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

Final Program

2016 IEEE Transportation Electrification Conference and Expo (ITEC'16)

June 27-29, 2016

Edward Village Michigan
Dearborn, Michigan, USA
http://itec-conf.com

iTEC2016

ITEC Sponsors: IEEE · pels IEEE Power Electronics Society · 50 years IAS IEEE Industry Applications Society · IEEE PES Power & Energy Society

Welcome Message from the General Chair

It gives me great pleasure to welcome you to the 2016 IEEE Transportation Electrification Conference and Expo (ITEC'16). We have established ITEC as a global brand to lead a major initiative within IEEE on transportation electrification. ITEC's definition of transportation electrification is comprehensive and includes electrification of both propulsion and non-propulsion systems. ITEC is at the intersection of all types of electrified transportation from land vehicles including heavy-duty, rail, and off-road vehicles, to airplanes and ships. It is a unique conference and exhibition focused on what industry and their customers need and desire. It has professional training courses, tutorials, and technical sessions with active industry interest and participation. In addition, ITEC has a large industry exhibition focused on components, subsystems, and systems for all types of electrified vehicles and transportation systems (land, sea, air, and space).

We have an excellent conference planned for you to experience, with a comprehensive program exceptionally attractive to industry, government agencies, and general public, in addition to the academic researchers, students, and educators. ITEC includes professional training courses offered by internationally renowned experts from industry and academia. In addition, we have an all-star group of keynote presenters covering current status and future trends in transportation electrification. The program will also include state-of-the-art tutorials and numerous panel discussions, as well as over 100 high-quality technical paper presentations.

The Organizing Committee of ITEC'16 has been working exceptionally hard to organize this excellent technical conference for you. Thanks to their dedication and countless hours of work as well as ITEC's strategic and business plan and leadership of IEEE Power Electronics Society, Industry Applications Society, and Power & Energy Society, ITEC has quickly become the main global technical event for transportation electrification.

We are enthusiastically looking forward to meeting you at ITEC and hope that you have a memorable experience. If you are not part of the broader organizing community of ITEC and would like to be directly involved with the conference, we welcome you to join forces with us in improving ITEC and addressing the needs of the industry.

Warmest Regards,

Berker Bilgin

Berker Bilgin
General Chair, ITEC'16

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, including electric vehicles, hybrid electric vehicles, and plug-in hybrid electric vehicles (EVs, HEVs, and PHEVs) as well as heavy-duty, rail, off-road vehicles, airplanes and ships.

We have features for every step of the way…

KEYNOTE PRESENTATIONS

IT'S ABOUT THE KNOWLEDGE SHARED...

Kevin Layden
Director of Electrified Powertrain Engineering
Ford Motor Company

Dr. John M. Miller
Sr. Scientist and Technical Advisor
Momentum Dynamics Inc.

Dr. Konstantinos Laskaris
Traction Motor System Architect
Tesla Motors Inc.

Tim Grewe
General Director, Global Electrification
General Motors

Dr. Glen Steyer
Executive Director
AAM

Dr. Seung-Ki Sul
IEEE Fellow, Professor
Seoul National University

Dr. Waleed Said
Founder and President
Efficient Power Tech Solutions, LLC (EPTech)

Dr. Jason R. Wells
Vice-President
PC Krause and Associates

Dr. Peter Friedrichs
Senior Director, SiC
Infineon

Gary Parker
Director of Powertrain Systems
Cummins Inc.

Jack Chapman
Staff Engineer
General Dynamics Electric Boat

Dr. Alireza Khaligh
Director of Maryland Power Electronics Laboratory
University of Maryland at College Park

Professional Training Courses and Tutorials

Course 1
Mechanical Design of Electric Machines
Dr. Wei Tong – Kollmorgen Corp.

Course 2
Accelerated Lifetime Testing for Power Electronic Modules
Marc Tüllmann, Infineon Technologies AG

Course 3
An Introduction to Functional Safety for Electrified Powertrains
Jody Nelson, Agish George, and Michael Woon, kVA

Course 4
Design Through Simulation of an Interior Permanent Magnet Machine and Controller
David Farnia, JMAG and Dakai Hu, MathWorks

Course 5
Wireless Power Transfer Systems
Madhu Chinthavali and Omer C. Onar, Oak Ridge National Laboratory

Tutorial 1
Smarter Drives Need Smarter Development – Case Study of the Design-V Applied to Power Electronics
Gernot Pammer, Egston – Austria; Ben Black, National Instruments; Jean Belanger, Opal-RT Technologies

Tutorial 2
Electric Motor Noise Modeling
Dr. Debbie Reeves, MSC Software Company

Tutorial 3
High Speed Flux-Switching Permanent Magnet Machine and Comparison with Other Types of PM Machines
Dr. Bulent Sarlioglu, Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC)

IEEE Continuing Education Units

Professional Training Courses and Tutorials at ITEC'16 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 PHD certificates that can be used as evidence of participation in these courses to help meet their requirements activity (1 CEU=10 PDHs).

Panel Discussions

Panel 1
Transmissions in Electrified Propulsion Systems

Panel 2
Opportunities and Challenges in Autonomous Vehicles

Panel 3
NVH Performance in Electrified Powertrain Systems

Panel 4
The Past and the Future of Electrified Vehicle Industry

Panel 5
Advancements in Charging and Wireless Charging Technologies

Panel 6
SiC Power Devices in Automotive Traction Inverters – Are there any remaining hurdles?

Panel 7
Advancements in Traction Motor Winding Technologies

Panel 8
Electrified Transportation as a Power Grid Resource

Panel 9
Cybersecurity Issues in Electrified Transportation: Towards Standards Needs

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

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

ITEC Steering Committee

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Deepak Divan, Georgia Institute of Technology
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Babak Fahimi, University of Texas at Dallas
Silva Hiti, Faraday Future
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John M. Miller, J-N-J Miller Design Services, PLLC
Jim Nagashima, Nagashima Advanced Technology Consulting
Kaushik Rajashekara, University of Texas at Dallas
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David Cottini, Powersys-JMAG, USA
Michael Degner, Ford Motor Company, USA
Suresh Gopalakrishnan, General Motors, USA
Konstantinos Laskaris, Tesla Motors, USA
Alireza Safee, Osram Sylvania, USA
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Hong Yang, Magna Powertrain, USA

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Technical Chair for Electric Machines
Hossein Dadkhah, Fiat Chrysler Automobiles, USA

IEEE Southeastern Michigan Section Liaison Chair, Kevin Taylor

Off-Road Vehicle Industry Liaison Chairs
Long Wu, John Deere, USA

Battery Industry Liaison Chair
Said Al-Hallaj, All Cell Technologies, USA

IAS Representatives
Tomy Sebastian, Halla Methatronics, President Elect, IEEE- IAS
Ayman El-Refaie, General Electric, USA
Avoki Omekanda, General Motors, USA
Mohammad Islam, Halla Mechatronics, USA

PES Representatives
Abdel-Aty Edris, Quanta Technology, USA

Technical Track Chairs and Co-Chairs

Track 1: Power Electronics and Electric Motor Drives
Chair: Baiming Shao, Mercedes-Benz R&D, USA
Co-Chair: Matthias Preindl, Columbia University, USA

Track 2: Electric Machines and Actuators
Chair: Hossein Dadkhah, Fiat Chrysler Automobiles, USA
Co-Chair: Silva Hiti, Faraday Future, USA

Track 3: Battery and Battery Management
Chair: Hong Yang, Magna Powertrain, USA
Co-Chair: Lucia Gauchia, Michigan Technical University, USA

Track 4: Electric, Hybrid Electric, and Plug-in Hybrid Electric Vehicle System Architectures
Chair: Yinye Yang, Magna, Canada
Co-Chair: Sachin Bhide, Fiat Chrysler Automobiles, USA

Track 5: Smart Grid, Electrical Infrastructure, and V2G
Chair: Srdjan Lukic, North Carolina State University, USA
Co-Chair: Sheldon Williamson, University of Ontario Institute of Technology, Canada

Track 6: Electrification of Heavy-Duty and Off-Road Vehicles
Chair: Long Wu, John Deere, USA
Co-Chair: Jin Wang, Ohio State University, USA

Track 7: Fuel Cells Applications in Transportation
Chair: Fei Gao, Université de Technologie de Belfort-Montbéliard (UTBM), France
Co-Chair: Omer C. Onar, Oak Ridge National Laboratory, USA

Track 8: Electrical Systems and Components for Sea, Undersea, Air, and Space Vehicles
Chair: Alireza Safee, Osram Sylvania, USA
Co-Chair: Babak Nahid-Mobarakeh, University of Loraine, France

Track 9: Modeling, Simulation, and Control
Chair: Ali Davoudi, University of Texas at Arlington, USA
Co-Chair: Ilse Cervantes, Institute for Scientific and Technological Research of San Luis Potosi, Mexico

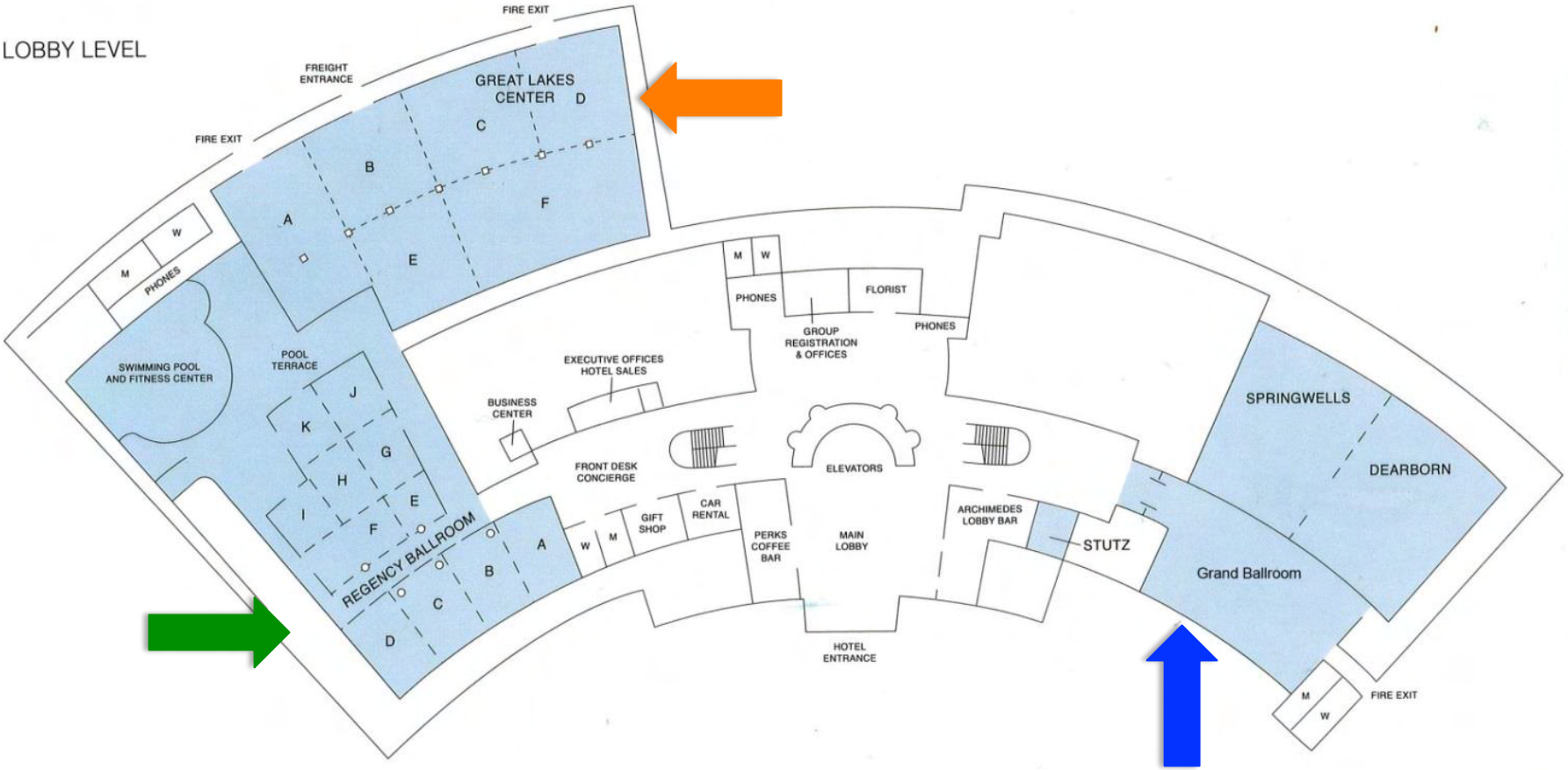
Track 10: Standards, Policies, and Regulations for Transportation Electrification
Chair: Sanjaka G. Wirasingha, Valeo, USA

Meeting Room Floor Plan

Plenary Sessions:
Springwells (Hubbard) Ballroom

Exhibit Hall:
Great Lakes Center

Breakout Rooms (Lobby Level):
Regency A-B, C-D, E-F, G-H, J-K, and I



ITEC'16 Program-at-a-Glance

Program-at-a-Glance
2016 IEEE Transportation Electrification Conference and Expo (ITEC'16)
June 27-29, 2016

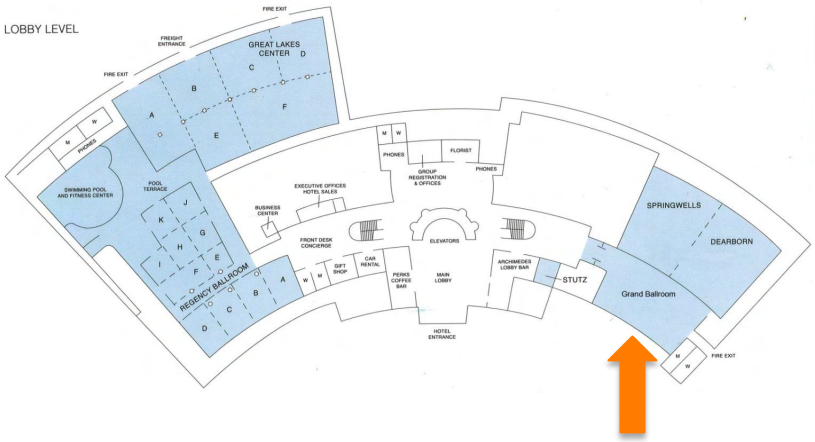
	7:30AM-8:30AM	8:30AM-10:10AM	10:10AM-10:30AM	10:30AM-12:00PM	12:00PM-2:00PM	2:00PM-3:20PM	3:20PM-4:20PM	4:20PM-5:40PM	5:40PM-7:30PM
Monday June 27, 2016	Conference Registration Open	Plenary Session 1	Coffee Break	Plenary Session 1	Poster Session 1 Exhibit Hall Buffet Lunch	Course 1 Course 2 Course 3 Panel 1 Panel 2	Coffee Break in Exhibit Hall Monday June 27: ice-cream station (sponsored by IEEE Transportation Electrification Community) Tuesday, June 28: cookies & coffee	Course 1 Course 2 Course 3 Panel 3 Panel 4	Networking Dinner in the Exhibit Hall
Tuesday June 28, 2016		Plenary Session 2		Plenary Session 2	Poster Session 2 Exhibit Hall Buffet Lunch	Course 4 Tutorial 1 Tutorial 2 Panel 5 Session 1		Course 4 Tutorial 3 Panel 6 Panel 7 Session 2	Exhibit Hall Buffet Dinner
Wednesday June 29, 2016		Course 5 Panel 8 Session 3 Session 4 Session 5		Course 5 Panel 9 Session 6 Session 7 Session 8	Lunch Break (on own)	Session 9 Session 10 Session 11 Session 12 Session 13		Session 14 Session 15 Session 16 Session 17	

