DC Converter Topologies	**S83:** Power Converter Common Mode Voltage and EMI II	**S84:** Protection Devices / Algorithms	**S85:** Model Predictive Control of Power Electronics	**S86:** AC-AC Converters	**S87:** Novel Applications and Features of WBG Gate Drivers

Special Sessions • 10:30AM – 12:10PM

141	142A/B
SP8: Future Trends and Challenges in Vehicle Electrification – Part II Battery and Charging	**SP9:** Paradigm Shift towards 100% Renewables in Modern Power Systems: Theory and Practice of Grid-Forming Inverter Technologies

12:10PM – 2:00PM **Lunch On Your Own** ..... *Available for Purchase in the Cafeteria*

Oral Sessions • 2:00PM – 3:40PM

140B	140C	140D	140E	140F	140G	250A	250B	250C	251A	251B/C	252A/B
S88: Synchronous Reluctance Machines	**S89:** Induction Motor Drives	**S90:** Diagnostics, Noise and Vibration in Electric Machines II	**S91:** Battery Charging Systems	**S92:** Converters for Microgrid II	**S93:** Photovoltaic Converter Control and Hardware Enhancement Features	**S94:** Grid Interactive Inverters	**S95:** Power Converter Stability I	**S96:** Measurements, Testing and Standards III	**S97:** Design Optimization and Loss Minimization Studies	**S98:** Magnetic Design for Isolated DC-DC Converters	**S99:** Circuit Design with Silicon Carbide MOSFETS

Special Sessions • 2:00PM – 3:40PM

141	142A/B
SP10: Advanced Cooling Systems for Electric Machines and Power Electronic Converters – Part I	**SP11:** Measurement Technology Required for the Power Electronics Industry that Leads the Decarbonized Society

3:40PM – 4:00PM **Coffee Break** ..... *Pre-function 100's and Pre-function 200's*

Oral Sessions • 4:00PM – 5:40PM

140B	140C	140D	140E	140F	140G	250A	250B	250C	251A	251B/C	252A/B
S100: Interior Permanent Magnet Machines	**S101:** Medium Voltage and High-Power Drives	**S102:** Switched Reluctance and Flux Switching Machines II	**S103:** Battery System	**S104:** Power Converters for Grid Support	**S105:** DC-DC Converters for Renewable Energy	**S106:** Inverters for High-Power Industrial Applications	**S107:** Reliability, Diagnostics and Fault Analysis of Power Converters II	**S108:** Big Data, Machine Learning and AI Applications in Energy Systems	**S109:** Control of Power Converters II	**S110:** Isolated DC-DC Converters with Dual Active Bridges	**S111:** Transformer Design and Isolation Materials

Special Sessions • 4:00PM – 5:40PM

141	142A/B
SP12: Advanced Cooling Systems for Electric Machines and Power Electronic Converters – Part II	**SP13:** Standard Development for Solid State Transformer: An Update on Existing IEEE Standards on Magnetics and New Standard for Solid State Transformer

5:15PM – 6:15PM **Buses to Ford Museum** ..... *Atwater Drive*

6:00PM – 10:00PM **Industry Reception** ..... *Ford Museum*

Thursday, October 13th

7:00AM – 12:00PM	**Registration**	*140A*
7:30AM – 8:30AM	**Oral Presenters Breakfast**	*260*
8:00AM – 4:00PM	**Creative Digressions**	*258*

Oral Sessions • 8:30AM – 10:10AM

140B	140C	140D	140E	140F	140G	250A	250B	250C	251A	251B/C	252A/B
S112: IPM and Synchronous Reluctance Machines	**S113:** Monitoring, Diagnostics, Reliability and EMI	**S114:** Switched Reluctance and Flux Switching Machines III	**S6115:** Electrified Air Vehicles	**S116:** Devices V2G Applications	**S117:** Emerging High Power Converters and Monitoring Techniques	**S118:** Low Power Converters for Industrial Applications	**S119:** Power Semiconductor Reliability and Diagnostics	**S120:** Magnetics	**S121:** Control of Power Converters III	**S122:** Modulation Strategies for Multi-Level Converters	**S123:** High Power Module Design

Special Sessions • 8:30AM – 10:10AM

141	142A/B
SP14: Advanced Power Electronics and Drives for Commercial Vehicle Electrifications	**SP15:** Power Electronics for Integration of MV Utility-Scale PV Systems

10:10AM – 10:30AM	**Coffee Break**	*Pre-function 100's and Pre-function 200's*

Oral Sessions • 10:30AM – 12:10PM

140B	140C	140D	140E	140F	140G	250A	250B	250C	251A	251B/C	252A/B
S124: Design Optimization in Electric Machines	**S125:** High Speed High-Efficiency Motor Drives	**S126:** Wound Field and PM Machines	**S127:** Inductive Power Transfer And Traction Applications	**S128:** Power Converters Control	**S129:** Generators and Control for Wind Applications		**S130:** Fault Detection and Diagnostics		**S131:** Control Strategies for Active Bridge Converters	**S132:** Control Methods and PWM Techniques for Multi-Level Converters	**S133:** Silicon Carbide Devices

Special Sessions • 10:30AM – 12:10PM

141	142A/B
SP16: Towards Enhancing the Resiliency of Grid-Interactive Inverters	**SP17:** GaN Integrated Circuits and Challenges Solved by Integration

12:10PM – 2:00PM	**Awards Luncheon**	*Grand Ballroom A/B*
2:30PM – 4:00PM	**Closing Reception**	*Atrium*

COMMITTEE MEETINGS

IAS members attending ECCE are also invited to attend IAS Department and Committee Meetings occuring at the IAS Annual Meeting.

IAS Committee Meetings at ECCE

SUNDAY, OCTOBER 9		
3:00PM – 4:00PM	**IAS-IPCSD Standards Meeting**	*Room 252A/B*
4:00PM – 5:00PM	**IAS-IPCSD Editorial Meeting**	*Room 252A/B*
7:30PM – 9:30PM	**IAS-IPCSD – Department Meeting**	*Room 252A/B*
TUESDAY, OCTOBER 11		
2:00PM – 3:00PM	**IAS Renewable and Sustainable Energy Conversion Systems Committee (RESC) Meeting**	*Room 140B*
3:00PM – 4:00PM	**IAS Transportation Systems Committee (TSC) Meeting**	*Room 140C*
4:30PM – 6:00PM	**IAS Electrical Machines Committee (EMC) Meeting**	*Room 141*
5:00PM – 6:00PM	**IAS Power Electronics Devices and Components Committee (PEDCC) Meeting**	*Room 140B*
6:00PM – 7:00PM	**IAS Industrial Drives Committee (IDC) Meeting**	*Room 142A/B*
7:00PM – 8:00PM	**IAS Industrial Power Converters Committee (IPCC) Meeting**	*Room 140C*
7:00PM – 9:00PM	**IEEE IAS/PELS Young Professional Reception**	*Grand Truck Pub*

ECCE Committee Meetings

SUNDAY, OCTOBER 9		
8:00AM – 8:30AM	**ECCE Newcomers Reception**	*Room 250A*
TUESDAY, OCTOBER 11		
7:30AM – 8:30AM	**ECCE 2022, 2023 and 2024 Handoff** *(Invitation Only)*	*Room 142C*
8:30AM – 9:30AM	**ECCE 2023 Organizing Committee Meeting** *(Invitation Only)*	*Room 142C*
10:00AM – 12:00PM	**ECCE Steering Committee Meeting** *(Invitation Only)*	*Room 142C*

PELS Meetings

MONDAY, OCTOBER 10		
11:30AM – 1:30PM	**PELS Open Access Journal**	*Room 355*
11:30AM – 12:30PM	**PELS TC 10: Design Methodologies**	*Room 356*
1:00PM – 2:30PM	**IEEE Journal of Emerging and Selected Topics in Power Electronics (JESTPE) Steering Committee**	*Room 354*
1:30PM – 3:00PM	**PELS TC1 – Power and Control Core Technologies**	*Room 356*
2:30PM – 3:30PM	**PELS Industry Committee**	*Room 354*
3:00PM – 5:00PM	**PELS ITRW**	*Room 355*
3:30PM – 5:00PM	**Power Electronics Magazine Advisory Board**	*Room 354*
3:00PM – 4:30PM	**PELS TC 11: Aerospace Power**	*Room 356*
3:00PM – 4:30PM	**PELS Chapter Chair Ice Cream Meet 'n Greet Social**	*Room 357*

PELS Meetings *(continued)*

TUESDAY, OCTOBER 11

8:00AM – 9:30AM	**PELS & CPSS Meeting**	*Room 354*
8:00AM – 9:30AM	**PELS TC7 – Communication Energy Systems** *(Continental Breakfast)*	*Room 355*
8:00AM – 10:00AM	**IEEE Journal of Emerging and Selected Topics in Power Electronics (JESTPE) Awards and Editorial Board**	*Room 357*
9:00AM – 10:00AM	**PELS TC 9: Wireless Power Transfer Systems**	*Room 356*
9:30AM – 11:00AM	**PELS TC2 - Power Conversion Systems and Components**	*Room 355*
10:30AM – 11:30AM	**WIE Committee Meeting**	*Room 356*
10:30AM – 12:00PM	**PELS TC 8: Electronic Power Grid Systems.**	*Room 357*
11:30AM – 1:00PM	**PELS TC3 Motor Drives & Actuators**	*Room 355*
12:00PM – 1:30PM	**Energy Access/EBL**	*Room 356*
1:00PM – 2:00PM	**International Future Energy Challenge (IFEC) Information Session**	*Room 354*
1:30PM – 2:30PM	**PELS Digital Media Committee**	*Room 355*
1:30PM – 3:30PM	**PELS Global-Intersociety Relations Committee**	*Room 356*
2:00PM – 3:00PM	**PELS TC 12: EnergyAccess and OffGrid Systems**	*Room 357*
2:30PM – 4:00PM	**PELS TC6 – High Performance and Emerging Technologies Meeting**	*Room 355*
12:00PM – 1:30PM	**PELS Mentorship Roundtable Luncheon**	*Room 260*
3:30PM – 4:30PM	**PELS TC5 - Sustainable Energy**	*Room 357*
5:00PM – 6:30PM	**PELS TOWNHALL** *(Doors open and Reception at 4:30PM).*	*Room 353*
7:00PM – 9:00PM	**Young Professional Reception** Sponsored by **IAS, PELS, and PSMA** *(Advance registration is required)*	*Grand Truck Pub* *612 Woodward Ave, Detroit, MI 48226*

WEDNESDAY, OCTOBER 12

8:00AM – 9:00AM	**WIE, YP, and You: How to Become Involved with IEEE PELS and PSMA Too**	*Room 354*
9:00AM – 11:00AM	**PELS VP of Products Committee Meeting**	*Room 355*
9:30AM – 12:00PM	**VP of Technical Operations Committee Meeting**	*Room 356*
11:30AM – 1:30PM	**PELS Fellows Committee** *(Closed meeting).*	*Room 355*
12:00PM – 2:00PM	**IEEE Transactions on Power Electronics Paper Awards and Editorial Board Meeting**	*Room 260*
1:00PM – 2:00PM	**PELS Mentorship Committee Meeting**	*Room 357*

THURSDAY, OCTOBER 13

8:30AM – 12:00PM	**PELS VP of Conferences Committee Meeting.**	*Room 357*
9:00AM – 10:30AM	**PELS VP of Standards Committee**	*Room 355*
9:00AM – 11:00AM	**PELS Nominations Committee** *(Members Only)*	*Room 356*
2:30PM – 6:30PM	**PELS Administrative Committee Meeting**	*Room 354*

SPECIAL EVENTS

ECCE Welcome Reception

Sunday, October 9 | 6:00PM – 8:00PM

Location: Grand Riverview Ballroom B

The conference will host a Sunday Welcome 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.

Newcomer's Orientation

Sunday, October 9 | 8:00PM – 8:30PM

Location: Room 250A

The Newcomer's Orientation is designed for first time attendees and will cover everything you need to know about the conference, schedules, program offerings, behind-the-curtain tricks and tidbits to help you navigate the conference.

Expo Hall Opening Reception

Monday, October 10 | 4:30PM – 7:30PM

Location: Expo Hall E

Join us for the opening of the ECCE 2022 Exhibit Hall! Enjoy a drink and hors 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.

Industry Night Out Reception

Wednesday, October 12 | 6:00PM – 9:00PM

Location: Ford Museum

This unique night brings together members from both ECCE and IAS to enjoy touring the iconic Ford Museum. At The Henry Ford, you'll discover America—its culture, inventions, people and can-do spirit—and hundreds of hands-on ways to explore it, enjoy it and be inspired by it. Expand your network and knowledge during our Industry Night Out reception. Heavy appetizers and beverages will be provided.

IMPORTANT NOTE:

Transportation to the Henry Ford Museum has been arranged by the ECCE Organizing Committee. Shuttle buses are first come first served and space is limited. To ensure a spot, please arrive 15 minutes prior to departure.

Bus loading is outside the Atrium doors on Atwater Drive. Please follow signage from the ECCE registration desk to locate the queue. If you are not presenting during the afternoon sessions, please arrive at the bus loading location by the first departure time.

First Departure To Ford Museum

- Loading begins 5:15PM
- Buses depart by 5:30 PM

Second Departure To Ford Museum

- Loading begins 6:15PM
- Buses depart by 6:30PM

Individuals may also make their own arrangements to travel to the Ford Museum for the reception. Doors open at 6PM to tour the museum with food service beginning at 6:30PM. Ample parking at the museum is available at no additional fee.

IEEE Awards Luncheon

Thursday, October 13 | 12:10PM – 2:00PM

Location: Grand Riverview Ballroom

We will gather to celebrate the great achievement of some of our colleagues at our traditional IEEE Award Luncheon event.

Closing Reception

Thursday, October 13 | 2:30PM – 4:00PM

Location: Atrium

Join us for drinks and desert following the Awards Luncheon in the Atrium of the Huntington Place.

Tour Options

Ford Rouge Factory Tour

Tuesday, October 11 | 9:00AM – 10:30AM

Cost: $60

Pop open the hood on game-changing technology, sustainable design and sheer American grit at America's greatest manufacturing experience. Get an inside look at the making of America's most iconic truck, the Ford F-150, and immerse yourself in modern manufacturing's most progressive concepts.

ECCE 2022 has arranged a shuttle bus from the Huntington Place Convention Center to the Ford Rouge Factory Tour departing at 8 AM. The tour is self-guided and will take about 1.5 hours to complete. The bus will depart at 11 AM to go directly to Ann Arbor for the University of Michigan Facility tour. A boxed lunch will be provided on the bus.

No transportation has been arranged back to the convention center from the Ford Rouge Factory.

Please make arrangements for your return if you are not joining Tour 2.

University of Michigan Facilities Tour

Tuesday, October 11 | 11:00AM – 4:30 PM

Cost: $60

For those that have registered only for Tour 2, ECCE has arranged a bus departing from the Huntington Place at 11 AM. Please arrive by 10:45 AM at the Atwater Street Entrance for loading. Participants joining from Tour 1 will be shuttled directly to Ann Arbor.

- **12:00PM – 1:00PM: MCity Autonomous Vehicle Test Track at the University of Michigan**
- **1:15PM – 2:00PM: UM Transportation Research Institute**
- **2:15PM – 2:30PM: UM Ford Robotics Building / M-Air**
- **2:45PM – 3:00PM: UM Battery Lab**

Spend the afternoon delving into the many facilities at the University of Michigan created to further sustainability. They have 55 years of history focusing on multidisciplinary transportation safety and mobility. Sustaining global leadership in transportation safety and mobility research is paramount.

TOUR SIGN UP Pre-registration and payment for tours are required. To sign up for a tour, visit the ECCE Registration Desk located in the Atrium.

Women in Engineering Event

Monday, October 10 | 7:30PM – 8:30PM *Location: Room 250C*

At the ECCE 2022 Women in Engineering Event, we will hold a panel on the role of women in Energy Conversion Systems. We will have panelists from academia and industry in US and worldwide. Discussion will take place over dinner.

Women in Engineering Breakfast at ECCE 2022

WIE, YP, and You: How to become involved with IEEE PELS & PSMA too

Wednesday, October 12 | 8:00AM – 9:00AM

Location: Room 354 (Huntington Place)

Learn about all the ways you can engage with PELS and PSMA and uncover all the exciting opportunities behind these acronyms.

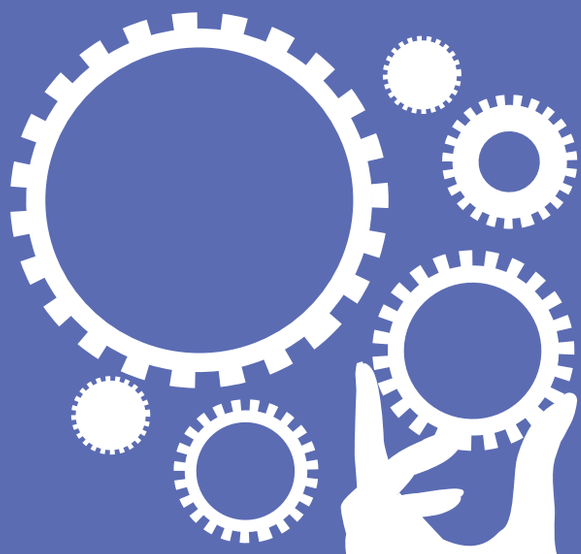
Hosted by the IEEE Power Electronics Society (PELS) Women-in-Engineering (WIE), Young Professionals (YP) Committees, and PSMA.

There is no cost to join the breakfast chat.

WIE Travel Grant Program

A travel reimbursement program was established to support professional women in engineering and students who wish to attend ECCE 2022 and is funded by the ECCE 2022 Organizing Committee. Congratulations to the 2022 WIE Grant Recipients:

- Ozge Taskin
- Qianwen Xu
- Zahra Saadatizadeh
- Peri Roja
- Warda Matin Khan
- Giulia Di Nezio
- Mhret Berhe Gebremariam
- Samantha Coday
- Udochkwu Akuru
- Costanza Ahumada Sanhueza



Women in Engineering (WiE) Events

ECCE Family Room

Sunday , October 9 through Thursday, October 13

Location: Room 331A

The ECCE Family Room will be available for the duration of the conference, providing a child-friendly environment to interact with your kids. The room will provide various snack and drinks, a place to watch movies/shows, books, coloring materials, games, and a nap area.

Special thanks to all the attendees who will be contributing by lending books, games, or art supplies for use during the conference.

Kids using the Family Room should be accompanied by a parent, guardian, or caregiver at all times.

PRESENTER INFORMATION

Oral Presenters

SPEAKER READY ROOM

Sunday through Thursday

Location: Room 259

All oral presenters must check in at the Speaker Ready Room at least four (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.

Speaker Ready Room Hours:

Sunday, October 9 . . . . . 8:30AM – 5:00PM
Monday, October 10 . . . . . 8:30AM – 5:00PM
Tuesday, October 11 . . . . . 8:30AM – 12:00PM
Wednesday, October 12 . . . . . 8:30AM – 6:00PM
Thursday, October 13. . . . . 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 4:00PM the day prior for speakers presenting before 12:00PM or by 12:00PM for speakers presenting after 1:00PM. 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 in the Portside Ballroom (260)** located on the second floor of the Huntington Place Convention Center. Oral presenters should meet with their respective session chairs to review the format and timing of their session and alert conference management of any changes. Oral Presenters should attend the orientation each day that they are scheduled to provide an oral presentation (or chair a session); you may only attend on days on which you are scheduled to speak.

USE OF PERSONAL COMPUTERS PROHIBITED

Please note that the use of personal laptops for presentations is not permitted. All presentations must be uploaded to the show computers. AV personnel will be on-hand to assist in uploading your presentation.

Poster Presenters

POSTER PRESENTATION SCHEDULE

Monday, October 10 and Tuesday, October 12

Location: Exhibit Hall E

POSTER SESSION I
Monday, October 10 . . . . . 5:00PM – 7:30PM

POSTER SESSION II
Tuesday, October 11 . . . . . 10:30AM – 1:00PM

POSTER SESSION III
Tuesday, October 12 . . . . . 2:30PM – 5:00PM

Posters will be on display on Monday and Tuesday in Exhibit Hall E at the Huntington Place Convention Center. Poster presenters should be available for questions at their display boards during their scheduled poster presentation time. If you are unsure which session your poster should be presented, please review the complete Technical Session schedule. Poster Presenters will have access to Exhibit Hall E at the Huntington Place Convention Center to set up and tear down their posters at the times listed below.

POSTER SESSION I

Monday, October 10

Setup . . . . . 4:30PM – 5:00PM
Poster Presenters' Orientation . . . . . 4:45PM – 5:00PM
Poster Session . . . . . 5:00PM – 7:30PM
Breakdown . . . . . 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

Tuesday, October 11

Setup . . . . . 9:30AM – 10:30AM
Poster Presenters' Orientation . . . . . 10:15AM – 10:30AM
Poster Session . . . . . 10:30AM – 1:00PM
Breakdown . . . . . 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 in the Speaker Ready Room.

POSTER SESSION III

Tuesday, October 11

Setup . . . . . 2:00PM – 2:30PM
Poster Presenters' Orientation . . . . . 2:15PM – 2:30PM
Poster Session . . . . . 2:30PM – 5:00PM
Breakdown . . . . . 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 in the Speaker Ready Room.

All uncollected posters will be discarded at the end of the conference.

IAS Conference authors were invited to present posters at ECCE to expose their work to the ECCE audience. This optional offer was accepted by a few authors. Their posters are in the Exhibit Hall. See the insert Flyer and the Virtual Platform for the list of IAS posters."

PLENARY SESSION
KEYNOTE SPEAKERS

Keynote Session Chairs

Yunwei (Ryan) Li
University of Alberta, Canada
ECCE 2020 General Chair

John Shen
Simon Fraser University, Canada
ECCE 2016 General Chair

Monday, October 10 8:30AM–11:15AM

8:30AM | Welcome Remarks

Emmanuel Agamloh
Baylor University, USA
ECCE 2022 General Chair

8:45AM | From Concept to Road: The F150 Lightning Story

Linda Zhang
F-150 Chief Nameplate Engineer, Ford Motor Company

Linda Zhang is responsible for leading the team delivering Ford's first-ever all-electric F-150 pickup. Zhang, who has been with Ford for nearly 25 years, joined the company after graduating with a degree in electrical engineering from the University of Michigan and moving into the Ford College Graduate program. From there, she worked in manufacturing, product development, finance, and corporate strategy, gathering business fundamentals that would serve her well as she worked on programs like Ford Explorer, Escape, Kuga and F-150. "The all-electric F-150 program", she said, "has been particularly fulfilling" – because of her background in electrification and the truck's prominent position in the Ford portfolio.

9:15AM | Grid as an Ecosystem

Deepak Divan
Professor, John E Pippin Chair and GRA Eminent Scholar Director, GT Center for Distributed Energy, ECE Georgia Institute of Technology, Atlanta, GA

Deepak Divan does research in the areas of power electronics, power systems, smart grids, and distributed control of power systems. He works closely with utilities and industry and is actively involved in research, teaching and entrepreneurship. Dr. Divanhas founded or seeded several companies, including Varentec in Santa Clara, CA, which was funded by leading green-tech Venture Capital firm Khosla Ventures and renowned investor Bill Gates, as well as Soft Switching Technologies, Innovolt, and Smart Wires, which together have raised >$160M in venture funding. Dr. Divan is an elected Member of the US National Academy of Engineering, member of the National Academies Board on Energy and Environmental Systems and NASEM Committee on the Future Grid. He a Fellow of the IEEE, past President of the IEEE Power Electronics Society, is a recipient of the IEEE William E Newell Field Medal and is Chair of the IEEE Empower a Billion Lives global competition to develop scalable energy access solutions.

9:45AM | Plug & Power: Our New Age of Electrified Vehicles

Ryan Shaw
Manager, Advanced Engineering, Power Systems and Advanced Functions, NA Magna International Inc.

Ryan Shaw, was named manager of North American Advanced Engineering in July 2020. In this role, Shaw is responsible for the development of new technologies related to propulsion and driveline systems for automotive products in the North American market. He and his team are focused on providing innovative yet practical solutions to vehicle electrification for the current and future market. Most recently, he has been responsible for developing electrified beam axle drives within Magna. These products offer a drop in solution for customers looking to electrify trucks, SUVs, and commercial vehicles. Shaw has held various roles within engineering throughout his career, progressing from an intern to Senior Systems Engineer before entering his current management role. His prior positions had a strong focus on system-level engineering, starting in the traditional automotive market and then transitioning to electrification. Shaw has more than 10 years of experience in the automotive industry and holds a bachelor's degree in Mechanical Engineering from the Rochester Institute of Technology, with a focus on automotive systems.

10:15AM | Future of Simulation-Based Product Innovation

Prith Banerjee
Chief Technology Officer, ANSYS

Prith Banerjee, is Chief Technology Officer at ANSYS, a leader in engineering simulation. Prior to that, he was CTO of Schneider Electric, CTO of ABB, Managing Director of R&D at Accenture, and Director of HP Labs. Previously he spent 20 years in academia as a Professor, Chairman, and Dean at the University of Illinois and Northwestern University. He is the founder of two software startup companies, Accelchip and Binachip. Banerjee currently serves on the Board of Directors of Turntide Technologies. In the past, he has served on the Board of Cray, CUBIC. and Anita Borg Institute, and the Technical Advisory Boards of Ambit, Atrenta, Calypto, Cypress, Ingram Micro, and Virsec. He is a Fellow of the AAAS, ACM, and IEEE. He was listed in the Fast Company list of 100 top business leaders in 2009. He received a B.Tech. in electronics engineering from the Indian Institute of Technology, Kharagpur, and an M.S. and Ph.D. in electrical engineering from the University of Illinois, Urbana.

10:45AM | GM's Ultium Architecture: Today and Tomorrow

Tim Grewe
General Director of Electrification Strategy & "Ultium Everywhere" for General Motors."Ultium Everywhere" expands GM portfolio into locomotive, aerospace, and secondary use.

Tim Grewe, has a BSEE from Rensselaer Polytechnic Institute as well as a MSEE from Syracuse University. He started his career with General Electric developing distributed power systems for aircraft, rail, off-road & heavy-duty transportation. Tim joined GM as Chief Engineer for the Allison Hybrid City Bus. His teams have launched multiple generations of GM electric propulsion systems including the Ultium platform. Recent examples include the GMC Hummer EV and Cadillac Lyriq. Tim is the holder of numerous patents and is active in the electrification industry.

Monday, October 10 12:30PM-2:10PM

Special Session 1 | SiC and GaN Applications in Electric Vehicles: Current Issues

Room141
Chair/Organizer:
Victor Veliadis, *PowerAmerica*

According to the International Energy Agency, 10 million electric vehicles (EVs) were in operation globally in 2020, and the rate of increase is accelerating.[1] SiC and GaN semiconductor technology is playing an important role in realizing the growth in EV sales. This is due to the greater power densities, switching frequencies, energy efficiency and thermal management of SiC and GaN devices and modules in comparison to silicon technology.

The advantages SiC and GaN technology bring to EVs include providing increased range before recharging – 5 to 10 percent – and shrinking the space needed for electrical components. This allows more space for batteries and other requirements reducing system cost by hundreds of dollars. According to the market research firm Omdia, the EV market for SiC power semiconductors is expected to triple between 2020 and 2025, reaching $1.5 billion. For GaN power semiconductors, the EV market is expected increase five-fold from 2020 to 2025, reach $50 million.[2]

Several key EV systems can employ SiC and GaN technology. Lower system costs and vehicle design simplification are being improved with WBG device integration with vehicles. Demonstrating the cost competitiveness of WBG semiconductors relative to silicon technology and the systemic cost savings represents the main hurdle for EV applications, as well as understanding the use of GaN vs. SiC in specific applications. Realizing these advantages is not trivial, and this will be the essence of the panel's discussion.

Session Panelists/Speakers
Vincent McNeil, *NXP Semiconductors*
Agasthya Ayachit, *Mercedes-Benz R&D North America*
Brij Singh, *Deere & Co.*
Llew Vaughan-Edmunds, *Navitas Semiconductor*
Kevin Bai, *University of Tennessee-Knoxville*

Special Session 2 | Energy Access and Off-Grid Systems: Technology Innovation for Scalable, Affordable and Sustainable Energy Access Solutions To Provide Energy Access To Anybody And At Any Part Of The World

Room 142A/B
Chairs/Organizers:
Sanjib Kumar Panda, *National University of Singapore, Singapore*
Issa Batarseh, *University of Central Florida, USA*

Ensuring universal, affordable, and sustainable energy access is one of the biggest societal challenges of our time. As of 2022, close to a billion people worldwide still live without having access to electricity, and another two billion have unreliable access. The centralized electricity grid is not the optimal choice for remote and rural applications, due to environmental impact, cost, mismatch to user needs and challenges around financial feasibility. Decentralized approaches, such as solar home systems and microgrids, have emerged as a response to shortcomings of the centralized grid approach, but affordability, scalability, interoperability and societal and technical sustainability remain a key challenge. Power electronics technology is one of the key enabling technologies for context-appropriate and sustainable energy access solutions. Some of the key technology areas for innovation are: decentralized bottom-up grids, self-organizing grids and microgrids, DC nanogrids, hyper-efficient appliances, energy storage, autonomous plug-and-play inverters for inverter dominant grids, ultra-automation in AC or DC microgrids etc. This session will reflect on lessons learned from past electrification efforts and showcase some of the exciting technology solutions enabling scalable, affordable and sustainable energy access solutions.

Session Panelists/Speakers
Sanjib Kumar Panda, *National University of Singapore, Singapore*
Philip Krein, *University of Illinois Urbana-Champaign, USA*
Deepak Divan, *Georgia Institute of Technology, USA*
Jelena Popović *Univ. of Twente, The Netherlands*
Issa Batarseh, *University of Central Florida, USA*

Monday, October 10 2:20PM-4:25PM

Special Session 3 | High Efficiency, High Power Density, and Fault-Tolerant Motor and Drives for Electric Vehicles and Electric Airplanes - Similarities and Differences

Room 141
Chairs/Organizers:
Bulent Sarlioglu, *University of Wisconsin-Madison*
Ozge Taskin, *Ricardo UK*
Ayman EL-Refaie, *Marquette University*

The electric vehicle business is booming and the all-electric aircraft business is in its infancy. All-electric aircraft use electric propulsion motors and power electronic drives to propel aircraft. Significant research and development are currently underway to design high efficiency and high power density motor design.

Both electric vehicle and all-electric aircraft applications require high-efficiency motors and drives having high power density due to space limitations While electric vehicles require kW/l volumetric power density, electric aircraft favors kW/kg specific power density. Electric aircraft applications typically require robust designs and redundancy whereas electric vehicles may or may not require these capabilities. Integrated motor drives are becoming important where motor and power electronics are built together with a joint cooling. This approach helps with cost, volume, reduced EMI/EMC concerns, and higher integration capabilities.

This special session will focus on new technologies for electric motor and power electronic designs which include new motor and power electronic topologies, optimization, cooling, and additive manufacturing. Integrated motor drive subjects will also be covered along with fault-tolerant drives. Wide bandgap-based power electronic drives will be covered. In this special session, key industry, academic, and government experts will discuss the next-generation motor design that will pave the way for future electric transportation.

Panelists/Speakers
Michelle Witherspoon, *GE Aviation*
Hao Ge, *Tesla*
Thomas Jahns, *UW-Madison*
Peter DeBock, *US Department of Energy (DOE) ARPA-e*
Xavier Collazo-Fernandez, *NASA*

[1] https://www.iea.org/reports/global-ev-outlook-2021?mode=overview

[2] The Silicon Carbide and Gallium Nitride power semiconductor market: applications, forecasts and key players, PowerAmerica Virtual Wide Bandgap Summer Workshop, USA 5 August 2021, Richard Eden, Principal Analyst

Tuesday, October 11 8:30AM-10:10AM

Special Session 4 | Challenges and Opportunities for Lunar Surface Microgrids

Room 141
Chair/Organizer:
Jin Wang, *The Ohio State University*

Lunar mircrogrid is one of the most exciting new frontiers for power electronics. Mobile and stationary dc microgrids for rovers, charging stations, science experiment stations, habitats, and in-situ research utilization all require a new generation of power converters, circuit breakers, as well as associated control, protection, and reconfiguration strategies. Though there has been abundant research and development of terrestrial dc and ac microgrids, lunar microgrids present a new set of challenges and opportunities because of extreme operation conditions, unique load and source combinations, the need for ultra-high power density and high efficiency, stringent requirements on resiliency and survivability, etc. Thus, with experts from NASA, industry and academia, the proposed special session is aiming to provide an overview of power electronics related challenges and potential approaches for lunar microgrids.

Speakers/Panelists
Jeffrey Csank, *Electrical Engineer, NASA Glenn Research Center*
Josep M. Guerrero, *Professor, Aalborg University*
Michael Futrell, *Senior Principal Engineer, Collins Aerospace*
Parag Kshirsagar, *Discipline Lead, Raytheon Technologies Research Center*
Jin Wang, *The Ohio State University*

Special Session 5 | New Developments In Wide-Bandgap Bidirectional Switches And Applications

Room 142A/B
Chairs/Organizers:
Victor Veliadis, *PowerAmerica, NCSU*
Thomas M. Jahns, *University of Wisconsin - Madison*

Monolithic bidirectional switches hold the potential to trigger a revolution in the future of power electronics technology. Unfortunately, an impressive catalog of high-performance power converter topologies designed to use bidirectional switches have never achieved marketplace success for lack of commercially-available monolithic BD (M-BD) switch devices. No silicon-based M-BD switch technology has emerged that has successfully crossed the threshold into large-scale production. New wide-bandgap power device technology using GaN and SiC has opened intriguing avenues to WBG-based M-BD switches that hold much higher promise for overcoming the barriers to commercialization. Both lateral and vertical M-BD device topologies have been proposed using GaN and SiC that have resulted in prototype devices with ratings as high as 1400V and 100A. The purpose of this special session is to discuss new developments in promising state-of- the-art WBG-based M-BD switch technology in a manner that objectively evaluates both their strengths and technical challenges. This session also highlights some of the most promising applications for this prospective new generation of M-BD switches as well as the most likely power converter topologies that will take fullest advantage of their availability. These application areas cover a wide spectrum extending from ac solid-state circuit breakers to static power converters to motor drives.

Panelists/Speakers:
Subhashish Battacharya, *North Carolina State University*
Johann Kolar, *ETH Zurich*
Bulent Sarlioglu, *University of Wisconsin – Madison, WEMPEC*
Michael Harris, *Atom Power*
Xiaoqing Song, *ABB US Corporate Research Center*

Wednesday, October 12 8:30AM-10:10AM

Special Session 6 | Future Trends and Challenges in Vehicle Electrification - Part I Power Electronics and Motors

Room 141
Chairs/Organizers:
Mazharul Chowdhury and Jihyun Kim, *General Motors, United States*
Arshan Khan and Lakshmi Reddy, *CNH Industrial, United States*

The electrification of transportation is accelerating to reduce CO2 and other greenhouse gas emissions due to burning of fossil fuels. Battery electric vehicles (BEVs) are now not only hitting the personal vehicle market but also surging in trucks, buses, industrial and agricultural vehicles. With millions of EVs sold around the world, electric cars accounted for nearly 10% percent of the global passenger vehicle market in 2021. The prospect for electric vehicle is better than ever despite the current COVID-19 pandemic and other economic crisis due to war in certain part of the world. Automotive OEMs prepare to ramp up production of EVs to meet the expected strong customer demand and to fulfill regional regulatory requirements. In this special session, a panel of industry and academic experts will discuss major challenges and trends in power electronics, motors, battery and charging. Various challenges related to cost, power density, safety, cooling, performance, hardware design, NVH, controls etc. will be discussed. In addition, experts will share their views on the impact of COVID, global chip crisis and Ukraine conflict on EV components supply chain and price. Finally, the challenge related to talent acquisition and how academia, industry and government are trying to address talent shortage and workforce development in area of electrification will be discussed.

Speakers/Panelists:
Ayman El-Refaie, *Marquette University*
Avoki Omekanda, *General Motors*
Amir Ranjbar, *Canoo*
Brian McKay, *Aptiv*
Saeed Siavoshani, *FEV*
Hossein Dadkhah, *Dana Corporation*

Special Session 7 | Reliability of Power-Electronic Systems for Solar Energy

Room 142A/B
Chairs/Organizers:
Sudip K. Mazumder, *University of Illinois Chicago*
Frede Blaabjerg, *Aalborg University*
Patrick McCluskey, *University of Maryland at College Park*
Jack D. Flicker, *Sandia National Laboratories*

One of the most important elements for market acceptance of new technologies is ensuring reliability. Nowhere is this more true than in the shift from well characterized fossil fuel technologies to newer renewable and sustainable energy technologies. The key enabling technology driving these shifts is the development of power converters. As such, this special session will present reliability issues, mechanisms, and impacts associated with emerging power-electronic systems. The topics and their detailed contents include:

- Multilevel String Solar Inverter Reliability
- Physically Informed AI in Solar Power Electronics Reliability Design
- Prognostics of Power Electronic Converters
- PV Inverter Reliability - Advanced Inverter Functionality

Speakers/Panelists:
Sudip K. Mazumder, *University of Illinois Chicago, United States*
Frede Blaabjerg, *Aalborg University, Denmark*
Patrick McCluskey, *University of Maryland at College Park, United States*
Jack D. Flicker, *Sandia National Laboratory, United States*

Wednesday, October 12 | 10:30AM-12:10PM

Special Session 8 | Future Trends and Challenges in Vehicle Electrification - Part II Battery and Charging

Room 141
Chairs/Organizers:
Mazharul Chowdhury and Jihyun Kim, *General Motors, United States*
Arshan Khan and Lakshmi Reddy, *CNH Industrial, United States*

The electrification of transportation is accelerating to reduce CO2 and other greenhouse gas emissions due to burning of fossil fuels. Battery electric vehicles (BEVs) are now not only hitting the personal vehicle market but also surging in trucks, buses, industrial and agricultural vehicles. With millions of EVs sold around the world, electric cars accounted for nearly 10% percent of the global passenger vehicle market in 2021. The prospect for electric vehicle is better than ever despite the current COVID-19 pandemic and other economic crisis due to war in certain part of the world. Automotive OEMs prepare to ramp up production of EVs to meet the expected strong customer demand and to fulfill regional regulatory requirements. In this special session, a panel of industry and academic experts will discuss major challenges and trends in power electronics, motors, battery and charging. Various challenges related to cost, power density, safety, cooling, performance, hardware design, NVH, controls etc. will be discussed. In addition, experts will share their views on the impact of COVID, global chip crisis and Ukraine conflict on EV components supply chain and price. Finally, the challenge related to talent acquisition and how academia, industry and government are trying to address talent shortage and workforce development in area of electrification will be discussed.

Speakers/Panelists:
Ameer Al-Janabi, U*niversity of Cambridge, UK*
V Anand Sankaran, *Battery Center of Excellence at Ford Motor Company, Michigan*
Mohammad Alamgir, *LG Chem Power, Inc, Michigan*
Wasim Sarwar, *Rimac Automobili, UK*
Ahmed Mohammed, *Eaton Research Labs, Colorado*
Awad Syed, *Our Next Energy (ONE), Michigan*

Special Session 9 | Paradigm Shift Towards 100% Renewables in Modern Power Systems: Theory and Practice of Grid-Forming Inverter Technologies

Room 142A/B
Chairs/Organizers:
Xiaonan Lu, *Associate Professor, Purdue University*
Jin Tan, *Senior Engineer and Distinguished Research Staff, National Renewable Energy Laboratory*

There are tremendous research efforts and industry practice of modernizing power systems with power electronics technologies nowadays, and the topics include but are not limited to localized and network-interconnected microgrids, grid-forming capabilities, interactive and integrated inverter-based resources, solid-state substation modeling and control, among others. Advanced and cutting-edge technologies have been proposed and developed to address the challenges and concerns with the growing development and deployment of inverter-based resources (IBRs). Note that the challenges and R&D efforts lie in multiple sections throughout the entire electric grid, ranging from grid-edge customers and substations to large-scale distribution systems and upstream transmission grids. Innovative and cutting-edge technologies are being developed and field-validated toward resilient and modernized power grids with 100% IBRs.

To showcase the cutting-edge technologies of power electronics intensive power systems with special emphasis on grid-forming inverters, this special session will aim at industry needs and practice and technology innovations in academia. The session intends to share the latest research progress and industry practice of grid-interactive power electronics and stimulate the interests of a broad audience group, including the researchers and engineers from manufacturers, utilities, national labs, and universities. Invited presentations from leading industry experts, academic researchers, national lab scientists, and government employees will be organized. Panel discussions and interactions with the audience will also be incorporated in this special session.

Speakers/Panelists:
John Seuss, *Solar Energy Technologies Office (SETO), U.S. DOE*
Abhishek Banerjee, *Siemens Technology, USA*
Phil Hart, *General Electric Research Center, USA*
Wei Du, *Pacific Northwest National Laboratory, USA*
Li Yu, *Hawaiian Electric Corporation (HECO), USA*
Cameron Kruse, *Kauai Island Utility Cooperative (KIUC), USA*
Alston Dcosta, *AES, USA*

Wednesday, October 12 | 2:00PM-3:40PM

Special Session 10 | Advanced Cooling Systems for Electric Machines and Power Electronic Converters – Part I

Room 141
Chairs/Organizers:
Bulent Sarlioglu, *University of Wisconsin-Madison*
Jin Wang, *Ohio State University*
Sreekant Narumanchi, *National Renewable Energy Laboratory*

Increasing the power density of the electric motors and power electronic converters is becoming important in several emerging applications such as electric vehicles, electric airplanes, and mining, which demand high functionality of the components within a small footprint and with the smallest mass. Thermal management and advanced cooling can directly help increase the power density of components by enabling more power and current handling capabilities while keeping the operational temperatures within limits, or reduced footprint and weight of components for the same power-handling capabilities. In addition to power electronics and electric machines, thermal management is important for enabling integrated electric (traction) drives with improved metrics.

The goal of this special session is to share the advancements in thermal management of electric machines, power electronics, and integrated electric drives. This includes phase-change materials, additive manufacturing, air-, liquid-, and two-phase cooling advancements, new materials, as well as simulation and optimization techniques. Advanced thermal management can help in reducing cost, and improve the performance, reliability, and efficiency of components. One important aspect of this session is that advances in thermal management will be presented within the context of power electronics and electric machines that have been demonstrated improved metrics through lab-scale, as well as demonstration/implementation within real-world operational environments.

Speakers/Panelists:
Brij Singh, *John Deere*
Jeffrey Ewanchuk, *Raytheon Technologies Research Center*
Alan Mantooth, *University of Arkansas*
Jin Wang, *Ohio State University*

Special Session 11 | Measurement Technology Required for the Power Electronics Industry that Leads the Decarbonized Society

Room 142A/B
Chair/Organizer:
Christopher Scholz, *Hioki, USA*

Huge investments are being made around the world to reach carbon neutrality with the aim of realizing a sustainable society. In particular, the automobile industry is undergoing electrification development on a global scale, and the adoption of inverters equipped with next-generation power semiconductors such as SiC and GaN is expanding in order to improve the performance of electric vehicles. These new semiconductor technologies are challenging the established paradigms of test instruments in terms of accuracy, bandwidth and capabilities.

This special session brings together panelists from electrical measuring instrument manufacturers and academia who have been leading the power electronics industry in connection with critical measurement technologies. Attendees of this special session will hear opinions exchanged amongst competitors and will learn of the newest test challenges as a way to foster test equipment innovation.

Speakers/Panelists:
Masayuki Harano, *HIOKI E.E., Ueda, Japan*
Mike Hawes, *Keysight Technologies*
John Tucker, *Tektronix*
Ken Johnson, *Teledyne LeCroy*
Dave Gallop, *Dewesoft*
Chris Hewson, *Power Electronic Measurements (PEM) Ltd*
Paul R. Ohodnicki, *University of Pittsburgh*

Wednesday, October 12 4:00PM-5:40PM

Special Session 12 | Advanced Cooling Systems for Electric Machines and Power Electronic Converters – Part II

Room 141
Chairs/Organizers:
Bulent Sarlioglu, *University of Wisconsin-Madison*
Jin Wang, *Ohio State University*
Sreekant Narumanchi, *National Renewable Energy Laboratory*

Increasing the power density of the electric motors and power electronic converters is becoming important in several emerging applications such as electric vehicles, electric airplanes, and mining, which demand high functionality of the components within a small footprint and with the smallest mass. Thermal management and advanced cooling can directly help increase the power density of components by enabling more power and current handling capabilities while keeping the operational temperatures within limits, or reduced footprint and weight of components for the same power-handling capabilities. In addition to power electronics and electric machines, thermal management is important for enabling integrated electric (traction) drives with improved metrics.

The goal of this special session is to share the advancements in thermal management of electric machines, power electronics, and integrated electric drives. This includes phase-change materials, additive manufacturing, air-, liquid-, and two-phase cooling advancements, new materials, as well as simulation and optimization techniques. Advanced thermal management can help in reducing cost, and improve the performance, reliability, and efficiency of components. One important aspect of this session is that advances in thermal management will be presented within the context of power electronics and electric machines that have been demonstrated improved metrics through lab-scale, as well as demonstration/implementation within real-world operational environments.

Speakers/Panelists:
Ercan M. Dede, *Toyota Research Institute of North America*
Ozge Taskin, *Ricardo, UK*
Patrick McCluskey, *University of Maryland*
Bidzina Kekelia, *DOE NREL*

Special Session 13 | Standard Development for Solid State Transformer: An Update On Existing IEEE Standards On Magnetics And New Standard for Solid State Transformer

Room 142A/B
Chairs/Organizers:
Marco Liserre, *Kiel University, Germany*
Johan Enslin, *Clemson University, US*
Xu She, *Lunar energy, US*
Matt Wikowski, *Enachip, US*
Zhixiang Zou, *Southeast University, China*

Solid state transformer is an emerging technology that replaces the traditional line frequency transformer with additional functions and intelligence. It has gained significant attention in the past 10 years. This is evident that number of publications in IEEE alone has increased by more than 25x from 2010 to 2020. Around the world, there are many on-going demonstration projects for different applications, such as smart grid integration, EV fast charger, wind and solar power conversion, etc. However, there is no standard available as to what is the recommended practice in designing such a device and how to integrate it into electric grid. To fill this gap, IEEE Power electronics society (PELS) has launched the new standard development (P3105) on this particular topic. Also within the PELS, the Electronic transformers technical committee is the driven force that develops various standards for the magnetic components. The proposed special session brings the experts from both P3105 and ETTC working groups, together with some key industry players in SST area, to discuss this new development effort as well as gaps and challenges.

Speakers/Panelists
George Slam, *Wurth Elektronik, Chairperson ETTC*
Paul Ohodnicki, *University of Pittsburgh*
Rudy Wang, *Delta Electronics*
Vijay Bhavaraju, *Eaton Corporation*
Jung-Ik Ha, *Seoul National University, Korea*
Alex Q. Huang, *University of Texas Austin*

Thursday, October 13 8:30AM-10:10AM

Special Session 14 | Advanced Power Electronics and Drives for Commercial Vehicle Electrifications

Room 141
Chair/Organizer:
AK Arafat, *Drive System Design*

The global interest in electrification has significantly increased in recent years. The majority of current efforts to reduce carbon emissions are directed toward integrating electrified vehicles (EV) into all forms of ground transportation. The possibility of electrifying urban commercial vehicles (such as buses and trucks) is of special relevance to minimize emissions with optimum solutions due to more regular and predictable duty cycles. In this session, the panelists from the automotive industry and academia will discuss cutting-edge technologies on high energy efficiency, high power density, and high reliability of traction drives for commercial vehicle electrifications.

Specifically, Dr. Yash Singh from Eaton Research Labs will first give a talk on the various facets of power conversion for commercial vehicles based on fuel cells. Increased range and cost-effective system design are made possible by high power density and power conversion efficiency. BEVs are becoming more and more popular in the passenger car market, but they are encountering major opposition in the commercial vehicle market for a variety of reasons, including low energy density and a prolonged charging process. Hydrogen-based fuel cells can be an alternative energy source for commercial vehicles because of their faster refueling time and high energy density. Dr. JiangBiao He from the University of Kentucky will present the technologies of developing Silicon Carbide (SiC) fault-tolerant power converters in commercial EV applications, to currently achieve high efficiency and fault-tolerant operation capability. Another key aspect of commercial electrification is the reliability of the system and the power electronics. Dr. Santhosh from Cummins will present system and sub-system level reliability and improvement scopes for future commercial electric vehicles. Finally, Mr. Harsha will discuss the heavy-duty (HD) traction e-drive application requirements. In the presentation, it will be discussed how HD requirements for the electric drive (e-motor and inverter) applications differ from LD (low duty) requirements and what difficulties are typically encountered in terms of operating voltages, efficiency, performance, and dependability. Specific design features for inverters, motors, and batteries will be covered in the topics because they are essential for the rapid spread of electrification in the HD market.

Speakers/Panelists:
Yash Veer Singh, *Eaton Research Lab*
JiangBiao He, *University of Kentucky*
Santhosh Krishnamoorthi, *Cummins Inc.*
Harsha Nanjundaswamy, *BorgWarner Inc*

Special Session 15 | Power Electronics for Integration of MV Utility-Scale PV Systems

Room 142A/B
Chairs/Organizers:
Juan Carlos Balda, *University of Arkansas*
Ke Ma, Shanghai *Jiao Tong University*
Yongheng Yang, Z*hejiang University*
Adel Nasiri, *University of South Carolina*

The dc-bus voltage of utility-scale photovoltaic (PV) systems has reached 1,500 V to increase efficiency and reduce system complexity. Several vendors are already offering 1,500 V PV inverters. The availability of commercial high-voltage (HV) semiconductor devices based on silicon carbide (SiC), as well as cascaded multilevel converters, have spurred interest within the research community in medium-voltage (MV) topologies for the power conversion of PV systems. This special session provides an overview of topologies currently commercialized or under development for interfacing large utility-scale PV systems to the power grid including availability of HV SiC devices.

