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## **Organizing Committee**

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<b>General Chair</b>	<b>Chris Mi</b> <i>Univerisy of Michigan-Dearborn</i>
<b>Vice Chair</b>	<b>James Gover</b> <i>Kettering University</i>
<b>Program Chair</b>	<b>Fang Z. Peng</b> <i>Michigan State University</i>
<b>Program Co-chair</b>	<b>Abul Masrur</b> <i>US Army-RDECOM-TARDEC</i>
<b>Program Co-chair</b>	<b>Taehyung Kim</b> <i>Univerisy of Michigan-Dearborn</i>
<b>Program Co-chair</b>	<b>Sonya Gargies</b> <i>US Army-RDECOM-TARDEC</i>
<b>Program Co-chair</b>	<b>David Gao</b> <i>Tennessee Tech University</i>
<b>Publications Chair</b>	<b>Taehyung Kim</b> <i>Univerisy of Michigan-Dearborn</i>
<b>Publications Co-chair</b>	<b>Sangshin Kwak</b> <i>Daegu University, South Korea</i>
<b>Patronage Chair</b>	<b>Kevin Taylor</b> <i>Great Lakes Electronics</i>
<b>Patronage Co-chair</b>	<b>Jim Budwey</b> <i>ICTS Groups</i>
<b>Treasurer</b>	<b>Pingan He</b> <i>Univerisy of Michigan-Dearborn</i>
<b>Secretary</b>	<b>Kevin Bai</b> <i>Univerisy of Michigan-Dearborn</i>
<b>Publicity Chair</b>	<b>Aisha Yousuf</b> <i>Univerisy of Michigan-Dearborn</i>
<b>Exhibits Chair</b>	<b>Jim Budwey</b> <i>ICTS Groups</i>
<b>Exhibits Co-chair</b>	<b>Kevin Taylor</b> <i>Great Lakes Electronics</i>

<b>Industry Committee Chair</b>	<b>Mark Ciechanowski</b> <i>Dearborn Group</i>
<b>Industry Committee Co-chair</b>	<b>Mark Steffka</b> <i>General Motors</i>
<b>Government Committee Chair</b>	<b>Michael O’Keefe</b> <i>National Renewable Energy Laboratory</i>
<b>Government Committee Co-chair</b>	<b>Laura Marlino</b> <i>Oakridge National Laboratory</i>
<b>Tutorials Chair</b>	<b>Ravi Warriar</b> <i>Kettering University</i>
<b>Tutorials Co-chair</b>	<b>Mark Ciechanowski</b> <i>Dearborn Group</i>
<b>Awards Chair</b>	<b>John Shen</b> <i>University of Central Florida</i>
<b>Webmaster</b>	<b>Scott Lytle</b> <i>Yazaki North America</i>
<b>Energy Policy Panel Organizer</b>	<b>James Gover</b> <i>Kettering University</i>
<b>Energy Policy Panel Organizer</b>	<b>John Cederquist</b> <i>GDLS</i>
<b>OEM/Supplier Liaison</b>	<b>Bob Mitchell</b> <i>Kettering University</i>
<b>Ride n Drive</b>	<b>Bob Mitchell</b> <i>Kettering University</i>
<b>University Exhibits Chair</b>	<b>Doug Melton</b> <i>Kettering University</i>
<b>Regional Publicity Chair</b>	<b>Alex Ruderman</b> <i>Elmo Motion</i>

## **VPPC Steering Committee**

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**Prof. Mehrdad Ehsani**    *Texas A&M University*

**Prof. Ali Emadi**                    *Illinois Institute of  
Technology*

**Prof. C.C. Chan**                    *University of Hong  
Kong, Harbin Institute  
of Technology*

**Prof. Babak Fahimi**                *University of Texas at  
Arlington*

**Dr. Randy Frank**                    *Randy Frank Associates*

**Prof. John Shen**                    *University of Central  
Florida*

**Prof. John Economou**                *Cranfield University, UK*

## Welcome from the Conference Chair

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On behalf of the organizing committee of the 5th International IEEE Vehicle Power and Propulsion Conference (VPPC'09), I welcome all of you in Michigan, September 7-11, 2009, for a great event dedicated to the sustainability of future transportation through the

innovations and applications of hybrid, plug-in, and battery powered vehicles. The conference will be held in Dearborn, Michigan, a suburb of Detroit, at the first-class Fairlane Center conference facility of the University of Michigan-Dearborn, with the plenary sessions at the 4-star Ritz-Carlton official conference hotel. The banquet will be held at the historic Henry Ford Museum on Thursday, September 10, 2009. The conference will feature two plenary sessions, five panel discussions, 36 oral sessions consisting of 242 presentations, and a poster session consisting of 97 technical papers.

This year, we received submissions from 1100 authors in 45 countries. Among the 435 submissions, 290 were accepted as regular papers. More than 300 people are registered for the conference, of which 35% are from outside the US and 15% are students. Additionally, a unique feature for this year's conference is the introduction of the "Technical Forum" which allows those who do not wish to write a regular paper to present their work in parallel with the regular technical sessions. There were 69 technical forum papers submitted and 49 were accepted to be presented at the conference.

In conjunction with VPPC'09, two top notch journals, the IEEE Transactions on Vehicular Technology (TVT) and the International Journal of Power Electronics (IJElec), have each planned a special issue. I encourage you to consider submitting a paper to the IEEE TVT, Special Issue on Vehicle Power and Propulsion; and the IJElec Special Issue on Power Electronics in Electric/Hybrid Electric Vehicle Applications.

I would like to thank the plenary speakers, luncheon speakers, tutorial instructors, and panelists. We are fortunate to have these top experts from the government, industry, and academia to speak at the conference. I would like to extend my appreciation to the members of the organizing committee, special session organizers, international advisory committee, reviewers, and volunteers who have offered their time and expertise. Additionally, I would like to thank the exhibitors and patrons of VPPC'09 for their generous support. The exhibits feature indoor displays of the latest technology and products in the vehicle power and propulsion field, as well as a fleet of advanced vehicles from automotive OEM and aftermarket conversion companies. Lastly, I would like to recognize University of Michigan, IEEE VTS, PELS, and the VPPC Steering Committee for their support.

The economic downturn has already had a huge negative impact on the automotive industry. This presents both challenges, as well as opportunities. VPPC is a platform for us to share fresh ideas and innovative concepts and solutions for vehicular power and propulsion systems! Dear friends and guests, it is my sincere hope that you not only gain knowledge from the conference to better face the challenges ahead, but also to take with you the lifelong friendships forged during the conference.

I look forward to meeting you in Dearborn!

Sincerely,  
Chris Mi, Ph.D.  
VPPC'09 General Chair

## Welcome from the VTS President

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On behalf of the Board and members of the IEEE Vehicular Technology Society, it is my pleasure to welcome you to VPPC 2009. These are challenging times to be holding automotive events, particularly in this part of the world, but the best response to the current economic situation is increased research and innovation of the kind showcased here.

The IEEE is 125 this year, and closer to home, VTS will celebrate its 60th birthday later this month. A lot has changed in the 60 years since the 'Vehicular and Railroad Group' was first formed by members of the Detroit Section of the IRE, one of the bodies which merged to form the IEEE. One of the things which has not changed is the enthusiasm of engineers to develop their profession, and as part of our 60th celebrations we will be honoring a number of those who have shaped the industry most over the years in a Hall of Fame. In another new initiative, the society has commissioned a number of courses for its members. One of the first is on grounding for hybrid vehicles.

VTS has no paid staff, and so is entirely dependent on the generosity of volunteers who have worked long hours to make this conference a reality. I would like to thank General Chair Chris Mi and his team for all their efforts, as well as the VPPC Steering Committee who have worked hard over a number of years to grow the conference from its beginnings as two sessions at VTC only 6 years ago.

I wish you an enjoyable, productive, and above all stimulating conference.

James Irvine  
President, IEEE Vehicular Technology Society

## Maps and Directions

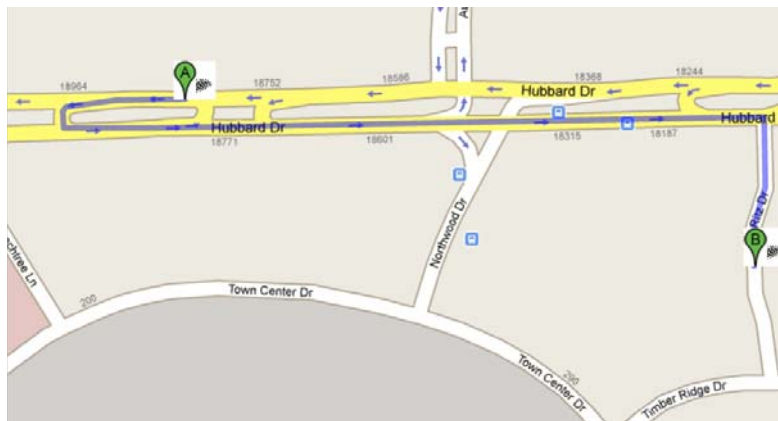
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**A) University of Michigan - Dearborn**  
Fairlane Center  
19000 Hubbard Drive,  
Dearborn, MI 48126



**B) The Ritz Carlton Dearborn**  
300 Town Center Drive  
Dearborn, MI 48126





## Plenary Speakers

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### Challenges of Hybrid Electric Vehicles for Military Applications



**Gus Khalil**

*US Army TARDEC, Warren, Michigan, USA*

**Abstract:** Hybrid electric vehicles have been steadily coming to fruition in the commercial market due to their proven benefits in fuel economy and lower emission of pollutants. For military vehicles, the drivers for hybrid electric vehicles are quite different; although the fuel economy remains a desirable feature for both the commercial and military sectors. The military needs for hybrid electric reside in their ability to generate significant level of electric power onboard the vehicles to meet the demand of the warfighter thus expanding his mission capabilities in terms of mobility, survivability and lethality. The Army recognizes the payoffs of hybrid electric propulsion for tactical and combat vehicles. However, the fielding of hybrid electric military vehicles has been much slower than the commercial vehicles due to the technical challenges that must be overcome before the hybrid technology can be considered viable for military applications. This paper describes some of the challenges and the proposed solutions and their state of development and future trends.

**About the Speaker:** Mr. Khalil has worked at TARDEC since 1985 and is currently the Team Leader of the Hybrid Electric Research Team in the Mobility group at TARDEC. He is responsible for the development and maturation of hybrid electric components for integration into fielded military vehicles such as Future Combat systems (FCS) and other military platforms. He is a member of the NATO working group that is in charge of assessing hybrid electric technology for military applications and is also the chairman of the Steering committee for the International All Electric Combat Vehicle (AECV) conference. He received his bachelor's of Science in Mechanical engineering from Wayne State University in 1973 and his Master's of Science in mechanical engineering from Wayne State University in 1979. Previous employment includes Ford Chassis Division and Ford Tractors.