Exhibit Hall Open:
Monday, June 27th, 12:00 Noon – 7:30 PM
Tuesday, June 28th, 12:00 Noon – 7:30 PM

Monday, June 27, 2016
Keynote Presentations

Plenary Session 1
Monday, June 27, 2016
8:30 AM – 12:00 Noon
Venue: Grand (Hubbard) Ballroom

Plenary Session Chairs:
Ali Emadi, McMaster University
Nitin Patel, General Motors
Anand Sathyan, FCA US LLC



Welcome and Introduction
8:30 AM – 8:35 AM
Berker Bilgin, General Chair, 2016 IEEE Transportation Electrification Conference & Expo

Keynote Presentation 1: Power of Choice for CO_2 Reduction
8:35 AM – 9:05 AM

Speaker: Kevin Layden, Director of Electrified Powertrain Engineering, Ford Motor Company

Short Biography: Kevin Layden is the Director of Electrified Powertrain Engineering at Ford Motor Company. He is responsible for the development and implementation of electrified powertrains and associated advanced technologies. This includes hybrid vehicles, plug-in hybrids, electric vehicles, mild hybrids and start stop technology. As a Chief Engineer of Powertrain Calibration and NVH – North America, Kevin was responsible for the emissions, OBD, drivability and NVH development diesel and gas engines in North America from 2006 through 2009. During this period, his team delivered best in class TGW performance while introducing the revolutionary technology of the Ecoboost 3.5L engine and the 6.7L Powerstroke Diesel. In 2009, Kevin was the Chief Engineer of Calibration and NVH – Ford of Europe. Based in the UK for 3 years, he ensured global alignment of powertrain calibration and NVH processes while delivering highly fuel efficient diesel and gas engines for European and Global markets. Key deliveries in this time included the Fox I3 gasoline engine and the 88g/km DV6 diesel engine. Kevin joined Ford Motor Company in 1986 as an engine test engineer. In 1988, he moved into Powertrain Systems Engineering and was responsible for the calibration and certification of the 7.5L gasoline engines on the F250 and F350 trucks.

Monday, June 27, 2016

Keynote Presentations

Keynote Presentation 2: Can Wireless Power Charging Reach Supercharger Levels?

9:05 AM – 9:35 AM

Speaker: Dr. John M. Miller, Sr. Scientist and Technical Advisor to Momentum Dynamics, Inc.

Short Biography: Dr. John M. Miller is the owner and founder of J-N-J Miller Design Services PLLC, which was established in 2002 to provide professional consulting in hybrid electric vehicle propulsion systems, electrochemical energy storage systems, vehicle electrification, and wireless charging. He has over 39 years of experience in electrical engineering across various industries that include automotive electrical systems, electric traction drive systems, aerospace/military guidance systems, white goods microprocessor control, and electrical practice in residential/commercial/industrial installations. In 2014, he joined Momentum Dynamics Technical Advisory Board as senior scientist working on wireless power transfer for heavy duty vehicles. His previous work experience includes Distinguished R&D Scientist at Oak Ridge National Laboratory (ORNL) where he held positions as Director of the Power Electronics and Electric Power Systems Research Center, and served as Program Manager of the DoE Vehicular Technologies subprogram APEEM. Prior to ORNL, Dr. Miller held various engineering and senior management positions at Maxwell Technologies, Ford Motor Company, and Texas Instruments. He has published several books and over 150 technical papers. He holds a B.S.E.E. from the University of Arkansas-Fayetteville, M.S.E.E. from Southern Methodist University, Dallas, TX, and Ph.D. from Michigan State University, East Lansing, MI. Dr. Miller is a Life Fellow of the IEEE and Fellow of the SAE and a registered professional engineer in Michigan and in Texas.

Keynote Presentation 3: High Frequency Magnetic Field Variation Effects on EV Traction Motors

9:35 AM – 10:05 AM

Speaker: Dr. Konstantinos Laskaris, Traction Motor System Architect, Tesla Motors Inc.

Short Biography: Dr. Konstantinos Laskaris was born in Athens, Greece in 1978. He received his diploma in Electrical and Computer Engineering from the National Technological University of Athens (NTUA), Greece, in 2002, his master's degree in Signal Processing from the Imperial College London, UK, in 2002, and his PhD in "Electric motor geometry optimization for variable speed drives" from the NTUA, Greece in 2011. Since 2012, Dr. Konstantinos Laskaris is the Principal Motor Designer at Tesla Motors, located in Silicon Valley, California, where he leads a team of motor design engineers. His research interests include parametric design and loss modeling of synchronous and asynchronous machines using finite element analysis, as well as development of multi-objective optimization methods using supercomputers. Dr. Laskaris has also worked in education, as a laboratory partner in NTUA, teaching the science of electric machines and has been co-founder of the "Prometheus" team in NTUA, which participates in fuel economy contests and holds the Panhellenic fuel consumption record today.

Monday, June 27, 2016

Keynote Presentations

Coffee Break
10:05 AM – 10:30 AM

Keynote Presentation 4: GM's Vision for Electrified Vehicles
10:30 AM – 11:00 AM

Speaker: Tim Grewe, General Director, Global Electrification, General Motors

Short Biography: Tim is the Electrification General Director for General Motors. His responsibilities include the design, development, and certification of multiple Hybrid and Electric products including the Chevy VOLT, Chevy Malibu, Buick Excelle, and the Cadillac CT6. Tim's education includes a BSEE from Rensselaer Polytechnic Institute and a MSEE from Syracuse University. He started his career with General Electric developing distributed power systems for aircraft and locomotive transportation products. Tim is the holder of numerous patents and is active in the hybrid electric development industry.

Keynote Presentation 5: Integration of Electric Driveline and Associated Challenges
11:00 AM – 11:30 AM

Speaker: Dr. Glen Steyer, Executive Director, AAM

Short Biography: Dr. Steyer received his Ph.D. from The Ohio State University in Mechanical Engineering. He was employed in engineering consulting for 21 years with SDRC serving in numerous industries including automotive and aerospace. His professional activities have centered on system dynamics and noise and vibration. Glen has been employed by AAM for 16 years. He is currently serving as Executive Director with AAM with responsibilities in Engineering Systems and has overseen NVH, Gear Engineering, CAE and Product Validation. Dr. Steyer is actively engaged in product design and development for driveline products, including electric drive axles. Dr. Steyer has published over 50 technical papers on the topics of testing and simulation for noise and vibration concerns and is the holder of 2 patents.

Monday, June 27, 2016

Keynote Presentations

Keynote Presentation 6: Evolution of IPM Motor and its Control for Automotive Application

11:30 AM – 12:00 Noon

Speaker: Prof. Seung-Ki Sul, IEEE Fellow, Professor at Seoul National University, Acting Technical Consultant for Vehicle Division, LG Electronics. Co.

Short Biography: Dr. Seung-Ki Sul received the B.S., M.S., and Ph.D. degrees in electrical engineering from Seoul National University, Seoul, Korea, in 1980, 1983, and 1986, respectively. From 1986 to 1988, he was an Associate Researcher with the Department of Electrical and Computer Engineering, University of Wisconsin, Madison. From 1988 to 1990, he was a Principal Research Engineer with LG Industrial Systems Company, Korea. Since 1991, he has been a member of faculty of School of the Electrical and Computer Engineering, Seoul National University, where he is currently a Professor. He has been IEEE fellow since 2000. He published more than 140 most IEEE reviewed journal papers and a total of more than 330 international conference papers in the area of power electronics. He was the program chair of IEEE PESC'06 and general chair of IEEE ECCE-Asia, ICPE, 2011. He holds 14 U.S.A patents, 7 Japanese patents, 11 Korean patents, and granted 38 Ph.Ds under his supervision. Some of his former Ph.D students are working in worldwide major automotive industry. For a year of 2015, he served as the president of Korea Institute of Power Electronics. On his sabbatical leave, he is, now, working for LG electronics (LGE) at Michigan Troy office as technical expert for vehicle business unit of LGE. His current research interests include control of electrical machines, electric power train of electric/hybrid vehicles and ship.

Poster Session 1

MONDAY JUNE 27

Poster Session 1: Transportation Electrification I **Session Chairs:** M. Saad Alam, Aligarh Muslim University, India Pourya Shamsi, Missouri University of Science and Technology, USA	
Monday, June 27, 2016 12:00 PM – 2:00 PM *Venue: Great Lakes Center (Exhibit Hall)*	
PS1-1	**Finite Element Based Design Optimization of Magnetic Structures for Roadway Inductive Power Transfer Systems** Masood Moghaddami, Arash Anzalchi, and Arif Sarwat *Florida International University, United States*
PS1-2	**Battery Power Requirements in High-Performance Electric Vehicles** Quirin Kellner, W. Dhammika Widanage, and James Marco *WMG, The University of Warwick, United Kingdom*
PS1-3	**Constant On-Time Variable Frequency One-Cycle Control for Switched-Capacitor Converter** Lei Yang[1], Xiaobin Zhang[1], Bin Wu[2], Keyue Smedley[2], and Guann-pyng Li[2] *[1]Northwestern Polytechnical University, China, [2]University of California, Irvine, USA*
PS1-4	**Model-based Health Condition Monitoring Method for Multi-cell Series-Connected Battery Pack** Rui Xiong, Fengchun Sun, and Hongwen He *Beijing Institute of Technology, China*
PS1-5	**Series-Wound Heteropolar Inductor Motor for Automotive Applications** David Meeker *QinetiQ North America, United States*
PS1-6	**A Comparative Study of Battery Balancing Strategies for Different Battery Operation Processes** Linfeng Zheng, Jianguo Zhu, and Guoxiu Wang *University of Technology, Sydney, Australia*
PS1-7	**Design and Optimization of Fractional Slot Concentrated Winding Permanent Magnet Machines for Class IV Electric Vehicles** Tanvir Rahman, Rodrigo Silva, Kieran Humphries, Mohammad H. Mohammadi, and David A. Lowther *McGill University, Canada*
PS1-8	**Efficient Multi-cell SOC Estimation for Electrified Vehicle Battery Packs** Weizhong Wang[1], Pawel Malysz[2], Deqiang Wang[1], Ran Gu[1], Hong Yang[2], and Ali Emadi[1] *[1]McMaster University, Canada, [2]Fiat Chrysler Automobiles, United States*
PS1-9	**A Fuzzy Logic based Power Management Strategy for Hybrid Energy Storage System in Hybrid Electric Vehicles Considering Battery Degradation** Fanning Jin[1], Changjian Hu[2], and Mengqi Wang[1] *[1]University of Michigan-Dearborn, United States, [2]North Carolina State University, United States*

Poster Session 1

MONDAY JUNE 27

PS1-10	**Evaluation of the Model-based State-of-Charge Estimation Methods for Lithium-ion Batteries** Yongzhi Zhang, Rui Xiong, and Hongwen He *Beijing Institute of Technology, China*
PS1-11	**Development of Model for DC Link Filter Design** H. Bulent Ertan[1] and Murat Kayhan[2] *[1]Middle East Technical University, Turkey [2]Aselsan Inc., Turkey*
PS1-12	**An Improved Energy Management Strategy for a Battery/Ultracapacitor Hybrid Energy Storage System in Electric Vehicles** Kai Man So, Yoke San Wong, Geok Soon Hong, and Wen Feng Lu *National University of Singapore, Singapore*
PS1-13	**Design and Performance Analysis of Radial Flux C-Core Switched Reluctance Motor for In-Wheel Electrical Vehicle Application** Nikunj Patel, Varsha Shah, Makarand Lokhande, and Gor Chandani *S.V.National Institute of Technology, India*
PS1-14	**Dynamic Analysis of a Li-Iron Phosphate Cell Using the Electro-Chemical Modeling Approach** Hamed Hossein Afshari, Ryan Ahmed, Mohammad Farag, and Saeid Habibi *McMaster University, Mechanical Engineering Dep., Canada*
PS1-15	**Systematic Electric Vehicle Scaling for Test Bed Simulation** Martin Kardasz and Mehrdad Kazerani *University of Waterloo, Canada*
PS1-16	**Range Anxiety Reduction in Battery-Powered Vehicles** Mahmoud Faraj and Otman Basir *University of Waterloo, Canada*
PS1-17	**A Hierarchal Cascaded Multilevel Converter for Uniform SOC Battery Management** Zuhair Alaas[1], Caisheng Wang[1], Chenguang Jiang[2], Chen Duan[1], and Le Yi Wang[1] *[1]Wayne State University, United States, [2]Kettering University, United States*
PS1-18	**The SOH Estimation of LiFePO4 Battery Based on Internal Resistance with Grey Markov Chain** Min Zhu, Wensong Hu, and Narayan Kar *University of Windsor, Canada*
PS1-19	**Robust Sliding Mode Control of Permanent Magnet Synchronous Motor Drives** Max Reitz, Xin Wang, and Patrick Gu *Southern Illinois University Edwardsville, United States*
PS1-20	**Three Phase to Co-Phase Railway Electrification Approach Using Voltage Synthesizing Electronic Phase Shifter (EPS)** Mesaad AlBader[1] and Prasad Enjeti[2] *[1]College of Technological Studies (PAAET), Kuwait, [2]Texas A&M University, United States*

Poster Session 1

PS1-21	**Core Losses Analysis for Switched Reluctance Motor Under Hysteresis Current Control and Single Pulse Modes** Shiliang Wang, Zhuo Yang, and Lei Gu *University of Texas at Dallas, United States*
PS1-22	**Harmonics-Based Steady-State Mathematical Model of Bi-directional Inductive Wireless Power Transfer System in V2G Applications** Ahmed A. S. Mohamed, Felipe G. N. de Almeida, and Osama A. Mohammed *Energy Systems Research Laboratory, Florida International University, United States*
PS1-23	**Identification and Quantification of Ageing Mechanisms in Lithium-ion Batteries using the EIS Technique** Carlos Pastor-Fernandez[1], W. Dhammika Widanage[1], Gael. H. Chouchelamane[2], Miguel Angel Gama-Valdez[2], and Marco James[1] *[1]WMG - The University of Warwick, United Kingdom, [2]Jaguar Land Rover, United Kingdom*

Monday, June 27, 2016

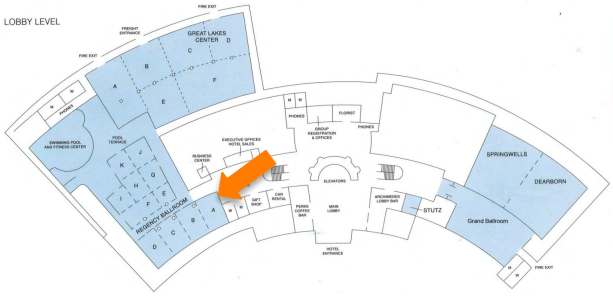
Afternoon Breakout Sessions

Course 1: Mechanical Design of Electric Machines

Monday, June 27, 2016

2:00 PM – 5:40 PM

Venue: Regency A-B



Instructor: Dr. Wei Tong – Kollmorgen Corp.

