iTEC2018

2018 IEEE Transportation Electrification Conference and Expo






ITEC is aimed at helping industry in the transition from conventional vehicles to advanced electrified vehicles

Final Program

Long Beach Convention Center
Long Beach, California, USA
June 13-15, 2018

ITEC Sponsors

IEEE | pels IEEE POWER ELECTRONICS SOCIETY | IEEE PES Power & Energy Society | IAS IEEE INDUSTRY APPLICATIONS SOCIETY

Dear ITEC 2018 Participants,

It is with great pleasure that I welcome conference participants from the industry, academia, government agencies, and the public to the 2018 IEEE Transportation Electrification Conference and Expo (ITEC'18). This year is the 7th year of the conference. The first five ITECs were held in the Detroit area, and last year it was in Chicago. ITEC aims to contribute to the industry transition from non-electric to more and all-electric forms of transportation, including; land, sea, air, and rail vehicles. Covering the electrification of both propulsion and non-propulsion systems and components.

ITEC will be held on June 13-15 at Long Beach Convention Center in California. Long Beach offers excellent restaurants, marina, beaches, as well as the historic Queen Mary ship. In addition, there are many attractions in the Greater Los Angeles area, such as; Disneyland, Universal Studios, Hollywood, Beverly Hills, and Santa Monica.

Our conference includes a diverse set of activities; keynote speakers, short courses, tutorials, panels, oral and poster presentations. It is an excellent venue to share ideas, disseminate knowledge, network, and become part of this exciting field. We will have an exhibition area where many companies, societies, and other entities will showcase their products and services in the area of transportation electrification.

We have 12 keynote speakers from companies, government, and academia. Subjects range from all-electric aircraft design of NASA's X57 to fully electric vehicles, electrification of off-road-vehicles to National Science Foundation's initiative on research and education programs in energy, power, and control networks. Also, we have five short courses and five tutorials in the areas of energy storage, power electronics, electric motors and hardware-in-the-loop system design for transportation electrification. Moreover, there will be three industry special sessions and seven panels where numerous experts from industry and academia will share their expertise and answer questions from participants.

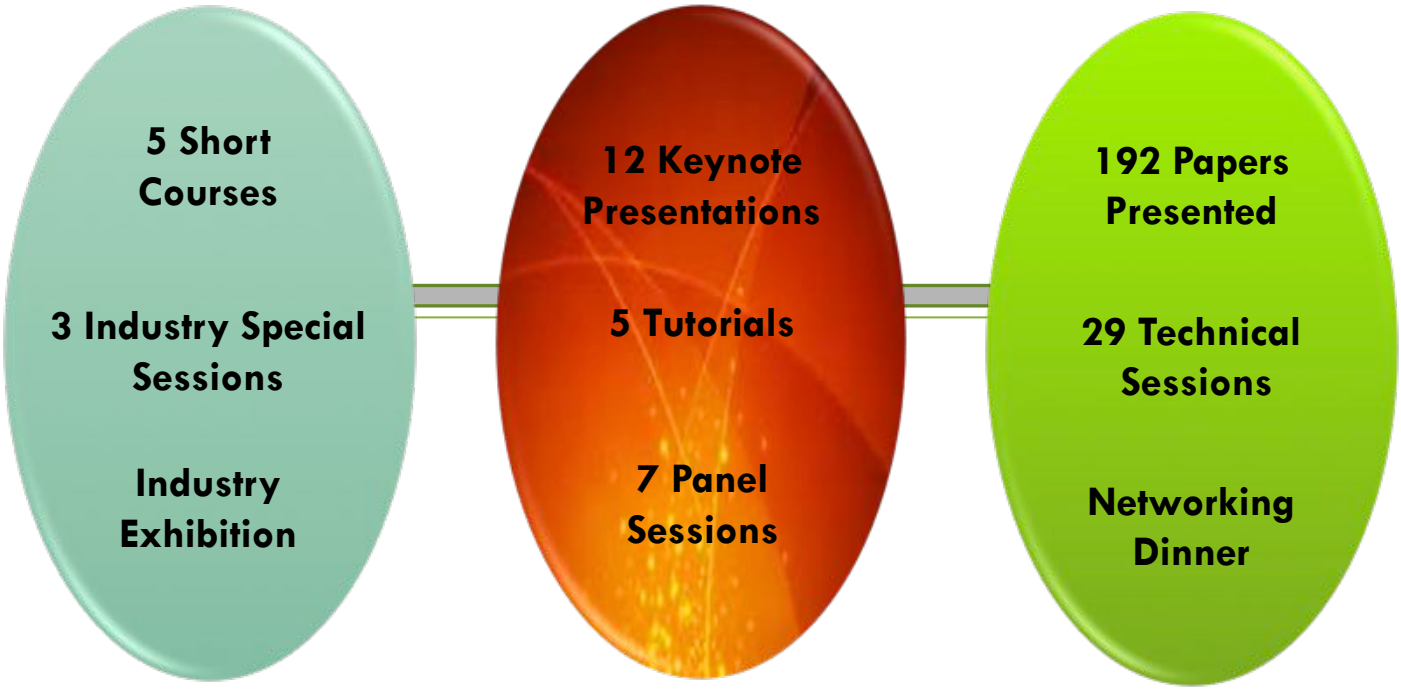
The organizing committee and I look forward to welcoming you at ITEC'18 on June 13-15 at Long Beach Convention Center in California.

We hope that you enjoy the conference and have a great experience.

Best regards,
Dr. Bulent Sarlioglu
General Chair, ITEC'18

You will experience….

ITEC is focused on components, systems, standards, and grid interface technologies, related to efficient power conversion for all types of electrified transportation for electric, hybrid electric, and plug-in hybrid electric vehicles (EVs, HEVs, and PHEVs) as well as heavy-duty, rail, off-road vehicles, airplanes and ships.



Keynote Speakers

It's About The Knowledge Shared...

Brij N. Singh
Senior Staff Engineer,
John Deere

Frede Blaabjerg
Professor, Villum Investigator at
Aalborg University, Denmark

Johney Green
Associate Laboratory Director,
Mechanical and Thermal Engineering
Sciences, National Renewable Energy
Laboratory

Dan Ludois
CSO, C-Motive Technologies
and WEMPEC

Christophe Espanet
Scientific Director, Sonceboz Group
Professor, University of Franche-Comte

Evgeni Ganev
Chief Engineer,
Honeywell

Patrick Wheeler
Department Head,
Electrical and Electronic Engineering
University of Nottingham, UK

Peter Savagian
Senior Vice President,
Product Development,
Faraday Future

Sean Clarke
X-57 Principal Investigator,
NASA Armstrong
Flight Research Center

Rachael Nealer
Program Manager at
US Department of Energy

Ali Emadi
President and CEO, Enedym, Inc
Professor, McMaster University

Alireza Khaligh
Professor at University of Maryland
and Expert at National Science
Foundation

JOHN DEERE
Faraday Future
SONCEBOZ
McMaster University
Honeywell
The University of Nottingham
NREL
National Renewable Energy Laboratory
NASA
NSF
AALBORG UNIVERSITY
C·MOTIVE

It's About Collaboration...

All conference registrants are welcome to attend the panel discussions, which are in parallel with technical sessions, at no additional charge.

Panels are 80 minutes in duration and are scheduled in the afternoons of Wednesday (June 13, 2018) and Thursday (June 14, 2018).

At each panel, the panel moderator/organizer and panelists will each give a short 5-10 minute presentation/ speech and then the floor will be opened to the audience for open panel discussions and Q&A.

Panel 1

E-motor – Rotational Elements, Bearings for Belt Starter Generators

Panel 2

Power Electronics - Applications of Si, SiC, GaN

Panel 3

Electrification Opportunities and Challenges For Off-road and Heavy Duty Vehicle Industry

Panel 4

Architecture of Electric Driveline Systems for Future Automotive: Low Voltage (36~48Vdc) versus High Voltage (400~850Vdc)

Panel 5

Multiphase Machines For Traction Drive Systems

Panel 6

Electro-Mechanical Automotive Accessory Systems – Current Challenges

Panel 7

Flying Cars and Electric Aircraft

Short Courses & Tutorials

Short Course 1
Hardware-in-the-Loop (HIL) Utilization for Power Electronics Control Development

Short Course 2
Trade-Off Analysis Including Motor Type, Winding Type, Material and Cooling Type Selection

Short Course 3
Impact of Electrification to Passenger Vehicles on Traditional Mechanical Design and Integration

Short Course 4
Developing Battery Models for System Level Simulation and Control Design

Short Course 5
Power Semiconductors for Vehicle Traction Inverters: From Discrete to Power Modules, from Silicon to Wide Band Gap Devices

Tutorial 1
Experimental Study and Performance Evaluation of Energy Management Strategies for FCHEVs Using Power Hardware-in-the-Loop Platform

Tutorial 2
Thermal Design of Power Electronics

Tutorial 3
Highly Reliable System Level Design and Simulation Platform for (H)EV

Tutorial 4
Primer on Magnetically Suspended Motor Shafts for Transportation Applications

Tutorial 5
Fundamental Criteria for E-motor Testing Process

Continuing Education

Educational Short-Courses and Tutorials at ITEC'18 are offered by internationally renowned experts from industry and academia. The content and the quality of the courses have passed IEEE's strict criteria for educational excellence and they are entitled to award IEEE Continuing Education Units (CEUs), recognized as the standard of excellence for continuing education programs in IEEE's fields of interest.

In the United States, many states require professional engineers to obtain Professional Development Hours (PDHs) for maintaining licensure. Through IEEE's continuing education offerings, professional engineers can earn PDH certificates that can be used as evidence of participation in these courses to help meet their requirements activity (1 CEU=10 PDHs).

In order to receive the CEUs available at the course, attendees must sign the roster sheets given at the beginning of the course as well as complete a review and hand them in to the conference organizing committee.

Industry Special Sessions

Industry Session 1
Rapid Motor & Drive Characterization

Industry Session 2
New Advancements in 4-Quadrant Power & Challenges in Functional Testing

Industry Session 3
Flying Cars and Electric Aircraft-Current Trends and Future Strategies

ITEC '18 Organizing Committee

General Chair
Bulent Sarlioglu
WEMPEC
University of Wisconsin-Madison

Program Co-Chairs
Matthias Priendl
Columbia University

Jin Ye
University of Georgia

Panels Chairs
Beijing Wang
FCA US LLC, US
Bruno Lequesne
E-Motors Consulting, LLC

Short Courses/Tutorials Chairs
Lucia Gouchia
Michigan Tech University, USA
Fei Gao
University of Technology of Belfort-Montbeliard, France

ITEC '18 Organizing Committee

Publication Chairs

Jin Ye, *University of Georgia*
Matthias Preindl, *Columbia University*

Registration Chair

Rebecca Krishnamurthy, *RNA Associates, Inc*

Awards Chair

Babak Nahid-Mobarakeh,*University of Loraine, France*

Exhibition Chair

Sanjaka Wirasingha
Valeo SA., USA

Off-Road Vehicle Industry Liaison Chair

Long Wu, *John Deere, USA*

Aerospace Industry Liaison Chairs

Kamiar Karimi, *The Boeing Company*
Sayeed Mir, *Autoliv-Nissin Brake Systems*
Waleed Said, *Zunum Aero*
Bulent Sarlioglu, *WEMPEC, University of Wisconsin-Madison*

Automotive Industry Liaison Chairs

Jon Poponea, *Robert Bosch LLC*
Joe Palazzolo, *GKN Driveline*
Jason T. Schug, *Ricardo Strategic Consulting*
Oliver Gross, *FCA US LLC*
Dhafar Al-Ani, *FCA US LLC*
Kumar Rajasekhara, *Marsilli*
Miaosen Shen, *NIO*
Paul Larsen, *ANSYS*
Tracy Moon, *Tridus Magnetics and Assemblies*
Nachiket Vader, *Rivian Automotive, LLC*
Mohamad Berri, *Ford Motor Company*
David Cottini, *Powersys-JMAG*
Michael Degner, *Ford Motor Company*
Suresh Gopalakrishnan, *General Motors*
Konstantinos Laskaris, *Tesla Motors*
Alireza Safee, *Osram Sylvania*
Sanjaka Wirasingha, *Valeo*
Bin Wu, *Mercedes-Benz R&D*
Hong Yang, *FCA US LLC*

Battery Industry Liaison Chairs

Said Al-Hallaj, *All Cell Technologies*
Pavel Dutov, *LG Chem*

ITEC '18 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
Faraday Future

Phil Krein
University of Illinois at Urbana-Champaign

John M. Miller
Oak Ridge National Laboratory

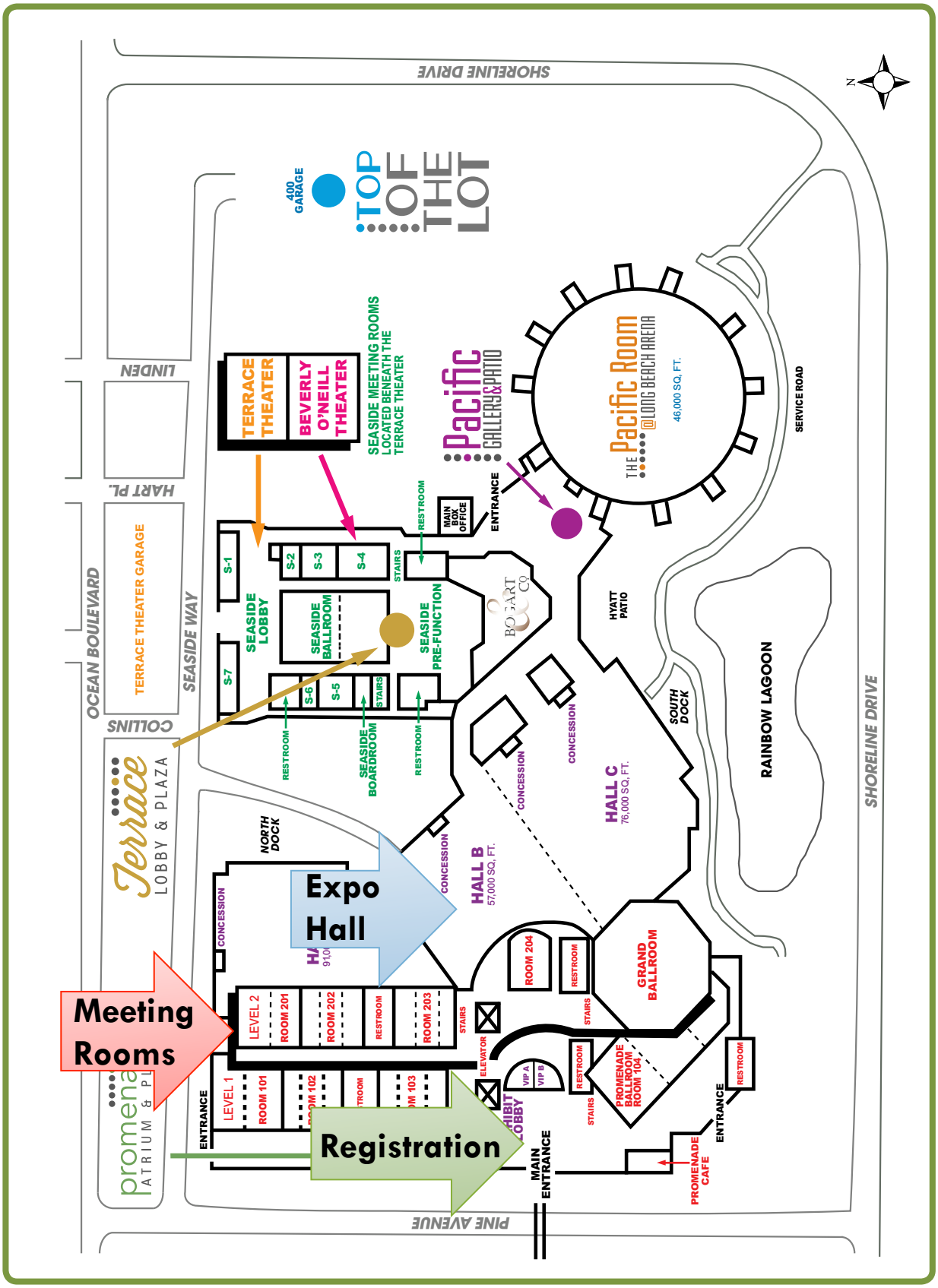
Jim Nagashima
Nagashima Advanced Technology Consulting

Kaushik Rajashekara
University of Houston

John Shen
Illinois Institute of Technology

Peter Steimer
ABB Switzerland Ltd.