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**DOE Vehicle Technologies R&D on  
Hybrid Electric Systems**



**David Howell**

*Office of Vehicle Technologies,  
U.S. Department of Energy*

**Abstract:** This paper presents an overview of R&D activities funded by the Hybrid Electric Systems Team at the Vehicle Technologies

Program Office of the United States Department of Energy (DOE). DOE has supported, over the long term, the development of advanced automotive technologies that could achieve significant improvements in fuel economy without compromising on safety, environmental effects, performance, or affordability. DOE-supported R&D attempts to address the technical barriers which prevent the market introduction of vehicles using such technologies. The support also leverages resources and expertise from automobile manufacturers, technology developers, small businesses, national laboratories, and universities. The Hybrid Electric Systems team's R&D focuses on the planning and modeling, development, and evaluation of advanced hybrid, electric, and plug-in hybrid electric vehicle (PHEV) systems. It also funds the 21st Century Truck Partnership and the FreedomCAR and Fuel Partnership. It includes energy storage R&D which addresses the critical issue of electricity storage and consists of a developer program – conducted in coordination with battery developers and original equipment manufacturers, applied battery research – which targets cross-cutting barriers for PHEV batteries, and focused fundamental research – which addresses critical problems of chemical instabilities for advanced batteries and researches promising new materials. It also includes advanced power electronics and electric motors R&D which addresses the issue of electric and electronic devices delivering the battery power to the vehicle's power control circuits, charging circuits, electric motors, and other related components; and vehicle and systems simulation and testing, which include system-level simulations to help specify the necessary performance characteristics of the hardware and to predict overall vehicle efficiency and performance for a given configuration. The paper also describes DOE's related R&D coordination efforts with other agencies.

**About the Speaker:** Mr. Dave Howell is the Team Lead for the Hybrid Electric Systems Team at the Office of Vehicle Technologies Program, U.S. Department of Energy Headquarters, in Washington DC. Earlier, he was Manager, Electrochemical Energy Storage Research and Development, a position that he had been in since 2003. For the past 6 years he has also served as the DOE Co-Chair of the FreedomCAR Electrochemical Energy Storage Tech Team. Dave was a member of the research staff of the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee for 12 years prior to joining DOE. At ORNL, he served as Project Manager for Aerospace Technologies. His primary focus was the development of advanced materials and processing techniques for aerospace structures. Dave served on active duty for 6 years at Wright Patterson AFB, Ohio. Dave was assigned as the Program Manager for Advanced Materials for Space Structures at the Air Force Materials Laboratory. In that role, he managed the Strategic Defense Initiative Organization's Advanced Materials for Space Structures Program supporting advanced materials R&D for spacecraft structures and mechanisms. Dave received a Bachelor of Science degree in Aerospace Engineering in 1985 from the University of Tennessee at Knoxville.

## Sustainability and Innovation in Powertrain Electrification – A Pragmatic View



**Robert Lee**

*Powertrain Product Engineering,  
Chrysler LLC*

**Abstract:** Bob Lee, Vice President – Powertrain Product Engineering, Chrysler LLC, presents a holistic view of energy efficient solutions for automobiles with the goal of sustainability and energy independence. The presentation analyzes the key factors for achieving energy efficient Powertrains and vehicles, progression of innovation, development & commercialization of powertrain electrification technologies and the "energy revolution" in progress currently.

**About the Speaker:** Robert Lee was appointed Vice President, PowerTrain Product Engineering on January 1, 2004. This position reports to Frank Klegon, Executive Vice President of Product Development. In this position, Mr. Lee is responsible for directing the design, development and release of all PowerTrain systems and components for Chrysler LLC.

Mr. Lee joined Chrysler in 1978 as an Engineer-in-Training in the Chrysler Institute of Engineering program and since has held a variety of positions of responsibility in various areas of PowerTrain Engineering.

Since 1994, Mr. Lee has led teams that have developed three totally new engines with totally new manufacturing facilities including most recently the highly acclaimed and award winning 5.7L HEMI® engine.

Mr. Lee has authored or co-authored 5 papers on new designs and the reliability processes for developing automotive engines.

In 2007, Mr. Lee served as chairman of the SAE North American International Powertrain Conference.

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### **Driving to a Sustainable Future: A New DNA for the Automobile**



**Larry Burns**  
*R&D and Strategic Planning,  
General Motors*

**Abstract:** Driven by the opportunity of sustainable personal mobility, the auto industry today is reinventing the automobile using a new “DNA” that will make our future vehicles more energy efficient and sustainable. The new DNA will replace today’s mechanically driven vehicles – which are powered by the internal combustion engine, energized by petroleum, and controlled mechanically – with electrically driven vehicles that are powered by electric motors, batteries,

and fuel cells, energized by electricity and hydrogen, and controlled electronically.

In this talk, Dr. Burns will address the opportunities and challenges presented by the emergence of the new DNA and the increasing electrification of the vehicle. He will highlight how the introduction of electric propulsion, diverse energy pathways, advanced electronics, and connected vehicle technologies will revolutionize personal mobility and be paradigm shifting for the industry.

**About the Speaker:** Larry Burns is vice president of General Motors Research & Development and Strategic Planning. In this post, he oversees GM's advanced technology, innovation programs, and corporate strategy. He is a member of GM's Automotive Strategy Board and Automotive Product Board.

In addition to driving innovation into today's vehicles, Burns is championing GM's "reinvention" of the automobile around advanced propulsion, electronics, telematics, and materials technologies. The goal is to realize sustainable mobility with vehicles that are aspirational and affordable.

Burns began his career in 1969 as a member of the Research & Development staff, where his research focused on transportation, logistics, and production systems. He subsequently held executive positions in several GM divisions in the areas of product program management, quality, production control, industrial engineering, and product and business planning. In May 1998, he was named a vice president of General Motors, with responsibility for R&D and Planning. Burns holds a Ph.D. in civil engineering from the University of California at Berkeley. He also has a master's degree in engineering/public policy from the University of Michigan and a bachelor's

degree in mechanical engineering from General Motors Institute (now Kettering University).

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## **Impact of Plug-in Vehicles on the Electric Power Grid: A DTE Energy Case Study**



**Haukur Asgeirsson, P.E.**  
*Power Systems Technologies,  
Detroit Edison – DTE Energy*

**Abstract:** The impact on the electric grid due to charging of plug-in electric vehicle can vary greatly based on loading and local electric distribution grid configuration. This presentations reviews case studies performed on DTE Energy electric distribution circuits for both residential and commercial charging of plug-in vehicles and makes recommendations on control strategy to minimize the effect on the electric infrastructure.

**About the Speaker:** Haukur (Hawk) Asgeirsson is the Manager of Power Systems Technologies at Detroit Edison. In his current position, he is responsible for employing Distributed Resources into the T&D planning and operating process and since 2002, he has installed 20 distributed generation projects to support the distribution system at Detroit Edison totaling nearly 20 MW. The Power System Technology group also manages all interconnections and is a champion of smart grid technology solutions at Detroit Edison.



Hawk was also responsible for the DOE DER Aggregation, Communication, Control, and Sale into the MISO Market using DEW, PI, and utility-aggregator business model for DTE Energy. In this project, a real time distribution modeling system has been created which integrates real time distribution circuit information, real time DG information and makes real time DG operating recommendations including offering aggregated DG for sale to the Independent System Operator.

Hawk is a member of GridApp, a consortium of utilities whose mission is to transition best technologies and best practices into broader use by member utilities. He is also an Advisor on the EPRI Distributed Generation & Energy Storage program and the EPRI Electric Transportation program. Hawk was also responsible for the EPRI “Best Practices Guide Book for Integration of DER into the Utility System Planning” and “Using Aggregated Distributed Energy resources for Economic Dispatch to an Independent System Operator”.

Mr. Asgeirsson is also involved in a DOE funded PHEV project titled “Technical Challenges of Plug-In Hybrid Electric Vehicles and Impacts to the U.S. Power System” This is a research collaboration between the University of Michigan and Pacific Northwest National Laboratory with DTE Energy, Ford and GM as industry advisors.

## Energy Storage System Technology Challenges facing Strong Hybrid, Plug-in, and Battery Electric vehicles



**John M. Miller, Ph.D**  
*Systems Applications Integration*  
*Maxwell Technologies*

**About the Speaker:** John Miller joined Maxwell in December 2005, assuming primary responsibility for world wide applications engineering that includes development of Maxwell University training for field application engineers. He remains active in the development and promotion of ultracapacitor-based solutions for the automotive and heavy vehicle industries. Previously, he spent 18 years in a series of engineering and research and development positions with the Ford Motor Company, where he led several Ford automotive electronics and electric and hybrid drive train development programs before taking early retirement in 2002. Immediately prior to joining Maxwell, he spent four years as an industry consultant, expert witness, author and guest lecturer. He holds 53 patents and has written more than 150 scientific and technical papers and three books, including *Hybrid Vehicle Propulsion Systems*, which was published in 2003. He holds a BS degree from the University of Arkansas, an MS degree from Southern Methodist University and a doctorate from Michigan State University, all in electrical engineering. Dr. Miller is a member of SAE, Fellow of IEEE and IEEE distinguished

lecturer and registered professional engineer for nearly 30 years.

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## **Automobiles in a Sustainable Energy World**



**Deepak Divan**

Intelligent Power Infrastructure Consortium,  
Georgia Institute of Technology

**Abstract:** The impact on the electric grid due to charging of plug-in electric vehicle can vary greatly based on loading and local electric distribution grid configuration. This presentations reviews case studies performed on DTE Energy electric distribution circuits for both residential and commercial charging of plug-in vehicles and makes recommendations on control strategy to minimize the effect on the electric infrastructure.

**About the Speaker:** Deepak Divan is a Professor in the School of Electrical and Computer Engineering and Founding Director of the Intelligent Power Infrastructure Consortium at the Georgia Institute of Technology in Atlanta, one of the leading engineering schools in the world. He is Chairman and CTO for Innovolt Inc., a company specializing in energy management and energy efficient technologies. He is Chairman of Integral Technologies, Pune, India, a company specializing in energy efficient lighting technologies using LEDs. From 1995-2004, he was Chairman and CEO/CTO of Soft Switching

Technologies, a company in the industrial power quality market. From 1985-95, he was a Professor in Electrical Engineering at the University of Wisconsin – Madison.

He is President of the IEEE Power Electronics Society for 2009 and 2010. He was Conference Chair for a new global conference on sustainable energy – IEEE Energy 2030, held in Atlanta on Nov 17/18, 2008. He is a Fellow of the IEEE and was the recipient of the 2006 IEEE William E Newell Field Award for contributions in power electronics technology. He has been a Distinguished Lecturer for the IEEE Industry Applications Society for 2004 and 2005. The IEEE or Institution of Electrical and Electronics Engineers is the world's largest professional organization with over 370,000 world wide members. He has over 250 papers and 35 issued and pending patents. His research interests are in sustainable energy, improving grid reliability and utilization, renewable energy, and the application of power electronics for power delivery, power quality, power reliability and industrial applications.

## Engineering Education for the Near Future



**Frank Barnes**

*Department of Electrical and Computer  
Engineering,  
University of Colorado at Boulder*

**Abstract:** Graduating engineering students are facing global competition on a new scale. Modern communications makes it possible to hire engineer for many jobs who are located anywhere in the world. Thus our graduates must expect to face competition from bright and highly trained engineers who live in Europe, Russia, India, China, Japan and many other places. Many of these engineers will work for much less, (1/3 or 1/10?) than our graduates will need to work and live in the US. With this in mind what should we be doing to educate our students?

Leadership skills whether they are technical, managerial, or entrepreneurial are one way for our students to be worth more than their competition. In this talk I will suggest some approaches to making leadership a larger part of you undergraduate engineering education program by including working on international design teams, deepening there technical understanding by requiring some teaching for graduation and broadening their understanding of world wide markets.

**About the Speaker:** Dr. Frank Barnes is a distinguished professor of electrical and computer engineering at the University of Colorado at Boulder. He is recipient of the National Academy of Engineering's top educational honor the Bernard M. Gordon Prize for his "pioneering an Interdisciplinary Telecommunications Program that produces leaders who bridge engineering, social science, and public policy."

