

TEC 2023



2023 IEEE Transportation
Electrification Conference
and Expo



Detroit
MICHIGAN USA
June 21-23

Sponsored by:



Schedule at a Glance

Tuesday, June 20

2:00pm – 6:00pm	Exhibitor Registration	Atrium, Front of 140 A
4:00pm – 6:00pm	Conference Registration	Atrium, Front of 140 A
6:00pm – 8:00pm	Welcome Reception	140 B-F

Wednesday, June 21

7:00am – 7:00pm	Registration	Atrium, Front of 140 A	
PLENARY SESSION 1	8:30am – 8:40am	Welcome & Awards	140 B-F
	8:40am – 8:50am	ITEC Best Papers Awards	140 B-F
	8:50am – 9:00am	ITEC Student Best Papers Awards	140 B-F
	9:00am – 9:30am	Keynote 1 – Fast Charge of High Energy Li-ion Batteries Utilizing Intelligent Battery Management System Said Al-Hallaj, <i>Beam Global</i> ..	140 B-F
	9:30am – 10:00am	Keynote 2 – Challenges and Solutions to Net Zero CO2 in the Transportation Sector Terry Alger, <i>Southwest Research Institute</i>	140 B-F
	10:00am – 10:30am	Coffee Break	140 B-F
	10:30am – 11:00am	Keynote 3 – Overcoming Limiting Factors through Software & ML/AI – How Industry Leaders are Innovating to Meet Performance Standards Fabrizio Martini, <i>Electra Vehicles</i>	140 B-F
	11:00am – 11:30am	Keynote 4 – Why Vocational Vehicles Will Be the Fastest Growing Market for Electrification for the Next 5 Years Tim Reeser, <i>Lightning emotors</i> ..	140 B-F
	11:30am – 12:00pm	Keynote 5 – Ship Electrification: Control and Optimization of Integrated Power Systems Jing Sun, <i>University of Michigan</i>	140 B-F

12:00pm – 2:00pm

Lunch
Expo Hall E

Poster Session 1
Expo Hall E

TC4 Mentorship Luncheon
250 C

12:00pm – 8:00pm	Expo	Expo Hall E
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2:00pm – 3:00pm	TC4 Committee Meeting	250 C
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2:00pm – 3:30pm

Tutorial 1:
Connecting EVs to the Grid: An Introduction to the IEC 61850 Substation Automation Standard
140 G

Industry Sessions 1: Onsemi/D&V Electronics
142 C

2:00pm – 2:45pm
Presentation 1: SiC-Enabled Solutions for Next Generation EVs

2:45pm – 3:30pm
Presentation 2: Emulation: A Key Element In Speeding Up Product Development and Validation

2:00pm – 3:40pm

Panel 1: Energy Storage Challenges for Transportation Applications
141

Panel 2: What is the Role for Hydrogen in Transportation?
142 A/B

2:00pm – 5:30pm

Short Course 1: Vehicle Electrification and Inverter Thermal Management
250 A

Short Course 2: Electric Vertical Takeoff and Landing (eVTOL) Aircraft
250 B

3:30pm – 4:30pm

Coffee Break
Expo Hall E

TTE Committee Meeting
250 C

4:00pm – 5:30pm

Industry Sessions 2: Marsilli North America/AVL
142 C

4:00pm – 4:45pm
Presentation 1: Optimizing Motor Production Projects: Key Factors to Consider for Optimal Motor Winding and Assembly Automation

4:45pm – 5:30pm
Presentation 2: How A Precise E-Motor Emulator Speeds Up Inverter Software Development and Release Testing

4:00pm – 5:40pm

Oral Session 1: Fuel Cells and Hydrogen
140 G

Panel 3: High-Performance Rare-Earth Magnet-Free Electric Machine Design
141

Panel 4: Beyond the Motor Shaft: Gearboxes for Electrified Vehicles
142 A/B

6:00pm – 8:00pm	Expo Welcome Reception	Expo Hall E
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6:30pm – 7:30pm	Student Coilwinding Competition	Expo Hall E
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KEY

-  **Industry Session**
-  **Keynote**
-  **Oral Session**
-  **Panel**
-  **Poster Session**
-  **Short Course**
-  **Tutorial**

Thursday, June 22

7:00am – 6:00pm	Registration		Atrium, Front of 140 A
PLENARY SESSION 2	8:30am – 8:40am	Welcome & Awards	140 B-F
	8:40am – 8:50am	TTE Best Paper Awards	140 B-F
	8:50am – 9:00am	PELS Transportation System Award TC4	140 B-F
	9:00am – 9:30am	Keynote 1 – Future Forward: Universal Charging for Multi-Modal Electric Mobility Solutions Dan Sloat, <i>Advanced Air Mobility Institute</i>	140 B-F
	9:30am – 10:00am	Keynote 2 – Advanced Air Mobility: Industry Trends, Challenges and Opportunities Zafer Sahinoglu, <i>MELIC (Mitsubishi Electric Innovation Center)</i>	140 B-F
	10:00am – 10:30am	Coffee Break	140 B-F
	10:30am – 11:00am	Keynote 3 – Software Defined Electrification: Advanced Technology for Performance, Speed, and Scale Wesley Pennington, <i>Tau Motors</i>	140 B-F
	11:00am – 11:30am	Keynote 4 – Electric Mobility Developments and Opportunities for Smart Vehicle-Grid-Integration Thomas Wallner, <i>Argonne National Laboratory</i>	140 B-F
11:30am – 12:00pm	Keynote 5 – An Ongoing Journey: Delivering Customer Value Kent Wanner, <i>John Deere</i>	140 B-F	
12:00pm – 5:00pm	Expo		Expo Hall E

12:00pm – 2:00pm

Lunch
Expo Hall E

Poster Session 2
Expo Hall E

2:00pm – 3:30pm

Industry Sessions 3: HBK/Powersys, Inc, SIMBA software

2:00pm – 3:40pm

**Oral Session 2:
Smart/Micro Grids**
140 G

Panel 5: High-Power Density Electric Propulsion System Technologies for Electrified Transportation
141

Panel 6: Safety, Driver Perception and Acceptance, and Regulation for Autonomous Vehicles
142 A/B

2:00pm – 5:30pm

Short Course 3: Smart Data-driven Battery Management Systems for E-mobility Using Digital-twinning, Machine Learning, and New IoT Techniques
250 A

Short Course 4: General Airgap Field Modulation Theory for Electrical Machines and Its Applications in Automotive and Aerospace Industries
250 B

3:30pm – 4:30pm **Coffee Break**

3:30pm – 5:30pm **TEC Steering Committee Meeting**

4:00pm – 5:40pm

Oral Session 3: Fault Detection, Management, and Control
140 G

Oral Session 20: Electric Vehicle On-Board Chargers
142 C

Tutorial 2: Design Consideration for Isolated Bias Supplies in Traction Inverters, On-Board Chargers, and DC/DC Converters
141

Panel 7: Innovative Energy Management Systems for Electrified Vehicles
142 A/B

6:00pm – 10:00pm

SWRI Sponsored Industry Night Dinner Cruise
Detroit Princess Cruise

Young Professional Reception Dinner Cruise
Detroit Princess Cruise

Friday, June 23

7:30am – 4:00pm **Registration**

8:00am – 12:00pm **Special Event: Ford Rouge Tour**

8:30am – 10:10am

**Tutorial 3:
Control and Design of Software-Defined Power Electronics for Electric Vehicle Energy Conversion System**
141

**Oral Session 4:
Power Electronics – DC/DC Conversion**
140 G

**Oral Session 5:
Electric Motor Control**
142 C

**Oral Session 6:
Battery Design and Modeling**
250 A

**Oral Session 7:
Wireless Electric Vehicle Charging**
250 B

**Oral Session 8:
Electrified Aircraft and Marine Vessels**
250 C

10:10am – 10:30am **Coffee Break**

10:30am – 12:10pm

**Tutorial 4:
Dynamic Modeling, Simulation, and Control of Electric Motor Drives for Automotive Motion Control Applications**
141

**Oral Session 9:
Power Electronics – Rectifiers and Inverters**
140 G

**Oral Session 10:
Electric Motor Design**
142 C

**Oral Session 11:
Battery State of Charge Estimation**
250 A

**Oral Session 12:
Electric Vehicle Fast Charging**
250 B

**Oral Session 13:
Heavy Duty Electrified Vehicles**
250 C

12:10pm – 1:40pm

Lunch On Your Own

WIE Luncheon
142 A/B

1:40pm – 3:50pm

**Oral Session 14:
Thermal Management**
140 G

**Oral Session 15:
Connected and Autonomous Vehicles**
141

**Oral Session 16:
Rapid Prototyping and Real-Time Simulation**
142 C

**Oral Session 17:
Battery State of Health and Aging**
250 A

**Oral Session 18:
Grid Impacts of Electric Vehicle Charging**
250 B

**Oral Session 19:
EMI and Partial Discharge Considerations**
250 C

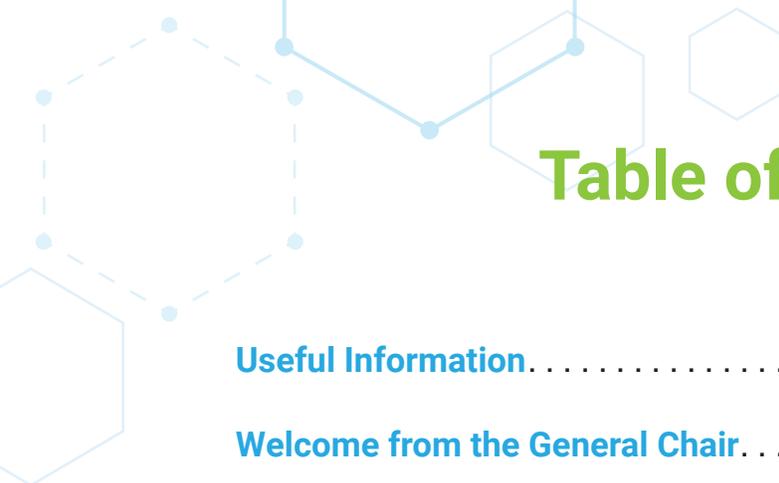


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Useful Information

Conference App

ITEC provides multiple functionalities through the conference app. Download **Whova** and use the code in the graphic, along with the email you registered with to log in to the event.

Use this app to submit questions to panel moderators, network, plan your program schedule and more.



Get *Whova* for 2023 IEEE Transportation Electrification Conference & Expo



2023 IEEE Transportation Electrification Conference & Expo Official Event App

- Explore the **professional profiles** of event speakers and attendees
- Send **in-app messages** and **exchange contact info**
- **Network and find attendees** with common affiliations, educations, shared networks, and social profiles
- Receive **update notifications** from organizers
- Access the **event agenda**, GPS guidance, maps, and parking directions at your fingertips



The event invitation code is:
xwwmajn4ob



Detailed Session Information and Speaker Bios

To provide more space in the printed program for note taking, the session information has been limited to basic descriptions. Much more detailed descriptions and speaker profiles are viewable on the website at www.itec-conf.com/agenda or on the conference app.



Last Minute Technical Session Changes

Please note that there may be discrepancies between the session schedule listed in the printed program and the publication file. For the most up to date information about presentations, please check the conference app or the ITEC program schedule page on the website: www.itec-conf.com/agenda.

Ford Rouge Factory Tour

June 23 | 8:00am – 12:00pm | Ford Museum – Factory Tour | Cost: \$60

Join us on the Henry Ford Museum's Ford Rouge Factory Tour!! The factory has undergone a sweeping transformation to become a model of 21st-century sustainable design and showcases how community, business and the environment can thrive together in a single environment. From start to finish, the Ford Rouge Factory Tour offers awe-inspiring encounters with America's celebrated manufacturing past, present, and future.

**Note bus loads from the Huntington Place at 8:00 am*

Welcome



Dear ITEC 2023 Participants,

I am excited to welcome you to the twelfth IEEE Transportation Electrification Conference (ITEC). This marks the first time ITEC will be held in downtown Detroit, offering participants great views along the river front, throughout the walkable downtown, and on the Detroit Princess river cruise Industry Night Out and Young Professional's events. Detroit's auto industry will be highlighted the third day as well, with a tour of the Ford Rouge Factory where the Ford F150 truck is manufactured.

ITEC, IEEE's premier transportation electrification focused conference, has a mission of bringing together engineers from industry, academia, and government agencies to share new ideas and technologies for electrifying all types of transportation. Last year's partnership with the Electric Aircraft Technologies Symposium (EATS), which will continue in 2025 when ITEC returns to California, brought a special focus on aircraft electrification. This year will cover all the latest topics for applications ranging from passenger vehicles to marine, aerospace to heavy duty applications, and charging systems and microgrids.

This year's program features a diverse array of sessions and activities, as well as an exhibition featuring more than twenty-five booths showcasing the latest design software, test and measurement equipment, manufacturing and recycling technologies, electrified vehicles and components, and educational and professional organizations as well. Ten keynotes, eight tutorials and short courses, seven panels, and five industry presentations are spread over the first two days and Friday morning. A total of 185 technical papers will be presented in poster sessions during Wednesday and Thursday's exhibition, as well as in oral presentation sessions spread throughout the conference and filling most of the schedule on Friday.

We hope you'll join us for many of the special events throughout the conference which are designed to spur new discussions and collaborations, including Tuesday evening's Welcome Reception, Wednesday night's Expo Welcome Reception and Student Coil Winding Competition, Thursday evening's Detroit river cruise, and Friday's Women in Engineering (WIE) Luncheon and closing reception.

The organizing committee and I look forward to welcoming you to this year's ITEC, we are certain the conference has something for everyone and will be a great experience!