Speakers/Panelists:
John Seuss, *DOE Solar Energy Technologies Offices (SETO)*
Ashish Kumar, *Wolfspeed, USA*
Kraig Olejniczak, *Wolfspeed, USA*
Jun Xu, Sungrow, *China*
Ariya Sangwongwanich, *Aalborg University, Denmark*

Thursday, October 13 10:30AM-12:10PM

Special Session 16 | Towards Enhancing the Resiliency of Grid-Interactive Inverters

Room 141
Chairs/Organizers:
Behrooz Mirafzal, *Kansas State University*
Robert Reedy, *DOE SETO*

Five experts from the industry, academia, DoE, and US national labs will give a joint panel on standards, transient performance, ancillary grid-support services, health monitoring, and resiliency of grid-interactive inverters. The panelists will present case studies and discuss their findings from industry projects, and DoE- and NSF-sponsored projects. The panelists will briefly present five topics to allow more time for discussions, dialogs, and Q&A in this session.

The energy infrastructure is rapidly changing as more sustainable energy resources such as photovoltaic arrays, wind turbines, and energy storage systems are distributed in the power grid as generation units. Moreover, distribution systems that are resilient to disruptive events, agile to the impetus of environmental changes, and employ a high penetration of sustainable energy resources will be the backbone of the future power grids, where inverters play the most significant role. Inverters also allow consumers to generate electricity from distributed energy resources when the utility power flow from the primary power plants is interrupted due to natural disasters, faults, and cyberattacks. Energy sectors are also moving toward developing advanced design and control schemes for future smart cities with interconnected smart buildings capable of working off-grid and are resilient to disruptive events. Therefore, new standards and designs for inverters to provide higher resiliency, flexibility, and reliability for modern power systems become critical.

Speakers/Panelists:
Robert Reedy, *Technology Manager at BGS and Contractor to DOE – SETO*
Behrooz Mirafzal, *Kansas State University*
Maozhong Gong, GE Research
Akanksha Singh, *National Renewable Energy Laboratory*
JiangBiao He, *University of Kentucky*

Special Session 17 | GaN Integrated Circuits and Challenges Solved by Integration

Room 142A/B
Chair/Organizer:
Tanya Gachovska, *MDA, Canada*

GaN HEMTs have proven ability to enable greater power density through reduced losses and higher frequency operation in many applications, especially those requiring very compact solutions. However, due parasitic there are some challenges associated with gate driving loops at high power and high swutching frequency. An integrated approach helps decreasing the parazitics and dramatically increase overall performance and robustness. In this special session, repersetative of five GaN companies will discuss the current state-of-the-art as well as the next few years' innovations in GaN integrated circuits and challenges solved by integration.

Speakers/Panelists:
Alex Lidow, *Efficient Power Conversion Corporation*
Simon Li, *GaNPower International*
Mohamed Imam, *Infineon*
Doug Bailey, *Power Integrations*
Francesco Ferrazza, *STMicroelectronics*

TUTORIALS

Sunday, October 9 8:30AM – 11:45PM

T1 | Maritime Electrification — State-of-the-Art Hybrid Power Systems for Green Marine Transport

Room 360
Organizers:
Chendan Li, *Norwegian University of Science and Technology*
Mehdi Zadeh, *Norwegian University of Science and Technology*
Sidun Fang, *Chongqing University*
Daniel Stroe, *Aalborg University*
Ahmed Abdelhakim, *ABB Research Sweden*

Marine sector decarbonization is another battlefield for meeting the goal of climate action and ensuring the fulfillment of ambitions for a zero-emission society. Driven immediately from the policies such as energy efficiency and carbon intensity indicator rating system for ships initialed by The International Maritime Organization (IMO) targeting 50% reduction on the total annual GHG emissions by 2050, and carbon taxation and labeling by European Union, a series of innovations that are centered around marine transportation are emerging from both industry and the academic. These innovations are featured by electrification through advanced power electronic based power systems with various new energy storage systems and low-emission fuels, as well as increased intelligence and efficient control strategies applied to these maritime power systems. This tutorial aims at providing the audience a compact yet comprehensive overview of the advancement of control, operation, and design of typical maritime power systems, the condition monitoring and data analysis for energy storage, as well as relevant industrial advancements. At the same time, several practical case studies will be demonstrated to deepen the understanding of how these new approaches solved the challenges of the current and emerging maritime power systems, and to guide the future analysis and design of more advanced maritime power systems.

T2 | Power Semiconductors in Electrified Powertrains – Transitioning from Silicon to Wide Bandgap Devices?

Room 359
Organizers:
Andre Christmann, *Infineon*
Alexander Beckmann, *Infineon*

This tutorial will provide a broad overview of power semiconductors in typical automotive xEV applications such as on-board charger, DC/DC and especially the traction inverter.

The session starts with the fundamentals of the semiconductor devices like IGBT/diodes (IGBT and RC-IGBTs) as well as wide band gap solutions (SiC and GaN) used in these applications resulting in key performance differentiators and figures of merits.

The purpose of the introduction is to gain a better understanding for typical selection criteria. Therefore, the presentation will discuss pros and cons and give several trade-offs, e.g. the qualitative cost performance trade-off.

Although the focus of this tutorial is power semiconductors, the performance of a semiconductor strongly depends on the package characteristics. The characteristics of the devices can be tuned to optimize power module performance. Both the device and module performance strongly influence the inverter efficiency, which, in turn, impacts MPG rating of the vehicle. Heat losses from the devices and module thermal performance determine the semiconductor and module size and therefore the cost of the inverter.

T4 | Circuit Board Layout for Wide Bandgap Power Transistors

Room 358
Organizer:
Eric Persson, *Infineon*

PCB layout is already challenging for power electronic circuits. But as wide-bandgap semiconductors (GaN and SiC) are increasingly adopted, their tenfold increase in switching speed compared to Silicon creates even more challenges for the circuit designer. Layout problems can lead to circuit malfunction, ringing and overshoot voltage spikes, EMI problems, higher loss than expected, and even transistor failure. Application notes often have the same advice to solve these problems: "be sure to minimize all parasitic layout inductance as much as possible." But what is the best way to approach this, especially when there are multiple conflicting layout goals? It is simply not possible to eliminate all layout impedance everywhere, so how does one make the tradeoffs to optimize the PCB layout for best performance?

This seminar addresses these questions, and leads you through a process to understand where parasitic impedances really matter, understand the magnitude of parasitic impedances, evaluate layout options, and make an informed decision on how to proceed. The focus is on the primary- side power circuits, and is intended to cover the range from approximately 50 W to 5 kW.

T5 | Model-Based Control Design and Testing with Embedded Code Generation Using the PLECS Toolchain

Room 357
Organizer:
Beat Arnet, *Plexim, Inc.*
Kris Eberle, *Plexim, Inc.*

The development of a power electronic system is a multidisciplinary endeavor. It includes not only the power stage design, but also the development of the controls, which are often implemented on a microcontroller (MCU). Yet few engineers are equally skilled in hardware and software design. For example, electrical engineers are usually not professional software developers by education, however, they are often assigned the task of programming embedded MCUs at work due to their knowledge of how to control a power converter and the full system requirements. Further, they have a good understanding of the MCU's on-chip peripherals such as PWM generators and ADCs.

Meanwhile, with today's short time-to-market pressures, there is little intrinsic motivation to write code that can be reused and maintained over a product's entire lifetime. As a result, the handwritten codebase often lacks modularity, clear structure and proper documentation. For these reasons, we should support electrical engineers in what they are good at, namely electronics and control design, and leave the software architecture and implementation either to experienced software developers or to a computer program that generates the code automatically. Of course, the latter option will only be desirable if it accelerates and simplifies the development process right from the start.

T8 | Virtual Synchronous Machines – Inverters for a Stable and Well-damped Grid

Room 356
Organizers:
Radu Bojoi, *Politecnico di Torino*
Fabio Mandrile, *Politecnico di Torino*
George Weiss, *Tel Aviv University*
Florian Reissner, *Tel Aviv University*

The current shift from fossil-based energy production towards renewable power in the electric grid, as well as the integration of Battery Storage Systems (BSS) and the bidirectional V2G, are radically challenging the power grid due to the proliferation of static power converters (inverters). Without new approaches to inverter control, the associated drop in overall system inertia and damping decreases and deteriorates the grid's stability and robustness against disturbances and faults.

A promising solution to this challenge is the Virtual Synchronous Machine (VSM): inverters behaving like synchronous generators to provide grid services and grid support. Therefore, the VSM-controlled inverters can contribute to system inertia, damping and the decentralized regulation of voltage and frequency. Moreover, their very fast response time, and their ease of reprogramming to add new features in their control algorithm, opens ways to improve their performance beyond what is possible with synchronous generators.

This tutorial will start presenting requirements for safe grid operation and stability requirements that impose bounds on damping and inertia from the power electronics perspective. Then, the concept of VSM will be presented and its advantages compared to other control strategies are highlighted.

We analyze the performance of a microgrid comprising VSMs in island mode as well as when connected to a main grid. We also consider microgrids comprising both VSM and synchronous machines and show the interdependence between system parameters, VSM parameters and the physical equipment of the inverter. Finally, we introduce more advanced concepts for the safe and stable operation of VSMs: the influence of measurement errors and grid voltage distortions, black start mechanisms and ways to improve the damping of oscillations and fault ride-through using communication links between inverters.

T9 | Electric Propulsion: Challenges and Opportunities

Room 355
Organizers:
Jin Wang, *The Ohio State University*
Tom Jahns, *University of Wisconsin*
Bulent Sarlioglu, *University of Wisconsin*
Patrick McClusky, *University of Maryland*
John Kizito, *North Carolina A&T University*
Julia Zhang, *The Ohio State University*

For better fuel economy and carbon oxide reduction, future aircrafts call for electric propulsion. Though there have been significant developments in electric machines and power electronics in the last few decades, electric propulsion presents significant challenges and opportunities.

At the system level, the high power rating of the electric propulsion calls for higher distribution voltage. Currently, the distribution voltage for more electric aircrafts is limited to 540 V because of partial discharge related issues. In the future, where a single aisle commercial aircraft will require more than 10 Megawatt of propulsion power, the electric power distribution voltage is expected to reach as high as 4 kV, which presents a significant challenge in the system architecture and insulation designs. At the sub-system level, to realize high fuel economy, electric machines and power electronics drives are expected to have ultra-high power densities of 14 kW/kg and 25 kW/kg, respectively, which requires significant innovations in material, device, machine structure, power electronic packaging, control and thermal management.

This tutorial will start with an introduction of different types of turbo and hybrid propulsion systems and state-of-the-arts of power electronics and electric machines for aircrafts. Then the tutorial will first focus on the partial discharge phenomena at low air pressure and how it will affect the designs of power electronics and electric machines. Newly published results on partial discharges in motor windings and power modules with Silicon Carbide (SiC) based high dv/dt waveforms will also be presented.

T10 | Solid-State Transformers – Fundamentals, Industrial Applications, Challenges

Room 354
Organizers:
Johann W. Kolar, *ETH, Zurich*
Jonas Huber, *ETH, Zurich*

Solid-State Transformers (SSTs) provide isolation and power flow control between medium- voltage (MV) and low-voltage (LV) AC or DC systems and are formed by input- and output-side power electronic converters, which are linked through a medium-frequency transformer (MFT). Accordingly, SSTs are expected to show high power density and offer full controllability of the terminal currents and/or the transferred power and, in case of AC voltages, the reactive power at the input and the output side. Therefore, SSTs are considered for replacing bulky low- frequency transformers (LFTs) of high-power EV charging stations, datacenters, or traction vehicles, and are in general seen as key elements of future smart microgrids. However, the connection to MV and the thus necessary overvoltage protection, the high overall complexity, the relatively high realization costs, and the potentially lower efficiency in case of AC-AC conversion are still major challenges for practical applications.

T14 | Recent Advances on Modular-based Multilevel Voltage-Source Converter (VSC) for MV and HV applications: Principle, Control, and Its Competitiveness with MMC

Room 353
Organizers:
Dong Dong, *Virginia Tech*
Di Zhang, *Naval Postgraduate School*

The global electrification trend in power grid and transportation accelerates the demand for high- performance, high-density, and high efficiency ac-dc power conversion system in the Medium- voltage (MV) and High-voltage (HV) areas ranging from a few kV to hundreds of kV. The conventional voltage-source converter (C-VSC) cannot meet such demand due to limited range of voltage offering, poor power quality, slow dynamic-response, and last but not least, long development and test cycle.

Since the invention of Modular Multilevel Converter (MMC) technology, it quickly dominated the high-voltage direct current (HVDC) VSC market and penetrated to the MV grid-interface applications like STATCOM. The modular-in-nature solution offered by MMC fundamentally changed the way of building MV and HV converters. However, MMC still faces several challenges like large footprint, high-cost, and low-efficiency, making it face a strong competition from the C- VSC in the MV area. Therefore, combing the benefits from both MMC-VSC and C-VSC are strongly desired for next-generation modular-in-nature VSCs.

This tutorial will summarize and present an overview of the most recent research progress on various modular MV/HV VSC converter topologies, including Alternative-Arm-Converter (AAC), Asymmetric Alternate Arm Converter (AAAC), hybrid modular-multilevel converters (HMMC) and hybrid modular-multilevel rectifier (HMMR), as the next-generation solution beyond both MMC and C-VSC. The basic operational principle, topological derivation, modeling and control, and apple-apple comparison with MMC in terms of efficiency, cost, and size will be discussed. Several emerging and existent MV and HVDC application cases will be presented to showcase the detailed HMMC/HMMR use cases and their competitiveness to surpass MMC and C-VSC as the next-generation VSC solutions.

T18 | Advanced Power Conversion Systems For Next-Generation Wireless Battery Charging

Room 330B
Organizers:
Deepak Ronanki, *Indian Institute of Technology Roorkee, India*
Sheldon Williamson, *Ontario Tech University*
Mauricio Esguerra, *MAGMENT UG*

Electrification of the transportation sector is essential to avoid irreversible climate change. As electrified transport systems proliferate, the development of battery chargers and their infrastructure is becoming crucial for the long-term and commercial success of these systems. The batteries in the electrified vehicles are recharged through on-board/off-board conductive and wireless chargers, which are fed from the grid and/or renewable energy resources. Conductive battery chargers are well established and more popular due to their high efficiency; however, handling high-power cables during adverse weather conditions is a risk of electric shock. Furthermore, wireless charging is considered to be the notable solution for opportunity charging of electrified vehicles especially for brief stops or traffic intersections and reduce the battery size under in-motion charging. While there have been many articles published on power conversion systems including power converters and couplers, this tutorial approaches the problem from basic to advanced levels. Understanding wireless chargers and their application from basic and advanced level for future transportation are crucial. Additionally, this tutorial will discuss the design process and simulations through case studies.

Power converters convert AC to high-frequency AC (HFAC) and HFAC to DC on the vehicle side in WPT charging. Coupling devices are equipped to transfer power through electro-magnetic/static coupling, and compensation circuits are connected on-road and vehicle side to reduce VA rating. The primary converter is operated corresponding to the feedback signal from the battery through wireless communication. This tutorial provides a practical introduction and technical advancements in wireless power transfer (WPT) based battery charging systems regarding the theoretical analysis, design, modelling, control, and simulation. Its focus is on the summary of inductive, capacitive and hybrid EV battery charging architecture with related examples and an in-depth discussion of WPT chargers design on various simulation platforms. It provides a step- by-step design of different WPT systems including the inductive and capacitive couplers, and then a comprehensive understanding and design of dual-stage and single-stage power conversion systems. The objective is to expose the audience to all facets of WPT systems with an emphasis on the hands-on tools required for executing academic research and for meeting industry expectations.

T19 | Advanced Magnetic Designs Enabling Electrification of High Power Industrial Systems

Room 330A
Organizers:
Paul Ohodnicki, *University of Pittsburgh*
Brandon Grainger, *University of Pittsburgh*
Byron Beddingfield, *North Carolina State University*
Subhashish Bhattacharya, *North Carolina State University*

This tutorial will outline the emerging technologies in co-optimization of converters by highlighting recent developments in magnetic materials for wide bandgap (WBG) power electronics and component design. The tutorial will provide design examples showing how these technologies are enabling the electrification of high power systems for industrial applications. It will also highlight the research conducted at the industry and university consortium for Advanced Magnetics for Power and Energy Development (AMPED). Leveraging extensive experience in high power/voltage power converters in multiple industry sectors – HVDC, FACTS, MV converters for high-speed motor and traction drives, MVDC and AC grid enabling SSTs (Solid State Transformers), and shipboard SSTs, the team will demonstrate and provide tools for using emerging magnetic materials and postprocessing techniques, e.g., ferrites and advanced amorphous and nanocrystalline alloys, spatially tuned properties, and heterogeneous materials.

T21 | Extend The Lifespan of Electric Vehicle Batteries In Their Second Life for Renewable and Smart Energy Grids

Room 320
Organizer:
Chris Mi, *San Diego State University*

Electric vehicles (EVs) started to enjoy a booming market share since the last decade. The number of EVs on roads is enormous and keeps growing rapidly, and so is the quantity of EV batteries. It is estimated that the first huge wave of EV battery retirement in California will hit in 2025, and retired batteries will keep coming thereafter. EV batteries today, almost exclusively lithium-ion based, cost heavily in both production and recycling. Economically dealing with retired EV batteries is an important topic.

Renewable energy, such as solar and wind, currently has a high penetration rate especially in sunshine-rich states like California. Battery energy storage systems (BESSs) are frequently incorporated with PV and wind power systems as a standard approach to buffer the volatile nature of the energy output. Household small PV and storage systems are popular products in the market. For commercial buildings, similar technology is also available, but normally featuring large and centralized battery stacks and consequently high cost. The high cost of new batteries in renewable and grid storage systems could be a major discouragement for potential clients, especially small/medium business owners.

T24 | Power HIL: Enabling Flexible and Repeatable Testing of Power Electronics Systems in Close-to- reality Environment

Room 321
Organizers:
Srdjan Srdic, *EGSTON Power Electronics*
Igor Cvetkovic, *Virginia Tech*

The growing market need for flexible and repeatable testing of power electronics systems in grid, automotive, aerospace and defense applications, has made power hardware-in-the loop (P-HIL) a very attractive test approach. With P-HIL, test voltages and currents are generated in user- configurable real-time models, enabling emulation of different operating environments for the physical system that is being tested. A single software-configurable P-HIL test platform can be used to test various systems in different test scenarios and operating environments. This is extremely beneficial because it provides high testing flexibility, reduces system cost, and accelerates product time-to-market. Enabling repeatable automated tests of power electronics systems significantly de-risks product development by reducing time needed for design iteration.

EGSTON Power Electronics is a leading manufacturer of high-performance P-HIL test and emulation platforms, ranging from 100 kVA to 1.2 MVA power. The COMPISO System from EGSTON Power Electronics is the most versatile P-HIL test and emulation platform currently on the market. With four-quadrant operation, 5 kHz large-signal bandwidth, several predefined operation modes and software applications for easier system use in different test scenarios, the COMPISO System is successfully serving the testing market since 2016.

This seminar will include the company introduction followed by an overview of P-HIL concepts and advantages of P-HIL approach in system testing. The COMPISO System emulation and test platform will be introduced, and its many advantages explained using several use cases as examples.

Sunday, October 9 1:00PM–4:15PM

T3 | Practical Application of Silicon Carbide(SiC) in the E-Mobility Ecosystem

Room 360
Organizers:
Anuj Narain, *Wolfspeed*
Adam Anders, *Wolfspeed*

This tutorial will cover the impact thatWolfspeed's Silicon Carbide (SiC) canmake on electric vehicles and associated power ecosystem. A multitude of applications from solar panels for charging infrastructure, off-board chargers, on-board chargers, DC-DC converters and drivetrain can benefit from the application of SiC. Along every step of the ecosystem, Silicon Carbide saves cost and space while bringing higher efficiency as compared to Silicon. This session will review system and board level application of SiC in the E-Mobility ecosystemfollowed by hands on design sessions that will be conducted using online simulators as well as physical hardware demonstrators.

T6 | Power Electronics Modeling for Real-Time Simulation

Room 359
Organizers:
Giovanni De Carne, *Karlsruhe Institute of Technology*
Matthew Milton, *University of South Carolina*
Andrea Benigni, *RWTH Aachen University*

Digital Real Time Simulators (DRTS) are powerful tools that enable the connection between the digital and real world. Large and complex systems, such as electrical grids, can be simulated in real time, where the digital simulators can compute their model solutions with relatively small time steps (10~50µs or below). These small time steps permit to interface the simulated electrical networks with real hardware, such as grid controllers or power devices, with reasonable time fidelity and response. Interfacing these simulators with external devices by means of sensors and digital or analog communication, such as in Hardware-In-the-Loop (HIL) testing, allows to exchange digital- or hardware-measured variables between the digital and real world. While digital real time simulation has clear potential to flexibly test any hardware in realistically simulated grid conditions, its limitations must be considered. On the opposite of off-line simulations, where a larger size of the simulated network makes the simulation computations only slower, DRTSs must respect hard real time constraints. These constraints mean that the simulated system solution shall be delivered within the desired time step and any overrun results in the interruption and failure of the simulation. As a consequence, the size of the simulated system must stay relatively small to meet computational timing constraints. Increasing the simulation details, e.g. power electronics switches or high-order generator equations, decreases the system scale, that can be solved in a certain time step. These restrictions are exacerbated with simulation of switching power electronics due to computational cost of solving models of their non-linear nature.

T7 | Advanced Control of Power Electronics Systems

Room 358
Organizers:
Sudip K. Mazumder, *University of Illinois, Chicago*
Tobias Geyer, *ABB Drives*
Debanjan Chatterjee, *ABB Corporate Research*

This tutorial provides a fundamentally different perspective to multi-scale control of switching power electronic systems along with plurality of practical experimental results and is expected to be of great interest to the power electronic system engineers, professionals, educators, and students. Many new materials are planned for this tutorial with several recent developments. The tutorial will start with basics for researchers, engineers, professionals, and students and gradually working its way through to intricacies in advanced control concepts, realizations, and practical implementations for advance control realizations on new topologies and control platforms.

It is based on controlling the time evolution of the switching states (i.e., switching sequences) as well as controlling the switching transition of the power semiconductor device of the solid state electronic system. The former – i.e., switching sequence based control yields rapid response under transient condition, optimal equilibrium response, and yields seamless transition between the two states of dynamics. The first part of the tutorial will primarily focus on switching sequence based control for power electronics systems. By enabling integration of modulation and control, switching sequence based control precludes the need for ad-hoc offline modulation synthesis. In other words, an optimal switching sequence for the power converter is generated dynamically without the need for prior determination of any modulation scheme (which generates a pre- determined switching sequence) in typical conventional approaches. One of the fundamental distinctions between switching sequence based control and conventional model

predictive control is that the former ensures optimal determination of the switching sequence of the power converter under stability bound. The tutorial will provide the mechanism to carry out switching sequence based control and model predictive control syntheses and demonstrate the differences between the two optimal control schemes. Several device, converter, and network level implementations (e.g., microinverter, solar inverter, pulsed-power systems, microgrid, parallel inverters, multilevel converter, aircraft power system) of the switching sequence based control will be provided encompassing author's multiple years of project experience encompassing leading advanced defense and energy industries. Finally, the tutorial will focus on switching transition control. The primary objective of this control is to demonstrate how key power electronic system parameters including dv/dt and di/dt stress, switching loss, and electromagnetic noise emission can be controlled dynamically by modulating the dynamics of the power semiconductor devices. Both electrical and newly developed optical control mechanisms to achieve switching transition control will be demonstrated. In the context of the latter, mechanisms for monolithic integration of switching sequence control as well as switching transition control will be outlined and the revolutionary impact of such a novel integration on system performance will be demonstrated with numerous recent and ongoing practical applications.

T11 | Design and Control of Solid-State DC Transformers for DC Transmission and Distribution Grids

Room 357
Organizers:
Rik W. De Doncker, *RWTH Aachen University*
Jingxin Hu, *Nanjing University of Aeronautics and Astronautics*
Shenghui Cui, *Seoul National University*
Subhashish Bhattacharya, *North Carolina State University*

The transition from a predominantly fossil fuel-based power generation towards renewable power sources, predominantly wind turbines and photovoltaic systems, inevitably leads towards an energy supply system that greatly depends on power electronics to feed the energy in the electrical grid. As all power electronic driven systems are intrinsically DC sources or loads, DC transmission and distribution systems become evident, not only because it is more efficient and cost effective, but also increases the ampacity of cables. The development and commercialization of medium-voltage, multi-megawatt DC-DC converters, also called solid-state DC transformers, is a key enabler to realize flexible and interconnected DC grids. Compared to AC transformers, solid-state DC transformers not only need to transform voltage and control power flow, but also need to offer similar efficiencies (up to 99%) at high switching frequencies, provide the same insulation levels and limit fault currents, that is, offer fault-ride-through capabilities. In this tutorial, we introduce and describe the latest advances and best practices of galvanically isolated bidirectional DC-DC converters for solid-state DC transformers. It covers a wide selection of key enabling technologies from converter topologies, optimized control, to the design of highly efficient megawatt medium-voltage DC-DC converters based on emerging MV SiC devices.

T12 | Motor Drive Design And Evaluation Using Multi-Domain Tool Suite For Faster Development Process

Room 356
Organizer:
Albert Dunford, *Altair Engineering*

A key objective with all designers is to reduce development time and costs. Motor drive development requires teams from different domains to work closely during the design process which involves design and development of the motor, power converter hardware, control algorithms, PCBs, automatic embedded code generation, EMI, etc. Simulation allows for rapid development and testing. A proper tool suite that can cover various aspects of the motor drive development process will allow more to be done in simulation, so that when prototypes are built, they can be tested and verified with confidence. Better prototyping means fewer design iterations to prove a design is ready for production deployment

This tutorial will present design workflows that leverage the full suite of Altair's tools for a comprehensive simulation to production grade motor drive development. The following aspects of the drive development will be considered:

- Power converter hardware design including device selection such as IGBT vs SiC devices
- Motor design
- Close loop control design
- Non-ideal switch models, PCB parasitics, and analysis of conducted EMI
- Complete motor drive efficiency map
- Embedded Firmware development and verification
- System level simulations such as:
  - > Torque speed load profiles
  - > Mechanical structure impacts
  - > Tuning Control gains via interactive Hardware in the Loop

Where applicable automation and scripting will be utilized to reduce manual activities required by designers.

- The tutorial will showcase how different design tools can be used in various design stages. PSIM, power electronics simulation
- Flux, machine FEA simulation
- Activate/Compose, System model control and scripting
- Pollex PCB design
- Embed, Model based automatic code generation for drive development
- Motion Solve

T13 | Electric Vehicle Batteries and Charging Systems: A Primer

Room 355
Organizers:
Ashish Arora, *Exponent*
Rita Garrido Menacho, *Exponent*

A number of automobile manufacturers have released electric vehicles (EV) over the past few years with an even larger number of EV models being prepared for release in the not too distant future due to the demand for clean energy and reduction in carbon emissions. The charging infrastructure for these vehicles is also aggressively being rolled out by different organizations. While Lithium-ion (Li-ion) cells have been around for decades powering a variety of consumer electronic devices, their use in electric vehicle applications is relatively new. The requirements that the cells have in these applications where hundreds if not thousands of cells are connected together are completely different from the requirements that the cells have in consumer electronic products due to many factors including the significantly higher battery operating voltages in EV applications. Similar challenges also exist for the charging infrastructure required to power these vehicles.

A number of organizations in the world have developed standards that guide the design and development of both EV batteries and chargers. These standards address everything from crash worthiness requirements for the vehicles and their batteries, to the requirement for the batteries to be designed with passive propagation resistance that prevents a single cell thermal runaway condition from propagating and resulting in a larger failure. Relatively newer standards also require vehicles to provide a 5 minute warning to the driver of possible fire ingress into the passenger compartment due to a thermal runaway in the battery.

The tutorial will start with a basic overview of Li-ion cells and then delve deeper into how these cells are incorporated in EV battery packs and the infrastructure required to keep the cells operating both safely and reliably. The tutorial will also

address the need for passive propagation resistance and how this is achieved in EV battery packs on the road today. The discussion on EV batteries will include an overview of the reliability and abuse standards that have been developed around the world and how these standards dictate some of the design aspects of EV batteries.

The second half of the tutorial will focus on EV chargers. EV chargers are designed with different capabilities. The tutorial will discuss the various EV charger designs that have been deployed in the field and the advantages and limitations of these chargers. This section of the tutorial will also detail the various EV charger standards and the requirements in these standards.

The tutorial will end with a discussion on recent EV battery and charger recalls and detail two case studies: one focused on an EV battery failure in the field and the second detailing the failure of an EV charger that resulted in an electric shock to a user.

T15 | Best Practices for Low-Power (IoT/IIoT) Designs: Separating the Source-Side & Load-Side Analyses

Room 354
Organizer:
Brian Zahnstecher, *PowerRox LLC*

The Internet of Things (IoT) and Industrial IoT (IIoT) have come a very long way from emerging topics to driving mainstream, high-volume products across every major market space today. This has been enabled by innovation on the source-side and load-side of the system power budget and related Power IoT ecosystem. On the load side, Moore's Law has provided much of this enhancement, but a key value proposition that has also made a major impact in minimizing system power budgets has been in Intelligent Power Management (IPM) and the optimal control of loads that focus on best practices in utilization, particularly for battery-powered deployments. On the source side, advancements in energy storage coupled with the inclusion of ambient energy scavenging or energy harvesting (EH) techniques drive increased battery life and even total (primary) battery mitigation in some applications.

T16 | Design Strategies for High-Power, High-Current, Isolated DC/DC Converters using Soft-Switching Technology and Silicon Carbide Transistors

Room 353
Organizers:
Mark Scott, *Miami University*
Alexander Isurin, *Vanner Inc*

Engineers must be familiar with and understand the many nuances of their design space to create a successful product. It takes time and experience to gain this knowledge. This tutorial lowers the learning curve for engineers (and researchers) developing isolated DC/DC converters. It presents design guidelines for implementing silicon carbide (SiC) power devices in isolated DC/DC converters that use soft-switching technology. It targets hardware with a high conversion ratio at power levels of 2 kW and beyond. In these applications, the high-voltage terminals operate at hundreds of volts and the low-voltage terminals conduct several hundred amps. . It covers both isolated DC/DC converters and active rectifiers based on isolated DC/DC converters. Overall, the knowledge and experience shared are broadly applicable to multiple industries and applications.

The tutorial begins with an overview of isolated DC/DC converter applications in the automotive and aerospace fields as well as their associated design challenges. Then, it outlines how one selects a power supply topology for a given application using the specified metrics – cost, reliability, compatibility, size, and weight. Next, the attention turns to SiC power devices. The presenters compare SiC components to traditional power devices like silicon (Si) MOSFETs and IGBTs. This comparison includes datasheet analysis and experimental validation. This is followed by a discussion on passive components. Afterward, the tutorial reviews soft-switching technology and then dives into multiple topologies. Finally, the speakers address high-current, high- frequency transformers. They present various design strategies and provide experimental results for multiple implementation methods. The talk ends with a summary of the main talking points.

Upon completion of the tutorial, audience members will feel more comfortable using SiC components in their designs, regardless of the topology or application. They will also be more confident selecting an isolated DC/DC converter for their application, implementing soft- switching technology, and specifying the resonant components for their design.

T17 | Emerging Cybersecurity Challenges in Modern Energy Systems – Assessment and Solutions

Room 330B
Organizers:
Subham Sahoo, *Aalborg University*
Yan Li, *Penn State University*
Charalambos Konstantinou, *King Abdullah University*

Cyberattacks on critical infrastructure can have a debilitating effect on national economic security, public health, and safety. The underlying processes of the critical power infrastructure sector controlled by the information and communication technology-based elements employed into power electronic systems, create a close coupling between the cyber and physical components. This transition greatly expands the attack surface of such systems, as cyberattacks targeting commercial-off-the-shelf hardware and software are well-known.

In this context, this tutorial not only aims to establish the scientific know-how comprising a framework from basic to advanced topics on power systems and power electronics security, but also plans to demonstrate its impact on different operation layers from lab-scale resources. The first part of the tutorial will emphasize on providing context on building testbeds for security studies, providing guidance on recognizing weaknesses, which can be valuable to attackers. It then aims at, along with threat modeling and risk assessment strategies, the modeling, resources, and metrics for industrial control systems security studies. Case studies on cyberattacks and defenses will be presented in a hardware-in-the-loop environment using OPAL-RT real-time simulator and EXataCPS emulator. Moreover, different cases of attack strategies will be simulated under nominal and abnormal operating conditions to uncover their system-wide impacts in power systems, as well as illustrate the impact of such attacks. The feasibility of the detection methods leveraging the hardware layer will then be investigated from a system resiliency perspective. The second part of the tutorial will then put spotlight on resiliency metrics against cyber-attacks across much faster dynamics in the microgrid scale. Keeping these issues in view, a stepwise design of software-defined networking (SDN) technique will be introduced to build the communication network, with the objective of enabling the network's real-time configuration ability. Three typical SDN planes will be introduced, namely, data plane, control plane and application plane. Their separation is designed to manage the data traffic and generate extensible functions such as cyberattack detection. Considering the holistic visibility of SDN also makes the system vulnerable to cyberattacks, the model-based programmable cyberattack detection and defense strategies will be introduced to secure the SDN network in microgrids. A demonstration will be provided to showcase the programmable detection and defense strategies. Finally, the third part of the tutorial will generally focus on the impact of cyber attacks on operation management of power electronic systems. Generalization from projections of cyber attacks on stability and reliability of the grid will firstly be carried out using a self-healing mechanism. Furthermore, different methodologies to model cyber attacks will be explained in detail, which are

programmed to be introduced into the systems as faults. To characterize between various malfunctioning events and cyber attacks, the design of anomaly detection tools will be explained. Finally, demonstration videos from experimental prototype will be shown to examine the performance of the self-healing mechanism under different cyber attacks, faults, unstable events. Moreover, its efficacy to restore the system back to normally and protect the physical infrastructure from cyber attacks will be analyzed in detail.

T20 | Development of DER Inverter Topologies and Pulse Width Modulation

Room 330A
Organizers:
Shuang Xu, *University of New Brunswick*
Meiqin Mao, *Hefei University of Technology*
Liuchen Chang, *University of New Brunswick*

As the power electronics industry has developed, various families of power electronic inverters and rectifiers have evolved, often linked by power level (single- or three- phase), switching devices, and topological origins. The process of switching the electronic devices in a power electronic converter from one state to another is called modulation. The most popular modulation strategy for controlling the ac output of bridge inverters is known as carrier-based pulse width modulation (PWM), which varies the duty cycle of the inverter switches at a high switching frequency to achieve a target average line-frequency output voltage or current. This tutorial provides a comprehensive overview of the evolution of single-phase converter topologies underlining power decoupling techniques and the development of various PWM techniques and pulse energy modulation (PEM). Different with most carrier-based PWM techniques, PEM employs energy reference rather than the voltage or current reference to compare with the carrier waveform to produce the triggering signals. Conventional passive power decoupling techniques paralleling a large electrolytic capacitor at the DC side were commonly used in single- phase power converters to buffer the second-order power mismatch. In recent years, as the active power decoupling technologies advance, it is promising to reduce the capacitance of the DC-link capacitor to enable the use of small film capacitors and extend the lifetime of the overall converter system, by employing independent power decoupling circuits such as bidirectional converters or dependent power decoupling circuits that share power electronic components with original converters. The active power decoupling topologies are evolved on three branches: current-reference, DC voltage-reference and AC voltage-reference. The tutorial presents benefits and drawbacks of each topology as compared with its predecessor in an underlying logic way enabling the audience to develop a systematic methodology to come up with new solutions for their own applications. In addition, a general comparison has also been made in terms of decoupling capacitance/inductance, additional cost, efficiency and complexity of control, providing a benchmark for future power decoupling topologies. Finally, a 10kW single-phase power inverter system is used as an example in the case study of power decoupling project at the Research Center for Photovoltaic System Engineering of Hefei University of Technology in China. The electrolytic capacitor of mF is replaced by a smaller film capacitor of ~200uF through topological and algorithmic designs, where a direct input current predictive control technique is used to achieve the power decoupling function.

T22 | The Benefits of Infrared Thermography Testing for the Thermal Management In Energy Storage and Conversion

Room 320
Organizer:
Stephan Larmann, *Infratec*

Power electronics components are pivotal for the development of efficient power conversion systems. New materials being applied allow for a better performance but are also extremely challenging in terms of their thermal behavior. Therefore the monitoring of exactly this thermal behavior of power electronics components and systems becomes increasingly important.

This tutorial discusses the usage of infrared thermography in monitoring the thermal stress single power electronics components as well as complete systems may undergo being operated. A sensible test set-up is influenced by the high temperatures modern power electronic materials can operate at, the small component size and the need for high switching speeds in systems for energy conversion. The very focus of the tutorial will be on hands-on test examples to explain step-by-step the critical success factors for such measurements. Participants shall be empowered to apply infrared thermography in their specific field of research based on a sound understanding of the physical fundamentals of this measurement technology.

T23 | Factors Influencing Active Torque Ripple Cancellation in PMSM/IPMSM Drives

Room 321
Organizer:
Ramakrishnan Raja, *Halla Mechatronics*

In this tutorial the main goal is to go in detail to understand various factors that needs to be considered to do an efficient active torque ripple cancellation for a PMSM/IPMSM drive at all operating condition. In this tutorial we will take a 12V 1-1KWPMSM/IPMSM machine for the case study and analyze how different sensor error and non-linearities affect the torque ripple at different operating condition. The tutorial will also deal with how to develop high bandwidth current loop and also various challenges in regards to current control of PMSM drive with respect to doing effective torque ripple cancellation at all operating condition. Finally will conclude with various key factors that needs to be considered in selection of the motor position and current sensor in order to achieve effective active torque ripple cancellation for mass production,

Monday, October 10 12:30PM–2:10PM

Session S01 | Axial Flux Machines I

Room 140B – Level 100
Chairs: Giulio De Donato, Narges Taran

12:30PM | Design of a Carbon Fiber Rotor in a Dual Rotor Axial Flux Motor for Electric Aircraft [#742]
Chase Wiley, Dorsa Talebi, Sri Vignesh Sankarraman, Matthew C. Gardner and Moble Benedict
Texas A&M University, United States; University of Texas at Dallas, United States

12:55PM | Performance Analysis of Slotless Dual-Stator and Single-Rotor Axial-Flux Permanent Magnet Machine [#1059]
Abdul Wahab Bandarkar, Yilmaz Sozer and Md Khalid Azam
University of Akron, United States

1:20PM | Winding Losses in Coreless Axial Flux PM Machines with Wave and Spiral PCB Stator Topologies [#1239]
Yaser Chulaee, Donovin Lewis, Greg Heins, Dean Patterson and Dan M. Ionel
University of Kentucky, United States; Regal Rexnord, Australia

1:45PM | Comparison of Thermal Characteristic in Various Aspect Ratios of Radial-Flux and Axial-Flux Permanent Magnet Machines [#614]
Ren Tsunata, Masatsugu Takemoto, Jun Imai, Tatsuya Saito and Tomoyuki Ueno
Okayama University, Japan; Sumitomo Electric Industries, Ltd., Japan

Session S02 | Control of Electric Drives

Room 140C – Level 100
Chairs: Constanza Ahuma, Yang Xu

12:30PM | A Model Modulated Predictive Current Control Algorithm for the Synchronous Reluctance Motor [#953]
Angelo Accetta, Maurizio Cirrincione, Massimiliano Luna, Marcello Pucci and Antonino Sferlazza
Institute of Marine Engineering - CNR, Italy; University of South Pacific, Fiji; University of Palermo, Italy

12:55PM | A Novel Nonlinear Active Disturbance Rejection Controller for Speed Control of Electric Drives [#485]
Yuefei Zuo, Shuangchun Xie, Libing Cao, Boon Siew Han, Chi Cuong (Martin) Hoang, Chok You, John Chan and Christopher H. T. Lee
Nanyang Technological University, Singapore; Schaeffler (Singapore) Pte Ltd, Singapore

1:20PM | Minimizing the Negative Impacts of Deadtime Insertion and Minimum Pulse Width in a 2-Level VSI [#307]
Caleb Secrest and Siddharth Ballal Borg
Warner Inc., United States

1:45PM | Stable and Passive Observer-Based V/Hz Control for Synchronous Motors [#636]
Lauri Tiitinen, Marko Hinkkanen, Jarno Kukkola, Mikko Routimo, Gianmario Pellegrino and Lennart Harnefors
Aalto University, Finland; ABB Oy, Finland; Politecnico di Torino, Italy; ABB Corporate Research, Sweden

Session S03 | Induction Machines

Room 140D – Level 100
Chairs: Silvio Vaschetto, Yao Duan

12:30PM | Fast 3D Transient Electromagnetic FEA for e-NVH Analysis of Induction Machines [#836]
Peng Han, Jingchen Liang, Pavani Gottipati and Mark Solveson
Ansys, Inc., United States

12:55PM | Detection of Stator Asymmetries in Wound Rotor Induction Motors Through the Advanced Analysis of Rotor Currents [#33]
Israel Zamudio-Ramirez, Jose Antonino-Daviu, Roque A. Osornio-Rios, Larisa Dunai, Alfredo Quijano-Lopez and Vicente Fuster-Roig
Universidad Autonoma de Queretaro, Mexico; Universitat Politecnica de Valencia, Spain

1:20PM | Power-Hardware-in-the-Loop Based Induction Motor Emulator with Rotor Cage Fault [#501]
Yupeng Liu, Chigozie Boniface, Paul Barendse and Pragasen Pillay
Concordia University, Canada; University of Cape Town, South Africa

1:45PM | Design of Multiphase Motor Windings for Control of Multiple Airgap Fields [#661]
Fnu Nishanth, Anvar Khamitov and Eric Severson
University of Wisconsin-Madison, United States

Session S04 | EV Powertrain I

Room 140E – Level 100
Chairs: Mehdi Zadeh, Rashmi Prasad

12:30PM | Switchable 400V/800V High Voltage Architecture for Ultium Battery Electric Trucks [#588]
Brendan Conlon, Mohammad Anwar, Kris Sevel, Michael Wang, Ranya Badawi and Arash Bavili
General Motors Company, United States

12:55PM | High Voltage DC Bus Architecture for Ultium Battery Electric Vehicles [#672]
Mohammad Anwar, Brendan Conlon, Kris Sevel, Ranya Badawi, Arash Bavili, Mike Wang and Amanda Luedtke
General Motors, United States

1:20PM | Four-wheel Independently Driven Formula: Experimental EV for Motion Control Studies [#1358]
Minh C. Ta, An-Toan Nguyen, Binh-Minh Nguyen, Pascal Messier and Joao Pedro F. Trovao University of Shebrooke, Canada; Toyota Institute of Technology, Japan

1:45PM | Direct AC charging of EV Reconfigurable Cascaded Multilevel Converter [#505]
Giulia Tresca, Andrea Formentini, Samuele Granata, Riccardo Leuzzi and Pericle Zanchetta
Universita di Pavia, Italy; Universita di Genova, Italy; University of Nottingham, United Kingdom

Session S05 | Grid-Forming Inverters

Room 140F – Level 100
Chairs: Akanksha Singh, Joseph Benzaquen

12:30PM | Dead-Time Effect on Two-Level Voltage Source Virtual Synchronous Machines [#951]
Vincenzo Mallemaci, Fabio Mandrile, Enrico Carpaneto and Radu Bojoi
Politecnico di Torino, Italy

12:55PM | Adaptive Virtual Inertia Calculation for a Virtual Synchronous Generator-Based Building-to- Building Grid [#1000]
Mhret Berhe Gebremariam, Pablo Garcia Fernandez, Angel Navarro Rodriguez and Cristian Blanco
University of Oviedo, Spain

1:20PM | Inrush Current Mitigation for Grid-Forming Inverters in Islanded Microgrids [#1158]
Mehmetcan Gursoy and Behrooz Mirafzal
Kansas State University, United States

1:45PM | Control of Aggregated Virtual Synchronous Generators Including Communication Delay Compensation [#1008]
Daniel del Rivero, Cristian Blanco, Angel Navarro-Rodriguez and Pablo Garcia
University of Oviedo, Spain

Session S06 | Energy Storage: Converter and Control

Room 140G – Level 100
Chairs: Ariya Sangwongwanich, Ryan Brody

12:30PM | An Optimal Wireless Battery Charger for Electric Vehicle Using EF2 Inverter at 6.78 MHz [#1135]
Soumya Ranjan Meher, Yogita Choudhary and Rajeev Kumar Singh
Indian Institute of Technology (BHU), Varanasi, India

12:55PM | Current Fed Resonant Dual Active Bridge Converter with Dual Source Property for CC-CV Charging [#1188]
Warda Matin Khan, Rajeev Kumar Singh and Ranjit Mahanty
Indian Institute of Technology (BHU), Varanasi., India

1:20PM | An Optimal Predictive Control for Maximum Utilization of Heterogeneous Battery Energy Storage System Interfaced Cascaded Multilevel Inverters [#1342]
Hassan Althuwaini, Alireza Zare and Mohammad B. Shadmand
University of Illinois Chicago, United States

1:45PM | Integrated Control Strategy Supporting the Optimal Management of a 3-kW Vanadium Redox Flow Battery: A Case Study for an Islanded DC Microgrid [#1370]
Norma Anglani, Riccardo Leuzzi, Salvatore Riccardo Di Salvo, Giulia Tresca and Pericle Zanchetta
University of Pavia, Italy

Session S07 | Converter Topologies for Industrial Applications

Room 250A – Level 200
Chairs: Robert Cuzner, Kevin Lee

12:30PM | Output Power Control of Isolated Secondary-Resonant Medium-Voltage AC-DC Converter [#528]
Kohei Budo and Takaharu Takeshita
Nagoya Institute of Technology, Japan

12:55PM | Three-phase Transformerless PV Inverter with Reconfigurable LCL Filter [#622]
Jalal Dadkhah, Carl Ho and Ken Siu
University of Manitoba, Canada; University of North Texas, United States

1:20PM | Design Oriented LCL Filter Comparison between Si IGBTs and SiC MOSFETs based Bidirectional AC/DC Power Converters [#218]
Kevin Lee and Zeljko Jankovic
Eaton, United States

1:45PM | Dimmable Passive Light-Emitting Diode Drivers for Smart Lampposts [#142]
Albert Ting Leung Lee and Shu Yuen Ron Hui
The University of Hong Kong, Hong Kong; Nanyang Technological University, Singapore

Session S08 | Modeling and Control Considerations of Power Converters I

Room 250B – Level 200
Chairs: Marco di Benedetto, Ludovico Ortombina

12:30PM | Reduced Order Small Signal Modeling of Parallel Resonant Converter Based on State-plane Analysis [#958]
Vishal Anand Aisur Gopalakrishnan, Utsab Kundu, Balasubrahmanyam Kuchibatla, Ranganathan Gurunathan and Kaushik Basu
Bloom Energy (I) Pvt Ltd, India; Indian Institute of Science, India

12:55PM | Generalised Harmonic Model for a Triple Active Bridge DC-DC Converter [#989]
Vishwabandhu Uttam, Venkateswara Rao Kudaravalli and Vishnu Mahadeva Iyer
Indian Institute of Science, India

1:20PM | Modeling and Controller Design Considerations of an Isolated Active Clamp Boost PFC Converter [#968]
Himanshu Bhusan Sandhibigraha, Manas Palmal and Vishnu Mahadeva Iyer
Indian Institute of Science, India

1:45PM | Charge-based Droop Control Addressing Control Saturation for Low-Inertia Converters [#715]
Zheng An, Rajendra Prasad Kandula, Joseph Benzaquen and Deepak Divan
Georgia Institute of Technology, United States; Oak Ridge National Laboratory, United States

Session S09 | Measurements, Testing and Standards I

Room 250C – Level 200
Chairs: Norma Anglani, Jun-ichi Itoh

12:30PM | New Experimental System and Procedure for On-line Insulation Life Testing of Stator Winding of Automotive Traction PMSM without using Dynamo System [#928]
Teppei Hayakawa, Yuto Maeda, Hiroaki Matsumori, Takashi Kosaka, Nobuyuki Matsui, Yoichi Miyoshi, Kiyotaka Koga and Subrata Saha
Nagoya Institute of Technology, Japan; Aisin corporation, Japan

12:55PM | Design and Implementation of Automated Characterization of T-type based Power Module for PV Inverter Reliability Assessment [#1212]
Ahmed Siraj, Mark Mckinney, Zheyu Zhang, Matt Ursino and Miles Russell
Clemson University, United States; Citadel University, United States; Yaskawa Solectria Solar, United States

1:20PM | Sampling-Based Active Power Measurement in PWM Inverters: Frequency Response Errors and Design Considerations with Novel Stochastic-Based Methodologies for Noise Quantification [#1206]
Giacomo Andrioli, Sandro Calligaro, Federico Pasut, Andrea Polo, Roberto Petrella and Roberto Rinaldo
DPIA - University of Udine, Italy; Power systems BU - Danieli Automation SpA, Italy