Course Description: Electric motors and generators are commonly referred to as electric machines. While electric motors convert electrical energy to mechanical energy, electric generators convert mechanical energy into electrical energy. Due to the similarities between electric motor and generator in many engineering aspects such as machine structures, power losses, cooling methods, electromagnetic principles and rotor dynamics, techniques developed from one can be essentially applied for another. Rapid increases in energy consumption and emphasis on environmental protection have demanded high efficient, reliable, cost-effective, quiet, and precisely controlled electric machines. Focusing on engineering design and practice, this course provides an in-depth introduction to electric machines. The topics covered include: electrical machine performing characteristics, practical design of key components (*e.g.*, rotor, stator, shaft, housing, etc.) and subsystems (*e.g.*, cooling, sealing, insulation, etc.), modeling and analysis, material selection, power loss mechanisms, vibration and noise, manufacturing methods, and machine testing.

Instructor's Short Biography: Dr. Tong is an internationally recognized expert in power and motion control systems and has over 28 years hands-on experience with electric machine applications. Since awarded his Ph.D. from University of Minnesota in 1989, he has worked across a variety of industry sectors such as power generation, superconducting magnetic energy storage, servo control, and robot at GE, Babcock & Wilcox, and Danaher. He is currently a Chief Engineer and Patent Review Board Chairman at Kollmorgen Corporation, a subsidiary of Danaher Corporation, responsible for the development, design, analysis and implementation of motion control systems. He has made significant contributions to the development of modern electric machines.

As an IEEE senior member and ASME Fellow, Dr. Tong was served as an Associate Editor of *Journal of Heat Transfer* (2009-2015) and an Associate Editor of *International Journal of Rotating Machinery* (2008 - 2016). Currently, he holds 28 U.S. patents and 16 foreign patents. He is a licensed Professional Engineer in Virginia. He has authored or co-authored numerous journal articles and books. Among them, the book "*Mechanical Design of Electric Motors*" was published by CRC Press in 2014 and the book "*Wind Power Generation and Wind Turbine Design*" by WIT Press in 2010.

Monday, June 27, 2016

Afternoon Breakout Sessions

Course 2: Accelerated Lifetime Testing for Power Electronic Modules

Monday, June 27, 2016

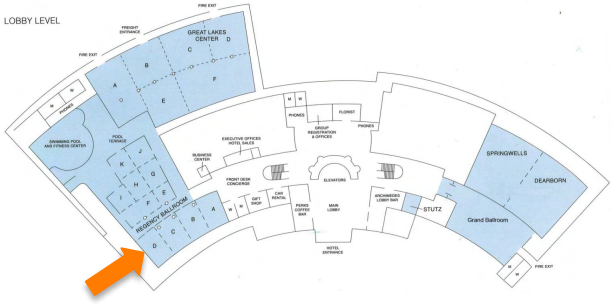
2:00 PM – 5:40 PM

Venue: Regency C-D

Instructor: Marc Tüllmann, Quality Manager Automotive Modules, Infineon Technologies AG

Course Description: Besides the electrical performance, reliability is one challenging key factor for the successful integration of power semiconductor electronics in EV and HEV applications. This course will provide insight in the fascinating world of reliability testing of semiconductor power devices. Main topics are the lifetime estimation from mission profiling up to the lifetime modeling, and finally the reliability testing. The contents from the theory to real life testing will be also introduced along with the judgment methods and decision criteria. The introduction and implementation of the automotive standard LV324, which is mandatory for power semiconductor manufacturers, will be also covered in this course. Some examples on the test strategies, the risks and side effects of inappropriate test methods will be presented. At the end of this course, the attendees will have an interesting overview on the next dimensions of reliability testing and robustness validation of power semiconductor devices.

Instructor's Short Biography: Marc Tüllmann has 16 years of experience in reliability testing of power semiconductor devices. He started his career in 1999 as a technical assistant in the Quality Management (QM) – reliability test department of Eupec GmbH and Infineon AG. After some practical working years, he started studying electrical engineering at the College and Business School of Paderborn/Germany. In 2006, he finished his study by receiving the Bachelor of engineering degree. Since 2006, he has been working for Infineon AG in the QM department as a QM engineer focusing on reliability testing. Later on he took the lead and responsibility as a quality manager for Infineon industrial high power modules. One of his main projects in the past was the electrification and qualification of Infineon power semiconductor components for Electric Drive Commercial, Construction, and Agricultural Vehicle (CAV) applications. Since 2014, Mr. Tüllmann is the quality manager for Infineon HybridPACK2 modules and he is responsible for product qualification strategy and testing for worldwide leading automotive manufacturer. Mr. Tüllmann is also a member of Infineon's robustness validation work group.



Monday, June 27, 2016
Afternoon Breakout Sessions

Course 3: An Introduction to Functional Safety for Electrified Powertrains

Monday, June 27, 2016
2:00 PM – 5:40 PM
Venue: Regency E-F

Instructors: Jody Nelson, Agish George, Michael Woon – kVA

Course Description: This course introduces functional safety development concepts, stemming from the ISO 26262 standard, with respect to electrified powertrains. Without preventive measures, the risk of safety critical system malfunction becomes unacceptably too high. The functional safety standard ISO 26262, published as the first edition in 2011, provides crucial safety-related requirements for passenger vehicles. Electric powertrains introduce new hazards in comparison to traditional, internal combustion engine powered powertrains. The course will cover these basic new hazards including increased braking torque, high voltage exposure and thermal concerns. Additionally, the course will cover more advanced hazards of neutral torque responses such as drive system stability, unique dual axle risks and haptic braking properties at low speed. The course will describe how automotive OEMs conduct the required hazard analysis and risk assessment (HARA) at the vehicle level. The HARA is the key analysis used to identify potential risks and develop the highest level safety requirements to mitigate these identified risks. Attendees of the course will become more familiar with the rugged processes required to develop safe passenger vehicles.

Instructors' Short Biography:

Jody Nelson received the B.S. and M.S. degrees in electrical engineering from the University of Wisconsin, Madison, with an emphasis on power electronics and was a member of WEMPEC. From 2002 until 2009 he worked for Daimler AG. At Daimler he worked in both the EMC Research and Development departments working on production hybrid and electric vehicles. He later moved to the electric motor control department where he focused on software development, diagnostics, high voltage safety, torque security and control board development for electric powertrains. In 2010 he co-founded kVA, a U.S. based company dedicated to improving functional safety in the automotive and industrial segments through consulting, assessments and training on ISO 26262 and IEC 61508.

Agish George is a Functional Safety Certified Automotive Engineer and has a Computer Science and Engineering background. At kVA he works with clients to support their needs in functional safety for various products. Prior to joining kVA in early 2015, he worked at Bosch for almost 14 years in the area of Engine Management systems. Agish George is a member of SAE and has authored a paper on "Writing Good Technical Safety requirements" for ISO26262.

Michael Woon received a B.S. degree in mechanical engineering from Michigan Technological University and an M.S. in mechanical engineering from the University of Michigan, Ann Arbor. During his studies he worked on several hybrid vehicle development projects, focusing on architecture and control design. Before coming to kVA Michael worked for GM in hybrid controls development for Spark EV, Bolt EV, Volt Gen2, and eAssist powertrains. He is currently a functional safety consultant at kVA with a focus on dynamics and controls applications.

Monday, June 27, 2016

Afternoon Breakout Sessions

Panel 1: Transmissions in Electrified Propulsion Systems

Monday, June 27, 2016

2:00 PM – 3:20 PM

Venue: Regency G-H

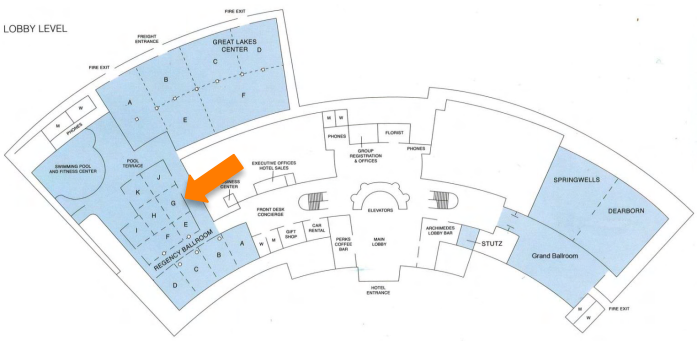
Panel Organizers and Moderators: Gang Chen and Haochi Li, Fiat Chrysler Automobiles

Panelists:

- Joe Palazzolo, Program Director eDrive, GKN
- Jim Criscuolo, Sr. Business Development Manager, Oerlikon
- Dave Crecelius, Director of Global Vehicle Electrification, AAM
- Phil Williams, Design/System Engineering Manager, Ricardo, Inc.

Panel Summary: In conventional vehicles, transmission is a device that is connected to the back of an engine and sends the power from the engine to drive wheels with different ratios to keep the engine running in its most efficient speed range. A vehicle requires a high torque on the drive wheels when starting from rest. However, an engine has an idle speed limit and only produces its maximum torque at relatively high speed. Transmissions, with varying gear ratios, serve to increase the flexibility of a powertrain such that a reasonably sized internal combustion engine can provide the speed and torque characteristics required by a motor vehicle, while keeping the engine running at its fuel efficient level.

An electric motor has a wider power range than an internal combustion engine. A traction motor can produce the peak torque at very low speed to start a vehicle. Therefore theoretically, an electric vehicle does not need a transmission. A single fixed gear ratio will work. However, should an electric vehicle have a multi-gear ratio transmission? Will that help down size a motor? Will that reduce the cranking current and hence, either allow a smaller sized battery pack or extend its EV range? Will that ease the thermal stress on an inverter and a motor? Will that improve the overall system efficiency, performance and reliability? What type(s) of transmission and how many gear ratios will be most suitable to electrified propulsion systems for different types of vehicles? This panel will offer a forum to discuss these topics with experts in the area.



Monday, June 27, 2016

Afternoon Breakout Sessions

Panel 2: Opportunities and Challenges in Autonomous Vehicles

Monday, June 27, 2016

2:00 PM – 3:20 PM

Venue: Regency J-K

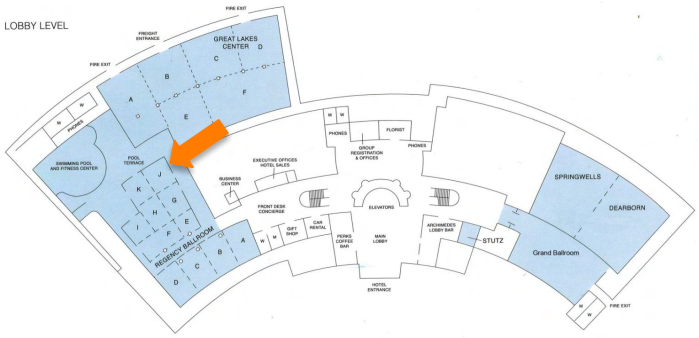
Panel Organizers: Stanley Baek, University of Michigan Dearborn

Panel Moderators: Stanley Baek and Wencong Su, University of Michigan Dearborn

Panelists:

- Steve Underwood, IAVS, University of Michigan, Dearborn
- Hongwei Zhang, Wayne State University
- Bryce Pilz, University of Michigan Law School
- Tao Zhang, Chief Scientist, Cisco

Panel Summary: For the past decades, researchers have made remarkable progress toward autonomous, or "driverless" vehicle technologies to replace a human driver. It is clear that autonomous cars will have a huge impact on our lives and economy. Autonomous vehicles are expected to offer the possibility of significant benefits - reducing crashes, fuel consumption, congestion, and pollution; increasing mobility for the disabled; and increasing road utilization. This panel will discuss the challenges and opportunities of the autonomous vehicle technology and legislative and regulatory acts.



Monday, June 27, 2016
Afternoon Breakout Sessions

Panel 3: NVH Performance in Electrified Powertrain Systems

Monday, June 27, 2016

4:20 PM – 5:40 PM

Venue: Regency G-H

Panel Organizer and Moderator: Kevin Hu, Fiat Chrysler Automobiles

Panelists:

- Sonny Kojic, Sr. Technical Specialist, CAE and NVH Engineering, Roush Industries Inc.
- Kiran Govinswamy, Director, Powertrain Vehicle Engineering & NVH, FEV North America Inc.
- Paul Weal, Director, Siemens PLM Software
- Glen C. Steyer, Executive Director, Engineering Systems, American Axle & Manufacturing, Inc.
- Avoki M. Omekanda, Staff Research Engineer, General Motors – Global R&D Center North

Panel Summary: The market for electric vehicles (EVs), which include hybrid, plug-in hybrid, and battery electric vehicles (HEVs, PHEVs, and BEVs), is rapidly expanding. The use of electrified devices introduces new sources of noise, and presents new challenges for NVH engineers in a way that most internal combustion engine (ICE) noise issues are well understood and can be controlled. The noise characteristics in EVs are different from ICE vehicles. EV noise is usually tonal harmonic that is related to an e-motor design, for example, the number of poles, the number of stator slots, the number of rotor bars – skewed or non-skewed in an induction machine. E-motor can make undesired whining noise and cause a significant concern in customer satisfaction, if not designed properly. Also with the absence of ICE noise, the EV noise cannot be masked. There are other noise contributors in gearbox and ancillary systems such as pumps, AC compressor, cooling fans, etc. This panel will provide a forum to discuss EV NVH engineering with focus on the electrified powertrain system.