Sincerely,

Dr. Phillip Kollmeyer

General Chair, ITEC 2023

Organizing Committee

Thank you to all of the publication track chairs and many reviewers who served countless hours.
You made it possible to accommodate a record number of submissions this year!

GENERAL CHAIR

>> Phillip Kollmeyer, *McMaster University*

GENERAL CO-CHAIR

>> Scott Hotz, *Southwest Research Institute*

PROGRAM CHAIR

>> Fei Gao, *University of Technology of Belfort-Montbéliard*

PROGRAM CO-CHAIR

>> Liang Du, *Temple University*

ASSISTANT PROGRAM CHAIR

>> Jennifer Bauman, *McMaster University*

FINANCE CHAIR AND TREASURER

>> Liang Du, *Temple University*

PUBLICATION CHAIR

>> Michael Eull, *Tau Motors*

PUBLICATION CO-CHAIR

>> Fei Lu, *Drexel University*

PANELS CHAIR

>> Pier Giuseppe Anselma, *Nissan Formula E*

PANEL ORGANIZERS

>> Keyur Patel, *Nexteer Automotive*

>> Woongkul Lee, *Michigan State University*

>> Atriya Biswas, *McMaster University*

>> Scott Halley, *Lubrizol*

>> Graham Conway, *Southwest Research Institute*

>> Yasaman Masoudi, *Stellantis*

SHORT COURSES/TUTORIALS CO-CHAIR

>> Elena Breaz, *University of Technology of Belfort-Montbéliard*

>> Liwei Zhou, *Columbia University*

KEYNOTES CHAIR

>> Huazheng Fang, *University of Kansas*

KEYNOTE CO-CHAIR

>> Matthias Preindl, *Columbia University*

SOCIAL CHAIRS

>> Mitch Marks, *HBK*

WOMEN IN ENGINEERING AND

TRAVEL AWARDS CHAIR

>> Subarni Pradhan, *McMaster University*

YOUNG PROFESSIONALS CHAIR

>> FNU Nishanth, *University of Wisconsin Madison*

AWARDS CHAIR

>> Benedikt Schmuelling, *University of Wuppertal, Germany*

Steering Committee

>> Bogdan Borowy, *Satcon Technology Corporation*

>> Rik DeDoncker, *RWTH Aachen University*

>> Deepak Divan, *Georgia Institute of Technology*

>> Ali Emadi (Chair), *McMaster University*

>> Babak Fahimi, *University of Texas at Dallas*

>> Silva Hiti, *Rivian*

>> Phil Krein, *University of Illinois at Urbana-Champaign*

>> John M. Miller, *Oak Ridge National Laboratory*

>> Jim Nagashima, *Nagashima Advanced Technology Consulting*

>> Kaushik Rajashekara, *University of Texas at Dallas*

>> Peter Steimer, *ABB Switzerland Ltd.*

Organizing Committee *(continued)*

Track Chairs

POWERTRAIN: DESIGN, THERMAL MANAGEMENT, PACKAGING, AND OPTIMIZATION TRACK CHAIRS

- >> Hassan Shabbir, *Magna Powertrain of America, Inc.*
- >> Pier-Giuseppe Anselma, *Nissan Formula-E, France*
- >> Xiangyu Han, *Tesla*
- >> Poria Fajri, *University of Nevada, Reno*

BATTERY, FUEL CELL AND ENERGY STORAGE SYSTEMS TRACK CHAIRS

- >> Zheng Liu, *University of Illinois*
- >> Zhixue Zheng, *University Institute of Technology (IUT) of Thionville-Yutz, France*
- >> Chanyeop Park, *University of Wisconsin-Milwaukee*
- >> Ali Zenati, *Saft Batteries*
- >> Hengzhao Yang, *Shanghai Tech*

ELECTRIC, HYBRID ELECTRIC, PLUG-IN HYBRID ELECTRIC VEHICLE SYSTEM ARCHITECTURES AND CONTROL TRACK CHAIRS

- >> Ankit Patel, *University of Minho, Portugal*
- >> Mohsen Rahimian, *University of Kashan*
- >> Xianke Lin, *Ontario Tech University*
- >> Di Zhu, *Ford Motor*
- >> Dianxun Xiao, *The Hong Kong University of Science and Technology (Guangzhou)*

CONNECTED AND AUTONOMOUS VEHICLES, SMART MOBILITY, AND VEHICLE FUNCTIONAL SAFETY TRACK CHAIRS

- >> Asma Ben Ali, *The University of Sfax Faculty of Sciences*
- >> Chao Huang, *The Hong Kong Polytechnic University*
- >> Ji Li, *University of Birmingham*
- >> Lea Pommier, *Enedym Inc.*

SMART AND MICRO GRIDS, EV-INTERACTING SMART GRID AND ELECTRICAL INFRASTRUCTURE TRACK CHAIRS

- >> Binesh Kumar, *Atom Power Inc*
- >> Junho Hong, *University of Michigan*
- >> Vahid Disfani, *University of Tennessee at Chattanooga*
- >> Xiaofeng Yang, *Beijing Jiaotong University*

ELECTRIFICATION OF HEAVY-DUTY AND OFF-ROAD VEHICLES TRACK CHAIRS

- >> Benedikt Schmülling, *University of Wuppertal, Germany*
- >> Sumeet Singh, *EMWorks Inc., Montreal, Canada*
- >> Siddharth Ballal, *BorgWarner Inc.*

ELECTRICAL SYSTEMS AND COMPONENTS FOR SEA, UNDERSEA, AIR, AND SPACE VEHICLES TRACK CHAIRS

- >> Atriya Biswas, *McMaster University*
- >> Panagiotis Laskaridis, *Cranfield University*
- >> Larry Juang, *Amazon Prime Air*
- >> Tao Yang, *The University of Nottingham*

RAPID PROTOTYPING, REAL-TIME SIMULATION, HIL AND SIL FOR TRANSPORTATION ELECTRIFICATION TRACK CHAIRS

- >> Reza Kheirollahi, *Drexel University*
- >> Rishabh Jain, *National Renewable Energy Laboratory (NREL)*

BATTERY CHARGERS: ONBOARD, WIRELESS, FAST, AND ULTRA-FAST TRACK CHAIRS

- >> Hua Zhang, *Rowan University*
- >> Nil Patel, *Concordia University*
- >> Gautham Ram, *TU Delft*
- >> Zedong Zheng, *Tsinghua University*

CODES, STANDARDS, POLICIES, AND REGULATIONS FOR TRANSPORTATION ELECTRIFICATION TRACK CHAIRS

- >> Woongkul (Matt) Lee, *Michigan State University*

POWER ELECTRONICS AND MOTOR DRIVES TRACK CHAIRS

- >> Peng Zhang, *General Motors*
- >> Radha Krishna Moorthy, *Oak Ridge National Lab*
- >> Lizhi Qu, *University of Nebraska-Lincoln*
- >> Qichen Yang, *Florida State University*
- >> Ludovico Ortombina, *University of Padova*

ELECTRIC MACHINES AND ACTUATORS TRACK CHAIRS

- >> Hao Ding, *Work in Rivian*
- >> Hang Dai, *Work in General Electric*
- >> Romina Rodriguez, *McMaster University*

Special Events

Welcome Reception

June 20 | 6:00pm – 8:00pm
Location: Room 140 B-F

Skip the long lines by picking up your badge early and enjoy drinks and appetizers on us!

**Complimentary for Full Conference Attendees*

TC4 Mentorship Luncheon

June 21 | 12:00pm – 2:00pm
Location: Room 250 C

Sponsored by IEEE Power Electronics Society (PELS), ITEC 2023 will hold a roundtable mentorship luncheon, which is open to individuals at any stage in their careers. The Mentorship Program was established in April 2017 by PELS as a member benefit to help members proper and further their career goals. ITEC 2023 will hold 6 round tables to discuss topics including career development in both academia and industry, preparedness for both academia and industry, and difference & switching between academia and industry. Lunch, desserts, and beverages will be served. There is no cost to attend this event.

For any questions related to the Mentorship Program, please contact ITEC 2023 Program Co-Chair and IEEE PLES TC4 Mentorship Chair Dr. Liang Du (ldu@ieee.org).

Women in Engineering Luncheon

June 23 | 12:10pm – 1:40pm | Location: 142 A/B

SPEAKER: Lihua Li, *Director of Electrification Controls & SW Department , General Motors*

Lihua Li is the director of Electrification Controls & SW department at GM. Li's responsibilities include directing the production development and deployment of Controls & SW in battery, motor, and propulsion systems for all GM EV.

Throughout her career, Li has held many responsibilities, including director of global propulsion systems research lab at GM R&D; director of propulsion systems operation at SGMW, GM's joint venture in China as well as many team and technical leadership responsibilities in developing GM's electric vehicles and businesses. Before joining GM, Li was Principal Engineer at One-Cycle Control Inc. Li received her PhD and master's degrees in electrical engineering from University of California, Irvine and her bachelor's degree in Instrumentation Engineering from Shanghai Jiao Tong University in China. Li served as executive leader in USCAR and 21CTP and is currently serving on GM Asian Community leadership advisory board.

ABSTRACT: Lihua Li will be discussing the challenges she has faced as a woman working in a male-dominated field, and how she has overcome them. She also will be speaking on her career progression, tips for networking, negotiating, planning her career path, work/personal/life balance, getting a mentor, managing people, productivity, and so much more.

**Note: RSVP during your registration to indicate that you are joining for this reception.*

Expo Reception

June 21 | 6:00pm – 8:00pm
Location: Expo Hall E

Mingle with industry professionals at our Expo Industry Reception This is the perfect opportunity to network and make connections in the industry while also getting the chance to view and or participate in our thrilling coil winding competition! To top it off, enjoy a delicious dinner on us. This is an event you won't want to miss!

**Complimentary for Full Conference Attendees*

Young Professional Reception Dinner Cruise

June 22 | 6:00pm – 10:00pm
Location: Detroit Princess Cruise

- >> Boarding starts at 6:00pm
- >> Cruise leaves dock at 7:00pm
- >> Cruise returns to docks at 9:00pm
- >> From 9:00pm – 10:00pm passengers de-board

**Note: You must pre-register for this event, tickets may still be available at the registration desk.*

SWRI Sponsored Industry Night Dinner Cruise

June 22 | 6:00pm – 10:00pm
Location: Detroit Princess Cruise

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**Note: You must pre-register for this event, tickets may still be available at the registration desk.*

Keynotes

Welcome & Awards

June 21 | 8:30am – 9:00am | Location: 140B-F

8:30am | **Welcome & Awards**

CONFERENCE CHAIR: Phillip Kollmeyer and Scott Hotz

8:40am | **ITEC Best Papers Awards**

8:50am | **ITEC Student Best Papers Awards**

Plenary Session 1

June 21 | 9:00am – 12:00pm | Location: 140B-F

9:00am | **Keynote 1 – Fast Charge of High Energy Li-ion Batteries Utilizing Intelligent Battery Management System**

SPEAKER: Said Al-Hallaj, *Chief Battery Scientist, Beam Global*

9:30am | **Keynote 2 – Challenges and Solutions to Net Zero CO2 in the Transportation Sector**

SPEAKER: Terry Alger, *Executive Director - Sustainable Energy & Mobility, Southwest Research Institute*

10:00am | **Coffee Break**

10:30am | **Keynote 3 – Overcoming Limiting Factors through Software & ML/AI – How Industry Leaders are Innovating to Meet Performance Standards**

SPEAKER: Fabrizio Martini, *Co Founder & CEO, Electra Vehicles*

11:00am | **Keynote 4 – Why Vocational Vehicles Will Be the Fastest Growing Market for Electrification for the Next 5 Years**

SPEAKER: Tim Reeser, *CEO, Lightning emotors*

11:30am | **Keynote 5 – Ship Electrification: Control and Optimization of Integrated Power Systems**

SPEAKER: Jing Sun, *Michael G. Parsons Collegiate Professor, Naval Architecture and Marine Engineering, University of Michigan*

NOTES

For most recent speaker content see **Whova** the ITEC 2023 app.



Keynotes *(continued)*

Welcome & Awards

June 22 | 8:30am – 9:00am | Location: 140B-F

8:30am | **Welcome & Awards**

CONFERENCE CHAIR: Phillip Kollmeyer and Scott Hotz

8:40am | **TTE Best Paper Awards**

PRESENTERS: Fei Gao, Mahesh Krishnamurthy

8:50am | **PELS Transportation System Award TC4**

PRESENTER: Liang Du

Plenary Session 2

June 22 | 9:00am – 12:00pm | Location: 140B-F

9:00am | **Keynote 1 – Future Forward: Universal Charging for Multi-Modal Electric Mobility Solutions**

SPEAKER: Dan Sloat, *Founder & President of the Advanced Air Mobility Institute*

9:30am | **Keynote 2 – Advanced Air Mobility: Industry Trends, Challenges and Opportunities**

SPEAKER: Zafer Sahinoglu, *General Manager, MELIC (Mitsubishi Electric Innovation Center)*

10:00am | **Coffee Break**

10:30am | **Keynote 3 – Software Defined Electrification: Advanced Technology for Performance, Speed, And Scale**

SPEAKER: Wesley Pennington, *CEO, Tau Motors*

11:00am | **Keynote 4 – Electric Mobility Developments and Opportunities for Smart Vehicle-Grid-Integration**

SPEAKER: Thomas Wallner, *Interim Deputy Director, Manager of the Advanced Mobility and Grid Integration Technology Research, Argonne National Laboratory*

11:30am | **Keynote 5 – An Ongoing Journey: Delivering Customer Value Through Electrification at John Deere**

SPEAKER: Kent Wanner, *Sr. Staff Power Electronics Engineer, John Deere*

NOTES _____

For most recent speaker content see **Whova** the ITEC 2023 app.