Long Beach Convention Center Map



ITEC'18 Program-at-a-Glance

	7:30AM-8:15AM	8:15AM-10:00AM	10:00AM-10:30AM	10:30AM-12:00PM	12:00PM-2:00PM	2:00PM-3:20PM	3:20PM-4:20PM	4:20PM-5:40PM	5:40PM-7:00PM
Wednesday June 13, 2018	**Conference Registration Open**	**Plenary Session 1**	**Coffee Break Outside Room 202**	**Plenary Session 1**	Poster Session 1 **Exhibit Hall Buffet Lunch**	Short Course 1 Short Course 2 Short Course 3 Tutorial 1 Panel 1 Panel 2	**Coffee Break in Exhibit Hall**	Short Course 1 Short Course 2 Short Course 3 Tutorial 2 Tutorial 3 Industry Special Session 1	**Networking Dinner in Exhibit Hall**
Thursday June 14, 2018		**Plenary Session 2**		**Plenary Session 2**	Poster Session 2 **Exhibit Hall Buffet Lunch**	Short Course 4 Short Course 5 Panel 3 Panel 4 Panel 5 Industry Special Session 2 Industry Special Session 3 TEC Meeting		Short Course 4 Short Course 5 Tutorial 4 Tutorial 5 Panel 6 Panel 7 IAS Workshop	**Ice Cream Social in Exhibit Hall**
Friday June 15, 2018		**8:30AM-10:10AM** Technical Sessions 1-8		**10:30AM-12:10PM** Technical Sessions 9-16	Lunch Break (On Own)	**2:00PM-3:40PM** Technical Sessions 17-24	**Coffee Break Outside Room 202**	**4:00PM-5:40PM** Technical Sessions 25-29	

Wednesday June 13, 2018

Keynote Presentations

Plenary Session 1

Wednesday, June 13, 2018

8:15AM – 12.00PM

Venue: Room 202

Plenary Session Chairs:

Burak Ozpineci,
Oak Ridge National Laboratory
Babak Nahid-Mobarakeh,
Université de Lorraine

Welcome and Introduction

8.15AM-8.20AM
Bulent Sarlioglu, WEMPEC & University of Wisconsin-Madison
General Chair, 2018 IEEE Transportation Electrification Conference & Expo

Power Electronics Society Presentation

Alan Mantooth - President
8.20AM-8.25AM

Industry Applications Society Presentation

Tomy Sebastian- President
8.25AM-8.30AM

Keynote Presentation 1: Building NASA's X-57 Electric Propulsion X- Plane: Vehicle Integration, System Tests, and Flight Qualification

8.30AM – 9.00AM

Speaker: *Sean Clarke*
X-57 Principal Investigator
NASA Armstrong Flight Research Center

Short Biography:
Sean Clarke is a senior Research Systems Development Engineer at NASA's Armstrong Flight Research Center and the Principal Investigator for the X-57 "Maxwell" X-Plane. He is the architect of the NASA HEIST Research testbed, a member of NASA's Electrical Power Systems Capability Leadership Team, and he earned his BSc in Electrical Engineering at the University of Florida, Gainesville.

Wednesday June 13, 2018

Keynote Presentations

Keynote Presentation 2: Electric Green Taxiing System for Aircraft

9.00AM – 9:30AM

Speaker: *Evgeni Ganev*
Chief Engineer,
Honeywell

Short Biography:

Dr. Evgeni Ganev is a chief engineer responsible for Electromechanical Power Systems at Honeywell Aerospace in Torrance, CA, USA. He has 37 years engineering experience, 26 of which with Honeywell. His expertise is in high-speed electric machines and control power electronics, as part of electric power generation systems, electric drives and electromechanical actuators. He enforces design reviews, approves requirements, supports feasibility and trade studies, develops technical competencies relevant to world class capability, and represents Honeywell to customers and external organizations. As strategy leader of the Honeywell Intellectual Property Steering Committee for Electric Power Systems, Mr. Ganev works with patent portfolio managers, marketing and legal people to develop IP plan. He has experience as a systems and chief engineer on numerous aerospace programs for space applications, commercial and military aircraft, and military ground vehicles. His work has been used in platforms like the F-22, International Space Station, JSF, Space Shuttle, Predator B, FCS, A380, A350, Electric Green Taxiing System and NG Jammer. Evgeni contributes to the electrification initiative of Honeywell Transportation Systems (HTS) by adapting aerospace technologies to automotive applications. Evgeni has contributed to aerospace initiatives like the Airforce INVENT, defining fundamental architectural, system and component matters. Mr. Ganev has published 39 papers and holds 42 US patents. Dr. Ganev received his Ph.D. in electric motion control, M.S. in power electronics and B.S. in industrial electronics from the University of Technology in Sofia.

Coffee Break 10:00 AM – 10:30 AM

Keynote Presentation 3: Design for Reliability in Power Electronic Systems for Automotives

9.30AM – 10.00AM

Speaker: *Frede Blaabjerg ,*
Professor, Villum Investigator,
Aaborg University, Denmark

Short Biography:

Frede Blaabjerg (S'86–M'88–SM'97–F'03)became an Assistant Professor in 1992, an Associate Professor in 1996, and a Full Professor of power electronics and drives in 1998. From 2017 he became a Villum Investigator. His current research interests include power electronics and its applications such as in wind turbines, PV systems, reliability, harmonics and adjustable speed drives. He has published more than 500 journal papers in the fields of power electronics and its applications. He is the co-author of two monographs and editor of 6 books in power electronics and its applications. He has received 24 IEEE Prize Paper Awards, the IEEE PELS Distinguished Service Award in 2009, the EPE-PEMC Council Award in 2010, the IEEE William E. Newell Power Electronics Award 2014 and the Villum Kann Rasmussen Research Award 2014. He was the Editor-in-Chief of the IEEE TRANSACTIONS ON POWER ELECTRONICS from 2006 to 2012. He has been Distinguished Lecturer for the IEEE Power Electronics Society from 2005 to 2007 and for the IEEE Industry Applications Society from 2010 to 2011 as well as 2017 to 2018.

He is nominated in 2014, 2015, 2016 and 2017 by Thomson Reuters to be between the most 250 cited researchers in Engineering in the world. In 2017 he became Honoris Causa at University Politehnica Timisoara (UPT), Romania.

Wednesday June 13, 2018

Keynote Presentations

Keynote Presentation 4: The Era of Fully Electric Vehicles

10.30AM – 11.00AM

Speaker: *Peter Savagian,*
Senior Vice President,
Product Development,
Faraday Future

Short Biography:
Peter Savagian is the Senior VP for Technology and Product Development at Faraday Future, a California based start-up Electric Vehicle company. There he leads the engineering and supply chain management for a new generation of fully-electric vehicles. Prior to Faraday, he worked at General Motors, leading the development of power electronics and electric machines on all electric and hybrid vehicles. At GM, his accomplishments in the field of electrified drives spanned a range of vehicles, beginning with the first modern Electric Vehicle, the 1996 GM EV1 to the first Plug-in Hybrid, the 2011 Chevy Volt, to the EV value benchmark, the 2017 Chevy Bolt. He holds 40 patents and has authored 17 technical publications in the field of electrified vehicles. Pete has a BS in Mechanical Engineering from the University of Wisconsin, an MS in Operations Research Engineering from the University of Southern California, and an MBA from Duke University.

Keynote Presentation 5: High Speed Electric Motors and Application to the Turbocharger Electrification

Speaker: *Christophe Espanet*
Scientific Director, Sonceboz Group
Professor, University of Franche-Comte

11.00AM – 11.30AM

Short Biography:
Christophe Espanet received his Bachelor and Master degrees in applied physics from the University of Paris, France, respectively in 1992 and 1993. He received his Ph.D. degree from the University of Franche-Comte (France) in 1999. His doctoral research dealt with the design and the optimization of PM in-wheel motors. From 1999 to 2007, he was an Associate Professor in the University of Franche-Comte and he is now a Full Professor with the same University. His research interests include the modeling and design of electrical systems and in particular electric machines. In 2014, he became the Scientific Director of Sonceboz Group, Switzerland, and he is in charge of the advanced research and the academic partnership of the Group. He has published about 100 academic publications in leading international conferences and journals. He has been Technical Chair of IEEE VPPC (Vehicle Power Propulsion Conference) in 2010 (Lille, France) and in 2014 (Coimbra, Portugal).

Wednesday June 13, 2018

Keynote Presentation 6: Electric Superbike Racing – the Design and Construction of a Winning Electric Motorbike

11.30AM – 12.00PM

Speaker: *Pat Wheeler*
Head of Department of Electrical and Electronic Engineering and Professor of Power Electronic Systems, University of Nottingham, UK. and
Li Dak Sum Chair Professor in Electrical and Aerospace Engineering, University of Nottingham, Ningbo, China

Short Biography:

Pat Wheeler received his BEng [Hons] degree in 1990 from the University of Bristol, UK. He received his PhD degree in Electrical Engineering for his work on Matrix Converters from the University of Bristol, UK in 1994. In 1993 he moved to the University of Nottingham and worked as a research assistant in the Department of Electrical and Electronic Engineering. In 1996 he became a Lecturer in the Power Electronics, Machines and Control Group at the University of Nottingham, UK. Since January 2008 he has been a Full Professor in the same research group. He is currently Head of the Department of Electrical and Electronic Engineering at the University of Nottingham, UK and the Li Dak Sum Chair professor at the University of Nottingham, Ningbo, China. He has published 400 academic publications in leading international conferences and journals.

Wednesday, June 13, 2018

Poster Session 1

Wednesday, June 13, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chairs: Anand Sathyan, LG & Suman Debnath, ORNL

Paper ID	Title/Author
6017	**A New Voltage Doubler Based DC-DC 2LCm-Y Power Converter Topologies for High-Voltage/Low-Current Renewable Energy Applications** *Mahajan Sagar Bhaskar{2}, Sanjeevikumar Padmanaban{1}, Patrick William Wheeler{3}, Frede Blaabjerg{1}, Pierluigi Siano{4}* {1}Aalborg University, Denmark; {2}Qatar University, Qatar; {3}University of Nottingham, United Kingdom; {4}University of Salerno, Italy
6021	**Determination of Differential Inductances for a Permanent Magnet Assisted Synchronous Reluctance Machine with a Ribless Rotor** *Marco Zimmermann, Bernhard Piepenbreier* University Erlangen-Nuremberg, Germany
6033	**High-Performance Integrated Modulation Scheme for Modular Multilevel Converters** *Deepak Ronanki, Sheldon S. Williamson* University of Ontario Institute of Technology, Canada
6041	**Super-Twisting Algorithm Based on Fast Terminal Sliding Surface for Buck Converter in Fuel Cell Electric Vehicle** *Qian Li{2}, Yigeng Huangfu{2}, Dongdong Zhao{2}, Minchi Xie{2}, Jun Zhao{1}* {1}AVIC Computing Technique Research Institute, China; {2}Northwestern Polytechnical University, China
6043	**Design of a 5-Phase IPM Machine for Electric Vehicles** *Omid Beik{2}, Rong Yang{1}, Ali Emadi{2}* {1}BorgWarner, Canada; {2}McMaster University, Canada
6054	**Thermal and Electrical Characteristics of EV Traction Motor Considering AC Resistance of MSO Coil** *Eui-Chun Lee{2}, Soon-O Kwon{2}, Jung-Pyo Hong{1}* {1}Hanyang.University, Korea; {2}Korea Institute of Industrial Technology, Korea
6057	**Urban Grid Monitoring and Distributed Energy Resource Integration-Approach Using Analytics** *Moody Demetry, Krishna Paracharan, Stanley Moses Sathianthan* Eversource Energy Corporation, United States
6058	**Advanced Fault-Tolerant Control Strategy for Switched Reluctance Motor Drives** *Peter Azer{1}, Jin Ye{2}, Ali Emadi{1}* {1}McMaster University, Canada; {2}San Francisco State University, United States

Wednesday, June 13, 2018

Wednesday, June 13, 2018

Poster Session 1

Wednesday, June 13, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chairs: Anand Sathyan, LG & Suman Debnath, ORNL

Paper ID	Title/Author
6073	**Electric Vehicle Policy Formulation Framework for SIDS in the Caribbean** *Chris Meetoo{2}, Sanjay Bahadoorsingh{2}, Dillon Jaglal{2}, Vickram Balbadar{2}, Chandrabhan Sharma{2}, Kevin Baboolal{1}, Marlon Williams{1}* {1}Trinidad and Tobago Government Electrical Inspectorate, Trinidad and Tobago; {2}University of the West Indies, Trinidad and Tobago
6083	**Modified Phase-Disposition PWM Technique for Modular Multilevel Converters** Deepak Ronanki, Sheldon S. Williamson University of Ontario Institute of Technology, Canada
6100	**FPGA-Based Real-Time Simulation of Floating Interleaved Boost Converter for FCEV Powertrain** Hao Bai{2}, Huan Luo{1}, Chen Liu{2}, Rui Ma{2}, Damien Paire{2}, Fei Gao{2} {1} FEMTO-ST Institute / Université Bourgogne Franche-Comté / UTBM, France; {2} FEMTO-ST Institute / Université Bourgogne Franche-Comté / UTBM/ FCLAB, France
6111	**Autonomous Circuit Design of a Resonant Converter (LLC) for on-Board Chargers Using Genetic Algorithms** Andreas Rosskopf, Sophia Volmering, Stefan Ditze, Christopher Joffe, Eberhard Baer, Fraunhofer IISB, Germany
6113	**Data-Driven Prognostics for PEM Fuel Cell Degradation by Long Short-Term Memory Network** Rui Ma{1}, Elena Breaz{2}, Chen Liu{1}, Hao Bai{1}, Pascal Briois{1}, Fei Gao{1} {1} FEMTO-ST Institute / Université Bourgogne Franche-Comté / UTBM/ FCLAB, France; {2} FEMTO-ST Institute / Université Bourgogne Franche-Comté / UTBM/ FCLAB / UTC-N, France
6137	**Topological Overview on Solid-State Transformer Traction Technology in High-Speed Trains** Deepak Ronanki, Sheldon S. Williamson University of Ontario Institute of Technology, Canada
6142	**A Parallel Solver to the Three-Level VSC Modeling for HIL Application** Chen Liu{2}, Rui Ma{2}, Hao Bai{2}, Franck Gechter{1}, Fei Gao{2} {1} FEMTO-ST Institute / Université Bourgogne Franche-Comté / UTBM, France; {2} FEMTO-ST Institute / Université Bourgogne Franche-Comté/ UTBM / FCLAB, France
6161	**Dictionary Learning for Bearing Fault Diagnosis** Kudra Baruti, Mehrdad Heydarzadeh, Mehrdad Nourani, Bilal Akin University of Texas at Dallas, United States

Wednesday, June 13, 2018

Wednesday, June 13, 2018

Poster Session 1

Wednesday, June 13, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chairs: Anand Sathyan, LG & Suman Debnath, ORNL

Paper ID	Title/Author
6167	**Decoupled Modeling of Mutually Coupled SRM Based on Net Flux Method** *Siddharth Mehta{2}, Md Ashfanoor Kabir{1}, Iqbal Husain{2}* {1}ABB US Corporate Research Center, United States; {2}North Carolina State University, United States
6170	**Improved Model Predictive Control Method for Modular Multilevel Converter (MMC) Based on Insertion Indexes** *Minh Nguyen{1}, Sangshin Kwak{1}, Jeihoon Baek{2}* {1}Chung-ang University, Korea; {2}Korea University of Technology and Education, Korea
6175	**Nonlinear Modeling Based Harmonic Analysis of the Interior Permanent Magnet Synchronous Machines** Jian Zhang, Xuhui Wen, Zhaopeng Yan Institute of Electrical Engineering, Chinese Academy of Sciences, China
6181	**Electrical Machine Rotor Shielding for Low Cost Electrical Drive** Mahir Al-Ani, Gaurang Vakil, Christopher Gerada University of Nottingham, United Kingdom
6189	**Reactive Power Compensation Scheme for an Imbalanced Three-Phase Series-Compensated Wireless Power Transfer System with a Star-Connected Load** *Alireza Safaee{1}, Konrad Woronowicz{1}, Ali Maknouninejad{2}* {1}Bombardier Transportation, Canada; {2}Schnieder Electric, United States
6197	**Comparison of Direct and Axle Drives with Electrically Excited Synchronous Machines for Traction Applications** *Jonathan Juergens, Juergen Redlich, Bernd Ponick* Leibniz UniversitÃ¤t Hannover, Germany
6198	**Time Efficient Integrated Electro-Thermal Model for Bidirectional Synchronous DC-DC Converter in Hybrid Electric Vehicles** *Peter Azer, Romina Rodriguez, Hao Ge, Jennifer Bauman, P. Sai Ravi, Ali Emadi* McMaster University, Canada
6200	**Time-Dependent Multi-Physics Analysis of Inductive Power Transfer Systems** *Masood Moghaddami, Arif Sarwat* Florida International University, United States
6220	**Control System to Regenerative and Anti-Lock Braking for Electric Vehicles** *Marina Gabriela P. Paredes, Jose Antenor Pomilio* University of Campinas, Brazil

Wednesday, June 13, 2018

Poster Session 1

Wednesday, June 13, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chairs: Anand Sathyan, LG & Suman Debnath, ORNL

Paper ID	Title/Author
6226	**Modularized High Power Density Bidirectional Buck-Boost DC-DC Converter for EV Battery Management** Zhi Geng{2}, Dazhong Gu{2}, Tianqi Hong{2}, Kedao Qi{2}, Kuang Zhang{1}, Joseph Ambrosio{2} {1}New York University, United States; {2}Unique Technical Service, LLC, United States
6283	**An Inductive Power Transfer System Design for Rail Applications** Luocheng Wang{2}, Tiefu Zhao{2}, Shen-En Chen{2}, Dave Cook{1} {1}Rail Propulsion Systems, United States; {2}University of North Carolina at Charlotte, United States
6291	**A PV Array Fed BESS Supported Speed Sensor-Less PMSM Driven Water Pumping System** Shadab Murshid, Bhim Singh Indian Institute of Technology Delhi, India
6294	**DM and CM Modeling of Non-Isolated Buck Converters for EMI Filter Design** Aaron Brovont{1}, Robert Cuzner{2} {1}University of Alabama, United States; {2}University of Wisconsin-Milwaukee, United States
6309	**Multi-Physics Modeling for Electric and Hybrid Vehicles with in-Wheel Electric Motors** Vandana Rallabandi{2}, Damien Lawhorn{2}, Dan Ionel{2}, Xiao Li{1} {1}ANSYS Inc., United States; {2}University of Kentucky, United States
6132	**Parameter Characterization and Performance Prediction of Permanent Magnet Synchronous Motor for High Performance Applications** *Mazharul Chowdhury, Mohammad Islam, Abraham Gebregergis* Halla Mechatronics, United States

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Short Course 1: Hardware-in-the-Loop (HIL) Utilization for Power Electronics Control Development

Wednesday, June 13th, 2018

2:00PM – 5:40PM (3:20PM-4:20PM Coffee Break in the Exhibit Hall)
Venue: Room 201A

Instructor:
Long Wu, John Deere Electronic Solutions
Sumit Dutta, John Deere Electronic Solutions
Scott Johnson, John Deere Electronic Solutions

Tutorial Description:
This tutorial will teach the audience how to construct and configure a highly capable hardware in the loop system to accelerate power electronics development and validate system integration functionality. The tutorial will start from clarifying the necessary analog/digital IOs of the HIL system with the hardware controller. Then different electric machine types including IPM, SMPM, IM and SR will be discussed to achieve high fidelity simulation. Afterwards, the tutorial will introduce additional advanced HIL features such as electric machine virtual characterization, instantaneous fault injection, inverter loss calculation and junction temperature estimation, advanced gate drive features, etc. Finally, the HIL application with versatile inverter topology including dc-dc converter, grid tied application as well as sensor nonlinearity and vehicle system integration will be presented with practical application examples.