Monday, June 27, 2016

Afternoon Breakout Sessions

Panel 4: The Past and the Future of Electrified Vehicle Industry

Monday, June 27, 2016

4:20 PM – 5:40 PM

Venue: Regency J-K

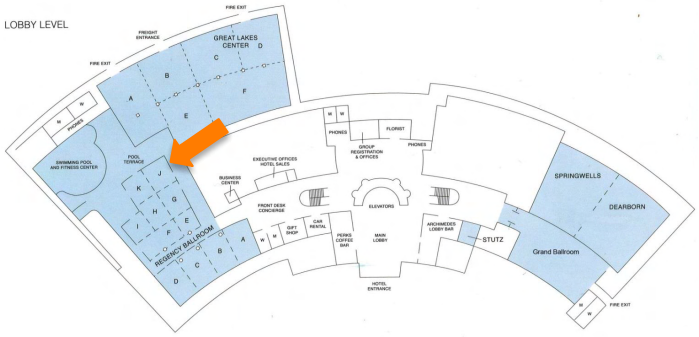
Panel Organizers: Dhafar Al-Ani, Fiat Chrysler Automobiles and Mohamad Berri, Ford Motor Company

Panel Moderator: Ali Emadi, Professor, McMaster University, Canada

Panelists:

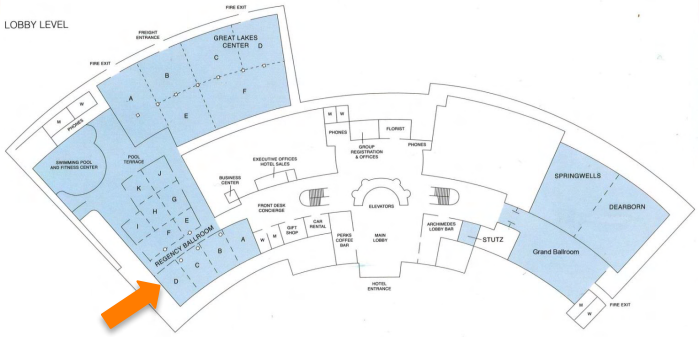
- Joe Palazzolo, Program Director eDrive, GKN
- Basar Alp, Head of Software and Systems Engineering Hybrid Electrical Vehicles (HEV), North America, Continental Automotive Systems
- Elie Naim, Technical Specialist, AVL

Panel Summary: With the stricter CO2 reduction targets and mandatory regulations on fuel economy, the number of electrified vehicles on the roads will increase in the next 10-20 years. This panel aims to discuss the changes that electrified vehicle industry has seen over the last years with the increasing market penetration of electrified vehicles. What are the automotive OEMs doing differently now as compared to the past? How did the needs of the industry change over time with the increasing demand for higher efficiency vehicles? What are the challenges and opportunities the automotive industry will see in the next decade?



Monday, June 27, 2016
Technical Committee Meeting

Joint PELS/IAS Technical Committee Meeting



Monday, June 27, 2016
7:30 PM – 8:30 PM
Venue: Regency C-D

Agenda

IEEE Transportation Electrification Community (TEC)
7:30 PM – 7:45 PM
TEC Chair: Dr. Phil Krein, University of Illinois at Urbana-Champaign

Meeting of the IEEE Power Electronics Society (PELS) Technical Committee (TC) on Vehicle and Transportation Systems
7:45 PM – 8:00 PM
TC Chair: Dr. Anand Sathyan, Fiat Chrysler Automobiles (FCA) US LLC

Meeting of the IEEE Industry Applications Society (IAS) Transportation Systems Committee
8:00 PM – 8:15 PM
TC Chair: Dr. Ayman El-Refaie, General Electric

ITEC 2017 Presentation
8:15 PM – 8:30 PM
General Chair ITEC'17: Dr. Omer Onar, Oak Ridge National Laboratory, USA

This meeting is open to all conference attendees and will discuss the activities of the technical committees of PELS and IAS related to vehicle and transportation systems, including ITEC.

Please attend this joint meeting if you are interested in getting more involved with the activities of IEEE-PELS and/or IEEE-IAS (e.g., ITEC, other conferences, workshops, publications, awards, etc.).

Tuesday, June 28, 2016
Keynote Presentations

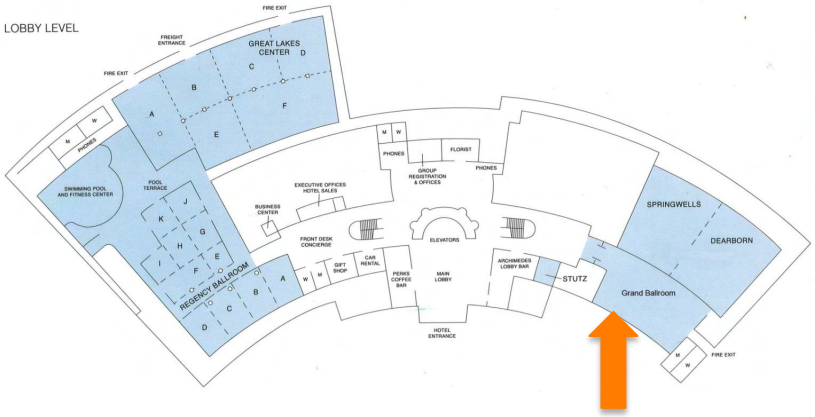
Plenary Session 2
Tuesday, June 28, 2016
8:30 AM – 12:00 Noon
Venue: Grand (Hubbard) Ballroom

Plenary Session Chairs:
Dr. Bulent Sarlioglu, WEMPEC, University of Wisconsin-Madison
Dr. Bruno Lequesne, President, E-Motors Consulting, LLC
Dr. Sanjaka Wirasingha, Valeo

Keynote Presentation 1: Materials, Components and Technologies for the Next Generation of Airplanes
8:30 AM – 9:00 AM

Speaker: Dr. Waleed Said, Founder and President, Efficient Power Tech Solutions, LLC (EPTech)

Short Biography: Dr. Waleed Said founded EPTech after retiring from UTC Aerospace Systems where he spent almost his entire career researching, advancing and qualifying high efficiency electrical and electromechanical power systems and overseeing their implementation on the latest breed of commercial and military airplanes that employ advanced electrical concepts.
Waleed provides consulting services and innovative solutions in R&D and trade studies for systems architectures, control techniques and design of high efficiency power electronics systems. EPTech's founder has a proven track record in successfully delivering compliant systems for performance, power quality, EMI/EMC, thermal and reliability requirements. Waleed enjoys a long and detailed hands-on experience in high efficiency power topologies using conventional Si based IGBT's, MOSFET's and power hybrids. This experience is augmented by a detailed knowledge and understanding of the latest advances Wide Bandgap device technologies such as SiC and GaN devices.



Tuesday, June 28, 2016

Keynote Presentations

Keynote Presentation 2: Effective Use of Modeling and Simulation in More Electric Vehicle Design and Integration

9:00 AM – 9:30 AM

Speaker: Dr. Jason R. Wells, Vice-President, PC Krause and Associates, Inc.

Short Biography: Jason R. Wells (S'00–M'06–SM'11) received the B.S. degree in biomedical engineering from the University of Illinois at Urbana-Champaign in 2000 and the B.S., M.S., and Ph.D. degrees in electrical engineering in 2000, 2003, and 2006, respectively. He is currently the Vice President of PC Krause and Associates, Inc. (PCKA), where he has worked since 2005. In this position, he serves as principal investigator and technical lead of numerous research and development efforts including both simulation software development and modeling, simulation, analysis, and design (MSA&D) related to More Electric Aircraft (MEA) power and distribution systems (PDS), with emphasis on power electronics and machines. In the software development role, he was a primary contributor to the next generation Automated State Model Generation for Simulink toolbox for the simulation of power electronic switched systems. In the MSA&D role, he has worked on projects spanning energy storage (batteries, capacitors, etc.), energy management (bidirectional dc-dc converters, inverters, electrical accumulators, etc.), sources (many types of electrical generators) and loads (electromechanical actuators, electro-hydraulic actuators, test load banks, etc.). His work on electrical accumulator technology was recognized as a U.S. Air Force Technology Milestone in 2010.

Keynote Presentation 3: Wide Band Gap Power Semiconductors for Automotive Applications

9:30 AM – 10:00 AM

Speaker: Dr. Peter Friedrichs, Senior Director, SiC, Infineon

Short Biography: Dr. Peter Friedrichs was born in 1968 in Aschersleben, Germany. After achieving his Dipl.-Ing. in microelectronics from the Technical University of Bratislava in 1993, he started a Ph.D work at the Fraunhofer Institut FhG-IIS-B in Erlangen. In 1996 he joined the Corporate Research of the Siemens AG and was involved in the development of power switching devices on SiC, mainly power MOSFETs and vertical junction FETs. Peter Friedrichs joined SiCED GmbH & Co. KG, a company being a joint venture of Siemens and Infineon and originated from the former Siemens research group, on March the 1st, 2000. Since July 2004 he was the managing director of SiCED, responsible for all technical issues. After the integration of SiCED's activities into Infineon he joined Infineon as Senior Director Silicon Carbide from April 1st, 2011.

Tuesday, June 28, 2016

Keynote Presentations

Coffee Break

10:00 AM – 10:30 AM

Keynote Presentation 4: Plug-in Hybrid Propulsion Systems for Commercial Vehicles

10:30 AM – 11:00 AM

Speaker: Gary Parker, Director of Powertrain Systems, Cummins Inc.

Short Biography: Gary Parker serves as the Director of Powertrain Systems inside the corporate Research and Technology area of Cummins Inc. He is responsible for developing and advancing the electrification initiatives in the markets that Cummins serves. These initiatives include a range of architectures from start stop, to on-board and off-board power generation, mild, full, plug-in hybrids, and electric vehicle powertrains. As the director of Powertrain Systems, Gary is responsible for system and component exploratory, development, and integration electrification initiatives. Gary has been an employee for Cummins Inc. for over 19 years and has served in various roles in systems including simulation development, controls, integration, performance calibration development, NVH, diagnostics, OBD, and program technical leadership in the organization. The simulation technologies developed through Gary's efforts have been in use at Cummins for over 15 years at all levels of the hardware-in-the-loop simulation spectrum. His product development efforts in Heavy Duty spanned across 4 product launches of the ISX15 and ISM11 platforms from 2002 thru 2010 that introduced EGR, VGT, DOC, DPF, SCR, and OBD technologies into the market to meet the stringent on-highway criteria emissions targets. Since 2010, Gary has been focused on powertrain electrification initiatives. Prior to joining Cummins, Gary received a Bachelors and a Masters degree in Mechanical Engineering from The Ohio State University with an emphasis on Systems and Mechatronics. He currently serves on the Engineering Advisory Board to the University's Center of Automotive Research. He also has received an MBA from Indiana University's Kelley School of Business.

Tuesday, June 28, 2016

Keynote Presentations

Keynote Presentation 5: Current Trends for Electric Marine Propulsion Systems

11:00 AM – 11:30 AM

Speaker: Jack Chapman, Staff Engineer, General Dynamics Electric Boat

Short Biography: Mr. Chapman has over 30 years of experience developing and testing power equipment and propulsion systems for marine vehicles and other commercial applications. He has over 20 U.S. and international patents on power conversion systems for applications ranging from shipboard propulsion to magnetic bearings and artificial hearts. His current focus is on development of advanced power systems and rotating machinery that include propulsion motors, generators, lithium Ion batteries, circuit protection, system safety, power semiconductors and controls for integrated power conversion systems.

Keynote Presentation 6: Plug-In Charging Challenges, Opportunities, and Directions

11:30 AM – 12:00 Noon

Speaker: Prof. Alireza Khaligh, Director of Maryland Power Electronics Laboratory, University of Maryland at College Park

Short Biography: Alireza Khaligh is the Director of Maryland Power Electronics Laboratory (MPEL) at the Electrical and Computer Engineering (ECE) Department and the Institute for Systems Research (ISR) in the University of Maryland at College Park (UMCP). He is an author/co-author of over 130 refereed journal and conference papers mainly focused on integrated and highly efficient power electronics interfaces for transportation electrification. Dr. Khaligh is the recipient of various awards and recognitions including the 2015 Inaugural Junior Faculty Fellowship from ISR at UMCP, the 2013 George Corcoran Memorial Award from the ECE Department of UMCP, three (2015, 2013, 2012) Best Vehicular Electronics Paper Awards from the IEEE Vehicular Technology Society, and 2010 Ralph R. Teetor Educational Award from the Society of Automotive Engineers (SAE). He is a Distinguished Lecturer of the IEEE Vehicular Technology Society. Dr. Khaligh was the General Chair of the 2013 IEEE Transportation Electrification Conference and Expo (ITEC). He is the General Chair of the 2016 IEEE Applied Power Electronic Conference and Expo (APEC).