Industry Panels

Panel 1: Everything Charging: Theoretical, Practical, and Infrastructural Challenges and Arising Opportunities Faced by Charging Community

June 21 | 2:00pm – 3:40pm | Location: 141

MODERATOR: **Yasaman Masoudi**, *Stellantis*

SPEAKERS: **Dennis Corrigan**, *DC Energy Consulting, LLC*; **Will McCoy**, *Vehya*;

Matilde D'Arpino, *Ohio State University*; **Edward Mussi**, *Stellantis*

Discussion includes various issues from infrastructure and operations and maintenance, to charging optimization, electro-chemical analysis of charging, protocols for on-board versus fast charge, etc

Panel 2: What is the Role for Hydrogen in Transportation?

June 21 | 2:00pm – 3:40pm | Location: 142 A/B

MODERATOR: **Graham Conway**, *Southwest Research Institute*

SPEAKERS: **Mohammad Fatouraie**, *Bosch*; **Mark Richards**, *DOE*; **Nathan Peters**, *MAHLE North America*

The global shift towards light-duty plug-in EVs is happening rapidly. In many markets the increase in adoption rate exceeds most analysts forecasts from just two years ago. The light-duty market is relatively easy to electrify and will continue to see year-on-year growth for the foreseeable future. As vehicle class size increase so do the challenges facing mass EV adoption. Longer charging times, high purchase price and reduced payload present challenges for many over-the-road long haul applications. Hydrogen has been discussed as a potential solution for the Class 8 applications as well as off-road applications. There are inherent challenges to hydrogen vehicles too, yet the topic has increased in relevance over the last 18 months. The application for hydrogen may be either a fuel-cell or internal combustion engine. This panel will discuss the areas where hydrogen could work and the steps we need to take to get there.

Panel 3: High-Performance Rare-Earth Magnet-Free Electric Machine Design

June 21 | 4:00pm – 5:40pm | Location: 141

MODERATOR: **Woongkul Lee**, *Michigan State University*

SPEAKERS: **Babak Fahimi**, *University of Texas, Dallas*; **Ayman EL-Refaie**, *Marquette University*;

Seungdeog Choi, *Mississippi State University*; **Gianmario Pellegrino**, *Politecnico di Torino*

The ever growing demands for high performance electric propulsion system will require a lot more rare earth magnet than we can currently produce. To meet the 2030 electrification goal, we need 10 times more rare earth materials used in permanent magnet motors. In this panel, we will discuss the reduced or rare earth magnet-free electric machine designs from multiple aspects such as materials, machine design, cooling techniques, electromagnetic performance, and power density.

Panel 4: Beyond the Motor Shaft: Gearboxes for Electrified Vehicles

June 21 | 4:00pm – 5:40pm | Location: 142 A/B

MODERATOR: **Scott Halley**, *Lubrizol*

SPEAKERS: **Ilker Sahin**, *Chief Engineer – Electrification, AVL*; **Suresh Natarajan**, *Head Customer Solution Engineering – Americas, Dana*; **Craig Renneker**, *VP Driveline Innovation, AAM*; **Christopher Suhocki**, *Southwest Research Institute*

Since the earliest days of transportation systems there has been a need to match the speed and torque requirements of the wheel with that produced by the powerplant. With an internal combustion engine (ICE) powered vehicle this has been accomplished through the years with a variety of transmission and final drive (axle) options. The electrification of vehicles presents similar challenges, along with the differing torque characteristics of an electric motor vs. an ICE and this panel will discuss some of the options in use and being considered for future applications.



Industry Panels *(continued)*

Panel 5: High-Power Density Electric Propulsion System Technologies for Electrified Transportation

June 22 | 2:00pm – 3:40pm | Location: 141

MODERATOR: **Woongkul Lee**, *Michigan State University*

SPEAKERS: **Mrinal Das**, *Onsemi*; **Muhammad Alvi**, *General Motors*; **Bingsen Wang**, *Stellantis*; **Di Pan**, *Crane Aerospace & Electronics*

As the application of electric propulsion rapidly expands towards high-power systems such as semi, off-road vehicles, and aircraft, the needs for high-voltage and high-power electric drives are also growing. In this panel, we will discuss high power density electric propulsion system technologies for various electrified transportation system including novel inverter topology, state-of-the-art WBG devices, cooling techniques, and packaging.

Panel 6: Safety, Driver Perception and Acceptance, and Regulation for Autonomous Vehicles

June 22 | 2:00pm – 3:40pm | Location: 142 A/B

MODERATOR: **Keyur Patel**, *Nexteer*

SPEAKERS: **Steve Dellenback**, *Vice President, SwRI*; **Shaunak D. Bopardikar**, *Assistant Professor, MSU*; **Siddarth Shah**, *Canoo*

The fully commercial autonomous vehicles have raced against time in the automotive industry to attract market traction. The commercial availability of fully autonomous vehicles brings new hurdles and challenges. Are we ready for full commercial autonomous vehicles on the public road and when if not? This panel will focus on discussing current and future fully autonomous regulatory, safety, and infrastructure commercial hurdles. The perspective on current fully autonomous commercial vehicle feasibility, infrastructure / commercial challenges, safety standards, regulation, and driver perception & acceptance will be debated.

Panel 7: Innovative Energy Management Systems for Electrified Vehicles

June 22 | 4:00pm – 5:40pm | Location: 142 A/B

MODERATOR: **Atriya Biswas**, *McMaster University*

SPEAKERS: **Poria Fajri**, *University of Nevada, Reno*; **Reza Amini**, *Assistant Research Scientist, University of Michigan*; **Oliver Gross**, *Energy Storage and Management Specialist, Stellantis*; **Quan Zhou**, *Group Leader of Connected and Autonomous Systems for Electrified Vehicles Research, University of Birmingham*; **Daniel Borroso**, *Electric Vehicle Expert / Chief Engineer/e-mobility Strategist, Stellantis*

Modern-day prolific energy management systems (EMSs) or supervisory controllers manage more than just distributing driver's power demands into different onboard power sources in a electrified vehicle. While the fundamental objective of any EMS is to strive for better energy efficiency of the electrified powertrain, versatile modern-day EMSs have been exploring various technologies to make electrified vehicles more attractive to customers, innovative, sustainable, and eco-friendly. A few such technologies are AI-driven, associated with vehicle-to-X communication, telematics, and battery health detection systems. Some of these technologies are on the verge of deployment, while some are in their infancy. This panel will discuss how these technologies are reshaping the market for electrified vehicles and the future scope of improvement in energy efficiency through collaborations among different innovative technologies.

Short Courses

Short Course 1: Vehicle Electrification and Inverter Thermal Management

June 21 | 2:00pm – 5:30pm | Location: 250 A

SPEAKER: **Ayush Lal**, *Senior Mechanical Engineer, Aptiv*

The presentation will give the audience a background on vehicle electrification, its current scenario and trends in electrification. Later, it will also deep dive in discussion about traction inverter, which is one of the essential components on an electric vehicle as it converts DC current from the battery to AC to drive an electric motor. We will be discussing 800V SiC inverters as well as inverter thermal management. We will be discussing about key industry players in the current scenario and impact of electric vehicles on the environment, including how countries are trying to electrify their fleets.

Short Course 2: Electric Vertical Takeoff and Landing (eVTOL) Aircraft

June 21 | 2:00pm – 5:30pm | Location: 250 B

SPEAKERS: **Chris Mi**, *Distinguished Professor, San Diego State University*;
John Hwang, *Assistant Professor, University of California, San Diego*

The aviation industry accounts for 9% of greenhouse gas emissions from the US transportation sector. Hence, NASA's Subsonic Fixed Wing program set performance targets at -75% NOx, and -70% fuel burn relative to 2006-era technology. Electric aircraft could be the most viable solution to achieve these goals. Electric aircraft can reduce operating costs by using electricity instead of jet fuel and reducing energy consumption. However, adopting electric propulsion for long-haul and large-capacity aircraft is not realistic due to weight, cost, and charging times of the battery. Hence, a more practical entry point for introducing electric aircraft is on vertical takeoff and landing (eVTOL) aircraft which provides many advantages when compared to traditional short-haul aircraft and helicopters since they do not require a runway, and they can be quiet, efficient, faster, and emission-free. Hence, eVTOL aircraft can be ideal for urban transportation, emergency medical services, and many other applications. This tutorial covers the fundamentals of eVTOL aircraft, including aircraft design, sizing, configurations, aerodynamics, propulsion system, energy storage, and multidisciplinary design optimization.

Short Course 3: Smart Data-driven Battery Management Systems for E-mobility using Digital-twinning, Machine Learning, and New IoT Techniques

June 22 | 2:00pm – 5:30pm | Location: 250 A

SPEAKERS: **Akash Samanta**, *Doctoral Research Scholar, Ontario Tech University*;
Sheldon Williamson, *Professor, Ontario Tech University*

Despite Lithium-ion batteries being widely accepted for automotive applications, it is noticed that the frequent incident of fire in electric vehicles is primarily due to ineffective battery management systems (BMS). Therefore, an intelligent safety framework and smart BMS are extremely essential to ensure safe, reliable, and longer battery life. The reliable operation of BMS requires accurate information of the voltage, current, temperature, aging profile, important states of each cell. Thus, intelligent state estimation techniques such as artificial intelligence and machine learning based techniques will be discussed in this short course. As high-resolution data is the backbone of any data-driven technique, collecting and processing high-resolution data needs the internet of things for accessing advanced platforms such as cloud computing and data storage. Furthermore, with the introduction of fast charging, the risk of thermal runaway and other safety issues have been increased many folds. Here, a recently patented digital-twin-based battery safety framework powered by deep learning algorithms will be introduced. The short will conclude with recent issues, challenges, and future research scopes.

Short Courses *(continued)*

Short Course 4: General Airgap Field Modulation Theory for Electrical Machines and Its Applications in Automotive and Aerospace Industries

June 22 | 2:00pm – 5:30pm | Location: 250 B

SPEAKERS: **Ming Cheng**, *Endowed Chair Professor, Southeast University*;
Peng Han, *Senior Application Engineer, Ansys, Inc.*

Electrical machines are devices that convert mechanical energy into electrical energy or vice versa. They were invented in the 1800s and have a history of nearly 200 years. With the rapid development of our social economy in this electrification era, the demand for high-performance electrical machines and their analysis theories is increasing day by day.

This short course will provide a comprehensive overview of airgap magnetic field modulation phenomena widely observed in electrical machines, and the general airgap field modulation theory that has been developed systematically to understand and research them. It will be shown by several examples that the developed theory not only serves to unify analysis of disparate electrical machines, but also paves the way towards the creation of new electrical machine topologies.

Tutorials

Tutorial 1: Connecting EVs to the Grid: An Introduction to the IEC 61850 Substation Automation Standard

June 21 | 2:00pm – 3:40pm | Location: 140 G

SPEAKER: **Jeffrey Vasel**, *Electrical Integration Manager, ABB Inc*

The subject of the ITEC 2023 conference is Transportation Electrification, but the energy required for the EVs comes from the grid. Therefore, the way in which we communicate with the grid is very important. There are many communication standards related to EV charging. These include plug connections such as Type 1, Type 2, CCS, and CHAdeMO. Another standard used for EV charging is OCPP for connecting a charging network to an EV charger. However, there is one important power system standard that often gets overlooked: The IEC 61850 Substation Automation standard. The IEC 61850 standard focuses on how substation devices communicate with each other. The purpose of this tutorial is to provide participants with an introduction to the IEC 61850 communication standard, so that they can better evaluate it and determine if it is a viable option for their future Transportation Electrification work. IEC 61850 has communication extensions for EVs, DERs, and BESS. These extensions will be discussed along with EV charging protocols and interfaces including OCPP and IEC 61851.

Tutorial 2: Design Consideration for Isolated Bias Supplies in Traction Inverters, On-Board Chargers, and DC/DC Converters

June 22 | 4:00pm – 5:40pm | Location: 141

SPEAKER: **Pradeep Shenoy**, *Power Design Services Manager, Texas Instruments*

This tutorial will cover the design of low power isolated bias supplies used to power gate drivers in various systems like traction inverters, on-board chargers, DC/DC converters (auxiliary power modules), HVAC, and other systems. The emphasis of the talk will be on practical design considerations, tradeoffs, and lessons learned from example designs. The tutorial will have three parts. The first part provides an overview of the typical architectures (centralized, semi-distributed, fully distributed), power requirements, and converter topologies used (flyback, pushpull, open loop LLC, integrated magnetic converters). The pros and cons of each approach will be explained. The second part covers a design example of an isolated bias supply. The key design parameters, component selection, and layout will be explained. Test results from a hardware prototype will show efficiency, output voltage regulation, thermal performance. The third part compares the EMI/EMC tradeoffs and impact of these isolated bias supply topologies. A side by side comparison of four topologies (flyback, pushpull, open loop LLC, and integrated magnetic) will be shown.



Tutorials *(continued)*

Tutorial 3: Control and Design of Software-Defined Power Electronics for Electric Vehicle Energy Conversion System

June 23 | 8:30am – 10:10am | Location: 141

SPEAKERS: **Liwei Zhou**, *Assistant Professor, University of Texas at Arlington*;
Matthias Preindl, *PhD Candidate, Columbia University*

We introduce a software-defined architecture for the purpose of improving the electric vehicle energy conversion system. The proposed structure is composed of three layers for the interfaces with various types of electrified loads/sources and the corresponding control functions, such as single/three-phase grid, battery, motor and DC supplies.