1:45PM | Multiphase Interleaved Reconfigurable High-Frequency-Voltage Inverter for Electrosurgical Generator [#426]
Liu Liu, Li Yongbo and Ling Gu
Nanjing University of Science and Technology, China

Session S10 | Control Strategies for Multi-level Converters

Room 251A – Level 200
Chairs: Deepak Ronaki, Pritam Das

12:30PM | A New Switching Strategy for a GaN-based Three-Level Active Neutral Point Clamped Converter [#1050]
Subhransu Satpathy, Partha Pratim Das, Subhashish Bhattacharya and Victor Veliadis
North Carolina State University, United States

12:55PM | Performance Comparison of a Modular Multilevel Converter under Centralized and Decentralized Control Structures [#1075]
Vasishta Burugula, Semih Isik and Subhashish Bhattacharya
North Carolina State University, United States

1:20PM | Analysis and Control of Grid-Tied Modular Multilevel Converters with a Passive Front-End Rectifier without LC Filter in the DC-Link [#917]
Thabet Alzahrani, Milijana Odavic, Sumeet Thakur and Kais Atallah
University of Sheffield, United Kingdom

1:45PM | Series Resonant Converter for Pulsating Power Operating at Fixed Frequency [#640]
Jinia Roy, Rohail Hassan and Juan Sabate
GE Research, United States

Session S11 | AC-DC Converters

Room 251B/C – Level 200
Chairs: Matthias Radecker, Benjamin Dean

12:30PM | Single-Phase PFC Boost Converter Operating in CCM with Active Input Filter using Linear Regulator Assistance [#1020]
Li Le, Juliane Ritzel Farret, Geise Gulart Sarturi and Matthias Radecker
Fraunhofer-Institut EAS-IIS Dresden, Germany; Federal University of Santa Maria, Brazil; Fieger Consulting and Software Design, Germany

12:55PM | A Boost-Half Bridge-based Single-Stage E-capless EV Charger [#78]
Tat-Thang Le, Jaeyeon Lee and Sewan Choi
Seoul National University of Science and Technol, Korea, Republic of

1:20PM | Self-Commissioning and Compensation of Phase Error in Low-Cost Voltage Sensing for Vienna Rectifiers and Other Grid-Tied Converters [#1172]
Massimiliano Biason, Sandro Calligaro, Roberto Petrella, Mattia Morandin and Marco Zordan
DPIA - University of Udine, Italy; Carel Industries s.p.a., Italy

1:45PM | Dynamic-Circulating-Current-Minimization Control for Isolated Three-phase AC-DC Converter with Matrix Converter [#891]
Jun-ichi Itoh and Hiroki Watanabe
Nagaoka University of Technology, Japan

Session S12 | GaN Power Devices and Characterization

Room 252A/B – Level 200
Chairs: Nidhi Haryani, Thomas Cook

12:30PM | A Simple and Accurate Method to Characterize Output Capacitance Losses of GaN HEMTs [#1131]
Qihao Song, Ruizhe Zhang, Qiang Li and Yuhao Zhang
Virginia Tech, United States

12:55PM | Short Circuit Capability and Performance Degradation of Cascode GaN Devices - A Case Study [#796]
Zhebie Lu and Francesco Iannuzzo
Aalborg University, Denmark

1:20PM | An Embedded GaN Power Module with Double-Sided Cooling and High-Density Integration [#853]
Xingyue Tian, Niu Jia, Dennis Boris Dennis Chertkovsky, Jingjing Sun, Hua Bai, Leon M. Tolbert and Han Cui
University of Tennessee, United States

1:45PM | Thermal Boundary Analysis for High-Power-Density GaN-Based Chargers [#1071]
Rahil Samani, Maryam Alizadeh, Ruoyu Hou, Juncheng Lu, Ignacio Galiano Zurbriggen and Andrew Michael Knight
University of Calgary, Canada; GaN Systems Inc., Canada

Monday, October 10 2:20PM – 4:25PM

Session S13 | Design Automation, Digital Twins and Autonomous Power Electronic Applications

Room 142A/B – Level 100
Chairs: Dong Cao, Yan Li

2:20PM | Optimizing a Digital Twin for Fault Diagnosis in Grid Connected Inverters - A Bayesian Approach [#1124]
Pavol Mulinka, Subham Sahoo, Charalampos Kalalas and Pedro Juliano Nardelli
CTTC/CERCA, Spain; AAU Energy, Denmark; LUT University, Finland

2:45PM | Digital Twin for HVAC Load and Energy Storage based on a Hybrid ML Model with CTA-2045 Controls Capability [#1139]
Rosemary Alden, Evan Jones, Steven Poore, Huangjie Gong, Abdullah Hadi and Ionel Dan
University of Kentucky, United States

3:10PM | Automatic Layout Design for Power Electronics PCBs [#519]
Yidong Tian, Andrew Forsyth, Zhuoru Li and Cheng Zhang
The University of Manchester, United Kingdom

3:35PM | Electromigration-Aware Reliability Optimization of MCPM Layouts Using PowerSynth [#1171]
Imam Al Razi, Whit Vinson, David Huitink and Yarui Peng
University of Arkansas, United States

4:00PM | An Interchangeable Data Structure Used in Automated PCB Layout Design and Optimisation for Power Electronics Applications [#1127]
Zhuoru Li, Yidong Tian and Cheng Zhang
University of Manchester, United Kingdom

Session S14 | Electric Machines for Transportation

Room 140B – Level 100
Chairs: Alireza Fatemi, Gerd Bramerdorfer

2:20PM | A Comparison of Induction Machine Rotor Flux Observers in Stationary Reference Frame for Rotor Flux Position Estimation [#1217]
Sumit Dutta, Anno Yoo, Vinod Peddi and Yuying Shi
General Motors, United States

2:45PM | Mechanical Flux-Weakening for a Surface Permanent Magnet Machine with Split Rotor [#1432]
Jonida Cekani, Fabio Giulii Capponi and Federico Caricchi
Sapienza University of Rome, Italy

3:10PM | Comparative Analysis Between Various High Specific Power Permanent Magnet Motor Topologies for Aerospace Applications [#726]
Ali Al-Qarni, Praveen Kumar, Salar Koushan and Ayman EL-Refaie
Marquette University, United States

3:35PM | Design and Analysis of Cobra Shaped Spoke Type Rotor with SMC Stator Core for Traction Applications [#506]
Mohanraj Muthusamy and Pragasen Pillay
Concordia University, Canada

4:00PM | A Practical Approach to Hairpin Winding Design: Patterns Investigation, Feasibility Verification and Fractional Slot Solutions [#114]
Matteo Carbonieri, Giada Venturini and Mircea Popescu
Motor Design Limited, United Kingdom

Session S15 | PM and IPM Motor Drives

Room 140C – Level 100
Chairs: AK Arafat, Kevin Lee

2:20PM | A Control Method of Servo Motor Drives for Fast Dynamic Response and Low Torque Ripple [#923]
Sangwon Lee, Cheol-min Hwang, Jaehoon Shim and Jung-Ik Ha
Seoul National University, Korea (South)

2:45PM | Modified Deadbeat Predictive Current Control for PMSM Drive System via a Composite Integral Sliding Mode Observer [#98]
Dongsong Jin, Ling Liu, Siyuan Liu and Deliang Liang
Xi'an Jiaotong University, China

3:10PM | A New AC loss Modeling for Motor Model on MILS Toward Control Parameter Calibrations [#230]
Hiroyuki Sano, Kensuke Matsunaga, Akira Ahagon, Ryo Endo, Yusaku Suzuki, Kazuki Semba and Takashi Yamada
JSOL Corporation, Japan

3:35PM | Networked Control of Multiple Ultra-High-Speed (UHS) PMSMs for AMEBA [#1030]
Kazi Nishat Tasnim, Md Khurshedul Islam, Moinul Shahidul Haque and Seungdeog Choi
Mississippi State University, United States; Nexteer Automotive, United States

4:00PM | Enhanced Dynamic Operation of Heavily Saturated IPMSM in Signal-Injection Sensorless Control [#792]
Inhwi Hwang, Yong-Cheol Kwon and Seung-Ki Sul
Seoul National University, Korea, Republic of

Session S16 | Diagnostics, Noise and Vibration in Electric Machines I

Room 140D – Level 100
Chairs: Jose Antonino-Daviu, Konstantinos Gyftakis

2:20PM | Uniform and Localized Magnet Demagnetization Detection of Permanent Magnet Motor based on On-line Flux Estimation [#804]
Cheng Pei Yi, Ping-Jui Ho, Chia-Jung Liu, Feng-Chi Lee and Shih-Chin Yang
National Taiwan University, Taiwan; Industrial Technology Research Institute (ITRI), Taiwan

2:45PM | Diagnostic Method for Non-Uniform Irreversible Demagnetization Fault Along z-Direction in PMSM Using Planar Search Coil [#723]
Jun-Hyuk Im, Jun-Kyu Kang and Jin Hur
Incheon National University, Korea (South)

3:10PM | Trailing Edge PM Demagnetization in Surface PM Synchronous Motors: Analysis and Detection [#217]
Jigyun Jeong, Hyeon-Jun Lee, Marcos Orviz Zapico, Sang Bin Lee, David Reigosa and Fernando Briz
Korea University, Korea, Republic of; University of Oviedo, Spain

3:35PM | Vibration Analysis of a Motor/Generator for Flywheel Batteries [#156]
Giorgio Piraccini, Elena Macrelli, Claudio Bianchini, Marco Troncossi and Alberto Bellini
DIN, Alma Mater Studiorum, University of Bologna, Italy; DEI, Alma Mater Studiorum, University of Bologna, Italy; University of Modena and Reggio Emilia, Italy

4:00PM | Automated Testing for Early Identification of PD in the Stator Insulation of Low Voltage VFD Motors [#91]
Cheolhui Park, Hyeon-Jun Lee, Marcos Orviz Zapico, Sang Bin Lee, David Diaz Reigosa, Fernando Briz del Blanco and Greg Stone
Korea University, Korea, Republic of; University of Oviedo, Spain; Stone Dielectrics, Canada

Session S17 | Transportation Electrification Applications

Room 140E – Level 100
Chairs: Rakib Islam, Babak Nahid- Mobarakeh

2:20PM | Manufacturing Parameter Variation Effects on Performance and Energy Loss on Ultium Traction Motors [#635]
Nima Farrokhzad Ershad, William Jensen, Jihyun Kim, Michael Muir, Axel Ramm and Edward Kaiser
General Motors, United States

2:45PM | 1.5kV, 1MVA Inverters for Electric Aircraft Applications: A Mission Profile-Based Comparative Study [#303]
Di Wang, Linke Zhou, Pengfei Zheng, Yuhang Yang, Alan Callegaro, Piranavan Suntharalingam, Mikhail Goykhman, Armen Baronian and Ali Emadi
McMaster University, Canada; Eaton Research Lab, United States; Eaton Aerospace, LLC., United States

3:10PM | Hybrid Propulsion System for Marine Vessels Based on a DC Microgrid [#644]
Galina Mirzaeva, Dmitry Miller, Steve Mitchell and Steber Alan
The University of Newcastle, Australia; Ampcontrol CSM, Australia; Steber International, Australia

3:35PM Advanced Hybrid Battery System for Power Driving and Regeneration of Electric Vehicles [#384]
Mahmoud Abdelnaby Sayed Abdallah, Shingo Takata, Takaharu Takeshita and Tatsuyuki Oohashi
South Valley University, Egypt; Nagoya Institute of Technology, Japan; FCC Co. Ltd., Japan

4:00PM | A New Hybrid Conductive-Inductive Battery Charger with Reduced Component Count for Electric Transportation Applications [#330]
Harish Karneddi and Deepak Ronanki
Indian Institute of Technology Roorkee, India

Session S18 | Stability and Control of Grid-Following Inverters

Room 140F – Level 100
Chairs: Behrooz Mirafzal, Gab-Su Seo

2:20PM | On Stability of PQ-Controlled Grid-Following and Droop-Control Grid-Forming Inverters [#767]
Tareq Hossen and Behrooz Mirafzal
Kansas State University, United States

2:45PM | Enhanced Current Loop PI Controllers with Adaptive Feed-forward Neural Network via Estimation of Grid Impedance: Application to Three-Phase Grid-Tied PV Inverters. [#1402]
Shyamal Shivneel Chand, Ravneel Prasad, Mudaliar Hiye, Dhirendran Kumar, Adriano Fagiolini, Marco Di Benedetto and Maurizio Cirrincione
The University of the South Pacific, Fiji; University of Palermo, Italy; Center for Power Electronics and Drives ROMA TRE, Italy

3:10PM | Economic Dispatch in Microgrids using Relaxed Mixed Integer Linear Programming [#1167]
Shweta Meena, Hao Tu, Hui Yu and Srdjan Lukic
North Carolina State University, United States

3:35PM | A Self-Organizing Nano Grid (SONG) for Energy Access Clusters [#676]
Kartavya Agarwal, Vikram Roy Chowdhury, Joseph Benzaquen, Prasad Kandula and Deepak Divan
Georgia Institute of Technology, United States; National Renewable Energy Laboratory, United States; Oak Ridge National Laboratory, United States

4:00PM | Real-time Implementation of Grid Code Compliant Grid Edge Energy Management System [#745]
Faeza Hafiz, Dmitry Ishchenko, Anil Kondabathini, Ghanshyamsinh Gohil, David Lawarence and Rasik Sarup
Hitachi Energy, United States; Duke Energy, United States; Open Energy Solutions Inc, United States

Session S19 | Grid-forming Converters and Technologies

Room 140G – Level 100
Chairs: Wei Qiao, Xiaonan Lu

2:20PM | Sub-Synchronous Damping by Battery Storage System in Grid Forming Control Mode [#1034]
Ziqi Zhou, Sante Pugliese, Marius Langwasser and Marco Liserre
Kiel University, Germany

2:45PM | Flexible Synchronization Control for Grid-Forming Converters with Regulated DC-Link Dynamics [#744]
Liang Zhao, Xiongfei Wang and Zheming Jin
Aalborg University, Denmark; Beijing Jiaotong University, China

3:10PM | Grid-Forming Inverter Control Strategy with Improved Fault Ride Through Capability [#1193]
Biqi Wang, Rolando Burgos, Bo Wen and Tang Ye
Virginia Tech, United States

3:35PM | Symmetrical Components Extraction for Grid-Forming Voltage Source Converters [#1253]
Ma Awal, Md Rifat Kaisar Rachi, Yu Hui, Schroder Stefan and Iqbal Husain
Danfoss Drives, United States; North Carolina State University, United States; Danfoss Silicon Power, Germany

4:00PM | Generalized Predictive Control for Voltage Source Inverter in Islanded Microgrid [#372]
Cheng Xue, Rui Liu, Han Zhang and Yunwei Li
University of Alberta, Canada

Session S20 | DC-DC Converters

Room 250A – Level 200
Chairs: Winway Chen, Zheyu Zhang

2:20PM | Quadratic Step-up/down Converters with Wider Conversion Ratio [#794]
Guanlin Li, Hongwen Li, Xiyou Chen, Mahshid Amirabadi, Xianmin Mu and Brad Lehman
Dalian University of Technology, China; Northeastern University, United States

2:45PM | Bidirectional High Step-up/down DC-DC Converter Utilizing Three-Winding Coupled Inductors [#750]
Zahra Saadatizadeh, Pedram Chavoshipour Heris and Mantooth H. Alan
University of Arkansas, United States

3:10PM | A High Step-Up Multi-Mode Resonant Switched-Resonator Converter [#641]
Dulika Nayanasiri, Yunwei Li and Cheng Xue
University of Alberta, Canada

3:35PM | An Interleaved High Gain DC-DC Converter with Direct Power Flow Path [#122]
Ahmed Allehyani
University of Jeddah, Saudi Arabia

4:00PM | Optimizing Transformer RMS Current using Single Phase Shift Variable Frequency Modulation for Dual Active Bridge DC-DC Converter [#1112]
Suman Mandal, Anshuman Shukla and Suryanarayana Doolla
Indian Institute of Technology Bombay, India

Session S21 | Power converter Common Mode Voltage and EMI I

Room 250B – Level 200
Chairs: Luca Solero, Carl Ho

2:20PM | 2DoF BTSPWM for Parallel Current Source Converter with Improved CMV and Harmonic Performance [#283]
Li Ding, Cheng Xue, Pengcheng Liu and Yun Wei
Li University of Alberta, Canada

2:45PM | Derivation and Validation of a Common-Mode Model for a Neutral Point Clamped Dual Active Bridge [#1150]
Ryan Olson, Ahmad El Shafei, Robert M. Cuzner, Yue Zhao, Ma Zhuxuan, Adel Nasiri and Tianchen Li
University of Wisconsin - Milwaukee, United States; University of Arkansas, United States; University of South Carolina, United States

3:10PM | Optimized DC-AC EMI Filter Design for DC-Fed High Speed SiC-Based Motor Drive [#978]
Ripun Phukan, Xingchen Zhao, Che-Wei Chang, Rolando Burgos, Dong Dong, Arnaud Plat and Debbou Mustapha
CPES - Center for Power Electronics, United States; AIRBUS SAS, France

3:35PM | Sinusoidal Frequency Modulated Carrier Wave Topology [#212]
Dinh Le, Ashik Amin, Tahmid Ibne Mannan and Seungdeog Choi
Mississippi state university, United States; Mississippi State University, United States

4:00PM | Open-loop Common-mode Voltage Injection Method of Four-level Hybrid Clamped Converter with Effective Capacitor Voltage Balancing [#407]
Yihui Zhao, Haibo Tang, Yihao Du, Chengfeng Deng, Jian Li and Jianyu Pan
Chongqing University, China

Session S22 | Wireless Power Transfer I

Room 250C – Level 200
Chairs: Li Ding, Jianfei Chen

2:20PM | On the Influence of the Parasitic Capacitance of a Bridge Rectifier on Series-Resonant Capacitive Wireless Power Transfer Systems [#199]
Adrian Amler, Nikolai Weitz and Martin Maerz
Friedrich-Alexander-UniversityErlangen-Nurnberg, Germany

2:45PM | A Capacitively-Coupled Single-Wire Earth-Return Power Tether for Aerial Platforms [#848]
Shiying Wang and Daniel Ludois
University of Wisconsin -Madison, United States

3:10PM | A High-Power Large Air-Gap Multi-MHz Dynamic Capacitive Wireless Power Transfer System Utilizing an Active Variable Reactance Rectifier for EV Charging [#1035]
Sounak Maji, Dheeraj Etta and Khurram Afridi
Cornell University, United States

3:35PM | Cross-Interference Free 6.78 MHz Multiple-Transmitter Using Power Factor Based Control for Wide-Area Wireless Power Transfer Systems [#623]
Masataka Ishihara, Kodai Matsuura, Akihiro Konishi, Kazuhiro Umetani and Eiji Hiraki
Okayama University, Japan

4:00PM | A SiC Based Two-Stage Pulsed Power Converter System for Laser Diode Driving Applications [#1287]
Raj Kumar Kokkonda, Subhashish Bhattacharya, Victor Veliadis and Chrysanthos Panayiotou
North Carolina State University, United States; Indian River State College, United States

Session S23 | Control of Power Converters I

Room 251A – Level 200
Chairs: Pericle Zanchetta, Petros Karamanakos

2:20PM | Self-Tuning Finite-State Model Predictive Control with Grid Impedance Estimation in a Grid-Tied Inverter [#1424]
Salvatore Riccardo Di Salvo, Riccardo Leuzzi, Giulia Tresca, Norma Anglani and Pericle Zanchetta
University of Pavia, Italy; University of Nottingham, United Kingdom

2:45PM | DC-Link Current Sensor-Less Average Current Mode Control for Series-Stacked-Buffer [#793]
Anwesha Mukhopadhyay and Vinod John
Indian Institute of Science, India

3:10PM | A Digital Controlled Short-circuit Current Limiting Method for LLC Converters with Fast Response and Resonant Current Overshoot Limiting [#753]
Jiwen Wei, Xu Yang, Gaohao Wei, Kangping Wang and Wenjie Chen
Xi'an Jiaotong University, China

3:35PM | Design of Variable-Load Class-E Inverter Using Laplace Based Steady-State Modeling [#1209]
Yuetao Hou and Khurram Afridi
Cornell University, United States

4:00PM | A Current Limiting Control Strategy for Single-Loop Droop-Controlled Grid-Forming Inverters Under Balanced and Unbalanced Faults [#228]
Wei Du, Quan Nguyen, Yuan Liu and Sheik Mohiuddin
Pacific Northwest National Laboratory, United States

Session S24 | Modular Multi-Level Converters

Room 251B/C – Level 200
Chairs: Li Ding, Hiroki Watanabe

2:20PM | Startup of the Switched-Capacitor Modular Multilevel Converter with Middle Submodule [#773]
Rami Yehia, Karl Schoder, Robson Gonzatti, Michael Steurer and Fang Peng
Florida State University, United States; Federal University of Itajuba, Brazil

2:45PM | Reactive Component Reduction in Modular Multilevel Matrix Converters through Iterative Design-Simulation Cycles [#1132]
Rafael Castillo-Sierra, Giri Venkataramanan and Dionisio Ramirez
University of Wisconsin-Madison, United States; Universidad Politecnica de Madrid, Spain

3:10PM | Modulation and Control Schemes of Modular Three Phase FCC-CSC for High Power Applications [#356]
Li Ding, Cheng Xue, Nie Hou and Yun Wei Li
University of Alberta, Canada

3:35PM | Optimized Distributed Digital Control and Communication Architecture for Flying Capacitor Modular Multilevel Converter Based PMSM Drives [#1164]
Riccardo Breda, Massimiliano Biason, Sandro Calligaro, Mattia Iurich, Simone Mazzer and Roberto Petrella
DPIA - University of Udine, Italy

4:00PM | Non-Intrusive Condition Monitoring of Submodule Capacitance of Modular Multilevel Converter with Image Identification Method [#544]
Xie Jiajun, He Yushuang, Xiong Ziyan, Chen Zhenghao, Wang Yuming, Du Yihao and Pan Jianyu
Chongqing University, China

Session S25 | SiC Characterization

Room 252A/B – Level 200
Chairs: Layi Alatise, Govind Chavan

2:20PM | Experimental Test Setup for Thermal Stress Analysis of SiC Devices under Active Short Circuits [#899]
Antonia Lanzafame, Luigi Danilo Tornello, Giacomo Scelba, Elena Venuti, Alessandra Raffa, Santi Agatino Rizzo and Giuseppe Scarcella
StMicroelectronics, Italy; University of Catania, Italy

2:45PM | Short Circuit Ruggedness of SiC MOSFETs for High Reliability Applications [#207]
Lydia Robinson, Hugo Calder, Andrew Gallant and Alton Horsfall
Durham University, United Kingdom

3:10PM | Static and Dynamic Characterization of 3.3-kV SiC MOSFET Modules With and Without External Anti-Parallel SiC JBS Diodes [#818]
Ahmed Rahouma, German Oggier, Juan Balda and Avinash Kashyap
University of Arkansas, United States; Universidad Nacional de Rfo Cuarto, Argentina; Microchip Technology Inc., United States

3:35PM | Positive and Negative Bias Temperature Instability on Crosstalk-Stressed Symmetrical & Asymmetrical Double-Trench SiC MOSFETs [#280]
Juefei Yang, Saeed Jahdi, Bernard Stark, Chengjun Shen, Olayiwola Alatise, Jose Ortiz-Gonzalez and Phil Mellor
University of Bristol, United Kingdom; University of Warwick, United Kingdom

4:00PM | Sub-0.5 ns Step, 10-bit Time Domain Digital Gate Driver IC for Reducing Radiated EMI and Switching Loss of SiC MOSFETs [#146]
Horii Kohei, Morikawa Ryuzo, Hata Katsuhiro, Morokuma Kenichi, Wada Yukihiko, Obiraki Yoshiko, Mukunoki Yasushige and Takamiya Makoto
The University of Tokyo, Japan; Mitsubishi Electric Corporation, Japan

Tuesday, October 11 8:30AM–10:10AM

Session S34 | Thermal Issues in Electric Machines

Room 140B – Level 100
Chairs: Fabio Giulii Capponi, Rafal Wrobel

8:30AM | Thermomagnetic Cooling for High Power Density Electrical Machines [#299]
Guangjin Li, Yafeng Zhang, Wei Zhang, Morley Nicola and Zi-Qiang Zhu
The University of Sheffield, United Kingdom

8:55AM | Losses Analysis of Induction Motors under Ambient and Cryogenic Conditions [#507]
Luis Fernando Dias Bucho, Joao Filipe Pereira Fernandes, Paulo Jose da Costa Branco, Marco Biasion, Silvio Vaschetto and Andrea Cavagnino
IDMEC Instituto Superior Tecnico, Portugal; Politecnico di Torino, Italy

9:20AM | Thermal Analysis of a Short-Operating-Duty Dual-Lane Fault-Tolerant Actuator for Aerospace Applications [#493]
Rafal Wrobel, Barrie Mecrow and Maamar Benarous
Newcastle University, United Kingdom; Collins Aerospace, United Kingdom

9:45AM | Slotless Motor with Active Metal Brazed Copper Winding for High Power Density Applications [#752]
Ritvik Chattopadhyay, Md Sariful Islam, Rajib Mikail and Iqbal Husain
North Carolina State University, United States; Halla Mechatronics, United States; ABB, United States

Session S35 | General Electric Drives

Room 140C – Level 100
Chairs: Arshiah Mirza, Constanza Ahuma

8:30AM | Common-Mode Voltage Mitigation in Dual Three-Phase Drives using Predictive Control and Modulated Virtual Vectors [#846]
Sodiq Agoro and Iqbal Husain
North Carolina State University, United States

8:55AM | Design Aspects of Three-Phase Current-Source Converter Commutation Cells with Monolithic Bidirectional GaN Transistors [#634]
Neha Nain, Ivana Kovacevic-Badstuebner, Jonas Huber, Ulrike Grossner and Johann W. Kolar
ETH Zurich, Power Electronic Systems Laboratory, Switzerland; ETH Zurich, Advanced Power Semiconductor Lab, Switzerland

9:20AM | A High-Accuracy Power Loss Model of SiC MOSFETs in Current Source Inverter Considering Current Commutation and Parasitic Parameters [#877]
Feida Chen, Sangwhee Lee, Thomas Jahns and Bulent Sarlioglu
University of Wisconsin-Madison, United States

9:45AM | Direct Flux Vector Control of Synchronous Machines in Multi-Motor-Mono-Inverter Setup for Fan Array Applications [#690]
Anantaram Varatharajan, Paolo Pescetto and Gianmario Pellegrino
Politecnico di Torino, Italy

Session S36 | Actuators and Non-Conventional Machines

Room 140D – Level 100
Chairs: Eric Severson, Renato Lyra

8:30AM | High force Density Five Degrees of Freedom Electromagnetic Actuator [#663]
Krishan Kant and David Trumper
MIT, United States

8:55AM | Comparison of Modulator Retention Shapes for Radial Flux Coaxial Magnetic Gears [#626]
Salek A Khan, Godwin Duan and Matthew C Gardner
University of Texas at Dallas, United States; Princeton University, United States

9:20AM | Design of a Dipole Interior Permanent Magnet Bearingless Slice Motor for Flux-weakening Control [#716]
Taryn Loutit and Minkyun Noh
UBC, Canada

9:45AM | Flux Angle Mapping Coaxial Magnetic Gears for High Gear Ratios [#983]
Salek A Khan, Matthew C Gardner and Godwin Duan
University of Texas at Dallas, United States; Princeton University, United States

Session S37 | Cybersecurity in Power Electronic Systems

Room 140E – Level 100
Chairs: Subham Sahoo, Dong Cao

8:30AM | Decentralized Anomaly Identification in Cyber-Physical DC Microgrids [#328]
Kirti Gupta, Subham Sahoo, Rabindra Mohanty, Bijaya Ketan Panigrahi and Frede Blaabjerg
Indian Institute of Technology, Delhi, India; Aalborg University, Denmark; Indian Institute of Technology, (BHU), Varanasi, India

8:55AM | Data-Driven Approach for Detection of Physical Faults and Cyber Attacks in Manufacturing Motor Drives [#590]
Bowen Yang, Jin Ye, Stephen Coshatt, Wenzhan Song and Feraidoon Zahiri
University of Georgia, United States; Robins Air Force Base, United States

9:20AM | Robust Model Predictive Control for Attack Mitigation of Virtual Synchronous Generators (VSGs) in an Islanded Microgrid [#657]
Jinan Zhang, Lulu Guo and Jin Ye
University of Georgia, United States; Tongji University, China

9:45AM | Load Redistribution Attacks in Multi-Terminal DC Grids [#735]
Zhi Jin Zhang, Matthieu Bloch and Maryam Saeedifard
Georgia Institute of Technology, United States

Session S38 | Converters for Microgrid I

Room 140F – Level 100
Chairs: Joseph Benzaquen, Yilmaz Sozer

8:30AM | A Robust Stabilization Method of Power Converter for Islanded Microgrids to Realize Plug and Play Function [#907]
Daisuke Kanda, Kenji Natori and Yukihiko Sato
Chiba University, Japan

8:55AM | Gird-Forming Distributed Generation Inverter Control for A Smooth Transition from Grid- Connected to Islanded Operation Mode in Microgrids [#525]
Biqi Wang, Qing Lin, Rolando Burgos and Bo Wen
Virginia Tech, United States

9:20AM | Wideband Dissipativity Enhancement for Multi-Sampling Controlled Grid-Following VSCs [#1066]
Shan He, Zhiqing Yang, Dao Zhou, Xiongfei Wang, Rik De Doncker and Frede Blaabjerg
Aalborg University, Denmark; Hefei University of Technology, China; RWTH Aachen University, Germany

9:45AM | Multi-Sampled Grid-Side Current Control for LCL-Filtered VSCs with Enhanced Dissipativity [#1070]
Shan He, Zhiqing Yang, Dao Zhou, Xiongfei Wang, Rik De Doncker and Frede Blaabjerg
Aalborg University, Denmark; Hefei University of Technology, China; RWTH Aachen University, Germany

Session S39 | High Power Converter Topologies for Photovoltaic Systems

Room 140G – Level 100
Chairs: Ed Muljadi, Akanksha Singh

8:30AM | A Split-Phase Enhanced Hybrid Active NPC Topology for PV Applications with Short-circuit Fault Tolerant Capability [#1024]
Satish Belkhode, Rajat Shahane, Anshuman Shukla and Jin Wang
Indian Institute of Technology Bombay, India; The Ohio State University, United States

8:55AM | DZ-Source Converter: A Duality Inspiration of Z-Source Converter for Current-Source High-Conversion Ratio Applications [#1129]
Amir Hakemi, Saman Asghari Gorji, Dezso Sera and Geoffrey Walker
Queensland University of technology, Australia

9:20AM | A 1kV, 480V Power Electronics Hub for DER Integration in Commercial Buildings [#364]
Michael Starke, Madhu Chinthavali, Steven Campbell and Benjamin Dean
Oak Ridge National Laboratory, United States

9:45AM | L2C2 Network-Based Non-Isolated Multi-Output Hybrid Converter with Reduced Leakage Current [#1269]
Rajat Kumar Keshari and Rajeev Kumar Singh
Indian Institute of Technology (BHU), Varanasi, India

Session S40 | Isolated DC-DC Resonant Converters

Room 250A – Level 200
Chairs: Ali Khajehoddin, Fahad Alaql

8:30AM | A Single Phase CLLC Resonant Converter with a Novel Matrix Integrated Transformer [#191]
Feng Jin, Ahmed Nabih, Zheqing Li and Qiang Li
CPES of Virginia Tech, United States

8:55AM | Multi-Mode Rectifier-Based Dual-Input LLC Converter for Wide Voltage PV Applications [#965]
Fahad Alaql, Reza Rezaii, Abdullah Alhatlani, Sahin Gullu, Md Safayatullah and Issa Batarseh
Imam Mohammad Ibn Saud Islamic University, Saudi Arabia; University of Central Florida, United States

9:20AM | Bidirectional Isolated Full-Bridge Resonant Converter with Ripple-Cancelling Characteristics for Electrical Vehicle On-Board Charger [#955]
Ryo Nishiyama, Shota Okutani, Pin-Yu Huang and Yuichi Kado
Kyoto Institute of Technology, Japan

9:45AM | Control Strategy of Transient Process for Dual-Bridge Series Resonant Converter [#357]
Zhuolan Li, Yu Zhang, Xinmi Wu and Jiawen Yang
Huazhong University of Science and Technology, China

Session S41 | Reliability, Diagnostics and Fault Analysis of Power Converters I

Room 250B – Level 200
Chairs: Stefano Bifaretti, Petros Karamanakos

8:30AM | Exploring Interactions Between Reflected Wave and Partial Discharge in WBG Motor Drives [#1152]
Sama Salehi Vala, Kushan Choksi, Abdul Basit Mirza and Fang Luo
Stony Brook University, United States

8:55AM | A Fast-Response High-Accuracy Overvoltage Protection Circuit for Soft-Switching Current- Source Converters [#714]
Zheng An, Mickael J. Mauger, Rajendra Prasad Kandula, Joseph Benzaquen and Deepak Divan
Georgia Institute of Technology, United States; Oak Ridge National Lab, United States

9:20AM | A Space Vector based Diagnosis Method for Switch Open-Circuit Fault in Vienna Rectifier [#274]
Menghu Liu, Li Peng, Wenzhe Xu, Xinyue Guo and Cai Chen
Huazhong University of Science and Technology, China

9:45AM | Robust Open Circuit Fault Tolerance for Five-Level HANPC Inverters Using an Improved SV- PWM Modulation [#1173]
Laith M. Halabi and Kyo-Beum Lee
Ajou University, Jordan; Ajou University, Korea, Republic of

Session S42 | Measurements, Testing and Standards II

Room 250C – Level 200
Chairs: Jun-ichi Itoh, Tianqi Hong

8:30AM | Comparison of Partial Discharge Characterizations Under 60 Hz Sinusoidal Waveform and High- frequency PWM Waveform [#1093]
Zhicheng Guo, Alex Q. Huang and Xianyong Feng
UT Austin, United States

8:55AM | A Guide for Accurate and Repeatable Measurement of the RTH,JC of SiC Packages [#317]
Jack Knoll, Christina DiMarino and Cyril Buttay
Virginia Tech, United States; UniversityLyon, France

9:20AM | An All-Passive Compound Current Sensor for Fast Switching Current Monitoring [#1303]
Ali Parsa Sirat, Hossein Niakan, Michael Campo, Jeffery De La Rosa Garcia and Babak Parkhideh
University of North Carolina at Charlotte, United States

9:45AM | Analysis and Design of Gate Controlless Hybrid Circuit Breaker Utilizing SiC-JFET for Low Voltage DC System [#1417]
Yoshihiro Fujisaki, Takanori Isobe and Tomoyuki Mannen
University of Tsukuba, Japan

Session S43 | Control, Modeling and Stability of Grid-Forming Converters

Room 251A – Level 200
Chairs: Omid Beik, Carl Ho

8:30AM | Modeling of Symmetrical and Asymmetrical Grid Faults for P-HIL Accuracy Analysis in LVRT Tests [#311]
Muhammad Usman Rafiq, Sante Pugliese and Marco Liserre
University of Kiel, Germany

8:55AM | Small-Signal Stability Support From Dynamically Configurable Grid-Forming/Following Inverters for Distribution Systems [#1237]
Lizhi Ding, Yuhua Du, Xiaonan Lu, Shuan Dong, Andy Hoke and Jin Tan
Purdue University, United States; National Renewable Energy Laboratory, United States

9:20AM | Capacitor Current Control for the Parallel-Connected Grid-Forming Inverters [#1330]
Prithwiraj Roy Chowdhury and Madhav Manjrekar
University of North Carolina at Charlotte, United States

9:45AM | Multivariable Grid-Forming Converters with Direct States Control [#361]
Meng Chen, Dao Zhou and Frede Blaabjerg
Aalborg University, Denmark; Aalborg Univeristy, Denmark

Session S44 | Multi-Level and Multi-Phase Converters

Room 251B/C – Level 200
Chairs: Deepak Ronanki, Alex Huang

8:30AM | A Half-Bridge Modular Multilevel Converter Topology with DC Fault Tolerance Capability [#839]
Araz Saleki, Bahram Jahanbakhshi Pordanjani, Saman Rezazade, Mahima Gupta and Mohammad Tavakoli Bina
Portland State University, United States; K. N. Toosi University of Technology, Iran; Shahid Beheshti University, Iran

8:55AM | A Novel Hybrid Cross-connected Sub-module-based Hybrid MMC for MV Applications [#997]
Rajat Shahane, Satish Belkhode and Anshuman Shukla
Indian Institute of Technology Bombay, India

9:20AM | A Medium Voltage Three-Stage Power Converter Topology for Distribution Grid Scale Energy Storage Systems [#1005]
Madhu Chinthavali, Aswad Adib, Joao Onofre Pereira Pinto, Rafal Wojda and Michael Starke
Oak Ridge National Laboratory, United States

9:45AM | Harmonic Analysis of Input DC Current in Six- and Nine-Phase Voltage Source Inverters [#1265]
Wesam Taha, Peter Azer and Ali Emadi
McMaster University, Canada; McMasterUniversity, Canada

Session S45 | Wide Bandgap Device Packaging

Room 252A/B – Level 200
Chairs: Adam Skorek, Fang Luo

8:30AM | Packaging of a 15-kV Silicon Carbide MOSFET With Insulation Enhanced by a Nonlinear Resistive Polymer-Nanoparticle Coating [#680]
Zichen Zhang, Shengchang Lu, Carl Nicolas, Nick Yun, Woongje Sung, Khai Ngo and Guo-Quan Lu
Virginia Tech, United States; SUNY Polytechnic Institute, United States

8:55AM | EMI Mitigation with Stacking DBC Substrate for High Voltage Power Module [#1335]
Xiaoling Li, Yuxiang Chen, Hao Chen, Sudharsan Chinnaiyan, Tianchen Li, Robert Cuzner, Adel Nasiri, Yue Zhao and Alan Mantooth
University of Arkansas, United States; University of Wisconsin-Milwaukee, United States; University of South Carolina, United States

9:20AM | Electro-Thermal Optimization of Common-Mode Screen for Organic Substrate-Based SiC Power Module [#512]
Narayanan Rajagopal, Emre Gurpinar, Burak Ozpineci and Christina DiMarino
Virginia Tech, United States; Oak Ridge National Laboratory, United States

9:45AM | A Highly Integrated GaN Power Module with Low Parasitic Inductance and High Thermal Performance [#128]
Hang Kong, Fengtao Yang, Chengzi Yang, Yifan Zhang, Zhenyu Wang, Yilong Yao, Yan Wang and Laili Wang
Xi'an Jiaotong University, China

Wednesday, October 12 8:30AM–10:10AM

Session S64 | Prof. Donald W. Novotny Memorial Session I

Room 140B – Level 100
Chairs: Thomas Jahns, Bulent Sarlioglu

8:30AM | In Memoriam: Prof Novotny Major Contributions to Electric Machine Research and Teaching
Thomas M. Jahns and Bulent Sarlioglu
University of Wisconsin-Madison, United States

8:55AM | Design and Comparison of Direct-Drive and Geared High Specific Power Permanent Magnet Motors for Aerospace Applications [#598]
Ali Al-Qarni, Salar Koushan, Towhid Chowdhury and Ayman EL-Refaie
Marquette University, United States

9:20AM | Magnetic, Thermal and Structural Scaling of Synchronous Machines [#1433]
Gaetano Dilevrano, Paolo Ragazzo, Simone Ferrari, Gianmario Pellegrino and Timothy Burress
Politecnico di Torino, Italy; Oak Ridge National Laboratory, United States

9:45AM | Design of an Extremely Efficient, Rare-Earth Free, 5 kW Motor in a NEMA 210 Frame [#1028]
Dorsa Talebi, Matthew C. Gardner, Shrikesh Sheshaprasad, Hamid A. Toliyat, Paul Knauer and Alan D. Crapo
Texas A&M University, United States; University of Texas at Dallas, United States; This Old Part Engineering, LLC, United States; Alan D Crapo Consulting, United States

Session S65 | Sensorless Drives

Room 140C – Level 100
Chairs: Peng Han, Yang Xu

8:30AM | Suitability of Bearingless Motor Windings for Non-Salient Rotor Displacement Self-Sensing [#1195]
Nathan Petersen and Eric Severson
University of Wisconsin, Madison, United States

8:55AM | Fast Evaluation of Self-Sensing Control Capability for a Synchronous Reluctance Motor [#546]
Alice Maimeri, Luigi Alberti, Silverio Bolognani and Berto Matteo
University of Padova, Italy

9:20AM | Adaptive Sensorless Control of High Speed Surface-Mounted PMSM Drives with Inductance Estimator based on Current Error [#243]
Zhihao Song, Wenxi Yao and Kevin Lee
Zhejiang University, China; Eaton Corporation, United States

9:45AM | Stator Flux Observer for the Sensorless Speed Control of Synchronous Machines with Uncertain Torque Constant [#1015]
Emilio Carfagna, Giovanni Migliazza, Fabio Bernardi, Cristiano Maria Verrelli and Emilio Lorenzani
University of Modena and Reggio Emilia, Italy; University of Roma Tor Vergata, Italy

Session S66 | Additive Manufacturing in Electric Machines

Room 140D – Level 100
Chairs: Vandana Rallabandi

8:30AM | Electrical Characteristics of Additively Manufactured Hollow Conductor Coils with Integrated Heat Pipes for Electric Aircraft Applications [#47]
Sina Vahid, Salar Koushan, Towhid Chowdhury and Ayman EL-Refaie
Marquette University, United States

8:55AM | Eddy Current Loss Reduction in Binder Jet Printed Iron Silicon [#1181]
Khan Jazib Islam, Thang Q. Pham, Hawke Suen, Tanzilur Rahman, Geeta Kumari, Patrick Kwon, Carl J. Boehlert and Shanelle N. Foster
Michigan State University, United States

9:20AM | Spaced Orthocyclic Winding Pattern for Improved Die Compressed Coils [#1321].
Dominick Sossong and Ian P. Brown
Illinois Institute of Technology, United States

9:45AM | Additively Manufactured Heat Exchanger for Improved Cooling of Electric Machines [#849]
Gokhan Cakal, Ahmed Hembel and Bulent Sarlioglu
University of Wisconsin-Madison, United States

Session S67 | EV Charging

Room 140E – Level 100
Chairs: Yigeng Huangfu, Aparna Saha

8:30AM | Transformerless Partial Power Converter for Electric Vehicle Fast Charging Stations [#736]
Daniel Pesantez, Hugues Renaudineau, Sebastian Rivera and Samir Kouro
Universidad Tecnica Federico, Santa Maria, Chile; Universidad de los Andes, Chile

8:55AM | Bridgeless Boost-Buck based Universal PFC Converter with Wide Output Voltage for Onboard Battery Charging Applications [#575]
Harish Karneddi and Deepak Ronanki
Indian Institute of Technology Roorkee, India

9:20AM | Isolated AC/DC Converter Used in EV/PHEV Battery Charger From Household AC Outlet [#1199]
Daisuke Endo, Hiroaki Matsumori, Takashi Kosaka, Sadanori Suzuki and Kenichi Nagayoshi
Nagoya Institute of Technology, Japan; Toyota Industries Corporation, Japan

9:45AM | Megawatt Scale Charging System Architecture [#1160]
Radha Sree Krishna Moorthy, Michael Starke, Benjamin Dean, Aswad Adib, Steven Campbell and Madhu Chinthavali
Oak Ridge National Laboratory, United States

Session S68 | Solid State Transformers and Applications

Room 140F – Level 100
Chairs: Nathan Weise, Kaushik Basu

8:30AM | Operation and Control of Soft Switching Solid State Transformer as a Virtual Synchronous Machine for Photovoltaic Application [#1298]
Vikram Roy Chowdhury, Zheng An, Rajendra Prasad Kandula and Deepak Divan
National Renewable Energy Laboratory, United States; Georgia Institute of Technology, United States; Oak Ridge National Laboratory, United States

8:55AM | A Simple Control Method without Voltage Balance Algorithm for Modular Solid-State Transformer [#918]
Paul Jang, Hwa-pyeong Park, Jongbok Baek, Dong-Uk Kim and Sungmin Kim
Tech University of Korea, Korea (South); Korea Institute of Energy Research, Korea (South); Hanyang University, Korea (South)

9:20AM | ZVS Boundary Analysis and Design Guideline of MV Grid-Compliant Solid-State Transformer for DC Fast Charger Applications [#1054]
Yos Prabowo, Shrivatsal Sharma, Subhashish Bhattacharya, Awneesh Tripathi and Vijay Bhavaraju
North Carolina State University, United States; Eaton Corporation, United States

9:45AM | Medium Voltage Energy Hub Based on Multilevel Cascaded H Bridge-Dual Active Bridge Back- to-Back Converter for Power Distribution Feeders Interconnection and Multiple Simultaneous Grid Services [#996]
Jongchan Choi, Joao Onofre Pereira Pinto, Madhu Chinthavali and Aswad Adib
Oak Ridge National Laboratory, United States

Session S69 | Advanced Power Converter Control Routines for Photovoltaic Systems

Room 140G – Level 100
Chairs: Ariya Sangwongwanich, Yunwei Li

8:30AM | Operation Mode Transition Technique of Flexible Modulation Scheme for Single-phase Transformerless PV Inverters [#705]
Zhongting Tang, Ariya Sangwongwanich and Frede Blaabjerg
Aalborg University, Denmark

8:55AM | A Lyapunov-based Generalized Dc-Side Controller Design for PV-Connected Systems [#1227]
Rahul Mallik, Branko Majnumovic, Soham Dutta, Gab-Su Seo, Dragan Maksimovic and Brian Johnson
University of Washington, United States; University of Colorado Boulder, United States; National Renewable Energy Laboratory, United States

9:20AM | Reconfigurable Step-up/down Partial Power Converter for PV Power Optimizer [#587]
Hugues Renaudineau, Daniel Pesantez, Nicolas Muller, Freddy Flores-Bahamonde, Samir Kouro and Jose Rodriguez
Universidad Tecnica Federico Santa Maria, Chile; Universidad Austral de Chile, Chile; Universidad Andres Bello, Chile; Universidad San Sebastian, Chile

9:45AM | An Adaptive DC Voltage Control for SiC based Medium Voltage Photovoltaic Inverter [#988]
Jenson Joseph Attukadavil, Sandeep Anand and Baylon G Fernandes
Indian Institute of Technology, Bombay, India

Session S70 | Multi-Level Converter Topologies

Room 250A – Level 200
Chairs: Zhituo Ni, Nikolas Menger

8:30AM | Efficiency and DC-link Ripple Analysis of Neutral-Point-Less (NPL) Multilevel Inverter with Discontinuous Pulse Width Modulations [#1198]
Mikayla Benson, Xiaofeng Dong, Musab Guven, Kangbeen Lee, Jinyeong Moon and Woongkul Lee
Michigan State University, United States; Florida State University, United States

8:55AM | An Actively Balanced Distributed Regenerative Snubber with Reduced Part Count in Multi-Level Power Converters [#1326]
Nathan Miles Ellis, Logan Horowitz, Rahul Iyer, Nathan Brooks and Robert Pilawa-Podgurski
UC Berkeley, United States

9:20AM | SCR-Front-End Regenerative CHB Drive with Improved Harmonic Profile [#309]
Zhituo Ni, Mehdi Narimani and Navid Zargari
Rockwell Automation Canada, Canada; McMaster University, Canada

9:45AM | A Multiphase Series Connected Converter for High Voltage High Power Dc-dc Applications [#1090]
Mohd Shadab Ansari, Anshuman Shukla and Himanshu J Bahirat
Indian Institute of Technology Bombay, India

Session S71 | Modeling of Power Converters

Room 250B – Level 200
Chairs: Mengqi Wang, Pritam Das

8:30AM | A Blackbox Modeling Approach for DC-DC Converters with Strong Nonlinear Dynamics Using an Improved Strategy for the Transition among Local Models [#631]
Fernando Perez, Airan Frances, Rafael Asensi and Javier Uceda
Universidad Politecnica de Madrid, Spain

8:55AM | Steady-State Analysis of Power Converters Using the Enhanced State Vector Algorithm [#1233]
Reza Sadri, Mohammad Daryaei and Sayed Ali Khajehoddin
University of Alberta, Canada

9:20AM | Improved Three-Terminal Model for PWM Converters with Current-Mode Control [#1242]
Yi-Hsun Hsieh and Fred C. Lee
Virginia Tech, United States

9:45AM | Numerical Design of Input Filters by Parameter Dependent Lyapunov Functions [#545]
Ramon Estalella Rodriguez, Carlos Olalla Martinez, Angel Cid Pastor and Isabelle Queinnec
University Rovira i Virgili, Spain; University of Toulouse, France

Session S72 | Wireless Power Transfer II

Room 250C – Level 200
Chairs: Jiangfeng Wang, Dianxun Xiao

8:30AM | High-Performance Multi-MHz Capacitive Wireless Power Transfer System with an Auxiliary ZVS Circuit [#1292]
Dheeraj Etta, Sounak Maji and Khurram K. Afridi
Cornell University, United States

8:55AM | Simulation-Compatible Capacitive-Coupler Modeling and Analysis for Wireless Power Transfer Applications [#405]
Ilya Zeltser, Eli Abramov and Mor Mordechai Peretz
Rafael Advanced Defense Systems Ltd., Israel; Ben-Gurion University of the Negev, Israel

9:20AM | Synchronous Rectification Based on a Digital Delay Line in a High-Frequency Resonant Converter for Wireless Power Transfer [#1224]
Kamlesh Sawant, Nathan Bich and Jungwon Choi
University of Minnesota Twin Cities, United States