Frank Barnes is a fellow of IEEE. He has served as interim dean, distinguished professor, chair of the electrical and computer engineering department for 17 years, and a founder of electrical engineering departments at other CU campuses. He has been a CU faculty member since 1959 and was named a distinguished professor by the University Of Colorado Board Of Regents in 1997. He was elected to the National Academy of Engineering in 2001. He has recently been working on energy storage and the effects of electric and magnetic fields on biology.

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### **Development of Electric, Hybrid and Fuel Cell Vehicles in China**



**C.C. Chan**

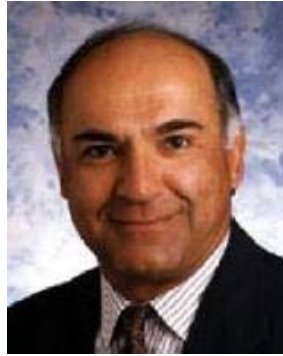
*University of Hong Kong*

**Abstract:** China has ranked number two in global vehicle production and sales. It is predicted that China will become number one in vehicle

production in 2012 and number one in sale by 2015. In this connection, China is facing big challenges in road transportation energy and environment protection. Therefore there is no alternative but China must develop high efficiency new energy vehicles including electric, hybrid and fuel cell vehicles. This presentation will address the state of the art, technical road map and commercial road map of the development of electric, hybrid and fuel cell vehicles in China, as well as the challenge and opportunity.

**About the Speaker:** Prof. C C Chan holds BSc, MSc, PhD, Honorary DSc, Honorary DTech degrees in electrical engineering. He has had over 10 years industrial experience and over 35 years academic experience. He is currently the Honorary Professor and the former Head of the Department of Electrical and Electronic Engineering, the University of Hong Kong. He is the Founding President of the International Academy for Advanced Study, China. He has served as Visiting Professor of a number of well-known universities around the world, including MIT, University of California Berkeley, Tsinghua University, etc. He is Co-founder of the World Electric Vehicle Association, the President of the Electric Vehicles Association of Asia Pacific, and Past President of the Hong Kong Institution of Engineers. He also serves as Senior Consultant to governments and industries worldwide. Prof. Chan is a Fellow of the Royal Academy of Engineering, U.K., the Chinese Academy of Engineering, the Ukraine Academy of Engineering Sciences, and the Hong Kong Academy of Engineering Sciences. He is also a Fellow of IEEE, IEE and HKIE. He received the IEE International Lecture Medal in 2000.

## **Sustainable Engineering: A New Field of Research**



**Mark Ehsani**

*Electrical and Computer Engineering Department,  
Texas A&M University*

**About the Speaker:** Dr. Mark Ehsani received his Ph.D. in electrical engineering from the University of Wisconsin-Madison in 1981. Since 1981, he has been at Texas A&M University where he founded the power electronics program. He is the co-author of more than 300 technical papers, 3 books, an IEEE standards book, and 20 patents. Three of these papers have received prize paper awards in IEEE-IAS. He has also been honored by numerous organizations, including IEEE awards and Texas A&M University as Halliburton Professor and Dresser Industries Professor. His current research work is in power electronics, motor drives, hybrid electric vehicles and systems. He has served on the Ad Com of Power Electronics Society, Executive Council of Industry Applications Society, elected member of the Board of Governors of Vehicular Technology Society, and as chairman and member of several technical committees, in several societies. He is a Fellow of IEEE, a Distinguished Speaker of Industrial Electronics Society, Power Engineering Society, and past Distinguished Lecturer of Industry Application Society and a registered Professional engineer in the state of Texas.



## Soft Switching of High Temperature Inverter



**Jason Lai**

*Department of Electrical and Computer  
Engineering,  
Virginia Tech University*

**About the Speaker:** Dr. Jason Lai is Professor and of Director of Future Energy Electronics Center, the Bradley Department of Electrical and Computer Engineering Virginia Polytechnic Institute and State University. He is Fellow of Institute of Electrical and Electronics Engineering. His research areas include power electronics for renewable energy and distribution applications and traction motor drives for electric and hybrid electric vehicle applications. He chaired 2000 IEEE Workshop on Computers in Power Electronics and 2005 IEEE Applied Power Electronics Conference and Exposition. He also chaired 2008 NSF Workshop on Advanced Power Conditioning for Renewable Energy and Distribution Systems.

## High Power Batteries: Enabling Technologies for the Drivetrain of the Future



**Ann Marie Sastry**

*Energy Systems Engineering Program,  
University of Michigan, Ann Arbor*

**Abstract:** Imminent changes in the world energy portfolio will amplify pressure on development of zero-emission vehicles (ZEV), of which battery-powered vehicles are the nearest-term realization. The anticipated electrification of the drivetrain, and its progenitors in hybrid systems, have intensified research in batteries, an essential component in both fuel cell and gas/hybrid vehicles. Though the basic electrochemistries have been known since Edison, it is their implementation in novel, often nano-structures, which has revolutionized their performance.

Here, we describe some of the technologies, i.e. Li-based batteries that are anticipated to enable hybrid, or fully-electric drivetrains. Some of these, and a new graduate engineering program developed to enable the transition to electric drivetrains at the University of Michigan, are described. These Li-ion rechargeable cells are used in applications ranging from the biomedical device, defense, computer, hybrid and electrical vehicle, and cellular phone industries. Li-ion technology is often selected over nickel metal hydride (NiMH) or nickel cadmium (NiCd) because of its high specific energy density (100-

158 Wh<sub>kg</sub>-1), volumetric energy density (245-430 Wh<sub>L</sub>-1) and nominal voltage (3.5V). The high reactivity of lithium metal can pose a safety risk in operation; materials selection in present use is a result of rigorous testing to assure safety in operation, and longer lifetimes. These materials include graphite/carbon, lithium-ion intercalated metal oxides, and lithium-ion salts with organic solvents, as anodic, cathodic active materials and electrolyte, respectively. In battery systems, solution of multiphysics problems, incorporating statistical variation in the agglomerates that comprise active materials, is urgently required for optimization of automotive and wireless power systems.

Balancing high energy and power requirements, while meeting constraints on form factor, comprises a challenging engineering and basic science problem. Insertion of new materials technologies, from nanoarchitected carbons to metallic additives, requires the capability to correctly predict fractions providing high conductivity, for both thin and fully 3D electrode architectures. In our work, we use take a stochastic approach in constructing model materials, so that transport and mechanical properties can be studied at the microscale. We also present results of coupled simulations, for rational design of cells, and higher-level models for design of power systems.

**About the Speaker:** Ann Marie Sastry is the Arthur F. Thurnau Professor of Mechanical, Biomedical and Materials Science and Engineering, and Director of the Energy Systems Engineering Program, at the University of Michigan. She is also CEO of Sakti3, Inc. She holds MS and PhD degrees from Cornell University, and a BS from the University of Delaware, all in Mechanical Engineering. She is the recipient of numerous honors for her work, including the 2007 ASME Gustus Larson Award, the University

of Delaware Presidential Citation for Outstanding Achievement (2004), the UM College of Engineering 1938E (2000), the University of Michigan Henry Russel Award (1999), and NSF's Presidential Early Career Award for Scientists and Engineers (1997). In 2005, she was honored with a University of Michigan Faculty Recognition Award, acknowledging outstanding contributions as a senior faculty member in research, teaching and service. She has served on three Editorial Boards: the ASME Journal of Engineering Materials and Technologies, Journal of Composite Materials, and as a Founding Associate Editor of the Journal of the Mechanical Behavior of Biomedical Materials.

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### **Key Issues and Solutions for Mass Electrification of Transportation**



**Nancy L. Gioia**

*Sustainable Mobility Technologies and Hybrid Vehicle Programs,  
Ford Motor Company*

**Abstract:** This keynote speech will focus on major issues and strategic solutions for sustainable vehicle electrification. Stakeholders and enablers for long-term success are partners in battery collaborations, electrical infrastructure providers (utilities), automotive manufacturers, fuel producers, policy makers, opinion shapers, researchers, and educators. Engaging these

resources in a focused and collaborative effort will make the future of electrified transportation possible and create promising opportunities for maximizing the benefits to the customer and the environment. The presentation will discuss a vital first step in this process that is currently being researched and evaluated; an electrified light duty fleet.

**About the Speaker:** Nancy Lee Gioia is Ford Motor Company's director of Sustainable Mobility Technologies and Hybrid Vehicle Programs. Appointed to this position Nov. 1, 2005, she is leading efforts develop and implement Ford's current and next generation of sustainable products – including today's Ford Escape Hybrid and Mercury Mariner Hybrid.

Prior to this assignment, Gioia was Director of Current Model Vehicle Quality for North America where she was responsible for overall current model quality performance. Gioia has held several key management and executive positions within Ford Product Development., in electronics architecture design and integration in vehicles. To date, Gioia has been a key part of 26 different vehicle launches at the company. Gioia joined Ford Motor Company in 1982 as a graduate trainee in the Electronics Division.

Gioia received her Bachelors degree in Electrical Engineering from the University of Michigan and her Master of Sciences in Manufacturing Systems Engineering from Stanford University. While studying with the assistance of a Ford Advanced Education Fellowship, she received the Outstanding Service Award from the Stanford Institute for Manufacturing and Automation.

## Schedule at a Glance

	<b>Monday Sept 7, 2009</b>	<b>Tuesday Sept 8, 2009</b>
7:00-7:30am		Author's Breakfast at Ritz-Carlton
7:30-8:00am		
8:00-8:30am		Tutorial 1, 2, 3 Rooms 110, 116 & 120
8:30-9:00am		
9:00-9:30am		
9:30-10:00am		
10:00-10:30am	Coffee Break	
10:30-11:00am	Tutorial 1, 2, 3 Rooms 110, 116 & 120	Plenary session Presidential Ballroom Ritz-Carlton
11:00-11:30am		
11:30-12:00pm		
12:00-12:30pm	Lunch Break Quad Room	Bus : Ritz-Carlton to Fairlane Center
12:30-1:00pm		Lunch, Quad Room GM Larry Burns
1:00-1:30pm		
1:30-2:00pm		
2:00-2:25pm	Tutorial 4, 5, 6 Rooms 110, 116 & 120	TS01A, TS02A, TS03A, TS04A, TS05A, TS05B, SS07, SS10, SS12
2:25-2:50pm		
2:50-3:15pm		
3:15-3:40pm		
3:40-4:10pm	Coffee Break	
4:10-4:35pm	Tutorial 4, 5, 6 Rooms 110, 116 & 120	Rooms 102, 110, 111, 116, 117, 120, 121, 126, 127
4:35-5:00pm		
5:00-5:25pm		
5:25-6:00pm	Bus: Ritz to Fairlane	
6:00-6:30pm	Welcome Reception Quad Room	
6:30-8:00pm		
8:00-10:30pm		
10:00-11:00pm		
Registration	AM: Fairlane PM: Fairlane	AM: Ritz PM: Fairlane
Exhibits	No Exhibits	Exhibits and Car Display at the Fairlane, PM only