The merits of the designed architecture include the reconfigurability to be suitable for different types of EV applications, all non-isolated topologies with common mode noise attenuation capability, improved efficiency and dynamic performance by VFSS and MPC of the elementary power module, high accuracy and robustness of the multi-layer control without being influenced by the parametric modeling error from various applications. For the EV charger design case based on our techniques, we achieved efficiency >99%, power density >10kW/L, with frequency up to 1MHz.

We will firstly introduce the configuration of the proposed software-defined EV energy conversion system. Secondly, several design cases, such as the single/three-phase grid connection, DC battery connection, a EV charger that can be reconfigured for 3 phase / 1 phase / split phase and motor connection, are illustrated in details with the control and switching strategies. Thirdly, the hardware design and magnetic component considerations are presented.

Tutorial 4: Dynamic Modeling, Simulation, and Control of Electric Motor Drives for Automotive Motion Control Applications

June 23 | 10:30am – 12:10pm | Location: 141

SPEAKERS: **Prerit Pramod**, *Engineering Manager, MicroVision*;
Siddharth Mehta, *Controls Engineer, Nexteer Automotive Corporation*

Safety critical, high performance motion control systems employ electric motor drive systems that are expected to meet stringent performance requirements in terms of static and dynamic torque tracking capability, disturbance rejection, and noise immunity. Torque control of electric motor drives is typically achieved via dynamic current control utilizing either feedback regulators or feedforward controllers. This tutorial covers the design, implementation and tuning of dynamic current and torque control architectures for permanent magnet synchronous motor drives. A systems approach is employed to explain the development of electric motor drives in a holistic manner, including mathematical models of electric machines and power converters considering non-linearities, current controller design variants including anti-windup strategies under voltage saturation condition, switching and commutation techniques, active capability and power management, and estimation of motor drive parameters. Techniques, tools and methodologies for the rigorous and comprehensive analysis of the performance of motor drives are detailed, encompassing both normal operation and under the presence of practical non-idealities exhibited by various constituent parts of electric drive systems.

Industry Sessions

Industry Sessions 1: Onsemi/D&V Electronics

June 21 | 2:00pm – 3:30pm | Location: 142 C

>> 2:00pm | Presentation 1: SiC-Enabled Solutions for Next Generation EVs |

SPEAKERS: **Mrinal K. Das** and **John Mookken**, *Onsemi*

Silicon Carbide MOSFETs have emerged as a key enabler for next generation electrified powertrains. Before the entitlement of this technology can be achieved, there are key challenges that need to be addressed in terms of cost, reliability, supply assurance, packaging, and high-volume manufacturing. The first half of this session focuses on how onsemi's Elite-SiC products leverage high performance, robust SiC technology on a completely vertically integrated manufacturing platform to deliver the power semiconductor components needed to realize the full potential of future powertrain systems.

At the system level, a more holistic chip2system approach is needed when optimizing a solution for the end application. Some of the concerns with current device and packaging technologies, like sintering SiC devices to heatsinks, for example, not only add more material cost, but also high manufacturing costs by requiring tighter tolerances and specific metallization and surface finishes for the chip, package and heatsink. This is a result of ever-increasing demand for systems with higher power density, better reliability and lower \$/kW metric. To significantly improve these metrics, it is necessary for semiconductor suppliers to look at the problem from a total system viewpoint. The second half of this session focuses on new concepts, materials, and manufacturing processes for a truly optimized solution from chip2system.

>> 2:45pm | Presentation 2: Emulation: A Key Element In Speeding Up Product Development and Validation

SPEAKER: **Uday Deshpande**, *D&V Electronics*

Emulation has become a key tool over the recent years to help speed up development and time to market. This tool enables the representation of the real-time behavior of a component. For example, a motor emulator will enable the user to test an inverter without the need for a physical motor (and a dyno); a battery emulator will represent the behavior of a battery (cell/module/pack) which will enable the development of battery management systems, charging systems, or to study electric powertrain systems.

While emulation is not new, in recent years, it has been increasingly used during the development of eMotive systems. Over the past 5-10 years, use of motor and battery emulators has gone from the domain of research into mainstream product development.

This presentation will share some thoughts and observations on emulation and the use of emulation tools, and offer some points for discussion on future directions, challenges, and opportunities.

Industry Sessions 2

June 21 | 4:00pm – 5:30pm | Location: 142 C

>> 4:00pm | Presentation 1: Optimizing Motor Production Projects: Key Factors to Consider for Optimal Motor Winding and Assembly Automation

SPEAKER: **Kumar Rajasekhara**, *CEO & President, Marsilli North America*

The success of a new motor winding project relies on a harmonious blend of several key factors, such as material and equipment selection, winding technology, and automation. The process begins with choosing the appropriate wire, insulation, steel laminations, and plastic insulators. Closely related to material selection is winding equipment selection, which includes wire tensioning to achieve precise layering and enhance the filling factor. The winding technology—whether open stator or closed stator—must be carefully chosen.

Market demands not only high-torque, powerful, compact motors, but also reliable, consistent, automated manufacturing solutions with full traceability for top-quality results.

This presentation provides a guide to best practices, introducing essential factors to consider for motor production projects. It focuses on available automated winding technologies—linear, flyer, and needle winding—outlining their advantages, disadvantages, and ideal applications. Finally, it explores various automation possibilities that can transform a motor project from average to exceptional.

Industry Sessions *(continued)*

>> 4:45pm | **Presentation 2: How A Precise E-Motor Emulator Speeds Up Inverter Software Development and Release Testing**

SPEAKERS: **Matt Hortop and Horst Hammerer**, AVL

The development and validation of software and functional safety requirements of drive inverters is becoming increasingly intricate. As the number of electric vehicle programs increase, so does the demand for inverter testing and validation. The historical method of performing inverter development on a dynamometer is failing to scale with the increases in activity and features, resulting in high levels of capital spending with little return. AVL takes a different approach.

By implementing an e-motor emulator (EME) with exceptional fidelity emulation capabilities, it becomes possible to disconnect the development efforts from the need to have physical motors. This can be used to speed up historical development plans. Additionally, many organizations are using the unique capabilities of an EME to re-design their development plans to be shorter, require lower cost of test assets, and are provide a level of quality that was not feasible with rotating machines present.

Industry Sessions 3

June 22 | 2:00pm – 3:30pm | Location: 250 C

>> 2:00pm | **Presentation 1: Saving Time & Money by Rapidly Characterizing Motors & Drives**

SPEAKER: **Mike Hoyer**, HBK

Characterizing electric motors and drives is a very important topic in many engineering labs throughout the world. Traditionally labs have unique interests to test and validate motors using multiple pieces of equipment from different suppliers. While these systems work, they often have high levels of complexity and operate much slower than an optimized system. This presentation proposes a solution specifically designed for motor and drive testing, saving time and money by rapidly performing efficiency motor mapping and advanced analysis resulting in the boosting of productivity and research and development.

>> 2:45pm | **Presentation 2: SIMBA software & Python in Power Electronics**

SPEAKER: **Ryoko Imamura**, Powersys, Inc, SIMBA software

Discover the latest SIMBA developments and Python's capabilities in Power Electronics in this short presentation. We'll highlight the new SIMBA Online and introduce the SIMBA Python Module, its functionality, and potential applications. We will start with the basics of Python including how to install it. Through case studies like LLC converter design and motor drive efficiency analysis, we'll demonstrate the impact of using Python with SIMBA. Perfect for engineers of all levels seeking to enhance their skills and discover new technologies.

Society Meetings

Meetings are open to all conference attendees and will discuss the activities of the PELS and IAS technical committees related to vehicle and transportation systems and ITEC. Please participate in these meetings if you are interested in getting involved with the IEEE-PELS and/or IEEE-IAS activities including ITEC, workshops, publications, awards, etc

>> **TC4 Committee Meeting**

Wednesday, June 21 | 2:00pm – 3:00pm | Location: 250 C

>> **TTE Committee Meeting**

Wednesday, June 21 | 3:30pm – 4:30pm | Location: 250 C

>> **ITEC 2024 & Steering Committee Meeting**

Thursday, June 22 | 2:00pm – 3:00pm | Location: 142 C

>> **TEC Steering Committee Meeting**

Thursday, June 22 | 3:30pm – 5:30pm | Location: 250 C

Oral Session Schedule

Wednesday, June 21 | 4:00pm – 5:40pm

OS 1 Fuel Cells and Hydrogen

Location: 140 G

SESSION CHAIRS: **Zheng Liu**, *University of Illinois Urbana-Champaign*; **Jennifer Bauman**, *McMaster University*

4:00pm | Economic Dispatch Method to Quantify H2 Impact on Electricity Generation in the Midwest Region [5010]

Mohamed Ali Saafi; *Aramco Americas, United States*

4:25pm | Coupled Inductors-Based Interleaved Boost Converters for Fuel Cell Electric Vehicles [5090]

Meryem Benzine¹, Issam Salhi², Arnaud Gaillard², Fei Gao²; ¹FEMTO-ST Institute, France; ²FEMTO-ST Institute / Université de Technologie Belfort Montbéliard, France

4:50pm | A Multiport Bidirectional Converter for Fuel Cell Range Extended Vehicles with On-Board Solar Generation [5178]

Pengfei Zheng, Jennifer Bauman; *McMaster University, Canada*

5:15pm | Evaluation of the Potential of Metal Hydride Applications in Future Hydrogen-Powered Aviation [5069]

Florian Franke, Stefan Kazula; *German Aerospace Center DLR, Germany*

Thursday, June 22 | 2:00pm – 3:40pm

OS 2 Smart/Micro Grids

Location: 140 G

SESSION CHAIRS: **Junho Hong**, *University of Michigan-Dearborn*; **Xiaofeng Yang**, *Beijing Jiaotong University*

2:00pm | Inertia Estimation of Islanded Microgrids Integrated with Power-Electronics-Interfaced DERs [5229]

Fanfu Wu¹, Yan Li¹, Liang Du²; ¹Pennsylvania State University, United States; ²Temple University, United States

2:20pm | Modeling and Control of Multi-Source Multi-Load DC Microgrids Utilizing WBG-Based Flexible DC Energy Router [5261]

Nihanth Adina¹, Zhining Zhang¹, Md. Hadiul Islam¹, Karun Potty², Peng Fu¹, Jin Wang¹; ¹Center for High-Performance Power Electronics, Ohio State University, United States; ²Lucid Motors, United States

2:40pm | Economic Dispatch of Energy Storage Systems for Smart Power Grid [5107]

Kadir Efecik, Xin Wang; *Southern Illinois University Edwardsville, United States*

3:00pm | Online Impedance Spectroscopy Characterization of PV Panels by Studying Resonant Behavior of Boost Converter [5105]

Xin Wang², Zhixue Zheng², Michel Aillierie², Alexandre De Bernardinis², Marie-Cécile Péra¹, Daniel Hissel¹; ¹FCLAB, CNRS, FEMTO-ST Institute, Université de Franche-Comté, France; ²LMOPS, Université de Lorraine & CentraleSupélec, France

3:20pm | V2G Optimization for Dispatchable Residential Load Operation and Minimal Utility Cost [5173]

Rosemary Alden², Ashutosh Timilsina², Simone Silvestri², Dan M Ionel¹; ¹SPARK Laboratory, University of Kentucky, United States; ²University of Kentucky, United States

Thursday, June 22 | 4:00pm – 5:40pm

OS 3 Fault Detection, Management, and Control

Location: 140 G

SESSION CHAIRS: **Chaitanya Kumar Ravipalli**, *Jacobi Motors LLC.*; **Kaitlyn Sitch**, *Temple University*

4:00pm | A Variable Speed Fault Detection Approach for Electric Motors in EV Applications Based on STFT and RegNet [5104]

Arta Mohammad-Alikhani², Subarni Pradhan¹, Sumedh Dhale², Babak Nahid-Mobarakeh²; ¹McMaster Automotive Resource Centre, McMaster University, Canada; ²McMaster University, Canada

4:20pm | Fault-Tolerant Six-Phase Motor Drive Topology and Control Technique for Short-Circuit Failures [5243]

Woongkul Lee¹, Bulent Sarlioglu²; ¹Michigan State University, United States; ²University of Wisconsin-Madison, United States

4:40pm | Fault Analysis for Battery Electric Drive System for Electrified Vehicles [5214]

Matilde D'Arpino², Ye Cheng¹, Harsh Bavishi², Giorgio Rizzoni²; ¹General Motors Company, United States; ²Ohio State University, United States

5:00pm | Anomaly Detection for Connected and Automated Vehicles: Accident Analysis [5031]

Mansi Girdhar², Yongsik You¹, Tai-Jin Song¹, Junho Hong²; ¹Chungbuk National University, Korea; ²University of Michigan-Dearborn, United States

5:20pm | A Distance-Based Health Indicator for RUL Prediction of Power Electronics [5099]

Qian Yang², Shailesh Joshi¹, Hiroshi Ukegawa¹, Raymond Viviano¹, Krishna R. Pattipati²; ¹Toyota Research Institute of North America, United States; ²University of Connecticut, United States

Oral Session Schedule

OS 20 Electric Vehicle On-Board Chargers

Location: 142 C

SESSION CHAIRS: Liwei Zhou, *Columbia University*;
Ali Bazzi, *University of Connecticut*

4:00pm | Performance Evaluation of a Reconfigurable On-Board Charger for Electric Vehicles with Multi-Output and Reduced Switch Count [5058]

Virendra Prasad Maurya, Priyatosh Jena, Rajeev Kumar Singh; *Indian Institute of Technology, Banaras Hindu University, India*

4:20pm | A Novel Phase Shift Control for Single-Stage Bidirectional Isolated Totem-Pole AC/DC Onboard Electric Vehicle Chargers [5166]