Poster Session 2

Poster Session 2: Transportation Electrification II
Session Chairs:
Abas Goodarzi, President & CEO, US Hybrid Corporation, USA
Shanelle Foster, Michigan State University, USA

Tuesday, June 28, 2016
12:00 PM – 2:00 PM
Venue: Great Lakes Center (Exhibit Hall)

PS2-1	**Optimal Output Regulation of a Grid Connected Inverter with LCL Filter** Jiaxin Teng and Dariusz Czarkowski *New York University, Tandon School of Engineering, United States*
PS2-2	**Development and Performance Analysis of a Switched Reluctance Motor Drive for an Automotive Air-Conditioning System** Sandra Castano Sanchez[1], Javier Maixe-Altes[2], and Ali Emadi[1] *[1]McMaster University, Canada, [2]Rovira i Virgili University, Spain*
PS2-3	**A Nonlinear Control for Switched-Capacitor Converter Based On One-Cycle Control Technique** Lei Yang[1], Xiaobin Zhang[1], Bin Wu[2], Keyue Smedley[2], and Guann-pyng Li[2] *[1]Northwestern Polytechnical University, China, [2]University of California, Irvine, USA*
PS2-4	**An Isolated Bi-directional Soft-switched Three-phase DC-AC Matrix-based Converter with Novel Unipolar SPWM Modulation under Synchronous Rectification** Yu Xiaohang and Mengqi Wang *University of Michigan-Dearborn, United States*
PS2-5	**Dual-Electrical-Port Control of Cascaded Brushless Doubly-Fed Induction Drive for EV/HEV Applications** Peng Han and Ming Cheng *Southeast University, China*
PS2-6	**Segments Number Design of the Complementary Magnetic-Geared Dual-Rotor Motors** Le Sun, Ming Cheng, Honghui Wen, and Lihua Song *Southeast University, China*
PS2-7	**Using Dedicated EV Charging Areas to Resolve Grid Violations Caused by Renewable Energy Generation** Vijay Vasan Ashok[1], Gautham Ram Chandra Mouli[1], Jos van der Burgt[2], Santiago Penate Vera[2], Martijn Huibers[2], Laura Ramirez Elizondo[1], and Pavol Bauer[1] *[1]Delft University of Technology, Netherlands, [2]DNV GL – Energy, Netherlands*
PS2-8	**Noise and Electromagnetic Comparison of a Three-Phase 12/8 and a 12/10 Switched Reluctance Machine** Earl Fairall, Nigel Schofield, and Ali Emadi *McMaster University, Canada*
PS2-9	**Closed Loop Control of Six Phase Interleaved Bidirectional dc-dc Boost Converter for a HEV/EV Application** David Schumacher, Matthias Preindl, Pierre Magne, Berker Bilgin, and Ali Emadi *McMaster University, Canada*

Poster Session 2

PS2-10	**Analytical Investigation of DC link Overvoltages during Freewheeling for Inverters in EV** Aravind Ramesh Chandran[1], Martin Hennen[1], and Antero Arkkio[2] *[1]Robert Bosch Gmbh, Germany [2]Aalto University, Finland*
PS2-11	**Multi-Objective Optimization of a 1-kW Wireless IPT Systems for Charging of Electric Vehicles** Soumya Bandyopadhyay, Venugopal Prasanth, Pavol Bauer, and Braham Ferreira *Delft University of Technology, Netherlands*
PS2-12	**Cascaded Buck Converter: A Reexamination** Ricardo Aguilar-Najar, Francisco Perez-Pinal, Gabriela Lara-Salazar, Carlos Herrera-Ramirez, and Alejandro Barranco-Gutierrez *Celaya Institute of Technology, Mexico*
PS2-13	**Development of a Sliding Mode Controller and Higher-Order Structure-Based Estimator** Stephen Andrew Gadsden[1], Hamed Afshari[1], and Saeid Habibi[2] *[1]University of Maryland, Baltimore County, United States [2]McMaster University, Canada*
PS2-14	**Design Considerations of a Switched Reluctance Machine with High Power Density** Qiang Yu, Berker Bilgin, and Ali Emadi *McMaster University, Canada*
PS2-15	**Optimal Traction and Regenerative Braking Reference Current Synthesis for an IPMSM Motor using Three Combined Torque Control Methods for an Electric Vehicle** Khaled Itani[1], Alexandre De Bernardinis[2], Zoubir Khatir[2], and Ahmad Jammal[3] *[1]ISAE Cnam Liban, Lebanon, [2]SATIE IFSTTAR, France, [3]Ministry of Higher Education, Lebanon*
PS2-16	**MTPA Fitting and Torque Estimation Technique Based on a New Flux-Linkage Model for Interior Permanent Magnet Synchronous Machine** Yu Miao[1], Matthias Preindl[1], Hao Ge[1], Bing Cheng[2], and Ali Emadi[1] *[1]McMaster University, Canada, [2]Mercedes-Benz R&D North America, United States*
PS2-17	**Reactive Power Control of Grid-Connected Inverter in Vehicle-to-Grid Application for Voltage Regulation** Wooyoung Choi, Woongkul Lee, and Bulent Sarlioglu *University of Wisconsin-Madison, United States*
PS2-18	**Mobile Phone mid-range Wireless Charger Development via Coupled Magnetic Resonance** Lei Shi[1], Kevin Bai[1], and Ismail Yasar[2] *[1]Kettering University, United States, [2]Reutlingen University, Germany*
PS2-19	**Lateral Stability Control of the in-wheel Motor Drive Articulated Electric Vehicle** Wenwei Wang, Jianing Fan, Rui Xiong, and Fengchun Sun *Beijing Institute of Technology, China*
PS2-20	**Fast Charge Battery Electric Transit Bus In-Use Fleet Evaluation** Robert Prohaska, Kenneth Kelly, and Leslie Eudy *NREL, United States*
PS2-21	**Sensitivity Analysis on Electrical Parameters for Permanent Magnet Synchronous Machine Manufacturing Tolerances in EV and HEV** Hussein Khreis[1], Andrea Deflorio[1], Karsten Voelz[1], and Benedikt Schmuelling[2] *[1]Robert Bosch GmbH, Germany, [2]University of Wuppertal, Germany*

Poster Session 2

PS2-22	**MPC-based Power Management System for a Plug-in Hybrid Electric Vehicle for Relaxing Battery Cycling** Masood Shahverdi[1], Michael Mazzola[2], Abdelwahed Sherif[2], Doude Mathew[2], and Zhu David[2] *[1]California State University LA, United States [2]Misssissippi State University, United States*
PS2-23	**Transient Thermal Analysis of a Copper Rotor Induction Motor using a Lumped Parameter Temperature Network Model** Firoz Ahmed, Eshaan Ghosh, and Narayan Kar *University of Windsor, Ontario, Canada*
PS2-24	**A Modified Control Method for Bidirectional Z source Converters** Wenzheng Xu, K.W. Chan, H.L. Nelson Chan, and Junwei Liu *The Hong Kong Polytechnic University, Hong Kong*
PS2-25	**Optimal Control of Regenerative Braking for SPM Synchronous Machines with Current Feedback** Aravind Samba Murthy[1], David Magee[2], and David Taylor[1] *[1]Georgia Institute of Technology, United States [2]Texas Instruments, United States*

Tuesday, June 28, 2016

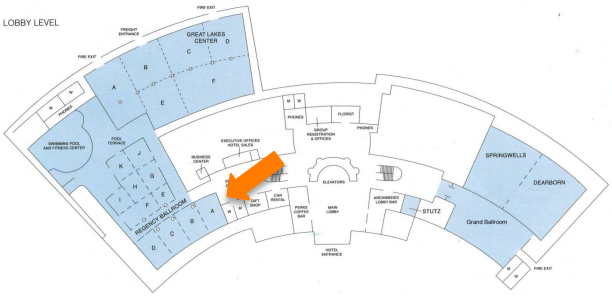
Afternoon Breakout Sessions

Course 4: Design Through Simulation of an Interior Permanent Magnet Machine and Controller

Tuesday, June 28, 2016

2:00 PM – 5:40 PM

Venue: Regency A-B



Instructors: David Farnia, JMAG Technical Sales, Powersys-Solutions and Dakai Hu, Applications Engineer, MathWorks

Course Description: This course will introduce the use of system-level simulation for developing a controller for an interior permanent magnet synchronous motor. This course is targeted at controls engineers, system engineers, researchers and academics looking to understand how simulation can help optimize and refine a controller strategy before moving into more costly hardware testing and implementation. Attendees should have an interest in understanding how FEA and behavioral simulation software can be used for motor control design. The course will begin with generating a high fidelity motor model from FEA software suitable for use in a system-level behavioral model. Instructors will model an electric motor to obtain electromagnetic torque, total flux linkage on the d- and q-axis (including the permanent magnet flux linkage and the flux linkage generated by current excitation), core and stator losses, id/iq, vd/vq current and voltage values, rotor angle/rotor flux angle, and stator temperature. Using this motor model, instructors will design the controller to characterize the optimal operation region/points under voltage/current/speed constraints; generate id and iq lookup tables based on torque command and speed feedback, and implement the lookup table together with close-loop torque and current control on the machine model. The control model will also examine the effects of different machine model fidelities from a very simple machine model to a very comprehensive non-linear model.

Instructors' Short Biographies:

David Farnia is the head of Technical Sales in North America for JMAG. He received a Master's Degree in Electromechanical Engineering from the University of Wisconsin and has spent more than 10 years designing/analyzing electric machines. In this time, David has worked on designs ranging from a 3 Watt computer cooling fan all the way up to a Megawatt hydro-electric generator. David started using JMAG at the University of Wisconsin and started working directly for JMAG team 5 years ago. In this time he has worked with customers to improve their electromagnetic simulations while applying customer feedback to improving JMAG's functionality.

Dakai Hu is an Application Engineer at MathWorks supporting customers adopting Model-Based Design related to motor and power controls. Prior to joining the MathWorks, Dakai worked for Emerson Network Power on the controller design of 400KVA to 1600 KVA Uninterruptible Power Supplies. Dakai received his Ph.D. in Electrical Engineering from the Ohio State University. While studying at OSU, he published 5 first-author conference and journal papers, with topics related to motor control and Hardware-in-the-Loop simulation designs.

Tuesday, June 28, 2016

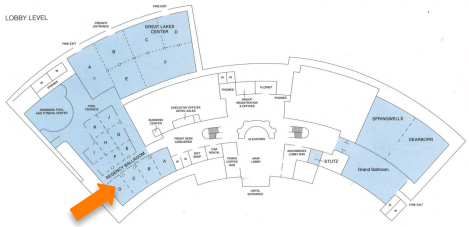
Afternoon Breakout Sessions

Tutorial 1: Smarter Drives Need Smarter Development – Case Study of the Design-V Applied to Power Electronics

Tuesday, June 28, 2016

2:00 PM – 3:20 PM

Venue: Regency C-D



Instructors:

Gernot Pammer, Director of Business Unit Power Electronics, Egston – Austria; Ben Black, Market Development Manager for Real-Time Test of Power Electronics and Power Systems, National Instruments; Jean Belanger, President and R&D Director, Opal-RT Technologies

Tutorial Description: The motor drives market continually strives for faster, more efficient, more flexible and safer drives. However this continual increase in complexity, often in competing directions of optimization, creates a challenge for embedded algorithm developers when it comes to validating functionality. With the goal always to create a stable and safe control system, the more complicated a device the more rigorously it should be tested. By broadly adopting a version of the Design V methodology that ties system requirements to embedded controller design, deployment and validation, creators of smart devices can respond to the challenge of increased embedded intelligence. A cohesive tool chain provides the basis for the Design V, but two important areas of rapid innovation are the technologies required to model power systems in real time and the power electronics hardware used to emulate them. Real-time simulation combined with active load emulation spans the gap between traditional signal-level hardware-in-the-loop (HIL) and physical test, creating a relatively new class of test system called power-level HIL (P-HIL). This tutorial will apply the Design V to a power electronics system. The material will walk through design, prototyping, deployment and then test of a power-electronics device, focusing extra depth on the modeling and P-HIL technologies.

Instructors' Short Biographies:

Gernot Pammer is Director of the Business Unit Power Electronics at Egston – Austria. In 1988 he founded his first company that developed sound reinforcement systems. In 1995 he received his Dipl. Ing. degree in Electrical engineering from Technische Universität Graz. After several years in education field, he founded a high tech venture company that developed high speed real time fibre-optics switching networks. In 2006 he started to work as a technology consultant for high technology companies. In 2009 he joined EGSTON and started to develop the new business unit Power Electronics. With the Compiso Power Amplifier Technology he won several industry and innovation awards.

Ben Black is Market Development Manager for Real-Time Test of Power Electronics and Power Systems at National Instruments and a Lecturer at The University of Texas at Austin. He earned his Ph.D. in 2007 from the George Woodruff School of Mechanical Engineering at the Georgia Institute of Technology. From 2007 through 2012, he worked as a System Engineer at National Instruments focusing on advanced control and advanced simulation projects. He has worked on interesting projects that have been as mission critical as a three-phase inverter controller for generating a micro-grid or an FPGA-based simulation of a PMSM. He also dedicates a significant amount of time to volunteer as an Executive Committee Member of the Central Texas First Lego League.

Jean Bélanger, as President and R&D Director, defines the vision and corporate direction of Opal-RT technologies and steers its efforts in research and development. Prior to co-founding Opal-RT in 1997, he worked at Hydro Quebec for 25 years, where he was one of the main design engineers of the 765-kV James Bay transmission system. From 1993 to 1996, he designed and delivered several large-scale simulators to a number of leading companies worldwide, including Mitsubishi, Hitachi, Toshiba and EPRI (China). Subsequently, he co-founded TEQSIM, the Hydro-Quebec subsidiary dedicated to the commercialization of real-time simulation technologies. Mr. Bélanger is an electrical engineer (Laval University, Quebec) with a Masters degree in Power Systems from Ecole Polytechnique of Montreal.

Tuesday, June 28, 2016

Afternoon Breakout Sessions

Tutorial 2: Electric Motor Noise Modeling

Tuesday, June 28, 2016

2:00 PM – 3:20 PM

Venue: Regency E-F

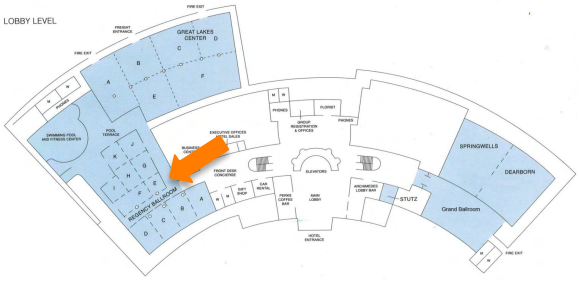
Instructor: Dr. Debbie Reeves, Senior Application Engineer, MSC Software Company

Course Description: The sound quality of electric vehicles can be a key differentiator between the different electric vehicle manufacturers. Sound quality is an important EV's attribute because of customers' expectation of it being very quiet. Customers often relate sound quality with good quality and it ultimately reflects on the manufacturers' brand identity. Therefore automotive companies have put considerable efforts to understand the role of sound and vibration with customers' perception of good quality vehicles.

With the absence of internal combustion engine in EV, noise from other sources can be much more noticeable in the interior of the vehicle. An example of a noise source in EV is the electric motor. The noise generated by an electric motor is due to the vibrations of its moving parts. The noise can be especially pronounced if there are imbalances in the spinning parts. Another noise source is the interaction of the motor with other structures in which it is mounted, which can amplify the noise.