9:45AM | Reduced Model for Fast Simulation of a Lithium-Ion Battery Pack Taking Into Account Current and State of Charge Dispersion [#55]
Fernanda Vendrame, Christophe Forgez and Marie Sayegh
Safran; Universite de Technologie de Compiegne, France; Universite de Technologie de Compiegne, France; Safran, France

Session S73 | Nonlinear Control Techniques for Power Electronics Applications

Room 251A – Level 200
Chairs: Marko Hinkkanen, Luca Solero

8:30AM | Design Elements of a Nonlinear Decentralized Control Scheme For Modular Power Conversion [#1012]
Chenmin Deng, Pedram Chavoshipour Heris, Duy T. Nguyen, Pushkar Saraf and Alex J. Hanson
The University of Texas at Austin, United States

8:55AM | Dynamic Performance Improvement of Microgrids with High Uncertainty Using Adaptive Robust Control [#1312]
Hasan Abdollahi Sofla and Iqbal Husain
North Carolina State University, United States

9:20AM | Robust Modifications to Model Reference Adaptive Control for Reference Voltage Tracking in a Dual Active Bridge dc-dc Converter [#704]
Kartikeya Jayadurga Prasad Veeramraju, Alvaro Cardoza, Jagannathan Sarangapani and Jonathan Kimball
Missouri University of Science and Technology, United States

9:45AM | Tuning of Weighting Factors by Direct Pole-Placement for Model Predictive Current Controlled Grid-Tied Converters with LCL Filter [#580]
Waqar A. Khan, Armin Ebrahimian, Iman Hosseini and Nathan Weise
Marquette University, United States

Session S74 | Multi-Level Converters

Room 251B/C – Level 200
Chairs: Zahra Saadatizadeh, Massimiliano Luna

8:30AM | Twelve-Step Inverter [#594]
Haitham Kanakri and Euzeli Cipriano Dos Santos, Jr.
Indiana UniversityPurdue UniversityIUPUI, United States

8:55AM | A Review on Hybrid Modular Multilevel Converters for Medium Voltage Applications [#1001]
Rajat Shahane, Nageswara Rao Karaka and Anshuman Shukla
Indian Institute of Technology Bombay, India

9:20AM | Three-Phase Modular Multilevel Converters Composed of Universal Smart Power Module [#286]
Mana Sakamoto and Hitoshi Haga
Nagaoka University of Technology, Japan

9:45AM | A Novel Three-Phase Seven-Level Hybrid Flying-Capacitor Inverter [#885]
Min-Seok Kim, Jonathan Pribadi and Dong-Choon Lee
Yeungnam University, Korea (South)

Session S75 | Silicon Carbide Switching Performance

Room 252A/B – Level 200
Chairs: Xiaoqing Song, Leon Tolbert

8:30AM | Comparison of Motor Neutral Point Overvoltage Oscillations in SiC-Based Adjustable Speed Drives using Two-Level and Three-Level Inverters [#618]
Wenzhi Zhou, Mohamed Diab and Xibo Yuan
University of Bristol, United Kingdom; Loughborough University, United Kingdom; The University of Bristol, United Kingdom

8:55AM | Influence of the Inverter Dead-time on the Reverse Recovery Characteristics of 3.3-kV SiC MOSFETs and JBSFETs [#1272]
Ashish Kumar, Subhashish Bhattacharya and Jayant Baliga
North Carolina State University, United States

9:20AM | Analytical Switching Transient Model of TO-247-4 Packaged SiC MOSFETs and Comparison with TO-247-3 Devices [#1053]
Manish Mandal, Shamibrota Kishore Roy and Kaushik Basu
Indian Institute of Science Bangalore, India

9:45AM | Analysis and Reduction of Turn-on Gate-source Voltage Oscillation on Paralleled SiC MOSFETs Application [#101]
Dongxin Jin, Nianzun Qi, Jin Ouyang and Cheng Luo
Eaton Research Labs, China; Southwest Jiaotong Univesity, China

Wednesday, October 12 10:30AM–12:10PM

Session S76 | Axial Flux Machines II

Room 140B – Level 100
Chairs: Greg Heins, Giulio De Donato

10:30AM | Stator Design for an Axial Flux PM Motor Using Straight Teeth Core with Distributed Winding [#463]
Junichi Asama, Aiku Ikuta and Shohei Watanabe
Shizuoka University, Japan

10:55AM | The Magnetization Effect on Soft Magnetic Composite Prepared Stators of Axial Flux Motors [#992]
Emir Poskovic, Fausto Franchini and Luca Ferraris
Politecnico di Torino, Italy

11:20AM | Improved Cooling for a High-Speed Axial-Flux Machine Using Soft Magnetic Composites [#1058]
Matthew Meier and Elias Strangas
Michigan State University, United States

11:45AM | Design and Analysis of an Axial Flux Coaxial Magnetic Gear with Balanced Axial Forces for Precision Aerospace Actuation Applications [#118]
Bryton Praslicka, Donald F. Knight, Tazio L. Stefanelli, Nick Palmer, Adam White, Joshua Jones and Hamid Toliyat
Texas A&M University, United States; Kaney, Inc., United States

Session S77 | Prof. Donald W. Novotny Memorial Session II

Room 140C – Level 100
Chairs: Bulent Sarlioglu, Thomas Jahns

10:30AM | In Memoriam: Prof. Novotny Major Contributions to WEMPEC, IEEE, and Electrofishing
Thomas M. Jahns and Bulent Sarlioglu
University of Wisconsin-Madison, United States

10:55AM | Generalized Control Technique for Three-Level Inverter Fed Six-Phase Permanent Magnet Synchronous Machines Under Fault Conditions [#1048]
Partha Pratim Das, Subhransu Satpathy, Subhashish Bhattacharya and Victor Veliadis
NCSU, United States

11:20AM | Flux-Weakening Control of Hybrid-Excited Permanent Magnet Synchronous Motors [#448]
Luca Cinti, Paolo Gherardo Carlet, Ludovico Ortombina and Nicola Bianchi
University of Padova, Italy

11:45AM | Loss Analysis of High-Speed IPMSM using Different Trajectory Control [#1258]
Minghao Gao, Guoyu Chu, Rukmi Dutta and Dan Xiao
University of New South Wales, Australia

Session S78 | Bearingless and High-Speed Machines

Room 140D – Level 100
Chairs: Wolfgang Gruber, Matthew C. Gardner

10:30AM | Homopolar Bearingless Slice Motor with Quadruple Three-Phase Windings [#881]
Simon Szoke and Minkyun Noh
University of British Columbia, Canada

10:55AM | Exact Torque and Force Model of Bearingless Electric Machines [#1353]
Anvar Khamitov and Eric Severson
University of Wisconsin-Madison, United States

11:20AM | Enhanced Torque Density of a Novel One-Axis Actively Positioned Single-Drive Bearingless Motor [#603]
Theeraphong Srichiangsa, Rikuya Oe, Hiroya Sugimoto, Yusuke Fujii, Kyohei Kiyota and Akira Chiba
Tokyo Institute of Technology, Japan; Tokyo Denki University, Japan

11:45AM | Optimization of Stack Length in Magnetic-Geared Motor with Magnetically Suspended High- Speed Rotor [#441]
Akira Kumashiro, Akira Chiba, Wolfgang Gruber, Wolfgang Amrhein and Gerald Jungmayr
Tokyo Institute of Technology, Japan; Johannes Kepler UniversityLinz, Austria; Linz Center of Mechatronics GmbH, Austria

Session S79 | EV Powertrain II

Room 140E – Level 100
Chairs: Woongkul Lee, Rakib Islam

10:30AM | Impact of Vehicle Requirements on Accessory Power Module (APM) Design for Ultium Electric Vehicle Platforms [#673]
Ranya Badawi, Mohammad Anwar, Steven Wybo and Mehrdad Teimorzadeh
General Motors, United States

10:55AM | Design and Testing of an Automotive Compliant 800 V 550 kVA SiC Traction Inverter with Full-Ceramic DC-Link and EMI Filter [#573]
Fausto Stella, Enrico Vico, Davide Cittanti, Chaohui Liu, Jinliang Shen and Radu Bojoi
Politecnico di Torino, Italy; National NewEnergyVehicleTech Innovation Center, China

11:20AM | Capacitive Link Universal Converters for EV Powertrain [#1277]
Anran Wei, Brad Lehman, Siavash Pakdelian and Mahshid Amirabadi
Northeastern University, United States; University of Massachusetts Lowell, United States

11:45AM | Fault Localization in Automotive Power Nets for Utilization in Energy Management Systems Used for Autonomous Driving Based on Graph Theory [#316]
Laurenz Tippe, Ahmed Alnaggar, Sarmed Hussain, Joachim Froeschl and Hans-Georg Herzog
Technical University of Munich (TUM), Germany; BMW Group, Germany

Session S80 | Control of High Penetration Renewable Grid

Room 140F – Level 100
Chairs: Ed Muljadi, Fariba Fateh

10:30AM | Enhanced Frequency Support Scheme of Generic Inverter-Based Resource Models for Renewable-Dominated Power Grids [#1085]
Jinho Kim, Eduard Muljadi, Bharat Vyakaranam, Quan Nguyen, Ahmad Tbaileh, Sohom Datta, Wei Du, Yuan Liu, Yousu Chen, Nader A. Samaan, Manisha Maharjan, Seo Sangwon and M Al Mamun
Auburn University, United States; PNNL, United States

10:55AM | A Decoupled Droop Control Strategy for Cascaded MulticeII Inverter with Low-Frequency Modulation [#1427]
Shuo Zhang, Wei Qiao and Liyan Qu
University of Nebraska-Lincoln, United States

11:20AM | Inter-area Oscillation Damping Controller for DFIG Based Wind Power Plants [#1077]
Sami Alalwani, Semih Isik and Subhashish Bhattacharya
North Carolina State University, United States

11:45AM | Modeling Analysis and Characterization of a Distributed Generation System Based on Microgrid for Hardware-in-the-loop (HIL) Applications [#952]
Paulo Leandro, Fabiano Salvadori and Gregory Almeida
Universidade Federal da Paraiba, Brazil; Instituto Federal de Alagoas, Brazil

Session S81 | Energy Storage and Harvesting

Room 140G – Level 100
Chairs: Xin Sui, Daniel-Ioan Stroe

10:30AM | Lite-Sparse Hierarchical Partial Power Processing for Heterogeneous Degradation of Batteries in Energy Storage Systems [#1368]
Alireza Ramyar, Wentao Xu, Xiaofan Cui, Jason Siegel, Anna Stefanopoulou and Al-Thaddeus Avestruz
University of Michigan, United States

10:55AM | A Multi-Stack Variable Stiffness Magnetic Torsion Spring for a Wave Energy Converter [#876]
Dawei Che, Bertrand Dechant, Alex Hagmuller and Jonathan Bird
Portland State University, United States; aquaharmonics Inc., United States

11:20AM | Used Lithium-Ion Batteries in Second-Life Applications: Feasibility Study [#341]
Minh Tran, Tuomas Messo, Roni Luhtala, Jussi Sihvo and Tomi Roinila
Tampere University, Finland

11:45AM | Analysis, Modeling, and Validation of Cascaded Magnetics for Magnetic Energy Harvesting [#63]
Gao Min, Yi Lifang and Moon Jinyeong
Florida State University, United States

Session S82 | DC-DC Converter Topologies

Room 250A – Level 200
Chairs: Minh-Khai Nguyen, Ahmed Allehyani

10:30AM | An Interleaved Multi-Phase Boost Converter with Coupled Inductors for High Power Density [#421]
Ahmed Ismail, Zhuxuan Ma, Ahmad Al-Hmoud and Yue Zhao
University of Arkansas, United States

10:55AM | A Four-Phase Soft-Switching Boost Converter with Single Auxiliary Switch [#718]
Minh-Khai Nguyen and Caisheng Wang
General Motors, United States; Wayne State University, United States

11:20AM | 48V-to-12V Always-Dual-Path Hybrid DC-DC Converter for Inductor Current Reduction [#159]
Hata Katsuhiro, Tanaka Shinsaku, Rikiishi Yasuhiro and Matsumoto Takashi
The University of Tokyo, Japan; Sanken Electric Co., Ltd., Japan

11:45AM | An Accurate Output Current Prediction Scheme for Primary-Side Regulation Active-Clamp Flyback Converter [#176]
Yu Yao, Chong Wang, Daying Sun, Wenhua Gu and Chuanxiang Sheng
Nanjing University of Science and Technology, China

Session S83 | Power Converter Common Mode Voltage and EMI II

Room 250B – Level 200
Chairs: Rangarajan Tallam, Robert Cuzner

10:30AM | Analysis, Design & PCB Optimization of a DC Bus Planar CM Inductor to Reduce EMI in SiC Converters [#597]
Zoran Vrankovic, Gennadi Sizov, Gary Skibinski, Rohit Suryadevara and Yao Da
Rockwell Automation, United States

10:55AM | Integrated Single-Stage EMI Filters for Grid-Tied Voltage Source Converters: A Design Oriented Approach [#904]
Srinivas Gulur, Vishnu Mahadeva Iyer and Subhashish Bhattacharya
Lucid Motors, United States; Indian Institute of Science, Bangalore, India; NC State University, United States

11:20AM | Synchronously Switched Active EMI Filter [#961]
Duy T. Nguyen, Chenmin Deng, Elijah Macias and Alex J. Hanson
The University of Texas at Austin, United States

11:45AM | A Modeling Technique for Low-Frequency Near-field Radiated EMI Measurement Based on the Study of the Mechanism of the Monopole Antenna [#1222]
Yirui Yang, Yanwen Lai, Shuo Wang and Zheng Luo
University of Florida, United States; Monolithic Power Systems, Inc., United States

Session S84 | Protection Devices / Algorithms

Room 250C – Level 200
Chairs: Tianqi Hong, Jinia Roy

10:30AM | Coordination of Solid-State Circuit Breakers for DC Grids Under High-Fault-di/dt Conditions [#643]
Govind Chavan, Xiaoqing Song, Debanjan Chatterjee, Abhinav Patni and Pietro Cairoli
ABB, United States

10:55AM | Adjustable Current Limit Feature with a Self-Sensing and Self-Triggering Monolithically Integrated SiC Circuit Breaker Device [#790]
Taro Takamori, Keiji Wada, Norman Boettcher, Tobias Erlbacher, Wataru Saito and Shin-ichi Nishizawa
Tokyo Metropolitan University, Japan; Fraunhofer IISB, Germany; Kyushu University, Japan

11:20AM | A Fault Current Limiter Based on Voltage-Controlled Tunable Inductors [#1289]
Junwei Cui, Chao Jia, Liyan Qu and Wei Qiao
University of Nebraska-Lincoln, United States

11:45AM | Galvanically Isolated Clamp-on Medium-Voltage Sensing [#223]
Blake D. Rose and Daniel C. Ludois
University of Wisconsin-Madison, United States

Session S85 | Model Predictive Control of Power Electronics

Room 251A – Level 200
Chairs: Tarisciotti Luca, Petros Karamanakos

10:30AM | A Unified Model Predictive Control for the Grid Integration of Vanadium Redox Flow Batteries [#1422]
Riccardo Leuzzi, Andrea Volpini, Salvatore Riccardo Di Salvo, Giulia Tresca and Pericle Zanchetta
University of Pavia, Italy; University of Nottingham, United Kingdom

10:55AM | Model Predictive Control with Sphere-Decoding Algorithm for parallel-connected H-Bridges [#347]
Cristina Terlizzi, Stefano Bifaretti and Alessandro Lampasi
University of Rome Tor Vergata, Italy; ENEA DTT, Italy

11:20AM | Model Predictive Control for a PLL-less SiC Grid-Tied Inverter with Zero-Voltage-Ride- Through Capability [#495]
Xiaofeng Dong and Hui Li
Florida State University, United States

11:45AM | Real-Time Network Protocol for Gate Driver Communication and Control [#1271]
Vladimir Mitrovic, Yu Rong, Boran Fan, Yijie Bai, Yuliang Cao, Dong Dong, Rolando Burgos and Dushan Boroyevich
Virginia Tech, United States; virginia Tech, United States

Session S86 | AC-AC Converters

Room 251B/C – Level 200
Chairs: Galina Mirzaeva, Mohamed Youssef

10:30AM | Zeta-Based AC-Link Universal Converter [#1263]
Mojtaba Salehi, Masih Khodabandeh and Mahshid Amirabadi
Northeastern University, United States

10:55AM | Comparison of Control Techniques for Dual-Mode Inversion Stage of a GaN-Based High- Power-Density Single-Phase Transformer-Less Online UPS [#1243]
Maida Farooq, Danish Shahzad and Khurram Afridi
Cornell University, United States

11:20AM | A Novel Modulation Scheme for Matrix Converters Based on Predictive Control and Featuring Constant Switching Frequency [#1329]
Galina Mirzaeva, Yuan Liu and Marco Rivera
The University of Newcastle, Australia; Universidad de Talca, Chile, Chile

11:45AM | Three-Phase Four-Wire Unified Power Quality Conditioner Based on AC-DC-AC Nine-Leg Converter and Shunt Converter [#702]
Jean Torelli Cardoso, Cursino Brandao Jacobina, Alan Santana Felinto and Mauricio Beltrao Rossiter Correa
Federal University of Campina Grande, Brazil

Session S87 | Novel Applications and Features of WBG Gate Drivers

Room 252A/B – Level 200
Chairs: Jin Wang, Zheyu Zhang

10:30AM | A Magnetic-Coupled Single Gate-Driver Structure for Series Power Devices in DC Circuit Breaker Applications [#221]
Jian Liu, Lakshmi Ravi, Dong Dong, Rolando Burgos, Steve Schmalz and Andy Schroedermeier
Virginia Tech, United States; Virginia Tech, United States; Eaton, United States

10:55AM | Wireless High-isolation Power Supply for Gate Drives Using Class-E Inverter and GaN devices [#527]
Yan Sheng, Zhao Yihui, Deng Chengfeng, Tang Haibo, Jiang Runquan and Pan Jianyu
Chongqing University, China

11:20AM | Improved Short-Circuit Protection Scheme with Fast Fault Detection for SiC MOSFET [#1096]
Shahjahan Ahmad Syed, N V Prasad Kamisetti and Narayanan Gopalaratnam
Indian Institute of Science, Bengaluru, India

11:45AM | 1.2 kV SiC MOSFET Full-Bridge Power Module with Integrated Gate Driver and Coupled Inductor [#318]
Jack Knoll, Jesi Miranda-Santos, Xingyu Chen, Christina DiMarino and Qiang Li
Virginia Tech, United States

Wednesday, October 12 2:00PM–3:40PM

Session S88 | Synchronous Reluctance Machines

Room 140B – Level 100
Chairs: Gianmario Pellegrino, Yves Perriard

2:00PM | Effect of Step Skew in Synchronous Reluctance Machines for High Performance Applications [#474]
Md Sariful Islam, Amina Shrestha and Mohammad Islam
Halla Mechatronics, United States

2:25PM | Design Optimization and Comparison of PM-Assisted Synchronous Reluctance Machine using Different Magnet Combinations [#377]
Praveen Kumar, Qingqing Ma, Ali Al-Qarni, Towhid Chowdhury and Ayman EL-Refaie
Marquette University, United States

2:50PM | Synchronous Reluctance Machines for Low Torque Ripple Requiring Applications [#1316]
Mazharul Chowdhury, Mohammad Islam and Iqbal Husain
NC State University, United States; Halla Mechatronics, United States

3:15PM | Design and Analysis of Line-Start Synchronous Reluctance Motor Considering the Maximum Inertia and Power Factor [#1313]
Kim Hyunwoo, Ahn Jungho, Kim Jeongwon, Yun Inyeol, Kang Junho and Lee Ju
Hanyang University, Korea, Republic of

Session S89 | Induction Motor Drives

Room 140C – Level 100
Chairs: Jiangang Hu, Arshiah Mirza

2:00PM | Stable and Passive Observer-Based V/Hz Control for Induction Motors [#637]
Lauri Tiitinen, Marko Hinkkanen and Lennart Harnefors
Aalto University, Finland; ABB Corporate Research, Sweden

2:25PM | Control of a Five-Phase Induction Motor Drive with High-Torque Density and Voltage Overmodulation [#1231]
Luca Vancini, Michele Mengoni, Gabriele Rizzoli, Luca Zarri and Angelo Tani
University of Bologna, Italy

2:50PM | Stator and Rotor Temperatures Estimation in Three-Phase Open-ended Winding Induction Motor Drives [#556]
Daniele Cremente, Luigi Danilo Tornello, Salvatore Foti, Giacomo Scelba, Antonio Testa and Giuseppe Scarcella
University of Catania, Italy; University of Messina, Italy

3:15PM | One New Terminal Reaching Law Based Sliding Mode with Direct Thrust Control for the Linear Induction Machines in Metro Transportation [#29]
Abdul Khalique Jnuejo, Wei Xu, Fayez F. M. El-Sousy, Ashfaque Ahmed Hashmani, Moustafa Magdi and Mohamed G. Hussien
Department of Electrical Engineering, Qaid-e-Awa, Pakistan; State Key Laboratory of Advanced Electromagnetic, China; Prince Sattam bin Abdulaziz University, College, Saudi Arabia; Electrical Engineering, Mehran University of Eng, Pakistan; Electrical Engineering Department, Faculty of En, Egypt; Department of Electrical Power and Machines Engi, Egypt

Session S90 | Diagnostics, Noise and Vibration in Electric Machines II

Room 140D – Level 100
Chairs: David Reigosa, Thomas Wolbank

2:00PM | Fault Detection and Severity Assessment in PMSMs Using Search Coils Exploiting Machine Symmetry [#1110]
Marcos Orviz, David Reigosa, Hyeon-Jun Lee, Jigyun Jeong, Sang Bin Lee and Fernando Briz
Universidad de Oviedo, Spain; Korea University, Korea, Republic of

2:25PM | Critical Aspects of Demagnetization Faults in Direct Drive Permanent Magnet Generators for Renewables [#10]
Konstantinos Gyftakis, Giorgos Skarmoutsos, Ignacio Barajas-Solano, Joe Burchell and Markus Mueller
University of Edinburgh, United Kingdom; Vivid Science, United Kingdom

2:50PM | E-motor NVH Analysis for PWM Induced Current Ripples in EV Applications [#763]
Cheng Gong, Peng Zhang, Song He and Gautam G.S.J.
General Motors, United States; Tata Consultancy Services, India

3:15PM | Hybrid Torque Sensing Concept for High Frequency and Dynamic Torque Ripple Measurements for Brushless dc Motors [#410]
Johannes Stoss, Benedikt Schmitz-Rode, Linus Niklaus, Andreas Liske and Marc Hiller
Karlsruhe Institute of Technology (KIT), Germany

Session S91 | Battery Charging System

Room 140E – Level 100
Chairs: Phillip Kollmeyer, Mehdi Zadeh

2:00PM | Analysis and Conceptualization of a Single-Phase Buck-Boost Integrated EV On-Board Charger Based on a Double Bridge Inverter Drive System [#1032]
Davide Cittanti, Enrico Vico, Fabio Mandrile, Eric Armando and Radu Bojoi
Politecnico di Torino, Italy

2:25PM | Analysis and Design of Soft-Switching Single-Stage Single-Phase PFC Converter for Bidirectional Plug-in EV Charger [#860]
Nil Patel, Luiz Lopes and Akshay Kumar Rathore
Concordia University, Canada; Singapore Institute of Technology, Singapore

2:50PM | Diode Current Reduction Method of Three-Phase Boost PFC Converter with Semi-Bridgeless PFC Diode [#1311]
Jeongjun Seo, Yonghee Lee and Jungik Ha
Seoul National University, Korea (South); LG Innotek Co. Ltd., Korea (South)

3:15PM | Supercapacitor and Bidirectional DC-DC Converter-based Active Charge Balancing Scheme for Lithium-ion Batteries [#189]
Akash Samanta, Alvin Huynh, Mohit Sharma, Vinicius Marcis and Sheldon Williamson
Graduate Research Scholar, Canada; Graduate Student, Canada; Associate Manager(R&D), India; Professor and Canada Research Chair, Canada

Session S92 | Converters for Microgrid II

Room 140F – Level 100
Chairs: Aswad Adib, Ali Khajehoddin

2:00PM | Aggregated Emulation of Multiple Converters with Heterogeneous Dynamics in Low-Voltage Microgrids - A Clustering Approach [#812]
Yubo Song, Subham Sahoo, Yongheng Yang, Frede Blaabjerg and Yun Wei Li
Aalborg University, Denmark; Zhejiang University, China; University of Alberta, Canada

2:25PM | Multi-Agent Deep Reinforcement Learning for Decentralized Voltage-Var Control in Distribution Power System [#1410]
Mengfan Zhang, Qianwen Xu, Sindri Magnusson, Robert Pilawa-Podgurski and Guodong Guo
KTH Royal Institute of Technology, Sweden; Stockholm University, Sweden; University of California, Berkeley, United States; North China Electric Power University, China

2:50PM | A Converter-Based Battery Energy Storage System Emulator for the Controller Testing of a Microgrid with Dynamic Boundaries and Multiple Source Locations [#1091]
Dingrui Li, Yiwei Ma, Chengwen Zhang, He Yin, Yu Su, Lin Zhu, Fred Wang and Leon M Tolbert
University of Tennessee, United States

3:15PM | Unified Control Method for Seamless Transition of a Weak Grid Connected AC Microgrid to Islanded Mode [#1324]
Mehrnaz Madadi, Subhashish Bhattacharya and Ke Zou
North Carolina State University, United States; Ford motor company, United States

Session S93 | Photovoltaic Converter Control and Hardware Enhancement Features

Room 140G – Level 100
Chairs: Dorai Yelaverthi, Rolando Burgos

2:00PM | Adaptive Internal Model based Current Control with Embedded Active Damping of a Three-Phase Grid Connected Inverter with LCL Filter for PV Application [#1294]
Vikram Roy Chowdhury and Akanksha Singh
National Renewable Energy Laboratory, United States

2:25PM | A Nonlinear Direct Power Controller for a Three-phase Grid Connected Inverter with Online Parameter Update for PV Application [#1291]
Vikram Roy Chowdhury and Akanksha Singh
National Renewable Energy Laboratory, United States

2:50PM | A Modular Step-up PV Converter With Coupled Output Power Balancers Utilizing A New Fully Soft-switched Active Voltage Quadrupler (AVQ) [#1122]
Kajanan Kanathipan and John Lam
York University, Canada

3:15PM | Power Electronic Hardware-in-the-Loop (PE-HIL): Testing Individual Controllers in Large-Scale Power Electronics Systems [#1023]
Suman Debnath, Phani R V Marthi, Zerui Dong, Qianxue Xia and Sudipta Chakraborty
Oak Ridge National Laboratory, United States; Opal-RT Corporation, United States; Georgia Institute of Technology, United States; Opal-RT Technologies, United States

Session S94 | Grid Interactive Inverters

Room 250A – Level 200
Chairs: Zahra Saadatizadeh, Carl Ho

2:00PM | Inductor Core Loss Estimation and Comparison of Modulations Achieving ZVS for High- Frequency DCM Grid-tied Inverters [#1389]
Cheng Huang, Rintaro Shimada, Tomoyuki Mannen and Takanori Isobe
University of Tsukuba, Japan

2:25PM | Half Bridge Current Source Inverter Topology for Grid-Connected Applications [#621]
Reza Alavi and Ho Carl
University of Manitoba, Canada

2:50PM | Dynamic Phasor-Based Modeling and Analysis of Selective Harmonic Compensated Single-Phase Grid-Forming Inverter Connected to Nonlinear and Resistive Loads [#786]
Udoka Chile Nwaneto and Andrew M. Knight
University of Calgary, Canada

3:15PM | An Improved High-Resolution Wide Bandwidth ANPC Converter using VLMM and Lyapunov Stability Theory for Grid-Connected Applications [#654]
Mohammad Babaie, Mostafa Abarzadeh and Al-Haddad Kamal
Ecole de technologie superieure, Canada; SmartD Technologies Inc., Canada

Session S95 | Power Converter Stability I

Room 250B – Level 200
Chairs: Giacomo Scelba, Fei Lu

2:00PM | Simplified Stability Analysis Method for Multiple Servo Drive System Connected to Common DC Bus Line [#665]
Katsuki Miura, Hiroki Watanabe, Keisuke Kusaka, Jun-ichi Itoh, Takeshi Kiribuchi and Hiroyuki Tokusaki
Nagaoka University of Technology, Japan; OMRON Corporation, Japan

2:25PM | A Cascaded Power Controller for Robust Frequency Ride-Through of Grid-Forming Converters [#281]
Paul Imgart, Anant Narula, Massimo Bongiorno, Mebtu Beza and Jan Svensson
Chalmers University of Technology, Sweden; Hitachi Energy, Hitachi Energy Research, Sweden

2:50PM | Impact of the Cascaded DC-DC Converter on the D-Q Impedance of a PFC Converter [#313]
Qing Lin, Bo Wen, Rolando Burgos, Xiong Li and Qiong Wang
CPES, Virginia Tech, United States; Google, United States

3:15PM | Active Damping of Power Control for Grid-Forming Inverters in LC Resonant Grids [#297]
Shiyi Liu, Heng Wu, Xiongfei Wang, Theo Bosma, Jos van der Burgt, Ganesh Sauba and Ravi Singh
DNV and Aalborg University, Denmark; Aalborg University, Denmark; DNV, Netherlands

Session S96 | Measurements, Testing and Standards III

Room 250C – Level 200
Chairs: Jinia Roy, Xuzhen Huang

2:00PM Vibration Monitoring of Power Transformer based on Ultra-Sensitive Fiber Optic Sensors [#306]
Nageswara Lalam, Brandon Grainger, Dolendra Karki, Ruishu Wright, Khurram Naeem and Paul Ohodnicki
National Energy Technology Laboratory, United States; University of Pittsburgh, United States

2:25PM | Shielding Technique for Noise Reduction in Hall-Effect Current Sensor of Voltage Source Inverter [#336]
Jiwon Yoo, Yoon-Ro Lee, Hwigon Kim and Seung-Ki Sul
Seoul National University, Korea (South)

2:50PM | Synchronized Micro-Controllers-based Data Acquisition System for Energy Plants using Modbus Protocol [#197]
Maeva Courcelle, Dustin Kottonau and Giovanni De Carne
Karlsruhe Institute of Technology, Germany

3:15PM | Combinational Rogowski Coil with Enhanced DC Measurement Capability for Double Pulse Test Applications [#974]
Sadia Binte Sohid, Han Cui, Wen Zhang, Fred Wang and Bernhard Holzinger
University of Tennessee Knoxville, United States; Keysight Technologies, Germany

Session S97 | Design Optimization and Loss Minimization Studies

Room 251A – Level 200
Chairs: Tarisciotti Luca, Omid Beik

2:00PM | Influence of Layout Parasitics and its Optimization in Two-Level Gallium-Nitride Based Current Source Inverter [#1174]
Mustafeez ul Hassan and Fang Luo
Stony Brook University, United States

2:25PM | Hybrid Phase-Frequency Control-enabled Global Loss Minimization of a Full- Bridge LLC Converter under Wide Gain and Load-range Operation [#645]
Naveed Ishraq, Saikat Dey and Ayan Mallik
Arizona State University, United States

2:50PM | Optimization and Co-design of a 2-MHz GaN-based 700W LLC Converter [#646]
Nitish Jolly, Ashwin Chandwani, Osarogie Purr Irabor and Ayan Mallik
Arizona State University, United States

3:15PM | Extended InC MPPT Control for Phase-Shifted Dual-Input LLC Converter [#990]
Abdullah Alhatlani, Sumana Ghosh and Issa Batarseh
Imam Mohammad Ibn Saud Islamic University, Saudi Arabia; University of Central Florida, United States

Session S98 | Magnetic Design for Isolated DC-DC Converters

Room 251B/C – Level 200
Chairs: Marcos Alonso, Mahshid Amirabadi

2:00PM | New Hybrid Model for Evaluating the Frequency-Dependent Leakage Inductance of a Variable Inductance Transformer (VIT) [#76]
Angshuman Sharma and Jonathan W. Kimball
Missouri University of Science and Technology, United States

2:25PM | Analysis and Design of a Multiport Resonant DC Transformer for Solid-State Transformer Applications [#370]
Thiago Pereira, Yuqi Wei, Homer A. Mantooth and Marco Liserre
Kiel University, Germany; University of Arkansas, United States

2:50PM | Multi-Objective-Optimized Parameter Design Method for High-frequency Resonant Converters [#947]
Ling Gu, He Fan, Zhiyu Jin and Da Xu
Nanjing University of Science and Technology, China

3:15PM | A Single Stage 950 V to 7V DC/DC Modified Flyback Converter Topology [#1255]
Shubham Srivastava, Mandeep Singh Rana and Santanu K. Mishra
IIT Kanpur, India

Session S99 | Circuit Design with Silicon Carbide MOSFETS

Room 252A/B – Level 200
Chairs: Alan Mantooth, Srivatsa Raghunath

2:00PM | Digital Active Gate Driving System for Paralleled SiC MOSFETs with Closed-loop Current Balancing Control [#743]
Liyang Du, Yuqi Wei, Xia Du, Andrea Stratta, Zahra Saadatizadeh and Alan Mantooth
University of Arkansas, United States

2:25PM | Gate Driver Power Supply for Medium Voltage SiC Mosfets with Air Core Transformer [#695]
Juan Sabate, Eladio Delgado and Maja Harfman-Todorovic
GE Research, United States

2:50PM | A Physics-based Simscape Compact SiC Power MOSFET Model with Temperature-Scaling [#994]
Abu Shahir Md Khalid Hasan, Md Maksudul Hossain and H. Alan Mantooth
University of Arkansas, United States

3:15PM | Understanding PCB Design Parameters for Optimal Thermal Performance of Surface-Mount SiC MOSFETs [#353]
Zheng An, Dorai Yelaverthi, Chunmeng Xu and Xiaoqing Song
Georgia Institute of Technology, United States; ABB US Research Center, United States

Wednesday, October 12 4:00PM–5:40PM

Session S100 | Interior Permanent Magnet Machines

Room 140B – Level 100
Chairs: Rukmi Dutta, Takashi Kato

4:00PM | Design, Analysis and Experimental Evaluation of a Novel High-Speed High-Power Ferrite IPM Machine for Traction Applications [#679]
Khoa Dang Hoang, Anshan Yu, Sana Ullah, Kais Atallah, Giorgio Valente and Annabel Shahaj
The University of Huddersfield, United Kingdom; Altair China, China; The University of Newcastle, United Kingdom; The University of Sheffield, United Kingdom; Hexagon System Dynamics, United Kingdom

4:25PM | Trade Study for Rare-Earth-Free Interior Permanent Magnet Synchronous Machine using MnBi Permanent Magnets [#117]
Ryan Brody, Paul Ohodnicki, Mohendro Ghosh, Ahmed Talaat, Cuauhtemoc Macias, Jun Cui, Andrew Sherman and Brandon Grainger
University of Pittsburgh, United States; Iowa State University, United States; Powdermet Inc., United States

4:50PM | Effect of Stray Magnetic Field on Position Sensor Used in Permanent Magnet Synchronous Machine (PMSM) Drive for Propulsion System [#591]
William Jensen, Mazharul Chowdhury, Jihyun Kim and Brian Gallert
General Motors, United States

Session S101 | Medium Voltage and High-Power Drives

Room 140C – Level 100
Chairs: Jun Wang, Mohammed Agamy

4:00PM | Three-Level Optimized Pulse Patterns With Reduced Common-Mode Voltage [#111]
Isavella Koukoula, Petros Karamanakos and Tobias Geyer
Tampere University, Finland; ABB Systems Drives, Switzerland

4:25PM | Gradient-Based Predictive Pulse Pattern Control with Active Neutral Point Balancing for Three- Level Inverter Medium-Voltage Drives [#894]
Mirza Abdul Waris Begh, Petros Karamanakos and Tobias Geyer
Tampere University, Finland; ABB System Drives, Switzerland

4:50PM | A New Reduced Power Cell for Regenerative Cascaded H-Bridge Motor Drives [#656]
Doho Kang, Zhituo Ni, Sarah Badawi, Mehdi Narimani, George Cheng and Navid Zargari
McMaster University, Canada; Rockwell Automation, Canada

Session S102 | Switched Reluctance and Flux Switching Machines II

Room 140D – Level 100
Chairs: Lavanya Vadamodala, Roy McCann

4:00PM | Magnetic Flux Path and Inductance Analysis of Flux-Switching Machines with Different Field and Armature Winding Configurations [#1300]
Mostafa Fereydoonian, Dheeraj Bobba and Woongkul Lee
Michigan State University, United States; Powersys-Solutions, United States

4:25PM | Experimental Investigations on 10,000-RPM Slitted-Rotor Switched Reluctance Machine [#1026]
Syed Shahjahan Ahmad, Anupam Verma, Mouli Thirumalasetty, Vijai Biradar, Gopalaratnam Narayanan and Pramod Kumar
Indian Institute of Science, India

4:50PM | Optimization Comparison of DC-Excited Vernier Reluctance Machine Synchronous Condensers [#406]
Abraham Botes and Maarten J. Kamper
University of Stellenbosch, South Africa

Session S103 | Battery System

Room 140E – Level 100
Chairs: Woongkul Lee, Shuvajit Das

4:00PM | Maximum Current Limit Equalization by Phase-Shift Control of Multi-Active Half- Bridge Equalizer [#1047]
Manish Milind Tathode, Shimul Kumar Dam, Baiju Payyappilly, Vinod John and Utsab Kundu
EE Department, Indian Institute of Science, India; University of Tennesse, United States; UR Rao Satellite Centre, ISRO, India

4:25PM | Realtime Internal-Impedance Measurement of Li-ion Battery Using Discrete-Interval-Binary- Sequence Injection [#61]
Minh Tran, Tomi Roinila and Joni Markkula
Tampere University, Finland

4:50PM | Multi-Loop Control of Hybrid Li-ion Battery Packs Using the Auxiliary DC Bus for State-of- Charge Regulation [#772]
Marium Rasheed, Craig Simpson, Hongjie Wang and Regan Zane
Utah State University, United States

Session S104 | Power Converters for Grid Support

Room 140F – Level 100
Chairs: Ma Awal, Khorshed Alam

4:00PM | A Low-Voltage-Ride-Through Strategy for Grid-Forming Converters Based on Reactive Power Synchronization [#138]
Han Deng, Yang Qi, Jingyang Fang, Vincent Debusschere and Yi Tang
Nanyang Technological University, Singapore; Northwestern Polytechnic University, China; Shandong University, China; University of Grenoble Alpes, France

4:25PM | Estimated Load Current Feedforward Method for DC-DC Converter to Improve DC Bus Voltage Regulation in a Multi-Port Converter Based System [#1244]
Md Rashed Hassan Bipu, Siye Cen and Iqbal Husain
North Carolina State University, United States

4:50PM | Control and Grid Support Function Evaluation for a Three-phase Back to Back Modular Multilevel Converter System [#1280]
Vikram Roy Chowdhury, Akanksha Singh and Barry Mather
National Renewable Energy Laboratory, United States

Session S105 | DC-DC Converters for Renewable Energy

Room 140G – Level 100
Chairs: Debanjan Chatterjee, Regan Zane

4:00PM | Analysis of Dual Phase-shifted Full-bridge Converter with Modular Asymmetry [#1360]
P. Roja and Vinod John
Indian Institute of Science, Bangalore, India

4:25PM | SiC-based Isolated Three-port DC-DC Converter Implementation for Medium Voltage Microgrid Applications [#1080]
Osamah Aljumah, Semih Isik, Sulaiman Alshammari and Subhashish Bhattacharya
North Carolina State University, United States

4:50PM | Analysis and Design of LLC Based Dual Half Active Bridge Resonant Converter [#1022]
Prakash Ji Barnawal, Vivek Nandan Lal and Rajeev Kumar Singh
Indian Institute of Technology(BHU), Varanasi, India

Session S106 | Inverters for High-Power Industrial Applications

Room 250A – Level 200
Chairs: Cristian Blanco Charro, Fei Lu

4:00PM | Hardware Implementation of a SiC Three-Phase Four-Leg VSI with Sigma-Delta Modulation to Comply with the Military Standards 1399 and 461 [#1425]
Matthew Storm, Alexander Julian and Giovanna Oriti
Naval Postgraduate School, United States; Consultant, United States

4:25PM | Design of Rogowski Coil Current Sensor Integrated with Busbar and Gate Driver for 211 kW Three-Level T-Type Inverter [#1061]
Xingchen Zhao, Ripun Phukan, Che-Wei Chang, Dong Dong, Rolando Burgos, Arnaud Plat and Debbou Mustapha
Virginia Tech, United States; Virginia Tech, United States; Airbus, France

4:50PM | Loss Analysis and Experimental Evaluation of a Si-IGBT Based ARCP Inverter [#865]
Eddy Aeloiza, Weiqiang Chen, Veli-Matti Leppanen and Tero Viitanen
ABB, United States; ABB, Finland

Session S107 | Reliability, Diagnostics and Fault Analysis of Power Converters II

Room 250B – Level 200
Chairs: Marco di Benedetto, Rangarajan Tallam

4:00PM | A Half-Bridge On-State Voltage Sensor for In-Situ Measurements [#1116]
Chondon Roy, Namwon Kim, Daniel Evans, Ali Parsa Sirat, James Gafford and Babak Parkhideh
University of North Carolina at Charlotte, United States; Oak Ridge National Laboratory, United States

4:25PM | Rogowski-pair Sensor for High-speed Switch Current Measurements without Reset Requirement [#1223]
Ali Parsa Sirat, Hossein Niakan, Chondon Roy and Babak Parkhideh
University of North Carolina at Charlotte, United States

4:50PM | Digital Twin based Real-Time Analysis of DC-DC Boost Converters [#1380]
Giulia Di Nezio, Marco Di Benedetto, Alessandro Lidozzi and Luca Solero
Roma Tre University, Italy

Session S108 | Big Data, Machine Learning and AI Applications in Energy Systems

Room 250C – Level 200
Chairs: Yan Li, Subham Sahoo

4:00PM | Audio Data-driven Anomaly Detection for Induction Motor Based on Generative Adversarial Networks [#919]
Jaehoon Shim, Taesuk Joung, Sangwon Lee and Jung-Ik Ha
Seoul National University, Korea (South)

4:25PM | Impedance Mapping in Smart Grids with Dynamic Mode Decomposition [#1081]
Gregory Baltas, Ngoc Bao Lai, Carlos Sabillon, Jun Cao and Pedro Rodriguez
Luxembourg Institute of Science and Technology, Luxembourg; Loyola UniversityAndalusia, Spain

4:50PM | Convolutional Neural Network Based Metal Object Detection System for Wireless EV Charging [#104]
Chengyin Liu, Hao Chen, Zeqian Cheng, Yizhen Lin, Jiande Wu and Xiangning He
Zhejiang University, China; China Tobacco Zhejiang industrial co, .LTD, China

Session S109 | Control of Power Converters II

Room 251A – Level 200
Chairs: Marko Hinkkanen, Mengqi Wang

4:00PM | An Optimized Start-up Scheme for Isolated Cascaded AC/DC Power Converters [#1240]
Garry Jean-Pierre, Vasistha Burugula, Awneesh Tripathi and Vijay Bhavaraju
Eaton Research Labs, United States; FREEDM Lab, United States

4:25PM | Double-Sided Control of DC-link Voltage in Back-to-Back Converters [#563]
Ziya Ozkan, Dao Zhou and Frede Blaabjerg
PostDoc, Denmark; Associate Professor, Denmark; Professor, Denmark

4:50PM | Real-Time Adaptive Control for Three-Phase Boost Rectifier Under Wide Load Variations. [#1431]
Shyamal Shivneel Chand, Dhirendran Kumar, Marco Di Benedetto, Ravneel Prasad, Hiye Mudaliar, Alessandro Lidozzi, Luca Solero and Maurizio Cirrincione
University of the South Pacific, Fiji; Roma Tre University, Italy; University of Palermo, Fiji; ROMA TRE University, Italy

Session S110 | Isolated DC-DC Converters with Dual Active Bridges

Room 251B/C – Level 200
Chairs: Regan Zane, Amirnasser Yazdani

4:00PM | Modeling and Soft-Switching Operation of an Isolated Modular-Multilevel-Converter-Based DC- DC Converter [#1162]
Hossein Saeedifard and Amirnaser Yazdani
Ryerson University, Canada

4:25PM | Reconfigurable Bidirectional DC-DC Converter for Electric Vehicle Onboard Charging Applications [#1029]
Ramana Manohar Reddy and Das Moumita
IIT Mandi, India

4:50PM | Investigation of the Five-level Hybrid Active NPC-based Dual-Active-Bridge Converter for EV Battery Charging Applications [#975]
Satish Belkhode, Gautam Ratanpuri, Suman Mandal, Anshuman Shukla and Suryanarayana Doolla
Indian Institute of Technology Bombay, India

Session S111 | Transformer Design and Isolation Materials

Room 252A/B – Level 200
Chairs: Robert Cuzner, Debanjan Chatterjee

4:00PM | Planar Structure High-Frequency Transformer Design for Medium Voltage Applications [#847]
Ruxi Wang, Zhiyu Shen, Chi Zhang, Boyi Zhang and Barbosa Peter
Delta Electronics, United States

4:25PM | Insulation Design for a Compact, Medium-Voltage Transformer [#1268]
Sharifa Sharfeldden, Ravisekhar Raju and Christina Dimarino
Virginia Polytechnic Institute & State Universit, United States; Fastwatt LLC, United States

4:50PM | Calculation of Transformer Leakage Flux by Simplified Flux Path Geometries [#1386]
Richard Beddingfield, Alex Leary, Ronald Noebe, Mark Nations, Randy Bowman and Subhashish Bhattacharya
North Carolina State Univesity, United States; NASA Glenn Research Center, United States; Nasa Glenn Research Center, United States

Thursday, October 13 8:30AM–10:10AM

Session S112 | IPM and Synchronous Reluctance Machines

Room 140B – Level 100
Chairs: Luigi Alberti, Thomas Jahns

8:30AM | Identification and Inversion of the Non-Linear Magnetic Model of Anisotropic Synchronous Machines [#1396]
Shafiq Odhano and Barrie Mecrow
Newcastle University, United Kingdom

8:55AM | Performance Evaluation of Dual 3-Phase Permanent Magnet Assisted Synchronous Reluctance Machines under Faults [#629]
Md Sariful Islam, Amina Shrestha and Mohammad Islam
Halla Mechatronics, United States

9:20AM | Feasible Operating Regime of a Triple Three Phase Synchronous Reluctance Motor using Field Analysis [#1191]
Musayyibi Shuaibu and Joseph Olorunfemi Ojo
Tennessee Tech University, United States

9:45AM | A Proposal of Hybrid Excitation Variable Flux Memory Motor Having Field Winding with Magnetization Function in the Rotor [#604]
Keito Yokomichi, Ren Tsunata, Masatsugu Takemoto and Jun Imai
Okayama University, Japan

Session S113 | Monitoring, Diagnostics, Reliability and EMI

Room 140C – Level 100
Chairs: Weiqiang Chen, Peng Han

8:30AM | Generalized Roughness Bearing Fault Diagnosis Using Time Series Analysis and Gradient Boosted Tree [#1301]
Mojtaba Afshar, Mehrdada Heydarzadeh and Bilal Akin
Dept. Elec. Eng. University of Texas at Dallas, United States

8:55AM | Methods for Reduced Computation Time for Frequency-Domain Evaluation Of Transient Voltage Effects In Electric Machines [#362]
Bianca Wex, Wolfgang Gruber and Siegfried Silber
Linz Center of Mechatronics, Austria; Johannes Kepler UniversityLinz, Austria

9:20AM | Fault-Tolerant Control of a Dual Three-Phase Interior PMSM Under Open-Phase Faults [#1395]
Marcos Orviz, Diego F. Laborda, Juan Manuel Guerrero and David Reigosa
Universidad de Oviedo, Spain

9:45AM | Degradation Monitoring of Power Modules Based on Frequency-Domain Thermal Model [#456]
Ke Ma, Quan Zhong, Mengqi Xu, Dingyi Wang, Haoran Wang and Shengming Wang
Shanghai Jiaotong University, China; Hefei University of Technology, China; Sungrow Power Supply Co., Ltd, China

Session S114 | Switched Reluctance and Flux Switching Machines III

Room 140D – Level 100
Chairs: Lavanya Vadamodala, Roy McCann

8:30AM | Fast Optimization of a Switched Reluctance Motor for 2W-EV Using Combined Surrogate Model and Multi-Objective Optimization [#905]
Farha Siddique, Bhim Singh and Sharankumar Shastri
Indian Institute of Technology Delhi, India

8:55AM | A Modified Geometry Based Analytical Model of Switched Reluctance Machines for Rapid Design Process [#1002]
Lavanya Vadamodala, Shuvajit Das, Anik Chowdhury and Yilmaz Sozer
Altair Inc, United States; University of Akron, United States

9:20AM | Modeling and Optimization for Self-Cooling of FSPM Machine with Airfoil-Shaped Rotor using Axial and Radial Inlets [#832]
Leyue Zhang, Josh Schroeder, Justin Paddock, Gregory Nellis and Bulent Sarlioglu
University of Wisconsin-Madison, United States

9:45AM | Offline Current Profiling Schemes for Torque Ripple Reduction in Mutually Coupled Switched Reluctance Machines Using a Three-Phase Voltage Source Converter [#1254]
Kun Hu and Jin Ye
University of Georgia, United States