Instructors' Short Biographies:
Dr. Long Wu (SM'12) is Senior Staff Engineer leading power electronics control at John Deere Electronic Solutions (JDES). He received his B.S., M.S. and Ph.D. degrees in electrical engineering from Shanghai Jiao Tong University, Marquette University and Georgia Institute of Technology in 1998, 2003 and 2007, respectively. Dr. Wu has 27 granted US patents in power electronics and was the recipient of best paper prize at ITEC2012. Dr. Wu has served on the IAS Industrial Drive Paper Award Committee since 2012. He is also an Associate Editor of IEEE Transaction on Industrial Application Society.

Scott C. Johnson, a native of Fort Wayne, IN, USA, received the B.S. degree in mathematics and physics from The College of Idaho (Caldwell, ID, USA) in 2011, the M.S. degree and Ph.D. degree in electrical engineering from Purdue University (West Lafayette, IN, USA) in 2013 and in 2016, respectively. He is currently a Senior Controls Engineer at John Deere Electronic Solutions in Fargo, ND, USA. His research interests include observer design, fault detection, electric motor control, linear algebra, and switched systems.

Sumit Dutta (M'14) Sumit Dutta received the B.Tech. (Hons.) degree in Energy Engineering from Indian Institute of Technology, Kharagpur, India, in 2008, and the M.S. and Ph.D. degree in electrical engineering from North Carolina State University in 2014. He is currently working as a Senior Power electronics Engineer at the John Deere Electronic Solutions. His research interests include DC to DC power conversion, wide band-gap power device applications to power converter design and controls, motor drives and renewable energy integration.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Short Course 2: Trade-Off Analysis Including Motor Type, Winding Type, Material and Cooling Type Selection

Wednesday, June 13th, 2018
2:00PM – 5:40PM (3:20PM-4:20PM Coffee Break in the Exhibit Hall)
Venue: Room 201B

Instructor:
James Goss, Motor-Design Ltd.

Tutorial Description:
This presentation illustrates various solutions for the power traction motors of electrical vehicles. Equivalent designs to those commercially available on the roads are investigated. Potential simple modifications of the winding configurations and cooling system are studied:

- flat wire (hairpin) winding vs stranded round wire in induction, synchronous permanent magnet and wound field machine topologies,
- winding material grades effect – copper vs aluminum,
- cooling systems – water jacket vs spray, fluid properties and flow rate.
- high torque density example – Ariel Hypercar. Recommendations of the feasibility, cost and manufacturing are also discussed.

Instructor's Short Biography:
James Goss received M. Eng and D. Eng degrees in power systems and electrical machines from the University of Warwick, U.K., in 2009 and University of Bristol, U.K., in 2014, respectively. His previous work experience includes placements with the National Grid and Converteam in 2007 and 2008, respectively. Since 2014, Dr. Goss is Head of Research and Innovation with Motor Design Ltd., Shropshire, U.K. His research interests include the design and modelling of electrical machines in traction applications.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Short Course 3: Impact of Electrification to Passenger Vehicles on Traditional Mechanical Design and Integration

Wednesday, June 13th, 2018
2:00PM – 5:40PM (3:20PM-4:20PM Coffee Break in Exhibit Hall)
Venue: Room 202A

Instructor:
Joe Palazzolo

Course Description:
Transmission

- Gear design
- Shaft
  - Design, alignment, processing
- Lubrication
  - Passive vs. active
- Seals
- Disconnect systems
- Cooling
- Noise, vibration and harshness

Halfshafts

- Duty Cycle
- Sizing
- Plunge, Angle

Instructor's Short Biography:
Joe Palazzolo is Program Director & Chief Engineer – eDrive Systems at GKN Driveline, and a GKN and SAE Engineering Fellow. He is responsible for managing the mechanical design and development of new automotive gearboxes, torque transfer devices, concepts, and industrialization into production applications. Mr. Palazzolo is the award winning author of *High-Performance Differentials, Axles & Drivelines* and *How to Rebuild the Ford 8.8 and 9 inch Axles*. He has authored three chapters featured in the *Automotive Engineering Encyclopedia*. He holds a Bachelor in Mechanical Engineering and a Masters in Automotive Engineering. He has received numerous patents for his work and creativity in advancing mobility systems.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Tutorial 1: Experimental Study and Performance Evaluation of Energy Management Strategies for FCHEVs Using Power Hardware-in-the-Loop Platform

Wednesday, June 13th, 2018
2:00PM – 3:20PM
Venue: Room 202B

Instructors: *Ahmed Al Durra and Imad Matraji, Khalifa University of Science and Technology*

Tutorial Description:
Energy Management Strategy (EMS) plays a key role for Fuel Cell Hybrid Electric Vehicles (FCHEVs), it directly affects the efficiency and performance of energy storages in FCHEVs. A Power Hardware-in-the-Loop (PHiL) test platform of FCHEVs is developed in order to implement and validate EMS experimentally for FCHEVs powertrain. The goal of this tutorial is to present the benefit/utility of a PHiL test platform of FCHEVs. The proposed validation method is very efficient, as it does not require the EV use and any EMS can be validated before the integration of the PEMFC in the EV without taking the risk of using Hydrogen. The EV simulated model leads to emulate the real vehicle behavior, demanded power, and provided power by the battery and ultra-capacitor. Different EMSs under system constraints have been implemented and validated such as fuzzy logic, extremum seeking, and neural network. In this tutorial, the fuzzy logic and extremum seeking methods are presented with experimental results. In the first method, a combination of the parameters from three offline optimized fuzzy logic controllers using data fusion approach. Then, the parameters of each offline optimized fuzzy logic controllers are fused using Dempster-Shafer (DS) evidence theory in order to calculate the final parameters for the online fuzzy logic controller. In the second method, Extremum Seeking Method (ESM) can also be effectively employed to find an optimal operating point of a static nonlinear system in real-time. A comparative study of different ESM schemes for online energy management strategy of FCHEVs is presented. The proposed EMSs are applied experimentally for three typical driving scenarios: highway, suburban and city.

Instructors' Short Biographies:

Ahmed Al-Durra received his PhD in ECE from Ohio State University, 2010. He is an Associate Professor in the ECE Department at Khalifa University of Science & Technology, UAE. His research interests are applications of control theory on Renewable Energy Systems, Micro and Smart Grids, and HEV. He has published over 130 scientific articles in Journals, Conferences, and book chapters. He has successfully accomplished several research projects at international and national levels (around 6.5M USD). He has supervised/co-supervised over 20 PhD/Master students. He is the head of the Energy Systems, Control & Optimization Lab at ADNOC Research & Innovation Center.

Dr. Imad Matraji received his Ph.D. degree in automatic control systems from the University of Technology of Belfort Montbéliard in 2013. His main research interest is performance optimization of PEM fuel cell (PEMFC) and their integration in automotive applications. Then, he joined Hydrogen South Africa at the University of Western Cape as a post-doctoral. He was engaged in the development of the balance of plant of 1kW fuel cell integration in an electric golf cart. In 2015, he integrated Khalifa University as a research associate and worked on the power management of fuel cell electric vehicle.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Panel 1: E-motor – Rotational Elements, Bearings for Belt Starter Generators

Wednesday, June 13th, 2018
2:00PM – 3:20PM
Venue: Room 202C

Panel Organizer:
Beijing Wang, Electrified Powertrain, Fiat Chrysler Automobiles

Panel Moderator:
Hossein Dadkhah, LG Electronics

Panelists:
- Norm Parker, Fiat Chrysler Automobiles
- Mike Beerbower, Nachi America
- Manuel Bautista, SKF North America

Panel Summary:

Rotational elements in electric machines are vital to motor performance. Not only have they determined motor mechanical losses, but also they are responsible for one of the major motor failures, besides winding overheat or loss of insulation. Among rotational elements, bearings are by far the most important and vulnerable rotational elements, particularly in a BSG (Belt-driven Starter Generator) type machine, as in this type of system, bearings work under high hubload, high speed and high temperature operating conditions. In addition, misalignment and tolerances in motor assembly as well as motor installation in vehicle system and dynamic axial force in operations will make proper selection of bearings even more challenging. This panel will invite bearing experts, OEM application representatives and people from component/vehicle system simulations to discuss and address key challenges associated with rotational elements in electric machines.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Panel 2: Power Electronics - Applications of Si, SiC, GaN

Wednesday, June 13th, 2018
2.00PM – 3.20PM
Venue: Room 204

Panel Organizer and Moderator:
Elie Naim, AVL Test Systems, Inc.

Panelists:
- Shengyi Liu, Boeing
- Burak Ozpineci, Oak Ridge National Laboratory
- Bruce Geil, U.S. Army Research Laboratory
- Srdjan Lukic, FREEDM Center

Panel Summary:

In 2010 some semiconductors makers claimed that the Si power MOSFET had hit a road block and a new technology was needed. Around that time some claimed that Wide Band Technology GaN and SiC would replace the traditional Si by 2015. Also known as compound semiconductors SiC and GaN, these wide band gap technologies showed no clear sign on when their application volumes in the future would be higher than Si.

This panel will touch base on the application usability of Si, SiC, GaN and when to determine which semiconductor material to use in power electronics applications:
1. What are the market technology drivers for each? (e.g Cost, efficiency, cooling, packaging, etc…)
2. Use cases of Si, SiC, GaN and when to determine which semiconductor material to use in power application (e.g above 900V, GaN would not be able to meet the higher voltage requirements)
3. From an electromagnetic point of view, what are the challenges with designing with Si, SiC and GaN

Finally I believe each type will be playing an important role in the future but each will settle into its own forte.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Tutorial 2 – Thermal Design of Power Electronics

Wednesday, June 13th, 2018
4:20PM – 5:40PM
Venue: Room 202B

Instructor:
Lauren Boteler, U.S. Army Research Laboratory

Tutorial Description:
There is a continual pull in the power electronics industry for smaller modules with increased power to improve power conversion for electric vehicle drivetrains and other applications. This increased power density leads to thermal and packaging challenges that must be understood and addressed. As modules become increasingly integrated and complex, it is important for everyone in the design chain to understand the thermal challenges. This tutorial will address basic thermal management issues as it relates to a power electronics module. The course will begin with a fundamental understanding of the three mechanisms of heat transfer (conduction, convection and radiation). Next, it will cover how to perform thermal resistance network calculations to understand the thermal impact of material selection, heat sink options, and geometry. As part of this analysis, various thermal terms will be defined including thermal resistance, heat transfer coefficients, thermal conductivity, fluid pressure drop, heat flux, and thermal spreading. Additional topics will include the pros and cons of typical thermal management solutions, temperature measurement options, how to read the thermal properties on a datasheet, and understanding simulation results. This tutorial will provide the background needed to perform back-of-the-envelope thermal calculations, understand the available thermal management solutions, and appreciate the thermal management challenges facing today's power electronics modules.

Instructor's Short Biography:
Dr. Lauren Boteler leads the thermal and packaging research programs as part of the Advanced Power Packaging group at the U.S. Army Research Laboratory (ARL). She received her B.S. and Ph.D. degrees in mechanical engineering from the University of Maryland in 2006 and 2011, respectively. Her work at ARL, beginning in 2005, has focused on power electronics packaging and thermal management solutions for a wide range of Army applications. More recently, she has initiated a research program in Advanced Power Packaging and Thermal Management which focuses on four main challenges of power electronics packaging: transient thermal mitigation, additive manufacturing, coengineering/ codesign, and high-voltage packaging.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Tutorial 3 – Highly Reliable System Level Design and Simulation Platform for (H)EV

Wednesday, June 13th, 2018
4:20PM – 5:40PM
Venue: Room 202C

Instructor: Emmanuel Rutovic, Powersys Solutions

Tutorial Description:

The design of Hybrid and Electric Vehicle (HEV) must support multiple domains design (Electrical, mechanical, control, …) and requires system level verification to assess design behavior against specifications and design standards. The aim of this tutorial is to provide an overview of the various technical challenges that can be addressed using a system level simulation platform.

Electrical motors, batteries, power devices are the major components that affect the performances of EV/ HEV vehicles. Availability of accurate and efficient models for those parts is the key of robust design development and design validation of the complete system.

Furthermore, automotive applications require compliance with safety standards (ISO 26262), and fault simulation must be part of the design flow. To achieve this objective, proven and accurate models are critical for failure mode analysis.

SaberRD modeling tools enable creation of characterized models for igbt, mosfet, battery, … and SaberRD-JMAG link enables creation of more accurate motor behavior (Torque ripple, Magnetic saturation, …). SaberRD provides seamless multi-domain integration in a highly reliable design and verification platform. For HEV simulations, validated parts are simply connected all together, then the important aspect of control strategy with the verification of interaction between motor and other components can be easily achieved using advanced robust design flow. In addition, Saber functional safety (fault simulation) analysis help to predict multi-disciplinary system performance in case of failure.

Instructor's Short Biography:

Emmanuel Rutovic received a M.S.degree in electrical engineering from the Polytechnic National Institute of Toulouse ENSEEIHT in 2010 and joined Powersys France, the distributor of SaberRD , as an application engineer. He is now Director of Operations of Powersys Canada where he is involved in the development of various simulation tools and oversees the consulting activities.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Industry Special Session 1 – HBM Test and Measurement

Rapid Motor and Drive Characterization

Wednesday, June 13nd, 2018
4:20PM – 5:40PM
Venue: 204

Presentation Summary:
Characterizing electric motors and drives, especially for electric and hybrid vehicles is a very important topic in many engineering labs throughout the world. Every lab has unique interests to test and validate experiments using multiple pieces of measurement 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 consolidating many systems into one allowing for rapid efficiency motor mapping and custom advanced real-time analysis significantly boosting productivity, capability and research and development by many days and/or weeks.

Objectives in the presentation include:
- Identify significant issues with traditional test methods
- How to overcome traditional test issues and boost productivity and R&D by many factors
- Display rapid efficiency mapping & custom real-time motor analysis done instantly instead of hours or days; analysis examples include torque ripple, dq0, Space Vector and many others

Presenter's Biography:
Mike Hoyer is an applications engineer for HBM Test and Measurement with a Bachelor's of Science degree in Electrical Engineering from New York Institute of Technology, Old Westbury, New York, and an Associates in Engineering Science degree from Farmingdale State University of New York. Mike has over 35 years of radio broadcasting experience and over 25 years of data acquisition, marketing and applications engineering experience in the automotive, aerospace and power industries providing solution oriented results worldwide via presentations, articles, trade shows, seminars, videos, webinars, white papers and on-site training and demonstrations.

Wednesday, June 13, 2018

Afternoon Breakout Sessions

Joint PELS/IAS Technical Committee Meeting

Wednesday, June 13th, 2018
7.00PM – 8.15PM
Venue: Room 201A

Agenda:

ITEC 2018 Presentation
7.00PM – 7.10PM
ITEC'18 General Chair: Dr. Bulent Sarlioglu, University of Wisconsin-Madison

IEEE Transactions on Transportation Electrification Presentation
7.10PM – 7.20PM
Editor-in-Chief: Dr. Ali Emadi, McMaster University

IEEE Power Electronics Society (PELS) Technical Committee on Vehicle and Transportation Systems (TC4)
7.20PM-7.30PM
Committee Chair: Dr. Alireza Khaligh, University of Maryland – College Park

IEEE Industry Applications Society (IAS) Transportation Systems Committee
7.30PM-7.40PM
Committee Chair: Dr. Mohammad Islam, Halla Mechatronics

IEEE Transportation Electrification Community
7.40PM-7.50PM
TEC Chair: Dr. Yaobin Chen, Indiana University-Purdue University Indianapolis

ITEC 2019 Presentation
7.50-8.00PM
ITEC'19 General Chair: Dr. Jin Ye – University of Georgia

Technical Committee Meeting is 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 this joint PELS&IAS meeting if you are interested in getting involved with the IEEE-PELS and/or IEEE-IAS activities including ITEC, workshops, publications, awards, etc.