This tutorial will present noise analysis of an electric motor. The first part of the tutorial will cover the principal of motor noise analysis. The second part of the tutorial will focus on a detail step by step process of building an electric motor acoustic model using MSC Actran. The complete analysis process of building the acoustic model and the processing of the simulation results will be presented.

Instructor's Short Biography: Dr. Debbie Reeves is a Senior Application Engineer at MSC Software Company. She received her Ph.D. from the Graduate Program in Acoustics at the Pennsylvania State University. She has been actively involved in the acoustic field for more than twenty years. Dr. Reeves' specialty is in the area of computational acoustics. Her experience in the acoustic field encompasses a broad range of applications from consumer electronics to wind turbine.



Tuesday, June 28, 2016

Afternoon Breakout Sessions

Panel 5: Advancements in Charging and Wireless Charging Technologies

Tuesday, June 28, 2016

2:00 PM – 3:20 PM

Venue: Regency G-H

Panel Organizers and Moderators: Vino Pathmanathan and Richard Scholer, Fiat Chrysler Automobiles, and Sriram Jala, Ford Motor Company

Panelists:

- Mark Klerer, Senior Director – Technology, Qualcomm
- Theodore Bohn, Principle Electrical Engineer, Center for Transportation Research, Argonne National Laboratory
- D. Douglas Burkett, Electrification Standards and Regulations Engineer, Electrified Powertrain Engineering, Ford Motor Company

Panel Summary: Electrification and complexity of hybrid, and electric vehicles from Wireless Charging WPT1/2/3 with z-heights Low/Medium/High is increasing rapidly with wide varieties of charging architecture within the vehicle, and simple/complex EVSE's. This panel will concentrate on the following topics:

- Definition of commonly used terms in Wireless Charging WPT1/2/3 with z-heights Low/ Medium/High from vehicle/EVSE
- Wireless Charging standards and Communication: North American, Asian, and European
- Interoperability: Standards, and Goals for standard groups (i.e.: Increase interoperability between the vehicle, and EVSE in a safe manner). Commonly observed interoperability issues
- Vehicle Architecture
- EVSE Architecture
- Suppliers Tier 1 & 2: (EVSE, and Vehicle Secondary Pad)
- Wireless Charging HMI: Vehicle, and EVSE
- First and Next steps in Wireless Charging

Tuesday, June 28, 2016

Afternoon Breakout Sessions

Technical Session (TS1): Power Converter Applications (Industry Presentation-Only Session)
Session Chairs:
Mahesh Krishnamurthy, Illinois Institute of Technology, USA
Lucia Gauchia, Michigan Tech University, USA

Tuesday, June 28, 2016
2:00 PM – 3:20 PM
Venue: Regency J-K

TS1-1	**Design Considerations for Next Generation Traction Drive IGBT based Power Modules** Andre Christmann and David Levett *Infineon Technologies Americas Corp.*
TS1-2	**Design Improvements to the PrimePACK IGBT Module for CAV Traction Drives** Andre Christmann and David Levett *Infineon Technologies Americas Corp.*
TS1-3	**Using Vector Based Approaches in Testing and Analyzing Grid-Connected Devices** Martin M. Weiss *NHR*
TS1-4	**Design and Test Challenges for Next Generation Power Converters** Gary Raposa *Keysight Technologies*

Special Session (TS2): Challenges and Advancements in Electric Motor Controls for Transportation Applications
Organizer: Daniel Luedtke, Fiat Chrysler Automobiles, USA
Session Co-Chair:
Wei Xu, Ford Motor Company, USA

Tuesday, June 28, 2016
4:20 PM – 5:40 PM
Venue: Regency J-K

TS2-1	**Overview of Motor Speed and Position Sensing for Vehicle Application (presentation-only)** Yochan Son *General Motors, USA*
TS2-2	**Creative Usage of Stator Flux Linkage to Fast Brake Electric Vehicles** Yukai Wang and Robert D. Lorenz *University of Wisconsin-Madison, USA*
TS2-3	**Implementing FPGA Based SoC's in Electrified Vehicles (presentation-only)** Tony Lennon *Mathworks, USA*
TS2-4	**Automotive HEV/EV Motor Microcontroller Technology (presentation-only)** Gary Miller *Renesas, USA*

Tuesday, June 28, 2016

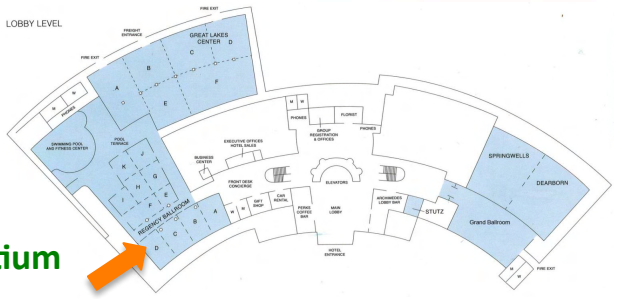
Afternoon Breakout Sessions

Tutorial 3: High Speed Flux-Switching Permanent Magnet Machine and Comparison with Other Types of PM Machines

Tuesday, June 28, 2016

4:20 PM – 5:40 PM

Venue: Regency C-D



Instructor: Dr. Bulent Sarlioglu, Associate Director, Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC)

Course Description: Permanent magnet electric machines are becoming popular for many applications because of its high efficiency. Applications include automotive, aerospace, industrial, oil and gas, and medical equipment. More specifically, a machine class called the flux-switching permanent magnet (FSPM) is highly efficient, with high power density and high-speed capability. Unfortunately, the FSPM requires a high fundamental frequency, which many modern power electronics cannot provide easily. High fundamental and high switching frequency decreases the relative efficiency of what could potentially be a highly useful machine. The goal of this tutorial is to present the unique features of flux switching permanent magnet machines, operation principles, advantages and disadvantages. A novel machine using 6-slot 4-pole machine design that can reduce the fundamental frequency requirement by 60 percent will be presented and compared with 12-slot 10-pole flux switching permanent magnet machine. The proposed machine is amenable for high-speed operation with the benefits of reduced volume and weight of the electric machine system. In this tutorial, the flux switching PM machines will be compared with other type of PM machines such as surface PM machines and internal PM machines.

Instructor's Short Biography: Dr. Bulent Sarlioglu is an assistant professor in the College of Engineering at the University of Wisconsin–Madison. He is also one of the associate directors of the Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC). Dr. Sarlioglu previously worked at Honeywell International Inc.'s aerospace division in California for 11 years, most recently as a staff systems engineer, earning Honeywell's technical achievement award in 2003 and an outstanding engineer award in 2011. Dr. Sarlioglu's expertise includes electrical machines, drives, and power electronics with a focus on renewable energy, electric vehicles and aerospace applications. He is the inventor or co-inventor of 16 US patents as well as many international patents. He received his PhD from University of Wisconsin–Madison in 1999. He was the general co-chair of IEEE ITEC in 2013. Currently, he serves in two IEEE committees regarding transportation electrification. He is also the editor of the IEEE Electrification Magazine responsible for electric airplane section.

Tuesday, June 28, 2016

Afternoon Breakout Sessions

Panel 6: SiC Power Devices in Automotive Traction Inverters – Are there any remaining hurdles?

Tuesday, June 28, 2016

4:20 PM – 5:40 PM

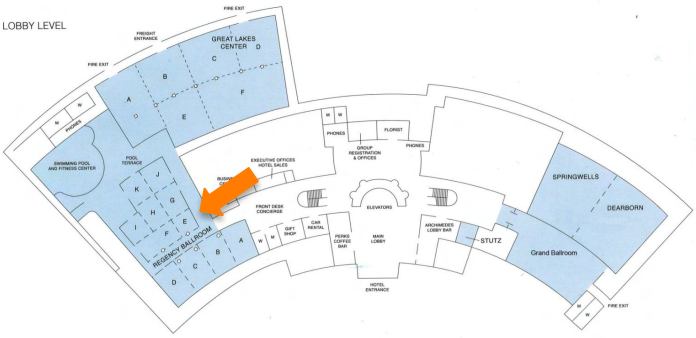
Venue: Regency E-F

Panel Organizers and Moderators: Serdar Yonak, Ford Motor Company and Maggie Wang, University of Michigan Dearborn

Panelists:

- Peter Friedrichs, Sr. Director, Wide Band-Gap, Infineon
- Jeffrey Casady, Program Manager, Wolfspeed/Cree
- Alex Huang, Professor, North Caroline State University
- Chingchi Chen, Technical Leader, Ford Motor Company

Panel Summary: Traction inverters play an important role in HEVs and EVs by managing the electrical energy flow between the traction battery and the vehicle's electric motor/generator. However, these inverters typically account for about 25 percent of the total electrical power loss in HEVs, with a majority of that loss associated with the power devices alone. Some OEMs have claimed that using SiC power devices will reduce power device losses to one tenth of that seen with silicon and enable the potential for a 10% improvement in fuel economy with a traction inverter that is 80% smaller. There has been a significant amount of SiC base material, device, and packaging research and development but have the major hurdles associated with cost, reliability, and system integration been overcome?



Tuesday, June 28, 2016

Afternoon Breakout Sessions

Panel 7: Advancements in Traction Motor Winding Technologies

Tuesday, June 28, 2016

4:20 PM – 5:40 PM

Venue: Regency G-H

Panel Organizers: Hossein Dadkhah and Anand Sathyan, Fiat Chrysler Automobiles

Panel Moderator: Hossein Dadkhah, Fiat Chrysler Automobiles

Panelists:

- Kumar Rajasekhara, President & CEO, Marsilli North America
- Konstantinos Laskaris, Traction Motor System Architect, Tesla Motors Inc.
- David A. Fulton, P.E. Director, Rotating Electrical Machines, BorgWarner PowerDrive Systems
- Khwaja Rahman, Technical Fellow, Electric Machines, General Motors R&D

Panel Summary: This panel focuses on three major winding technologies, which are heavily used in electric traction motors: round wire, hairpin, and concentrated windings. The panel concentrates on the discussion on the following issue in these winding technologies:

- Advantages and disadvantages of each of these winding technologies
- Effect of winding pattern on automation
- Effect of winding technology on automation
- Cooling aspects on all these winding technologies
- Performance of the winding technologies (power, torque, efficiency, etc.)
- Suitability of each of these winding technologies for different applications

Wednesday, June 29, 2016

Morning Breakout Sessions

Course 5: Wireless Power Transfer (WPT) Systems

Wednesday, June 29, 2016

8:30 AM – 12:00 PM

Venue: Regency A-B

Instructors: Madhu Chinthavali and
Omer C. Onar, Oak Ridge National Laboratory

Course Description: Wireless power transfer (WPT) is a convenient, safe, and autonomous means for electric and plug-in hybrid electric vehicle charging that has seen rapid growth in recent years for stationary applications. WPT does not require bulky contacts, plugs, and wires, is not affected by dirt or weather conditions, and is as efficient as conventional charging systems. When applied in-motion, WPT additionally relives range anxiety, adds further convenience, reduces battery size, and may help increase the battery life through charge sustaining approach. This tutorial covers the essentials of magnetic resonance coupling and relevant aspects of WPT operation, an analytical approach to calculate the coupling coefficient of WPT, a control strategy based on grid-side power converter regulation, to optimize overall system performance, a comprehensive design methodology, as well as modeling and simulation of WPT along with some experimental results obtained from the Oak Ridge National Laboratory. Experimental studies performed at the Oak Ridge National Laboratory covers the stationary and in-motion wireless power system operation results, performance of different coil designs, system characteristics under different switching frequencies, load clamping voltage, DC link voltage, high frequency inverter duty cycle, coil spacing, misalignment, foreign obstacles between the coils, insertion loss due to road surfacing materials, and the step-down transformer at the inverter input for increased inverter efficiency. The tutorial also covers some of the experimental lessons learned, as well.

Instructors' Short Biographies:

Madhu Sudhan Chinthavali received his Ph.D. and M.S. degrees in Electrical Engineering from The University of Tennessee in 2015 and 2003, respectively. He is presently leading the Power Electronics Team in the Power Electronics and Electric Machinery Group of the Oak Ridge National Laboratory. His research experience and interests covers power electronics applications in transportation electrification, renewables, building energy integrations, and energy storage systems, wireless and wired charging systems, integrated power electronics architectures, and high power applications. He is also the principal investigator for ORNL's wide bandgap device program, including the testing, packaging, designing, and integration activities.

Omer C. Onar is an R&D staff and Alvin M. Weinberg Fellow at the Power Electronics Team at the Power Electronics and Electric Machinery Group at the Oak Ridge National Laboratory. He received his Ph.D. degree in electrical engineering from the Illinois Institute of Technology, Chicago, IL, in July 2010. He received the Alvin M. Weinberg Fellowship at the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL), where he joined the Power Electronics and Electric Machinery Group. At Oak Ridge National Laboratory, he has been working on advanced power electronics and electric drives, renewable energies, energy storage systems, wireless power transfer systems, and grid applications. He is an associate editor for the IEEE Transactions on Transportation Electrification and the IEEE Transactions on Power Electronics.

Wednesday, June 29, 2016

Morning Breakout Sessions

Panel 8: Electrified Transportation as a Power Grid Resource

Wednesday, June 29, 2016
8:30 AM – 10:10 AM
Venue: Regency C-D

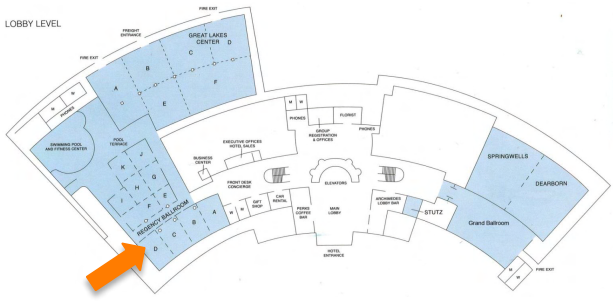
Panel Organizers: Katherine McKenzie, Program Manager, Electric Vehicle Transportation Center (EVTC), Hawaii Natural Energy Institute, University of Hawaii and David Block, Director Emeritus, Florida Solar Energy Center, University of Central Florida

Panel Moderator: Katherine McKenzie, Program Manager, Electric Vehicle Transportation Center (EVTC), Hawaii Natural Energy Institute, University of Hawaii

Panelists:

- Richard Raustad, Program Director, Electric Vehicle Transportation Center (EVTC), Florida Solar Energy Center, University of Central Florida
- Mark Burdge, Vice President, Sales & Government Programs, VIA Motors, Inc.
- Andrew Meintz, Vehicle to Grid Integration Engineer, National Renewable Energy Laboratory
- Haukur (Hawk) Asgeirsson, Manager – Power Systems Technologies, DTE Energy

Panel Summary: The emergence of electric vehicles (EVs) has the potential to help transform the nation's power network into an efficient, integrated "smart" grid and to help add distributed energy sources as an easily adoptable power option. This panel focuses on the diverse advantages and challenges offered by EVs connected to the grid. Applications and impacts of powering EVs in conjunction with distributed solar and wind power generation are summarized, along with demand control, energy storage, the role of EVs in back-up power, and managing load at the building level. The utility's and manufacturer's perspectives are shared along with a case study; fast-forward to Hawaii in 2045, the first state in the nation where 100% renewable power generation is required by law.