Session S115 | Electrified Aerial Vehicles

Room 140E – Level 100
Chairs: Babak Nahid-Mobarakeh, Md Sariful Islam

8:30AM | High-Reliability Converter with Silicone-coating Insulation Architecture for Electric Aircraft [#782]
Hiroshi Kamizuma, Hisashi Morooka, Ryo Moteki, Kimihisa Furukawa, Yuichi Mabuchi and Kinya Nakatsu
Hitachi, Ltd. Research & Development Group, Japan

8:55AM | Solar Array Regulation for High-voltage Satellite Power Bus [#509]
Ausias Garrigos, David Marroqui, Jose Manuel Blanes, Carlos Orts, Pablo Casado and Cristian Torres
Miguel Hernandez University of Elche, Spain

9:20AM | Reliability-Oriented Multi-Objective Design Optimization of Electric Aircraft Propulsion Drives [#713]
Benjamin Luckett and JiangBiao He
University of Kentucky, United States

9:45AM | Distributed Back-EMF-based Position Self-Sensing of Fault-Tolerant Permanent Magnet Modular Motor Drives for Electrical Aircraft Propulsion [#766]
Hao Zeng, Thomas Jahns and Bulent Sarlioglu
University of Wisconsin - Madison, United States

Session S116 | Devices V2G Applications

Room 140F – Level 100
Chairs: Alireza Fatemi, Marzieh Karami

8:30AM | η_{max}-Charging Strategy for Lithium-Ion Batteries of EVs in V2G Applications [#829]
Hamzeh Beiranvand, Nicola Blasuttigh, Thiago Pereira, Sandra Hansen geb. Noehren, Helge Krueger, Marco Liserre and Alessandro Massi Pavan
Kiel University, Germany; University of Trieste, Italy

8:55AM | Design and Implementation of a Hardware Test-bed for Real-time EV-Grid Integration Analysis [#1347]
Emin Ucer and Mithat Kisacikoglu
National Renewable Energy Laboratory, United States

9:20AM | Efficiency Trade-off-Oriented Analysis for the Integration of DC-DC Converter and Battery Pack in V2G Applications [#731]
Nicola Blasuttigh, Hamzeh Beiranvand, Thiago Pereira, Simone Castellan and Marco Liserre
University of Trieste, Italy; Kiel University, Germany

9:45AM | A Novel Multilevel EV Charging Station Based on the Parallel Hybrid Converter and Dual Active Bridge [#1098]
Nikhil Suresh Patil, Ibhan Chand Rath, Mohd Shadab Ansari and Anshuman Shukla
Indian Institute of Technology Bombay, India

Session S117 | Emerging High Power Converters and Monitoring Techniques

Room 140G – Level 100
Chairs: Dong Dong, Qianwen Xu

8:30AM | A 75 kVA Intelligent Power Stages (IPS) Unit Design for Future Grid-interface Application [#963]
Yuliang Cao, Yijie Bai, Vladimir Mitrovic, Boran Fan, Dong Dong, Rolando Burgos, Dushan Boroyevich, Radha Krishna Moorthy and Madhu Sudhan Chinthavali
Virginia Tech, CPES, United States; Oak Ridge National Laboratory, United States

8:55AM | A Unidirectional Single-Phase LLC Based High Frequency Link Inverter [#350]
Anirban Pal, Vishal Anand A. G., Bala Subrahmanyam Kuchibhatla and Kaushik Basu
University of Nottingham, United Kingdom; Bloom Energy (I) Pvt Ltd., India; Indian Institute of Science, Bangalore, India

9:20AM | Real-time Condition Monitoring of Power Modules in Grid-tied Power Converter [#1249]
Junchong Fan, Dihao Ma, Jin Wang, Madhu Chinthavali and Radha Moorthy
The Ohio State University, United States; Oak Ridge National Laboratory, United States

9:45AM | Automated Detection of Failures in Doubly-Fed Induction Generators for Wind Turbine Applications [#90]
Byambasuren Battulga, Muhammad Faizan Shaikh, Sang Bin Lee and Mohamed Osama
Korea University, Korea, Republic of; General Electric Company, Germany

Session S118 | Low Power Converters for Industrial Applications

Room 250A – Level 200
Chairs: Fang Luo, Utsab Kundu

8:30AM | Tuned Three-Level Flying Capacitor Power Amplifier for Visible Light Communication [#480]
Juan R. Garcia-Mere, Juan Rodriguez, Diego G. Lamar and Javier Sebastian
University of Oviedo, Spain

8:55AM | Ultra-Low Frequency DC-DC Converters Using Switched Batteries [#83]
Emeric Perez, Carlos-Augusto Berlitz, Yasser Moursy, Bruno Allard, Sami Oukassi and Gael Pillonnet
Univ. Grenoble Alpes, CEA, LETI, France; INSA Lyon, CNRS, Laboratoire Ampere, France

9:20AM | Active Reactance Control for Output Voltage Regulation in Wireless Power Transfer [#536]
Junhyeong Lee and Jung-Ik Ha
Seoul National University, Korea (South)

9:45AM | PWM Inverter-based High Frequency AC Power Architecture for Space Application [#761]
Surjakanta Mazumder, Deekshith V Prabhu, Prachin Kumar Chahar, Utsab Kundu, Pradeep K Peter and Kaushik Basu
Indian Institute of Science, Bangalore, India; U R Rao Satellite Centre, Bangalore, India

Session S119 | Power Semiconductor Reliability and Diagnostics

Room 250B – Level 200
Chairs: Rangarajan Tallam, Yunting Liu

8:30AM | On the Effect of SiC Power MOSFET Gate Oxide Degradation in High Frequency Phase Leg- Based Applications [#1377]
Javad Naghibi, Sadegh Mohsenzade, Kamyar Mehran, Iqbal Saqib and Martin Foster
Queen Mary University of London, United Kingdom; K. N. Toosi University of Technology, Iran; The University of Sheffield, United Kingdom

8:55AM | Optimizing Sensor Count and Placement to Detect Bond Wire Lift-offs and Surface Defects in High-Power IGBT Modules Using Low-Cost Piezo-electric Resonators [#827]
Tohfa Haque, Abu Hanif and Faisal Khan
University of Missouri Kansas City, United States

9:20AM | Single Chip Junction Temperature Measurement for Paralleled SiC MOSFETs in Conduction Mode [#508]
Manuel Riefer, Jonathan Winkler, Sebastian Strache and Ingmar Kallfass
Robert Bosch GmbH, University of Stuttgart, Germany; Robert Bosch GmbH, Germany; University of Stuttgart, Germany

9:45AM | Methodology of Gate Voltage Selection for Power Loss Manipulation of Power Semiconductor Device [#999]
Abhishek Chanekar, Nachiketa Deshmukh, Abhinav Arya and Sandeep Anand
Indian Institute of Technology Bombay, India; Indian Institute of Technology Kanpur, India

Session S120 | Magnetics

Room 250C – Level 200
Chairs: Paul Ohodnicki, Adam Skorek

8:30AM | Reduction Methodology of Eddy Losses in Ferrite Cores for High-Frequency Transformers Based on Loss-Effective Conductivity Extraction [#238]
Zheyuan Yi, Kai Sun, Hanyu Liu and Quanliang Zhang
Tsinghua University, China; Delta Electronics Shanghai Co. Ltd., China

8:55AM | Design of Variable Air-Core Coupled Co-axial Solenoidal Inductors [#1133]
Ujjwal Pratik and Zeljko Pantic
North Carolina State University, United States

9:20AM | 3.5 kW/in3 Planar Coupled Inductor Design and Optimization for a 50 kW 3-level Four-Switch Buck-Boost (3L-FSBB) Converter [#969]
Yuliang Cao, Yijie Bai, Vladimir Mitrovic, Boran Fan, Dong Dong, Rolando Burgos, Dushan Boroyevich, Radha Krishna Moorthy and Madhu Sudhan Chinthavali
Virginia Tech, United States; virginia Tech, United States; Oak Ridge National Laboratory, United States

9:45AM | Partial Saturation in Permanent Magnet Inductors [#535]
Bradford Houska, Decheng Yan, Joseph Benzaquen and Deepak Divan
Georgia Institute of Technology, United States

Session S121 | Control of Power Converters III

Room 251A – Level 200
Chairs: Giacomo Scelba, Francesco Gennaro

8:30AM | Rapid Prototyping of Model Predictive Control in a Grid-Following Three-Phase Inverter to Meet the Conducted EMI Limits in MIL-STD-461G [#868]
Ethan Foster, Alexander Julian, Giovanna Oriti and Matthew Storm
Naval Postgraduate School, United States; Consultant, United States

8:55AM | Constant Delay-Line Repetitive Control Analysis for VSI Under Grid-Tied and Intentional Islanding Operation [#893]
Alessandro Faro, Marco Di Benedetto, Alessandro Lidozzi and Luca Solero
ROMA TRE University, C-PED, Italy

9:20AM | Low Voltage, Minimum Switch Count Second-Harmonic Filter for Single-Phase Converters [#1007]
Anwesha Mukhopadhyay and Vinod John
Indian Institute of Science, Bangalore, India

9:45AM | Simultaneous Measurement of Bus Impedance and Control Loop Gains in Multi-Converter Systems [#457]
Tomi Roinila, Hessamaldin Abdollahi, Roosa Sallinen, Khodamoradi Aram and Enrico Santi
Tampere University of Technology, Finland; University of South Carolina, United States; University of Padova, Italy; University of South Carolina, Finland

Session S122 | Modulation Strategies for Multi-Level Converters

Room 251B/C – Level 200
Chairs: Sandro Calligaro, Winway Chen

8:30AM | Modulation Strategy for Three-level Neutral-Point-Clamped Converter achieving Clamping Diodes Loss Control [#1056]
Xiang Lin and Dong Dong
Virginia Tech, United States; Virginia Tech, United States

8:55AM | Three-parts Modulation and Hybrid Balancing for Three-phase Five-level NPC Inverter [#1308]
Eshet Wodajo, Malik Elbuluk, Seungdeog Choi and Ashik Amin
University of Akron, United States; Mississippi state university, United States; Mississippi State University, United States

9:20AM | A Generalized Modulation Strategy for Cascaded H-bridge Multilevel Inverter Under Unequal DC Sources [#732]
Pascal Lingom, Joseph Song-Manguelle, Simon Pierre Betoka, Mamadou Lamine Doumbia, Jean- Maurice Nyobe-Yome and Jin Tao
University of Quebec at Trois-Rivieres, Canada; Oak Ridge National Laboratory, United States; National Higher Polytechnic School of Douala, Cameroon; Department of Electrical Engineering and Automat, China

9:45AM | Quasi-3-Level Modulation of Multilevel Nested-T Topology [#411]
Wasi Haider Ali, Anatolii Tcai and Thiwanka Wijekoon
OTH Regensburg, Germany; Huawei Technologies, Germany

Session S123 | High Power Module Design

Room 252A/B – Level 200
Chairs: Christina DiMarino, Fang Luo

8:30AM | A 650 V, 2.1 mohm GaN Half-bridge Power Module for 400V EV Traction Inverter Application [#134]
Peng Han, Pengkun Liu, Qingyun Huang, Zibo Chen and Alex Huang
The University of Texas at Austin, United States

8:55AM | A New Package for SiC Power Modules with Ceramic Heatsink [#115]
Zhaobo Zhang, Xibo Yuan and Lihong Xie
University of Bristol, United Kingdom

9:20AM | Demonstration of Wire bondless Silicon Carbide Power Module with Integrated LTCC Jet Impingement Cooler [#1297]
Hao Chen, Tiwei Wei, Xiaoling Li, Yuxiang Chen, Yujui Lin, Sudharsan Chinnaiyan, Mehdi Asheghi and H. Alan Mantooth
University of Arkansas, United States; Stanford University, United States

9:45AM | Electro-Thermal Device-Package Co-Design for Ultra-Wide Bandgap Gallium Oxide Power Devices [#1186]
Benjamin Albano, Boyan Wang, Christina DiMarino and Yuhao Zhang
Virginia Tech, United States

Thursday, October 13 10:30AM–12:10PM

Session S124 | Design Optimization in Electric Machines

Room 140B – Level 100
Chairs: Gerd Bramerdorfer, Peng Han

10:30AM | Topology Optimization of Electric Machines: A Review [#409]
Fnu Nishanth and Bingnan Wang
University of Wisconsin-Madison, United States; Mitsubishi Electric Research Laboratories, United States

10:55AM | Low Space Harmonic Content Windings (LSHWs) Applied to Improve the Pareto Front in Design Optimization of Electric Machines [#1346]
Nanjun Tang and Ian P. Brown
Illinois Institute of Technology, United States

11:20AM | Sensitivity Study on Configuration of Large Scale Multi-Objective Optimization of a PMSM [#163]
Hiroyuki Sano, Taizo Senda, Yoshitaka Kida, Yusaku Suzuki and Takashi Yamada
JSOL Corporation, Japan

11:45AM | Scalability and Design and Optimization of High Specific Power 500kW SPM Machine with Additively Manufactured Coils and Integrated Heat Pipes [#308]
Salar Koushan, Sina Vahid, Ali Al-Qarni and Ayman EL-Refaie
Marquette University, United States

Session S125 | High Speed High-Efficiency Motor Drives

Room 140C – Level 100
Chairs: Mohammed Agamy, Wei Xu

10:30AM | RC Filter Free Flux-based Sensorless BLDC Drive for Permanent Magnet Motor using Pulse Amplitude Modulation [#757]
Ik-Tiat Song, Ching-Lon Huang, Yi-En Chen and Shih-Chin Yang
National Taiwan UniversityMechanical department, Taiwan

10:55AM | Design Oriented Analysis of Discrete-Time Current Regulators for Low Carrier Ratio Sensorless High-Speed Permanent Magnet Synchronous Machine Drives [#219]
Kevin Lee, Zhihao Song and Wenxi Yao
Eaton, United States; Zhejiang University, China

11:20AM | Soft-Switching dv/dt Filter with Ultra High Power Density and 50% Power Loss Savings for 150 kW SiC Motor Drives [#678]
Dakai Wang and Wensong Yu
North Carolina State University, United States

Session S126 | Wound Field and PM Machines

Room 140D – Level 100
Chairs: Ian Brown, Rukmi Dutta

10:30AM | Bicoherence and Skewness-Kurtosis Analysis for the Detection of Field Winding Faults in Synchronous Motors Using Stray Flux Signals [#165]
Jose Guerra Carmenate, Miguel Iglesias-Martinez, Jose Antonino-Daviu, Carlos A. Platero- Gaona, Pedro Fernandez de Cordoba Castella, Jose A. Conejero Casares and Larisa Dunai
Universidad de Pinar del Rio, Cuba; Universitat Politecnica de Valencia, Spain; Universidad Politecnica de Madrid, Spain

10:55AM | Influence of the Lamination Material and Rotor Pole Geometry on the Performance of Wound Field Synchronous Machines [#725]
Marco Biasion, Damian Kowal, Reza Rajabi Moghaddam and Michele Pastorelli
Politecnico di Torino, Italy; ABB, Sweden; Independent researcher, Sweden

11:20AM | Virtual-stator Loss Model for Synchronous Generators [#255]
Zhaoqiang Zhang, Arne Nysveen, Borge Johannes Fagermyr, Robert Nilssen and Hossein Ehya
Norwegian University of Science and Technology, Norway

11:45AM | Change of polarity in Synchronous Motors [#298]
Chiara Conto and Nicola Bianchi
University of Padova, Italy

Session S127 | Inductive Power Transfer and Traction Applications

Room 140E – Level 100
Chairs: Manuela Sechilariu, Rashmi Prasad

10:30AM | Design Optimization Methodology for High-Frequency Rotary Transformers for Contactless Power Transfer Systems [#419]
Harsha Vardhan, Milijana Odavic and Kais Atallah
University of Sheffield, United Kingdom

10:55AM | Modeling, Design, and Control of a Single-Stage AC-AC Converter-based Inductive Power Transfer System with V2G Capability [#1306]
Jalaj Kumar and Suvendu Samanta
Department of Electrical Engineering, IIT Kanpur, India

11:20AM | High Voltage DC-Bus Voltage Balancing Control of a 350 kW Multiport EV Charging System [#625]
Abhijit Choudhury, Yuichi Mabuchi, Kimihisha Furukawa and Nawaz Husain
Hitachi Ltd., Japan

11:45AM | Isolated Cryogenic Auxiliary Power Supply (CAPS) for GaN Based Converters [#1036]
Samuel Defaz, Mustafeez ul Hassan and Fang Luo
Stony Brook University, United States

Session S128 | Power Converters Control

Room 140F – Level 100
Chairs: Sheldon Williamson, Akash Samanta

10:30AM | Enhanced Operation of Hybrid MMC under Reduced DC-link Voltage [#1064]
Poornachandra Rao Nallamatti and Anshuman Shukla
Indian Institute of Technology, Bombay, India

10:55AM | Pulsating DC Power Minimization in a Multi-port DC/AC Converter by an Adaptive Phase-Shift in the Single-Phase AC Ports [#1205]
Gleisson Balen, Cristian Blanco, Angel Navarro-Rodriguez and Pablo Garcia
University of Oviedo - UNIOVI, Spain

11:20AM | CSS-RIP-APSA Controlled Grid Following Neutral Clamped DSTATCOM for Third Harmonic Mitigation [#1338]
Surya Prakash, Ranjan Kumar Behera, Khaled Al Jaafari, Omar Al Zaabi, Khalifa Al Hosani, Arobinda Dash and Utkal Ranjan Muduli
Indian Institute of Technology Patna, India; Khalifa University, United Arab Emirates

11:45AM | Demand Driven Energy Management for PIPO Auxiliary Power Supply Architecture [#1159]
Yalda Azadeh, Mustafeez ul Hassan, Abdul Basit Mirza, Fang Luo, Krishna Moorthy Radha and Madhu Sudhan Chinthavali
Stony Brook University, United States; Oak Ridge National Lab (ORNL), United States

Session S129 | Generators and Control for Wind Applications

Room 140G – Level 100
Chairs: Jingyang Fang, JiangBiao He

10:30AM | Coordinate Control of Wind Turbines in a MVDC Grid [#383]
Omid Beik and Gholamian Mahzad
North Dakota State University, United States; University of Isfahan, Iran

10:55AM | Design and Control of Series-DC Wind Farms Based on Three-Phase Dual Active Bridge Converters [#305]
Hussain A. Hussain and Kareem A. Noureldin
Kuwait University, Kuwait

11:20AM | High Pole Number Epoxy-Casted Rotor Reluctance Synchronous Wind Generator [#1286]
Jean-Claude Baziruwiha, Maarten Kamper and Stefan Botha
Stellenbosch, South Africa

11:45AM | Predictive Control of Wind Turbine Using Preview Wind Speed Information [#553]
Abhinandan Routray and Sung-Ho Hur
School of Electronics Engg, KNU, Daegu 41566, Korea (South)

Session S130 | Fault Detection and Diagnostics

Room 250B – Level 200
Chairs: Omid Beik, Stefano Bifaretti

10:30AM | Gate Driver Switching Noise Propagation Study for Medium Voltage SiC-based Power Electronics Building Blocks [#1126]
He Song, Igor Cvetkovic, Richard Zhang, Christina DiMarino and Dushan Boroyevich
Virginia Tech, United States

10:55AM | Zero Voltage Vector Based Open Fault Detection Method for a Grid-Connected Single Phase CHMI with Phase-Shifted PWM [#1189]
Juil Kwak, Dongho Choi and June-Seok Lee
Dankook university, Korea (South)

11:20AM | Design and Testing of a SiC-based Solid-State Bypass Switch for 1 kV Power Electronics Building Blocks [#304]
Sri Naga Vinay Mutyala, Igor Cvetkovic, Christina DiMarino and Dushan Boroyevich
Center for Power Electronics Systems (CPES), United States

11:45AM | Collector-Emitter Voltage Based Health Monitoring of Bond Wire in IGBT at Low Gate Voltage [#884]
Pankaj Kumar, Abhinav Arya, Abhishek Chanekar, Pratik Deshmukh and Sandeep Anand
Qualcomm India, India; Indian Institute of Technology Kanpur, India; Indian Institute of Technology Bombay, India; Intel Technology India Pvt. Ltd., India

Session S131 | Control Strategies for Active Bridge Converters

Room 251A – Level 200
Chairs: Yunting Liu, Marzieh Karami

10:30AM | Harmonic-Balance Based Power Flow and ZVS Analysis of a Quad-Active Bridge DC-DC Converter [#1236]
Ezekiel Olayiwola Arogunjo, Joseph Olorunfemi Ojo and Olivia Nnadi
Tennessee Technological University, United States; Tennessee Technological University, United States

10:55AM | A Novel Control Strategy for Extending the ZVS Range of Triple Active Bridge Converter [#1180]
Arnur Karbozov, Mriganka Ghosh Majumder, Harish S. Krishnamoorthy and Kaushik Rajashekara
University of Houston, United States

11:20AM | Voltage Phasor Based Current Limiting for Grid-Forming Converters [#567]
Tobias Erckrath, Peter Unruh and Marco Jung
Fraunhofer IEE, Germany

11:45AM | Time-varying Phasor Analysis of Nonlinear Droop with Virtual Impedance in Stand-alone Residential Nanogrids [#970]
Andres Salazar Llinas, Alberto Berzoy Llerena and Javad Mohamadpour
Velni Rivian, United States; sonnen Inc, United States; University of Georgia, United States

Session S132 | Control Methods and PWM Techniques for Multi-Level Converters

Room 251B/C – Level 200
Chairs: Phani Kumar Chamarthi, Kyo-Beum Lee

10:30AM | An Average Model for Three-Phase Five-level Flying Capacitor Converters with Phase-Shifted PWM [#522]
Biqi Wang, Rolando Burgos and Bo Wen
Virginia Tech, United States

10:55AM | Double-Vector Model Predictive Voltage Control for 5-Level Flying Capacitor Multilevel Converter [#873]
Seyed Iman Hosseini Sabzevari, Armin Ebrahimian, Waqar Khan and Nathan Weise
Marquette University, United States

11:20AM | Enhanced Pulse Width Modulation Methods for 1-ph Five Level Neutral Point Clamped Inverter [#365]
Phani Kumar Chamarthi, Mohamed Shawky El Moursi, Ahmed Al Durra, Khalifa Alhosani and Ameena Alsumaiti
Khalifa University, United Arab Emirates

11:45AM | A Si/SiC Hybrid Five-Level ANPC Full-Bridge DAB Converter with Dedicated Modulation Strategy [#459]
Na Gao, Yu Zhang, Xinmi Wu, Jiawen Yang, Qingxin Guan and Zhuolan Li
Huazhong University of Science and Technology, China

Session S133 | Silicon Carbide Devices

Room 252A/B – Level 200
Chairs: Andrew Lemmon, Govind Chavan

10:30AM | Electrothermal Ruggedness of High Voltage SiC Merged-PiN-Schottky Diodes Under Inductive Avalanche & Surge Current Stress [#282]
Chengjun Shen, Saeed Jahdi, Juefei Yang, Olayiwola Alatise, Jose Ortiz-Gonzalez and Phil Mellor
University of Bristol, United Kingdom; University of Warwick, United Kingdom

10:55AM | A 650V Hybrid-Channel SiC Trench MOSFET with Improved On-State Performance [#1108]
Luyang Zhang, Dai Tianxiang, Peter Gammon, Vishal Shah, Philip Mawby and Marina ANntoniou
University of Warwick, United Kingdom

11:20AM | Quasi-Two-Level (Q2L) Half Bridge Cascaded (HBC) Super Switch (SS) Concept for Medium Voltage Applications [#870]
Ruxi Wang, Chi Zhang, Tomas Sadilek, Zhiyu Shen and Peter Barbosa
Delta Electronics, United States

11:45AM | 15kV/50A SiC AC Switch Based On Series Connection of 1.7kV MOSFETs [#543]
Wei Xu and Alex Q. Huang
University of Texas at Austin, United States

Note to ORAL Session Chairs

1) **Attend the Presenters' Orientation Breakfast** on the morning of your session and receive a packet with important information from the TPCs. Review Speaker Bios from the packet or receive Bios at the Breakfast. Interact with Speakers in your session. Learn how to pronounce their names correctly. Make sure your presenters have uploaded their PowerPoint presentation in advance of the breakfast. If not, or they have any edits, updated files must be uploaded in the speaker ready room immediately.

2) **Begin the Session on Time:** Arrive at least 10 minutes early to ensure speakers are in their seats and ready to begin. Encourage the audience to take their seats so that the session can begin on time.

   New This Year – Before starting the session please check in the chat of the virtual platform if there are questions for papers in your sessions. If possible, please check for questions in advance, for example during the breakfast, in order to shortly discuss the on-line questions with the speakers.

3) **Introduce the Session:** Announce to the audience the name of the session to ensure that they are in the correct room. Provide a brief introduction of yourself. Remind audience to TURN-OFF all cell phones.

4) **Introduce each presenter** in your session using their bios. Pronounce their names correctly!

5) **Monitor the timing** of each presentation and make sure that each presentation starts and stops on time. Each presenter in your session has a 25-minute time slot (20 minutes for presentation and 5 minutes at the end of their presentation for Q&A). Please see the technical program schedule for the exact timing for your session. It is essential that each session run on time so that session attendees can conveniently leave and arrive in time to see specific paper presentations. We suggest that you provide 5-minute and 1-minute timing cues to assist the speakers. You may use the timecards provided in your packet received at the Presenters' Orientation.

6) **In the event of a no-show** you should leave a break so that each presentation occurs at the time in the schedule.

7) **Q&A: Encourage discussion and Q&A from the audience.**

8) **Wrap-Up:** provide a short summation of the session and end the session on time.

9) **Complete Session Evaluation Form** found in your packet. Identify No-Show presenters. Submit the completed form to the Speaker Ready Room immediately following the session.

Speaker Ready Room: *Room 259*

> Upload presentations

> AV Questions

> Return Session Evaluation

TECHNICAL PROGRAM SCHEDULE

PLENARY POSTER SESSIONS

IAS Conference authors were invited to present posters at ECCE to expose their work to the ECCE audience. This optional offer was accepted by about a few authors. Their posters are in the Exhibit Hall. See the inset Flyer and the Virtual Platform for the list of IAS posters.

Monday, October 10 **5:00PM–7:30PM**

Plenary Poster S26 | Renewable System Designs: Solar, Wave, and Converter Testing

Room Expo Hall E
Chair: Huiqing Wen

P101 | A Comparison on the Feasibility of Small-Scale Hybrid PV Installations in Distribution Grids Under Fixed and Variable Rate Energy Prices: Spain as a Lens [#1177]
Hafte Hayelom Adehna, Irene Pelaez, Cristian Blanco Charro and Pablo Garcia
Fernandez UniversityOviedo, Spain

P102 | Optimal Electric Power Take-off Strategy for Surface Riding Wave Energy Converter [#1337]
Shrikesh Sheshaprasad, Farid Naghavi, Shima Hasanpour, Mesaad Albader, Matthew C. Gardner, HeonYong Kang and Hamid A. Toliyat
Texas A&M University, United States; University of Texas at Dallas, United States

P103 | Transient DC-bias Suppression Strategy of Three-level Dual-Active-Bridge Converter with Five Control Degrees of Freedom [#534]
Zhichen Feng, Huiqing Wen, Qinglei Bu, Yinxiao Zhu and Xu Han
Xi'an Jiaotong-Liverpool University, China

P104 | Hardware Demonstration of a Novel Three-Phase Multilevel Inverter [#94]
Francis Chen, Lei Gu, William Dally and John Fox
Stanford University, United States

Plenary Poster S27 | DC and Renewable Power Systems

Room Expo Hall E
Chairs: Sarasij Das, Shilpa Marti

P301 | A Trade-off Between Cost and Efficiency in Solid-State Circuit Breakers [#420]
Reza Kheirollahi, Xin Zan, Shuyan Zhao, Yao Wang, Hua Zhang, Xiaonan Lu, Al-Thaddeus Avestruz and Fei Lu
Drexel University, United States; University of Michigan, United States; Purdue University, United States

P302 | Implementation of 99.96% Efficiency SSCB at 100A/1hour Continuous Thermal Testing [#263]
Shuyan Zhao, Reza Kheirollahi, Hua Zhang and Fei Lu
Drexel University, United States; Rowan University, United States

P303 | Performance of Memory-Polarized Distance Relay in Presence of PV Generator with Vdc - Q Control [#981]
Asha Radhakrishnan, Amrita Ghosh, Indla Rajitha Sai Priyamvada and Sarasij Das
Indian Institute of Science, India; Georgia Tech, United States

P304 | Circulating Current Reduction for Photovoltaic Parallel Modular Inverters Using Modified Space Vector Modulation [#1179]
Hye-Won Choi and Kyo-Beum Lee
Ajou University, Korea, Republic of

P305 | Design of Asymmetric Inductance for Multi-port Active Bridge Converter [#950]
Dong-Uk Kim, Sungmin Kim, ByungHwan Jeong and Byeng-Joo Byen
Hanyang University, Korea (South); Hyosung Corporation, Korea (South)

Plenary Poster S28 | Stability Aspects in Power Electronics Systems

Room Expo Hall E
Chair: Ludovico Ortombina

P501 | A Power Angle Limiting Method for Improving Stability of Grid-Forming Inverter Under Overcurrent Condition [#79]
Liang Huang, Chao Wu, Dao Zhou and Frede Blaabjerg
Aalborg University, Denmark; Shanghai Jiaotong University, China

P502 | A Mode Switching Method for Transient Stability Enhancement of VSG [#599]
Shihan Luo, Hua Han, Shimiao Chen, Guangze Shi, Junlan Ou, Zhenzhen Luo and Yuxin Cheng
Central South University, China

P503 | A Flexible-Combined Heat and Power System Interface Converter' Benefits in Increasing Stability Margin of a Microgrid with High Renewable Penetrations [#658]
Qing Lin, Bo Wen and Rolando Burgos
CPES, Virginia Tech, United States

P504 | Metastability of Pulse Power Loads with Nonlinear Coupled Magnetics [#770]
Chaitanya Inamdar, Wayne Weaver, Rush Robinett and David Wilson
Michigan Technological University, United States; Sandia National Laboratory, United States

P505 | Stability Assessment Study for a Triple-Stage Three-Phase Solid-State Transformer [#1421]
Samuele Granata, Riccardo Leuzzi, Giulia Tresca, Ezio Bassi, Francesco Benzi and Pericle Zanchetta
Universita di Pavia, Italy; University of Nottingham, United Kingdom

P506 | Power Control of Repurposing-Battery Modular Multilevel Converter [#296]
Tzung-Lin Lee, Yen-He Chen, Wei-Ting Zheng and Chen-Han Lin
National Sun Yat-sen University, Taiwan

P507 | Open-Loop RHP Poles Issues in Online Stability Monitoring for Microgrid [#825]
Qing Lin, Bo Wen and Rolando Burgos
CPES, Virginia Tech, United States

P508 | Accurate and Computationally-Optimized Small-Signal Model Identification of LLC Resonant Converter Based on Machine Learning Techniques [#1103]
Mattia Iurich, Sandro Calligaro and Roberto Petrella
DPIA - University of Udine, Italy

P509 | Ripple Estimation in Commercial Off-the-shelf DC-DC Converters [#162]
Fernando Perez, Airan Frances, Rafael Asensi and Javier Uceda
Universidad Politecnica de Madrid, Spain

P510 | A Hybrid Modulation Technique for Voltage Regulation in LLC Converters in the Presence of Transformer Parasitic Capacitance [#915]
Simone Palazzo, Giovanni Busatto, Enzo de Santis, Roberto Giacomobono, Dario Di Ruzza and Giuseppe Panariello
University of Cassino and Southern Lazio, Italy; Rete Ferroviaria Italiana S.p.a., Italy

Plenary Poster S29 | Selected Topics in Modeling and Diagnostics

Room Expo Hall E
Chair: Ludovico Ortombina

P701 | A Novel Low-Frequency Radiated Emissions Prediction Technique for the Inductor of a Non-Isolated Power Converter [#1221]
Yanwen Lai, Yirui Yang, Shuo Wang and Zheng Luo
University of Florida, United States; Monolithic Power Systems, Inc., United States

P702 | Coupling Coefficient Tuning to Ensure Zero/Low Ripple in a QBC in a Wide Duty Cycle Range [#962]
Massimiliano Luna and Giuseppe Marsala
CNR-INM, Italy

P703 | Self-Calibrating Loss Models for Real-Time Monitoring of Power Modules Based on Artifical Neural Networks [#417]
Sven Kalker, David Meier, Christoph H. van der Broeck and Rik W. De Doncker
RWTH Aachen University- ISEA, Germany

P704 | Machine Learning based Condition Monitoring for SiC MOSFETs in Hydrokinetic Turbine Systems [#769]
Alastair Peter Thurlbeck and Yue Cao
Oregon State University, United States

P705 | Short-Circuit Fault Diagnosis of a Three-Phase Current-Source Inverter [#1144]
Sneha Narasimhan, Sagar Kumar Rastogi and Subhashish Bhattacharya
North Carolina State University, United States

P706 | Series DC Arc Fault Detection Using a Wavelet-Based Filter Bank with Statistical Analysis [#1208]
Joseph Yeager, Hsin-Che Hsieh, Seunghoon Baek and Jih-Sheng Lai
Virginia Tech FEEC, United States

P707 | Fault Diagnosis using Shallow Neural Networks for Voltage Source Inverters in SynRM Drives [#1397]
Jacopo Riccio, Rahul Ranjeev Kumar, Giansalvo Cirrincione, Maurizio Cirrincione and Pericle Zanchetta
University of Nottingham, United Kingdom; University of the South Pacific, Fiji; University of Picardie Jules Verne, France

P708 | An Adaptive Dead Time Prediction Method for Primary-Side Regulation Active-Clamp Flyback Converter [#84]
Chong Wang, Daying Sun, Wenhua Gu and Sang Gui
Nanjing University of Science and Technology, China; Wuxi Taclink Optoelectronics Technology Company, China

P709 | Fault Reconfiguration of Series-Connected Dual-Transformer Active Bridge Converter for Reliable Shipboard DC System [#613]
Baichuan Teng, Jianjun Ma, Miao Zhu and Xu Cai
Shanghai Jiaotong University, China

P710 | GaN Four-leg Inverter Implementing Novel Common Mode Elimination using a Hardware-in-the- loop System-Level Controller [#777]
Caleb Li, Annette von Jouanne, Giovanna Oriti, Alex Julian, Emmanuel Agamloh and Alex Yokochi
Baylor University, United States; Naval Postgraduate School, United States; Consultant, United States

Plenary Poster S30 | Capacitors and Power Electronic Thermal Design

Room Expo Hall E
Chairs: Thomas Ebel, Adam Skorek

P901 | Methodology for Large-signal Loss Characterization of Ferroelectric Class II MLCC in High- frequency Range [#1039]
Jiang Yunlei, Hu Borong, Wen Bo, Shen Yanfeng and Long Teng
University of Cambridge, Great Britain; Danfoss Silicon Power R&D, Great Britain

P902 | Flex Wire Winding Resistance [#882]
Rafal Wojda
Oak Ridge National Laboratory, United States

P903 | Investigation of Cooling Techniques and Enclosure Types for Integrated Motor Drives [#1003]
Renato Amorim Torres, Hang Dai, Woongkul Lee, Kimberly Saviers, Thomas Jahns and Bulent Sarlioglu
University of Wisconsin-Madison, United States; Michigan State University, United States; Raytheon Technologies, United States

P904 | Thermal Management of SiC MOSFETs within Hydrokinetic Applications [#854]
Trenton Kilgore, Md Tariquzzaman and Yue Cao
Oregon State University, United States

P905 | Weight-Minimizing Optimization of Microchannel Cold Plate for SiC-based Power Inverters in More-Electric Aircraft [#659]
Che-Wei Chang, Xingchen Zhao, Ripun Phukan, Dong Dong, Rolando Burgos and Arnaud Plat
Virginia Tech, United States; virginia Tech, United States; Airbus, France

P906 | Coupled Electro-Thermo-Mechanical Analysis to Understand Fuse Element Ageing by Finite Element Method [#910]
Praveen Chandradhas, Laurent Milliere, Antonie Gerlaud and Amir Sajjad Bahman
Aalborg University, Denmark; Mersen, France

P907 | A Novel Approach of Electrothermal Modeling for Multichip Power Modules [#110]
Zongyao Zhou, Jianxiong Yu, Xinglai Ge, Jiajie Duan, Cheng Luo and Chunxu Lin
Southwest Jiaotong University, China; Zhejiang University, China; Eaton (China) Investment Corporation, China

P908 | Development of Nonlinear Resistive Field Grading Materials for Mitigating Enhanced Electric Field in Power Electronic Modules [#231]
Omar Faruqe, Farhina Haque, Pradip Saha, Adam J. Morgan, Woongje Sung and Chanyeop Park
Mississippi State University, United States; State University of New York Polytechnic Institu, United States

Plenary Poster S31 | Permanent Magnet Machines

Room Expo Hall E
Chair: David Reigosa

P1101 | Performance Comparison of Different Permanent Magnet Motors for Traction Applications [#1044]
Md Khurshedul Islam, Kazi Nishat Tasnim, Md Zakirul Islam, Han-Gyu Kim and Seungdeog Choi
Mississippi State University, United States; Tula Technology, United States

P1102 | A Study on Stator Shape to Reduce Cogging Torque and Torque Ripple of Double-Layer Spoke Type PMSM [#934]
Dong-Woo Nam, Dong-Ho Kim, In-Jun Yang, Si-Woo Song and Won-Ho Kim
Gachon University, Korea (South); Hanyang University, Korea (South)

P1103 | Tooth Modulation Effect of Electromagnetic Force on Fractional Slot Concentrated Winding PMSM According to Slot Opening [#924]
Jae-Hyun Kim, Jun-Yeol Ryu, Soo-Hwan Park, Kyoung-Soo Cha, Chi-Sung Park and Myung-Seop Lim
Hanyang University, Korea, Republic of

P1104 | Spoke Type Permanent Magnet Synchronous Generator Design Considering Magnetizing and Cogging Torque [#797]
Dong-Ho Kim, Su-Yong Kim, Si-Woo Song, Ju Lee and Won-Ho Kim
Hanyang University, Korea (South); Korea Electronics Technology Institute, Korea (South); Gachon University, Korea (South)

P1105 | Efficiency Improvement of Permanent Magnet Synchronous Machines With High Slot Fill Aluminum Winding [#1279]
Yuto Yamada, Hiroya Sugimoto and Kazuhito Imae
Tokyo Denki University, Japan; Aster Co., Ltd., Japan

P1106 | Comparative Study of Flux-Switching Machines with T-Array and U-Array Permanent-Magnet Arrangements [#912]
Fawen Shen, Yuming Yan, Shuai Wang, Benjamin Cheong, Chandana Jayampathi Gajanayake, Amit Gupta and Christopher H. T. Lee
Nanyang Technological University, Singapore; Rolls-Royce PLC, Singapore

P1107 | Torque Ripple Suppression and Current Regulation for Vector Controlled Switched Reluctance Motors [#727]
Shou Qiu, Daichi Makihara and Kyohei Kiyota
Tokyo Institute of Techonology, Japan

P1108 | Fault Diagnosis Using Voltage Angle In Dual Three-Phase Interior Permanent Magnet Synchronous Motor [#148]
Jun-Kyu Kang, Dong-Wook Yoo and Jin Hur
Incehon National University, Korea (South); KERI (Korea Electrotechnology research institute, Korea (South)

P1109 | Basic Examination for an Adjustable Field IPM Motor with a Field Adjustment Winding on a Rotor [#929]
Ryusyo Nakazawa, Masatsugu Takemoto, Satoshi Ogasawara and Koji Orikawa
Hokkaido University, Japan; Okayama University, Japan

Plenary Poster S33 | Materials, Losses, Thermal and Manufacturing Issues

Room Expo Hall E
Chairs: Rafal Wrobel, Poskovic Emir

P1301 | Iron Loss Characterization in Laminated Cores at Room and Liquid Nitrogen Temperature [#675]
Marco Biasion, Ines Santos Perdigao Peixoto, Joao Filipe Pereira Fernandes, Silvio Vaschetto, Gerd Bramerdorfer and Andrea Cavagnino
Politecnico di Torino, Italy; IDMEC Instituto Superior Tecnico, Portugal; Johannes Kepler UniversityLinz, Austria

P1302 | Airgap Flux-based Estimation of Permanent Magnet Temperature for Thermal Protection of PMSMs [#92]
Hyeon-Jun Lee, Jigyun Jeong, Marcos Orviz Zapico, Sang Bin Lee, David Reigosa and Fernando Briz
Korea University, Korea, Republic of; University of Oviedo, Spain

P1303 | Continuous-Domain Semi-Analytical Method for Tolerance Analysis of Axial Flux Permanent Magnet Machines [#1204]
Andres Escobar, Carlos Madariaga, Werner Jara, Juan Tapia, Michele Degano and Javier Riedemann
Pontificia Universidad Catolica de Valparaiso, Chile; University of Concepcion, Chile; University of Nottingham, United Kingdom; University of Sheffield, United Kingdom

P1304 | An Experimental Assessment of the Impact of High dv/dt SiC Converters on Insulation Lifetime of Electrical Machines [#252]
David Hewitt, Shubham Sundeep, Jiabin Wang, Antonio Griffo, Mohamed Diab and Xibo Yuan
University of Sheffield, United Kingdom; University of Bristol, United Kingdom

Tuesday, October 11 10:30AM–1:00PM

Plenary Poster S46 | Power Converter Design and Modelling of Energy Systems

Room Expo Hall E
Chairs: Chunmeng Xu, Ayan Mallik

P1501 | APOD PWM Based Method to Suppress Zero-Sequence Circulating Current in Parallel Three-Level NPC Inverters Under Interleaved Operation [#1182]
Jun-Hyeok Park, Hyung-Woo Lee and Kyo-Beum Lee
Ajou University, Korea, Republic of

P1502 | Co-simulation of Smart Grids and Homes including Ultra-fast HVAC Models with CTA-2045 Control and Consideration of Thermal Comfort [#1225]
Evan S. Jones, Rosemary E. Alden, Huangjie Gong, Abdullah Al Hadi and Dan M. Ionel
University of Kentucky, United States

P1503 | Charaterization of Emerging Computing Architectures for Dynamic Simulation of Future Power Grids with Large-Scale Power Electronics [#1013]
Jongchan Choi, Suman Debnath and Phani Marthi
Oak Ridge National Laboratory, United States

P1504 | A Multi-Parameter Approach to Optimal Power Dispatch in Grid-Connected Photovoltaic-Battery Systems [#264]
Ebrahim Mohammadi and Gerry Moschopoulos
Postdoctoral Fellow, Carleton University, Canada; Professor, Western University, Canada

P1505 | A Study of the Use of Tidal Energy to Supply the Electricity of a Remote Island [#504]
Erfan Rajaeian, Rooholamin Zeinali davarani, Fateme Zeinali Dolatabad, Roohollah Fadaeinedjad and Gerry Moschopoulos
Graduate University of Advanced Technology, Iran; Western University, Canada

Plenary Poster S47 | Automated Design Considerations in Power Electronics and Batteries/UPS Systems

Room Expo Hall E
Chairs: Qianwen Xu, Wilmar Martinez

P1701 | Reinforcement Learning Based Optimal Energy Management of A Microgrid [#1146]
Saqib Iqbal and Kamyar Mehran
Queen Mary University of London, QMUL, UK, United Kingdom

P1702 | Parameter Design Optimization for DC-DC Power Converters with Deep Reinforcement Learning [#1009]
Fanghao Tian, Diego Bernal Cobaleda, Hans Wouters and Wilmar Martinez
KU Leuven, Belgium

P1703 | Multi-Application Multi-Objective Optimization Algorithm for DC-DC Converter Topology Choice [#1094]
Carsten Fronczek, Andr{'e} Th{"o}nnessen and Rik W. De Doncker
ISEA RWTH Aachen University, Germany

P1704 | Optimal Control of Triple Active Bridge Based on Deep Machine Learning Techniques [#1393]
Marzieh Karami and Rohit Baranwal
Eaton Corporation, United States

P1705 | Robust Fuzzy Entropy-Based SOH Estimation for Different Lithium-ion Battery Chemistries [#1283]
Xin Sui, Shan He, Alejandro Gismero, Remus Teodorescu and Daniel-Ioan Stroe
Department of Energy, Aalborg University, Denmark

P1706 | Fast Incremental Capacity Peak Identification in Lithium-ion Batteries Using Pulse-injection-aided Machine Learning [#116]
Alan Li and Matthias Preindl
Columbia University, United States

P1707 | Deep Learning Tackles Temporal Predictions on Charging Loads of Electric Vehicles [#423]
Eugenia Cadete, Raul Alva, Albert Zhang, Sara Ahmed, Caiwen Ding, Mimi Xie and Yufang Jin
University of Texas at San Antonio, United States; Wissahickon High School, United States; University of Connecticut, United States

Plenary Poster S48 | Electrified Transportation Systems

Room Expo Hall E
Chairs: Md Sariful Islam, Woongkul Lee

P1901 | An Overview of Electrical Machines and Drives Technologies for Electrified Aircrafts [#1234]
Junhan Zhao, Xiaolong Zhang, Niraja Swaminathan and Kiruba Haran
University of Illinois Urbana-Champaign, United States

P1902 | Bandwidth Enhancement of Power-Electronics-Based Mission Profile Emulator with Reference Current Feedforward [#360]
Shihao Xia, Ke Ma, Qing Yan, Yuqing Sheng and Yangjun Deng
Shanghai Jiaotong University, China; Sungrow Power Supply Co., Ltd., China

P1903 | Comparative Study on Insulation Lifetime of Stator Winding of Dual Inverter Fed Open Winding IPMSM and Single Inverter Fed Star-Connected IPMSM for EV Application [#926]
Yuto Maeda, Teppei Hayakawa, Hiroaki Matsumori, Takashi Kosaka, Nobuyuki Matsui, Yoichi Miyoshi, Kiyotaka Koga and Subrata Saha
Nagoya Institute of Technology, Japan; Aisin corporation, Japan

P1904 | A Practical Test Bench Development of a Hyperloop Propulsion System: Modeling, Simulation, and Prototype Integration [#15]
Mohammad Abdul Bhuiya and Mohamed Youssef
Ontario Tech University, Canada

P1905 | Short Circuit Localization in Automotive Ringstructured Power Nets based on Graph Theory [#831]
Sarmed Hussain, Ahmed Alnaggar, Laurenz Tippe and Hans-Georg Herzog
BMW Group, Germany; Technical University of Munich, Germany

P1906 | A CBPWM Strategy with Flexible Zero-Sequence Voltage Injection for Three-Level TNPC Converters in Aircraft Electric Starter/Generator System [#401]
Feng Guo, Yue Zhao and Patrick Wheeler
University of Arkansas, United States; University of Nottingham, United Kingdom

P1907 | Model Predictive Control for the Reduction of Marine Propellers Vibrations [#774]
Constanza Ahumada, Luca Tarisciotti, Diego Sepulveda and Doris Saez
Universidad de Chile, Chile; UniversityAndres Bello, Chile

P1908 | Design Aspects, Challenges, and Benefits of SiC Based Integrated Switched Reluctance Machine Drives [#991]
Md Ehsanul Haque, Anik Chowdhury, Mohammad Arifur Rahman, Shuvajit Das, Abdul Wahab Bandarkar, Md Tawhid Bin Tarek, Okan Boler, Yilmaz Sozer, Ashraf Siddiquee, Jeffrey Geither, David Colavincenzo and Fernando Venegas
University of Akron, United States; Bendix CVS, United States

P1909 | Selective Gate Driver in SiC Inverter to Improve Fuel Economy of Electric Vehicles [#1165]
Luowei Wen, Wensong Yu, John Geiger and Iqbal Husain
North Carolina State University, United States; North Carolina State University, United States; Texas Instruments, United States

Plenary Poster S49 | Multi-Level Converters

Room Expo Hall E
Chairs: Nathan Miles Ellis, Pablo Garcia

P2101 | Circulating Currents and Losses Analysis of an MMC with Using SVM-based Common Mode Voltage Reduction Strategy for a Wind Turbine Application [#1383]
Chengjun Tang, Jian Zhao and Torbjorn Thiringer
Chalmers University of Technology, Sweden

P2102 | Open-Circuit Fault-Tolerant Method for Three-Level Quasi-Switched Boost T-Type Inverter [#959]
Minh-Khai Nguyen, Vinh-Thanh Tran and Duc-Tri Do
General Motors, United States; Ho Chi Minh City Univ. of Technology and Edu, Viet Nam

P2103 | A Novel Three-level, Three-phase, Single Stage Solid State Transformer with an Integrated DC Link [#892]
Sanjay Rajendran and Alex Huang
The University of Texas at Austin, United States

P2104 | Loss Estimation of a Dual Active Bridge as Part of a Solid State Transformer Using Frequency Domain Modelling [#455]
Nikolas Menger, Tobias Merz, Jannik Gehringer, Fabian Sommer and Marc Hiller
Karlsruhe Institute of Technology, Germany

Tuesday, October 11 10:30AM–1:00PM

Plenary Poster S50 | Modeling and Control Considerations of Power Converters II

Room Expo Hall E
Chair: Francesco Gennaro

P2301 | Current-Mode Controller for an Electric Vehicle Battery System [#1245]
Zhao Yuankun and Jaber Abu Qahouq
The University of Alabama (UA), United States

P2302 | Review of MPPT Methods for LLC Converters in Photovoltaic Applications [#1333]
Sumana Ghosh, Abdullah Alhatlani, Md Safayatullah and Issa Batarseh
University of Central Florida, United States; Imam Mohammad Ibn Saud Islamic University, Saudi Arabia