Thursday, June 14, 2018

Keynote Presentations

Plenary Session 2

Thursday, June 14, 2018
8:25AM – 12.00PM
Venue: Room 202

Plenary Session Chairs:

Jin Ye, *University of Georgia*
Omer Onar, *Oak Ridge National Laboratory*

Welcome Presentation by Transportation Electrification Community
Yaobin Chen - Chair

Keynote Presentation 1: Impact of Uncoordinated Plug-in Electric Vehicle Charging on Residential Power Demand
8.30AM – 9.00AM
Speaker: Johney Green Jr.
Associate Laboratory Director,
Mechanical and Thermal Engineering Sciences,
National Renewable Energy Laboratory

Short Biography: Dr. Johney Green Jr. serves as the Associate Laboratory Director for the Mechanical and Thermal Engineering Sciences directorate at the National Renewable Energy Laboratory (NREL). Green oversees early-stage and applied research and development in NREL's advanced manufacturing, buildings, concentrating solar power, geothermal, transportation, water, and wind programs. Prior to assuming his current position, Green held a number of leadership roles at Oak Ridge National Laboratory (ORNL), where he served as director of the Energy and Transportation Science Division and group leader for fuels, engines, and emissions research. Green has served on numerous advisory boards for organizations including the Georgia Institute of Technology, the University of Tennessee, and the University of Memphis. He is a fellow of SAE International and is active in the National Academy of Engineering. He holds two U.S. patents in combustion science and, as the lead or co-author of several technical publications. Green holds a bachelor's degree in mechanical engineering from the University of Memphis and a master's and doctorate in mechanical engineering from the Georgia Institute of Technology

Keynote Presentation 2: Engine Coolant Power Dense 200 kW 1050 V DC Bus SiC Dual Inverter
9.00AM – 9.30AM
Speaker: *Brij N. Singh,*
Senior Engineer,
John Deere

Short Biography: Brij N. Singh is a senior staff engineer in John Deere. He is leading a DOE PowerAmerica funded project in John Deere to develop a 200 kW SiC inverter for heavy-duty vehicle applications. Brij has earned a Ph.D. in Electrical Engineering from the Indian Institute of Technology, New Delhi, India, in 1996. In 1996, Brij joined the École de Technology Supérieure (School of Advanced Technology), Université du Québec (University of Quebec), Montreal, QC, Canada, as a Post-Doctoral Fellow. In 1999, Brij joined Concordia University, Montreal, QC, Canada as a Research Fellow. In 2000, Brij joined the Department of Electrical Engineering and Computer Science, Tulane University, New Orleans, Louisiana, as an Assistant Professor. In 2007, Brij joined John Deere in Fargo, North Dakota. In Tulane Brij received numerous teaching awards for outstanding instructions in electrical engineering. In John Deere Brij received numerous awards for product and technology innovations and team collaboration activities. Brij has published over 90 research papers in various Journals, such as IEEE Transactions and IET Journals. Brij has 15 US patents and over 25 US pending patents.

Thursday, June 14, 2018

Keynote Presentations

Keynote Presentation 3: Riding the Technology S-Curve: Electrostatic Machines

9.30AM – 10.00AM

Speaker: *Dan Ludois*
CoFounder and Chief Science Officer
C-Motive Technologies

Short Biography: Daniel Ludois received his Ph.D. in electrical engineering from the University of Wisconsin–Madison in 2012 and B.S. in Physics from Bradley University in 2006. Dr. Ludois currently serves as assistant professor of electrical and computer engineering in UW–Madison's College of Engineering, associate director of the internationally renowned Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC), and is an affiliate of the Wisconsin Energy Institute. Currently, Dr. Ludois's interests are focused on the use of electric fields in power conversion devices such as motors, generators and wireless power transfer. Dr. Ludois is also cofounder and chief science officer of C-Motive Technologies, a start-up business dedicated to producing innovative, energy and cost-efficient electrostatic motors. He received the NSF CAREER Award in 2015, was named Midwest Energy News 40 under 40 in 2016 and a Moore Inventor Fellow in 2017.

Coffee Break: 10.00AM – 10.30AM

Keynote Presentation 4: Switched Reluctance Motor Drives: Market Opportunities and Groundbreaking New Technologies

10.30AM – 11.00AM

Speaker: *Ali Emadi,*
President and CEO, Enedym Inc.
and Professor, McMaster University

Short Biography: Ali Emadi is the Founder, President, and CEO of Enedym Inc. – a university spin-off company of McMaster University. He is also the Canada Excellence Research Chair in Hybrid Powertrain at McMaster University in Hamilton, Ontario, Canada. Before joining McMaster University, Dr. Emadi was the Harris Perlstein Endowed Chair Professor of Engineering and Director of the Electric Power and Power Electronics Center and Grainger Laboratories at Illinois Institute of Technology in Chicago, IL. He is the principal author/coauthor of over 450 journal and conference papers as well as several books including *Vehicular Electric Power Systems* (2003) and *Energy Efficient Electric Motors* (2004). He is also the editor of the *Handbook of Automotive Power Electronics and Motor Drives* (2005) and *Advanced Electric Drive Vehicles* (2014). Dr. Emadi was the Inaugural General Chair of the 2012 IEEE Transportation Electrification Conference and Expo (ITEC) and has chaired several IEEE and SAE conferences in the areas of vehicle power and propulsion. He is the founding Editor-in-Chief of the *IEEE Transactions on Transportation Electrification*.

Thursday June 14, 2018

Keynote Presentations

Keynote Presentation 5: Driving Research Forward

11.00AM – 11.30AM

Speaker: *Rachael Nealer,*
Program Manager, Vehicle Technologies,
Department of Energy

Short Biography: Dr. Rachael Nealer is a program manager at the Department of Energy in the Vehicle Technologies Office. Her current portfolio spans research and development in transportation systems modeling as well as produces publicly available transportation data as a foundation for modeling and analysis done at DOE, the national labs, and beyond. Previously, Dr. Nealer worked at the Union of Concerned Scientists researching the environmental impacts of electric vehicles compared to gasoline vehicles over their life. Prior to UCS she worked at the Environmental Protection Agency in the Renewable Fuels Standard office and she received her joint PhD in Civil and Environmental Engineering and Engineering and Public Policy from Carnegie Mellon University where she specialized in lifecycle environmental impacts of transportation.

Keynote Presentation 6: Research and Education Programs in Energy, Power, Control Networks (EPCN)
11:30 AM – 12:00 PM

Speaker: *Alireza Khaligh*
Associate Professor at University of Maryland and Expert at the National Science Foundation

Short Biography: Dr. Alireza Khaligh is an Expert at the Energy, Power, Control, and Networks (EPCN) program in the Division of Electrical, Communications, and Cyber Systems (ECCS) at the National Science Foundation. He is also an Associate Professor and the Director of the *Maryland Power Electronics Laboratory (MPEL)* at the Department of Electrical and Computer Engineering (ECE) and the Institute for Systems Research (ISR) in the University of Maryland at College Park (UMD). Dr. Khaligh's major research interests include modeling, analysis, design, and control of power electronic converters. He is an author/co-author of more than 180 journal and conference papers. Dr. Khaligh is the recipient of various recognitions including 2017 Outstanding Young Alumnus Award from Illinois Institute of Technology, the 2016 E. Robert Kent Junior Faculty Teaching Award from Clark School of Engineering at UMD, the 2016 Junior Faculty Outstanding Research Award from Clark School of Engineering at UMD, the 2015 Junior Faculty Fellowship from the Institute for Systems Research at UMD, 2013 George Corcoran Memorial Award from the ECE Department at UMD, three Best Vehicular Electronics Awards from IEEE Vehicular Electronics Society (VTS), and 2010 Ralph R. Teetor Educational Award from Society of Automotive Engineers. Dr. Khaligh was the General Chair of the 2016 IEEE Applied Power Electronic Conference and Expo (APEC), Long Beach, CA, and also the General Chair of the 2013 IEEE Transportation Electrification Conference and Expo (ITEC), Dearborn, MI. Dr. Khaligh is a Distinguished Lecturer of the IEEE Vehicular Technology Society and also a Distinguished Lecturer of the IEEE Industry Applications Society.

Thursday, June 14, 2018

Poster Session 2

Thursday June 14th, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chair: Woonki Na, California State University, Fresno

Paper ID	Title/Author
6003	**Efficient Interfacing Electric Vehicles with Grid Using Bi-Directional Smart Inverter** *Ashley Kaiser, Andrew Nguyen, Ryan Pham, Michael Granados, Ha Thu Le* California State Polytechnic University, Pomona, United States
6004	**Making Electric Vehicles Smarter with Grid and Home Friendly Functions** *Thang Vo, Jassimran Sokhi, Andrew Kim, Ha Thu Le* California State Polytechnic University, Pomona, United States
6005	**A Review of Front End AC-DC Topologies in Universal Battery Charger for Electric Transportation** *Jaya Sai Praneeth A.V., Sheldon S. Williamson* University of Ontario Institute of Technology, Canada
6040	**Power Channel Based Power Electronics Transformer (PC-PET) with Reduced Capacitance for Interfacing AC and DC Grid** *Liqun He{1}, Yong Yang{1}, Mingdi Fan{1}, Menxi Xie{1}, Yinnan Yuan{1}, Shengfang Fan{2}* {1}Soochow University, China; {2}Suzhou Powersite Electric CO. Ltd., China
6055	**Decentralized Controller for Energy Storage Management on MVDC Ship Power System with Pulsed Loads** *Samy Faddel, Tarek Youssef, Osama Mohammed* Florida International University, United States
6061	**Analytical Models of Wireless Power Transfer Systems with a Constant-Power Load** *Yiming Zhang, Tianze Kan, Zhengchao Yan, Chris Mi* San Diego State University, United States
6064	**A Bayesian Framework for EV Battery Capacity Fade Modeling** *Mehdi Jafari, Laura E. Brown, Lucia Gauchia* Michigan Technological University, United States
6069	**Multi-Objective Coordinated Charging and Discharging Strategy of Electric Vehicle Between Different Regions** *Hui Hou{2}, Xianbin Ke{2}, Chengzhi Wang{1}, Xianqiang Li{2}, Mengya Xue{2}, Tao Xu{2}* {1}State Grid Hubei Electric Power Company, China; {2}Wuhan University of Technology, China
6076	**A Comparison of Electric Vehicle Power Systems to Predict Architectures, Voltage Levels, Power Requirements, and Load Characteristics of the Future All-Electric Aircraft** *Richard Alexander, Danielle Meyer, Jiankang Wang* Ohio State University, United States

Thursday, June 14, 2018

Poster Session 2

Thursday June 14th, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chair: Woonki Na, California State University, Fresno

Paper ID	Title/Author
6074	**Battery Modeling Using Real Driving Cycle and Big-Bang Big-Crunch Algorithm** *Loic Vichard{4}, Simon Morando{1}, Alexandre Ravey{4}, Fabien Harel{3}, Pascal Venet{3}, Serge Pelissier{5}, Daniel Hissel{2}* {1}Faurecia, France; {2}FCLAB, Universite Bourgogne - Franche-ComtÃ©, FEMTO-ST Institute, France; {3}FCLAB, Universite Bourgogne - Franche-Comte, Universite Claude Bernard Lyon 1, France; {4}FEMTO-ST Institute / UniversitÃ© Bourgogne Franche-Comte / UTBM / FCLAB, France; {5}Universite Claude Bernard Lyon/ IFSTTAR, France
6095	**A Bidirectional NPC-Based Level 3 EV Charging System with Added Active Filter Functionality in Smart Grid Applications** *Ali Mortezaei{2}, Mohamad Abdul-Hak{2}, Marcelo Godoy Simoes{1}* {1}Colorado School of Mines, United States; {2}Mercedes-Benz Research & Development North America, United States
6097	**Fault Considerations of Non-Isolated Electric Vehicle Chargers with a Mutual DC Supply** *Kilian Gosses{1}, Julian Kaiser{1}, Leopold Ott{1}, Matthias Schulz{1}, Fabian Fersterra{1}, Bernd Wunder{1}, Yunchao Han{2}, Melanie Lavery{2}, Martin MÃ¤rz{2}* {1}Fraunhofer IISB, Germany; {2}Friedrich-Alexander-University Erlangen-NÃ¼rnberg, Germany
6115	**Performance Analysis of a Single-Stage High-Frequency AC-AC Buck Converter for a Series-Series Compensated Inductive Power Transfer System** *Phuoc S Huynh, Deepa Vincent, Najath Azeez, Lalit Patnaik, Sheldon S. Williamson* University of Ontario Institute of Technology, Canada
6121	**Self-Pumped Air-Cooling Design for a High-Speed High-Specific-Power Motor** *Xuan Yi{2}, Reed Sanchez{2}, Kiruba S. Haran{2}, Joseph P. Veres{1}, Aaron T. Perry{2}, Philip J. Ansell{2}* {1}NASA Glenn Research Center, United States; {2}University of Illinois Urbana - Champaign, United States
6122	**Workplace Charge Management with Aggregated Building Loads** Myungsoo Jun, Andrew Meintz National Renewable Energy Laboratory, United States
6134	**Integrated Single-Phase EV Charging Using a Dual-Inverter Drive** *Sepehr Semsar, Theodore Soong, Peter Lehn* University of Toronto, Canada

Thursday, June 14, 2018

Poster Session 2

Thursday June 14th, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chair: Woonki Na, California State University, Fresno

Paper ID	Title/Author
6151	**Smart Grid Distribution Management System (SGDMS) for Optimized Electricity Bills** Weixian Li, Chong Hao Ng, Thillainathan Logenthiran, Van-Tung Phan, Wai Lok Woo University of Newcastle upon Tyne, Singapore
6158	**Multistate Markov Analysis in Reliability Evaluation and Life Time Extension of DC-DC Power Converter for Electric Vehicle Applications** *Vamsi Mulpuri, Moinul Haque, Mohammad Noor Shaheed, Seungdeog Choi* University of Akron, United States
6173	**Ruler-Search Technique (RST) Algorithm to Locate Charging Infrastructure on a Particular Interstate or US-Highway** *Subhaditya Shom, Arpan Guha, Mahmoud Alahmad* University of Nebraska- Lincoln, United States
6186	**Li-Fi Based Smart Traffic Network** *Adan Correa, Abdelrahman Hamid, Eric Sparks* University of Houston, United States
6188	**Multi-Objective System Design Synthesis for Electric Powertrain Development** *Martin Hofstetter{1}, Mario Hirz{1}, Martin Gintzel{2}, Andreas Schmidhofer{2}* {1}Graz University of Technology, Austria; {2}Magna Powertrain GmbH & Co KG, Austria
6205	**A 3.6 kV Full SiC Fuel Cell Boost Converter for High Power Electric Aircraft** *Otto Kreutzer, Maximilian Gerner, Markus Billmann, Martin MÃ¤rz* Fraunhofer IISB, Germany
6212	**Methodology for Utility Incentive Programs to Advance Nonroad Electric Vehicles and Charging Infrastructure** *Ian Metzger, Brenton Montgomery, Angela Gordon, Robert St. Amand, Scott Steiner* Lockheed Martin Energy, United States
6239	**An MPC-Based Power Management of a PV/Battery System in an Islanded DC Microgrid** *Salem Batiyah{1}, Nasibeh Zohrabi{1}, Sherif Abdelwahed{2}, Roshan Sharma{1}* {1}Mississippi State University, United States; {2}Virginia Commonwealth University, United States
6243	**Dynamic Analysis of a Novel Synchronous Reluctance Motor with a Sinusoidal Anisotropic Rotor** *Mbika Muteba, Dan Valentin Nicolae* University of Johannesburg, South Africa

Thursday, June 14, 2018

Poster Session 2

Thursday June 14th, 2018
12:00 PM – 2:00 PM
Exhibit Hall
Session Chair: Woonki Na, California State University, Fresno

Paper ID	Title/Author
6257	**A Novel Dependence-Decoupling Method for Battery Cell Balancing** *Jiucai Zhang{1}, Jin Shang{1}, Yizhen Zhang{1}, Gang Li{2}, Hongzhong Qi{2}, Ao Mei{2}* {1}GAC R&D Center Silicon Valley Inc, United States; {2}Guangzhou Automotive Engineering Institute, China
6265	**A Modular Multi-Level Converter for Energy Management of Hybrid Storage System in Electric Vehicles** *Sharon George, Mohamed Badawy* San Jose State University, United States
6268	**Comprehensive Design and Control of Electric Powertrain Evaluation Platform for Next Generation EV/HEV Development** *Xiaorui Wang, Deepak Gunasekaran, Allan Taylor, Wei Qian, Fang Z. Peng* Michigan State University, United States
6295	**State-of-Charge Estimation of the Lithium-Ion Battery Using Neural Network Based on an Improved Thevenin Circuit Model** *Haoliang Zhang{1}, Woonki Na{1}, Jonghoon Kim{2}* {1}California State University, Fresno, United States; {2}Chungnam National University, Korea
6314	**Bearingless Motor Technology for Industrial and Transportation Applications** *Eric Severson* University of Wisconsin Madison, United States
6322	**Optimal Charging of Plug-in Electric Vehicle (PEV) in Residential Area** *Harun Turker* Turker Ar-Ge Smart Grid, Turkey

Thursday, June 14, 2018

Afternoon Breakout Sessions

Short Course 4: Developing Battery Models for System Level Simulation and Control Design

Thursday, June 14th, 2018
2:00PM – 5:40PM (3:20PM-4:20PM Coffee Break in Exhibit Hall)
Venue: Room 201A

Instructor: Javier Gazarri, MathWorks

Tutorial Description:

Battery systems constitute an essential technology driving new areas of growth in sectors such as automotive, aerospace, renewable energy, medical devices, and consumer electronics. Applications that rely on battery packs as their energy supply require sophisticated management systems that ensure safe and reliable performance throughout intended operating conditions.