Wednesday, June 29, 2016

Morning Breakout Sessions

Panel 9: Cybersecurity Issues in Electrified Transportation: Towards Standards Needs

Wednesday, June 29, 2016
10:30 AM – 12:00 PM
Venue: Regency C-D

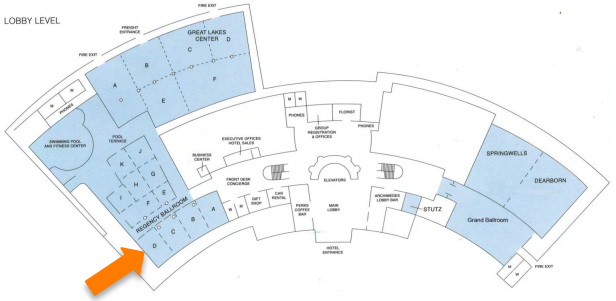
Panel Organizer and Moderator: Dr. Bruno Lequesne, E-Motors Consulting, LLC

Panelists:

- Dr. Phil Krein, University of Illinois at Urbana-Champaign
- Dr. John Miller, Sr. Scientist and Technical Advisor to Momentum Dynamics, Inc.
- Dr. Stacy Prowell, Chief Cyber Research Scientist, Vehicle Security Center, Oak Ridge National Laboratory Cybersecurity for Energy Delivery Systems
- Ashok Moghe, Principal Engineer, Chief Technology and Architecture Office at Cisco

Panel Summary: Transportation electrification imposes special considerations and concerns for cybersecurity, in addition to widely discussed issues of connection security and V2V communication and control. This panel will address cybersecurity issues directly associated with more-electric transportation, including propulsion system cyber vulnerabilities, cyber issues linked to human error and software bugs, vulnerabilities of active safety systems, the challenges of “always on” large battery packs, vehicle-to-grid aspects, and others. The discussion identifies and delineates key areas of concern in cybersecurity issues directed at transportation electrification, emphasizes gap areas, and identified existing practices and advances in cybersecurity for utility grids and aerospace systems that can be applied in the near term to cybersecurity issues in electrified transportation. Speakers will dress questions that include:

- How can extreme intentional operating modes be distinguished consistently from fault conditions or tampering?
- What are helpful known design and validation practices to evaluate operational cybersecurity challenges in highly energy-dense systems?
- Are there strategies that lead to inherent safe modes in the event of security issues or vehicle damage?
- What are best practices for securing software and hardware update and repair processes?
- What policy and standards-related activities would be of benefit in cybersecurity issues specific to transportation electrification, including interaction of devices with power grids?



Wednesday, June 29, 2016

Morning Breakout Sessions

Special Session (TS3): Advancements in Power Electronics
Organizer: Haoyu Wang, ShanghaiTech University, China
Session Co-Chairs:
Jiangbiao He, GE Global Research, USA
Omid Beik, McMaster University, Canada

8:30 AM – 10:10 AM
Venue: Regency E-F

TS3-1	**Current Controller Design for High Switching Frequency Converters** Roghayeh Gavagsaz-Ghoachani[1], Matheepot Phattanasak[2], Majid Zandi[3], Jean-Philippe Martin[1], Babak Nahidmobarakeh[1], and Serge Pierfederici[1] *[1]GREEN, University of Lorraine, France, [2]RERC, KMUTNB, Thailand, [3]Shahid Beheshti University, Iran*
TS3-2	**A Novel Inverter Topology for Reduction of Common Mode Voltage for GaN-based Variable Frequency Inverter** Casey Morris, Di Han, and Bulent Sarlioglu *University of Wisconsin-Madison, United States*
TS3-3	**DC Link Voltage Sensorless Control of a Three-Phase Boost Power Factor Correction Rectifier** Ayan Mallik and Alireza Khaligh *University of Maryland, United States*
TS3-4	**Analysis and Design of a High Efficiency, High Power Density Silicon Carbide Inverter** Michael Eull[1], Matthias Preindl[2], and Ali Emadi[1] *[1]McMaster University, Canada, [2]Columbia University, United States*
TS3-5	**Energy Transfer Analysis for Capacitor Voltage Balancing of Modular Multilevel Converters** Binbin Li [1], Rui Li[1], Barry Williams[1], and Dianguo Xu [2] *[1]University of Strathclyde, United Kingdom, [2]Harbin Institute of Technology, China*

Special Session (TS4): Off-road Electrification
Organizer: Dr. Omar Abdel-baqi, University of Wisconsin Milwaukee/Caterpillar Mining, USA
Session Co-Chair:
Lalit Patnaik, University of Ontario Institute of Technology, Canada

8:30 AM – 10:10 AM
Venue: Regency G-H

TS4-1	**Time-Domain Emergency Scenario Analysis in Rail Passenger Train** Maxime Berger[1], Carl Lavertu[1], Ilhan Kocar[2], Jean Mahseredjian[2] *[1]Bombardier Transportation, Canada, [2]Polytechnique Montreal, Canada*
TS4-2	**Analysis and performance of the Venturi Buckeye Bullet 3 land-speed Record Attempts** Matilde D'Arpino[1], David Cooke[2], Giorgio Rizzoni[2], and Giuseppe Tomasso[1] *[1]University of Cassino and South Lazio, Italy, [2]The Ohio State University, United States,*
TS4-3	**Data-Driven Decision Support Tool for Power Quality Measures in a Marine Vessel Power System** Espen Skjong, Serge Gale, Marta Molinas, and Tor Arne Johansen *Norwegian University of Science and Technology, Norway*
TS4-4	**NASA SCEPTOR Electric Concept Aircraft Power System (presentation-only)** Sean Clarke, Kurt Papathakis, Aamod Samuel, Yohan Lin, and Starr Ginn *NASA Armstrong Flight Research Center, United States*
TS4-5	**Ship-Wide Transient Specifications and Criteria for Medium-Voltage DC Shipboard Power System** Nasibeh Zohrabi, Jian Shi, and Sherif Abdelwahed *Mississippi State University, United States*

Wednesday, June 29, 2016

Morning Breakout Sessions

Technical Session (TS5): Advanced Electric Motor Control and Drives
Session Chairs:
Xiaodong Shi, Mercedes-Benz R&D, USA
James Jiang, McMaster University, Canada

8:30 AM – 10:10 AM
Venue: Regency J-K

TS5-1	**Virtual Square-Wave Current Injection Based Maximum Torque per Ampere Control for Interior Permanent-Magnet Synchronous Machines** Yue Zhao *University of Arkansas, United States*
TS5-2	**Impact of Parameter Estimation Errors on Feed-Forward Current Control of Permanent Magnet Synchronous Motors** Prerit Pramod, Zhe Zhang, Rakesh Mitra, Subhra Paul, Rakib Islam, and Julie Kleinau *Nexteer Automotive, United States*
TS5-3	**Design Considerations for an Optimized FPGA Implementation of Space-Vector PWM for a Two-Level Inverter** Danyal Mohammadi, Nader Rafla, and Said Ahmed-Zaid *Boise State University, United States*
TS5-4	**Optimized Regenerative Braking of Induction Machines with Indirect Field-Oriented Control** Aravind Samba Murthy[1], David Magee[2], and David Taylor[1] *[1]Georgia Institute of Technology, United States, [2]Texas Instruments, United States*
TS5-5	**Flatness Based Control of a High-Speed Saturable Permanent Magnet Synchronous Machine** Jeremy Cuenot[1], Sami Zaim[2], Babak Nahid-Mobarakeh[3], Serge Pierfederici[3], Eric Monmasson[4], Regis Meuret[2], and Farid Meibody-Tabar[3] *[1]Labinal Power Systems / University of Lorraine, France, [2]Labinal Power Systems, France, [3]University of Lorraine, France, [4]University of Cergy-Pontoise, France*

Special Session (TS6): Fuel Cell and Hybrid Energy Storage Technologies
Organizers:
Elena Breaz, University of Technology of Belfort-Montbeliard, France
Fei Gao, University of Technology of Belfort-Montbeliard, France

10:30 AM – 12:00 PM
Venue: Regency E-F

TS6-1	**Neural Network Modeling Strategy Applied to a Multi-Stack PEM Fuel Cell System** Francisco da Costa Lopes[1], Sousso Kelouwani[2], Loic Boulon[2], Kodjo Agbossou[2], Neigel Marx[2], and Khalid Ettihir[2] *[1]CEPEL - Electric Energy Research Center, Brazil, [2]Universite du Quebec a Trois-Rivieres, Canada*
TS6-2	**Energy Optimization of a PEM Fuel Cell System by Minimizing the Parasitic Consumption Generated by the Compressor** Dongdong Zhao, Yong Li, Yigeng Huangfu, Manfeng Dou, and Bo Tan *Northwestern Polytechnical University, China*
TS6-3	**Development of a MultiPhysical Multidimensional Modeling of Proton Exchange Membrane Fuel Cell** Daming Zhou, Fei Gao, Elena Breaz, Alexandre Ravey, and Abdellatif Miraoui *University of Technology of Belfort-Montbeliard, France*
TS6-4	**Predictive Control of a Battery/Ultracapacitor Hybrid Energy Storage System in Electric Vehicles** Junyi Shen and Alireza Khaligh *University of Maryland, United States*
TS6-5	**On the Design of a Direct Cell Coupled Hybrid Energy Storage System for Plug-in Hybrid Electric Vehicles** Ran Gu, Pawel Malysz, Deqiang Wang, Weizhong Wang, Hong Yang, and Ali Emadi *McMaster University, Canada*

Wednesday, June 29, 2016

Morning Breakout Sessions

Technical Session (TS7): Battery Management Systems **Session Chairs:** Pawel Malysz, Fiat Chrysler Automobiles, USA Alexandre De Bernardinis, IFSTTAR, France	
10:30 AM – 12:00 PM *Venue: Regency G-H*	
TS7-1	**The Influence of Temperature and Charge/Discharge Rate on Open Circuit Voltage Hysteresis of Li-ion Battery** Anup Barai, W. Dhammika Widanage, Andrew McGordon, and Paul Jennings *WMG, University of Warwick, United Kingdom*
TS7-2	**Comparative Evaluation of Partially-Decoupled Battery-Supercapacitor HESS Topologies for EVs from Battery Pack Capacity Fading Viewpoint** Ahmad Abuaish and Mehrdad Kazerani *University of Waterloo, Canada*
TS7-3	**Modeling, Parameterization, and State of Charge of Li-Ion Cells Using a Circuit Model** Hamed Hossein Afshari, Mina Attari, Ryan Ahmed, Mohammed Farag, and Saeid Habibi *McMaster University, Mechanical Engineering Dep., Canada*
TS7-4	**Comparison of Kalman Filter-based State of Charge Estimation Strategies for Li-Ion Batteries** Weizhong Wang, Deqiang Wang, Xiao Wang, Tongrui Li, Ryan Ahmed, Saeid Habibi, and Ali Emadi *McMaster University, Canada*
TS7-5	**Non-Dissipative Cell Balancing Using Half-Bridge Switching Circuit** Bharat Agrawal[1], Michael Adam[2], Brynn Vadala[1], Hannah Koke[1], Lucas McCurlie[1], Matthias Preindl[3], Ryan Ahmed[1], and Ali Emadi[1] *[1]McMaster University, Canada, [2]University of Lorraine, France, [3]Columbia University, Canada*

Technical Session (TS8): Electric Machines **Session Chairs:** Xu Yang, Faraday Future, USA Rakib Islam, Nexteer Automotive, USA	
10:30 AM – 12:00 PM *Venue: Regency J-K*	
TS8-1	**Design and Energy Saving Analysis of Heavy-duty Vehicles ESC-HPS based on a new-type Electromagnetic Slip Coupling** Guoqing Geng, Bin Tang and Zhe Xu *Jiangsu University, China*
TS8-2	**High Speed Surface Permanent Magnet Machines Rotor Design Analysis, Considerations, and Challenges** Erik Schubert, Silong Li, and Bulent Sarlioglu *University of Wisconsin-Madison, United States*
TS8-3	**FEM Based Model Development and Co-Simulation of Automotive Multi-Phase Claw-Pole Alternator and Rectifier** Dmytro Bilyi[1], Volodymyr Bilyi[2], and Dieter Gerling[2] *[1]FEAAM GmbH, Germany, [2]Universitaet der Bundeswehr Muenchen, Germany*
TS8-4	**Comparison of High-Speed Switched Reluctance Machines with Conventional and Toroidal Windings** Jianing Lin[1], Piranavan Suntharalingam[2], Nigel Schofield[1], and Ali Emadi[1] *[1]McMaster University, Canada, [2]General Motors, Canada*
TS8-5	**Maximizing Thermal Effectiveness and Minimizing Parasitic Loss in a Liquid Cooled Switched Reluctance Machine** Earl Fairall[1], Elizabeth Rowan[1], Jason Lo[2], Berker Bilgin[1], and Ali Emadi[1] *[1]Mcmaster University, Canada, [2]CanmetMATERIALS, Canada*

Wednesday, June 29, 2016

Afternoon Breakout Sessions

Special Session (TS9): Switched Reluctance Motor Drives
Organizer: Jin Ye, San Francisco State University, USA
Session Co-Chair:
Wen Cai, University of Texas, Dallas USA