<b>Wednesday Sept 9, 2009</b>	<b>Thursday Sept 10, 2009</b>	<b>Friday Sept 11, 2009</b>
Author's Breakfast at Ritz-Carlton	Bus: Ritz-Carlton to Fairlane Center	
	Breakfast at the Fairlane Center Quad Room	
Plenary session Presidential Ballroom Ritz-Carlton	PD01, Room 110/111 PD02, Room 120/121 PD03, Room 126 PD04/SS15, Room 116 PD05/SS20, Room 117	TS02E, TS03B, TS05E, TS05F, SS06B, SS22, SS24, SS2 6, SS14B
Coffee Break		
Plenary session  Presidential Ballroom Ritz-Carlton	PS: Poster Session 10am until 2pm	Rooms 102, 110, 111, 116, 117, 120, 121, 126, 127
Bus : Ritz-Carlton to Fairlane Center	Quad Room	Conference Adjourn with boxed lunch to go
Lunch, Quad Room Chrysler Robert Lee	Lunch South Dinning Hall B, C, D	
TS01B, TS02C, TS02B, TS04B, TS05C, SS06A, SS13A, SS16, SS25 A	TS02D, TS05D, SS13B/TS02F, SS14A, SS17, SS18, SS1 9, SS25B, SS27,	
Coffee Break		
Rooms 102, 110, 111, 116, 117, 120, 121, 126, 127	Rooms 102, 110, 111, 116, 117, 120, 121, 126, 127	
VPPC Steering Committee Meeting Quad Room	Bus: Ritz-Carlton to Henry Ford Museum	
	Banquet at the Henry Ford Museum, Awards	
	Bus: Henry Ford to Ritz- Carlton	
AM: Ritz PM: Fairlane	AM: Fairlane PM: Fairlane	AM: Fairlane PM: None
Exhibits and Car Display at the Fairlane, Wed. PM Only, Thurs. All day		No Exhibits

# **VPPC '09 Technical Program**

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## **Tutorials**

Monday Sept 7<sup>th</sup>, 2009, 8:30 am – 5:30 pm  
*Venue: Rooms 110, 116, 120, Fairlane Center*  
*University of Michigan-Dearborn, 19000 Hubbard Drive,*  
*Dearborn, Michigan 48126-2638*

## **Plenary Sessions**

Tuesday Sept 8<sup>th</sup>, 2009, 8:00 am – 12:00 pm  
Wednesday Sept 9<sup>th</sup>, 2009, 8:00 am – 12:00 pm  
*Presidential Ballroom, Ritz-Carlton*  
*300 Town Center Drive, Dearborn, MI 48126*

## **Luncheon Programs**

Tuesday Sept 8<sup>th</sup>, 2009, 12:30 pm – 2:00 pm  
Wednesday Sept 9<sup>th</sup>, 2009, 12:30 pm – 2:00 pm  
*Venue: Quad Room, Fairlane Center*  
*University of Michigan-Dearborn, 19000 Hubbard Drive,*  
*Dearborn, Michigan 48126-2638*

## **Panel Discussion Sessions**

Thursday Sept 10<sup>th</sup>, 2009, 8:30 am – 10:00 am  
*Venue: Rooms 110, 120, 116, 117, 126, Fairlane Center*  
*University of Michigan-Dearborn, 19000 Hubbard Drive,*  
*Dearborn, Michigan 48126-2638*

## **Oral Sessions**

Tuesday Sept 8<sup>th</sup>, 2009, 2:00 pm – 5:25 pm  
Wednesday Sept 9<sup>th</sup>, 2009, 2:00 pm – 5:25 pm  
Thursday Sept 10<sup>th</sup>, 2009, 2:00 pm – 5:25 pm  
Friday Sept 11<sup>th</sup>, 2009, 8:30 am – 12:00 pm  
*Venue: Rooms 102, 110, 111, 116, 117, 120, 121, 126,*  
*127*  
*Fairlane Center*  
*University of Michigan-Dearborn, 19000 Hubbard Drive,*  
*Dearborn, Michigan 48126-2638*

## **Poster Sessions**

Thursday Sept 10<sup>th</sup>, 2009  
10:00 am – 1:00 pm  
*Venue: Quad Room, Fairlane Center*  
*University of Michigan-Dearborn, 19000 Hubbard Drive,*  
*Dearborn, Michigan 48126-2638*



## Tutorials

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Monday Sept 7<sup>th</sup>, 2009  
8:30 am – 12:00 pm  
*Venue: Fairlane Center*

### Tutorial

Chair: Ravi Warriar

**Tutorial 1 SiC-Based Devices for Automotive Power Conversion Applications**

*Room 110* Dr. Burak Oezpececi; *Oak Ridge National Laboratory, USA.*

**Tutorial 2 Thermal Stress Failure in Electronics Prediction and Prevention**

*Room 116* Dr. E. Suhr; *University of California, Santa Cruz, USA.*

**Tutorial 3 Plug-In Hybrid Electric Vehicles: Transportation 2.0**

*Room 120* Dr. Ali Emadi; *Illinois Institute of Technology, Chicago, IL, USA.*

Monday Sept 7<sup>th</sup>, 2009  
2:00 pm – 5:30 pm  
*Venue: Fairlane Center*

**Tutorial 4 Lithium Batteries – The next Generation of Power Source for Vehicles**

*Room 110* X.Q. Yang; *Brookhaven National Lab, USA.*

**Tutorial 5 Modeling of Hybrid Electric Vehicles for Energy Management**

*Room 116* Alain Bouscayrol; *MEGEVH, French network on HEVs, University of Lille, Rochdi Trigui; MEGEVH, French Network on HEVs, INRETS*

**Tutorial 6 Fundamentals of Electro-Mechanical Energy Conversion with Sensor Design and Hybrid Vehicle Application**

*Room 120* Laszlo M Hideg; *Hybrid Electric Vehicles, Chrysler LLC., USA*

## Plenary Sessions and Luncheon

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Tuesday Sept 8<sup>th</sup>, 2009

8:00 am – 12:00 pm

*Venue: Presidential Ball Room, Ritz-Carton*

### **Opening Ceremony/Plenary Session**

Chair: Chris Mi, Co-Chair: Fang Z. Peng

#### **Opening**

Chris Mi; *University of Michigan-Dearborn, USA.*

#### **Welcome Remarks**

Daniel Little; *University of Michigan-Dearborn, USA.*

#### **Speech from IEEE VTS President**

James Irvine; *President, IEEE Vehicular Technology Society, Strathclyde University in Glasgow, UK.*

#### **Honorary Awards Program**

James Irvine; *President, IEEE Vehicular Technology Society*

#### **KS01-1 Engineering Education for the Near Future**

Frank Barnes; *National Academy of Engineering, University of Colorado at Boulder, USA.*

Coffee Break

10:00 am – 10:30 am

#### **KS01-2 Challenges of Hybrid Electric Vehicles for Military Applications**

Ghassan Khalil; *Hybrid Electric Research Team US Army TARDEC, USA.*

#### **KS01-3 Sustainable Engineering: A New Field of Research**

Mark Ehsani; *Texas A&M University, USA.*

#### **KS01-4 High Power Batteries: Enabling Technologies for the Drivetrain of the Future**

Ann Marie Sastry; *University of Michigan, USA.*

Tuesday Sept 8<sup>th</sup>, 2009  
12:30 pm – 2:00 pm  
*Venue: Quad Room, Fairlane Center*

**Luncheon Program**

Chair: James Gover

- KS01-5 Driving to a Sustainable Future: A New DNA for the Automobile**  
Larry Burns; *Vice President, R&D and Strategic Planning, General Motors, USA.*

Wednesday Sept 9<sup>th</sup>, 2009  
8:00 am – 12:00 pm  
*Venue: Presidential Ball Room, Ritz-Carton*

**Plenary Session**

Chair: Fang Z. Peng, Co-Chair: James Gover

- KS02-1 Speech from IEEE PELS President Automobiles in a Sustainable Energy World**  
Deepak Divan; *President of IEEE Power Electronics Society, Georgia Institute of Technology, USA.*
- KS02-2 Key Issues and Solutions for Mass Electrification of Transportation**  
Nancy Gioia; *Ford Motor Company, USA.*
- KS02-3 Soft Switching of High Temperature Inverter**  
Jason Lai; *Virginia Tech, USA.*
- KS02-4 Impact of Plug-In Vehicles on the Electric Power Grid: A DTE Energy Case Study**  
Haukur Asgeirsson; *DTE Energy, USA.*

Coffee Break  
10:00 am – 10:30 am

- KS02-5 US DOE Vehicle Technologies R&D on Hybrid Electric Systems**  
David Howell; *Department of Energy, USA.*
- KS02-6 Development of Electric, Hybrid and Fuel Cell Vehicles in China**  
C.C. Chan; *University of Hong Kong, China.*

**KS02-7 Energy Storage System Technology  
Challenges Facing Strong Hybrid, Plug-In  
and Battery Electric Vehicles**  
John M. Miller; *Maxwell Technologies, Inc.  
USA.*

Wednesday Sept 9<sup>th</sup>, 2009  
12:30 pm – 2:00 pm  
*Venue: Quad Room, Fairlane Center*

**Luncheon Program**  
Chair: Chris Mi

**KS02-8 Sustainability and Innovation in Power-  
train Electrification – A Pragmatic View**  
Robert Lee; *Vice President – Powertrain  
Product Engineering, Chrysler, LLC, USA.*

## Panel Sessions

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Thursday Sept 10<sup>th</sup>, 2009

8:30 am – 10:00 am

*Venue: Room 110/111, Fairlane Center*

**Panel Discussion: Future Transportation  
and Energy Policy**

Moderator: James Gover, and Fang Z. Peng

**Panelist**

**Dennis Assanis**, National Academy of Engineering,  
Professor of Mechanical Engineering, University of  
Michigan, USA

**Dr. Tom Gentile**, Chairman of the IEEE USA Energy  
Policy Committee, Canada

**Michael Delaney**, DTE Energy Ventures, USA

**Mr. Sean Gleason**, Technical Specialist, Hybrid  
Programs, GM, USA

**Ali Emadi**, President and CEO, HEVT, Professor,  
Illinois Institute of Technology, USA

**Giorgio Rizzoni**, Professor and Director, Center for  
Automotive Research, the Ohio State University, USA

Thursday Sept 10<sup>th</sup>, 2009  
8:30 am – 10:00 am  
*Venue: Room 120/121, Fairlane Center*

**Panel Discussion: Bridging the Gap Between  
Industry, Government and Academia for  
Developing Electrified Vehicle Technology**  
Moderator: Jay Iyengar and John Z. Shen

**Panelist**

**Mr. John Wood**, Executive Director, Automotive Partnership, Canada

**Marcia S. Black-Watson**, Deputy Director – Employers Bureau of Workforce Transformation, Department of Energy, Labor & Economic Growth, State of Michigan, USA

**Mr. Timothy Grewe**, Chief Engineer, Hybrid Programs, GM, USA

**Dr. Mircea Gradu**, Director of Transmissions and Driveline and Head of Virtual Engineering, Chrysler Group LLC, USA

**Dr. Sankar Dasgupta**, Head of Electrovaya, Canada

**Dr. Yann Guezennec**, Center for Automotive Research – Ohio State University, USA.

Thursday Sept 10<sup>th</sup>, 2009  
8:30 am – 10:00 am  
*Venue: Room 126, Fairlane Center*

**Panel Discussion: Thermal Phenomena in  
Vehicular Electronics**  
Moderator: Ephraim Suhir and Michael O'Keefe

**Panelist/Presentation Title**

**SS06C-1 Solderless Assembly of Electronic  
Products – A More Reliable and More  
Cost Effective Approach to Electronics  
Manufacturing?**  
*Joseph Fjelstad, Verdant Electronics, USA.*

**TF06C-2 Challenges and Opportunities in  
Thermal Management of Automotive  
Power Electronics**  
*Avram Bar-Cohen and Patrick McCluskey  
University of Maryland – Maryland, USA.*

**TF06C-3 Thermal Stress Failures in Electronic  
and Photonic Systems: Prediction,  
Prevention, Modeling**  
*Ephraim Suhir, University of California at  
Santa Cruz – California, USA.*

Thursday Sept 10<sup>th</sup>, 2009  
8:30 am – 10:00 am  
*Venue: Room 116, Fairlane Center*