P2303 | Novel Junction Temperature Optimized Operation of Dual Active Bridge Converter Using Extended-Phase-Shift Modulation Featuring SiC MOSFETs [#477]
Yoganandam Vivekanandham Pushpalatha and Dimosthenis Peftitsis
Norwegian University of Science and Technology, Norway

P2304 | An Investigation into the Effect of the Gate Drive Resistance on the Performance of the Balanced Inverter [#888]
Pengkun Tian, Feida Chen, Thomas Jahns and Bulent Sarlioglu
University of Wisconsin-Madison, United States

P2305 | Design Considerations and Performance Evaluation of 50kW, 40kHz DAB Converter with Coaxial Winding Transformer [#1137]
Mark Nations, Subhashish Bhattacharya and Richard Beddingfield
North Carolina State University, United States

P2306 | Unified Modular Three-Port Impedance Modelling of Grid-Connected Interlinking Voltage-Source Converters [#179]
Ni Liu, Hong Wang, Hexi Shi, Haoxi Xiang, Li Sun and Zhe Chen
Harbin Institute of Technology, ShenZhen, China; Aalborg University, Denmark

P2307 | A Novel Stability Assessment Framework for Inverter-Dominated Systems with Grid-Forming and Grid-Following Inverters [#1157]
Yuhua Du, Lizhi Ding and Xiaonan Lu
Purdue University, United States

Plenary Poster S51 | WBG Design and Applications

Room Expo Hall E
Chairs: Yue Zhao, Tiefu Zhao

P2501 | A Figure of Merit (FOM) for Power FET Switching Devices [#1352]
Patrick Palmer, Edward Shelton, Jeff Carter, Lathom Louco and Sam Sohirad
Simon Fraser University, Canada; Oxford University, United Kingdom; Borg Warner, United Kingdom; Brog Warner, United States

P2502 | A di/dt Triggered Self-Powered Unidirectional DC Circuit Breaker for both GaN and SiC platform for 400 V DC Applications [#1385]
Bhawani Shankar, Rafael Perez Martinez, Philip Zuk and Srabanti Chowdhury
Stanford University, United States; Transphorm, Inc, United States

P2503 | Design and Demonstration of a Medium-Voltage Silicon Carbide ANPC Power Stage [#1211]
Zhuxuan Ma, Fei Diao, Zhongjing Wang, Yuheng Wu, Mohammad Hazzaz Mahmud and Yue Zhao
University of Arkansas, United States; Wolfspeed Inc., United States

P2504 | Thermal Stress Reduction in Power Devices Using Distributed Loss PWM for CSIs [#823]
Sangwhee Lee, Renato Amorim Torres, Feida Chen, Thomas Jahns and Bulent Sarlioglu
University of Wisconsin Madison, United States

P2505 | Weight Judgement Based Thermal Balancing Strategy for Interleaved Buck Converters [#451]
Zehui Li, Junrui Liang and Haoyu Wang
ShanghaiTech University, China; Shanghaitech University, China

P2506 | A 900V/4mohm/80A Bidirectional SiC DC Solid State Contactor (SSC) [#855]
Zibo Chen, Chen Chen and Alex Q. Huang
The University of Texas at Austin, United States

P2507 | Driver Integrated Online Rds-on Monitoring Method for SiC Power Converters [#751]
Zibo Chen, Chen Chen and Alex Q. Huang
The University of Texas at Austin, United States

P2508 | Unipolar and Bipolar Pulsed Gate Stresses and Threshold Voltage Shifts in GaN e-HEMTs [#403]
Arkadeep Deb, Olayiwola Alatise, Jose Ortiz-Gonzalez, Erfan Bashar, Mohamed Taha, Mahdi Tousizadeh, Philip Mawby and Saeed Jahdi
University of Warwick, United Kingdom; University of Bristol, United Kingdom

P2509 | Estimator-based Energy Sharing Control for Battery Power Module Applications [#1154]
Abdulrahman Mostafa, Mahmoud Gaafar, Omar Abdel-Rahim and Mohamed Orabi
APEARC, Faculty of Engineering, Aswan University, Egypt

Plenary Poster S52 | Switched Reluctance and Flux Switching Machines I

Room Expo Hall E
Chairs: Roy McCann, Luigi Alberti

P2701 | Modelling and Controller Design for Simplified Torque Control of Switched Reluctance Machine [#1216]
Mouli Thirumalasetty and Narayanan Gopalaratnam
Indian Institute of Science Bengaluru, India

P2702 | Design and Parametric Analysis of Dual Mechanical Port Field Excited Flux Switching Generator for Wind Turbine Applications [#269]
Wasiq Ullah, Faisal Khan, Udochukwu B. Akuru, Shahid Hussain, Muhammad Yousaf and Lilian L. Amuhaya
COMSATS UniversityIslamabad, Abbottabad Campus, Pakistan; Tshwane University of Technology, Pretoria, South Africa; Botswana International University of Science and, Botswana

P2703 | Performance Comparison of Optimized Stator-Mounted Permanent Magnet Machines Using Genetic Algorithm Optimization [#454]
Guanbo Zhang and Guang-Jin Li
The University of Sheffield, United Kingdom

P2704 | Optimization of Magnetization State Manipulation in Variable-Flux PMSMs [#1394]
Marcos Orviz, Diego F. Laborda, David Reigosa, Juan Manuel Guerrero and Fernando
Briz Universidad de Oviedo, Spain

P2705 | Proposal of a Variable Magnet Motor Switchable Between Vernier Motor and PMSM [#980]
Kohei Aiso
Shibaura Institute of Technology, Japan

Plenary Poster S53 | Materials, Losses and Thermal Issues

Room Expo Hall E
Chair: Greg Heins

P2901 | A Novel Measurement Setup for Evaluating the Effect of Mechanical Stress on Soft Magnetic Material Properties [#1374]
Gereon Goldbeck, Gerd Bramerdorfer, Christoph Dobler, Daniel Woeckinger and Wolfgang Amrhein
Johannes Kepler UniversityLinz, Austria, Austria

P2902 | Simplified Thermal Model of Disk-Shaped Automotive Smart Braking Actuators [#1391]
Federica Graffeo, Silvio Vaschetto, Alessio Miotto, Fabio Carbone, Alberto Tenconi, Emmanuel Agamloh and Andrea Cavagnino
Politecnico di Torino, Italy; Brembo S.p.A., Italy; Baylor University, United States

P2903 | Changes in the Steinmetz Coefficients of Punched Soft-Magnetic Sheets [#650]
Zbigniew Gmyrek, Jacek Szulakowski, Silvio Vaschetto and Andrea Cavagnino
Lodz University of Technology, Poland; Politecnico di Torino, Italy

P2904 | Iron Losses Measurements and Prediction of Ultra-High Switching Frequency PWM-Supplied Laminated Magnetic Cores [#653]
Daniele Cremente, Giacomo Scelba, Giulio De Donato, Silvio Vaschetto, Emmanuel Agamloh and Andrea Cavagnino
Universita degli studi di Catania, Italy; Sapienza Universita di Roma, Italy; Politecnico di Torino, Italy; Baylor University, United States

Plenary Poster S54 | Electric Drives I

Room Expo Hall E
Chair: Jiangang Hu

P3101 | Model-Predictive Control of Open-End Winding Synchronous Reluctance Drives [#1025]
Jacopo Riccio, Luca Rovere, Mauro Di Nardo, Shafiq Odhano and Pericle Zanchetta
University of Nottingham, United Kingdom; Newcastle University, United Kingdom

P3102 | Implementation of an Auxiliary Low-Voltage DC Power Supply from an Electric Traction Open- Ended Motor Drive Configuration [#552]
Salvatore Foti, Luigi Danilo Tornello, Giacomo Scelba, Daniele Cremente, Mario Cacciato and Antonio Testa
University of Messina, Italy; University of Catania, Italy

P3103 | A New Method to Select Rotor Position Sensor Resolution in Variable Speed Drives [#1420]
Luigi Danilo Tornello, Gaetano Turrisi, Giacomo Scelba, Giulio De Donato, Fabio Giulii Capponi and Giuseppe Scarcella
University of Catania, Italy; Sapienza University of Rome, Italy

P3104 | Experimental Identification of Induction Machine Flux Maps for Traction Applications [#1411]
Luisa Tolosano, Eric Armando, Sandro Rubino, Fabio Mandrile and Radu Bojoi
Politecnico di Torino, Italy

P3105 | Model Predictive Current Control using Single Layer Neural Network for PMSM Drives [#1170]
Hasan Ali Gamal Al-kaf, Samer Saleh Hakami, Laith M. Halabi and Kyo-Beum Lee
Ajou University, Yemen; Ajou University, Jordan; Ajou University, Korea, Republic of

P3106 | Combined Winding Drives for Industrial-Scale Bearingless Motors [#1114]
Zhouzhou Wang and Eric Severson
University of Wisconsin-Madison, United States

P3107 | Compensating the Thermally Derated Torque for Six-Phase Induction Machine Based Electric Drive System Using Linear Parameter Varying Control [#349]
Athar Hanif and Qadeer Ahmed
The Ohio State University, Columbus, OH, United States

P3108 | An Interactive Tool for the Analysis of Mechanical Stresses on Wind Turbine Shafts [#937]
Simon Pierre Betoka, Joseph Song-Manguelle, Pascal Lingom, Mamadou Lamine Doumbia, Jean- Maurice Nyobe-Yome and Thomas Alphonse Mbock-Singock
University of Quebec at Trois-Rivieres, Canada; Oak Ridge National Laboratory, United States; University of Douala, Cameroon; University of Quebec Rouyn-Noranda, QC, Canada, Canada

P3109 | Fast Gradient Method Based on Dynamic Programming in Model Predictive Control for PMSM Drives [#685]
Jonghun Yun, Jiwon Yoo, Shenghui Cui and Seung-Ki Sul
Seoul National University, Korea (South)

P3110 | Multi-objective Design Optimization for Current Sensor Rogowski Coil [#682]
Xia Du, Andrea Stratta, David Porras, Yuqi Wei, Yuheng Wu, Zahra Saadatizadeh, Chris Farnell and Alan Mantooth
University of Arkansas, United States

P3111 | Analysis and Quantification of Position Sensor Offset Error in Feedforward Controlled PMSMs [#42]
Gayan Edirisinghe, Lihini Rajapaksha, Sunil Abeyratne and Sandun Kuruppu
Sri Lanka Institute of Information Technology, Sri Lanka; University of Peradeniya, Sri Lanka; Saginaw Valley State University, United States

P3112 | Performance Analysis of the Alternate Arm Converter for Electric Drive Applications [#1104]
Nageswara Rao Karaka, Govind Avinash Reddy and Anshuman Shukla
Indian Institute of Technology, Bombay, India

Tuesday, October 11 2:30PM–5:00PM

Plenary Poster S55 | Energy Storage and Harvesting

Room Expo Hall E
Chair: Akanksha Singh

P3301 | Lifetime Evaluation of Lithium-ion Batteries Under Pulsed Charging Currents [#1045]
Siyu Jin, Xin Sui, Xinrong Huang, Shunli Wang, Remus Teodorescu and Daniel-Ioan Stroe
Aalborg University, Denmark; Chang'an University, China; Southwest University of Science and Technology, China

P3302 | Energy Storage for Hourly Dispatching Utility-Scale Solar Power Using HOMER Pro - A Cost Investigation [#746]
Pranoy Roy, Yuan Liao and JiangBiao He
University of Kentucky, United States

P3303 | Aging Mechanisms of Electrodes in LiFePO4/Graphite Batteries [#813]
Yaqi Li, Alex Juul Soegaard, Jonas Ilum Soerensen, Jia Guo, Daniel-Ioan Stroe, Kjeld Pedersen and Leonid Gurevich
Aalborg University, Denmark

P3304 | Holistic Design of Small-Scale Oscillating Water Column in Stand-Alone DC Microgrid [#64]
Sangwon Seo, Jinho Kim, Eduard Muljadi, R. Mark Nelms and Harley Moeljanto
Auburn University, United States; ROI Engineering LLC, United States

P3305 | Generalized Analysis and Evaluation of Switched Inductor PWM-based Lithium-ion Battery Cell Balancing [#1281]
Mohammad Al-Smadi and Jaber Abu Qahouq
The University of Alabama (UA), United States

Plenary Poster S56 | Data Analytics for Accelerated Simulation/energy Forecasting and Smart Protection Algorithms

Room Expo Hall E
Chair: Yan Li

P3501 | An FPGA-based Power Converter Simulation Accelerator Towards Highly Time-Efficient Machine Learning-Aided Design Methodology [#351]
Zhenyu Xu, Xueshen Zhang, Tao Wei, Keon-Woo Kim and Yeonho Jeong
University of Rhode Island, United States; Samsung Electronics Co., Ltd, Korea (South)

P3502 | Converter Circuits to Machine Learning: Optimal Feature Selection [#1106]
Ahmed k. Khamis and Mohammed Agamy
Universityat Albany SUNY, United States

P3503 | Series AC Arc Fault Detection using Decision Tree-Based Machine Learning Algorithm and Raw Current [#445]
Kamal Chandra Paul, Linus Schweizer, Tiefu Zhao, Chen Chen and Yao Wang
University of North Carolina at Charlotte, United States; Karlsruhe Institute of Technology, Germany; University of Central Florida, United States; Hebei University of Technology, China

P3504 | Ground Fault Localization of Branched Wire Network Using Reverse Image Search [#1192]
Xiaoyan Liu, Maohang Qiu, Mengxuan Wei and Dong Cao
University of Dayton, United States

P3505 | Eccentricity Severity Estimation of Induction Machines Using a Sparsity-Driven Regression Model [#496]
Xiangtian Zheng, Hiroshi Inoue, Makoto Kanemaru and Dehong Liu
Texas A&M University, United States; Mitsubishi Electric Corporation, Japan; Mitsubishi Electric Research Laboratories, United States

Plenary Poster S57 | Selected Topics in Emerging Technologies

Room Expo Hall E
Chairs: Xuzhen Huang, Jinia Roy

P3701 | Towards Predictive Motor Analysis: Multi-physics Modeling and Its Applications [#215]
Seunghwan Keum and Scott Parrish
General Motors Global Research and Development, United States

P3702 | Analysis and Suppression of Voltage Oscillation of Solid-state Circuit Breaker Entering Active Region [#422]
Dehao Qin, Zheyu Zhang, Di Zhang, Yuntao Xu, Ravi Lakshmi, Shahsavarian Tohid, Dong Dong and Yang Cao
Clemson University, United States; Naval Postgraduate School, United States; virginia Tech, United States; University of Connecticut, United States; Virginia Tech, United States

P3703 | A Solid-State Circuit Breaker without Current Limiting Inductor [#497]
Di Zhang, Yuntao Xu, Brandt Jonathan, Zheyu Zhang, Qin Dehao and Dong Dong
Naval Postgraduate School, United States; Clemson University, United States; Virginia Tech, United States

P3704 | Series PV Arc Fault Detection Using Current Demodulation and Autocorrelation Coefficients [#660]
Jonathan Kim, Brad Lehman and Roy Ball
Northeastern University, United States; Northeastern Unviersity, United States; Mersen, United States

P3705 | Compensation Network Design Method for Capacitive Power Transfer System Considering Coupling Variation [#872]
Sunghyuk Choi, Gyu Cheol Lim, Jin-Su Hong, Euihoon Chung, Gyu Yeong Choe and Jung-Ik Ha
Seoul National University, Korea (South); Hyundai Motors Company, Korea (South)

Plenary Poster S58 | Power Electronic Converter Topologies

Room Expo Hall E
Chairs: Mahshid Amirabadi, Carsten Fronczek

P3901 | A Differential Power Processing Converter Adopting Active Clamp Structure and Integrated Planar Transformer [#181]
Ji-Hoon Lim, Dong-In Lee, Ye-Ji Hyeon and Han-Shin Youn
Incheon National University, Korea (South)

P3902 | Impact of GaN-HEMT Combinations with Different Die-Size on the Efficiency of a Single-Phase Photovoltaic Differential Buck Inverter [#1014]
Tobias Brinker, Philipp Mand and Jens Friebe
Leibniz University, Hannover, Germany

P3903 | A Class E Based Multichannel Auxiliary Power Supply with Load Independent Zero-Voltage- Switching Operation [#106]
Li Ying, Watson Alan, Kaya Mustafa and Wheeler Patrick
University of Nottingham, United Kingdom

P3904 | A Cost-Effective Winding Structure On Modular Matrix Transformer LLC Application [#112]
Zhengming Hou, Shengcheng Kao and Jih-Sheng Lai
Virginia Tech, United States

P3905 | Design and Control of Integrated DC-DC Converter for Electric Vehicles [#48]
Issac Kim, Won-Yong Jang, Myeong-Won Kim and Jung-Wook Park
Yonsei University, Korea, Republic of

P3906 | Investigation into Magnetic Control of Hard-Switching DC-DC Converters [#167]
J. Marcos Alonso, Hector Chinchero, Guirguis Abdelmessih, Yueshi Guan and Yijie Wang
University of Oviedo, Spain; University of Burgos, Spain; Harbin Institute of Technology, China

P3907 | Dual-Buck Three-Phase AC-AC Converter Without Commutation Problems [#69]
Usman Ali Khan, Myeong-Won Kim, Ashraf Ali Khan and Jung-Wook Park
Yonsei UniversitySeoul South Korea, Korea (South); Memorial University of Newfoundland, Canada

P3908 | A novel single stage AC-AC converter for Hybrid Solid State Transformer [#896]
Sanjay Rajendran and Alex Huang
The University of Texas at Austin, United States

P3909 | Single-phase Transformerless Unified Power Quality Conditioner Based on Three-Leg Converter [#699]
Jean Torelli Cardoso, Cursino Brandao Jacobina and Alan Santana Felinto
Federal University of Campina Grande, Brazil

Plenary Poster S59 | Modeling and Control Considerations of Power Converters III

Room Expo Hall E
Chair: Fei Lu

P4101 | Analysis and Verification of the Series Resonant Converter for Constant Power Loads [#686]
Arkadeb Sengupta, Utsab Kundu and Vinod John
Indian Institute of Science, Bangalore, India

P4102 | A Parameter Estimator for Inductance within a Dual Active Bridge Converter [#415]
Zachary Smith, Michael McIntyre, Paul Ohodnicki and Brandon Grainger
University of Pittsburgh, United States; University of Louisville, United States

P4103 | Evaluation of Position Controllers for a Wheatstone Bridge Active Magnetic Bearing system [#740]
Luca Tarisciotti, Constanza Ahumada, Luca Papini, Catalina Gonzalez Castano and Paolo Bolognesi
University Andres Bello, Chile; University of Chile, Chile; University of Pisa, Italy

P4104 | A PWM Strategy for Cascaded H-bridges to Reduce the Loss Caused by Parasitic Capacitances of Medium Voltage Dual Active Bridge Transformers [#216]
Haiguo Li, Zihan Gao and Fred Wang
The University of Tenessee, United States

P4105 | A Method to Compensate for the Distortion of the Output Voltage of an H-Bridge Inverter Under Sinusoidal Unipolar PWM [#418]
Hitesh Kumar, Somenath Banerjee and Santanu K. Mishra
Indian Institute of Technology Kanpur, India

P4106 | Five-leg Single-phase Transformerless Unified Power Quality Conditioner [#701]
Jean Torelli Cardoso, Cursino Brandao Jacobina, Alan Santana Felinto and Mauricio Beltrao Rossiter Correa
Federal University of Campina Grande, Brazil

P4107 | A Model Independent Predictive Control of Active Front Ends in Offshore Wind Turbine Systems [#1357]
Yuzhe Zhang, Xiaodong Liu, Zhenbin Zhang and Feng Wang
Shandong University, China; State Grid Wuxi Power Supply Company, China; Shandong Agriculture and Engineering University, China

P4108 | Hybrid Predictive Control of Grid-tied MMC to Mitigate Circulating Current Using a Simple PR Controller [#1334]
Zexin Liu, Ralph Kennel, Yuanxiang Sun, Yanhua Liu and Zhenbin Zhang
SDU, China; TUM, Germany

Plenary Poster S60 | Magnetics and Packaging

Room Expo Hall E
Chairs: Helen Cui, Jun Wang

P4301 | The Shape of Polar Anisotropic Magnetizer to Reduce the Dead Zone of a Ring Bonded Magnet [#942]
Jeong-Yeon Min, Dong-Woo Nam, Hyun-Jo Pyo, Min-Ki Hong and Won-Ho Kim
Gachon University, Korea (South)

P4302 | Frequency Dependence Deterioration of AC Resistance in Large-Diameter Litz Wire for High Power Induction Heating [#1190]
Kawahara Shota, Umetani Kazuhiro, Ishihara Masataka and Hiraki Eiji
Okayama University, Japan

P4303 | Optimized Thermal Modelling of High Power Planar PCB Magnetics [#190]
Lucia Clavero Ordonez, Alberto Delgado Exposito, Pedro Alou Cervera, Miroljub Bakic and Thiwanka Wijekoon
Universidad Politecnica de Madrid, Spain; Huawei Technologies Duesseldorf, Germany

Plenary Poster S61 | Diagnostics, Noise and Vibration in Electric Machines

Room Expo Hall E
Chair: Luca Zarri

P4501 | Demagnetization Risk Assessment in a Dual Stator Permanent Magnet Vernier Machines [#261]
Zia Ullah, Mudassir Raza Siddiqi and Shehab Ahmed
King Abdullah University of Science & Technology, Saudi Arabia; Incheon National University, Korea (South)

P4502 | Assessment of the Rotor Condition in Soft-started Induction Motors Through the Hilbert Transform of Transient Stray Flux Signals [#449]
Vicente Biot-Monterde, Angela Navarro-Navarro, Israel Zamudio-Ramirez, Jose Antonino-Daviu and Roque A Osornio-Rios
Universitat Politecnica de Valencia, Spain; Universidad Autonoma de Queretaro, Mexico

P4503 | Detection and Separation of Faults in Permanent Magnet Synchronous Machines using Hybrid Fault-Signatures [#259]
Zia Ullah, Junhyuk Im and Shehab Ahmed
King Abdullah University of Science and Technolo, Saudi Arabia; Incheon National University, Korea (South)

P4504 | Electric Motor and Power Electronics NVH Control Strategies for Electric Propulsion Systems of Battery Electric Vehicles [#119]
Song He, Peng Zhang, Vinod Chowdary Peddi and Cheng Gong
General Motors Company, United States

P4505 | Condition Monitoring of Direct Torque Controlled Permanent Magnet Synchronous Machines [#270]
Ibrahim M. Allafi and Shanelle N. Foster
Michigan State University, United States

P4506 | EDM Damage Assessment and Lifetime Prediction of Motor Bearings Driven by PWM Inverters [#499]
Ryan Collin, Alex Yokochi and Annette von Jouanne
Baylor University, United States

Plenary Poster S62 | Modelling and Analysis of Electric Machines in Specialized Applications

Room Expo Hall E
Chair: Silvio Vaschetto

P4701 | Generalized High-Fidelity Reduced-Order Modeling of Doubly-Fed Machines and Induction Machines [#429]
Peng Peng and Peng Han
General Motors Company, United States; ANSYS. Inc, United States

P4702 | Theoretical and Experimental Reevaluation of Short-Circuited Rotor Windings in Induction Machines [#830]
Peng Han, Peng Peng, Wei Qin and Ming Cheng
Ansys, Inc., United States; General Motors Company, United States; Southeast University, China

P4703 | Comparison of Numerical Induction Motor Models with FEA-Based-Lookup Tables [#866]
Ryoko Imamura
Powersys Inc., United States

P4704 | Space-Vector Dynamic Model of Dual-Three Phase Induction Motors with Balanced and Unbalanced Structures in State Form [#358]
Angelo Accetta, Massimiliano Luna and Marcello Pucci
INM-CNR, Italy

P4705 | 3 MW Design and Comparison of Geared Slip-Synchronous Wind Turbine Systems [#1084]
Dillan Ockhuis and Maarten Kamper
Stellenbosch University, South Africa

P4706 | Passive Electrodynamic Bearings [#628]
Abdoalateef Alzhrani and Kais Atallah
University of Sheffield, United Kingdom

P4707 | Performance Comparison of Transverse and Axially Laminated Synchronous Reluctance Machines [#1436]
Emmanuel Agamloh and Shovan Deb
Baylor University, United States

Plenary Poster S63 | Electric Drives II

Room Expo Hall E
Chairs: Mohammed Agamy, Ali Bazzi

P4901 | Feedforward Deadtime Compensation Using Current Zero Crossing Detection [#1138]
Michael Kercher, Wensong Yu and Iqbal Husain
North Carolina State University, United States; North Carolina State University, United States

P4902 | Linear Dead-Time Compensation Control Using the Voltage Command Value Suitable for Low-Inductance Motors [#288]
Motoki Hada, Keiichiro Kondo, Kohei Aiso, Yasuaki Aoki and Takahiro Watanabe
Waseda University, Japan; Shibaura Institute of Technology, Japan; Denso Corporation, Japan

P4903 | Sensorless Disturbance Rejection for High-Precision Permanent Magnet Motor Motion System [#875]
Yi-Jen Lin, Po-Huan Chou, Wei-Chieh Hsu, Chi-Jun Wu and Shih-Chin Yang
National Taiwan University, Taiwan; Industrial Technology Research Institute, Taiwan

P4904 | Shunt-Connected Solar Microinverter for Induction Motor Soft-Starting and Active and Reactive Power Compensation [#1373]
Musab Guven, Kangbeen Lee, Younsuk Dong and Woongkul Lee
Michigan State University, United States

P4905 | State of Charge Estimation of Battery Energy Storage Systems in Low Voltage Electric Drive Applications for Hybrid and Electric Vehicles [#651]
Ester Vasta, Alberto Lucifora, Luigi Danilo Tornello, Salvatore Foti, Mario Cacciato, Christian Pernaci, Christian Pernaci and Giacomo Scelba
University of Catania, Italy; University of Messina, Italy; Audi AG, Italy

P4906 | Vector Projection-based Sensorless Control of a SynRM Drive Including Self and Cross-Saturation [#359]
Angelo Accetta, Maurizio Cirrincione, Massimiliano Luna, Marcello Pucci and Antonino Sferlazza
INM-CNR, Italy; USP - University of South Pacific, Fiji; University of Palermo, Italy

P4907 | Automatic Recovery Method for Reversal of Rotor Polarity in Traction Motor Sensorless Control for Electric Vehicles [#49]
Myeong-Won Kim, Issac Kim and Jung-Wook Park
Yonsei Univ., Korea, Republic of; Yonsei Univ, Korea, Republic of

P4908 | V/f control for Switched Reluctance Motor [#681]
Takahiro Kumagai, Jun-ichi Itoh and Masakazu Kato
Nagaoka University of Technology, Japan; Nagaoka Motor Development Co., Ltd., Japan

P4909 | Learning-based Position Sensorless Control in Low-speed Region for SMPMSM [#903]
Jaehoon Shim, Byung Ryang Park, Sunghyuk Choi and Jung-Ik Ha
Seoul National University, Korea (South)

P4910 | DC-Link Current Harmonics Reduction of a Dual Inverter with a Lower Floating Capacitor Voltage [#693]
Akihito Mizukoshi and Hitoshi Haga
National Institute of Tech., Kisarazu College, Japan; Nagaoka University of Technology, Japan

P4911 | Real-Time Data-Driven System Identification of Motor Drive Systems Using Online DMD [#1016]
Muhammed Ali Gultekin and Ali Bazzi
University of Connecticut, United States

P4912 | Non-Uniform Global Demagnetization Detection in Interior PMSMs Using Search Coils [#1113]
Marcos Orviz, David Reigosa, Jigyun Jeong, Hyeon-Jun Lee, Sang Bin Lee and Fernando Briz
Universidad de Oviedo, Spain; Korea University, Korea, Republic of

This year, IAS Annual Meeting authors were invited to display posters of their work in the ECCE Exhibit Hall for added exposure of their work to the ECCE audience. This optional offer was taken by about 10 authors, and their work are featured during the ECCE posters session. See the virtual platform for the list of IAS posters.

TECHNICAL PROGRAM SCHEDULE

REMOTE Q/A SESSIONS

Some parts of the world are currently on Covid lockdown. Some of our ECCE2022 attendees are facing travel restrictions. We understand! Papers from these authors are featured in a special program that will take place the week after the Detroit event, from Oct 17-19, 2022. Meet the authors live on Zoom to ask them question you have on their papers. Check out the Zoom links for the live sessions on the Virtual Platform: **ecce2022.vfairs.com**

Monday, October 17 9:00AM–9:55AM

Remote Q/A Session R01 | Control, Analysis and Modeling of Renewable Energy Systems

Link available on virtual platform
Chairs: Ngoc Ha Pham, Meiqin Mao

Parametric Broadband Excitation for Real-time Condition Monitoring of Monocrystalline Photovoltaic Modules Using Impedance Spectroscopy [#321]
Linda Shelembe and Paul Barendse
University of Cape Town, South Africa

Analysis of Switch-mode Converter Inductor Current Ripple Excitation of a Monocrystalline PV module Using Impedance Spectroscopy for Condition Monitoring [#322]
Linda Shelembe and Paul Barendse
University of Cape Town, South Africa

Quantitative Evaluation of Different Voltage Lift Techniques in DC-DC Converters for Renewable Energy Systems [#559]
Xinying Li, Yan Zhang, Jinjun Liu and Yihai Li
Xi'an Jiaotong University, China

A Perturbation and Observation Based Sawtooth Carrier Modulation Strategy of Parallel Converters [#32]
Xi Liu, Chenghui Zhang and Xiangyang Xing
Shandong University, China

A ZVS Based Bidirectional Equalizer for Battery Equalization [#939]
Rui Ling, Zhibin Dai, Xinchi He, Dongxue Li and Jiquan Zhao
Chongqing University, China; Vicor Corporation, United States

A Non-uniform Planar Coil In Electro-magnetic Vibration Energy Harvesting [#72]
Xianchao Liu, Han Peng, Kai Gao, Wang Shaojing and Xu Peng
Huazhong University of Science and Technology, China; State Grid Shanghai Electric Power Research Inst, China

Prediction of I-V Characteristics for Bifacial PV Modules via an Alpha-beta Single Double-diode Model [#901]
Dou Hong, Jieming Ma, Ka Lok Man, Huiqing Wen and Prudence Wong
Xi'an Jiaotong-Liverpool University, China; University of Liverpool, United Kingdom Power Loss

Reduction for PV Emulator Using Transistor-based PV Model [#97]
Habes Ali Khawaldeh, Mohammad Al-soeidat, Dylan Lu and Li Li
University of Technology Sydney, Australia

Energy Storage Minimization Control in Grid-Connected Photovoltaic Virtual Synchronous Generator [#100]
Yuguang Hou, Jia Liu, Xuewen Li and Jinjun Liu
Xi'an Jiaotong University, China

Remote Q/A Session R02 | Grid Inverters and Applications

Link available on virtual platform
Chairs: Ahmed Abuhussein, Pallavi Bharadwaj

LTP Modeling and Harmonic Analysis of Discrete Universal SOGI-FLL [#468]
Haoyang Zheng, Zeng Liu, Kaiwen Feng, Jinjun Liu and Houkai Zhang
Xi'an Jiaotong University, China

Design and FPGA Implementation of a Real-time Simulation Platform for an MMC-H DC Transformer [#821]
Liye Wu, Yichao Sun, Carlos Teixeira, Brendan McGrath, Donald Holmes and Yufan Li
Nanjing Normal University, China; RMIT University, Australia

Transient Stability Study of a Real-World Microgrid with 100% Renewables [#1415]
Yaswanth Velaga, Jing Wang, Annabelle Pratt, Laurence Abcede and Nagadev Shamukh
National Renewable Energy Laboratory, United States; San Diego Gas & Electric, United States

Global Maximum Power Point Tracking for Photovoltaic Systems Using Hybrid Secant and Binary Search Algorithms [#789]
Anusha Kumaresan, Glen G. Farivar, Hossein Dehghani Tafti, Neha Beniwal, Naga Brahmendra Yadav Gorla and Josep Pou
Nanyang Technological University, Singapore; University of Western Australia, Australia

Modeling and Evaluation of Winding Losses in High Voltage Planar Transformers [#232]
Hanyu Liu, Kai Sun, Guoen Cao, Zheyuan Yi and Shilei Lu
Tsinghua University, China; Chinese Academy of Sciences, China

A Robust IMFOGI Control for Power Quality Enhancement of a Dual Stage SPV-BES-BDC- SyRG DG Set Based Standalone Microgrid [#491]
Subhadip Chakraborty, Gaurav Modi and Bhim Singh
Indian Institute of Technology Delhi, India

Impact on the Harmonic Distortion of Low-Capacitance Static Compensator with Discontinuous Modulation [#1428]
Qingxiang Liu, Ezequiel Rodriguez Ramos, Glen Ghias Farivar, Salvador Ceballos, Josep Pou, Christopher David Townsend and Ramon Leyva
Nanyang Technological University, Singapore; TECNALIA, Spain; University of Western Australia, Australia; Universitat Rovira i Virgili, Spain

Efficiency Improvement of Computer Power Supply using Power Consumption Estimation from CPU Performance Monitors [#391]
Shinichi Kawaguchi
Kanagawa Institute of Technology, Japan

Adaptive Reduced-Order Method of Aggregated Impedance Model for Large-Scale Photovoltaic Stations Small Signal Stability Analysis [#374]
Xun Jiang, Meiqin Mao and Liuchen Chang
Hefei University of Technology, China; Hefei University of Technology, Canada

High-Speed Three-Phase Enhanced Phase-Locked Loop for Grid Synchronization Under Adverse Conditions [#898]
Surya chandra Gulipalli, Srinivas Gude and Chia-Chi Chu
National Tsing Hua University, Taiwan; Delta Electronics, Inc., Taiwan

Remote Q/A Session R03 | Electrification of Rail, Sea and Air Transportation Systems

Link available on virtual platform
Chairs: Shuvajit Das

Modeling and Harmonic Instability Analysis of the PET-Based Train-Grid System [#444]
Chunxu Lin, Dan Liu, Huimin Wang, Kexin Wang, Yun Zuo, Qingli Deng, Junwen Mu and Xinglai Ge
Southwest Jiaotong University, China

SOC inconsistency Estimation Using Sensor Fusion Method Based on the Dual Extended Kalman Filter Neglecting the Cell-to-cell Aging Condition [#1365]
Jinhyeong Park, Jaewon Kim, Dongjae Lee, Roland Kobla Tagayi, Jelim Lee, Woonki Na and Jonghoon Kim
Chungnam National University, Korea (South); California State University, United States

An Any-cell-to-any-cell Equalization Based on Half-bridge CLLC Converters for Lithium-ion Battery Strings [#170]
Ruijia Cai, Yundong Ma, Ruiran Dai, Zhao Zhiqiang, Peng Wang and Pengfei Wang
Nanjing University of Aeronautics and Astronauti, China

Design of Power Hardware-in-the-Loop Simulation for Aircraft Brushless Wound-Rotor Synchronous Motor [#184]
Yuanhao Xie, Dong Jiang and Zicheng Liu
Huazhong University of Science and Technology, China

An Experimental Investigating on the Effect of Contact Resistance for Pouch Type Lithium-ion Battery of the Performance and Safety [#1362]
Insu Baek, Deokhun Kang, Changki Choi, Batool Dania, Bongwoo Kwak, Woonki Na and Jonghoon Kim
Chungnam National University, Korea, Republic of; Chungnam National University, Pakistan; Korea Institute of Industrial Technology, Korea, Republic of; California State University, United States

Data-driven Prediction of Battery Degradation Using EIS-based Robust Features [#1363]
SeungHwa Sin, PyeongYeon Lee, SangWoo Cho, Mazhar Abbas, SangRyuk Lee and Jonghoon Kim
Chungnam National University, Korea, Republic of

Complete Process Emulation of Integrated Starter/Generator Using Power Electronic Devices [#173]
Yuanhao Xie, Dong Jiang and Liangchen Tian
Huazhong University of Science and Technology, China

Partial Discharge Detection of Electrical Machine Insulation Under PWM Voltage with High dv/dt for More Electric Aircraft [#175]
Hao Sun, YaLin Wang, Yi Ding, YiFan Rui, Lu Fan and Yi Yin
Shanghai Jiao Tong University, China

Active Filter Circuit in the HF AC-link of a Bidirectional Wireless Battery Charger for EV [#1105]
Asier Garcia-Bediaga, Ander Avila, Itziar Alzuguren, Alejandro Rujas and Miroslav Vasic
Ikerlan Technology Research Centre (BRTA), Spain; Technical University of Madrid (UPM), Spain

Remote Q/A Session R04 | Wireless Power Transfer

Link available on virtual platform
Chairs: Zhen Xin, Jiangfeng Wang

Frequency Optimization Method for Underwater Wireless Power Transfer Considering Coupling Conditions [#150]
Jia Li, Kailong Liu, Jixie Xie, Chong Zhu and Xi Zhang
Shanghai Jiao Tong University, China; Warwick Manufacturing Group University, United Kingdom

A Two-Dimensional Misalignment-Tolerant IPT System Based on Three-arm Voltage Doubler Rectifier [#187]
Shunpan Liu, Yihao Wu, Lingyun Zhou, Ruikun Mai, Zhengyou He and Stefan Goetz
Southwest Jiaotong University, China; University of Cambridge, United Kingdom

Design of Power Amplifier Operating on Wide Input Power Range Based on Impedance Mismatch Evaluation Model [#249]
Huan Hu, Ke Jin, Xue Wang, Weiyang Zhou and Chen Yang
Nanjing University of Aeronautics & Astronautics, China

Arrangement Strategy of Antenna Array Based on Cruciform Growth Algorithm for Microwave Wireless Power Transmission [#250]
Xue Wang, Ke Jin, Shuchen Cheng and Weiyang Zhou
Nanjing University of Aeronautics & Astronautics, China

Advanced Self-Oscillating Control for Domino Wireless Power Transfer Systems with Quasi- Load Independent Outputs [#273]
Kaiyuan Wang and Yun Yang
The Hong Kong Polytechnic University, Hong Kong

Pulse Density Modulation Control of LCC-S Compensated WPT System with Switch-Controlled Capacitors for Constant Output Voltage of Frequency-Selective Receivers [#87]
Ke Li, Wen Ding and Jiangnan Yuan
Xi'an Jiaotong University, China

A Robust Primary-Side Hybrid Data-Driven Load Monitoring Strategy for Wireless Power Transfer Systems [#295]
Yang Yun and Wu Huihuan
The Hong Kong Polytechnic University, Hong Kong

Shielding Design for High-Frequency Wireless Power Transfer System for EV Charging with Self-Resonant Coils [#1136]
Ruiyang Qin, Jie Li, Jingjing Sun and Daniel Costinett
The University of Tennessee, Knoxville, United States

A Dynamic Reconstruction Strategy for Adaptive Power Receiving of Moving Targets in MPT System [#811]
Jianying Ding, Ke Jin, Xing Li, Weiyang Zhou and Zhongwei Chen
Nanjing University of Aeronautics and Astronaut, China

Remote Q/A Session R05 | Power Converter Topologies A

Link available on virtual platform
Chairs: Zhituo Ni, Vishnu Mahadeva Iyer

Three-Phase Voltage-Fed Inverter with Pulse-Voltage-Injected Two-Phase Modulation for CVCF Applications [#395]
Taketo Ikeuchi and Shin-ichi Motegi
Kobe City College of Technology, Japan

Modular Multilevel Converter Based Topology with Lower Number of High-Frequency Switches [#70]
Saleh Farzamkia, Houshang Salimian Rizi and Alex Q. Huang
University of Texas at Austin, United States

A High Step-Up DC-DC Converter Using a Three Winding Coupled Inductor for Photovoltaic to Grid Applications [#326]
Saeed Habibi, Ramin Rahimi, Mehdi Ferdowsi and Pourya Shamsi
Missouri University of Science and Technology, United States

A Novel Modular Multilevel Converter with Single Bridge Arm Per Phase for Size Reduction [#278]
Chang Pan, Lei Lin, Xiaojie Shi and Tianxiang Yin
Huazhong University of Science and Technology, China

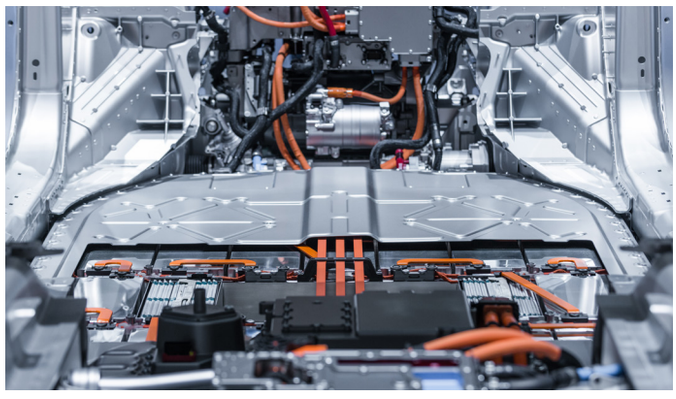
Single-Phase Single-Stage PFC Based on a Novel Floating Capacitor Filter for Electric Vehicle On-Board Charger Application [#1087]
Itziar Alzuguren, Asier Garcia-Bediaga, Ander Avila, Alejandro Rujas and Miroslav Vasic
Ikerlan Technology Research Centre (BRTA), Spain; UPM, Spain

Boost Operation of a Dual-Active-Bridge AC-DC Converter with an Active Energy Buffer [#542]
Shohei Komeda, Shunsuke Takuma and Yoshiya Ohnuma
Tokyo Univ. of Marine Science and Technology, Japan; Nagaoka Power Electronics Co., Ltd., Japan

Single Phase High Power Density MISN PFC Converter [#684]
Tianlin Huang, Wending Zhao and Xinke Wu
Zhejiang University, China

Three-Phase Three-Level Reduced Switch Count Isolated AC/DC Neutral-Point Clamped Converter With High-Frequency DC-Link [#691]
Ailton Dutra, Montie Vitorino and Mauricio Correa
Federal University of Campina Grande, Brazil

Five-Level Three-Phase AC/DC Stacked Multicell Converter with Reduced Switch Count [#692]
Ailton Dutra, Reuben Souza, Montie Vitorino and Mauricio Correa
Federal University of Campina Grande, Brazil



Monday, October 17 10:00AM–10:55AM

Remote Q/A Session R06 | Grid Forming Inverters and Distributed Generation

Link available on virtual platform
Chairs: Liqun He, Ahmed Abuhussein

Inertia Evaluations on Grid Forming Inverters with Virtual Synchronous Generator Control Applied to Photovoltaic Power Systems [#453]
Qiang Lin, Tetsu Shijo, Kenichirou Ogawa, Hiroshi Uno, Yasuhiro Kanekiyo and Junichi Arai
Toshiba Corporation, Japan; Energy and Environment Technology Research Inst, Japan

Improved Control Strategy of Grid-Forming Inverters for Fault Ride-Through in a Microgrid System [#1367]
Jing Wang
National Renewable Energy Laboratory, United States

Virtual Flux-based Grid-Forming Current Controller for Flexible Operation of Voltage Source Converters [#861]
Afif Nazib, Donald Grahame Holmes and Brendan McGrath
Universiti Malaysia Perlis, Malaysia; RMIT University, Australia

Virtual Synchronous Machine Control Applied to Solid State Transformer [#1351]
Yushi Miura and Junya Higuchi
Nagaoka University of Technology, Japan

Event Detection Based Voltage and Frequency Restoration for Mobile Emergency Energy Storage Vehicle without Communication [#155]
Haocheng Wang, Xiao Zhang, Nian Lv, Zhenxiong Wang, Hao Yi and Fang Zhuo
Xi'an Jiaotong University, China

An Advanced Voltage Regulation Strategy for the Meshed Distribution Networks with Soft Normally-Open Point [#795]
Zhang Aozhe, Zhou Jianqiao, Zang Jiajie, Zhang Jianwen, Xi Dongmin, Shi Gang, Wang Zhida and Fan Xinming
Inner Mongolia University of Technology, China; Shanghai Jiao Tong University, China; Shanghai University of Engineering Science, China; Foshan Power Supply Bureau of Guangdong Power Gr, China

Short-Circuit Fault Protection Scheme for Serial-Shunt Type Soft Normally Open Point [#275]
Xinyi Kong, Jianwen Zhang, Jianqiao Zhou, Jiajie Zang, Gang Shi, Xu Cai, Xinming Fan and Dongmin Xi
Shanghai Jiaotong University, China; The Key Laboratory of Control of Power Transmiss, China; Foshan Power Supply Bureau, China; Inner Mongolia University of Technology, China

Ultra-Efficient Ultra-Wide Load Range Power Conversion Platform for DC Building Applications [#437]
Sui Pung, Victor Cheung, Qingchun Li and Tin Ho, River Li
ASTRI, Hong Kong; ASTRI, China

FRA-based DQ Impedance Measurement for Three-Phase Power Electronic Systems [#44]
Toshiji Kato, Kaoru Inoue, Kazuki Yomura and Miwa Yoshiki
Doshisha University, Japan

Remote Q/A Session R07 | Data-Driven Assessment and Design for Power Electronic Applications

Link available on virtual platform
Chairs: Shuai Zhao

Health indicator Evaluation for Battery Pack Inconsistency and SOH Estimation Based on LSTM [#1364]
Jonghoon Kim, Dongho Han, Sanguk Kwon, Taesuk Mun, Miyoung Lee and Faiz Majeed
Chungnam National University, Korea (South)

A Sequential Network-model Alliance Module for Lithium-ion Battery Temperature Prediction [#276]
Li Marui, Dong Chaoyu, Li Xiangke, Dong Xiaohong, Mu Yunfei and Jia Hongjie
Tianjin University, China; The Hong Kong Polytechnic University, China; Hebei University of Technology, China

Energy Equalization of Battery Pack with Inconsistent Capacity [#944]
Rui Ling, Miaoya Yu, Shu Liu, Dongxue Li and Fei Feng
Chongqing University, China; Vicor Corporation, United States

Digital Twin System of Capacitive DC Bank Considering the Electrothermal Coupling Effect [#532]
Mingshuo Zhu, Yi Liu, Meng Huang and Xiaoming Zha
Wuhan University, China

Multi-Branch ResNet-Transformer Based Deep Hybrid Approach for Short-term Spatio- Temporal Solar Irradiance Forecasting [#515]
Saeedeh Ziyabari, Liang Du and Saroj K Biswas
Temple University, United States

Deep Neural Network-based Black-box Modeling of Power Electronic Converters Using Transfer Learning [#758]
Pouria Qashqai, Rawad Zgheib and Kamal Al-Haddad
Ecole de technologie superieure (ETS), Canada; Hydro-Quebec, Canada

Semi-Supervised Disaggregation of Daily Load Profiles at Transmission Buses with Significant Behind-the-Meter Solar Generations [#1065]
Zhenyu Zhao, Daniel Moscovitz, Shengyi Wang, Xiaoyuan Fan and Du Liang
Temple University, United States; PJM Interconnections, United States; Pacific Northwest National Lab, United States

An Improved Hardware-in-loop Power Electronics Converter Fast Multi-physics Design System [#268]
Chi Zhang, Wei Liu, Cheng Jiachang, Wang Kun and Shi Yimeng
Firstack Technology, China

Remote Q/A Session R08 | Power Converter Topologies; DC-DC and AC-DC-AC

Link available on virtual platform
Chairs: John Lam, Yifeng Wang

A High-efficiency Resonant DC-DC Converter with Wide Voltage Gain Range [#201]
Mengying Chen, Bo Chen, Yifeng Wang, Ping Wang, Mingzhi Zhang and Chaochang Che
Tianjin University, China

A Novel Current Sharing Method of Interleaved LLC Resonant Converter by a Common CL Filter [#234]
Fan Zhai, Guidan Li, Yifeng Wang, Bo Chen, Zhongjie Wang and Chaochang Che
Tianjin University, China

A Novel Bidirectional TLCT Resonant DC-DC Converter with Wide Voltage Range [#136]
Yifeng Wang, Mingzhi Zhang, Bo Chen, Mengying Chen, Chen Chen and Chaochang Che
Tianjin University, China

An Improved ISOP-LLC Converter for Wide Voltage Variation Range [#195]
Yifeng Wang, Chen Chen, Bo Chen, Danfeng Zhao, Ruilin Ji and Mingzhi Zhang
Tianjin University, China; State Grid Tianjin Power Costumer Service Center, China

Novel Common-Ground Dual-Buck Inverter for Photovoltaic Applications with No Leakage Current Issues [#332]
Ashraf Ali Khan, Usman Ali Khan, Shahnawaz Khan and Shehab Ahmed
KAUST, Saudi Arabia; Yonsei University, Korea (South); University of Lahore, Pakistan

A Six-Leg AC-DC-AC Single-Phase Three-Wire Power Converter [#1178]
Bruna Gehrke, Cursino Jacobina, Rodrigo Lacerda, Filipe Rocha and Italo Silva
Federal University of Campina Grande, Brazil; Federal University of Paraiba, Brazil

Dynamic Pulse-Positioning for a Single-Stage Isolated AC-DC Converter [#982]
Vishwa Perera, Juan Zuniga and John Salmon
University of Alberta, Canada

An Interleaved High Step-Up DC-DC Converter with Coupled Inductor and Built-in Transformer for Renewable Energy Applications [#586]
Ramin Rahimi, Saeed Habibi, Mehdi Ferdowsi and Pourya Shamsi
Missouri University of Science and Technology, United States