Jiaqi Yuan², Amirreza Poorfakhraei², Ali Emadi¹; ¹*McMaster Automotive Resource Centre, McMaster University, Canada*; ²*McMaster University, Canada*

4:40pm | A Single-Phase Single-Stage Charger for High Voltage Batteries [5247]

Utsav Sharma, Bhim Singh; *Indian Institute of Technology Delhi, India*

5:00pm | Multidevice Dual Active Half Bridge DC-DC Converter with Zero-Input-Current-Ripple for EV Onboard Chargers Application [5209]

Pedram Chavoshpour Heris, Rahul Biswash, Zahra Saadatizadeh, Alan Mantooh, David Huitink; *University of Arkansas, United States*

5:20pm | A Reduced Carrier Count Triangular Modulation for Quasi Single-Stage AC-DC Dual Active Bridge [5057]

Priyatosh Jena, Rajeev Kumar Singh; *Indian Institute of Technology, Banaras Hindu University, India*

Friday, June 23 | 8:30am – 10:10am

OS 4 Power Electronics – DC/DC Conversion

Location: 140 G

SESSION CHAIRS: Manikanta Pallantla, *Texas Instruments*;
Sreejith Chakkalakkal, *McMaster University*

8:30am | An EMI-Compliant and Automotive-Rated 48V to Point-of-Load Dickson-Based Hybrid Switched-Capacitor DC-DC Converter [5204]

Sahana Krishnan, Margaret Blackwell, Robert Pilawa-Podgurski; *University of California, Berkeley, United States*

8:50am | Expandable Isolated Bidirectional Three-Port DC-DC Converter with High Voltage Conversion Ratio for PV-Battery Systems [5203]

Zahra Saadatizadeh, Alan Mantooh; *University of Arkansas, United States*

9:10am | Energy-Storage Based Multilevel Voltage-Balancing DC-DC Converter in Urban Rail Transit [5091]

Wentao Mu, Xiaofeng Yang, Yongqi Zhu, Miao Wang, Yan Liu, Trillion Q. Zheng; *Beijing Jiaotong University, China*

9:30am | Controllability Techniques for the Multilevel Power Converter Manhattan Topology [5252]

Matthew Jahnes, Matthias Preindl; *MPLab - Columbia University, United States*

9:50am | Analysis, Design, and Comparison of Isolated DC-DC Converters for Traction Application [5270]

Adnan Farooq Khan, Soumya Shubhra Nag, Bhim Singh; *Indian Institute of Technology Delhi, India*

OS 5 Electric Motor Control

Location: 142 C

SESSION CHAIRS: Lavanya Vadamodala, *Altair Engineering*; Martin Nachtsheim, *Technische Hochschule Ingolstadt*

8:30am | Optimization-Based Gain Tuning Method of Sliding-mode-Based Flux Linkage Observer for PMSM Drives with Wide Operating Range [5136]

Xudong Wang², Wesam Taha², Sumedh Dhale², Babak Nahid-Mobarakeh², Ali Emadi¹; ¹*McMaster Automotive Resource Centre, McMaster University, Canada*; ²*McMaster University, Canada*

8:50am | Improving Anti-Slip Performance in Multi-Motor Single Inverter Based Heavy Electric Vehicle [5154]

Saurabh Singh², Naveen Kumar Endla², Abhinav Arya², Sandeep Anand², Kishore Chatterjee², Srinivas Gopalan¹, Sujay Sirur¹; ¹*Cummins Technical Center, India*; ²*Indian Institute of Technology Bombay, India*

9:10am | Complex Vector Current Regulation Strategy for a High-Speed Doubly Salient Machine with Stator PMs [5184]

Chandra Sekhar Goli³, Somasundaram Essakiappan¹, Dan M Ionel², James Gafford³, Madhav Manjrekar³; ¹*QM Power, Inc., United States*; ²*SPARK Laboratory, University of Kentucky, United States*; ³*University of North Carolina at Charlotte, United States*

9:30am | Online Identification of Induction Machine Parameter Deviations for Aging Detection - A Comparative Study Using Recursive Least Squares Algorithm and Extended Kalman Filter [5185]

Martin Nachtsheim³, Karina Grund², Christian Endisch², Ralph Kennel¹; ¹*Technical University of Munich, Germany*; ²*Technische Hochschule Ingolstadt, Germany*; ³*Technische Hochschule Ingolstadt/Technical University of Munich, Germany*

Oral Session Schedule

9:50am | Torque Sharing Strategy with Current Profiling and Integral LQR Controller for SRM Drives [5141]

Paulo Robson Melo Costa, Marcelo Vinícius de Paula, Vinícius A. de Abreu Batista, Bruna Aderbal de Oliveira, Tarcio André Dos Santos Barros; *Universidade Estadual de Campinas, Brazil*

OS 6 Battery Design and Modeling

Location: 250 A

SESSION CHAIRS: **Di Zhu**, *Ford Motor Company*;
Vivek Kumar, *Ford Motor Company*

8:30am | Generative Design and Optimization of Battery Packs with Active Immersion Cooling [5052]

Zheng Liu, Jiabin Wu, Wuchen Fu, Pouya Kabirzadeh, Sara Kohtz, Nenad Miljkovic, Yumeng Li, Pingfeng Wang; *University of Illinois Urbana-Champaign, United States*

8:50am | Reduced Operational Inhomogeneities in a Reconfigurable Parallely-Connected Battery Pack Using DQN Reinforcement Learning Technique [5278]

Alexander Stevenson, Mohd Tariq, Arif Sarwat; *Florida International University, United States*

9:10am | Joint Estimation of Open Circuit Voltage and Equivalent Circuit Model Parameters Using State-Space Model Optimization [5199]

Sneha Sundaresan², Sooraj Sunil², Krishna R. Pattipati¹, Balakumar Balasingam²; ¹*University of Connecticut, United States*; ²*University of Windsor, Canada*

9:30am | Phase Shift Control Based Active Balancing Battery Management System [5015]

Yudong Hu¹, Xuan Zhou², Allan Taylor¹; ¹*Kettering University, United States*; ²*University of Michigan–Dearborn, United States*

9:50am | Online Electrochemical Impedance Spectroscopy Estimation of Lithium-Ion Batteries Using a Deep Learning Framework [5027]

Min Jae Jung², Yi Xu², Hyun Jun Jang¹, Woo Sung Kim¹, Sang-Gug Lee²; ¹*Hyundai Motor Group, Korea*; ²*Korea Advanced Institute of Science and Technology, China*; ²*Korea Advanced Institute of Science and Technology, Korea*

OS 7 Wireless Electric Vehicle Charging

Location: 250 B

SESSION CHAIRS: **Benedikt Schmuelling**, *University of Wuppertal*; **Bo Zhang**, *Idaho National Laboratory*

8:30am | A Novel LCC-CLCC Resonant Tuning Network for Light-Load Conditions in Wireless Power Transfer Systems [5006]

Sudarshan Tejanag Harave¹, Omer Onar², Mostak Mohammad², Veda Prakash Galigekere², Gui-Jia Su¹; ¹*Oak Ridge National Laboratory, United States*; ²*Power Electronics and Electric Machinery Group, Oak Ridge National Laboratory, United States*

8:50am | Severe Temperature Impact Study on Ferrite Electromagnetic Shielding for Wireless Electric Vehicle Charging [5113]

Bo Zhang¹, Yukiyasu Yamauchi², Veda Prakash Galigekere³, Omer Onar³, Mostak Mohammad³; ¹*Idaho National Laboratory, United States*; ²*KEMET Electronics Corporation, United States*; ³*Power Electronics and Electric Machinery Group, Oak Ridge National Laboratory, United States*

9:10am | Design of Grid-Side Power Management for Bidirectional DWPT Chargers on EV Roadways [5003]

Ahmed Azad², Ujjwal Pratik¹, Reza Tavakoli², Zeljko Pantic¹; ¹*North Carolina State University, United States*; ²*Utah State University, United States*

9:30am | Optimal Power Sharing Speed Compensation in On-Road Wireless EV Charging Systems [5144]

Donovin Lewis², Omer Onar¹, Veda Prakash Galigekere¹, Mostak Mohammad¹, Dan M Ione²; ¹*Power Electronics and Electric Machinery Group, Oak Ridge National Laboratory, United States*; ²*SPARK Laboratory, University of Kentucky, United States*

9:50am | Design Considerations of DC/DC Regulator for High-Power Dynamic Wireless Charging Systems [5239]

Lingxiao Xue¹, Gui-Jia Su¹, Veda Prakash Galigekere², Omer Onar², Mostak Mohammad²; ¹*Oak Ridge National Laboratory, United States*; ²*Power Electronics and Electric Machinery Group, Oak Ridge National Laboratory, United States*

OS 8 Electrified Aircraft and Marine Vessels

Location: 250 C

SESSION CHAIRS: **Hao Huang**, *University of Houston*;
Le Chang, *General Motors*

8:30am | DC Link Voltage Control Strategy for Electric Propulsion Aircraft [5030]

Pellin Liu², Xianwu Zeng², Ravi-Kiran Surapaneni¹, Gowtham Galla¹, Ludovic Ybanez¹, Xiaoze Pei²; ¹*Airbus UpNext, France*; ²*University of Bath, United Kingdom*

8:50am | Robust and Fault-Tolerant Grounding Scheme for Distributed Electrified Aircraft Propulsion [5040]

Hao Huang², Anil Kumar Reddy Siddavatam², Kaushik Rajashekara², Di Zhang¹; ¹*Naval Postgraduate School, United States*; ²*University of Houston, United States*

9:10am | Fault-Tolerant Power-Sharing Strategy with a Novel MPPT Method for Parallel PV Converters in Electric Airplanes [5207]

Pengwei Li, Matt Silverman, Ali Bazzi; *University of Connecticut, United States*

Oral Session Schedule

9:30am | **An Adaptive and Multifunctional DC-DC Converter for Onshore Ship Charging [5114]**

Sohaib Qazi², Prasanth Venugopal², Gert Rietveld², Alan Watson¹, Patrick Wheeler¹, Thiago Batista Soeiro²;
¹University of Nottingham, United Kingdom; ²University of Twente, Netherlands

9:50am | **Efficient, Resilient Control of Hybrid Shipboard Microgrids Considering Fuel Efficiency and Battery Cycle Life [5191]**

Kaitlyn Sitch, Liang Du; *Temple University, United States*

Friday, June 23 | 10:30am – 12:10pm

OS 9 Power Electronics - Rectifiers and Inverters

Location: 140 G

SESSION CHAIRS: **Hassan Shabbir**, *Magna Powertrain Inc.*; **Naser Pour Aryan**, *SEMIKRON Elektronik GmbH*

10:30am | **Oscillation Analysis and Mitigation in a Si IGBT-Based ARCP Inverter [5076]**

Weiqiang Chen, Eddy Aeloiza, Veli-Matti Leppanen, Tero Viitanen; *ABB Inc, United States; ABB Inc, Finland*

10:50am | **Three-Phase Current Source Inverter Using Novel Monolithic SiC Bidirectional FET (BiDFET) [5079]**

Ramandeep Narwal, Subhashish Bhattacharya, Bantval Jayant Baliga, Douglas C. Hopkins; *North Carolina State University, United States*

11:10am | **Circulating Current Control Enabling Parallel Grid Tied Inverter Operation for EV Fast Charging Stations [5283]**

Youssef Fahmy, Matthias Preindl; *MPLab - Columbia University, United States*

11:30am | **Single Stage Cascaded H-Bridge Topology Based Power Electronic Traction Transformer [5269]**

Adnan Farooq Khan, Soumya Shubhra Nag, Bhim Singh; *Indian Institute of Technology Delhi, India*

11:50am | **An Innovative Method for Short Circuit Protection of a Three-Phase MOSFET Power Inverter [5024]**

Naser Pour Aryan, Bastian Vogler, Thomas Ziegler; *SEMIKRON Elektronik GmbH & Co. KG, Germany*

OS 10 Electric Motor Design

Location: 142 C

SESSION CHAIRS: **Sumeet Singh**, *EMWorks Inc.*; **Pedro da Costa Goncalves**, *McMaster University*

10:30am | **Design of a Switched Reluctance Motor for a 48 V Hybrid Electric Vehicle Propulsion Application [5051]**

Aniruddha Agrawal, Sreejith Chakkalakal, Berker Bilgin; *McMaster University, Canada*

10:50am | **Multiphysics Design and Optimization of a Rare-Earth Free, Manganese Bismuth Based, Surface Mounted Permanent Magnet Machine [5046]**

Mohendro Kumar Ghosh³, Brandon Grainger³, Scott McElhinny³, Ryan Brody³, Jun Cui¹, Andrew Sherman², Paul Ohodnicki Jr.³; ¹Iowa State University, United States; ²Powdermet, Inc., United States; ³University of Pittsburgh, United States

11:10am | **Traction Motor Design Trade-Offs with Additively Manufactured Anisotropic Bonded Magnets [5263]**

Vandana Rallabandi¹, Shajjad Chowdhury¹, Himel Barua¹, Parans Paranthaman¹, Steve Bullock¹, Mostak Mohammad², Emily Cousineau¹; ¹Oak Ridge National Laboratory, United States; ²Power Electronics and Electric Machinery Group, Oak Ridge National Laboratory, United States

11:30am | **Axial Flux Permanent Magnet Vernier Machine with Single-Wound Dual-Stator and Spoke Permanent Magnet Rotor for Electric Vehicle In-Wheel Traction [5167]**

Ali Mohammadi¹, Yaser Chulaee², Aaron Cramer², Ion Boldea³, Dan M Ionel¹; ¹SPARK Laboratory, University of Kentucky, United States; ²University of Kentucky, United States; ³University Politehnica of Timisoara, Romania