**Panel Discussion: Education, Law and  
Practical Issues**

Moderator: Sheldon Williamson and Jin Wang

**Panelist/Presentation Title**

- SS15-1 Formula Hybrid Racing at Illinois Institute of Technology: Academic Year 2008/2009**  
Garrett Nielson, Jonathan Sibley, Sanjaka Wirasingha, Antonis Antoniou, Ali Emadi;  
*Illinois Institute of Technology, USA.*
- TF15-1 An Overview of Current Research Activities on Fuel Cell Technology at FAU**  
Ali Zilouchian, Amir Abtahi; *Florida Atlantic University, USA.*
- TF15-2 Intellectual Property – An Engineering Overview**  
Marcus Millet; *Lerner, David, Littenberg, Krumholz & Mentlik LLP, USA.*
- TF15-4 Civilization without Oil**  
Oliver H. Winn, *Retired, USA.*



Thursday Sept 10<sup>th</sup>, 2009  
8:30 am – 10:00 am  
*Venue: Room 117, Fairlane Center*

**Panel Discussion: Development in U.S.,  
Asia and Europe**

Moderator: C.C. Chan and Chunbo Zhu

**Panelist/Presentation Title**

- SS20-1    Communication and Control of Electric Drive Vehicles Supporting Renewables**  
Tony Markel, Michael Kuss, Paul Denholm;  
*National Renewable Energy Laboratory, USA.*
- SS20-2    Study on the Policy of New Energy Vehicles in China**  
Xiang Zhang, Jianzhong Yang, Bo Sun, and Jia Wang; *Shanghai Haima Automobile R&D Co, Ltd. China.*
- SS20-3    Optimizing of the Train Power System in Zagreb**  
Tomislav Capuder, Luka Lugarić, Jurica Brekalo Štrbić, Slavko Krajcar; *University of Zagreb, Croatia.*
- SS20-4    Relationship of Customer Needs to Electric Vehicle Performance**  
Aayush Gupta, Vivek Bhise; *University of Michigan-Dearborn, USA.*

## **Oral Sessions**

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Tuesday Sept 8<sup>th</sup>, 2009, 2:00 pm – 5:25 pm

Wednesday Sept 9<sup>th</sup>, 2009, 2:00 pm – 5:25 pm

Thursday Sept 10<sup>th</sup>, 2009, 2:00 pm – 5:25 pm

Friday Sept 11<sup>th</sup>, 2009, 8:30 am – 12:00 pm

*Venue: Rooms 102, 110, 111, 116, 117,  
120, 121, 126, 127  
Fairlane Center*

*University of Michigan-Dearborn, 19000 Hubbard Drive,  
Dearborn, Michigan 48126-2638*

Tuesday Sept 8<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 102

**Title: Vehicular Electric Power Systems and Loads**

Chair: M.A. Rahman, Co-Chair: Abul Masrur

- TS01A-1 Optimal Control and Gain Scheduling of Electrical Power Steering Systems**  
Rakan Chabaan; *Lawrence Technological University, USA.*
- TS01A-2 Electric Vehicle Charging Stations in Magdeburg**  
Thoralf Winkler, Przemyslaw Komarnicki, Gerhard Mueller; *Fraunhofer Institute for Factory Operation and Automation IFF, Germany.*  
Guenter Heideck, Maik Heuer, Zbigniew A. Styczynski *O-v-G-University Magdeburg, Germany.*
- TS01A-3 Hardware Implementation of the Current Control Using the Internal Model Method in the Electric Power Steering Application**  
Tsunghsien Hu, Chih-Jung Yeh; *Automotive Research and Testing Center (ARTC), Taiwan, R.O.C.*
- TS01A-4 Modeling of the Automotive 14 V Power Net for Voltage Stability Analysis**  
Rainer Gehring, Joachim Froeschl; *BMW Group, Germany.*  
Tom P. Kohler, Hans-Georg Herzog; *Technische Universitaet Muenchen, Institute of Energy Conversion Technology, Germany.*

Coffee Break

3:40 pm – 4:10 pm

- TS01A-5 Fast Battery Equalization with Isolated Bidirectional DC-DC Converter for PHEV Applications**  
Ziling Nie, Chris Mi; *University of Michigan – Dearborn, USA.*

**TF01A-1 The Research of Vehicle Power Li-Ion Battery Pack Balancing Method**  
Bing Zhu; *Tongji University, China.*  
Qingping Wang, *Shanghai Automotive Industry Corporation, China.*

Tuesday Sept 8<sup>th</sup>, 2009  
2:00 pm – 5:25 pm  
*Venue: ROOM 110*

**Title: Vehicular Power Electronics and Motor Drives**

Chair: Taehyung Kim, Co-Chair: Byoung-Kuk Lee

**TS02A-1 Drive Control for Fuel cells and Lithium Ion Battery Hybrid Railway Vehicle**

Takemasa Furuya, Kenichi Ogawa,  
Takamitsu Yamamoto; *Vehicle Control Technology Division/Drive Systems Laboratory, Japan.*

**TS02A-2 Advances on IPM Technology for Hybrid Electric Vehicles**

M.A. Rahman, *Memorial University of Newfoundland, Canada.*  
M.A. Masrur, *US Army RDECOM-TARDEC, USA.*

**TS02A-3 A Novel Control Strategy of Linear Induction Motor Drives based on Dynamic Maximum Force Production**

Haidong Yu, *John Deere, USA.*  
Babak Fahimi, *University of Texas at Arlington, USA.*

**TS02A-4 Gear Locking Mechanism to Extend the Consistent Power Operating Region of the Electric Motor to Enhance Acceleration and Regenerative Braking Efficiency in Hybrid Electric Vehicles**

Piranavan Suntharalingam, John Economou, Kevin Knowles; *Cranfield University, UK.*

Coffee Break  
3:40 pm – 4:10 pm

- TS02A-5 Extended Constant-Torque and Constant-Power Speed Range Control of Permanent Magnet Machine Using a Current Source Inverter**  
Gui-Jia Su, Lixin Tang; *Oak Ridge National Laboratory, USA.*  
Zhiqiao Wu, Johnson Controls, USA.
- TS02A-6 Intelligent Direct Torque Control of Brushless DC Motors for Hybrid Electric Vehicles**  
Aayush Gupta, Taehyung Kim, Taesik Park, Cheol Lee; *University of Michigan – Dearborn, USA.*
- TF02A-1 Three Phase Brushless Direct Current Motor Controller**  
Jon Gervais, Austin Youngblood, Kevin Grant, Peter Stanley, Walter Delashmit; *University of North Texas, USA.*

Tuesday Sept 8<sup>th</sup>, 2009  
2:00 pm – 5:25 pm  
*Venue: ROOM 111*

**Title: Advanced Vehicles**

Chair: Fang Z. Peng, Co-Chair: Mahesh Krishnamurthy

- TS03A-1 Motion Characteristics Simulation and Optimization of Suspension System in Patrolling Forest Fire Vehicle**  
Xingqiang Ba, Jianguo Yu; *Northeast Forestry University, China.*  
Chuanli Chang; *Highway Bureau of Harbin, China.*  
Yingxue Li, Jintan Li; *Ruizhong Mechanical Equipment Co. Ltd., China.*
- TS03A-2 ITS based Predictive Intelligent Battery Management System for Plug-In Hybrid and Electric Vehicles**  
Mohamad Abdul-Hak, Nizar Al-Holou; *University of Detroit Mercy, USA.*

**TS03A-3 Design, Development and Characterisation of a FPGA Platform for Multi-Motor Electric Vehicle Control**

Ricardo de Castro, Rui Esteves Araújo, Hugo Oliveira; *University of Porto, Portugal.*

**TS03A-4 Solar/Battery Electric Auto Rickshaw Three-Wheeler**

Priscilla Mulhall, Sanjaka Wirasingha, Young Joo Lee, Ali Emadi; *Illinois Institute of Technology, USA.*

Srdjan Lukic, *North Carolina State University, USA.*

Coffee Break  
3:40 pm – 4:10 pm

**TS03A-5 Ergonomic Verification of Reactive Torque Control Based on Driver's Sensitivity Characteristics for Active Front Steering**

Ryo Minaki, Hiroshi Hoshino; *Tokyo Denki University, Japan.*

Yoichi Hori, *University of Tokyo, Japan.*

**TS03A-6 Advanced Vehicles with Dynamically Reconfigurable Number of Stator Turns**

Pedro Otaduy, D.J. Adams; *Oak Ridge National Laboratory, USA.*

**TF03A-1 Development of Hybrid Electric Vehicle**

T.W. Ching, K.U. Chan; *University of Macau, Macau.*

Tuesday Sept 8<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 116*

**Title: Energy Storage Components/Systems**

**Chair: Sonya Gargies, Co-Chair: Daniel Hissel**

**TS04A-1 A Targeted Equalizer for Lithium Ion Battery Packs**

Thomas Stuart, Wei Zhu; *University of Toledo, USA.*

**TS04A-2 New Energy Management of Capacitive Energy Storage in Metro Railcar by Simulation**

Istvan Szenasy; *Szechenyi University, Hungary.*

**TS04A-3 An Efficient Solar Charging Algorithm for Different Battery Chemistries**

Ala Al-Haj Hussein, Micheal Pepper, Ahmad Harb, Issa Batarseh; *University of Central Florida, USA.*

**TS04A-4 Online Detection of Terminal Voltage in Li-Ion Batteries via Battery Impulse Response**

Anahita Banaei, Amir Khoobroo, Babak Fahimi; *University of Texas at Arlington, USA.*

Coffee Break  
3:40 pm – 4:10 pm

**TS04A-5 Fuzzy Logic Energy Management Strategy for Fuel Cell/Ultracapacitor/Battery Hybrid Vehicle with Multiple-Input DC/DC Converter**

Agustín Melero-Pérez, Wenzhong Gao, J. Jesús Fernández-Lozano; *Tennessee Tech University, USA.*

**TS04A-6 Battery Pack Modeling for the Analysis of Battery Management System of a Hybrid Electric Vehicle**

Chitradeep Sen, Narayan C. Kar; *University of Windsor, Canada.*

**TS04A-7 Influence of Control Strategies on Battery/Supercapacitor Hybrid Energy Storage Systems for traCtion Applications**

Anne Laure Allègre, Alain Bouscayrol; *University of Lille, France.*  
Rochdi Trigui; *LTE, INRETS, France*

**TF04A-1 Battery Modeling for HEV**

Xiao Hu, Scott Stanton; *Ansoft, USA.*

Tuesday Sept 8<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 117

**Title: Fuel Cell Hybrid Vehicle  
and Control Strategy**

Chair: David Gao, Co-Chair: Dragan Simic

- TS05A-1 Modeling and Evaluation of a Plug-In Hybrid Fuel Cell Shuttle Bus**  
Clay Hearn, Michael Lewis, Richard Thompson, Raul Longoria; *University of Texas at Austin, USA.*
- TS05A-2 Fuzzy Clustering Approach to Obtain Dynamics of Fuel Cell Stack Voltage**  
Nand Kishor, L.S. Yadav, A.S. Raghuvanshi; *Motilal Nehru National Institute of Technology Allahabad, India.*
- TS05A-3 Fuzzy Controller Design for Parallel Hybrid Vehicle Analysis Using Forward Simulation**  
Peyman Naderi; *Islamic Azad University, Borujerd Branch, Iran, Islamic Republic of.*  
Mojtaba Mirsalim; *Amirkabir University, Iran, Islamic Republic of.*  
S.M. Taghi Bathaee, Reza Chini; *Khaje-Nasir University, Iran, Islamic Republic of.*
- TS05A-4 Adaptive Control Strategy for Hybrid Electric Vehicles**  
Antonis Antoniou, Ali Emadi; *Illinois Institute of Technology, USA.*