Typical tasks of the battery management system include charge and discharge power limiting, cell balancing, thermal management, and safety cut-off. Designing this control system requires knowledge of the battery cell internal resistance and dynamics. Battery system engineers often resort to battery cell models that contain internal resistance and dynamic information for optimization, tuning, testing, and verification of their algorithms via simulation.

This tutorial shows how to develop battery cell models for system level simulation and control design based on equivalent circuits parameterized via parameter estimation. Using a combination of simulation and optimization, equivalent circuit parameters result in fitting a unit cell simulation to isothermal pulsed discharge experiments. The procedure is repeated at different temperatures and, if available, at different number of cycles. The result are nonlinear multi-dimensional look-up tables that populate each equivalent circuit element of the battery cell block. This block constitutes the functional unit of a battery pack model that includes thermal behavior and can be utilized to design cooling strategies, state-of-charge and state-of-health monitoring methods, cell balancing, and general battery management tasks.

Instructor's Short Biography:

Javier Gazarri is a Senior Application Engineer at MathWorks in Novi, Michigan, focusing on the use of physical modeling tools as an integral part of Model-Based Design. He specializes in battery modeling, from cell-level to system-level, parameter estimation for model correlation, battery management system design, balancing, aging, and state-of-charge estimation. During his five-year tenure at MathWorks he has authored five journal articles, and has offered battery modeling seminars in numerous events, both industrial and academic.

Before joining MathWorks, Javier worked on fuel cell modeling at the National Research Council of Canada in Vancouver, British Columbia. He has a Bachelor degree in Mechanical Engineering from the University of Buenos Aires (Argentina), a MASc degree (Inverse Methods), and a PhD degree (Solid Oxide Fuel Cells) both from the University of British Columbia (Canada).

Thursday, June 14, 2018

Afternoon Breakout Sessions

Short Course 5 – Power Semiconductors for Vehicle Traction Inverters: From Discrete to Power Modules, from Silicon to Wide Band Gap Devices

Thursday, June 14th, 2018
2:00PM – 5:40PM (3:20PM-4:20PM Coffee Break in Exhibit Hall)
Venue: Room 201B

Instructor:
André Christmann, Infineon Technologies

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

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

IGBTs (Insulated Gate Bipolar Transistors) – and soon also SiC devices - are at the heart of most modern traction inverters and perform the electronic switching functions. They are assembled in different kinds of packages, mounted onto cooling structures and connected via bus bars to a capacitor bank. A fully functional inverter stack compromises of these components integrated together with other subassemblies, such as control boards, filters and current sensors.
The tutorial will connect various aspects of inverter design from the view point of power semiconductors: Packaging, thermal and electrical performance.

Thermal Design and Efficiency
Both the device and the package performance strongly influence the inverter efficiency, which, in turn, impacts battery life and MPG(e) rating of the vehicle.

Electrical Performance
Apart from losses there are several key parameters of power semiconductor switches that must be considered for example, ease of gate drive design, protection, short circuit capability and switching speed for EMI.

Packaging
Different power semiconductor packages and their integration into inverter systems will be compared. For example an approach with discrete components and a power module based Inverter will be discussed by using Figure of Merits for key design parameters.

Instructor's Short Biography:
André Christmann after completing his PhD worked for 3 years at the Fraunhofer Institute in the area of power semiconductor development. From 2004 - 2011 he was responsible for the development of power semiconductor modules for electrical applications in vehicles at Infineon Technologies AG (Warstein, Germany). During this time he managed the HybridPACK 1 power module development, which is now an industry wide standard footprint for automotive power semiconductor modules. In 2011 he transferred to Infineon North America where he took over a position as System Application Engineer in the area of power semiconductor modules.

Thursday, June 14, 2018

Afternoon Breakout Sessions

Panel 4 –Architecture of Electric Driveline Systems for Future Automotive: Low Voltage (36~48Vdc) versus High Voltage (400~850Vdc)

Thursday, June 14th, 2018

2.00PM – 3.20PM

Venue: Room 202A

Panel Organizer: Dhafar Al-Ani, McMaster University

Panel Moderators:

Dhafar Al-Ani, McMaster University

Joe Palazzolo, Engineering Director eDrive, GKN

Panelists:

1. Joe Palazzolo, Director, GKN Driveline
2. Daniel Benchetrite, New Mobility Director, North America Powertrain Valeo
3. Elie Naim, Technical Specialist –AVL

Panel Summary:

Electrification of the Driveline is a powerful method to get optimal weight, efficiency, size, and performance, which all combine to deliver a high quality and very responsive driveline systems. With all of the hybridization and electrification systems, what are the advantages and concerns of two opponent architecture concepts that are Lower-Voltage systems like 48V and High-Voltage systems from 250, 450 to 850V systems and beyond?

Thursday, June 14, 2018

Afternoon Breakout Sessions

Panel 5 –Multiphase Machines For Traction Drive Systems

Thursday, June 14th, 2018
2:00PM – 3:20PM
Venue: Room 202B

Panel Organizer:
Omid Beik, Senior R&D Engineer, Magna Powertrain

Panel Moderators:
Omid Beik, Senior R&D Engineer, Magna Powertrain
Berker Bilgin, Research Program Manager, McMaster Automotive Resource Center (MARC),

Panelists:
Nigel Schofield, Huddersfield University
James Goss, Motor Design, Ltd
Avoki Omekanda, General Motors

Panel Summary:
Multiphase design for electric machines results in improved torque characteristic and capability in low and extended speed range; it also leads to lower power ratings for the associated power electronic converters and improved DC-link ripples. An important area in the aerospace sector has been improved fault tolerance by recourse to a multiphase design, an area of similar importance for the reliability for electric vehicles. For electric vehicle applications the specification requirements for traction machines include high power density, high efficiency, low mass and wide range of speed operation.

In this panel, various aspects of multiphase machines will be discussed:

- What is the main drive for going forward with multiphase design for traction motors.
- Benefits of multiphase winding in terms of total power electronics die.
- Manufacturing considerations for multiphase windings.
- If happens, when and to what capacity will the automotive industry shift to multiphase machines.

Thursday, June 14, 2018

Afternoon Breakout Sessions

Industry Special Session 3: Flying Cars and Electric Aircraft - Current Trends and Future Strategies

Thursday, June 14th, 2018

2.00PM – 3.20PM

Venue: Room 202C

Speaker: *Kaushik Rajashekara , University of Houston*

Short Summary:

Interest in flying cars is as old as airplanes and automobiles. In recent years, with the rapid advances in technology of engines, electric motors, power converters, and communications, there is an increasing interest in flying vehicles and in electrification of air transport in general. Several companies are already developing a variety of personal air vehicles with the intent of commercialization. Similarly, with the advances in battery and power conversion technologies, there is an increasing interest in the electrification of larger aircraft systems. Airbus, Boeing, and a few other companies have already demonstrated the feasibility of these airplanes and are planning to commercialize them in the near future.

In this panel, representatives from companies that are actively engaged in the development and commercialization of such vehicles will be presenting the work being done in their respective organizations. The following items will be discussed.

- The current trends of flying cars, VTOL (Vertical Take-off and Landing) vehicles, and Electric/Hybrid Electric Aircraft.
- The technical challenges and the problems related to large scale commercialization and deployment
- Meeting Federal regulations and Aerospace standards

Thursday, June 14, 2018

Afternoon Breakout Sessions

Industry Special Session 2 – NH Research, Inc (NHR)

New Advancements in 4-Quadrant Power & Challenges in Functional Testing

Thursday, June 14th, 2018
2:00PM – 3:20PM
Venue: Room 203A

Presentation Summary:
Bidirectional power flow is quickly becoming the new standard for modern products. Examples of bidirectional products include: AC applications, Exporting critical power systems (UPS) and Energy Storage Systems (ESS); DC applications, accessory power modules (APMs) and DC/DC converters; and AC-DC applications, electric vehicle's on-board-chargers (OBCs) especially when they support vehicle-to-grid (V2G), vehicle-to-load (V2L), and vehicle-to-vehicle (V2V) modes. Test equipment manufacturers have released multiple new AC & DC products including 4-quadrant grid-simulators, 4-quadrant bidirectional electronic loads, and battery emulators intended to simplify power control, reduce testing complexity, and maximize testing productivity.
The session will review AC & DC fundamentals as well as commonly available test equipment examples. Building on this foundation, the session will further explore how newer 4-quadrant loads operate, the benefits of newer 4-quadrant loads, and how a bidirectional 4-quadrant load can be considered a "load" even when it may "source" true and reactive powers.
This exploration into the world of test equipment will help to untangle the considerable number of equipment options as well as technical criteria when selecting power supplies, loads, and measuring devices. A partial list of criteria covered includes: Device output characteristics, linear or switching; Quadrants and how many is enough (1, 2, or 4); Unidirectional versus bidirectional power flows; Thermal management through air-cooling, water-cooling, or regeneration; Flexibility in using series, parallel, or series-parallel operation; and more.

Presenters' Biographies:

Martin Weiss has over 20 years' experience developing automated test systems for the evaluation of power electronics & battery systems. He currently holds the position of Product Director with NH Research where he is responsible for all hardware & software testing solutions. Prior to NH Research, he worked as a Principal Design Engineer designing power supplies, battery systems, and test platforms for multiple high-tech companies including Vocollect, Marconi Communications, and Telxon.

Ben Jackson has over 6 years of experience developing automated test systems for military, space, industrial, EV, and solar applications. He currently holds the position of Senior Applications Engineer at NH Research where he is responsible for customizing hardware & software solutions for a wide range of customers. Prior to NH Research, he worked as a Lead Engineer designing next-generation inductive power transfer systems and automated test solutions for the aerospace industry.

Thursday, June 14, 2018

Afternoon Breakout Sessions

Panel 3: Electrification Opportunities and Challenges for Off-road and Heavy Duty Vehicle Industry

Thursday, June 14th, 2018
2:00PM – 3:20PM
Venue: Room 203B

Panel Organizer and Moderator:
Long Wu, John Deere

Panelists:
- Kent Wanner, John Deere
- Andy Dorsett Manager, Wheel Loaders, Joy Global (Komatsu)
- Armen Baronian, Eaton
- Laurence Dunn, Hyster-Yale Group

Panel Summary:

Tightening global legislation and consumer demand for more "green" solutions and better vehicle performance are driving the electrification effort forward for the Off-Road and Heavy Duty Industry. In this panel discussion, panelists from different sectors of the off-road / heavy duty industry will share their perspective on the electrification opportunities and challenges considering different requirements on vehicle operation, power density and environmental constraints compared with automotive industry.

Thursday, June 14, 2018

Afternoon Breakout Sessions

IEEE Transportation Electrification Steering Committee Meeting

Thursday, June 14th, 2018
2:00PM – 3:20PM
Venue: Room 204

The IEEE Transportation Electrification Community (TEC) brings together both IEEE Societies and entities (ITEC sponsors PELS, IAS, and PES as well as four others) as well as individuals with an interest in the broad field of transportation electrification. This meeting is a formal meeting of TEC's steering committee. It is open to anyone, especially individuals who want to be more involved in one or another of TEC's activities, or simply want to be more informed about the behind the scene workings of TEC and IEEE.

IEEE TEC is the sponsor of Thursday night Ice Cream Social, where attendees will have more opportunities to ask questions about TEC and IEEE.

Agenda Item	Time Allotment
Call to Order – Yaobin Chen	2:00pm-2:05pm
Agenda	2:05pm-2:10pm
Summary of Strategic Plan	2:10pm-2:20pm
Implementation of TEC Partnership Fee	2:20pm-2:30pm
Launch of TEC Tutorial Program	2:30pm-2:40pm
ITEC 2019 – Jin Ye	2:40pm-2:50pm
IEEE Transactions on Transportation Electrification Presentation – Ali Emadi	2:50pm-3:00pm
Financial Activities 2018 Budget 2019 Draft Budget	3:00pm-3:10pm
New/Old Business	3:10pm-3:20pm
Adjournment	3:20pm

Thursday, June 14, 2018

Afternoon Breakout Sessions

Panel 6: Electro-Mechanical Automotive Accessory Systems – Current Challenges

Thursday, June 14th, 2018

4.20PM – 5.40PM

Venue: Room 202A

Panel Organizer and Moderator:

Bruno Lequesne, E-motors Consulting

Panelists:

- Tomy Sebastian, Halla Mechatronics
- Christophe Espanet, Moving Magnet Technologies
- Avoki Omekanda, General Motors

Panel Summary:

Accessory systems have been the driving force behind automotive electrification long before hybridization and electric vehicles made it visible. The starter motor invented in 1911 was a key contributor to the development of the gasoline engine. More recently, electric power steering has brought a significant fuel economy advantages for the user (4 to 5%), while other systems have provided comfort (entertainment systems) or improved safety (ABS braking systems). In this panel, we will review some important systems recently introduced to the marketplace, or being considered for production. The focus will be on electromechanical technologies where the motor drive is central to the system. We will see the challenges they are facing, the future they hold, and in particular we will examine what impact hybridization or electric propulsion, on the one hand, autonomous driving, on the other hand, may have on such systems.

Thursday, June 14, 2018

Afternoon Breakout Sessions

Tutorial 4 – Primer on Magnetically Suspended Motor Shafts for Transportation Applications

Thursday, June 14th, 2018
4:20PM – 5:40PM
Venue: Room 202B

Instructor: *Eric Severson, University of Wisconsin-Madison*

Tutorial Description:
The goal of this tutorial is to train participants on the opportunity for magnetic suspension technology to disrupt transportation motor systems. Participants will analyze critical challenges posed by conventional bearing systems in high performance applications, focusing on electrified cars and aircraft. Participants will then explore the basic principles of magnetic forces, operation, and control of magnetic bearings and bearingless motors. Ultimately, participants will evaluate the potential for magnetic suspension technology to disrupt their product development or research field.
Recent commercialization of wideband gap power electronic devices and low cost embedded control systems are enabling higher speed, more light-weight motor systems. This technology is proving critical for transportation applications, which depend on weight reductions to decrease fuel consumption and/or extend battery life. All of this is placing increasingly hostile demands on our bearing systems that conventional bearings are unable to meet. In today's motor systems, bearings are typically the first components to fail—with upward of 80% of turbocharger failures attributable to bearing failure. These challenges have driven a resurgence of industrial interest in magnetic suspension. Come join us to find out how magnetic bearing and bearingless motor technology can address your unique needs.

Instructor's Short Biography:
Eric Severson received his PhD from the University of Minnesota in 2015, where he then worked as a postdoctoral researcher. He received the 2009 NSF GRFP fellowship and the 2009 Department of Defense NDSEG fellowship. Dr. Severson is currently an assistant professor at the University of Wisconsin Madison and an associate director of WEMPEC. His research interests include magnetic suspension for motor systems, the design and control of high fundamental frequency electric machines, and bearingless motors.

Thursday, June 14, 2018

Afternoon Breakout Sessions

Panel 7: Flying Cars and Electric Aircraft

Thursday, June 14th, 2018

4.20PM – 5.40PM

Venue: Room 202C

Panel Organizer and Moderator:

Kaushik Rajashekara, *University of Houston*

Panelists:

- Marty Bradley, Boeing
- Paul Moller, Moller International
- Jacek Kawecki, Uber
- Matt Knapp, Zunum
- Andrew Gibson, Empirical Systems Aerospace

Panel Summary:

Interest in flying cars is as old as airplanes and automobiles. In recent years, with the rapid advances in technology of engines, electric motors, power converters, and communications, there is an increasing interest in flying vehicles and in electrification of air transport in general. Several companies are already developing a variety of personal air vehicles with the intent of commercialization. Similarly, with the advances in battery and power conversion technologies, there is an increasing interest in the electrification of larger aircraft systems. Airbus, Boeing, and a few other companies have already demonstrated the feasibility of these airplanes and are planning to commercialize them in the near future.

In this panel, representatives from companies that are actively engaged in the development and commercialization of such vehicles will be presenting the work being done in their respective organizations. The following items will be discussed.