11:50am | **Structural Design Evaluation of Integrated Rotor Hub and Shaft for a High-Speed Surface Mounted Radial Flux Permanent Magnet Synchronous Motor [5251]**

Akshay Manikandan³, Mohamed Abdalmagid², Giorgio Pietrini², Mikhail Goykhman¹, Ali Emadi²; ¹Eaton Aerospace LLC., Eaton Corp, United States; ²McMaster Automotive Resource Centre, McMaster University, Canada; ³McMaster University, Canada

OS 11 Battery State of Charge Estimation

Location: 250 A

Vivek Kumar, *Ford Motor Company*; **Carlos Vidal**, *McMaster University*

10:30am | **Electric Vehicle's Range and State of Charge Estimations Using AutoML [5267]**

Kyler Witvoet², Sara Saad², Carlos Vidal², Ryan Ahmed², Ali Emadi¹; ¹McMaster Automotive Resource Centre, McMaster University, Canada; ²McMaster University, Canada

10:50am | **Inverse Characterization of Open-Circuit Voltage for State-of-Charge Estimation of Batteries [5201]**

Sooraj Sunil, Sneha Sundaresan, Prarthana Pillai, Balakumar Balasingam; *University of Windsor, Canada*

Oral Session Schedule

11:10am | **Orthogonal Autoencoders for Long-Term State-of-Charge Forecasting of Li-Ion Battery Cells** [5222]

Wael Hassanieh, Mayuresh Savargaonkar, Abdallah Chehade; *University of Michigan–Dearborn, United States*

11:30am | **Generating Realistic Data for Developing Artificial Neural Network Based SOC Estimators for Electric Vehicles** [5150]

Alexis Kalk², Oleg Birkholz¹, Jiaming Zhang², Christian Kupper², Marc Hiller²; ¹*APL Automobil-Prüftechnik Landau GmbH, Germany*; ²*Karlsruhe Institute of Technology, Germany*

11:50am | **Active Balancing of Reconfigurable Batteries Using Reinforcement Learning Algorithms** [5237]

Bowen Jiang, Junfei Tang, Yujing Liu, Luca Boscaglia; *Chalmers University of Technology, Sweden*

OS 12 Electric Vehicle Fast Charging

Location: 250 B

SESSION CHAIRS: **Binesh Kumar**, *Atom Power Inc.*; **Mohammad Alam**, *General Motors*

10:30am | **A Robust System Monitoring and Control for Battery Energy Storage Systems in Electric Vehicle Charging** [5004]

Yukun Lou², Alireza Ramyar², Xiaofan Cui¹, Jason Siegel², Anna Stefanopoulou², Al-Thaddeus Avestruz²; ¹*Stanford University, United States*; ²*University of Michigan, United States*

10:50am | **An EV Integrated Bidirectional DC Fast Charger Based on a Dual Wound Synchronous Machine** [5096]

Sukhjot Singh, Peter W Lehn; *University of Toronto, Canada*

11:10am | **A Solid-State Transformer with an AC Link for Multi-Port Fast Charging of Electric Vehicles** [5055]

Mohammed Mosaddique Nawaz Hussain, Kimihisha Furukawa, Yuichi Mabuchi, Abhijit Choudhury; *Hitachi Limited, Japan*

11:30am | **Transformer Design for Solid-State Transformer (SST)-Based EV Charging Station Applications** [5224]

Eslam Abdelhamid Younis, Omar Zayed, Ahmed Elezab, Mohamed Ibrahim, Mehdi Narimani; *McMaster University, Canada*

11:50am | **Directional Current Selectivity in a MW-Level Solid-State Switchgear for DC Fast Charging Infrastructure** [5098]

Chunmeng Xu, Govind Chavan, Abhinav Patni, Steven Englebretson, Pietro Cairoli; *ABB Inc, United States*

OS 13 Heavy Duty Electrified Vehicles

Location: 250 C

SESSION CHAIRS: **Fnu Nishanth**, *University of Wisconsin-Madison*; **Conor Healy**, *University College Cork*

10:30am | **Optimal Battery Size and Charging Power Level Design for Off-Road Construction Equipment Considering Battery Weight and Real-World Activity Constraints** [5118]

Fuad Un-Noor, George Scora, Kanok Boriboonsomsin; *CE-CERT, University of California, Riverside, United States*

10:50am | **Design of a Modular E-Axle for All-Terrain Heavy-Duty Applications Considering Gradient Weight Transfer** [5161]

Conor Healy, John Hayes; *University College Cork, Ireland*

11:10am | **Permanent Magnet Synchronous Motor Drive Control for Hybrid Construction Machinery – Revisited** [5211]

Thiago M. Parreiras², Dener A. de Lisboa Brandão³, Mariana de F. Ramos³, Thales A. C. Maia³, Tomás P. Corrêa³, Igor A. Pires³, Anderson Nascimento¹, Braz Cardoso³; ¹*CNH Industrial Brasil, Brazil*; ²*Institute of Technological Sciences, Universidade Federal de Itajubá, Brazil*; ³*Universidade Federal de Minas Gerais, Brazil*

11:30am | **Design Considerations for Electric Traction Power Systems** [5102]

Anindita Golder, Jigyesh Sharma, Kushan Tharuka, Tarlochan Sidhu, Sheldon Williamson; *Ontario Tech University, Canada*

11:50am | **The Impacts of Battery Capacity Degradation on Optimizing BEBs Transit System Configuration** [5044]

Ali Shehabeldeen, Ahmed Foda, Moataz Mohamed; *McMaster University, Canada*

Friday, June 23 | 1:40pm – 3:20pm

OS 14 Thermal Management

Location: 140 G

SESSION CHAIRS: **Srihari Gangaraj**, *Brunswick Corporation*; **Omkar Champhekar**, *Ansys Inc.*

1:40pm | **Heating-Cooperative Charging of Lithium-Ion Batteries at Low Temperatures** [5060]

Xiangfeng Meng², Xin Xu¹, Zhongbao Wei¹; ¹*Beijing Institute of Technology, China*; ²*Contemporary Amperex Technology Co., China*

2:00pm | **Optimal Design of Pin-Fin Heatsinks for SiC Power Modules Based on Analytical Thermal Modeling and TLBO Algorithm** [5094]

Linke Zhou², Mohamed Hefny², Yuhang Yang², Di Wang², Samantha Jones-Jackson², Giorgio Pietrini¹, Ali Emadi¹; ¹*McMaster Automotive Resource Centre, McMaster University, Canada*; ²*McMaster University, Canada*

Oral Session Schedule

2:20pm | Experimental Investigation on Modular Phase Change Material (PCM) Thermal Management Structure for Cylindrical Battery Cells [5039]

Foo Shen Hwang¹, Colin Reidy², Dorel Picovici¹, Dean Callaghan¹, David Culliton¹, Cathal Nolan¹, Thomas Confrey¹; ¹South Eastern Technological University Carlow, Ireland; ²South Eastern Technological University Waterford, Ireland

2:40pm | Preliminary Design of Air and Thermal Management of a Nacelle-Integrated Fuel Cell System for an Electric Regional Aircraft [5073]

Chetan Kumar Sain, Jeffrey Hänsel, Stefan Kazula; German Aerospace Center DLR, Germany

Cooling System Design of a High-Speed Radial-Flux Permanent Magnet Machine for Aerospace Propulsion Applications [5168]

Dikhsita Choudhary³, Samantha Jones-Jackson³, Mohamed Abdalmagid², Giorgio Pietrini², Mikhail Goykhman¹, Ali Emadi²; ¹Eaton Aerospace LLC., Eaton Corp, United States; ²McMaster Automotive Resource Centre, McMaster University, Canada; ³McMaster University, Canada

OS 15 Connected and Autonomous Vehicles

Location: 141

SESSION CHAIRS: **Elliot Yixin Huangfu**, McMaster University; **Quan Zhou**, University of Birmingham

1:40pm | Highway Charging Infrastructure Costs Reduction for Limited-Range Electric Vehicles with Real-Time Communication [5081]

Anastasia Popiolek¹, Philippe Dessante¹, Zlatina Dimitrova², Marc Petit¹, Mouhcine Waraq²; ¹GeePs, CNRS, CentraleSupélec, Université Paris-Saclay, Sorbonne Université, France; ²Stellantis N.V., Morocco; ²Stellantis N.V., France

2:00pm | Object Perception Framework for Connected and Automated Vehicles: A Case Study [5195]

Zhengwei Bai², Jacqueline Garrido Escobar¹, Guoyuan Wu², Matthew Barth¹; ¹CE-CERT, University of California, Riverside, United States; ²University of California, Riverside, United States

2:20pm | Uncertainty Characterization for 3D Object Detection Algorithms [5020]

Bao Ming Ding, Yixin Huangfu, Saeid Habibi; McMaster University, Canada

2:40pm | Assessing the Suitability of Different Machine Learning Approaches for Smart Traffic Mobility [5218]

Mostafa Zaman², Sujay Saha¹, Sherif Abdelwahed²; ¹University of Dhaka, Bangladesh; ²Virginia Commonwealth University, United States

3:00pm | Short-Range and Long-Range Obstacle Detection Method for a Delivery Robot Based on Multi-Sensor Fusion [5177]

Sabir Hossain, Xianke Lin; Ontario Tech University, Canada

OS 16 Rapid Prototyping and Real-Time Simulation

Location: 142 C

SESSION CHAIRS: **Henrik Schmidt**, Auto Mobil Forschung Dresden GmbH; **Fei Gao**, University of Technology of Belfort-Montbeliard

1:40pm | Stray Current and Rail Potential Dynamic Emulator for Urban Rail Transit System [5092]

Huanxu Shao, Xiaofeng Yang, Yanfang He, Trillion Q. Zheng; Beijing Jiaotong University, China

2:00pm | An Artificial Intelligence Approach for Virtual Prototyping of Functional Situational Awareness Systems for Hybrid Military Vehicles [5139]

Deborah George, Ganesh K Venayagamoorthy; Real-Time Power and Intelligent Systems Laboratory, Clemson University, United States

2:20pm | Automated Controller Hardware-in-the-Loop Testbed for EV Charger Resilience Analysis [5175]

Michael Starke, Namwon Kim, Benjamin Dean, Steven Campbell, Madhu Chinthavali; Oak Ridge National Laboratory, United States

2:40pm | Rapid Prototyping of G2V/V2G DWPT Charge-Control and Grid-Side Power Management for EV Applications [5002]

Ahmed Azad², Reza Tavakoli², Ujjwal Pratik¹, Zeljko Pantic¹; ¹North Carolina State University, United States; ²Utah State University, United States

3:00pm | Experimental Analysis of Powertrain Test Bed Dynamometers for Black Box-Based Digital Twin Generation [5034]

Henrik Schmidt, Günther Prokop; Technische Universität Dresden, Germany

OS 17 Battery State of Health and Aging

Location: 250 A

SESSION CHAIRS: **Akash Samanta**, Ontario Tech University; **Di Zhu**, Ford Motor Company

1:40pm | A Convolutional Neural Network for Estimation of Lithium-Ion Battery State-of-Health During Constant Current Operation [5276]

Junran Chen¹, Manjula Manivanan¹, Josimar Duque¹, Phillip J. Kollmeyer¹, Satyam Panchal², Oliver Gross², Ali Emadi¹; ¹McMaster Automotive Resource Centre, McMaster University, Canada; ²Stellantis N.V., United States

Oral Session Schedule

2:00pm | Lithium Iron Phosphate State of Charge Estimation, Cycle Life and Capacity Fading [5116]

Manraj Singh Ladhar, Sheldon Williamson; *Ontario Tech University, Canada*

2:20pm | A Hybrid Approach Based on Gaussian Process Regression and LSTM for Remaining Useful Life Prediction of Lithium-Ion Batteries [5053]

Xiaoyu Guo¹, Zikang Yang¹, Yujia Liu¹, Zhendu Fang², Zhongbao Wei²; ¹Beijing HE Energy Storage Technology Co. Ltd, China; ²Beijing Institute of Technology, China

2:40pm | Investigating the Applicability of Electrochemical Impedance Spectroscopy for Parallel-Connected Lithium-Ion Battery Modules [5152]

Wenlin Zhang, Ryan Ahmed, Saeid Habibi; *McMaster University, Canada*

3:00pm | Online Determination of Lithium-Ion Battery State of Health Based on Normalized Change of State of Temperature for e-Mobility Applications [5206]

Alvin Huynh, Akash Samanta, Chandan Chetri, Sheldon Williamson; *Ontario Tech University, Canada*

OS 18 Grid Impacts of Electric Vehicle Charging

Location: 250 B

SESSION CHAIRS: **Hanan Habbi**, *Oakland University*; **Jennifer Bauman**, *McMaster University*

1:40pm | Performance and Implementation Requirements for Residential EV Smart Charge Management Strategies [5123]

Manoj Kumar Cebol Sundarajan¹, Jesse Bennett², Don Scoffield¹, Kalpesh Chaudhari², Andrew Meintz², Timothy Pennington¹, Bo Zhang¹; ¹Idaho National Laboratory, United States; ²National Renewable Energy Laboratory, United States

2:00pm | An Optimal Methodology for Mitigating the Impacts of EVs and Solar Systems on the Grid by Utilizing Existing Residential Battery Storage Capacity with No Further Grid Upgrades [5200]

Rafi Zahedi², Amirhossein Ahmadian², Kourosh SedghiSigarchi¹, Rajit Gadh²; ¹California State University, Northridge, United States; ²University of California, Los Angeles, United States

2:20pm | Frequency Regulation Reserves Provision in EV Smart-Charging [5035]

Nikolaos Damianakis, Yunhe Yu, Gautham Ram Chandra Mouli, Pavol Bauer; *Delft University of Technology, Netherlands*