Remote Q/A Session R09 | Advanced Drivers, Driving, and Thermal Design

Link available on virtual platform
Chairs: Zheyu Zhang

Multiobjective Optimisation of active Gate Drivers for Fast-switching MOSFETs [#46]
Magnus Sandell, Xiang Wang, Gavin Watkins, Shusuke Kawai, Takeshi Ueno and Kohei Onizuka
Toshiba Europe Ltd, United Kingdom; Toshiba Corporation, Japan

A 15MHz GaN FET AZVT Buck Converter that Achieves 7.2-point Efficiency Increase at Heavy Load [#367]
Motohiro Kanai, Hidetoshi Taki, Kyohei Tanimura and Kousuke Miyaji
Shinshu University, Japan; Shinshu Universtiy, Japan

Measurement of Maximum dIC/dt with Printed Circuit Board Rogowski Coil for Junction Temperature Estimation of IGBT Modules [#583]
Yafei Shi, Huai Wang, Yichao Duan, Jianlong Kang and Zhen Xin
Hebei University of Technology, China; Aalborg University, Denmark

Study on the Impacts of Signal Carrier in a Compact Gate Driver with Single Isolation Channel for Both Signal and Power Transferring [#548]
Cheng Jiang, Han Peng, Qiaozhi Yue and Qiaoling Tong
Huazhong University of Science and Technology, China

Study on the Immersion Oil Cooling Method of Power Module [#954]
Yang Fengtao, Liu Chaohui and Shen Jinliang
Xi'an Jiaotong University, China; National New Energy Vehicle Technology Center, China

Reshaped Switching Trajectory of SiC MOSFET via Co-Optimized Active Gate Driver [#1235]
Mingrui Zou, Peng Sun, Yulei Wang, Zheng Zeng, Kaiyan Li and Xudong Han
Chongqing University, China

Conduction Time Variation-Based Active Thermal Control Method for Si and SiC Hybrid Switch [#835]
Haichen Liu, Tiefu Zhao, Xiwen Xu and Jiale Zhou
University of North Carolina at Charlotte, United States

Remote Q/A Session R10 | PM & Synchronous Reluctance Machine Design

Link available on virtual platform
Chairs: Akira Chiba, Fabio Giulii Capponi

Investigation of the Impact of Magnet Segmentation on High Frequency Eddy Current Losses in an Interior Permanent Magnet Motor [#764]
Samith Sirimanna, Xiaolong Zhang and Kiruba Haran
University of Illinois Urbana Champaign, United States

Shape Optimization of Stator Teeth in Interior Permanent Magnet Synchronous Motors with Distributed Windings to Reduce Rotor Loss [#754]
Katsumi Yamazaki, Taiga Uematsu, Akihiro Tanaka and Tohru Nakada
Chiba Institute of Technology, Japan; Nissan Motor Co., Ltd., Japan

Permanent Magnets Assistance Design Methods of High-Speed Synchronous Reluctance Machines [#703]
Gianvito Gallicchio, Marco Palmieri, Francesco Cupertino, Mauro Di Nardo, Michele Degano and Chris Gerada
Politecnico di Bari, Italy; University of Nottingham, United Kingdom

Reduction of On-Load Torque Ripple in PMSM using Time-Space Harmonics Analysis of Air- Gap Flux Density [#133]
Yan Dong, Lei Haowei, Zhang Zhen, Shi Tingna and Xia Changliang
Zhejiang University, China; Zhejiang UniversityAEEI Center, China

Future Electrical Machine Materials: Possibilities, Opportunities and Challenges [#161]
Mousalreza Faramarzi Palangar and Wen L. Soong
University of Adelaide, Australia

Design and Analysis of Two Degree-of-Freedom Rotary-Linear Machines with Hybrid Permanent Magnets for Robotic Applications [#143]
Yaojie He, You Zhou and Christopher H.T. Lee
Nanyang Technological University, Singapore

Accurate MTPA Strategy of PMSM Considering Cross Saturation Effect Based on Full-Flux- Linkage Model [#105]
Jiayue Zhou, Xi Xiao, Zitan Wang, Haifeng Lu, Jianyun Chai and Zhang Meng
Tsinghua University, China; Beijing Institute of Control Engineering, China

Influence of Circulating Currents on Electromagnetic Performance of 6-Slot/2-Pole High-speed PM Motors with Rotor Eccentricity [#285]
Tianran He, Ziqiang Zhu, Fan Xu, Hong Bin, Di Wu, Liming Gong and Jintao Chen
University of Sheffield, United Kingdom; Midea Group Corporate Research Center, China

Designing a LEAF-Benchmark Variable Magnetization-IPM Motor with Two V-Shaped PMs at a 100 kW Power Level [#242]
Kyouhei Yoneda, Wataru Suzuki and Kazuto Sakai Toyo University, Japan

Internal Permanent Magnet Motor with U-shaped Permanent Magnet Arrangement to Enable a Small Magnetization Current with High Power and Efficiency for Electric Vehicles [#241]
Wataru Suzuki, Kyohei Yoneda and Kazuto Sakai
Toyo University, Japan

Tuesday, October 18 9:00AM–9:55AM

Remote Q/A Session R11 | Power Converters and Control for Renewable Energy Systems A

Link available on virtual platform
Chairs: Hengzhao Yang

A Symmetrical Architecture for PV String Using LLC-based Voltage Multiplier by Differential Power Processing Technique [#140]
Xue Wang, Huiqing Wen, Yinxiao Zhu, Guanying Chu and Rui Du
Xi'an Jiaotong -Liverpool University, China; Lincoln University, China

A Simplified Power Balance Strategy for Three-Phase Cascaded H-bridge Photovoltaic Inverter [#814]
Hao Xue and Jinwei He
Tianjin University, China

Space Vector Modulation Technique for Leakage Current Attenuation in Grid-Connected Three- Phase Multilevel PV Inverters [#1252]
Luan Aleixo Canario Mendonca, Filipe Antonio da Costa Bahia, Andre Pires Nobrega Tahim, Jose Renes Pinheiro and Fabiano Fragoso Costa
Federal University of Bahia, Brazil

Leakage Current Reduction with 240CPWM in Silicon Carbide Based Transformerless Grid- connected PV Converter [#1049]
Hafsa Qamar, Haleema Qamar, Nikhil Korada, Raja Ayyanar and Madhura Sondharangalla
Arizona State University, United States

A Dual-Input-Single-Output Boost Converter with Inductors Coupling For Dual Electromagnetic Energy Harvesters [#568]
Letian Tong, Han Peng, Xianchao Liu, Kai Gao, Shaojing Wang and Peng Xu
Huazhong University of Science and Technology, China; State Grid Shanghai Electric Power Research Inst, China

Power Converter Technologies for 20MW Wind Turbines [#271]
Xibo Yuan, Yonglei Zhang and Xin Peng
China University of Mining and Technology, China

Fuel Cell Stack Broadband Excitation for Online Condition Monitoring Using different Switch- mode DC-DC Topologies [#460]
Surprise Mahlangu and Paul Barendse
University of Cape Town, South Africa

A Single-Phase Single-Stage Five-Level Common-Ground Transformerless Inverter with Six- Switches and Switched-Capacitor Cell [#584]
Fan Peng, Guohua Zhou, Nengmou Xu, Siya Gao and Dong Wu
Southwest Jiaotong University, China

A Novel Single-Phase Transformerless Grid-Connected PV Inverter [#1241]
Arnaldo Oliveira Cunha Junior, Filipe Antonio da Costa Bahia, Joao Paulo Ramos Agra Mello, Andre Pires Nobrega Tahim and Fabiano Fragoso Costa
Federal University of Bahia, Brazil; Federal Rural University of Pernambuco, Brazil

Remote Q/A Session R12 | Wireless Chargers

Link available on virtual platform
Chairs: Md Sariful Islam

A High Power Density 3/1-phase Compatible MISN-PFC Converter for On-Board Charger [#624]
Wending Zhao, Tianlin Huang and Xinke Wu
Zhejiang University, China

Analysis of a Three-Phase IPT Secondary Side in Interoperable Single-Phase Operation [#639]
Thorsten Kurpat and Lutz Eckstein
RWTH Aachen University, Germany; Institute for Automotive Engineering RWTH Aachen, Germany

A Large-scale Wireless Charging Station for Electric Vehicles [#400]
Jaehong Lee and Seung-Hwan Lee
University of Seoul, Korea (South)

Z3 class 50 kW Bidirectional IPT charger for EV [#931]
Fernando Gonzalez-Hernando, Ander Jauregi, Irma Villar, Alejandro Rujas and Luis Mir
Ikerlan Technology Research Centre (BRTA), Spain, Spain

A Four Port Isolated PV-Based EV Charger that Supports level-2 and DC Charging [#851]
Mohamed Tamasas Elrais, Reza Rezaii, Sumana Ghosh and Issa Batarseh
University of Central Florida, United States

Remote Q/A Session R13 | Selected Topics in Emerging Technologies

Link available on virtual platform
Chairs: Yuzhuo Li, Qiang Wei

An Integrated Receiver for Inductive Power Transfer [#71]
Yiming Yin, Heyuan Li and Minfan Fu
ShanghaiTech University, China

Impedance-Model-Based Design of High-Order Class E Inverter [#95]
Yifan Jiang, Rong He, Kai Zhao and Minfan Fu
ShanghaiTech University, China

A Dual Coupled Double-Sided LCC IPT System Adapted to Battery Charging Profile Under High Misalignment [#144]
Shuyu Yang, Kailong Liu, Jixie Xie, Chong Zhu and Xi Zhang
Shanghai Jiao Tong University, China; Warwick Manufacturing Group University, United Kingdom

A Full Load Range Soft-Switching Inductive Power Transfer System [#227]
Xin Li, Yiming Zhang and Yi Tang
Nanyang Technological University, Singapore; Fuzhou University, China

An Adaptive Multi-Target Microwave Power Transmission Method Based on Split-Calibration and Power-Focusing Algorithm [#248]
Shuchen Cheng, Ke Jin, Huan Hu and Weiyang Zhou
Nanjing University of Aeronautics & Astronautics, China

An Adaptive Single-peak GMPPT Method Based on Cloud Model Under Dynamic Laser Wireless Transmission [#337]
Zhongwei Chen, Ke Jin, Weiyang Zhou and Jianying Ding
Nanjing University of Aeronautics & Astronautics, China

Efficiency Optimization of Class-F Power Amplifier at Different Power Levels for Microwave Power Transmission [#438]
Chen Yang, Ke Jin, Weiyang Zhou and Huan Hu
Nanjing Univ. of Aeronautics and Astronautics, China

Thermal Analysis Based on Equivalent Thermal Model for Magnetic Couplers in Wireless Charging System [#662]
Dongsheng Wang, Hao Feng and Li Ran
Chongqing University, China

Si IGBT and SiC MOSFET Hybrid Switch-Based Solid State Circuit Breaker for DC Applications [#840]
Haichen Liu, Jiale Zhou, Tiefu Zhao and Xiwen Xu
University of North Carolina at Charlotte, United States

Switched-Resistance Method for Estimation of Inductor ESR in dc-dc Converters: Theory and Design Challenges [#620]
Kausik Biswas, Olive Ray and Srinivas Boppu
Indian Institute of Technology Bhubaneswar, India

Remote Q/A Session R14 | Power Converter Performance Improvement

Link available on virtual platform
Chairs: Li Zhang, Zhituo Ni

Technical Investigation on Robustness Enhancement for Grid-Connected Inverter in Weak Grid by Adding an Improved Grid Voltage Feedforward Path [#287]
Huili Zhang and Tianzhi Fang
Nanjing Univ. of Aeronautics and Astronautics, China

Design Method of Control Parameters for PCS Grid-Connected Mode Based on the Stability Analysis of Islanding Switching [#458]
Sheng Ren, Min Chen and Haoqing Cai
Zhejiang University, China

AC Impedance Modeling of True-Bipolar MMC-HVdc System With Dual-Droop Control [#132]
Bole Feng, Yue Wang, Pengkun Li, Quanle Zhu, Yinglin Xue, Fengmo Li, Runtian Li and Yi Liu
Xi'an Jiaotong University, China; State Grid Corporation of China, China

Leakage Current Analysis and Mitigation for Modular Multilevel Converter with Floating Submodules [#366]
Yongtao Liang, Dong Jiang, Wei Sun, Jianan Chen and Hong Li
Huazhong University of Science and Technology, China; Beijing Jiaotong University, China

Unsupervised Anomaly Detection for Multilevel Converters Based on Wavelet Packet Transform and Variational Autoencoders [#31]
Shu Ye and Feng Zhang
Shanghai Jiao Tong University, China

Current Ripple Mitigation in DC-Link Capacitors of Three-Phase NPC Converters Using Mixing Level-Shifted Modulation Schemes [#344]
Yong-Yao Shen, Szu-Chi Peng, Surya chandra Gulipalli, Po-Tai Cheng and Chia-Chi Chu
National Tsing Hua University, Taiwan

PI Tuning of High-bandwidth Buck Converters Based on Genetic Algorithm and Accurate Small-Signal Model [#966]
Yu Shao, Xiangpeng Cheng, Jinjun Liu, Zeng Liu and Jiwen Wei
Xi'an Jiaotong University, China

A Modular and Integrated Reconfigurable Design for Battery Energy Storage System [#719]
Huizhen Huang, Amer Ghias and Zuo Wang
Nanyang Technological University, Singapore

Finite Control Set Model Predictive Control for Five-Level Modified Active Nested Neutral Point Clamped Converter [#895]
Wenyuan Ding, Faraji Faramarz, Vijesh Jayan, Zuo Wang, Amer M .Y. M. Ghias and Honnyong Cha
Nanyang Technological University, China; Kyungpook National University, Korea (South); Nanyang Technological University, Singapore

Remote Q/A Session R15 | Electric Drives A

Link available on virtual platform
Chairs: Kevin Lee, Zhe Zhang

Model-Free Predictive Pulse Pattern Control for Permanent Magnet Synchronous Motor Drives [#52]
Dianxun Xiao, Battur Batkhishig, Aathira Karuvaril Vijayan, Alan Callegaro, Rohit Baranwal and Ali Emadi
McMaster University, Canada; Eaton, United States

Vibration Frequency Estimation Scheme Based on Second-Order Extended State Observer for IPMSM Drive System Without Accelerometer [#369]
Yun Zuo, Shuaishuai Wang, Huimin Wang, Dan Liu, Chunxu Lin, Abebe Teklu Woldegiorgis, Junwen Mu and Xinglai Ge
Southwest Jiaotong University, China

An Open Source Virtual Prototyping Platform for Electric Drive Systems [#436]
Baoyun Ge
University of Florida, United States

Design and Analysis of a 54-Pulse Converter and 7-level Hybrid Inverter for Medium Voltage Induction Motor Drive [#447]
Rohit Kumar, Bhim Singh and Piyush Kant
Indian Institute of Technology Delhi, India; Indian Institute of Technology, kanpur, India

Impedance-Based Analysis of Digital Control Delay in Metro Traction Drive System [#781]
Junwen Mu, Yun Zuo, Chunxu Lin, Huimin Wang, Shuaishuai Wang and Xinglai Ge
Southwest Jiaotong University, China

Open-End Nine-Leg Half-Controlled Converter for Six-Phase Synchronous Generator-Based Wind Energy Conversion Systems [#380]
Emerson de Lacerda Soares, Cursino Brandao Jacobina, Nayara Brandao de Freitas, Nady Rocha and Ayslan Caisson Noroes Maia
Federal University of Campina Grande, Brazil; INESC TEC, Portugal; Federal University of Paraiba, Brazil; Federal Institute of Ceara, Brazil

Flying Start of Permanent Magnet Generator Connected PWM Rectifier Based on Short Circuit Current Vector Increments [#435]
Sun Gaoyang, Guo Hong, Ding Xiaofeng and Yang Yanyong
Beihang University, China

A Comparison Between Nonlinear Kalman Filters for Sensorless Induction Motor Drives [#1072]
Abbas Hassan, Ali Bazzi and Jensen Finn
American university of Beirut, Lebanon; University of Connecticut, United States; Aarhus university, Denmark

Current Measurement Offset Error Compensation for Indirect Field-Oriented Controlled Induction Motor Drives [#294]
Sangmin Lee and Kibok Lee
Incheon National University, Korea (South); Inha University, Korea (South)

Torque Ripple Reduction Method for Interior Permanent Magnet Synchronous Machine with Minimal Loss [#139]
Jianzhen Qu, Pinjia Zhang, Chengning Zhang and Shuo Zhang
Tsinghua University, China; Beijing Institute of Technology, China

Zero-Sequence Current Reduction Method of Dual Inverter with a Common DC-Link for High- Speed Applications [#549]
Jun Ohata and Hitoshi Haga
Nagaoka University Of Technology, Japan; Nagaoka University of Technology, Japan

Tuesday, October 18 10:00AM–10:55AM

Remote Q/A Session R16 | Solid State Transformers and Utility Applications

Link available on virtual platform
Chairs: Anirban Pal, Cheng Wang

A Novel Modular Multilevel Converter Based Power Electronic Transformer with Integrated Switching Pairs [#1214]
Yinyu Yan, Yichao Sun, Wanxin Guo, Zhendong Ji, Dongye Li and Jianfeng Zhao
Nanjing Normal University, China; Nanjing University of Science and Technology, China; Nanjing Institute of Technology, China; Southeast University, China

Model Predictive Control of a Modular Multilevel DC Transformer Under Quasi-square Modulation [#822]
Yufan Li, Yichao Sun, Carlos Teixeira, Liye Wu, Brendan McGrath and Donald Grahame Holmes
Nanjing Normal University, China; RMIT University, Australia

Hierarchical Control for dc-Link Voltage and Power Sharing of CHB-based Solid State Transformer [#125]
Jianqiao Zhou, Jianwen Zhang, Jiacheng Wang, Jiajie Zang, Gang Shi, Xu Cai and Xinming Fan
Shanghai Jiao Tong University, China; Simon Fraser University, Canada; Shanghai University of Engineering Science, China; Foshan Power Supply Bureau, China

Design and Implementation of DC-Transformer using 10 kV SiC MOSFET for Medium-Voltage Extreme Fast Charger [#667]
Hao Feng, Jehyuk Won, Xinyu Liang, Srdjan Srdic and Srdjan Lukic
Chongqing University, China; Gachon University, Korea (South); Analog Devices, United States; EGSTON Power Electronics, Austria; North Carolina State University, United States

Integrated Onboard Battery Charger Based on Four-bridge Converter [#126]
Bonyang Li, Min Zhou, Dong Jiang and Jialou Gao
Huazhong University of Science and Technology, China

New Measurement Algorithm for Supraharmonics Real-time Monitoring Based on Dynamic Compressed Sensing [#516]
Ting Yang, Fengxia Yang, Yuqing Niu and Wei Li
Tianjin University, China; The University of Sydney, Australia

A Hierarchical Control Scheme With Flexible Power Regulation for the Series-Type Microgrid System [#648]
Changwei Qin and Xiaoyan Li
Shandong Jianzhu University, China; Shandong University, China

The Control Method for LCL-Type Single-Phase Grid-Connected Inverter Based on Circuit Energy Storage [#957]
Zenghao Xia, Miaoya Yu, Hao Wu, Xinlin Li, Xingwang Huang and Xiaodong Li
Chongqing University, China

Economic Analysis of Retrofitting Electric Motors with a Rewinding Process to Partial Loads [#413]
Victor Aguiar, Fabio Nascimento, Ricardo Pontes, Wilkley Correia and Fernando Ferreira
Fed. R. Univ. of the Semi-Arid Region (UFERSA), Brazil; Federal University of Ceara (UFC), Brazil; University of Coimbra (UC), Portugal

Remote Q/A Session R17 | Power Converter Topologies; AC-AC and multilevel

Link available on virtual platform
Chairs: Bilal Akin, Shohei Komeda

New Type High-Frequency Transformer Isolated Cascaded AC-AC Converter for DVR to Compensate Sag or Swell in Voltage [#291]
Ashraf Ali Khan, Usman Ali Khan, Hafiz Furqan Ahmed and Shehab Ahmed
KAUST, Saudi Arabia; Yonsei University, Saudi Arabia; National Sun Yat-sen University, Taiwan

Quasi Two-Level Operation and Neutral-Point Voltage Balance Method for a Four-Level ANPC based Dual Active Bridge DC-DC Converter [#433]
Jupeng Pang, Kui Wang, Zedong Zheng, Tong Zheng and Yongdong Li
Tsinghua University, China

Low-Frequency Ripple Voltage Suppression Based on Active Power Decoupling for Modular Multilevel Converter Sub-Module Capacitors [#557]
Hang Su, Shunfeng Yang, Fuyuan Zhuang, Yunshan Wang, Jingchun Huang and Qingyuan Wang
Southwest Jiaotong University, China

Improved Virtual Space Vector Modulation Scheme for the Reduced Switch Count Three-Level Inverter With Unbalanced Neutral-Point Voltage Conditions [#647]
Changwei Qin and Xiaoyan Li
Shandong Jianzhu University, China; Shandong University, China

Six-Leg Single-Phase to Three-Phase AC-DC-AC Converter Using High-Frequency Link [#1100]
Filipe Vieira Rocha, Cursino Brandao Jacobina, Rodrigo Pereira de Lacerda, Nayara Brandao de Freitas and Nady Rocha
UFCG, Brazil; INESC TEC, Portugal; UFPB, Brazil

Remote Q/A Session R18 | Power Converter Control and Optimization

Link available on virtual platform
Chairs: Alessandro Lidozzi, Salvatore Foti

Implementation of Vector Control for Single Phase Dual Active Bridge to Achieve ZVS and ZCS for Switching Loss Reduction [#784]
Ganesan Perumal and Kamalesh Hatua
Centre for Development of Advanced Computing, India; Indian Institute of Technology Madras, India

General Pulse Distribution Method of MMC under Phase-leg Based PD-PWM Modulation [#819]
Yichao Sun, Yufan Li, Brendan McGrath, Carlos Teixeira, Donald Grahame Holmes and Jianfeng Zhao
Nanjing Normal University, China; RMIT University, Australia; Southeast University, China

Square-Wave Current Control Optimization Method of Variable Frequency Modulation Inverter for Two-Stage HMI Digital Ballast [#141]
Yifeng Wang, Shaoqi Yang, Xiaoyong Ma, Chen Wang, Yu Bai and Lei Li Tianjin
University, China; Beijing Huayuan Movie Equipment Co., LTD, China

A Computationally Efficient FCS-MPC Imitator for Grid-Tied Three-Level NPC Power Converters Based on Sequential Artificial Neural Network [#801]
Xinliang Yang, Yanda Lyu, Kun Wang, Uihyun Kim, Zhenbin Zhang and Ki-Bum Park
KAIST, Korea (South); Technical University of Denmark, Denmark; KAIST, Korea, Republic of; Shandong University, China

A Weighting Factor Design Approach for FCS-MPC Techniques Based on PSO and K-Means Algorithm [#802]
Xinliang Yang, Junda Li, Kun Wang, Uihyun Kim, Zhenbin Zhang and Ki-Bum Park
KAIST, Korea (South); Shandong University, China; KAIST, Korea, Republic of

An Improved Model-free Predictive Power Control for Three-Phase AC/DC Converters [#683]
Shengnan Li, Tingyi He, Shuijun Wu, Xin He, Peng He, Yunhang Dai, Yongchang Zhang, Qiyan Qu, Yufei Wang, Haisen Zhao and Guorui Xu
Electric Power Research Institute of Yunnan Powe, China; Yunnan Electric Test & Research Institute Group, China; North China Electric Power University, China; North China University of Technology, China; University of Chinese Academy of Sciences, China

Online Parameter Optimization Method of Harmonic Controller for Grid-Connected Inverter [#664]
Tang Jian, Zou Zhixiang, Liu Xingqi, Zhang Yi, Xu Ruokai, Wang Yuchen and Hua Wei
Southeast University, China

Power Oscillation Suppression Control Strategy with Peak Current Limitation for Three-Phase Four-Leg Inverter Under Unbalanced Voltage Dips [#50]
Hao Yang, Zhao Liu, Ning Zhou, Shuai Meng, Qifeng Sun and Dongming Zhao
Nanjing University of Science and Technology, China

Analysis and Modeling of Multi-Resonant Switched Tank Converter with Partial Power Voltage Regulation [#168]
Ruiran Dai, Yundong Ma, Zhiqiang Zhao, Ruijia Cai, Peng Wang and Pengfei Wang
Nanjing University of Aeronautics and Astronauti, China

Remote Q/A Session R19 | Packaging, Materials and Passive Components

Link available on virtual platform
Chairs: Christina DiMarino

Observation of PWM-Dependent Chip Deformation of Automotive Power Module [#312]
Peng Sun, Liang Wang, Yulei Wang, Zheng Zeng, Xudong Han, Mingrui Zou and Kaiyan Li
Chongqing University, China

Design and Evaluation of a 1200-V/200-A SiC Three-Level NPC Power Module [#130]
Zhang Honglang, Wu Yingzhe, Yin Shan, Jin Shoudong, Lin Shaofeng, Jiang Tian, Li Hui and Cheng Yuhua
Univ. of Electron. Sci. & Technol. of China, China; Xiamen SAN-U Optronics Co., Ltd., China

Multi-Physics Coupling Analysis and Optimization Design of SiC MOSFET Power Module Package Insulation [#606]
Wang Yalin, Li Wenyi, Ding Yi, Sun Hao and Yin Yi
Shanghai Jiao Tong University, China

Knowledge-aware Artificial Neural Network for Loss Modeling of Planar Magnetic Components [#394]
Junyun Deng, Wenbo Wang, Prasanth Venugopal, Jelena Popovic and Gert Rietveld
University of Twente, Netherlands; Yongjiang Lab, China

Feasible Evaluations of Low Profile Magnetic Structure Based on Meander Winding and Split- Magnetic Cores with High-Cooling Capability Used in Power Converters [#392]
Jun Imaoka, Kazuya Matsuta, Hiroki Ochiai, Koichi Shigematsu, Mostafa Noah and Masayoshi Yamamoto
Nagoya University, Japan

Low Loss Non Air Gap Multi-Permeability Planar Inductor Design for Totem-Pole PFC [#331]
Pengyuan Ren, Wenjie Chen, Xingwei Huang, Yuxuan Chen, Yongxing Zhou and Xu Yang
Xi'an Jiaotong University, China

The Influence of Asymmetric Parameters on Crosstalk between Paralleled SiC MOSFETs [#489]
Yujie Ding, Hongyao Liu, Saijun Mao, Kun Wang, Wenyu Li and Zhikun Wang
Fudan University, China; UniSiC Technology (Shanghai) Co.,Ltd., China

Power Semiconductor Lifetime Extension Technique using Turn-on Energy as a Variable to Maintain Constant Loss [#154]
Howe Li Yeo, Vaisambhayana Sriram and Anshuman Tripathi
Nanyang Technological University, Singapore

Modeling and Design Method of Coupled Inductor Using Powder Core with Concentrated Air Gap [#96]
Sihoon Choi, Jun Imaoka and Masayoshi Yamamoto
Nagoya University, Japan

Integrated High Frequency Nanocrystalline Based Planar Magnetics Design for a Bidirectional CLLLC Resonant Converter [#1264]
Sunil Kumar Dube, Ramu Nair and Pritam Das
SUNY Binghamton, United States

Mission-Profile-Based Lifetime study for SiC Module Chips using Graphene Films [#826]
Sepideh Amirpour and Torbjorn Thiringer
China Euro Vehicle Technology AB, Sweden; Chalmers University of Technology, Sweden

Remote Q/A Session R20 | Electric Machine Effects of Design and Operation

Link available on virtual platform
Chairs: Athanasios Karlis, David Reigosa

Measurement of Vibration and Acoustic Noise Generated by Magnetostriction in Three Stator Cores Made of High Silicon Steel, Amorphous Iron, and Conventional Silicon Steel [#427]
Yifei Cai, Fares El-Faouri, Saikawa Naoki and Chiba Akira
Tokyo Institute of Technology, Japan

Investigation of Effective Conditions of Radial Force Sum Flattening for Acoustic Noise Reduction in Switched Reluctance Motors [#229]
Akira Chiba, Candra Adi Wiguna, Kyohei Kiyota, Sozer Yilmaz, Gundogmus Omer, Junichi Asama and Atsuya Ohashi
Tokyo Institute of Technology, Japan; University of Akron, United States; Shizuoka University, Japan

Online Optimization Method of Two-step Commutation for Switched Reluctance Generator [#188]
Zhiyuan Chai, Peilin Liu, Xin Li and Chuang Liu
Nanjing University of Aeronautics and Astronauti, China

Vibration Characteristics of Induction Motors Considering the Lower-Order Harmonics in Power Supply [#596]
Haisen Zhao, Zihan Zhou, Zixu Wang, Jinping Kang, Eldeeb Hassan, Guorui Xu, Yang Zhan and Yongchang Zhang
North China Electric Power University, China; BorgWarner Noblesville Technical Center, United States

Mathematical Derivation of Current Reference for Radial-Force Sum Flattening in Switched Reluctance Motors [#1305]
Fares El-Faouri, Yifei Cai, Yusuke Fujii and Akira Chiba
Tokyo Institute of Technology, Japan

Contact Resistance Prediction with Grey Box Thermal Model and Experimental Validation of Axial Flux Motors [#214]
Zhaozong Li, Chengning Zhang, Fengyu Zhang, Zeyuan Xu, David Gerada, Christopher Gerada, Xueping Li, Shuo Zhang and Yue Zhao
The University of Nottingham, United Kingdom; Beijing Institute of Technology, China; Beijing Institute of Technology, United Kingdom; The University of Nottingham, China

Proactive Low-Frequency Ride-Through Method for Speed-Sensorless Induction Motor Drives Against Changing Torque [#301]
Ruhan Li, Cheng Luo, Kai Yang, Zhijie Xu, Yifei Zheng and Yuhao Huang
Huazhong University of Science and Technology, China

Design of Satellite Reaction Wheel with FPCB Windings for Angular Momentum Optimization [#815]
Nai-Wen Liu, Kuo-Yuan Hung, Yi-Jen Lin and Shih-Chin Yang
National Taiwan University, Taiwan

Operation Characteristics of a Magnetic Resonance Coupling Motor with a Magnetic Ring for 8 and 4 Poles [#239]
Takaki Toda and Kazuto Sakai
Toyo University, Japan

Wednesday, October 19 9:00AM–9:55AM

Remote Q/A Session R21 | Power Converter Topologies B

Link available on virtual platform
Chairs: Sheldon Williamson, Montie Vitorino

Analytical Comparison of 3-Level 2-Phase and Double-Step-Down Topologies for Integrated High-Ratio DC-DC Converters in BCD and GaN Process [#1325]
Muhammad Rizwan Khan, Xin Zhang and Cheng Huang
Iowa State University, United States; IBM T. J. Watson Research Center, United States

A Synchronous Rectification Method with Switching Delay for CLLC Converters to Achieve Secondary-side ZVS [#342]
Leheng Wang, Huan Chen and Kai Sun
Tsinghua University, China

Minimum Current Operation of Impedance Control Network Resonant Converters [#373]
Mausamjeet Khatua and Khurram Afridi
Cornell University, United States

A Multi-Mode Hybrid CCM/DCM Three-Phase Step-Up AC/DC Soft-Switched Converter with an Adaptive Active-Controlled Auxiliary Circuit and Constant Output Voltage [#867]
Siamak Derakhshan and John Lam
York University, Canada

A Single-Stage Multilevel AC-DC Bidirectional Converter with Natural Grid Harmonic Elimination [#1296]
Ramu Nair, Sunil Dube and Pritam Das
SUNY Binghamton, United States

A New Full-MOSFET-Switches-Based Buck-Boost Type Inverter with Reactive Power Support Capability [#612]
Yanqi Cheng, Weimin Wu, Jianming Chen, Gang Lu, Eftychios Koutroulis, Frede Blaabjerg and Henry Chung
Shanghai Maritime University, China; Zhejiang HRV Electric Co. Ltd, China; Technical University of Crete, Greece; Aalborg University, Denmark; City University of Hongkong, China

Grid Filter Reduction of Single-Phase Inverters using 3-Leg Topology [#89]
Guanhong Song, Bo Cao, Hassan Athab and Liuchen Chang
University of New Brunswick, Canada

An Algorithm for Harmonic Elimination in Three-Phase Multilevel Inverters [#916]
Concettina Buccella, Maria Gabriella Cimoroni, Sobhan Mohamadian and Carlo Cecati
DISIM, University of L'Aquila, Italy

Remote Q/A Session R22 | Select Topics on EMI and Multilevel Topologies

Link available on virtual platform
Chairs: Tommaso Scimone, Li Zhang

Decoupling Control of Circulating Current Suppression and Current Distortion Elimination for the Paralleled Vienna-Type Rectifiers [#803]
Wanqing Han, Xiaoyan Li, Changwei Qin, Xianzhe Pang and Chenghui Zhang
Shandong University, China; Shandong Jianzhu University, China

Automatic-Optimization ADRC-Based Disturbance Rejection Method for Low Voltage Interface Converter in Microgrid [#147]
Long Tao, Ping Wang, Yifeng Wang, Xiaoyong Ma, Huaidong Shi and Shaoqi Yang
Tianjin University, China

An Instantaneous Power Balancing Control With Power Factor Correction for Single-Stage Three-Phase AC-DC Converters [#979]
Mojtaba Forouzesh, Yan-Fei Liu and Paresh C. Sen
Queen's University, Canada

A Capacitor Aging Effect Balancing Strategy for an MMC Distributed Control System [#554]
Wang Li, Yang Shunfeng, Wang Haiyu, Qi Xin, Su Hang and Wang Qingyuan
Southwest Jiaotong University, China

Common-Mode Voltage Reduction Scheme for MMC with Consideration of Dead Zone [#324]
Hui Liu, Jianan Chen, Dong Jiang and Wei Sun
Huazhong University of Science and Technology, China; Nanjing University of Technology, China

Power MOSFET Lifetime Prediction Method Based on Optimized Long Short-Term Memory Neural Network [#158]
Hongyu Ren, Xiong Du, Yaoyi Yu, Jing Wang, Junjie Zhou and Yuhao Peng
State Key Laboratory of Power Transmission Equip, China

Analysis on Voltage to Ground of Submodules for MMC Under NLM and CPS-PWM [#174]
Huang Yihong, Lin Lei, Shi Xiaojie and Yin Tianxiang
Huazhong University of Science and Technology, China

A Constant Common-Mode Voltage PWM Method for Three-Phase Series-end Winding Topology [#272]
Zhiyuan Wang, Zicheng Liu, Dong Jiang and Ronghai Qu
Huazhong University of Science and Technology, China

Remote Q/A Session R23 | Wide Bandgap Design and Applications

Link available on virtual platform
Chairs: Yue Zhao

Design Considerations for Developing 1.2 kV 4H-SiC BiDFET-enabled Power Conversion Systems [#805]
Ajit Kanale, Tzu-Hsuan Cheng, Ramandeep Narwal, Aditi Agarwal, B. Jayant Baliga, Subhashish Bhattacharya and Douglas C. Hopkins
North Carolina State University, United States

Influence of Emitter Side Design on the Unintentional Turn-on of 10kV+ SiC n-IGBTs [#972]
Ioannis Almpanis, Marina Antoniou, Paul Evans, Lee Empringham, Peter Gammon, Florin Udrea, Philip Mawby and Neophytos Lophitis
University of Nottingham, United Kingdom; University of Warwick, United Kingdom; University of Cambridge, United Kingdom

A Wide-Range Input Auxiliary Power Supply based on Series-Connected SiC MOSFETs with Active Gate Driver [#1319]
Arindam Sircar, Inhwan Lee, Muhammad Abubakr Saeed and Xiu Yao
Universityat Buffalo, United States

Analysis of Nonlinear Conductivity Coating used to Improve Electric Field Distribution in Medium Voltage Power Module [#828]
Yuan Gao, Yang Yang, Hongbo Zhao, Thore Stig Aunsborg, Stig Munk-Nielsen and Christian Uhrenfeldt
Aalborg University, Denmark; Northwestern University, United States

Real EOFF as a Factor in Design of Soft-switched DC-DC Converters with SiC MOSFET Power Modules [#932]
Jacek Rabkowski, Fernando Gonzalez-Hernando, Mariusz Zdanowski, Irma Villar and Uxue Larranaga
Warsaw University of Technology, Poland, Poland; Ikerlan Technology Research Centre (BRTA), Spain, Spain; CAF Power & Automation, Spain

Modeling and Analysis of Bridge-Leg Crosstalk of GaN HEMT Considering Staged Effect of Common-Source Inductance [#616]
Xiao Li, Xuyang Liu, Jianyu Cao, Yushan Liu, Haiwen Yuan and Yaosuo Xue
Beihang University, China; Oak Ridge National Laboratory, United States

A Comparison of GaN-Based Cascode and E-mode HEMTs Using Bridgeless Totem Pole PFC [#484]
Beyza Saglam, Mehmet Hakan Aksit and Bunyamin Tamyurek
ASELSAN, Turkey; Gazi University, Turkey

Remote Q/A Session R24 | Design and Performance Assessment of Electric Machines A

Link available on virtual platform
Chairs: Eric Severson, Jonathan Bird

Impact of Two Types of Grounding on the Common-mode Voltage of Wide-bandgap Motor Drive Systems [#355]
Yipu Xu, Xibo Yuan, Zihao Wang, Yan Li and Yonglei Zhang
China University of Mining and Technology, China

Design and Analysis of Dual-Winding Permanent Magnet Machine with High Torque Density [#265]
Shaoshuai Wang, Jianzhong Zhang, Ning Wang and Yongbin Wu
Southeast University, China

Performance Analysis and Mechanical Assembly Considerations for a Spoke-Type Permanent Magnet Vernier Machine with an Inner Salient Pole Core on the Rotor [#511]
John Mushenya and Azeem Khan
University of Cape Town, South Africa

A Two-Dimensional Analysis Model of Cogging Torque in Homopolar Inductor Machines [#889]
Yufei Wang, Guomin Zhang, Haisen Zhao and Zhongjing Liu
Institute of Electrical Engineering CAS, China; North China Electric Power University, China

Thermal Modeling with Surrogate Model-Based Optimization of Direct Oil Cooling Heat Transfer Coefficient for HEV Motor [#755]
So-Yeon Im, Tae-Gun Lee, Ki-Won Kim, Jin-Cheol Park, Jun-Woo Chin and Myung-Seop Lim
Hanyang University, Korea, Republic of; Korea Automotive Technology Institute, Korea, Republic of

Influence of Magnetic Shield Thickness in End Region on Stator Leakag e Reactance of Synchronous Condenser [#633]
Xu Guorui, Zhu Xueyang, Li Weili, Liu Wenmao, Zhan Yang and Zhao Haisen
North China Electric Power University, China; Beijing Jiaotong University, China

Transformer Integration and Winding Design for ISOP-LLC Converter [#196]
Yifeng Wang, Chen Chen, Bo Chen, Zhongjie Wang, Ruilin Ji and Mingzhi Zhang
Tianjin University, China; State Grid Tianjin Power Costumer Service Center, China

Open-circuit Fault-tolerant Control Strategy of Five-leg Drive in Active Magnetic Bearing [#30]
Jianfu Ding, Dong Jiang, Feng Hu, Jichang Yang and Zlcheng Liu
Huazhong University of Science and Technology, China

Remote Q/A Session R25 | Electric Drives B

Link available on virtual platform
Chairs: Ali Bazzi, Seema Kewat

An Improved Model-Free Predictive Current Control Method for PMSM Drives Based on Extended Control Set and Fast Current Difference Updating [#816]
Yongchang Zhang, Wenjia Shen, Haitao Yang, Guo Xiaojiang, Fu Mingzhi and Qin Meng
North China Electric Power University, China; North China University of Technology, China; Huaneng Clean Energy Research Institute, China

Model Predictive Current Control of PMSM Drives Based on Evaluation of Switch Jumps [#817]
Haitao Yang, Min Li, Yongchang Zhang, Xiaojiang Guo, Mingzhi Fu and Meng Qin
North China University of Technology, China; North China Electric Power University, China; Huaneng Clean Energy Research Institute, China

An Improved Synchronous Frequency Extractors PLL with Low Computational Burden [#45]
Kai Liu, Yuchen Wang and Wei Hua
Southeast University, China

Control Method of Dual Parallel Surface-Mounted Permanent-Magnet Synchronous Motor Systems with Different Parameters Using Single Inverter [#902]
Cheonsu Park and Shinji Doki
Nagoya University, Japan

Synchronous Switch Current Reversion (SSCR) Technique for Motor Braking Enhancement [#995]
Li Teng, Zhiwu Xie, Yu Yin and Junrui Liang
Shanghaitech University, China; ShanghaiTech University, China

Sensorless Estimation for Stator Winding Temperature of Automotive Electric Motors Based on Sequential Current Pulse Injection [#385]
Yansong Lu, Hao Yin, Jingbo Han, Jingxuan Li, Chong Zhu and Xi Zhang
Shanghai Jiao Tong University, China

A Virtual Voltage Vector-Based Space Vector Modulation Scheme for Three-Phase Open- Winding Motor Drive with Five-Leg Converter [#41]
Zhiping Dong, Hang Zhao, Rundong Huang, Wusen Wang and Chunhua Liu
City University of Hong Kong, Hong Kong; The Hong Kong University of Science and Technolo, Hong Kong

Fault Tolerant Operation of an LCI and VSI Fed Hybrid Induction Machine Drive for Medium Voltage High Power Applications [#800]
Harikrishnan Pookulangara, Pratyush Pandey, Jose Titus and Kamalesh Hatua
PhD scholar, India; Assistant Professor, India; Associate Professor, India

Discontinuous PWM Scheme for an Open-end Winding Induction Motor Drives Fed by Dual Inverter [#688]
Kibok Lee and Yongsu Han
Inha University, Korea (South); Myongji University, Korea (South)

Design and Comparison of Output Filter Configurations for SiC-MOSFET-Based Automotive DC-AC Inverters [#670]
Mohammad Ali, Jens Friebe and Axel Mertens
Leibniz UniversityHannover, Germany

Wednesday, October 19 10:00AM–10:55AM

Remote Q/A Session R26 | Power Converters and Control for Renewable Energy Systems B

Link available on virtual platform
Chairs: Zian Qin

Flexible Power Point Tracking for Photovoltaic Systems Under Partial Shading Conditions [#339]
Yinxiao Zhu, Huiqing Wen, Qinglei Bu, Guanying Chu and Haochen Shi
Xi'an Jiaotong-Liverpool University, China; Huazhong University of Science and Technology, China

Analysis of Direct-duty-ratio based MPPT control scheme for Integrated Dual-DC Boost Converter [#630]
Ritam Chakrborty and Olive Ray
Indian Institute of Technology Bhubaneswar, India

Modified Hybrid Modulation Technique for Cascaded H-Bridge Converter with DC Bus Oscillation [#845]
Sumit Rohidas Patil, Amir Hussain and Wajiha Shireen
University of Houston, United States

Power Ramp-Rate Control for Differential Power Processing-based Distributed PV Systems [#172]
Yinxiao Zhu, Huiqing Wen, Guanying Chu, Qinglei Bu, Xue Wang and Haochen Shi
Xi'an Jiaotong - Liverpool University, China; Huazhong University of Science and Technology, China

A Comparison of PI-Based and Sorting-Based State of Charge Balancing Methods in Cascaded H-Bridge Converters [#397]
Gaowen Liang, Ezequiel Rodriguez, Glen Farivar, Naga Brahmendra Yadav Gorla, Neha Beniwal, Josep Pou and Georgios Konstantinou
Nanyang Technological University, Singapore; University of New South Wales, Australia

Energy Redistribution as a Method for Mitigating Risk of Propagating Thermal Runaway [#741]
Jacob Mueller, Yuliya Preger, Andrew Kurzawski, Luciano Garcia Rodriguez and John Hewson
Sandia National Laboratories, United States

An Adaptive Cyber Security Scheme for AC Micro-grids [#333]
Junjie Xiao, Lu Wang, Zian Qin and Pavol Bauer
Delft University of Technology, Delft, Netherlands

An Analysis of SoC Self-convergence for Adaptive Droop Control Systems of Battery Energy Storage with Different Capacity [#166]
Yasushi Eto, Yuichi Noge, Masahito Shoyama and Tadatoshi Babasaki
Kyushu University, Japan; NTT Facilities, Inc., Japan

Remote Q/A Session R27 | AC/DC Distribution, AC/DC Microgrids and Renewable Energy Integration

Link available on virtual platform
Chairs: Anshuman Shukla, Fariba Fateh

Adaptive Droop Controller for PV - Battery Based Microgrids [#729]
Yusuf Gupta and Mohammad Amin
Norwegian University of Science and Technology, Norway

A Communication-less Secondary Voltage Control Based on Small-AC-Signal Injection for DC Microgrids [#471]
Pu Zhao, Zeng Liu, Qing Wang and Jinjun Liu
Xi'an Jiaotong University, China

Distribution Power Loss Minimization of Energy Storage Systems in DC Microgrids under FDI Attacks [#200]
Yajie Jiang, Yun Yang, Siew-Chong Tan and Shu Yuen Ron Hui
The University of Hong Kong, Hong Kong; The Hong Kong Polytechnic University, Hong Kong; Nanyang Technological University, Hong Kong

Fault-Ride Through Strategy for Islanded Microgrids Via Dynamically Reconfigurable Voltage Reference [#574]
Xia Shen, Wen Huang, Chao Shen, Yang Shen, Zhikang Shuai and Z.john Shen
Hunan University, China; Southeast university, China; Illinois Institute of Technology, United States

Quantum Approximate Optimization Algorithm-Enabled DER Disturbance Analysis of Networked Microgrids [#1068]
Hang Jing, Ye Wang, Yan Li, Liang Du and Ziping Wu
Penn State University, United States; Duke University, United States; Temple University, United States; ComEd, United States

Generator Preventive Maintenance Scheduling in Large Power Systems with High Penetration of Renewable Energy Resources [#226]
Thanh Tung To, Solmaz Kahourzade and Amin Mahmoudi
University of South Australia, Australia; Flinders University, Australia

FOFLL Based Synchronization Scheme with LDLMS Control for Solar Fed Microgrid Feeding Hybrid AC/DC Loads [#619]
Suvom Roy, Farheen Chishti, Bhim Singh and B.K. Panigrahi
Indian institute Of Technology, Delhi, India

Field Testing of a Hierarchical Model-Free Transactive Control Strategy in a Residential House [#205]
Mohammed Olama, Kadir Amasyali and Christopher Winstead
Oak Ridge National Laboratory, United States

Remote Q/A Session R28 | Power Converter Topologies C

Link available on virtual platform
Chairs: Sandro Calligaro, Fabio Mandrile

Design and Implementation of Inverted Voltage Balancing Control for Bidirectional Flying- Capacitor DC/DC Converter [#35]
Hung-Chi Chen and Ding-Hao Lin
National Yang Ming Chiao Tung University, Taiwan

Triple-Phase Shift Power-Level Controller (TPSPC) For Single-Phase Dual Active Bridge (DAB) DC/DC Converter [#428]
Hamid Naseem and Jul-Ki Seok
Yeungnam University, Korea, Republic of

Enhancement of The CCM Operating Region of A Synchronous Buck Converter Using A Flux- Rate Switching-Based Adjustable Inductor [#913]
Ruman Kalyan Mahapatra, L. Umanand and K. Gopakumar
Indian institute of science, India; Indian Institute of Science, India

Optimization of Stacked Structure LLC Resonant Converter with Hybrid Modulation Strategy [#747]
Yuqi Wei and Alan Mantooth
University of Arkansas, United States

An 80A 48V-Input Capacitor-assisted Dual-Inductor Hybrid Dickson Converter for Large- Conversion-Ratio Applications [#1339]
Weijie Han, Chen Chen, Jin Liu and Hoi Lee
University of Texas at Dallas, United States

A Three-Port DC-DC-DC Converter based on Dual Active Bridge Series Resonant Topology for Electric Vehicle DC Fast Charging Applications [#776]
Md Safayatullah, Reza Rezaii, Fahad Alaql and Issa Batarseh
University of Central Florida, United States; Imam Mohammad Ibn Saud Islamic University, Saudi Arabia

GaN-Based T-Type Totem-Pole Rectifier with ZVS Control and Reactive Power Regulation [#256]
Jingjing Sun, Liyan Zhu, Ruiyang Qin, Jie Li, Daniel Costinett and Leon Tolbert
The University of Tennessee, Knoxville, United States; The University of Tennessee, Knoxville, United States

Quadratic Extended-Duty-Ratio Boost Converter with Voltage Multiplier Cell for High Gain Applications [#1099]
Ankul Gupta, Nikhil Korada, Raja Ayyanar and Madhura Sondharangalla
Arizona State University, United States

Remote Q/A Session R29 | Design and Performance Assessment of Electric Machines B

Link available on virtual platform
Chairs: Matthew C. Gardner, Poskovic Emir

Comparative Study on Slotted and Slotless High-Speed Permanent Magnet Motors with Toroidal Windings [#284]
Fan Xu, Tianran He, Ziqiang Zhu, Hong Bin, Di Wu, Liming Gong and Jintao Chen
University of Sheffield, United Kingdom; Midea Group Corporate Research Center, China

Design and Analysis of Electric-Excitation Claw-Pole Field-Modulated Machine Considering Effective Harmonics [#251]
Yu Dong, Xianglin Li, Xiaosong Wang, Kejin Lu and Xingtian Feng
China University of Petroleum (East China), China; Qingdao University, China

A Combined 3-D Geometric and Magnetic Modeling Approach of Coils in Air-Cored Resonant Induction Machines [#1259]
Zhao Jin, Matteo Iacchetti, Alexander Smith, Rajesh Deodhar, Yoshiyuki Komi, Ahmad Abdullah and Chiaki Umemura
The University of Manchester, United Kingdom; IMRA Europe S.A.S. UK Research Centre, United Kingdom; Aisin Corporation, Japan