- The current trends of flying cars, VTOL (Vertical Take-off and Landing) vehicles, and Electric/Hybrid Electric Aircraft.
- The technical challenges and the problems related to large scale commercialization and deployment
- Meeting Federal regulations and Aerospace standards

Thursday, June 14, 2018

Afternoon Breakout Sessions

Tutorial 5 – Fundamental Criteria for E-motor Testing Process

Thursday, June 14th, 2018
4:20PM – 5:40PM
Venue: Room 203A

Instructors: *Lucia Arcaleni and Vincenzo Luca Fiengo, Loccioni*

Tutorial Description: To be successful in the competitive market, the manufacturing companies need to be focused on providing innovative, high quality and added-value products. The strategy is to continue developing innovative technological solutions for eol quality check and laboratories, ensuring high safety of users and integrating services. On e-motor prototype validation and eol testing the correct set up procedure and the philosophy of testing sequence, from the product simulation to the eol, is today more than essential. This tutorial would suggest some issue solutions about set up, test bench architecture and tests sequence in different validation and development process phases.
How to build up the correct testing philosophy? Identify the correct test sequence is the core step to avoid any useless investment and to focus each testing process to the final target: the maximum production efficiency. Which is the effect of a correct testing strategy together with the impact of an innovative testing product design?
After the strategy identification, which is the correct set up to implement? Some technical issue are becoming more and more critical in the hybrid and electric vehicle e-motor test: first of all the needs to reach high speed of rotation (20000 rpm and more), as second the high accuracy measurement of different parameters (like cogging torque) together with the necessity to implement high dynamic cycle in high torque and power conditions. It requires strict alignment, attention on the materials, and detailed mechanical design of the benches. We can resume that these issues requires more perspicacity than in the past where the combustion engine was the focus. Last but not the least the great importance of the noise and vibration reduction required
by the market, during the electric vehicle performance: which are the common test set up required on e-motor systems? Accelerometer or laser doppler vibrometer are able to be installed in the new high frequency environment? What about the other no contact measurement sensors?
The tutorial wants to give suggestions about e-motors testing set up, inherent with the new requirements born with the hybrid market, based on some realized application.

Instructors' Short Biographies:

Lucia Arcaleni, 29 years old, is a research and development engineer at Loccioni (Italy) since 5 years. She is a mechanical engineer, graduated in 2012, at Università Politecnica delle Marche with a thesis on optical control quality methods development and an executive master on technologies and management for innovations at ISTAO business school. She is today a student of the Center for professional development of Stanford University, for "Energy Storage" and "Behaviorally Informed Design for Energy Conservation" courses. In Loccioni, she is a research project leader for different e-motor testing application, both for 48V and high voltage solution, for OEMs and Tier1.

Vincenzo Luca Fiengo, is currently a Research and Development Engineer at Loccioni (Italy). Born in Italy, in 1992, he received Master's degree in Automation Engineering, from the University of Napoli Federico II, in March 2017. In March – July 2016 he visited the Department of Electrical Engineering, University of Eindhoven (Netherlands), where he developed his master thesis on a control architecture for charging electric vehicles. In Loccioni Group, he is a research project leader for different e-motor testing applications, for OEM and TIER1 customers.

Thursday, June 14, 2018

Industry Applications Society Workshop

"West Coast Chapter Meeting 2018"

ITEC 2018 Conference attendees, IAS members and non-members are cordially invited to take part in the IAS Workshop organized in conjunction with the ITEC 2018 Conference, http://itec-conf.com/ . This workshop, called "West Coast Chapter Meeting 2018", is the third in the series of regional IAS chapter meetings in USA, following the "East Coast Chapter Meeting", New York NY, 2016 and the "Central US Chapter Meeting", Arlington TX, 2016. The aim of these regional meetings is to establish direct contact between IAS members and IAS Executive Board members as well as to provide information about the current status of the IA-Society. Your valuable feedback and ideas may be expressed to help shape the strategic plan for IAS going forward.

Venue:
Long Beach Convention Center, Long Beach, CA USA, Room 204

Date and time:
Thursday, 14 June 2018, 4:20PM - 5:40PM

Hosts:
ITEC 2018 Organizing Committee
IAS Chapters and Membership Department

Schedule:

4:20 PM	Opening and introduction of the invited speakers David Eng, IAS Chapters Area Chair R-6
4:23 PM	Welcome address and ITEC 2018 Overview Bulent Sarlioglu, ITEC 2018 Organizing Committee General Chair
4:30 PM	IAS Overview - Products and Services Tomy Sebastian, IAS President Patrick McCarren, IAS Executive Director
4:50 PM	Introduction of the activity of IAS Technical Departments Ahmed Rubaai, IAS Manufacturing Systems Development and Applications (MSDA) Department Chair Steve Coppinger, Process Industries (PI) Department Chair Andrew Hernandez, Industrial and Commercial Power Systems (I&CPS) Department Chair Ayman El-Refaie, Industrial Power Conversion Systems (IPCS) Department Chair
5:10 PM	IAS chapters and membership activity Peter Magyar, Chapters and Membership Department (CMD) Chair Blake Lloyd, CMD Travel Awards and Events Standing Committee Chair Lesley Arakkal, CMD Chapter Promotion Programs Standing Committee Chair David Eng, CMD, IAS Chapters Area Chair R-6 Jason Poon, CMD, IAS Student Branch Chapters Area Chair R-4 and R-6 Wang Xin, CMD, IAS Student Branch Chapters Area Chair R-1, R-2, R-3 and R-5
5:25 PM	Q&A Session
5:40 PM	Closing

Moderator:
David Eng, IAS Chapters Area Chair R-6

Workshop contact:
Peter Magyar, IAS CMD Chair
peter.magyar@ieee.org

Registration:
The participation is free of charge.
Registration is requested online. You can access it through the Whova App agenda. Look for IAS Workshop and find the registration link inside the description.

Friday, June 15, 2018

Morning Breakout Sessions

Technical Session 1: Power Electronics I Session Chairs: Ye Li, Apple and Jiucai Zhang, GAC R&D Center Silicon Valley	
Friday, June 15, 2018 8:30 AM – 10:10 AM, Room 201A	
TS1-1	**Die Level Sensor Integration in SiC Power Modules** *Minhao Sheng, Muhammad Alvi, Robert Lorenz, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison*
TS1-2	**Design of a Fast Dynamic on-Resistance Measurement Circuit for GaN Power HEMTs** *Fei Yang, Chi Xu, Enes Ugur, Shi Pu, Bilal Akin, University of Texas at Dallas*
TS1-3	**A Modular Single-Phase Bidirectional EV Charger with Current Sharing Optimization** *Mithat Kisacikoglu, University of Alabama, United States*
TS1-4	**Input Impedance Modeling of Three-Level Multi-Stage NPC Topology** *Markus Makoschitz, Johannes Stoeckl, Wolfgang Hribernik, Austrian Institute of Technology GmbH*
TS1-5	**A Three-Phase AC-AC Matrix Converter with Simplified Bidirectional Power Control for Inductive Power Transfer Systems** *Masood Moghaddami, Arif Sarwat, Florida International University, United States*

Technical Session 2: Electric Machines I Session Chairs: Hao Ge and Christian Dinca, Tesla	
Friday, June 15, 2018 8:30 AM – 10:10 AM, Room 201B	
TS2-1	**Design and Analysis of Line Start Synchronous Reluctance Motor with Dual Saliency** *Bikrant Poudel, Ebrahim Amiri, Parviz Rastgoufard, University of New Orleans*
TS2-2	**A High Torque Density Outer Rotor Claw Pole Stator Permanent Magnet Synchronous Motor** *Jingchen Liang{2}, Amir Parsapour{2}, Eva Cosoroaba{2}, Minxiang Wu{2}, Ion Boldea{1}, Babak Fahimi{2}, {1}* Universitatea Politehnică Timişoara*, Romania; {2}University of Texas at Dallas, United States*
TS2-3	**Performance Validation of a PM Spoke Machine for MotorSport Application Including 3DLeakage Effects** *Giuseppe Volpe{2}, Fabrizio Marignetti{2}, Sara Roggia{1}, Mircea Popescu{1}, James Goss{1}, {1}Motor Design ltd., United Kingdom; {2}University of Cassino and Southern Lazio, Italy*
TS2-4	**High Temperature Operation and Increased Cooling Capabilities of Switched Reluctance Machines Using 3D Printed Ceramic Insulated Coils** *Fabian Lorenz, Johannes Rudolph, Ralf Werner, Chemnitz University of Technology*
TS2-5	**Sensitivity Analysis and Design of a High Performance Permanent-Magnet-Assisted Synchronous Reluctance Motor for EV Application** *Pengyu Li, Wen Ding, Guoji Liu, Xi'an Jiaotong University*

Friday, June 15, 2018

Morning Breakout Sessions

Technical Session 3: Electric Machines II
Session Chairs: Paolo Omenetti, Loccioni, and Babak Nahid-Mobarakeh, University of Lorraine-France

Friday, June 15, 2018
8:30 AM – 10:10 AM, Room 202A

TS3-1	**A New Space Harmonics Minimization Strategy for Fractional Slot Concentrated Windings** *Md Sariful Islam{3}, Md Ashfanoor Kabir{2}, Rajib Mikail{1}, Iqbal Husain{3}, {1}ABB Inc., United States; {2} ABB US Corporate Research Center, United States; {3}North Carolina State University, United States*
TS3-2	**Comparison of the Reluctance and Permanent Magnet Synchronous Machine Operating at High Temperatures** *Marcin Lefik{2}, Krzysztof Komeza{2}, Ewa Napieralska Juszczak{3}, Daniel Roger{3}, Piotr Napieralski{1},* *{1}Lodz University of Technology, Poland; {2}Technical University of Lodz, Poland; {3}* Université d'Artois / LSEE, France
TS3-3	**A Proposition for Improving the Design of Motor Windings for Low-Pressure Environment** *Daniel Roger{2}, Sonia Ait-Amar{2}, Ewa Napieralska Juszczak{2}, Piotr Napieralski{1}, {1}Lodz University of Technology, Poland; {2}* Université d'Artois / LSEE, France
TS3-4	**Efficiency Optimization Method of an Ultra-High Speed, Low Torque Permanent Magnet Motor with Multiphase Configuration** *Md Tawhid Bin Tarek, Seungdeog Choi, University of Akron, United States*
TS3-5	**Synchronous Space Vector Voltage Modulation of Three-Phase Inverter with Low Switching Number** *Hyeon-Gyu Choi, Jin-Su Hong, Jung-Ik Ha, Seoul National University, Korea*

Technical Session 4: Motor Drivers I
Session Chairs: Lei Gu, Karma Automotive and Dionne Hernandez Lugo, NASA

Friday, June 15, 2018
8:30 AM – 10:10 AM, Room 202B

TS4-1	**Online MTPA Control of IPMSM for Automotive Applications Based on Robust Numerical Optimization Technique** *Hyeon-Sik Kim{2}, Younggi Lee{2}, Seung-Ki Sul{2}, Jayeong Yu{1}, Jaeyoon Oh{1}, {1}LG Electronics Inc., Korea; {2}Seoul National University, Korea*
TS4-2	**Nonlinear Kalman Filtering Based Sensorless Direct Torque Control of Surface-Mounted Permanent Magnet Synchronous Motors** *Joon Bum Park, Xin Wang, Southern Illinois University, United States*
TS4-3	**Compensation of Nonlinear Effects in Automotive 48V Position Sensorless IPMSM Drive Systems** *Le Sun{4}, Shamsuddeen Nalakath{4}, Horacio Beckert Polli{2}, Daniel Luedtke{3}, Matthias Preindl{1}, {1} Columbia University, United States; {2}FCA US LLC, United States; {3}Fiat Chrysler Automobiles, United States; {4}McMaster University, Canada*
TS4-4	**Optimization-Based Position Sensorless Control for Induction Machines** *Alan Dorneles Callegaro{3}, Shamsuddeen Nalakath{3}, Lakshmi Narayanan Srivatchan{2}, Daniel Luedtke{2}, Matthias Preindl{1}, {1}Columbia University, United States; {2}Fiat Chrysler Automobiles, United States; {3}McMaster University, Canada*

Friday, June 15, 2018

Morning Breakout Sessions

Technical Session 5: Thermal Management and Packaging
Session Chairs: Yiming Zhang, San Diego State University, And Ernesto Inoa, AC Propulsion, Inc.

Friday, June 15, 2018
8:30 AM – 10:10 AM, Room 202C

TS5-1	**Thermal Analysis of an Electrical Traction Motor with an Air Cooled Rotor** *Markus Jaeger, Andreas Ruf, Kay Hameyer, Thorben Grosse-von Tongeln, RWTH Aachen University, Germany*
TS5-2	**Thermal Analysis of Lateral GaN HEMT Devices for High Power Density Integrated Motor Drives Considering the Effect of PCB Layout and Parasitic Parameters** *Woongkul Lee, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS5-3	**Thermal Runaway Prevention of Li-Ion Batteries by Novel Thermal Management System** *Mark Hartmann, Joe Kelly, Outlast Technologies LLC, United States*
TS5-4	**Impact of Heat Dissipation Profiles on Power Electronics Packaging Design** *Tong Wu{1}, Burak Ozpineci{2}, {1}University of Tennessee, United States; {2}University of Tennessee / Oak Ridge National Laboratory, United States*
TS5-5	**Performance Evaluation of Thermal Management for a 3-Phase Interleaved DC-DC Boost Converter** *Romina Rodriguez, Maryam Alizadeh, Jennifer Bauman, P. Sai Ravi, Ali Emadi, McMaster University, Canada*

Technical Session 6: Electric Vehicle Systems and Components I
Session Chairs: Kartik Iyer, University of Minnesota,Twin Cities and Dhafa Al-Ani, Fiat Chrysler Automobiles

Friday, June 15, 2018
8:30 AM – 10:10 AM, Room 203A

TS6-1	**Influencing Factors in Low Speed Regenerative Braking Performance of Electric Vehicles** *Shoeib Heydari{3}, Poria Fajri{3}, Nima Lotfi{2}, Bamdad Falahati{1}, {1}SEL Engineering Services, Inc., United States; {2}Southern Illinois University, United States; {3}University of Nevada Reno, United States*
TS6-2	**Mass Production Costing of Induction Machines for Automotive Applications** *Vladimir Hundak, Tom Cox, Gaurang Vakil, Christopher Gerada, University of Nottingham, United Kingdom*
TS6-3	**Design and Optimization of an Electric Vehicle with Two Battery Cell Chemistries** *Christina Riczu, Saeid Habibi, Jennifer Bauman, McMaster University, Canada*
TS6-4	**Design of a 48V Electric All-Wheel-Drive System for a Hybrid Vehicle** *Martin Nell{2}, Daniel Butterweck{2}, Kay Hameyer{2}, Orkan Eryilmaz{1}, {1}GKN Driveline, Germany; {2} RWTH Aachen University, Germany*

Friday, June 15, 2018

Morning Breakout Sessions

Technical Session 7: Smart Grid, Electrical Infrastructure, and V2G Applications I Session Chairs: Liang Du, Temple University and Ha Le, California State Polytechnic University Pomona	
Friday, June 15, 2018 8:30 AM – 10:10 AM, Room 203B	
TS7-1	**A Data-Driven Framework for Residential Electric Vehicle Charging Load Profile Generation** *Zonggen Yi, Don Scoffield, Idaho National Laboratory, United States*
TS7-2	**Estimated Value of Smart / Managed Charging of Electric Vehicles for a Vertically Integrated Utility** *Deepak Aswani, Bill Boyce, David Yomogida, Sacramento Municipal Utility District, United States*
TS7-3	**An Implementation of Solar PV Array Based Multifunctional EV Charger** *Anjeet Verma{2}, Bhim Singh{2}, Ambrish Chandra{1}, Kamal Al-Haddad{1}, {1}* École de Technologie Supérieure*; {2}Indian Institute of Technology Delhi, India*

Technical Session 8: Aerospace and Marine Applications Session Chairs: Ali Mohammadpour, Honeywell and Jalpa Shah, Eaton	
Friday, June 15, 2018 8:30 AM – 10:10 AM, Room 203C	
TS8-1	**Design of Minimum Fuel Consumption Energy Management Strategy for Hybrid Marine Vessels with Multiple Diesel Engine Generators and Energy Storage** *Olve Mo, Giuseppe Guidi, SINTEF Energy Research, Norway*
TS8-2	**Wireless Energy Harvesting System Through Metal for Aerospace Sensor** *Chi Pham{2}, Tuan Anh Vu{2}, William Tran{2}, Anh Vu Pham{2}, Christopher Gardner{1}, {1}Lawrence Livermore National Laboratory, United States; {2}University of California, Davis, United States*
TS8-3	**Turbo-Electric Distributed Aircraft Propulsion: Microgrid Architecture and Evaluation for ECO-150** *David Loder, Andrew Bollman, Michael Armstrong, Rolls-Royce North American Technologies Inc., United States*
TS8-4	**Design and Small Signal Stability Analysis of DC Side Parallel-Connected Power System for the All-Electric Vessel** *Jian Zhang, Xuhui Wen, Zhaopeng Yan, Institute of Electrical Engineering, Chinese Academy of Sciences, China*

Friday, June 15, 2018
Morning Breakout Sessions

Technical Session 9: Power Electronics II Session Chair: Wei Liang, Stanford	
Friday, June 15, 2018 10:30 AM – 12:10 AM, Room 201A	
TS9-1	**RUL Estimation of Power Semiconductor Switch Using Evolutionary Time Series Prediction** *Moinul Haque, Mohammad Noor Shaheed, Seungdeog Choi, University of Akron*
TS9-2	**Design of an Integrated Inductor for 45kW Aerospace Starter-Generator** *Muhammad Raza Khowja, Christopher Gerada, Gaurang Vakil, Syed Quadir Quadri, Patrick William Wheeler, Chintan Patel, University of Nottingham*
TS9-3	**Minimum Volume Design of a Forced-Air Cooled Three-Phase Power Factor Correction Stage for Electric Vehicle Chargers** *Friedrich Schultheiß{1}, Thinh Nguyen-Xuan{1}, Achim Endruschat{2}, Martin März{2}, {1}BMW AG, Germany; {2}Fraunhofer IISB, Germany*
TS9-4	**High Power Traction Inverter Design and Comparison for Electric Vehicles** *Lihua Chen, Baoming Ge, Ford Motor Company*
TS9-5	**On the Period-Doubling Bifurcation in PWM-Controlled Buck Converter** *Sen Li, Babak Fahimi, University of Texas at Dallas*