2:40pm | EV Charging Site Day-Ahead Load Prediction in a Synthetic Environment for RL Based Grid-Informed Charging [5043]

Harish Suryanarayana, Alex Brissette; *ABB Inc, United States*

3:00pm | Design and Demonstration of a Smart Charging System for Plug-In Electric Vehicles [5194]

Kartik Sastry, Shashank Holla, Shreyas Tater, Eric Gustafson, David Taylor, Michael Leamy; *Georgia Institute of Technology, United States*

OS 19 EMI and Partial Discharge Considerations

Location: 250 C

SESSION CHAIRS: **Gian Carlo Montanari**, *Florida State University*; **Matt Woongkul Lee**, *Michigan State University*

1:40pm | An Accelerated Testing Procedure to Evaluate and Compare the Resistance to Partial Discharges of Insulating Materials for Electrified Transportation Assets [5012]

Gian Carlo Montanari², Skyler Schwartz³, Debasish Nath¹, Robert Cuzner³; ¹Center for Advanced Power Systems, Florida State University, United States; ²Florida State University, United States; ³University of Wisconsin-Milwaukee, United States

2:00pm | Network Common Mode EMI Attenuation Using Bandwidth Indexing [5089]

Dinh Le, Ashik Amin, Seungdeog Choi; *Mississippi State University, United States*

2:20pm | Experimental Study of Magnetic Field Effect on Multi-Rotor Drones Operation in Autonomous Power Line Inspection [5029]

Shervin Salehi Rad¹, Reza Kheirollahi¹, Shuyan Zhao¹, Amr Mostafa¹, Zilong Zheng¹, Yao Wang¹, Hua Zhang², Gary Friedman¹, Fei Lu¹; ¹Drexel University, United States; ²Rowan University, United States

2:40pm | Multi-Physics Reliability Modeling of High-Frequency Electromagnetic Transformers in Solid-State Transformer Systems [5253]

Reza Ilka, Jiangbiao He; *University of Kentucky, United States*

3:00pm | A Comprehensive Review of Partial Discharge Modeling and Measurement in WBG-Based AC Machine Drives [5262]

Kangbeen Lee², Mostafa Fereydoonian², Saleh Sanjari Nia¹, Woongkul Lee²; ¹Borgwarner Inc., United States; ²Michigan State University, United States

Poster Session 1

Wednesday, June 21 | 12:00pm – 2:00pm | Location: Expo Hall E

SESSION CHAIRS: Zhixue Zheng, *University of Lorraine*; Atriya Biswas, *McMaster University*

5110 | Investigation of a Kelvin-Source Connected SMD Silicon MOSFET and its Application in a High Current Full Bridge Synchronous Rectifier

Kyle Kozielski², Guvanathi Abeysinghe Mudiyansele², Rachit Pradhan², Giorgio Pietrini², Ashish Solanki¹, Parthasarathy Nayak¹, Mehdi Narimani², Ali Emadi²;
¹Eaton Research Labs, *United States*; ²McMaster University, *Canada*

5169 | Model-Based Design Methodology for Inductor-Based Equalization Circuits for Lithium-Ion Battery Packs

Emanuele Di Fazio², Francesco Porpora², Matilde D'Arpino¹, Mauro Di Monaco², Giuseppe Tomasso²; ¹The Ohio State University, *United States*; ²University of Cassino and Southern Lazio, *Italy*

5171 | Physical Design Considerations for 3-L Neutral-Point Clamped DC-DC Converters Using Discrete SiC MOSFETs

Shreyas Shah, Rachit Pradhan, Ali Emadi; *McMaster Automotive Research Centre (MARC), McMaster University, Canada*

5087 | Dual Phase Shift Control for Isolated Resonant Switched Capacitor

Yan Liu¹, Xiaofeng Yang¹, Haixia Tan¹, Yantao Wang¹, Trillion Q Zheng¹, Seiki Igarashi²; ¹Beijing Jiaotong University, *China*; ²Fuji Electric Co., Ltd., *Japan*

5157 | Electro-Thermal Models of Power Modules for Stochastic Optimization of Inverters

Hannes Byden², Eric Bourniche¹, Arnaud Leblay¹, Gabriel Domingues², Mats Alak¹; ¹BorgWarner, *Luxembourg*; ²Lund University, *Sweden*

5071 | Standardization of Core and Component Characterization at the Advanced Magnetics for Power and Energy Development Laboratory

Chris Bracken³, Richard Beddingfield², Mark Juds³, Bharadwaj Reddy Andapally¹, Brandon Grainger³, Paul Ohodnicki³; ¹CBMM, *United States*; ²North Carolina State University, *United States*; ³University of Pittsburgh, *United States*

5137 | Systematic Design Approach for Airgap-Less Hybrid Integrated Coupled Inductor for Interleaved Paralleled Inverters Using Finite Element Analysis

Mostafa Abarzadeh², Hamidreza Mosaddegh¹, Mojtaba Ayaz Khoshhava¹, Mohammadbabaie¹, Simon Caron², Kamal Al-Haddad¹; ¹École de Technologie Supérieure, *Canada*; ²SmartD Technologies Inc., *Canada*

5140 | Modeling and Control Optimization of a Three-Port Resonant Converter Using Space Mapping Optimization

Guvanathi Abeysinghe Mudiyansele, Niloufar Keshmiri, Mohamed Bakr, Ali Emadi; *McMaster University, Canada*

5146 | An Insight Into the Dynamics of a Dual Active Bridge

Ezekiel Arogunjo, Joseph Ojo; *Tennessee Tech University, United States*

5127 | Hybrid Neural Sliding Mode Observer for Sensorless Speed Control of Induction Motor

Mohammad Babaie¹, Mojtaba Ayaz Khoshhava¹, Mostafa Abarzadeh², Hamidreza Mosaddegh¹, Simon Caron², Kamal Al-Haddad¹; ¹École de Technologie Supérieure, *Canada*; ²SmartD Technologies Inc., *Canada*

5138 | A Universal Robust Algorithm for Parameters Estimation of Induction Machines at Standstill Operation in Variable Frequency Drives

Mojtaba Ayaz Khoshhava¹, Mostafa Abarzadeh², Hamidreza Mosaddegh¹, Mohammadbabaie¹, Simon Caron², Kamal Al-Haddad¹; ¹École de Technologie Supérieure, *Canada*; ²SmartD Technologies Inc., *Canada*

5143 | Data-Based Model-Free Current Control of a PMSM Using Full-Form Dynamical Linearization Technique

Masoumeh Ahrabi, Subarni Pradhan, Sumedh Dhale, Babak Nahid Mobarakeh; *McMaster University, Canada*

5026 | Irreversible Demagnetization Reduced Order Modeling in MnBi Interior Permanent Magnet Synchronous Motor Multi-Objective Optimization

Ryan Brody, Paul Ohodnicki, Brandon Grainger; *University of Pittsburgh, United States*

5041 | Position Control of SRM for Agricultural Implements Electrification

Marcelo Vinicius de Paula³, Paulo Robson Melo Costa², Angel Pontin Garcia¹, Tarcio André Dos Santos Barros²; ¹Faculty of Agricultural Engineering UNICAMP, *Brazil*; ²Faculty of Electrical Engineering UNICAMP, *Brazil*; ³Faculty of Mechanical Engineering UNICAMP, *Brazil*

5119 | Multiobjective Grey Wolf Optimization of Firing Angles for SRM Drives

Vinicius Augusto de Abreu Batista, Marcelo Vinicius de Paula, Paulo Robson Melo Costa, Bruna Aderbal de Oliveira, Tarcio Andre Dos Santos Barros; *UNICAMP, Brazil*

5142 | Field Analysis Based Open-Phase Fault Modeling and Postfault Torque Control for a Triple Three-Phase Synchronous Reluctance Motor

Musayyibi Shuaibu, Olorunfemi Ojo; *Tennessee Tech University, United States*

Poster Session 1

5165 | Optimization of an Electric Vehicle Traction Motor with a PM Flux Intensifying Stator and a Reluctance Outer Rotor

Oluwaseun Badewa², Ali Mohammadi², Donovin Lewis², Dan Ionel², Somasundaram Essakiappan¹, Madhav Manjrekar¹; ¹QM Power, Inc., Kansas City, MO, United States; ²SPARK Laboratory, ECE Department, University of Kentucky, Lexington, KY, United States

5115 | Optimization of Powertrain Platform for Electric Passenger Vehicles

Meng Lu², Gabriel Domingues-Olavarria², Hannes Bydén², Mateski Aleksandar¹, Mats Alaküla²; ¹Borgwarner, United States; ²Lund University/IEA, Sweden

5153 | EcoCAR Mobility Challenge Electrified Powertrain System, Design, and Integration

Adam Gleeson², Alex Allca-Pekarovic¹, Niloufar Keshmiri², Ali Emadi²; ¹McMaster University, Canada; ²McMaster University EcoCAR, Canada

5062 | Multi-Feature Extraction and Fusion-Based State of Health Estimation of Large-Format Lithium-Ion Batteries Under Uncertain Aging Mode

Yujia Liu¹, Hao Yu¹, Xiaoyu Guo¹, Qinghua Li², Zhongbao Wei²; ¹Beijing HE Energy Storage Technology Co. Ltd, China; ²School of Mechanical Engineering, Beijing Institute of Technology, China

5061 | Robust Control of Interleaved Boost Converter for Fuel Cell Systems

Congcong Wang, Rui Ma, Jian Song, Hailong Sun, Zhi Feng, Xiaoyue Chai; Northwestern Polytechnical University, China

5067 | Thermal Management of Water-Cooled PEM Fuel Cell System with DDPG-FLC Strategy

Ruoyang Song, Zhongbao Wei; School of Mechanical Engineering, Beijing Institute of Technology, China

5100 | Hardware-in-Loop Experimental Verifications for Hourly Dispatching Solar PV Power with Battery Energy Storage

Md Shohel Rana², Pranoy Roy¹; ¹Eaton Corporation, United States; ²Technical Solution Center, Allied Electronics & Automation, United States

5077 | Light-Commercial Electric Vehicle Design and Total Cost of Ownership Assessment for South America Region

Daniel G Barroso, Lucas Bruck, Ali Emadi; McMaster Automotive Res Centre (MARC), Canada

5047 | Real-Time Mixed-Integer Energy Management Strategy for Multi-Motor Electric Vehicles

Anand Ganesan¹, Nikolce Murgovski¹, Derong Yang³, Sebastien Gros²; ¹Chalmers University of Technology, Sweden; ²Norwegian University of Science and Technology, Norway; ³Volvo Car Corporation, Sweden

5066 | Distributed Hybrid DL Cyber-Attacks Detection Using Data Parallelism in Cloud-Dew Computing

Mohamed Moussa, Lubna Alazzawi; Wayne State University, United States

5160 | Perception Stack Design for the EcoCAR Electric Vehicle Challenge

Arthur Faron, Samuel Khzym, Jeffin Mappanath James, Niloufar Keshmiri, Ali Emadi; McMaster University, Canada

5170 | A Comparison of Fixed and Dynamic Regenerative Braking Low-Speed Boundary on Eco-driving of Autonomous Electric Vehicles

Masoud Mohammadi³, Poria Fajri³, Farshad Harirchi¹, Reza Sabzehgar²; ¹Amazon Web Services, United States; ²San Diego State University, United States; ³University of Nevada, Reno, United States

5050 | A CUSUM-Based Condition Monitoring Algorithm for Power Electronics Based on SOM-MQE Feature Extraction Method

Qian Yang², Krishna R. Pattipati², Shailesh Joshi¹, Hiroshi Ukegawa¹, Raymond Viviano¹; ¹Toyota Research Institute of North America, United States; ²University of Connecticut, United States

5133 | Impact of Phase Displacement among Coupled Inverters on Harmonic Distortion in MicroGrids

Rasul Hemmati², Reza Saeed Kandezy², Masoud Safarishaal², Mahshid Zoghi², John Jiang², Di Wu¹; ¹North Dakota State University, United States; ²University of Oklahoma, United States

5014 | Modelling and Simulation of a fully Electrified Urban Private Transport - a case Study for Berlin, Germany

Florian Straub, Dietmar Göhlich; Technische Universität Berlin, Germany

5121 | Modeling and Classification of EV Charging Profiles Utilizing Topological Data Analysis

Zhenyu Zhao, Yuzhou Chen, Liang Du; Temple University, United States

5036 | Electromobility Impact on the Power Grid - Base Case for Probabilistic Modelling

Alice Jansson, Olof Samuelsson, Francisco Márquez-Fernández; Lund University, Sweden

5148 | Intelligent Multi-Vehicle DC/DC Charging Using an Active Response Management

Michele Weisbach, Heiko Fechtner, Utz Spaeth, Alexander Popp, Benedikt Schmuelling; University of Wuppertal, Germany

5112 | Home-Base Charging Load Profiles of Battery Electric Trucks Considering Tour Completion and Time-of-Use Rates

Jacqueline Garrido², Emmanuel Hidalgo², Matthew Barth², Kanok Boriboonsomsin¹; ¹College of Engineering - Center for Environmental Research and Technology, United States; ²University of California Riverside, United States

Poster Session 1

5075 | Performance Evaluation of a Dual Wound Generator for Naval Power System Applications

Timothy Donnelly, Lee Rashkin, Marvin Cook; *Sandia National Laboratories, United States*

5021 | A DC SSCB Based on Natural Commutation in High Power Thyristors

Reza Kheirollahi¹, Shuyan Zhao¹, Zilong Zheng¹, Hua Zhang², Fei Lu¹; ¹*Drexel University, United States*; ²*Rowan University, United States*