Coffee Break

3:40 pm – 4:10 pm

- TF05A-1 Non-Linear Model based Control of a Fuel Cell Power System for Automotive Applications**  
Claudio H. Lopes Filho; *Ford Motor Company, Brazil.*
- TF05A-2 Simulation, Design and Evaluation of an Entire Hybrid Electric All Terrain Vehicle**  
Dragan Simic; *Austrian Institute of Technology, Austria.*



Tuesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 120*

**Title: Electric Machine Drive and Converter**

**Chair: Charles Lizhi Zhu, Co-Chair: Ravi Warrier**

- TS05B-1 Practical Input-Output Stability Analysis Techniques Applied to DC Machine Systems**  
Charles Sullivan; *Delphi Corporation, USA.*
- TS05B-2 A Local Linear Black-Box Identification Technique for Power Converters Modeling**  
Guido Ala, Antonino Spagnuolo, Fabio Viola; *Università degli Studi di Palermo, Italy.*
- TS05B-3 An Adaptive Controller for Sensorless PM Synchronous Motor Drive for Electric Vehicles**  
Hassan Nikkhajoei; *UAE University, United Arab Emirates.*  
Vahid Oghafy, Jafar Soltani Zamani; *Isfahan University of Technology, Iran, Islamic Republic of.*
- TS05B-4 Research on Braking of Battery-supplied Interior Permanent Magnet Motor Driving System**  
Guangzhao Luo, Zhe Chen, Yantao Deng, Manfeng Dou, Weiguo Liu; *Northwestern Polytechnical University, China.*

Coffee Break

3:40 pm – 4:10 pm

- TS05B-5 The Role of Coenergy & The Development of a Comprehensive Analytical Model for a PM Motor**  
Randy Stevenson; *Galt Research, USA.*

- TS05B-6 Compensating the Influence of the Stator Resistor and Inverter Non-Linearities in Signal-Injection based Sensorless Strategies**  
 Fabien Gabriel, Pascal Druyts, Xavier Neyt, Marc Acheroy; *Royal Military Academy, Belgium.*  
 Frederik De Belie, Jan Melkebeek; *Ghent University, Belgium.*
- TS05B-7 Interior Permanent Magnet Machine Analysis Using Finite Element based Equivalent Circuit Model**  
 Scott Stanton, Dingsheng Lin, Zhangjun Tang; *Ansoft, LLC, USA*

Tuesday Sept 8<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 121

**Title: Lithium-Ion Batteries**  
 Chair: Gao Liu, Co-Chair: Peter Roth

- SS07-1 Spatially Resolved Model for Lithium-Ion Batteries for Identifying and Analyzing Influences of Inhomogeneous Stress Inside the Cells**  
 Jochen Bernhard Gerschler, Franz Kirchhoff, Heiko Witzenhausen, Friedrich E. Hust, Dirk Uwe Sauer; *ISEA RWTH Aachen University, Germany.*
- SS07-2 A Cost Optimized Battery Management System with Active Cell Balancing for Lithium Ion Battery Stacks**  
 Carl Bonfiglio, Werner Roessler; *Infineon Technologies, Germany.*
- SS07-3 Solar Photovoltaic Charging of Lithium-Ion Batteries**  
 Thomas Gibson, Nelson Kelly; *GM Corp, GM R&D Center, USA.*
- SS07-4 Adaptive Battery Management Systems for the New Generation of Electrical Vehicles**  
 Dmitriy Danilov, Peter H.L. Notten; *Eindhoven University of Technology, Netherlands.*

Coffee Break  
3:40 pm – 4:10 pm

- SS07-5 Energy Storage System for GM Volt – Lifetime Benefits**  
Todd Mackintosh, Harshad Tataria,  
Sudhakar Inguva; *General Motors, USA.*
- TF07-1 Critical Safety Issues for HEV and PHEV Li-Ion Batteries**  
E. Peter Roth; *Sandia National  
Laboratories, USA.*

Tuesday Sept 8<sup>th</sup>, 2009  
2:00 pm – 5:25 pm  
*Venue: ROOM 126*

**Title: Powertrain Control**  
Chair: Pingan He, Co-Chair: Sheldon Williamson

- SS10-1 Active Torque Cancellation for Transmitted Vibration Reduction of Low Cylinder Count Engines**  
Elias Ayana, *University of Minnesota and  
Cummins Power Generation, USA.*  
Paul Plahn, *Cummins Power Generation,  
USA.*  
Krzysztof Wejrzanowski; *Cummins  
Generator Technologies, UK.*
- SS10-2 Emission Characteristics of Parallel Hybrid Electric Bus as a Function of the Instantaneous Degree of Hybridization**  
Mengliang Li, *China Automotive  
Technology and Research Center, China.*  
Yanxin Nie; *Wuhan University of  
Technology, China.*
- SS10-3 An Adaptive Online Energy Management Controller for Power-Split HEV based on Dynamic Programming and Fuzzy Logic**  
Zheng Chen, Chris Mi; *University of  
Michigan-Dearborn, USA.*

**SS10-4 Coordinated EGR-Rate Model-Based Controls of Turbocharged Diesel Engines via an Intake Throttle and an EGR Valve**

Ingo Friedrich, Chia-Shang Liu; *IAV Automotive Engineering Inc, USA.*

Dale Oehlerking; *Navistar International, USA.*

Coffee Break  
3:40 pm – 4:10 pm

**SS10-5 Dynamic analysis and Simulation of Driveability and Control of a Double Transition Shifting System**

Di Wu, Yong Zhang, Yin-Ping Chang; *Oakland University, USA.*

Kumar Hebbale, Chi-Kuan Kao; *GM R&D Center, USA*

**TF10-1 Fuzzy Control Strategy Of Energy Distribution in Single-Axle Parallel Hybrid Electric Vehicle**

Xiaogang Wu, Xudong Wang, Jiachen Bing; *Harbin University of Science & Technology, China.*

Tuesday Sept 8<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 127*

**Title: Power Management**

Chair: Zhenhua Jiang, Co-Chair: Alain Bouscayrol

**SS12-1 Energy Management of Vehicle Electrical System with Auxiliary Power Unit**

Mathias Käbisch, Maik Heuer, Günter Heideck, Zbigniew A. Styczynski; *O-v-G-University Magdeburg, Germany.*

**SS12-2 Predictive Control for HEV Energy Management: Experimental Results**

Saida Kermani, Sebastien Delprat, Thierry Marie Guerra, Rochdi Trigui; *University of Valenciennes Hainaut et Cambresis France.*

- SS12-3 Energy Management Algorithm for a Hybrid Fuel Cells Scooter**  
Jung-Ho Cheng, Vera Hsu, Chen-Yen Yu;  
*National Taiwan University, Taiwan.*
- SS12-4 Integrated Powertrain Control for Hybrid Electric Vehicles with Electric Variable Transmission**  
John Kessels, Darren Foster; *TNO Science and Industry, Netherlands.*  
Paul van den Bosch; *Eindhoven University of Technology, Netherlands.*
- Coffee Break  
3:40 pm – 4:10 pm
- SS12-5 Offline Optimization for Components Sizing and Analysis of a Plug-In Hybrid Urban Microbus**  
Rochdi Trigui, Emmanuel Vinot, Majed Boujelben; *INRETS, France.*
- SS12-6 State of the Art Power Management Algorithms for Hybrid Electric Vehicles**  
Yusuf Gurkaynak, Alireza Khaligh, Ali Emadi; *Illinois Institute of Technology, USA.*
- TF12-1 A Multi-Agent based Power Management System for Plug-In Hybrid Electric Vehicles**  
Habiballah Rahimi-Eichi, Zhenhua Jiang;  
*University of Miami, USA.*
- TF12-2 Vehicle Movement Energy Transfer to Pavement**  
Hassan Homami, *Parsons Brinckerhoff, USA.*

Wednesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 102

**Title: Vehicular Electric Power Systems and Loads**

Chair: Abul Masrur, Co-Chair: M.A. Rahman

- TS01B-1 A Contactless Bi-Directional Power Interface for Plug-In Hybrid Vehicles**  
Duleepa Thrimawiathana, Udaya Madawala; *The University of Auckland, New Zealand.*
- TS01B-2 Practical Considerations for Designing IPT System for EV Battery Charging**  
Chang-Yu Huang, John T. Boys, Grant Covic, Mickel Budhia; *The University of Auckland, New Zealand.*
- TS01B-3 Challenges in the Design of a 100 kW Induction Motor for a PHEV Application**  
John Herbst, Jon Hahne, Howard Jordan, Hsing Pang Liu, Angelo Gattozzi, *University of Texas at Austin, USA.*  
Ben Wu; *TECO Westinghouse Motor Company, USA.*
- TS01B-4 Research on the Model of Magnetic-Resonance based Wireless Energy Transfer System**  
Chunlai Yu, Rengui Lu, Yinhua Mao, Litao Ren, Chunbo Zhu; *Harbin Institute of Technology, China.*
- Coffee Break  
3:40 pm – 4:10 pm
- TS01B-5 Modeling of Eddy Current Loss in the Magnets of Permanent Magnet Machines for Hybrid and Electric Vehicle Traction Applications**  
Xiaofeng Ding, Chris Mi; *University of Michigan-Dearborn, USA.*
- TF01B-1 Railway Power Supply Investment Planning Considering the Voltage Drops – Assuming the Future Traffic to be Known**  
Lars Abrahamsson, Lennart Söder; *Royal Institute of Technology, Sweden.*

Wednesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 110

**Title: Vehicular Power Electronics  
and Motor Drives**

Chair: John Z. Shen, Co-Chair: Jay Iyengar

**TS02B-1 Steady State and Transient Analysis of  
a Three Phase Current-Fed Z-Source  
PWM Rectifier**

Qin Lei, Shuitao Yang, Fangzheng Peng;  
*Michigan State University, USA.*

Ryosuke Inoshita; *DENSO Corporation,  
Japan.*

**TS02B-2 Development of a 55 kW 3X DC-DC  
Converter for HEV Systems**

Wei Qian, Fang Z. Peng; *Michigan State  
University, USA.*

Leon Tolbert, *The University of Tennessee,  
USA.*

**TS02B-3 Battery Charging Power Electronics  
Converter and Control for Plug-In  
Hybrid Electric Vehicle**

Sharanya Jaganathan, Wenzhong Gao;  
*Tennessee Tech University, USA.*

**TS02B-4 Modular Bidirectional DC-DC Converter  
for Hybrid/Electric Vehicles with  
Variable-Frequency Interleaved Soft-  
Switching**

John Elmes, Rene Kersten, Issa Batarseh;  
*University of Central Florida, USA.*

Michael Pepper, Keith Mansfield;  
*Advanced Power Electronics Corporation,  
USA.*

Coffee Break

3:40 pm – 4:10 pm

**TS02B-5 Double Input DC/DC Converter  
Topology for Hybrid Electrical Vehicles**

Vadim Zheglov, Wenzhong Gao; *Tennessee  
Tech University, USA.*

**TS02B-6 Three-Port Full Bridge Converter Application as a Combined Charger for PHEVs**

Sung Young Kim, Ilsu Jeong, Kwanghee Nam; *Postech University, Korea.*  
Hong-Seok Song; *Hyundai/Kia Motors, Korea*

**TF02B-1 Zero-Transition Converters for Electric Propulsion**

T.W. Ching; *University of Macau, Macau.*

**TF02B-2 A Novel Control Strategy Design and Implementation for a Switched Reluctance Motor based Integrated Starter Alternator**