Technical Session 10: Electric Machines III Session Chairs: Matthias Priendl, Columbia University and Dhafar Al-Ani, Fiat Chrysler Automobiles	
Friday, June 15, 2018 10:30 AM – 12:10 AM, Room 201B	
TS10-1	**A Comparative Study of Inner Vs Outer Rotor Transverse Flux Machine Performances Based on Silicon-Steel Stator Structure** *Adeeb Ahmed, Iqbal Husain, North Carolina State University*
TS10-2	**Trade Studies for a Manganese Bismuth Based Surface Permanent Magnet Machine** *Jagadeesh Tangudu{2}, Gaoyuan Ouyang{1}, Jun Cui{1}, {1}Iowa State University, United States; {2}United Technologies Research Center, United States*
TS10-3	**Torque Per Ampere Enhancement of a Three-Phase Induction Motor by Means of a Capacitive Auxiliary Winding** *Mbika Muteba, Dan Valentin Nicolae, University of Johannesburg, South Africa*
TS10-4	**Improved Sensorless Direct Torque Control Using Space Vector Modulation and Fuzzy Logic Controllers** *Hossein Saberi, Shahab Mehraeen, Louisiana State University*
TS10-5	**Enhanced Algorithm for Real Time Temperature Rise Prediction of a Traction Linear Induction Motor** *Konrad Woronowicz{1}, Alireza Safaee{1}, Ali Maknouninejad{2}, {1}Bombardier Transportation, Canada; {2}Schnieder Electric, United States*

Friday, June 15, 2018
Morning Breakout Sessions

Technical Session 11: Electric Machines IV
Session Chair: Ryan Ahmed, General Motors

Friday, June 15, 2018
10:30 AM – 12:10 AM, Room 202A

TS11-1	**Evaluating the Feasibility of Single-Rotor Topologies in Hybrid Excitation Synchronous Machines for Automotive Traction Applications** *Mohamad Salameh, Antonio Di Gioia, Ian Brown, Mahesh Krishnamurthy, Illinois Institute of Technology, United States*
TS11-2	**Comparison of Low-Pole Axial Flux-Switching and Surface Permanent Magnet Machines** *Ju Hyung Kim{1}, Mingda Liu{2}, Bulent Sarlioglu{2}, {1}University of Wisconsin-Madison, United States; {2} Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS11-3	**Noise and Vibration Performance in Fractional Slot Permanent Magnet Synchronous Machines Using Stator Bridge** *Shuvajit Das{3}, Iftekhar Hasan{3}, Yilmaz Sozer{3}, Rakib Islam{2}, Alejandro Piña Ortega{1}, Jeff Klass{2}, {1}Dyson Ltd., United Kingdom; {2}Nexteer Automotive, United States; {3}University of Akron, United States*
TS11-4	**A Comparative Study of Constant Power Operation Techniques for Low Inductance Machines** *Damien Lawhorn, Narges Taran, Vandana Rallabandi, Dan Ionel, University of Kentucky, United States*

Technical Session 12: Magnetic Materials and Components
Session Chairs: Khurram Afridi, University of Colorado – Boulder and Suman Debnath, Oak Ridge National Laboratory

Friday, June 15, 2018
10:30 AM – 12:10 AM, Room 202B

TS12-1	**Novel Core Designs to Miniaturise Passive Magnetic Components** *Adam Walker, Gaurang Vakil, Christopher Gerada, University of Nottingham, United Kingdom*
TS12-2	**Compact Busbar-Integrated Current Sensing Using 2D Magnetoresistive Point Field Detectors in Power Electronic Systems** *Muhammad Alvi{2}, Minhao Sheng{2}, Robert Lorenz{2}, Matthias Brusius{1}, {1}Sensitec GmbH, Germany; {2}Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS12-3	**Design of Wireless Temperature Monitoring System for Measurement of Magnet Temperature of IPMSM** *Donghoon Park, Hyun-Sam Jung, Hyung-June Cho, Seung-Ki Sul, Seoul National University, Korea*
TS12-4	**Modeling the Degradation of Relative Permeability in Soft Magnetic Materials** *Marco Cossale{1}, Gerd Bramerdorfer{1}, Gereon Goldbeck{1}, Martin Kitzberger{1}, Dietmar Andessner{2}, Wolfgang Amrhein{1}, {1}Johannes Kepler University Linz, Austria; {2}Linz Center of Mechatronics GmbH, Austria*
TS12-5	**Additive Manufacturing of a Soft Magnetic Rotor Active Part and Shaft for a Permanent Magnet Synchronous Machine** *Stefan Urbanek{1}, Bernd Ponick{1}, Alexander Taube{2}, Kay-Peter Hoyer{2}, Mirko Schaper{2}, Stefan Lammers{2}, Tobias Lieneke{2}, Detmar Zimmer{2}, {1}Leibniz Universitat Hannover, Germany; {2} Paderborn University, Germany*

Friday, June 15, 2018

Morning Breakout Sessions

Technical Session 13: Battery Charging Applications and Systems I Session Chairs: Ye Li, Apple and Jiucai Lang, GAC R&D Center Silicon Valley	
Friday, June 15, 2018 10:30 AM – 12:10 AM, Room 202C	
TS13-1	**A Comparison of the Performance and Thermal Management Requirements of Lithium-Ion Batteries During Ultra-Fast Charging** *Melissa He, Phillip Kollmeyer, Mike HauÃŸmann, Ali Emadi, McMaster University, Canada*
TS13-2	**Single-Phase Charging Operation of a Three-Phase Integrated Onboard Charger for Electric Vehicles** *Jimmy Ye{1}, Chuan Shi{2}, Alireza Khaligh{2}, {1}Columbia University, United States; {2}University of Maryland, College Park, United States*
TS13-3	**High-Frequency High-Density Bidirectional EV Charger** *Rimon Gadelrab, Yuchen Yang, Bin Li, Fred Lee, Qiang Li, Center for Power Electronics Systems, Virginia Polytechnic Institute and State University, United States*
TS13-4	**Challenges and Advancements in Fast Charging Solutions for EVs: a Technological Review** *Chengxiu Chen{2}, Fei Shang{1}, Mohamad Salameh{2}, Mahesh Krishnamurthy{2}, {1}Hatco Corporation, United States; {2}Illinois Institute of Technology, United States*

Technical Session 14: Electric Vehicle Systems and Components II Session Chair: Veda Galigekere, Oak Ridge National Laboratory and Beijing Wang, Fiat Chrysler Automobiles	
Friday, June 15, 2018 10:30 AM – 12:10 AM, Room 203A	
TS14-1	**Impact of Temperature Variation on Fuel Economy of Electric Vehicles and Energy Saving by Using Compensation Control** *Silong Li, Di Han, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS14-2	**Experimental Validation of Energy Management Strategy in Hybrid Energy Storage System for Electric Vehicle** *Maciej Wieczorek{2}*, Mirosław*Lewandowski{2}, Krzysztof* Staroński *{1}*, Mikołaj Pierzchała *{2}, {1} Electrotechnical Institute, Poland; {2}Warsaw University of Technology, Poland*
TS14-3	**Cable Modeling for Accurate Estimation of Current and Voltage Ripple in Electric Vehicles** *Andreas Henriksson{1}, John Simonsson{3}, Urban Lundgren{2}, Peter Ankarson{2}, {1}Chalmers University of Technology, Sweden; {2}RISE Research Institutes of Sweden AB, Sweden; {3}Volvo Cars AB, Sweden*
TS14-4	**Modeling EV Fleet Load in Distribution Grids: a Data-Driven Approach** *Qiyun Dang, Yuchong Huo, McGill University, Canada*

Friday, June 15, 2018

Morning Breakout Sessions

Technical Session 15: Policy, Economics, and Grid Impact of Transportation Electrification
Session Chairs: Liang Du, Temple University
and JK Wang, Ohio State University

Friday, June 15, 2018
10:30 AM – 12:10 AM, Room 203B

TS15-1	**Methodology for Evaluating Potential Benefits and Economic Value of Residential Photovoltaic and Battery Energy Storage System** *Pablo Castro Palavicino, Yujiang Wu, Matthew Smuda, Wooyoung Choi, Woongkul Lee, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS15-2	**Indices to Determine the Environmental and Economic Impact of Using an Electric Vehicle Over Gasoline or Hybrid Vehicles on a Regional Basis** *Arpan Guha, Subhaditya Shom, Ala'A Rayyan, Mahmoud Alahmad, University of Nebraska-Lincoln, United States*
TS15-3	**Visualizing the Impact of PEV Charging on the Power Grid** *Ziran Gao, Danielle Meyer, Jiankang Wang, Ohio State University, United States*
TS15-4	**Electrification of Class 8 Trucking: Economic Analysis of in-Motion Wireless Power Transfer Compared to Long-Range Batteries** *Evan Sproul{1}, David Trinko{1}, Zachary Asher{1}, Braden Limb{1}, Thomas Bradley{1}, Jason Quinn{1}, Regan Zane{2}, {1}Colorado State University, United States; {2}Utah State University, United States*

Technical Session 16: Modeling, Simulation, and Control I
Session Chairs: Woonki Na, California State University, Fresno
and Phil Kollmeyer, McMaster University

Friday, June 15, 2018
10:30 AM – 12:10 AM, Room 203C

TS16-1	**A Current Observer to Reduce the Sensor Count in Three-Phase PM Synchronous Machine Drives** *Michael Eull{1}, Mustafa Mohamadian{2}, Daniel Luedtke{2}, Matthias Preindl{1}, {1}Columbia University, United States; {2}Fiat Chrysler Automobiles, United States*
TS16-2	**Practical Considerations for the Implementation of Dynamic Programming for HEV Powertrains** *Jeremy Lempert{2}, Brynn Vadala{2}, Kamran Arshad-Ali{1}, Joel Roeleveld{2}, Ali Emadi{3}, {1}Fiat Chrysler Automobiles, United States; {2}McMaster Institute for Automotive Research and Technology, McMaster University, Canada; {3}McMaster University, Canada*
TS16-3	**Effects of Current Excitation on Nodal Forces in Switched Reluctance Motors** *Haoding Li{1}, Berker Bilgin{1}, Ali Emadi{2}, {1}McMaster Automotive Resource Centre, McMaster University, Canada; {2}McMaster University, Canada*
TS16-4	**Sensitivity Analysis of the Vehicle Model Mass for Model Predictive Control Based Power Management System of a Plug-in Hybrid Electric Vehicle** *Nicolas Sockeel{4}, Jian Shi{2}, Masood Shahverdi{1}, Michael Mazzola{3}, {1}California State University, Los Angeles, United States; {2}Center for Advanced Vehicular System, Mississippi State University, United States; {3}Energy Production and Infrastructure Center, United States; {4}Mississippi State University, United States*
TS16-4	**Thermal Modeling and Measurement of a Traction Motor in a Production Pure Electric Vehicle** *Bozhi Yang{1}, Xiaohui Li{1}, Yongling Sun{1}, Jin Shang{1}, Fei Xiong{2}, Linpei Zhu{2}, Xiong Liu{2}, Hongzhong Qi{2}, Gang Li{2}, {1}GAC R&D Center Silicon Valley Inc, United States; {2}Guangzhou Automotive Engineering Institute, China*

Friday, June 15, 2018
Afternoon Breakout Sessions

Technical Session 17: Power Electronics III
Session Chairs: Kang Peng, Infineon Technologies and Emre Gurpinar, Oak Ridge National Laboratory

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 201A

TS17-1	**Two-and-One Set of Arms MMC-Based Multilevel Converter with Reduced Submodule Counts** *Mahdi Jafarishiadeh, Reza Ahmadi, University of Kansas*
TS17-2	**Control-Strategy-Based Reconfiguration to Mitigate Short Circuit Faults in NPC Inverters** *Ethan Hotchkiss, Weiqiang Chen, Ali Bazzi, University of Connecticut*
TS17-3	**Comparative Evaluation of Conducted Common-Mode EMI in Voltage-Source and Current-Source Inverters Using Wide-Bandgap Switches** *Hang Dai, Thomas M. Jahns, Renato Amorim Torres, Di Han, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison*
TS17-4	**Experimental Validation of Design Concepts for Future EV-Traction Inverters** *Andreas Bubert, Karl Oberdieck, Huihui Xu, Rik W. De Doncker, RWTH Aachen University, Germany*
TS17-5	**Design and Performance Analysis of an Electric Light Utility Vehicle** *Markus Koller{1}, Bernd* Plaßnegger *{1}, Rebin Jaber{1}, Markus* Kocagöz *{1}, Ralf Kobler{2}, Dietmar Andessner{2}, {1}AIT Austrian Institute of Technology GmbH, Austria; {2}Linz Center of Mechatronics GmbH, Austria*

Technical Session 18: Electric Machines V
Session Chairs: Fernando Dias, Idaho National Laboratory, and Theodore Bohn, Argonne National Laboratory

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 201B

TS18-1	**Fast Computation Method to Obtain Typical Machine Waveforms Applied to a 6/4 FSPM Machine** *Pablo Castro Palavicino, Dheeraj Bobba, Mingda Liu, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS18-2	**Performance Analysis of C-Core and E-Core Flux-Switching Permanent Magnet Machine with Airfoil-Shaped Rotor** *Hao Ding, Mingda Liu, William Sixel, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS18-3	**Rotor Thermal Design for Electric Machines: Challenges and Opportunities** *William Sixel, Mingda Liu, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS18-4	**Comparison of Dual-Stator 6/4 FSPM Machine with Overlapping and Non-Overlapping Winding** *Mingda Liu, William Sixel, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS18-5	**Rotor Resistance for Improved Start-Up Performance of Line-Start Permanent-Magnet Synchronous Motors** *Arash Hassanpour Isfahani{1}, Sadegh Vaez-Zadeh{2}, {1}Dynsity Technology Holdings Inc, United States; {2}University of Tehran, Iran*

Friday, June 15, 2018
Afternoon Breakout Sessions

Technical Session 19: Motor Drivers II
Session Chairs: Sheldon Williamson, University of Ontario Institute of Technology and Hao Ge, Tesla

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 202A

TS19-1	**Practical Implementation of Current Derivative Measurement for Sensorless Control of Permanent Magnet Machines** *Ramakrishnan Raja{1}, Tomy Sebastian{1}, Mengqi Wang{2}, {1}Halla Mechatronics, United States; {2} University of Michigan, Dearborn, United States*
TS19-2	**Transient Stability Comparison Between Five-Phase and Three-Phase Permanent Magnet Assisted Synchronous Reluctance Motor** *Akm Arafat, Md. Zakirul Islam, Md Tawhid Bin Tarek, Seungdeog Choi, University of Akron, United States*
TS19-3	**Modeling of a Bearingless Flux-Switching Permanent-Magnet Linear Motor** *Maksim Sokolov, Seppo Saarakkala, Reza Hosseinzadeh, Marko Hinkkanen, Aalto University, Finland*
TS19-4	**Non-Invasive Magnet Temperature Estimation in IPMSM by High Frequency Pulsating Sinusoidal Voltage Injection** *Hyun-Sam Jung{2}, Donghoon Park{2}, Hwigon Kim{2}, Seung-Ki Sul{2}, Daniel J. Berry{1}, {1}General Motors, United States; {2}Seoul National University, Korea*
TS19-5	**Variable Time Step Control for Six-Step Operation in IPMM** *Jaeyong Park, Jung-Ik Ha, Seoul National University, Korea*

Technical Session 20: Wireless Charging Systems
Session Chairs: Yiming Zhang, San Diego State University and Lixin Tang, Dynsity Technology Holding

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 202B

TS20-1	**Small Signal Modeling and Control of Parallel-Series/Series Resonant Converter for Wireless Inductive Power Transfer** *Suvendu Samanta, Akshay Kumar Rathore, Concordia University, Canada*
TS20-2	**Modeling, Simulation, and Experimental Verification of a 20-kW Series-Series Wireless Power Transfer System for a Toyota RAV4 Electric Vehicle** *Omer C. Onar, Madhu Chinthavali, Steven Campbell, Larry E. Seiber, Cliff P. White, Veda Galigekere, Oak Ridge National Laboratory, United States*
TS20-3	**Eddy Current Loss Analysis of Underwater Wireless Power Transfer System** *Zhengchao Yan{2}, Yiming Zhang{2}, Tianze Kan{2}, Fei Lu{2}, Kehan Zhang{1}, Baowei Song{1}, Chris Mi{2}, {1}Northwestern Polytechnical University, China; {2}San Diego State University, United States*
TS20-4	**Sensitivity Analysis of Primary-Side LCC and Secondary-Side Series Compensated Wireless Charging System** *Veda Galigekere, Omer C. Onar, Jason Pries, Shenli Zou, Zhiqiang Wang, Madhu Chinthavali, Oak Ridge National Laboratory, United States*
TS20-5	**Impact of Foreign Objects on the Performance of Capacitive Wireless Charging Systems for Electric Vehicles** *Brandon Regensburger, Ashish Kumar, Sreyam Sinha, Khurram Afridi, University of Colorado Boulder, United States*