Influence of Rotor Damping Effect on Dynamic Characteristic of Dual-Excited Synchronous Generator with Excitation Control [#533]
Xu Guorui, Fu Yue, Wang Zhenzhen, Zhan Yang, Zhao Haisen and Zhang Yongchang
North China Electric Power University, China

Improvement of Reactive Power Consumption Ability for Dual-Excited Synchronous Condenser [#632]
Xu Guorui, Li Zijing, Li Zhiqiang, Zhao Haisen, Zhan Yang and Zhang Yongchang
North China Electric Power University, China; China Electric Power Research Institute, China

Impact of Inverter Switching Harmonics in Detecting Changes in Impedance Due to Broken Rotor Bars [#185]
Lebohang Ralikalakala and Paul Barendse
University of Cape Town, South Africa

Influence of PWM Excitation on DC Winding Induced Voltage in Wound Field Switched Flux Machines [#605]
Zhongze Wu, Lai Jin, Wentao Zhang, Ying Fan, Wei Hua and Ming Cheng
Southeast University, China

A Stable and Computationally Efficient Spatial Harmonic Model for Predicting the DC Winding Induced Voltage in WFSF Machine [#80]
Wentao Zhang, Zhongze Wu, Ying Fan, Wei Hua and Ming Cheng
Southeast University, China

A Motor Capable of Conversion Between Synchronous Motor and Induction Motors with Pole Change for Electric Vehicles [#254]
Hayate Matsumoto and Kazuto Sakai
Toyo University, Japan

Remote Q/A Session R30 | Converter Control Optimization and Enhancement

Link available on virtual platform
Chairs: Alessandro Lidozzi, Salvatore Foti

Computation-Efficient Variable Angle Phase-Shifting PWM Method for Cascaded H-Bridge Converters [#842]
Yiwei Pan, Ariya Sangwongwanich, Thiago Pereira, Yongheng Yang, Marco Liserre and Frede Blaabjerg
Aalborg University, Denmark; Kiel University, Germany; Zhejiang University, China

Open-Circuit Fault Diagnosis and Fault-Tolerant Control for Coupled-Inductor-Based Aalborg Inverter [#611]
Chengqi Xiao, Weimin Wu, Jianmin Chen, Gang Lu, Eftichios Koutroulis, Henry Shu-Hung Chung and Frede Blaabjerg
Shanghai Maritime University, China; Zhejiang HRV Electric Co. Ltd, China; Technical University of Crete, Greece; City University of Hong Kong, China; Aalborg University, Denmark

VRFT for Current-Mode Buck Converter with Anti-Windup Compensation [#177]
Naoki Kameya, Yasutaka Fujimoto, Yu Hosoyamada and Toyoaki Suenaga
Yokohama National University, Japan; Kyosan Electric Manufacturing Co., Ltd., Japan

Stability and Accuracy Evaluation of LCL Coupling Networks for PMSM Emulation PHIL [#1430]
Luca Bigarelli, Marco Di Benedetto, Alessandro Lidozzi and Luca Solero
ROMA TRE University, C-PED, Italy

A Discrete-Time Domain Modeling of LLC Resonant Converter Considering the Nonlinearity of Voltage-Controlled Oscillator [#59]
Yuecheng Zhang, Xinbo Ruan and Ying Li
NUAA, China; University of Nottingham, United Kingdom

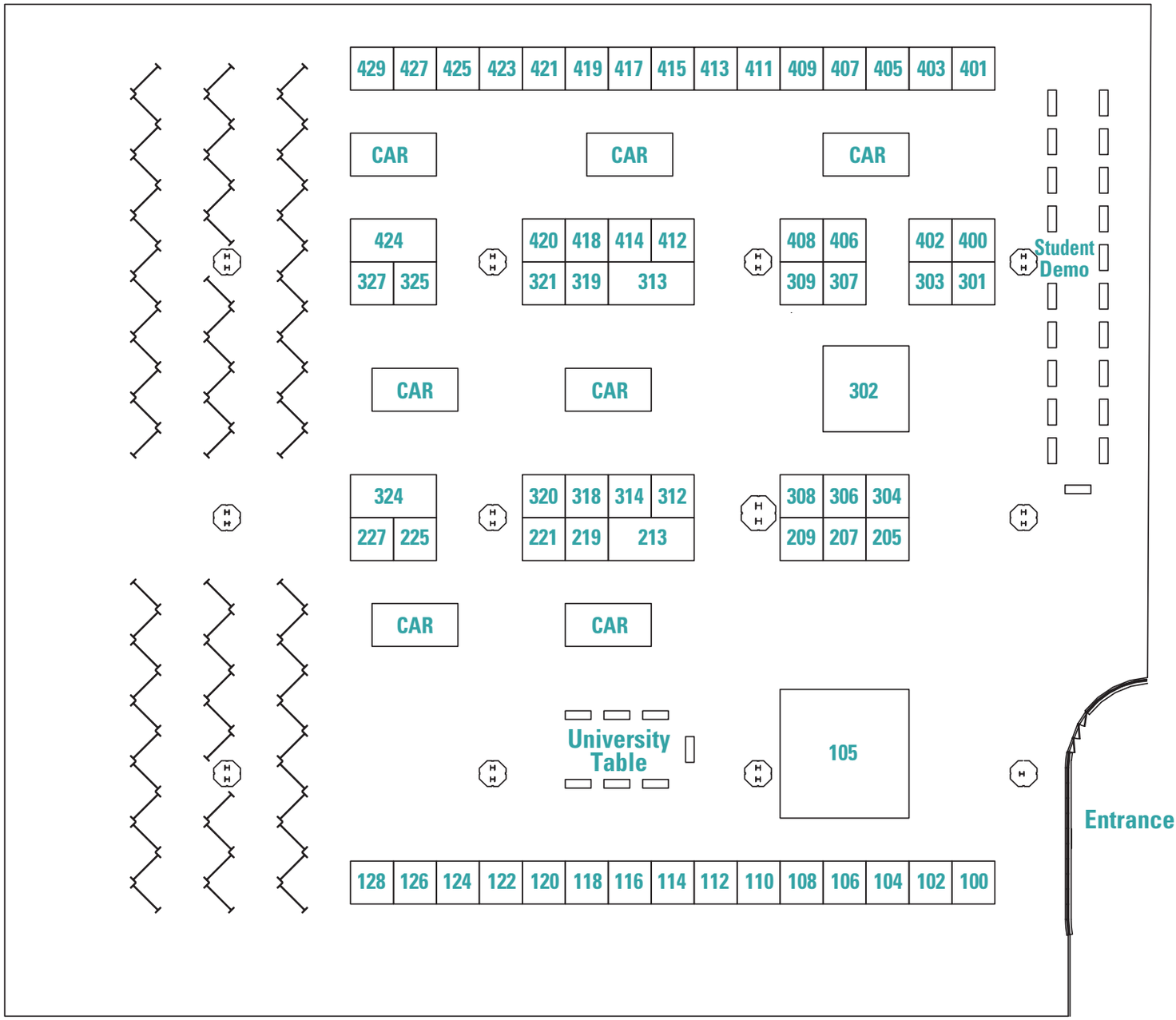
Active-Damping for Digital Controlled LC-Type Voltage Source Inverter with Positive Proportional Feedback of Filter Capacitor Voltage [#452]
Li Zhang, Haoxin Yang and Yi Tang
Huazhong University of Science and Technology, China; Nanyang Technological University, Singapore

Exploration of the Pareto Optimization of Bidirectional Isolated DC-DC Power Electronic Converters for More Electric Aircraft [#151]
Alejandro Fernandez-Hernandez, Fernando Gonzalez-Hernando, Asier Garcia-Bediaga, Irma Villar and Gonzalo Abad
Ikerlan Technology Research Centre (BRTA), Spain; Mondragon Unibertsitatea, Spain

A Novel Online On-State Voltage Drop Measurement Technique for Thyristors [#323]
Yanyong Yang, Dayong Zheng, Xiaofeng Ding and Pinjia Zhang
Beihang University, China; Tsinghua University, China

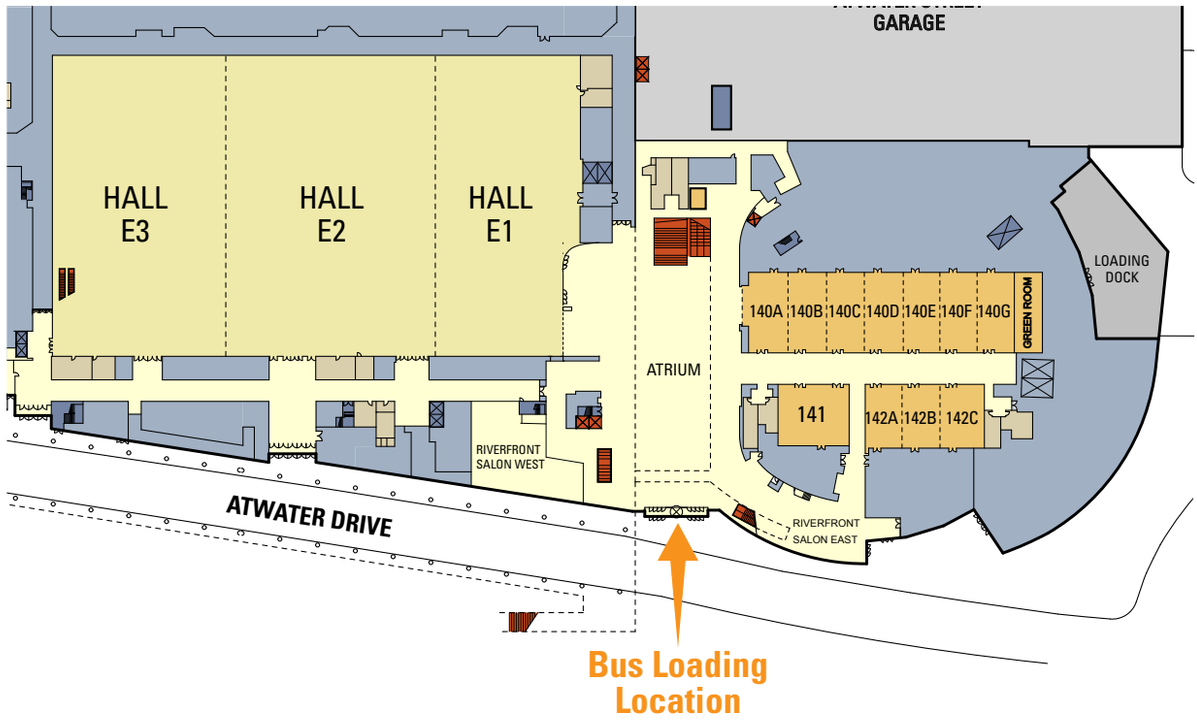
Fieldbus Communication Scheme for Modular Converter Systems - Considerations for Minimal Switching Period and Low Data Latency [#1055]
Stefan Rietmann, Simon Fuchs, Simon Beck and Juergen Biela
ETH Zurich, HPE, Switzerland

EXHIBIT HALL FLOOR PLAN

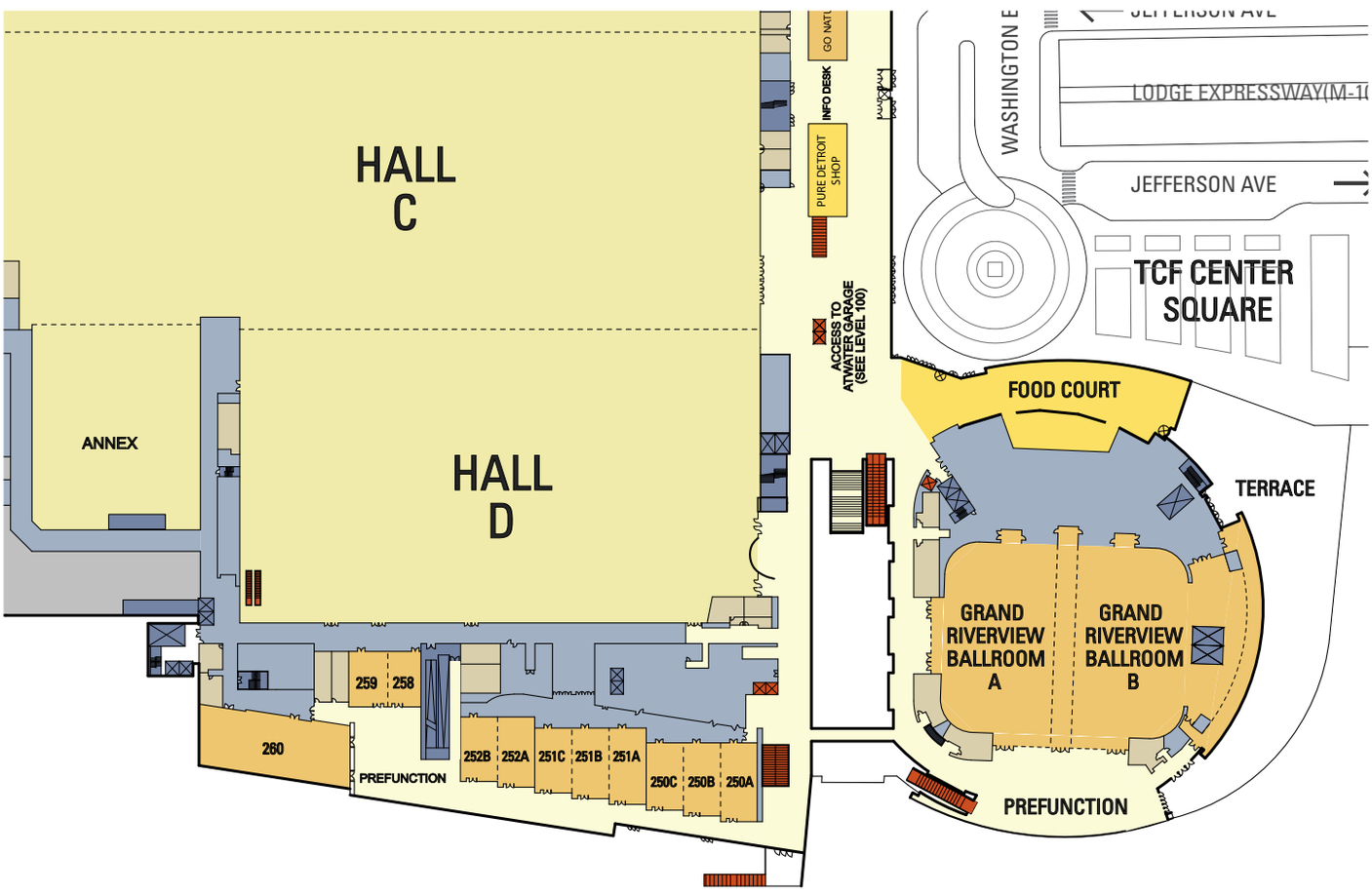


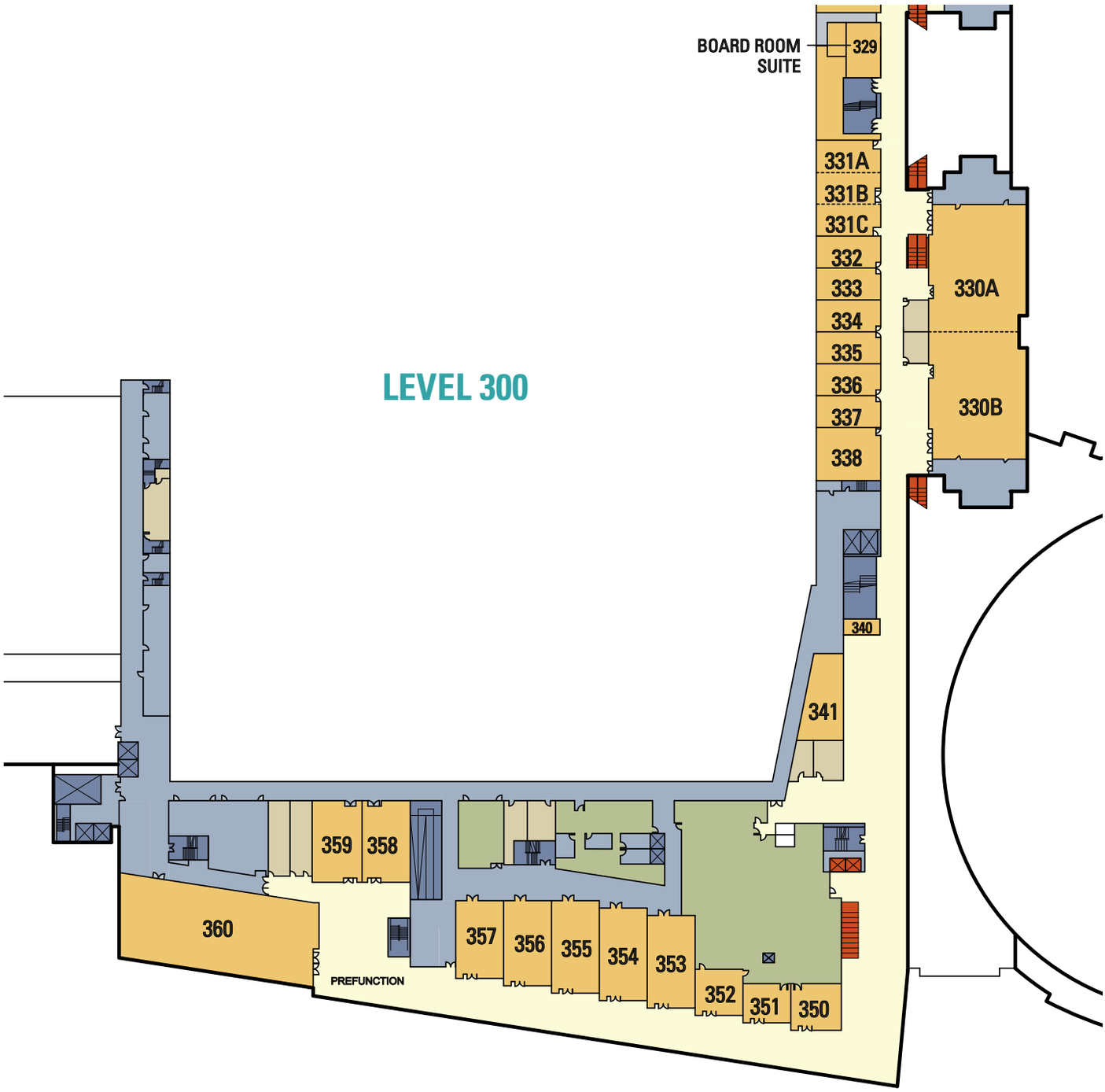
CONVENTION CENTER FLOOR PLAN

LEVEL 100



LEVEL 200




LEVEL 300
BOARD ROOM SUITE
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PREFUNCTION

STUDENT DEMONSTRATIONS

Open – Monday, October 10 **4:30PM – 7:00PM**
Judging – Tuesday, October 11 **1:30PM – 5:00PM**

Location: Expo Hall E

Student Demonstrations provide an opportunity for students from various universities and countries to showcase their emerging technology research outcomes and interact with academia and industry.

High Performance Litz/Solid PCB Inductor Design for High Frequency and High Current Ripple Applications

Demonstrators: Liwei Zhou, Matthias Preindl, *Columbia University*

High Efficiency Non-Isolated Bidirectional EV Charger Integrated into Traction Drivetrain with Variable-Frequency Critical-Soft-Switching

Demonstrators: Liwei Zhou, Matthias Preindl, *Columbia University*

A GaN-based High-Power Density Single-Stage Onboard EV Charger Using the ICN Architecture

Demonstrators: Dheeraj Etta, Maida Farooq, Khurram Afridi, *Cornell University*

Medium Voltage Solid-State Circuit Breaker with Symmetrical Structure and 99.98% Efficiency

Demonstrators: Reza Kheirollahi, Shuyan Zhao, Fei Lu, *Drexel University*

GaN-based Independently Controlled Dual Output Flyback Converter

Demonstrators: Arnab Sarkar, Nachiketa Deshmukh, Sandeep Anand, *Indian Institute of Technology Bombay*

A Cost-competitive, High Power Density (386 W/cubic Inches) Electronic Capacitor for Single Phase Inverter

Demonstrators: Nachiketa Deshmukh, Arnab Sarkar, Sandeep Anand, *Indian Institute of Technology Bombay*

Neutral-point-less Multilevel Inverter Operation with a Single dc-link Capacitor for Electric Propulsion Applications

Demonstrators: Kangbeen Lee, Mikayla Benson, Mostafa Fereydoonian, Woongkul Lee, *Michigan State University*

Design and Flight Qualification of a Flying Capacitor Multilevel Converter for Electric Aircraft Applications

Demonstrators: Samantha Coday, Nathan Ellis, Robert Pilawa-Podgurski, *University of California, Berkeley*

FPGA-based Forced Air Cooled 3-phase SiC MOSFET Inverter

Demonstrators: Xiaoyan Liu, Dong Cao, U*niversity of Dayton*

Demonstration of Cyber-attack Detection and Diagnosis for PV Farms in the Real-time Testbed

Demonstrators: Jinan Zhang, Jin Ye, *University of Georgia*

A 650 V, 2.1 mohm GaN Half-bridge Power Module for 400V EV Traction Inverter Application

Demonstrators: Peng Han, Alex Q. Huang, *University of Texas at Austin*

The Hybrid Solid State Transformer – A Medium Voltage Implementation

Demonstrators: Sanjay Rajendran, Alex Q. Huang, *University of Texas at Austin*

Modular, Multifunction, Multiport and Medium Voltage Utility Scale SiC PV Inverter

Demonstrators: Wei Xu, Zhicheng Guo, Alex Q. Huang, *University of Texas at Austin*

A Novel High Insulation 100 kW Medium Frequency Transformer

Demonstrators: Zhicheng Guo, Alex Q. Huang, *University of Texas at Austin*

A 75kW Two-Stage SiC Intelligent Power Stage (IPS) for Grid Interface

Demonstrators: Zibo Chen, Alex Q. Huang, *University of Texas at Austin*

High Power Density Integrated Motor Traction Drives using WBG-based Current-Source Inverter

Demonstrators: Feida Chen, Sangwhee Lee, Ken Chen, Bulent Sarlioglu, Thomas M. Jahns, *University of Wisconsin-Madison*

Multi-objective Control of Hybrid Lithium-ion Batteries Using an Energy Transfer Unit

Demonstrators: Marium Rasheed, Regan Zane, *Utah State University*

An 18 kW 500 kHz 98.8% Efficiency High-density Battery Charger with Partial Power Processing

Demonstrators: Yuliang Cao, Minh Ngo, Ning Yan, Dong Dong, *Virginia Tech*

First Demonstration of Ransomware Attack and Forensics on a Commercial Smart Inverter

Demonstrators: BoHyun Ahn, Seerin Ahmad, Alycia M Jenkins, Taesic Kim, *Texas A&M University-Kingsville*

Cyber-Physical Anomaly Diagnostic Tool in Power Electronics Based Power Systems

Demonstrators: Kirti Gupta, Subham Sahoo, Bijaya Ketan Panigrahi, *Indian Institute of Technology Delhi*

EXHIBITOR LISTING

Alphabetical Listing by Exhibitor Name

University Lounge

University of Maryland
University of Pittsburgh
University of Wisconsin WEMPEC
Wisconsin Electric Machines and Power Electronic Consortium
FREEDM Systems Center
Ohio State University-Center for High Performance
Power Electronics | CHPPE
Georgia Institute of Technology

Numerical Listing by Booth Number

University Lounge

University of Maryland
University of Pittsburgh
University of Wisconsin WEMPEC
Wisconsin Electric Machines and Power Electronic Consortium
FREEDM Systems Center
Ohio State University-Center for High Performance
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Ford is a family company, one that spans the globe and has shared ideals. We value service to each other and the world as much as to our customers. Generations have made their memories with us and included us in their hopes and dreams. After 117 years, we're used to adapting to and leading change. That's why we're evolving to focus on services, experiences, and software as well as vehicles.

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We see a future where everyone can live and move without limitations. That's why we are developing technologies, systems, and concepts that make vehicles safer and cleaner, while serving our communities, the planet, and, above all, people.

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https://www.opal-rt.com

OPAL-RT is the world leader in the development of PC/FPGA-based real-time simulators, Hardware-in-the-Loop (HIL) testing equipment, and Rapid Control Prototyping (RCP) systems to design, test, and optimize control and protection systems used in power grids, power electronics, motor drives, automotive, trains, aircraft, and various industries, as well as R&D centers and universities.

STMicroelectronics — BOOTH 313/315

+1 408 919 8400
2755 Great America Way
3rd Floor
Santa Clara, California 95054
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https://www.st.com/content/st_com/en.html

At ST, we create technology for a sustainable world, in a sustainable way. We enable safer, smarter and greener ways of living while acting together to protect the planet.

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GaNPOWER International — BOOTH 402

information@iganpower.com
+1-604-320-1704
230-3410 Lougheed Hwy
Vancouver, British Columbia V5M2A4
Canada
https://iganpower.com

GanPower is a Vancouver, Canada based private company with a focus on developing Gallium Nitride (GaN) based technology in power electronics. GaNPower was established by a group of professionals who believe that a sustainable future requires a responsible energy conversion solution and GaN material based power electronics holds the key to such a solution.

How2Power.com — BOOTH 219

631-269-4540,
P.O. Box 755
Smithtown, New York 11787
United States
http://www.how2power.com

A website created to help electronics and electrical engineers solve real-world design challenges in power conversion. It's both an online power electronics publication and an information portal.

Imperix — BOOTH 304

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Rue De La Dixence 10
Switzerland, Sion 1950
Switzerland
https://imperix.com

Imperix develops high-end control equipment and prototyping hardware for power electronics, drives, smart grids, and related topics. Its products are designed to enable cutting-edge innovation in corporate and academic environments. They are especially valued for their ability to accelerate the implementation of laboratory-scale power converters and facilitate the derivation of high-quality experimental results.

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magniX has developed a family of electric propulsion units (EPUs) for aerospace and defense. With high levels of reliability, unparalleled performance and operational practicality, magniX EPUs can work with multiple sources of energy including batteries, fuel cells and more.

Plecko Co.

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Torquemeters

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Torquemeters is now recognized globally as an innovative, high-quality engineering solutions provider for Aerospace, Oil & Gas, Automotive and Industrial applications.

Typhoon HIL

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United States
https://www.typhoon-hil.com

Typhoon HIL Inc. is the market and technology leader in the rapidly-growing field of ultra-high-fidelity controller-Hardware-in-the-Loop (C-HIL) simulation for power electronics, microgrids, and distribution networks. We provide industry-proven, vertically integrated test solutions along with the highest-quality customer support.

Halla Mechatronics

989-316-7400
3933 Monitor Rd
Bay City, Michigan 48706
United States
https://hallamechatronics.com

Halla Mechatronics is a North American subsidiary of the Halla Group established in 2013 in Bay City, MI. It is a state-of-the-art Research and Development facility committed to the design of electronics, embedded systems, and magnetics. With a multidisciplinary engineering team, our "mechatronic" know-how enables us to develop innovative design solutions for use in many precision motor-control applications.

Powersys

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https://powersys-solutions.com/

POWERSYS is a consulting and software company providing global solutions of engineering softwareand services for industry, research and education in the field of Electrical & Electromechanical Power Systems.

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khaligh@umd.edu
ECE Business Office
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College Park, Maryland 20742
United States
https://khaligh.ece.umd.edu

With years of R&D experience in the modeling, simulation, design, and development of power electronics solutions, our team is highly experienced in a wide range of power electronic systems.

University of Pittsburgh

412-624-9800
ssoeadm@pitt.edu
3700 O'Hara Street
Pittsburgh, Pennsylvania 15261
United States
https://engineering.pitt.edu

Internationally renowned for research and education, the University of Pittsburgh Swanson School of Engineering offers a wide variety of degree programs for undergraduate students and flexibility to discover the world, grow, and have multidisciplinary interests.

University of Wisconsin WEMPEC Wisconsin Electric Machines and Power Electronic Consortium

608-262-3934
admin@wempec.wisc.edu
1415 Engineering Dr.
Rm 2559
Madison, Wisconsin 53706
United States
https://wempec.wisc.edu

The Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC) is a technology center at the University of Wisconsin-Madison. WEMPEC began in January 1981 with a mission to provide education, research, and service.

FREEDM Systems Center

919.513.3334
1791 Varsity Drive
Suite 100
Raleigh, North Carolina 27606
United States
https://www.freedm.ncsu.edu

At the FREEDM Center, we're building the internet of energy: a network of distributed energy resources that intelligently manages power using secure communications and advanced power electronics. Our research priorities include power electronics packaging, controls theory, solid state transformers, fault isolation devices, and power systems simulation and demonstration.

Ohio State University-Center for High Performance Power Electronics | CHPPE

614-292-2572
205 Dreese Labs
2015 Neil Ave
Columbus, Ohio 43210
United States
https://ece.osu.edu/center-for-high-performance-power-electronics

The research at CHPPE is focused on harnessing the strengths of wide band gap (WBG) devices in a wide range of existing and emerging power electronics applications.

Georgia Institute of Technology

404-894-2000
778 Atlantic Drive
Suite 119
Atlanta, GA 30332
United States
https://cde.gatech.edu/

The Center for Distributed Energy (CDE) has been established at Georgia Tech with financial support from the Georgia Research Alliance and Georgia Tech to do advanced research and to develop technologies and holistic solutions that can transform electricity delivery and utilization. Research areas include power conversion, industrial applications, energy conservation, distributed energy resources, distributed control of the grid, security and communications in energy, as well as microgrids, dc nanogrids and energy access for emerging markets. CDE partners include utilities, industry, manufacturers, research organizations, start-ups, VCs and other academic institutions with interests in aligned areas. In addition to doing traditional forward-looking cutting-edge academic research, CDE is uniquely focused on accelerating and de-risking technologies so that they can see faster adoption and higher impact.

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338 Kuzetonoshiro-cho
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Japan
https://www.nidec.com/en/nagamori-f/

Nagamori Foundation was established to contribute to the scientific and industrial development inside and outside Japan by commending those who engage in R&D activities, domestic and overseas, in the area of research and technology. The Foundation's main activity is to promote researches related to motors, actuators, and power generators, address a major challenge of "creating affluent lives" and "perpetually conserve the global environment," and operate the Nagamori Awards, a system to commend those who have made an innovative technological development.

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https://www.amepower.com

We are a certified engineering company specialized on delivering customized solutions to improve the efficiency and reliability of High Power Electronics systems. With over 20 years of combined experience, AmePower has evolved from being leaders suppliers of Power electronics components in the South East, to a Power Electronics solutions provider. Our area of expertise includes GTO to IGBT Technology conversion, IGBT system upgrades and Form/Fit/Function custom converters for LRVs, HRVs, Locomotives, Wind Turbines, Mining Trucks, Cranes etc.

Ansys

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United States
https://www.ansys.com

Using engineering simulation software, our customers can rapidly innovate and easily validate design ideas, predicting the future of transformational products.

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United States
https://dewesoft.com

Dewesoft develops and manufactures versatile and easy-to-use data acquisition systems - the ultimate tools for test and measurement engineers.

Egston Power Electronics

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https://www.egstonpower.com

EGSTON Power Electronics aims to develop products that consistently meet the highest expectations for quality, reliability and function. Our products are mounted in racks, yet we are not afraid to think outside the box, and we keep doing that throughout all phases of every single project to achieve total customer satisfaction

Electronic Concepts

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United States
https://www.ecicaps.com

Electronic Concepts offers a unique combination of resources including: vertically integrated manufacturing, modern and automated production, and broad engineering expertise. It is with these elements that allow us to design film capacitors that set the industry standard. Electronic Concepts has the flexibility to handle any film capacitor requirement, with a commitment to quality and service.

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EMWorks provides best-in-class electromagnetic simulation software for electrical and electronics design with multiphysics capabilities. The company's products are fully and seamlessly embedded in SOLIDWORKS and Autodesk Inventor®. Applications include electromechanical and power electronics, antennas, RF and microwave components, power and signal integrity of high-speed interconnects.

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Our smart engineering software incorporates state-of-the-art technologies for Simulation Process and Data Management (SPDM), process integration and design optimization.

ECCE 2023

BOOTH 108

Cui, Helen, helencui@utk.edu
Music City Center
Nashville, Tennesse
https://www.ieee-ecce.org/2023

The Fifteenth Annual IEEE Energy Conversion Congress and Exposition (ECCE 2023) will be held in Nashville, Tennessee, USA, from October 29–November 2, 2023. ECCE is a pivotal international event on energy conversion. ECCE 2023 will feature both industry-driven and application-oriented technical sessions as well as an exposition. The conference will bring together practicing engineers, researchers and other professionals for interactive and multidisciplinary discussions on the latest advances in areas related to energy conversion, including new and emerging applications.

Fuji Electric

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50 Northfield Ave
Edison, New Jersey 08837
United States
https://americas.fujielectric.com

Fuji Electric understands you need reliable, high-quality devices for your applications. We provide solutions for various industries needing power electronics, which is why Fuji Electric products are utilized around the world to keep your operations running smoothly.

GaN Systems

BOOTH 306

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770 Palladium Drive
Ottawa, Ontario K2V 1C8
Canada
https://gansystems.com

GaN Systems provides innovative tools and insights to support power system design engineers to create products revolutionizing some of the world's most economically essential and environmentally impactful industries.

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San Carlos, California 94070
United States
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United States
https://www.hbkworld.com/en

As the union of market-leading organizations HBM and Brüel & Kjær, HBK are the product physics experts, providing integrated solutions and world-leading expertise across all test and measurement domains.

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Since 1935, Hioki EE. Corporation has been at the forefront of the electrical manufacturing industry, providing the finest electrical test and measuring instruments through advanced engineering and innovative technology.

HVR Advanced Power Components

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HVR Advanced Power Components, Inc. is an affiliate of HVR International Ltd., the major world-wide supplier of ceramic-carbon resistors. Based in Jarrow, northeast England since 1963, HVR International began as Morganite Resistors, and later became Allen-Bradley Electronics. The HVR identity began in 1991, aiming to expand the range and variety of ceramic composite resistor applications. We maintain world quality standards in our ISO 9001:2008 certified factory.

Industry Applications Society IEEE

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Lynda Bernstein
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ias-administrator@ieee.org
445 Hoes Lane
Piscataway, New Jersey 08854
United States
https://ias.ieee.org

Bio: IEEE Industry Applications Society will be a world leader in the advancement of science and technology linking theory and practice in the application of electrical and electronic systems for the benefit of humanity.

InfraTec Infrared

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We are a global partner offering our customers the best solutions thanks to our expertise and in-depth knowledge of their applications.

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United States
https://www.paytongroup.com

Bio: Payton Planar Magnetics is the global leader of Planar Magnetics Technology with more than 25 years of research and development experience. We offer a wide range of custom-designed, state-of-the-art magnetics, of the highest quality, for a variety of applications

Plexim

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info@plexim.com
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Cambridge, Massachusetts,02140
United States
https://plexim.com

Plexim, with locations in Zurich and Boston, is an innovative software company active in the field of technical simulation. For 20 years we have successfully developed and marketed PLECS – the leading simulation software for power electronic systems and electrical drives. In addition, we offer automatic code generation and real-time systems as pioneering technologies for the development and test of controls.

Power Electronics Society IEEE

BOOTH 227

pels-staff@ieee.org.
445 Hoes Lane4
Piscataway, New Jersey 08854
United States
https://www.ieee-pels.org

The Power Electronics Society (PELS) is one of the fastest-growing technical societies of the Institute of Electrical and Electronics Engineers (IEEE). For over 35 years, the PELS has facilitated and guided the development and innovation in power electronics technology.

Stellantis

BOOTH 420

communications@stellantis.com
800 Chrysler Dr
Auburn Hills, Michigan 48326
United States
https://www.stellantis.com/en

Stellantis is a leading global automaker and mobility provider that offers clean, connected, affordable and safe mobility solutions. Our Company's strength lies in the breadth of our iconic brand portfolio, the diversity and passion of our people, and our deep roots in the communities in which we operate. Our ambitious electrification and software strategies and the creation of an innovative ecosystem of strategic, game-changing partnerships are driving our transformation to a sustainable mobility tech company.

Taiwan Semiconductor

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sales@tscus.com
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https://taiwansemi.com

Taiwan Semiconductor products are used in a vast array of applications in the electronics industry, including automotive, computer, consumer, industrial, telecom and photovoltaic. Through strategic expansion of innovative manufacturing capabilities, and its focus on pioneering efficient semiconductor solutions, Taiwan Semiconductor is committed to being the right choice for a successful and lasting business relationship.

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We offer the most extensive range of test solutions to help with design, development, and deployment of devices and systems. Whether you need to test the physical and electrical properties of your device or you need to see individual packets being transmitted between devices, we've got you covered. Our test equipment, training, and testing services help you make better, safer, and more reliable products.

Virginia Tech CPES Center for Power Electronics Systems

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Dennis Grove
540-505-9679
dgrove@vt.edu
1185 Perry Street
655 Whittemore Hall (0179)
Blacksburg, Virginia 24061
United States
https://cpes.vt.edu

The Center for Power Electronics Systems (CPES) with annual research expenditures of $6-7 million dollars, is dedicated to improving electrical power processing and distribution that impact systems of all sizes – from battery-operated electronics to vehicles to regional and national electrical distribution systems.

PELS Members' Townhall Meeting

Tuesday, October 11
Doors open at 4:30PM | Meeting Begins 5:00PM–6:30PM
Location: Room 353

Please join the PELS leaders for our annual Townhall meeting. An update of the society will be given by President, Liuchen Chang, as well as an opportunity to ask the PELS officers questions. Come learn about upcoming PELS initiatives and programs for members and students.

Refreshments will be served, we hope you can attend.

PELS-IAS-PSMA Sponsored YP Reception

Tuesday, October 11 | 7:00PM–9:00PM
Location: Grand Truck Pub, 612 Woodward Ave, Detroit

Join us at the Young Professional Networking Reception at ECCE 2022

Registration for the ECCE conference is not required to attend the reception. This is a great networking opportunity for young professionals and students, as you will meet other fellow students, young professionals, and leaders of the societies in a casual atmosphere over food and drinks.

There is no cost to attend! We hope you can join us.

PELS Mentorship Roundtable

Tuesday, October 11 | 12:00PM–1:30PM
Location: Room 260 (Huntington Place)

Register to meet the leaders in power-electronics through a face-to-face mentoring event. Our distinguished mentors have started businesses, climbed the ranks of IEEE and become high-performers at corporations and universities.

PELS members will get a rare opportunity to ask questions and get professional advice directly from mentors who have a career's worth of knowledge to share.

Space is limited to 5 people per table which provides a casual, personal, and quiet atmosphere for conversation. Lunch, desserts, and beverages will be served. There is no cost to attend this event.

NOTES

CALL FOR PAPERS

ECCE 2023

IEEE ENERGY CONVERSION CONGRESS & EXPO Nashville, TN | OCT.29-Nov.2

Important Dates

February 19, 2023
Digest submission deadline

May 15, 2023
Author notification

June 1, 2023
2 page Late Breaking Research Briefs

July 23, 2023
Final papers submission with IEEE copyright forms

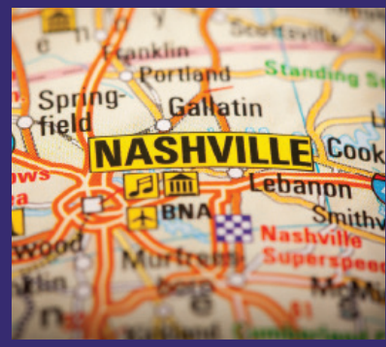
IEEE

IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

pels IEEE POWER ELECTRONICS SOCIETY Powering a Sustainable Future

The Fifteenth Annual IEEE Energy Conversion Congress and Exposition (ECCE 2023) will be held in Nashville, Tennessee, USA, from October 29 to November 3, 2023. ECCE is a pivotal international event on energy conversion. ECCE 2023 will feature both industry-driven and application-oriented technical sessions as well as an exposition. The conference will bring together practicing engineers, researchers and other professionals for interactive and multidisciplinary discussions on the latest advances in areas related to energy conversion, including new and emerging applications.

Technical papers are solicited on any subject pertaining to the scope of the conference including, but not limited to, the following major topics:



Energy Conversion Systems and Applications

- Renewable and alternative energy power Electronics systems
- Critical power and energy storage systems
- Aerospace energy conversion systems
- Grid-forming technologies
- High power/voltage power conversion (HVDC,
- FACTS and multi-terminal DC systems)
- Power-to-X and green hydrogen systems
- Microgrids, hybrid ac/dc grids, and dc grids
- Energy Access and off-grid systems
- Energy conversion for information technology and communication systems
- Electrification for commercial, industrial and transportation applications
- Big data and artificial intelligence in energy conversion
- Wireless power transfer
- Lighting applications and displays
- Industrial motor drives
- Medical, IoT and energy harvesting
- Power electronics for agriculture.

Component, Converter & Subsystem Technologies

- Power electronic devices, gate drivers, and integrated circuits
- Passive components and materials
- Power electronic packaging integration
- Reliability, advanced fault protection systems, diagnostics, prognostics, and health management
- Thermal management and advanced cooling technologies
- Innovative magnetic materials, alternative conductor and winding insulation technologies
- Electromagnetic interference and electromagnetic compatibility
- Power conversion topologies, modulation, and control
- Electrical drive systems and topologies and their control
- Rotating/linear electromechanical devices
- Advanced manufacturing
- Digital twins, cloud design and simulation techniques for energy convesion systems
- Cyber-and-physical security for power electronics systems

Digest Submission

Prospective authors are requested to submit a single column, 1.5-line spaced digest no longer than five (5) pages (including references) summarizing the proposed paper. The digest should include key equations, figures, tables, and references as appropriate, but no author names or affiliations. Digests not conforming to these requirements will be rejected without review. The digests must clearly state the objectives of the work, its significance in advancing the state of the art, and the methods and specific results in sufficient detail. All digests will go through a double-blind peer review process to ensure a confidential and fair review. The papers presented at the conference will be included in the IEEE Xplore Digital Library. Please refer to the conference website for a detailed list of technical topics and the digest submission method.

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IEEE ENERGY CONVERSION CONGRESS & EXPO Nashville, TN | OCT.29-Nov.2

IMPORTANT DATES

February 15, 2023
Tutorial proposal due

May 15, 2023
Notice of acceptance

June 15, 2023
Final Tutorials Materials Due

Call for Tutorials

The 15th Annual IEEE Energy Conversion Congress and Exposition (ECCE 2023) will be held in Nashville, Tennessee, USA, from October 29 to November 2, 2023. ECCE is a pivotal international event on energy conversion. It will bring together practicing engineers, researchers, and other professionals for interactive discussions on the latest advances in areas related to energy conversion.

The ECCE organizing committee invites proposals for tutorials to be presented at ECCE 2023. Each tutorial is 3 hours long, excluding break times. Each accepted tutorial will receive one conference registration together with an honorarium of $1,000.

Please note that publication of a technical paper will still require a paid full registration. All tutorial proposals should be submitted via the ECCE 2023 web portal under "Call for Tutorials". Please follow the Tutorial Proposal Form on the website as a submission template. The proposals will be reviewed by a panel of subject matter experts.

One or more of the following elements are strongly encouraged in the tutorial proposals:

a) Industry led or co-hosted lectures

b) Interactive instructor-audience approaches, including hands-on demonstrations and practices

c) Application focused session on tools or methods for the practicing engineer

d) ECCE 2023 regionally oriented topics at the host city, e.g. smart mobility

e) Collaborative cross-disciplinary topics and tutorial teams are welcome

f) Topics that engage the audience in formats that serves to communicate with the attendees

Tutorials considered to be less attractive to the audience are:

a) Topics that are too narrowly focused

b) Lectures that are not balanced between theory and application

c) Tutorial topics or teams presented previously in immediate past ECCE or other major IAS/PELS conferences

d) Tutorials that narrowly focus on presenter's own research works that are already publicly available

e) Solicitation of a particular product or service

Potential topic areas include but are not limited to:

Energy Conversion Systems and Applications

- Renewable energy, including under-represented ocean-wave, tidal, geothermal
- Smart grids, micro-grids, nano-grids
- Electrical energy storage, including real physics or controlled virtual storage
- Energy conversion for information and communications technology
- Energy harvesting and conversion
- Smart, energy efficient buildings
- Energy efficiency for advanced manufacturing
- Big data and machine learning in energy conversion
- Cybersecurity in energy conversion systems
- Transportation electrification, including aircraft and urban aerial mobility
- Battery charging technologies
- Resiliency in energy systems

Component, Converter & Subsystem Technologies

- Power electronic devices
- Power conversion topologies
- Modeling and control of power converters
- Electric machines and drives
- Passive components, magnetics, and materials – particularly for high frequency
- Packaging, integration, and advanced manufacturing
- EMI and EMC
- Thermal management and advanced cooling technologies
- Wireless power transfer
- High voltage power conversion, including insulation technologies
- Design automation and optimization
- Reliability, diagnostics, prognostics, and health management
- Fault-tolerant converters and systems
- Protection and advanced gate drives for converters

Others

- Pedagogy for undergraduate learning or under-represented groups
- Post-COVID technology innovations
- Entrepreneurship, technology transfer, business management
- Development and use of standards for specific applications

IEEE

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IEEE ENERGY CONVERSION CONGRESS & EXPO Nashville, TN | OCT.29-Nov.2

IMPORTANT DATES

April 1, 2023
Special Session proposal due

May 15, 2023
Notification of acceptance

Call for Special Sessions

The 15th Annual IEEE Energy Conversion Congress and Exposition (ECCE 2023) will be held in Nashville, Tennessee,, USA, from October 29 to November 2, 2023. Special Sessions are solicited focusing on emerging technologies and industry-oriented topics. Industry and government organizers or speakers are of particular interest. Guest speakers will be invited on the day their session is scheduled. No written papers are required. Materials presented in the Special Sessions will not be included in the conference proceedings. Each session will be assigned either one or two 100-minute slot(s), subject to conference program scheduling.

Different session formats are solicited:
1) Formal presentations; 2) Informal talks with or without slides; 3) Full Q&A panel; 4) Debate; 5) Other creative or hybrid styles.

One or more of the following elements are strongly encouraged in the special session proposals: A) Significant industry or government involvement; B) Industrial application oriented; C) ECCE 2023 regionally oriented topics; D) Collaborative cross-disciplinary topics or teams; E) Creative formats that engage the audience, especially industry.

Factors considered as less attractive to the audience are a) Non-emerging topics; b) Academic lectures; c) Similar teams with similar topics from the immediate past ECCE; d) Solicitation of a particular product or service; e) Unclear plans including unconfirmed speakers.

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Potential topic areas include but are not limited to:

Energy Conversion Systems and Applications

- Transportation electrification, including EV, trucks, aircraft, UAV, trains, ships
- Energy storage systems, including real or virtual storage
- Charging stations, vehicle to grid
- Additive manufacturing
- Renewable energy integration
- Smart grids, micro-grids, nano-grids
- Resiliency in energy systems
- Smart and energy efficient buildings
- Energy conversion for information technology
- Big data and machine learning in energy conversion
- Cybersecurity in energy conversion
- Design automation and optimization

Component, Converter & Subsystems

- Power semiconductor devices, magnetics, capacitances
- Power conversion topologies, modeling, and control
- Electric machines and drives
- Packaging, integration, and advanced manufacturing
- EMI and EMC
- Thermal management, advanced cooling technologies
- Wireless power transfer
- High voltage power conversion, including insulation technologies
- Reliability, diagnostics, prognostics, and health management

Others

- Advanced testing and validation, including demo
- Standards development
- Education and career development
- Entrepreneurship, technology transfer, business management
- Post-COVID technology innovations

Proposal Submission and Review Process

All special session proposals must be submitted via the ECCE 2022 web portal under "Call for Special Sessions". Please follow the Proposal Form on the website as a submission template. The proposals will be reviewed by a panel of subject matter experts.

Special Session Proposal Template

Format: Maximum 5 pages. All pages are formatted to 8.5x11" or A4 paper with margins of one inch on every side.
All texts use single space, Times New Roman, and a font size of 11 or 12. *A Word template will be posted on the official website under Call for Special Sessions.*

Recommended Sections:

1. **Special Session Title**
2. **Proposed Session Format** (Choose from "formal presentations", "informal talks", "full Q&A panel", "debate", or create own style – see Call For Proposal. Describe the format at a high level, and note any creative activities such as software/ hardware demonstration, virtual tours, interactive audience polls, etc.)
3. **Proposed Timing** (Choose "100 minutes" or "2x100 minutes".)
4. **Session Organizers** [List name(s), title(s), affiliation(s), and email(s).]
5. **Session Speakers/Panelists** (List names, titles, and affiliations. Clearly note each speaker's availability: choose "confirmed" or "tentative"; failure to do so will be treated as all tentative.)
6. **Abstract** (No more than 500 words. Accepted abstract will be published through the conference website and program book.)
7. **Session Outline** (Only list the proposed topics/titles/activities. No detailed descriptions necessary. Indicate time allocation and speaker breakdown, if possible.)
8. **Organizer Biography** (No more than 200 words for each person. External website link can be included but may not be reviewed.)
9. **Speaker/Panelist Biography** (No more than 200 words for each person. External website link can be included but may not be reviewed.)

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http://www.ieee-ecce.org/2023

ECCE 2022

IEEE ENERGY CONVERSION CONGRESS & EXPO

Detroit, Michigan, USA Oct. 9-13

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