Peng Zhang, Sheldon Williamson; *Concordia University, Canada.*

Wednesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 111*

**Title: Vehicular Power Electronics and Motor Drives**

Chair: Chunbo Zhu, Co-Chair: J. Hong

**TS02C-1 Ironless Machine Design and Novel Digital Control for Automotive Applications**

Igor Stamenkovic, Nikola Milivojevic, Mahesh Krishnamurthy, Ali Emadi; *Illinois Institute of Technology, USA,*  
Nigel Schofield; *University of Manchester, UK*

**TS02C-2 Optimal Design of a Surface Mounted Permanent Magnet in-Wheel Motor for an Urban Hybrid Vehicle**

Hoang Cong Minh Mai, Frédéric Dubas; *University of Franche Comté, France.*  
Didier Chamagne, Christophe Espanet; *FEMTO-ST Institute, France.*



**TS02C-3 Electrical Motor Design for Hybrid Heavy-Duty Electrical Powertrain**  
Zhenwei Wu, Christophe Kieffer, Frederic Dubas, Daniel Hissel, Christophe Espanet; *University of Franche-Comte, France.*  
Daniel Depernet, *University of Technology of Belfort Montbeliard, France.*

**TS02C-4 A Novel Five-Phase Pancake Shaped Switched Reluctance Motor for Hybrid Electric Vehicles**  
Anas Labak, Narayan C. Kar; *University of Windsor, Canada.*

Coffee Break  
3:40 pm – 4:10 pm

**TS02C-5 Sliding Mode-Based DTC-SVM Control of Permanent Magnet Synchronous Motors for Plug-in Hybrid Electric Vehicles**  
Hong Fu, Guangyu Tian, Quanshi Chen; *Tsinghua University, China.*  
Yaobin Chen, *Indianapolis University-Purdue University, USA.*

**TF02C-1 Analysis of the Magnetic Flux Density, the Magnetic Force and the Torque in a 3D Brushless DC Motor**  
Majid Pakdel; *Isfahan University of Technology, Iran.*

**TF02C-2 Calculation of Magnetic Flux Density and the Force of Linear Induction Motors Using Finite-Element Analysis**  
Majid Pakdel; *National Iranian Steel Co., Naghshejahan Higher Education Institute, Iran.*

Wednesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 116

**Title: Energy Storage Components/Systems**

Chair: Wes Zanardelli, Co-Chair: Keyu Chen

**TS04B-1 Plug-In Hybrids and New Energy Storages**

Vít Bršlica; *University of Defence in Brno, Czech Republic.*

**TS04B-2 Electric Vehicles and Energy Storage – A Case Study on Ireland**

Aoife Foley, Paul Leahy, Brian O Gallachoir, Eamon McKeogh; *University College Cork, Ireland.*

**TS04B-3 High Current Battery Impedance Testing for Power Electronics Circuit Design**

Ke Zou, Stephen Nawrocki, Renxiang Wang, Jin Wang; *Ohio State University, USA.*

**TS04B-4 Lithium-ion Batteries Life Estimation for Plug-In Hybrid Electric Vehicles**

Vincenzo Marano, Simona Onori, Yann Guezennec and Giorgio Rizzoni; *Center for Automotive Research – Ohio State University, USA.*

Nullò Madella; *Politecnico di Milano, Italy.*

Coffee Break

3:40 pm – 4:10 pm

**TS04B-5 Development of Improved Li-Ion Battery Model Incorporating Thermal and Rate Factor Effects**

Sachin Bhide, Taehyun Shim; *University of Michigan – Dearborn, USA.*

**TS04B-6 Redox Flow Batteries for Hybrid Electric Vehicles: Progress and Challenges**

Mohd R. Mohamed, Suleiman M. Sharkh, Frank C. Walsh; *University of Southampton, UK.*

**TS04B-7 Dynamic Power Sharing Strategy for Active Hybrid Energy Storage Systems**

Yu Zhang, Zhenhua Jiang; *University of Miami, USA.*

Wednesday Sept 9<sup>th</sup>, 2009

2:00 am – 5:25 pm

Venue: ROOM 117

**Title: Simulation and Modeling of HEV**

Chair: Kevin Bai, Co-Chair: Sonya Gargies

**TS05C-1 Driver-Vehicle Closed-Loop Simulation of Differential Drive Assist Steering Control System for Motorized-Wheel Electric Vehicle**

Qingnian Wang, Junnian Wang; *Jilin University, China.*

**TS05C-2 A Simulation Study of the Impact of Driving Patterns and Driver Behavior on Fuel Economy of Hybrid Transit Buses**

Siavash Zoroofi, Shaahin Filizadeh, Paul Zanetel; *University of Manitoba, Canada.*

**TS05C-3 HEV System based on Electric Variable Transmission**

Yongchang Du, Jinwen Gao, Liangyao Yu, Jian Song; *Tsinghua University, China.*  
Feng Zhao; *Chinese Academy of Science, China.*

**TS05C-4 HEV Series Architectures Evaluation: Modeling, Simulation and Experimentation**

David Bouquain, Benjamin Blunier, Abdellatif Miraoui; *University of Technology of Belfort-Montbéliard, France.*

Coffee Break

3:40 pm – 4:10 pm

**TS05C-5 Modeling the Drive Train for Two Parallel Hybrid Electric Vehicles in MATLAB/Simulink**

Michael Ade, Andreas Binder; *Darmstadt University of Technology, Germany.*

Wednesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 120*

**Title: Thermal Phenomena  
in Vehicular Electronics**

**Chair: Michael O'Keefe, Co-Chair: Ephraim Suhir**

**SS06A-1 Thermal Management of Electronic and  
Electrical Devices in Automobile  
Environment**

Wataru Nakayama, *ThermTech  
International, Japan.*

Osamu Suzuki; *Hitachi, Ltd. Japan.*

Yoshikatsu Hara, *Fujitsu Ten, Ltd, Japan.*

**SS06A-2 Spray Cooling of Power Electronics  
using High Temperature Coolant and  
Enhanced Surface**

Huseyin Bostanci, David Van Ee, Benjamin  
A. Saarloos, Daniel P. Rini; *RINI  
Technologies, Inc. USA.*

Louis C. Chow *University of Central Florida,  
USA.*

**SS06A-3 Practical Considerations Relating to  
Immersion Cooling of Power Electronics  
in Traction Systems**

Cindy Barnes, Phil Tuma, *3M Company –  
Minnesota, USA.*

Coffee Break

3:40 pm – 4:10 pm

**SS06A-4 Rapid Modeling of Power Electronics  
Thermal Management Technologies**

Kevin Bennion, Kenneth Kelly; *National  
Renewable Energy Laboratory – Colorado,  
USA.*

**SS06A-5 Vaporizable Dielectric Fluid Cooling of  
IGBT Power Semiconductors for Vehicle  
Powertrains**

David L. Saums, *DS&A LLC, USA*

Scott Gill, Tim Louvar, Abhijit Sathe, Dale  
Thompson; *Parker Hannifin Corporation –  
Indiana, USA.*

Wednesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 121

**Title: Plug-In HEV**

Chair: Mahesh Krishnamurthy,

Co-Chair: Chris Edrington

**SS13A-1 Deriving In-Use PHEV Fuel Economy Predictions from Standardized Test Cycle Results**

Jeffrey Gonder, Aaron Brooker; *National Renewable Energy Laboratory, USA.*

Richard Carlson, John Smart; *Idaho National Laboratory, USA.*

**SS13A-2 Effect of Battery Capacity on the Performance of Plug-in Hybrid Electric Vehicles**

Shweta Neglur, Mehdi Ferdowsi; *Missouri University of Science and Technology, USA.*

**SS13A-3 Characterizing Naturalistic Driving Patterns for Plug-In Hybrid Electric Vehicle Analysis**

Brian Adornato, Rakesh Patil, Zoran Filipi; *University of Michigan, USA.*

Zevi Baraket, Tim Gordon; *University of Michigan Transportation Research Institute, USA.*

**SS13A-4 Pihef: Plug-In Hybrid Electric Factor**

Sanjaka Wirasingha, Ali Emadi; *Illinois Institute of Technology, USA.*

Coffee Break

3:40 pm – 4:10 pm

**SS13A-5 Trade-Off Between PHEV Fuel Efficiency and Estimated Battery Cycle Life with Cost Analysis**

Neeraj Shidore, Jason Kwon, Anant Vyas; *Argonne National Laboratory, USA.*

**TF13A-1 Universal Fuel Economy Calculation for Plug in Hybrid Vehicles**

Mark Sampica; *GE, USA.*

Wednesday Sept 9th, 2009  
2:00 pm – 5:25 pm  
Venue: ROOM 126

**Title: Fuel Cell Vehicle**  
Chair: Taehyung Kim, Co-Chair: Neeraj Shidore

- SS16-1 Dynamic Modeling and Analysis of a 100-Cell PEM Fuel Cell Stack Considering Temperature and Liquid Water**  
Heonjoong Lee, Song-Yul Choe; *Auburn University, USA.*  
Young-Soo Kim; *Hyundai Rotem, Co., Seoul, Korea.*
- SS16-2 Comparative Analysis of CCM and DCM Modes of Interleaved Boost Converters for Fuel Cell Electric Vehicles**  
Gyu-Yeong Choe, Byoung-Kuk Lee;  
*SungKyunKwan University, Korea.*  
Jin Hur, *University of Ulsan, Korea.*  
Dong-Wook Yoo, *Korea Electrotechnology Research Institute, Korea.*
- SS16-3 Analysis of Low Frequency Current Ripples in Fuel Cell Electric Vehicles Considering Driving Conditions**  
Jong-Soo Kim, Byoung-Kuk Lee;  
*SungKyunKwan University, Korea.*  
Jin Hur, *University of Ulsan, Korea.*  
Dong-Wook Yoo, *Korea Electrotechnology Research Institute, Korea.*
- SS16-4 Design and Control of an Ultracapacitor Boosted Hybrid Fuel Cell Vehicle**  
Bo Chen, Yimin Gao, Mehrdad Ehsani; *Texas A&M University, USA.*  
John Miller; *Maxwell Technologies, Inc., USA.*

Coffee Break  
3:40 pm – 4:10 pm

**SS16-5 Fuel Cell System Integration on a Heavy-Duty Vehicle and Development of a Control Strategy with Real Time Simulation**

Jean Jouvrey; *FEMTO-ST/UTBM, France*;  
Fabien Harel, Sylvie Begot, Daniel Hissel;  
*University of Franche-Comté, France*.  
I. Rodel, V. Faure; *PANHARD, France*.  
S. Boblet; *Helion Hydrogen Power, France*.

**SS16-6 Fuel Economy Simulation of a Reformer-Linked Vehicular Fuel cell System**

Dominik Buecherl, Hans-Georg Herzog;  
*Technische Universitaet Muenchen, Institute of Energy Conversion Technology, Germany*.

Wednesday Sept 9<sup>th</sup>, 2009

2:00 pm – 5:25 pm

Venue: ROOM 127

**Title: Passive Components**

Chair: Jin Wang, Co-Chair: Edward Sawyer

**SS25A-1 Comparative Evaluation and Analysis of the 2008 Toyota Lexus, Camry and 2004 Prius DC Link Capacitor Assembly vs. the SBE Power Ring DC Link Capacitor**

Terry Hosking; *SBE, Inc, USA*.

**SS25A-2 Development of a Novel Ultracapacitor Electric Vehicle and Methods to Cope with Voltage Variation**

Kiyotaka Kawashima, Toshiyuki Uchida,  
Yoichi Hori; *University of Tokyo, Japan*.