Friday, June 15, 2018
Afternoon Breakout Sessions

Technical Session 21: Battery Charging Applications and Systems II
Session Chairs: Fei Gao, University of Technology of Belfort-Montbeliard and Yang Liang, FCA Group, LLC

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 202C

TS21-1	**Design and Implementation of a Dual Cell Link for Battery-Balancing Auxiliary Power Modules** *Weizhong Wang, Matthias Preindl, Columbia University, United States*
TS21-2	**Development of a DC Fast Charging Station Model for Use with EV Infrastructure Projection Tool** *Emin Ucer{3}, Mithat Kisacikoglu{3}, Fatih Erden{1}, Andrew Meintz{2}, Clement Rames{2}, {1}Bilkent University, Turkey; {2}National Renewable Energy Laboratory, United States; {3}University of Alabama, United States*
TS21-3	**Optimal Design of Solar-Wind Hybrid System Using Teaching-Learning Based Optimization Applied in Charging Station for Electric Vehicles** *Amangaldi Koochaki{2}, Mohammad Divandari{2}, Ebrahim Amiri{3}, Oleksandr Dobzhanskyi{1}, {1} American University of Iraq, Iraq; {2}Azad University, Iran; {3}University of New Orleans, United States*
TS21-4	**Lithium-Ion Battery Management Using Physics-Based Model Predictive Control and DC-DC Converters** *Gustavo Florentino, Scott Trimboli, University of Colorado Colorado Springs, United States*

Technical Session 22: Connected and Automated Vehicles and Smart Grid
Session Chairs: Andrew Rockhill, Eaton and Geng Niu, Karma

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 203A

TS22-1	**A Cognitive Price-Based Approach for Real-Time Management of En-Route Electric Vehicles** *Abla Hariri, Mohammad Esfahani, Osama Mohammed, Florida International University, United States*
TS22-2	**Optimal Sizing of a Dynamic Wireless Power Transfer System for Highway Applications** *Andrew Foote{2}, Omer C. Onar{1}, Suman Debnath{1}, Madhu Chinthavali{1}, Burak Ozpineci{2}, David Smith{2}, {1}Oak Ridge National Laboratory, United States; {2}University of Tennessee / Oak Ridge National Laboratory, United States*
TS22-3	**Cybersecurity for Battery Management Systems in Cyber-Physical Environments** *Sourabh Kumbhar, Tasnimun Faika, Darshan Makwana, Taesic Kim, Young Lee, Texas A&M University-Kingsville, United States*
TS22-4	**An Adaptive Green Zone Strategy for Hybrid Electric Vehicle Control** *David Trinko, Eric Wendt, Zachary Asher, Marco Peyfuss, John Volckens, Jason Quinn, Thomas Bradley, Colorado State University, United States*
TS22-5	**Review of Electrical Architectures and Power Requirements for Automated Vehicles** *Jared Baxter{2}, Daniel Merced{1}, Daniel Costinett{2}, Leon Tolbert{2}, Burak Ozpineci{2}, {1}University of Tennessee, United States; {2}University of Tennessee / Oak Ridge National Laboratory, United States*

Friday, June 15, 2018

Afternoon Breakout Sessions

Technical Session 23: Smart Grid, Electrical Infrastructure, and V2G Applications II
Session Chairs: Ha Le, California State Polytechnic University Pomona
and Abdellah Derghal, CReSTIC, IUT de Troyes, FRANCE

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 203B

TS23-1	**Grid Impact Studies from Dynamic Wireless Charging in Smart Automated Highways** *Suman Debnath{1}, Andrew Foote{2}, Omer C. Onar{1}, Madhu Chinthavali{1}, {1}Oak Ridge National Laboratory, United States; {2}University of Tennessee / Oak Ridge National Laboratory, United States*
TS23-2	**Building a Path Toward Ubiquitous Plug-in Vehicle Charging Infrastructure** *Philip Krein, Zhejiang University / University of Illinois at Urbana-Champaign Institute, China*
TS23-3	**Shunt-Series-Switched Multi-Functional Grid-Connected Inverter for Voltage Regulation in Vehicleto-Grid Application** *Wooyoung Choi, Woongkul Lee, Di Han, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS23-4	**New Predictive Control Method for Optimal Minimization of Plug-in Electric Vehicle (PEV) Charging Cost with Vehicle-to-Home (V2H) Capability** *Harun Turker{2}, Seddik Bacha{1}, {1}Grenoble Alpes University, France; {2}Turker Ar-Ge Smart Grid, Turkey*

Technical Session 24: Modeling, Simulation, and Control II
Session Chairs: Akshay Rathore, Concordia University
and Nicholas Piotrowski, Associated Research

Friday, June 15, 2018
2:00 PM – 3:40 PM, Room 203C

TS24-1	**Pareto Front Analysis of the Objective Function in Model Predictive Control Based Power Management System of a Plug-in Hybrid Electric Vehicle** *Nicolas Sockeel{4}, Jian Shi{2}, Masood Shahverdi{1}, Michael Mazzola{3}, {1}California State University, Los Angeles, United States; {2}Center for Advanced Vehicular System, Mississippi State University, United States; {3}Energy Production and Infrastructure Center, United States; {4}Mississippi State University, United States*
TS24-2	**Optimal, Adaptive and Predictive Real-Time Control of Fail-Operational Powertrain for Automated Electric Vehicles** *Kirill Gorelik{1}, Ahmet Kilic{1}, Roman Obermaisser{2}, {1}Robert Bosch GmbH, Germany; {2}University of Siegen, Germany*
TS24-3	**Transmission and Control Strategy Optimization for a Parallel Hybrid Electric Micro-Utility Vehicle in Urban Drive Cycles** *Parth Joshi, V Kartik, Indian Institute of Technology Bombay, India*
TS24-4	**Fault-Tolerant Model Predictive Control of Five-Phase PMa-SynRM Under Single Phase Open-Circuit Fault Condition** *Shamini Dharmasena, Akm Arafat, Md Tawhid Bin Tarek, Seungdeog Choi, University of Akron, United States*

Friday, June 15, 2018

Afternoon Breakout Sessions

Technical Session 25: Motor Drivers III Session Chairs: Berker Bilgin, McMaster University and Geng Niu, Karma	
Friday, June 15, 2018 4:00 PM – 5:40 PM, Room 202A	
TS25-1	**Zeta-SEPIC Based PFC Converter Fed SRM Drive** *Aniket Anand, Bhim Singh, Indian Institute of Technology Delhi, India*
TS25-2	**Current-Source Inverters for Integrated Motor Drives Using Wide-Bandgap Power Switches** *Renato Amorim Torres, Hang Dai, Woongkul Lee, Thomas M. Jahns, Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronic Consortium / University of Wisconsin-Madison, United States*
TS25-3	**Development of a PMSM Traction Drive System for PHEV, HEV, EV Using Virtual Prototyping** *Alan Courtay, Bryan Kelly, Synopsys, Inc., United States*
TS25-4	**A Novel PWM-Control-Based Strategy for Noise Reduction in Switched Reluctance Motors** *Zhe Zhang{2}, Ali Bazzi{2}, James Monte{1}, {1}Qualtech Systems, Inc, United States; {2}University of Connecticut, United States*
TS25-5	**Surrogate-Based Optimization of Firing Angles for Switched Reluctance Motor** *Bahar Anvari{2}, Mine Kaya{1}, Steven Englebretson{2}, Shima Hajimirza{1}, Hamid A. Toliyat{1}, {1}Texas A&M University, United States; {2}US Corporate Research Center ABB, Inc., United States*

Technical Session 26: Wide Bandgap Semiconductor Applications Session Chairs: Emre Gurpinar, Oak Ridge National Laboratory and Kang Peng, Infineon Technologies	
Friday, June 15, 2018 4:00 PM – 5:40 PM, Room 202B	
TS26-1	**A Bi-Directional and Single Phase AC-DC Converter with Integrated LCL Filter and GaN E-HEMTs** *Wenbin Shu, Siqi Li, Sizhao Lu, Kunming University of Science and Technology, China*
TS26-2	**Reduction of Power Losses of SiC MOSFET Based Power Modules in Automotive Traction Inverter Applications** *Wibawa Chou, Asantha Kempitiya, Oleg Vodyakho, Infineon Technologies America, United States*
TS26-3	**Characterization and Comparison of Trench and Planar Silicon Carbide (SiC) MOSFET at Different Temperatures** *Saeed Anwar{2}, Zhiqiang Wang{1}, Madhu Chinthavali{1}, {1}Oak Ridge National Laboratory, United States; {2}University of Tennessee, United States*
TS26-4	**Loss Analysis and Mapping of a SiC MOSFET Based Segmented Two-Level Three-Phase Inverter for EV Traction Systems** *Emre Gurpinar{1}, Burak Ozpineci{2}, {1}Oak Ridge National Laboratory, United States; {2}University of Tennessee / Oak Ridge National Laboratory, United States*
TS26-5	**Efficiency Improvement of Fault-Tolerant Three-Level Power Converters** *Ramin Katebi, Jiangbiao He, Waqar A. Khan, Nathan Weise, Marquette University, United States*

Friday, June 15, 2018

Afternoon Breakout Sessions

Technical Session 27: Battery Charging Applications and Systems III
Session Chairs: Dionne Hernandez Lugo, NASA
and Rohit Baranwal, MTS Systems

Friday, June 15, 2018
4:00 PM – 5:40 PM, Room 202C

TS27-1	**An Internet of Things (IoT)-Based Network for Dispersed and Decentralized Wireless Battery Management Systems** *Tasnimun Faika, Taesic Kim, Maleq Khan, Texas A&M University-Kingsville, United States*
TS27-2	**Simultaneous State and Parameter Estimation of Li-Ion Battery with One State Hysteresis Model Using Augmented Unscented Kalman Filter** *Atriya Biswas, Ran Gu, Phillip Kollmeyer, Ryan Ahmed, Ali Emadi, McMaster University, Canada*
TS27-3	**A Mesh-Structured Switched-Capacitor Equalizer for Lithium-Ion Battery Strings of Electric Vehicles** *Yunlong Shang{1}, Yun Zhang{2}, {1}San Diego State University, United States; {2}University of Jinan, China*
TS27-4	**Hybrid Energy Storage System State-of-Charge Estimation Using Artificial Neural Network for Micro-Hybrid Applications** *Carlos Vidal, Mike HauÃŸmann, Daniel Barroso, Parisa M. Shamsabadi, Atriya Biswas, Ephrem Chemali, Ryan Ahmed, Ali Emadi, McMaster University, Canada*

Technical Session 28: Smart Grid, Electrical Infrastructure, and V2G Applications III
Session Chairs: JK Wang, Ohio State University
and Sriram Jala, Ford Motor Company

Friday, June 15, 2018
4:00 PM – 5:40 PM, Room 203A

TS28-1	**Deep Learning Based Micro-Grid Fault Detection and Classification in Future Smart Vehicle** *Moinul Haque, Mohammad Noor Shaheed, Seungdeog Choi, University of Akron, United States*
TS28-2	**Robust Identification of EV Charging Profiles** *Shengyi Wang{3}, Liang Du{3}, Jin Ye{2}, Dongbo Zhao{1}, {1}Argonne National Lab, United States; {2}San Francisco State University, United States; {3}Temple University, United States*
TS28-3	**Optimal System Design for a Solar Powered EV Charging Station** *Gautham Ram Chandra Mouli, Pavol Bauer, Delft University of Technology, Netherlands*
TS28-4	**A Real Time Energy Management for EV Charging Station Integrated with Local Generations and Energy Storage System** *Yu Wu{1}, Alexandre Ravey{2}, Daniela Chrenko{1}, Abdellatif Miraoui{1}, {1}* FEMTO-ST Institute / Université Bourgogne Franche-Comté / UTBM*; {2}* FEMTO-ST Institute / Université Bourgogne Franche-Comté / UTBM

Friday, June 15, 2018

Afternoon Breakout Sessions

Technical Session 29: Heavy-Duty, Off-Road, and High-Power Applications Session Chairs: Jalpa Shah, Eaton and Akshay Rathore, Concordia University	
Friday, June 15, 2018 4:00 PM – 5:40 PM, Room 203B	
TS29-1	**Design Considerations of the PM Transverse Flux Linear Motor for an Urban-Type Electromagnetic Train** *Oleksandr Dobzhanskyi{1}, Rupert Gouws{2}, Ebrahim Amiri{3}, {1}American University of Iraq, Iraq; {2} North-West University, South Africa; {3}University of New Orleans, United States*
TS29-2	**Electrification System Simulation Study of the Proposed Dar-Moro Standard Gauge Model in Tanzania** *Kenedy Greyson, Dar es Salaam Institute of Technology, Thailand*
TS29-3	**Modeling and Simulation of Regenerative Braking Energy in DC Electric Rail Systems** *Mahdiyeh Khodaparastan, Ahmed Mohamed, City College of New York, United States*
TS29-4	**Three-Phase Medium Voltage DC Fast Charger Based on Single-Stage Soft-Switching Topology** *Soumik Sen{2}, Liqi Zhang{2}, Tianxiang Chen{2}, Jiucai Zhang{1}, Alex Huang{2}, {1}GAC R&D Center Silicon Valley Inc, United States; {2}University of Texas at Austin, United States*
TS29-4	**A Compact 250 kW Silicon Carbide MOSFET Based Three-Level Traction Inverter for Heavy Equipment Applications** *Zhongjing Wang{1}, Mohammad Hazzaz Mahmud{1}, Muhammad Hammad Uddin{1}, Brice McPherson{2}, Brett Sparkman{2}, Yue Zhao{1}, Alan Mantooth{1}, John Fraley{2}, {1}University of Arkansas, United States; {2}Wolfspeed, a Cree Company, United States*

ITEC2019

June 17-19, 2019
Metro Detroit,
Michigan, USA

2019 ITEC: Call for Papers

http://itec-conf.com

Paper and presentation proposals are being invited in the following or related technical track topic areas:

1) Power Electronics and Electric Motor Drives
2) Electric Machines and Actuators
3) Thermal Management, Packaging, and Optimization of Traction Drive Systems
4) Battery, Battery Management Systems, Chargers and Charging Infrastructures
5) Electric, Hybrid Electric, and Plug-in Hybrid Electric Vehicle System Architectures
6) Connected and Automated Vehicles, Smart Mobility, Intelligent Transportation Systems, and Vehicle Security
7) Smart Grid, Electrical Infrastructure, and V2G/V2I Applications
8) Electrification of Heavy-Duty and Off-Road Vehicles
9) Electrical Systems and Components for Sea, Undersea, Air, and Space Vehicles
10) Modeling, Simulation, and Control
11) Codes, Standards, Policies, and Regulations for Transportation Electrification

2019 ITEC: Call for Papers

www.itec-conf.com

Paper Submission Guidelines:

Prospective authors are invited to submit their paper proposals through the conference webpage (http://itec-conf.com/). Each paper proposal must include:

Technical track name, paper title, name(s) of author(s), affiliation(s), mailing address(es), and e-mail address(es). If there are multiple authors, please identify the corresponding author.
An abstract of maximum 100 words and a digest of maximum 5 pages (single-column, double spaced, including figures and tables).

iTEC2019

June 17-19, 2019
Metro Detroit
Michigan, USA

Key Dates:

Deadline for submission of paper proposals (abstracts/digests): **November 30, 2018**
Author's notification of acceptance: **February 20, 2019**
Deadline for submission of final camera-ready manuscripts: **April 20, 2019**
Deadline for early registration: **May 1, 2019**

General Chair: Prof. Jin Ye, University of Georgia

Call for Short-Course, Tutorial, and Panel Sessions

If you would like to lecture a short-course or a tutorial please contact the General Chair Prof. Jin Ye at jin.ye@uga.edu with a one paragraph short-course/tutorial summary with a short-biography.

If you would like to organize a panel session or would like to be a panelist in one of the ITEC 2019 industry panel sessions, please contact the General Chair with details.

2019 ITEC: Call for Exposition

www.itec-conf.com

Conference Expo:

ITEC 2019 features a large industry exhibition focused on electrified vehicles and components, subsystems, and systems for all types of electrified vehicles and transportation systems (land, air, space, and sea). Areas of interest also includes test, measurement, instrumentation, safety, software, control system development, testing and rapid prototyping, safety, and manufacturing.

Exhibitor package includes:

- Two complimentary registrations with every 10'x10' booth space purchased
- Four complimentary registrations with every 20'x10' booth space purchased
- Exhibitor literature will be included in conference materials

Unit Cost (10'x10' Booth Space)

Corporation: $2500.00
Non-Profits, Small Businesses/Start-Ups/Universities: $1500.00

Unit Cost (20'x10' Booth Space)

Corporation: $5000.00
Non-Profits, Small Businesses/Start-Ups/Universities: $3000.00

Exhibitor Registration:
Register online at http://itec-conf.com/exhibition/

iTEC2019

June 17-19, 2019
Metro Detroit,
Michigan, USA

ITEC Conference Partners

www.itec-conf.com

ITEC'18 Lanyards Partner

ITEC'18 Media Partner

ITEC'18 Ice Cream Social Partner

Bulent Sarlioglu,

ITEC 2018 General Chair,

University of Wisconsin-Madison / WEMPEC