5007 | Efficiency and Output Power Sensitivity to Control Parameter Variations in an LCC-Series Wireless Power Transfer System

Sudarshan Tejanag Harave, Omer Onar, Mostak Mohammad, Veda Prakash Galigekeere, Gui-Jia Su; *Oak Ridge National Laboratory, United States*

Virtual in Poster Session 1

5159 | Utilizing Supercapacitors As a Primary Power Source for Electric Vehicle Motors During Urban Driving Cycles

Hazem Sharf, Eiman Elghanam, Mohamed Hassan, Ahmed Osman; *American University of Sharjah, U.A.E.*

5054 | Incremental State-of-Charge Determination of a Lithium-Ion Battery Based on Capacity Update Using Particle Filtering Framework

Shreyansh Chouhan, Arijit Guha; *National Institute of Technology Rourkela, India*

5064 | Fuel Consumption Analysis Tool Based on Hybrid Electric Vehicle Models

Eneko Otaola, Beñat Arteta, Joshué Pérez, Andres Sierra-Gonzalez, Pablo Prieto; *TECNALIA, Basque Research and Technology Alliance (BRTA), Spain*

5018 | Adaptive Finite-Time Control for Electromechanical Servo System with Mismatched Uncertainties

Rongchao Niu, Fulun Peng, Zhibing Ru, Hongguang Li, Chuangfei Bai; *Xi'an Institute of Applied Optics, China*

Poster Session 2

Thursday, June 22 | 12:00pm – 2:00pm | Location: Expo Hall E

SESSION CHAIRS: **Babak Nahid-Mobarakeh**, *McMaster University*; **Yasaman Masoudi**, *Stellantis*

5212 | A New Flexible Modified Impedance Network Converter

Shirin Besati, Somasundaram Essakia, Madhav Manjrekar; *University of North Carolina at Charlotte, United States*

5179 | A Space Vector Modulation-Based Sinusoidal Current Control Strategy for Three-Phase Dual Active Bridge Converters

Cun Wang, Jennifer Bauman; *McMaster University, Canada*

5280 | Reconfigurable Software-Defined Power Converters for Multiple Grid Interfaces

Matthew Jahnes, Matthias Preindl; *Columbia University, United States*

5183 | Multi-Objective Optimized Computational Neural Network for Performance Enhancement in Non-Sinusoidal PMSM Drives

Eduardo Silva, Lucas Rocha, Paulo Silva, Mozer Lorenzo, Rodrigo Vieira; *Universidade Federal de Santa Maria, Brazil*

5189 | An Improved Fast Transient Flux Weakening Control for Interior Permanent Magnet Synchronous Machine Drives at High-Speed Region

Yuhao Wang, Babak Nahid-Mobarakeh, Wesam Taha; *McMaster University, Canada*

5193 | Efficiency Evaluation of 800V Electric Vehicle Powertrain Using Two-Level Voltage Source Inverter with Different Modulation Techniques

Aathira Karuvaril Vijayan, Sreejith Chakkalakkal, Ali Emadi; *McMaster University, Canada*

5232 | Energy-Efficient IPMSM Drive Control for Electric Vehicles in Urban Driving Conditions

Samiksha Rawat, Krishna Raj R; *IIT Delhi, India*

5275 | Flatness-Based Trajectory Planning/ Replanning for a Permanent Magnet Synchronous Machine Control

Milad Akrami², Ehsan Jamshidpour¹, Serge Pierfederici³, Vincent Frick²; ¹*GREEN Laboratory, University of Lorraine, France*; ²*ICube Laboratory, University of Strasbourg/CNRS, France*; ³*LEMTA Laboratory, Université de Lorraine, France*

5225 | Thermal Evaluation of Stator Liner and Winding Insulation in Power Traction Motors

Hasnain Nisar, Arshiah Mirza, Ali Bazzi; *University of Connecticut, United States*

Poster Session 2

5242 | Investigating the Effects of PWM Currents on a High-Speed PMSM for an Aerospace Application

Srikanth Pillai², Alexander Forsyth², Mohamed Abdalmagid², Giorgio Pietrini², Mikhail Goykhman¹, Ali Emadi²; ¹Eaton Aerospace LLC, Eaton Corp, United States; ²McMaster University, Canada

5234 | Optimization of PV Interconnections for a Solar-Charged Electric Vehicle to Maximize On-Board Solar Generation

Hosnee Mobarak, Jennifer Bauman; McMaster University, Canada

5259 | A Vertically Stacked Bus-Bar Design Approach for Equal Power Loop Inductance in Three-Phase Voltage Source Inverter

Kaushik Mirdoddi, Soumya Shubhra Nag; Indian Institute of Technology, Delhi, India

5266 | Multiphysics Thermo-Structural Design of the Rotor in High-Speed Permanent Magnet Machines for Aerospace Propulsion Applications

Islam Zaher², Akshay Manikandan², Mohamed Abdelmagid², Giorgio Pietrini², Mikhail Goykhman¹, Ali Emadi²; ¹Eaton Corporation, United States; ²McMaster University, Canada

5186 | A Multi-Objective, Machine-Learning-Based Optimization Method and its Application to a Power Card Package Design

Christian Molina-Mangual, Emanuel Torres-Surillo, Ryan Wong, Vanessa Smet; Georgia Institute of Technology, United States

5180 | Characterization of Li-Ion Batteries Under Low Pressure for Electric Air Mobility

Faissal El Idrissi, Emanuele Gravante, Prashanth Ramesh, Matilde D'Arpino; The Ohio State University, United States

5182 | Impact of Battery Pack Power Limits on Vehicle Performance

Matilde D'Arpino, Nabin Regmi, Pranay Ketineni; Ohio State University, United States

5201 | Inverse Characterization of Open-Circuit Voltage for State-of-Charge Estimation of Batteries

Sooraj Sunil, Sneha Sundaresan, Prarthana Pillai, Balakumar Balasingam; University of Windsor, Canada

5265 | A Comprehensive Comparison for Battery Cathode Leaching Processes

Zheng Liu², Jarom Sederholm², Kai-Wei Lan², Marta Hatzell¹, Nicola Perry², Nenad Miljkovic², Paul Braun², Yumeng Li², Pingfeng Wang²; ¹Georgia Institute of Technology, United States; ²University of Illinois Urbana-Champaign, United States

5172 | State of Charge Estimation of Lithium-Ion Batteries: Comparison of GRU, LSTM, and Temporal Convolutional Deep Neural Networks

Phillip Kollmeyer, Ali Emadi; McMaster Automotive Resource Centre, Canada

5219 | Performance Comparison of Open-Circuit Voltage Modelling of Li-Ion Batteries at Different C-Rates

Prarthana Pillai, James Nguyen, Balakumar Balasingam; University of Windsor, Canada

5274 | Comparison of Feedforward and NARX Neural Networks for Lithium-Ion Battery State of Charge

Romulo Navega Vieira, Mina Naguib, Phillip J. Kollmeyer, Ali Emadi; McMaster University, Canada

5238 | Lithium-Ion Battery State-of-Health Estimation via Histogram Data, Principal Component Analysis, and Machine Learning

Junran Chen¹, Phillip Kollmeyer¹, Fei Chiang², Ali Emadi¹; ¹McMaster Automotive Resource Centre, Canada; ²McMaster University, Canada

5241 | Frictionless Travel Using Public Transportation: CICO Solution Integrated with Journey Reconstruction

Maryam Alizadeh, Hanna Haponenko, Paniz Eilkhani, Nafise Ghorbankhani, Mohamed Elsayed, Carlos Vidal, Ali Emadi; McMaster University, Canada

5215 | Deep Learning Approaches for Vehicle and Pedestrian Detection in Adverse Weather

Mostafa Zaman³, Sujay Saha², Nasibeh Zohrabi¹, Sherif Abdelwahed³; ¹Pennsylvania State University, United States; ²University of Dhaka, Bangladesh; ³Virginia Commonwealth University, United States

5246 | Transient Stability Assessment of Islanded Microgrids Through Quantum Computing

Yan Li¹, Liang Du²; ¹Penn State University, United States; ²Temple University, United States

5190 | Power-based Control for Microgrids and Extreme Fast Charging Stations with Low-Harmonic Current Content in the Medium Voltage Power Grid

Dener Brandao³, Thiago Parreiras⁴, João Callegari³, Igor Pires², Danilo Brandao¹, Braz Cardoso Filho¹; ¹Department of Electrical Engineering, Universidade Federal de Minas Gerais, Brazil; ²Department of Electronic Engineering, Universidade Federal de Minas Gerais, Brazil; ³Graduate Program in Electrical Engineering, Universidade Federal de Minas Gerais, Brazil; ⁴Institute of Technological Sciences, Universidade Federal de Itajubá, Brazil

5174 | Increasing the Braking Energy Recuperation in Electric Transportation Grids Without Storage

Ibrahim Diab, Gautham Ram Chandra Mouli, Pavol Bauer; Delft University of Technology, Netherlands

5258 | Coordinated Centralized Control Scheme for Voltage Regulation of Bus Voltages Using PV Sources

Atif Iqbal³, Sheetal Kunal Deshmukh³, Shirazul Islam³, Irfan Khan⁴, Mousa Marzband², Abdullah Al-Wahedi¹; ¹Kahramaa, Qatar; ²Northumbria University, United Kingdom; ³Qatar University, Qatar; ⁴Texas A&M University, United States

Poster Session 2

5181 | Machine Learning-Based Mesoscopic Energy Consumption Models for Heavy-Duty Battery Electric Trucks

Emmanuel Hidalgo Gonzalez, Jacqueline Garrido, Matthew Barth, Kanok Boriboonsomsin; *UCR, United States*

5245 | Design and Optimization of a Fast-Switching Electromagnetic Valve Actuator for Off-Highway Vehicle Hydraulic Systems

Parth Purohit², Fnu Nishanth², Pia Strampp², Arpan Chatterjee¹, Perry Li¹, Eric Severson²; ¹*University of Minnesota, United States*; ²*University of Wisconsin-Madison, United States*

5249 | Development and Testing of 10kV/60Hz Modular Transformer to Study Strong Electric Field Impacts on Drones in Power Line Inspection Applications

Shervin Salehi Rad¹, Reza Kheirollahi¹, Amr Mostafa¹, Zilong Zheng¹, Shuyan Zhao¹, Yao Wang¹, Hua Zhang², Gary Friedman¹, Fei Lu¹; ¹*Drexel University, United States*; ²*Rowan University, United States*

5207 | Fault-Tolerant Power-Sharing Strategy Parallel PV Converters for Electric Airplanes

Pengwei Li, Matt Silverman, Ali Bazzi; *University of Connecticut, United States*

5188 | Disjoint Multipath Routing for Naval SCADA Systems by Utilizing RYU SDN Controller

Andrew Smith¹, Ryan Delany¹, Yan Li¹, Liang Du²; ¹*Penn State University, United States*; ²*Temple University, United States*

5192 | Flexible Load Uncertainty Management on Shipboard Microgrids Through Redispatch with Control Effort Reduction

Kaitlyn Sitch, Liang Du; *Temple University, United States*

5005 | Tools for Partial Discharge and Health Condition Inference in Aircraft and Aerospace Electrical Asset Components

Riddhi Ghosh, Debasish Nath, Giancarlo Montanari; *Florida State University, United States*

5227 | SDN Dynamic Controller Configuration to Mitigate Compromised Controllers

Ryan Delany¹, Andrew Smith¹, Yan Li¹, Liang Du²; ¹*Penn State University, United States*; ²*Temple University, United States*

5236 | Physics Guided power-Based Exploration Strategy for Reinforcement Learning Applied to Energy Management Oh HEVs

Matteo Acquarone², Atriya Biswas¹, Daniela Anna Misul², Ali Emadi¹; ¹*McMaster University, Canada*; ²*Polytechnico di Torino, Italy*

5210 | Constant Current/Constant Voltage Charging via Series-Series Compensated Resonant Inductive Wireless Charging for Electric Vehicle

Niranjan Shrestha, Jeonggi Son, Sheldon Williamson; *Ontario Tech University, Canada*

5279 | DC Circuit Breakers: Standards and Potential Markets

Reza Kheirollahi¹, Zilong Zheng¹, Shuyan Zhao¹, Hua Zhang², Fei Lu¹; ¹*Drexel University, United States*; ²*Rowan University, United States*

5281 | Mitigation of Second Harmonic Pulsations for Single-Phase Inverters

Liwei Zhou, Matthew Jahnes, Noah Silverman, Matthias Preindl; *Columbia University, United States*

5282 | Magnetic and Winding Loss Estimation Using Harmonic Binning

Reanna Orzechowski, Matthew Jahnes, Youssef Fahmy, Liwei Zhou, Matthias Preindl; *MPLab, United States*

5285 | Framework for Digital Twin Real-Time Battery System for Model-in-the-loop and Hardware-in-the-loop Simulations

Harshad Rajendra Pandit, Nikhil Biju, Vivek Pisharodi, Pantelis Dimitrakopoulos, Manish Shenoy; *Gamma Technologies, Greece*; *Gamma Technologies, Germany*; *Gamma Technologies, United States*

Virtual in Poster Session 2

5072 | Improved State-of-Charge and Voltage Estimation of a Lithium-Ion Battery Based on Adaptive Extended Kalman Filter

5059 | A Novel Energy Management Strategy Considering Internal Loss and Hydrogen Consumption for Fuel Cell UAV

5109 | An Energy Management Strategy for All Electric Aircraft Based on Multi-Stack Fuel Cells

Exhibitor Directory

Expo Hours: Wednesday, June 23 | 12:00pm – 8:00pm | Thursday, June 24 | 12:00pm – 5:00pm
Location: Expo Hall E

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