2:00 PM – 3:20 PM
Venue: Regency A-B

TS9-1	**Compact and Cost Efficient Integrated Electric Drive System Based on High Speed Switched Reluctance Motor (Presentation-Only)** Saphir Faid *Punch Powertrain, Belgium*
TS9-2	**Analytical Calculation of the Electromagnetic Field in Switched Reluctance Machine Using Conformal Mapping Method** Lei Gu[1], Emine Bostanci[1], Mehdi Moallem[2], Shiliang Wang[1], and Devendra Patil[1] *[1]University of Texas at Dallas, United States, [2]Isfahan University of Technology, Iran*
TS9-3	**Near Zero-Ripple Switched Reluctance Drives** Pourya Shamsi *Missouri University of Science and Technology, United States*
TS9-4	**Control Method to Balance Capacitor Voltages in Split-AC Switched Reluctance Motor Drives during Startup and at Low Speeds** Dingyi He, Fan Yi, Wen Cai, Yikai Gao, Adam Clark, and Lei Gu *The University of Texas at Dallas, United States*
TS9-5	**A Position Sensorless Control of Switched Reluctance Motors based on Sliding-Mode Observer** Xiao Wang, Fei Peng, and Ali Emadi *McMaster University, Canada*

Technical Session (TS10): Converter/Inverter Design and Control
Session Chairs:
Sriram Jala, Ford Motor Company, USA
Bill Peterson, E&M Power, USA

2:00 PM – 3:20 PM
Venue: Regency C-D

TS10-1	**SiC BJT Proportional Base Driver with Collector-emitter Voltage Measurement and a Switching Regulator** Alejandro Pozo Arribas and Mahesh Krishnamurthy *Illinois Institute of Technology, United States*
TS10-2	**Stability Issue of DC-DC Converters with Input LC Filter via Flatness-Based Control** Roghayeh Gavagsaz-Ghoachani[1], Matheepot Phattanasak[2], Majid Zandi[3], Jean-Philippe Martin[1], Babak Nahidmobarakeh[1], and Serge Pierfederici[1] *[1]GREEN, University of Lorraine, France, [2]RERC, KMUTNB, Thailand, [3]Shahid Beheshti University, Iran*
TS10-3	**A New Approach for DC Bus Voltage Balancing in a Solar Electric Vehicle Charging Station** Ivano Forrisi[1], Jean-Philippe Martin[1], Giovanni Petrone[2], Giovanni Spagnuolo[2], Babak Nahid-Mobarakeh[1], and Serge Pierfederici[1] *[1]University of Lorraine, France, [2]University of Salerno, Italy*
TS10-4	**Enhanced and Fast Detection of Open Circuit Faults in Inverters for Electric Drives** Heinrich T. Eickhoff[1], Roland Seebacher[1], Annette Muetze[1], and Elias G. Strangas[2] *[1]Graz University of Technology, Austria, [2]Michigan State University, East Lansing, MI, United States*
TS10-5	**Performance Comparison and Device Analysis between Si IGBT and SiC MOSFET** Ahmad Albanna[1], Andrew Malburg[1], Mohammad Anwar[1], Atul Gupta[2], and Nidhi Tiwari[2] *[1]General Motors, United States, [2]General Motors, India*

Wednesday, June 29, 2016

Afternoon Breakout Sessions

Technical Session (TS11): Conductive/Inductive Charging Technology
Session Chairs:
Nevin Altinyurt, Ford Motor Company
Maggie Wang, University of Michigan-Dearborn, USA

2:00 PM – 3:20 PM
Venue: Regency E-F

TS11-1	**Performance Analysis of a High-efficiency Multi-winding Wireless EV Charging System Using U-U and U-I Core Geometries** Vamsi Krishna Pathipati[1], Najath Abdul Azeez[1], Kunwar Aditya[1], Nicholas Dohmeier[2], Chris Botting[2], and Sheldon Williamson[1] *[1]University of Ontario-Institute of Technology, Canada, [2]Delta-Q Technologies, Canada*
TS11-2	**Analysis and Design of Coupling Capacitors for Contactless Capacitive Power Transfer Systems** Deepak Rozario, Najath Abdul Azeez, and Sheldon Williamson *University of Ontario Institute of Technology, Canada*
TS11-3	**Infrastructure Optimization and Economic Feasibility of In-Motion Wireless Power Transfer** Braden J. Limb[1], Thomas H. Bradley[2], Regan Zane[1], and Jason C. Quinn[1] *[1]Utah State University, United States, [2]Colorado State University, United States*
TS11-4	**Analytical Modeling of Wireless Power Transfer (WPT) Systems for Electric Vehicle Application** Madhu Chinthavali, Zhiqiang Wang, and Steven Campbell *Oak Ridge National Laboratory, United States*
TS11-5	**A High-Power Wireless Charging System Development and Integration for a Toyota RAV4 Electric Vehicle** Omer Onar, Steven Campbell, Larry Seiber, Cliff White, and Madhu Chinthavali *Oak Ridge National Laboratory, United States*

Technical Session (TS12): Electric Machines and Actuators
Session Chairs:
James Jiang, McMaster University, Canada
Dhafar Al-Ani, Fiat Chrysler Automobiles, USA

2:00 PM – 3:20 PM
Venue: Regency G-H

TS12-1	**Discussion of Machine Placement and Integration on the Thermal Design of HEV IPM Machines** Christian Paar and Annette Muetze *Graz University of Technology, Austria*
TS12-2	**Comparative Study Between Interior and Surface Permanent Magnet Traction Machine Designs** Rong Yang, Nigel Schofield, and Ali Emadi *McMaster University, Canada*
TS12-3	**New Perspective to Understand Winding Configurations of Even and Odd Numbers of Pole Flux-Switching Permanent Magnet Machine** Ju Hyung Kim, Yingjie Li, Dheeraj Bobba, and Bulent Sarlioglu *University of Wisconsin-Madison, United States*
TS12-4	**Internal Short-Circuit Modeling and Analysis Based on a Dynamic Model for Interior Permanent Magnet Synchronous Machines** Pablo Castro Palavicino, Hilmi Gurleyen, Yujiang Wu, and Bulent Sarlioglu *University of Wisconsin-Madison, United States*
TS12-5	**A Field Reconstruction Method for Modeling of Interior Permanent Magnet Synchronous Machines** Lei Gu[1], Mehdi Moallem[2], Emine Bostanci[1], Shiliang Wang[1], and Devendra Patil[1] *[1]University of Texas at Dallas, United States, [2]Isfahan University of Technology, Iran*

Wednesday, June 29, 2016

Afternoon Breakout Sessions

Technical Session (TS13): EV, HEV and PHEV System Architectures
Session Chairs:
Hadi Malek, Ford Motor Company USA
Hao Ge, McMaster University, Canada

2:00 PM – 3:20 PM
Venue: Regency J-K

TS13-1	**Evaluation of Torque Compensation Control Algorithm of IPM Machines Considering the Effects of Temperature Variations** Silong Li[1], Bulent Sarlioglu[1], Sinisa Jurkovic[2], Nitin Patel[2], and Peter Savagian[2] *[1]University of Wisconsin-Madison, United States, [2]General Motors Company, United States*
TS13-2	**Electrification of Turbocharger and Supercharger for Downsized Internal Combustion Engines and Hybrid Electric Vehicles-Benefits and Challenges** Woongkul Lee, Erik Schubert, Yingjie Li, Silong Li, Dheeraj Bobba, and Bulent Sarlioglu *University of Wisconsin – Madison, United States*
TS13-3	**Evaluation and Selection of Accumulator Size in Electric-Hydraulic Hybrid (EH2) Powertrain** Geng Niu[1], Fei Shang[1], Mahesh Krishnamurthy[1], and Jose Garcia[2] *[1]Illinois Institute of Technology, United States, [2]Purdue University, United States*
TS13-4	**New Over Current Protection Technology Addressing DC Transportation** Remy Ouaida[1], Jean Francois Depalma[2], and Gille Gonthier[3] *[1]Innovation and RD, France, [2]Innovation and RD VP, France, [3]BU Industrie, France*
TS13-5	**Optimization of Hybrid Electric Vehicles with Coupled Thermal and Electrical Simulation** Quentin Werner[1,2], Serge Pierfederici[2], Noureddine Takorabet[2], and Babak Nahidmobarakeh[2] *[1]Daimler AG / University of Lorraine, Germany, [2]University of Lorraine, France*

Technical Session (TS14): Modeling and Optimization
Session Chairs:
Christian Paar, Graz University of Technology, Austria
Nigel Schofield, McMaster University, Canada

4:20 PM – 5:40 PM
Venue: Regency A-B

TS14-1	**Design Optimization for Reducing Harmonic Distortion of Flux Linkage in Low Pole Flux Switching Permanent Magnet Machines** Dheeraj Bobba, Yingjie Li, and Bulent Sarlioglu *University of Wisconsin – Madison, United States*
TS14-2	**Battery Voltage Optimization of a Variable DC Bus Voltage Control Powertrain for Medium Duty Delivery Trucks for Various Drive Cycles** Ali Najmabadi, Kieran Humphries, Benoit Boulet and Tanvir Rahman *McGill University, Canada*
TS14-3	**An Energy Demand Model for the Microscopic Simulation of Plug-In-Hybrid Vehicles** Lorenz Ammon, Bernd Huber, Florian Huebler, Ruediger Berndt, Sebastian Schellenberg, and Vitali Schneider *University of Erlangen-Nuremberg, Germany*
TS14-4	**Optimal Energy/Time Routing in Battery-powered Vehicles** Mahmoud Faraj and Otman Basir *University of Waterloo, Canada*
TS14-5	**Medium-Duty Plug-in Electric Delivery Truck Fleet Evaluation** Robert Prohaska, Adam Ragatz, Mike Simpson, and Kenneth Kelly *NREL, United States*

Wednesday, June 29, 2016

Afternoon Breakout Sessions

Technical Session (TS15): Power Electronics and Control
Session Chairs:
Matthias Preindl, Columbia University, USA
Babak Nahidmobarakeh, GREEN, University of Loraine, France

4:20 PM – 5:40 PM
Venue: Regency C-D

TS15-1	**Investigation of Common Mode Noise in Electric Propulsion System High Voltage Components in an Electrified Vehicle** Avinash Kishore[1], Chetan Patki[1], William Ivan[2], Mohammad Anwar[2], and Mehrdad Teimorzadeh[2] *[1]General Motors, India, [2]General Motors, United States*
TS15-2	**A Novel Wireless Converter Topology for Dynamic EV Charging** Steven I Ruddell[1], Udaya K Madawala[1], Duleepa J Thrimawithana[1], and Martin Neuburger[2] *[1]University of Auckland, New Zealand, [2]Hochschule Esslingen University, Germany*
TS15-3	**An Opportunistic Wireless Charging System Design for an On-Demand Shuttle Service** Kate Doubleday, Andrew Meintz, and Tony Markel *National Renewable Energy Laboratory, United States*
TS15-4	**Full Electric Ship Propulsion, Based on a Dual Nine-Switch Inverter Topology for Dual Three-Phase Induction Motor Drive** Carlos Reusser *Universidad Tecnica Federico Santa Maria, Chile*
TS15-5	**Three-Phase Common Mode Inductor Design and Size Minimization** Di Han, Casey Morris, Woongkul Lee, and Bulent Sarlioglu *University of Wisconsin-Madison, United States*

Technical Session (TS16): Smart Grid, Electrical Infrastructure, and Vehicle-to-Grid Interface
Session Chairs:
Richard Raustad, University of Central Florida, USA
Omer C. Onar, Oak Ridge National Laboratory, USA

4:20 PM – 5:40 PM
Venue: Regency E-F

TS16-1	**Green Energy based Inductive Self-Healing Highways of the Future** Venugopal Prasanth, Natalia Scheele, Erwin Visser, Aditya Shekhar, Gautham Ram Chandra Mouli, Pavol Bauer, and Sacha Silvester *Delft University of Technology, Netherlands*
TS16-2	**A Communication Architecture for Wireless Power Transfer Services based on DSRC Technology** Andrea Gil-Batres[1], Ashok Moghe[2], and Joachim Taiber[1] *[1]Clemson University ICAR, United States, [2]Cisco Systems Inc., United States*
TS16-3	**Stochastic Energy Management for Microgrids with Constraints under Uncertainty** Jianzhe Liu, Giorgio Rizzoni and Benjamin Yurkovich *The Ohio State University, United States*
TS16-4	**Implementation of Dynamic Charging and V2X Using Chademo and CCS/Combo DC Charging Standard** Gautham Ram Chandra Mouli[1], Johan Kaptein[2], Pavol Bauer[1], and Miro Zeman[1] *[1]Delft University of Technology, Netherlands, [2]ABB B.V. EV Charging Infrastructure, Netherlands*
TS16-5	**A Modified Resonant Converter for Capacitive Power Transfer Systems** Deepak Rozario, Najath Abdul Azeez, and Sheldon Williamson *University of Ontario Institute of Technology, Canada*

Wednesday, June 29, 2016

Afternoon Breakout Sessions

Technical Session (TS17): Diagnostics and Fault Tolerant Operation, and Policy **Session Chairs:** Ryan Ahmed, Samsung SDI, USA Sara Dadras, Ford Motor Company, USA	
4:20 PM – 5:40 PM *Venue: Regency G-H*	
TS17-1	**Economic and CO2 Emission Benefits of a Solar Powered Electric Vehicle Charging Station for Workplaces in the Netherlands** Gautham Ram Chandra Mouli, Mark Leendertse, Prasanth Venugopal, Pavol Bauer, Sacha Silvester, Stefan van de Geer, and Miro Zeman *Delft University of Technology, Netherlands*
TS17-2	**Emergent Entrepreneurial Networks for the Transition to Urban Mobility** David Bodde and Jianan Sun *Clemson University, United States*
TS17-3	**Thrust Sensor Based Nonlinear Motor Control for Quadcopters** Steven Elliott and Thomas Carr *Southern Methodist University, United States*
TS17-4	**On-line Fault Diagnosis of DC Motor based on the Hidden Markov Model** Jiayuan Zhang, Wei Zhan, and Mehrdad Ehsani *Texas A&M University, United States*
TS17-5	**Fault Diagnosis and Fault Tolerant Control for Electrified Vehicle Torque Security** Jiyu Zhang[1], Tianpei Li[1], Alessandro Amodio[2], Bilin Aksun-Guvenc[1], and Giorgio Rizzoni[1] *[1]The Ohio State University, United States, [2]Politecnico di Milano, Italy*

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Deadline for submission of paper proposals (abstracts/digests):	November 10, 2016
Author's notification of acceptance:	February 3, 2017
Deadline for submission of final camera-ready manuscripts:	April 7, 2017
Deadline for early registration:	April 7, 2017

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General Chair: Omer C. Onar, Oak Ridge National Laboratory, USA
Program Chair: Xiaodong Shi, Mercedes-Benz R&D, USA
Program Co-Chair: Ryan Ahmed, Samsung SGI, USA

Conference Venue and Contacts

Conference Site and Hotel Reservation

Edward Village Michigan
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