**SS25A-3 Optimization of Powder Core Inductors of Buck-Boost Converters for Hybrid Electric Vehicles**

Bong-Gi You, Jong-Soo Kim, Byoung-Kuk Lee; *Sungkyunkwan University, Korea*.  
Gwang-Bo Choi; *Changsung Corporation, Korea*.  
Dong-Wook Yoo; *Electrotechnology Research Institute, Korea*.

**SS25A-4 Parasitic Parameters of Capacitor Tank in Converter and the Effect on Switching Transient Process**  
Fangzheng Li, Xudong Sun, Lipei Huang,  
Jianguo Jiang; *Tsinghua University, China.*

Coffee Break  
3:40 pm – 4:10 pm

**TF25A-1 A Fully Integrated 3 Phase IGBT Switching Assembly with a Very Low Loss DC Link Capacitor**  
Edward Sawyer; *SBE, Inc, USA.*

**TF25A-2 Capacitors and Dielectrics for Power Electronics and Energy Storage**  
Ben Koch, Eugene Furman, Mike Lanagan;  
*Penn State University, USA.*



Thursday Sept 10<sup>th</sup>, 2009

2:00 pm – 5:30 pm

Venue: ROOM 102

**Title: Vehicular Power Electronics  
and Motor Drives**

Chair: Zareh Soghomonian, Co-Chair: Ali Emadi

- TS02D-1 A Modified Cascaded Multilevel Inverter with Reduced Switch Count Employing Bypass Diodes**  
Arif Al-Judi, Hussain Bierk, Ed Nowicki;  
*University of Calgary, Canada.*
- TS02D-2 Influence of DC-Link Fluctuations on Three-Phase Induction Motor Drives**  
Fletcher Fleming, Oleg Vodyakho, Chris Edrington, Mischa Steurer; *Florida State University, USA.*  
Mahesh M. Krishnamurthy, *Illinois Institute of Technology, USA.*
- TS02D-3 Application of Current-Fed Quasi-Z-Source Inverter for Traction Drive of Hybrid Electric Vehicles**  
Qin Lei, Shuitao Yang, Fang Zheng Peng;  
*Michigan State University, USA.*  
Ryosuke Inoshita; *DENSO Corp. Japan.*
- TS02D-4 High Efficiency Three-Phase Soft-Switching Inverter for Electric Vehicle Drives**  
Pengwei Sun, Jih-Sheng Lai, Hao Qian, Wensong Yu; *Virginia Tech., USA.*  
Chris Smith, John Bates; *Azure Dynamics Inc., USA.*

Coffee Break

3:40 pm – 4:10 pm

- TS02D-5 A Novel Dead Time Compensation Circuit for Improved PWM Inverter Operation in Brushless Motor Drive Systems for Electric Vehicles**  
Richard Guinee; *Cork Institute of Technology, Ireland.*

**TS02D-6 Selective Harmonic Elimination for Multilevel Inverters with Unbalanced DC Inputs**

Damoun ahmadi, Jin Wang; *Ohio State University, USA.*

**TF02D-1 A New ZVZCS Isolated Dual Series Resonant DC-DC Converter**

Majid Pakdel; *Isfahan University of Technology, Iran.*

**TF02D-2 A Novel Hysteresis Current Control Method for Motor Filter with Low Switching Losses**

Jiang Zheng, Xiao-Jun Ye, Yan Liu, Sen Ouyang, *South China university of Technology, China.*

Thursday Sept 10<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 110*

**Title: Energy Optimization and Control Strategy**

**Chair: Yanhui Xie, Co-Chair: Ziyad Salameh**

**TS05D-1 Saving Potential of HDV Auxiliaries Energy Consumption Determined by Entire Vehicle Simulation**

Dragan SIMIC; *Austrian Institute of Technology, Austria.*

Ernst Pucher; *Vienna University of Technology, Austria.*

**TS05D-2 Torque Estimation of Electrical Power Steering Systems**

Rakan Chabaan; *Lawrence Technological University, USA.*

**TS05D-3 A Brake Strategy for an Automatic Parking System of Vehicle**

Chi-Chun Yao, Chia-Feng Lin, Kuang-Jen Chang; *Automotive Research & Testing Center, Taiwan.*

**TS05D-4 A Simple Power Based Control Strategy for Hybrid Electric Vehicles**

Abdulkadir Bedir, Ali T. Alouani; *Tennessee Tech university, USA.*

Coffee Break  
3:40 pm – 4:10 pm

**TS05D-5 Acceleration Simulation of Transit Bus with a New Type of Electric Drive System**

Yuan Zou, Zhang Chengning, Sun Fengchun; *Beijing Institute of Technology, China.*

Thursday Sept 10<sup>th</sup>, 2009  
2:00 pm – 3:40 pm  
*Venue: ROOM 111*

**Title: Plug-In HEV**

Chair: Mahesh Krishnamurthy,  
Co-Chair: Alireza Khaligh

**SS13B-1 A Novel Grid-tied, Solar Powered Residential Home with Plug-In Hybrid Electric Vehicle (PHEV) Loads**

Yusuf Gurkaynak, Zhihao Li, Alireza Khaligh;  
*Illinois Institute of Technology, USA.*

**SS13B-2 Design Methodology for a Range-Extended PHEV**

Matthew Doude, Marshall Molen;  
*Mississippi State University, USA.*

**TF13B-1 Simulation and Control Strategy Study on Hybrid Bus with New Kind of Powertrain System**

Liqing Sun, Guanghua Zhai; *Beijing Institute of Technology, China.*  
Chunfu Wang; *Shenzhen University, China.*

Coffee Break  
3:40 pm – 4:10 pm

Thursday Sept 10<sup>th</sup>, 2009

4:10 pm – 5:25 pm

*Venue: ROOM 111*

**Title: Motors and Power Electronics in HEV/PHEV**

**Chair: Laura Marlino, Co-Chair: Alireza Khaligh**

**TF02F-1 Adaptive Gain Scheduled PI Speed Controller for Vector Control of PMSM Drive for EV/HEV**

Amit Vilas Sant, K R Rajagopal; *Indian Institute of Technology, India.*

**TF02F-2 Motor Design and Analysis for HEV**

Zed Tang; *Ansys, Inc., USA.*

**TF02F-3 High Power Inverter Design and Analysis for HEV**

Scott Stanton; *Ansys, Inc., USA.*

Thursday Sept 10<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 116*

**Title: PHEV and the Smart Grid**

**Chair: Ian Hiskens, Co-Chair: Tony Markel**

**SS14A-1 Power System Stabilization by Charging Power Management of Plug-In Hybrid Electric Vehicles with LFC Signal**

Masaaki Takagi, Hiromi Yamamoto, Kenji Yamaji; *The University of Tokyo, Japan.*

**SS14A-2 Impact of Electric Vehicles on Power Distribution Networks**

Ghanim Putrus, Pasist Suwanapingkarl, David Johnston, Edward Bentley, Mahinsasa Narayana; *Northumbria University, United Kingdom.*

**SS14A-3 Bidirectional Battery Charger for HEV**

Giovanni Vitale, Nunzio Abbate; *STMicroelectronics, Italy.*

**SS14A-4 Impacts of Plug-In Vehicles and Distributed Storage on Electric Power Delivery Networks**

Peter Evans; *New Power Technologies, USA*.  
Soorya Kuloor; *Optimal Technologies (US), Inc., USA*.

Benjamin Kroposki; *National Renewable Energy Laboratory, USA*.

Coffee Break  
3:40 pm – 4:10 pm

**TF14A-1 Communicating with the Grid – Getting it Wrong will Quickly Destroy the Value of the PHEV**

Doug Houseman; *Capgemini, USA*.

Thursday Sept 10<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 117*

Title: HEV Optimization

Chair: Bingzhan Zhang, Co-Chair: Rochdi Trigui

**SS17-1 Verification of the Optimum Hybridization Factor as Design Parameter of Hybrid Electric Vehicles**

Dominik Buecherl, Igor Bolvashenkov,  
Hans-Georg Herzog; *Technische Universitaet Muenchen, Institute of Energy Conversion Technology, Germany*.

**SS17-2 Optimizing Capacitance in SPWM Converter/Inverter for Series Hybrid Electric Bus Systems**

Xi Lu, Honnyong Cha, Fang Zheng Peng;  
*Michigan State University, USA*.

**SS17-3 Continuous Wavelet-Based Active Filter Design for Harmonic Mitigation in Hybrid Electric Vehicles**

Jiaxin Ning, Wenzhong Gao; *Tennessee Tech University, USA*.

**SS17-4 Controller Hardware-In-the-Loop Simulation for Design of Power Management Strategies for Fuel Cell Vehicle with Energy Storage**  
Yuhang Deng, Hui Li, Simoo Foo; *Florida State University, USA.*

Coffee Break  
3:40 pm – 4:10 pm

**SS17-5 Optimal Design of a Parallel Hybrid Electric Vehicle using Multi-Objective Genetic Algorithms**  
Chirag Desai, Sheldon Williamson;  
*Concordia University, Canada.*

**TF17-1 Control Strategy Development for a Hybrid Vehicle with Electric Variable Transmission**  
Yueyuan Wei, Wenzhang Zhan, Yi Lin;  
*Beijing Automotive Technology Center Co., LTD, China.*

**TF17-2 Analytic System Optimization and Test Verification for an Idealized Parallel ICE-Electric Powertrain**  
Mengyang Zhang, Tim Coatesworth, Roland Holloman, Fred Household;  
*Chrysler LLC, USA.*  
Yan Yang, Yuhong Fu; *1Power Solutions Inc., USA.*  
Chris Mi; *University of Michigan-Dearborn, USA.*

Thursday Sept 10<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 120*

**Title: HIL Simulations**

Chair: Faisal Oueslati, Co-Chair: David Gao

**SS18-1 A Driving Simulation Platform Applied to Develop Driver Assistance Systems**  
Jianqiang Wang, Shengbo Li, Xiaoyu Huang, Keqiang Li; *Tsinghua University, China.*

**SS18-2 Design and HIL Simulation of Proportional Compression Salient-Pole Permanent Magnet Synchronous Motor for Electrical Traction Vehicle**  
Weiguo Liu, Guangzhao Luo, Nannan Zhao, Manfeng Dou; *Northwestern Polytechnical University, China.*

**SS18-3 Withdrawn**

**SS18-4 Real-Time Low-Level Simulation of Hybrid Vehicle Systems for Hardware-in-the-Loop Applications**  
Marco J. Tavernini, Benjamin A. Niemoeller, Philip T. Krein; *University of Illinois, USA.*

Coffee Break  
3:40 pm – 4:10 pm

**SS18-5 HIL and RCP Tools for Embedded Controller Development in Hybrid Vehicles**  
Shreyas Nagaraj, Bret Detrick; *dSPACE, Inc, USA.*

**TF18-1 Powertrain Controls Development, Functional Testing, Validation and Calibration on a Common HIL Platform Featuring High Fidelity Models**  
Alan Soltis, *Opal-RT Technologies, Canada.*

Thursday Sept 10<sup>th</sup>, 2009  
2:00 pm – 5:25 pm  
*Venue: ROOM 121*

**Title: Intelligent Vehicle Power Management**  
Chair: Yi Lu Murphey, Co-Chair: Jungme Park

**SS19-1 Classification and Review of Control Strategies for Plug-in Hybrid Electric Vehicles**  
Sanjaka Wirasingha and Ali Emadi;  
*Illinois Institute of Technology, USA.*

- SS19-2 Intelligent Power Management in SHEV based on Roadway Type and Traffic Congestion Levels**  
Zhihang Chen, Leonidas Kiliaris, Yi Murphey;  
*University of Michigan-Dearborn, USA.*  
Abul Masrur, *U.S. Army RDECOM-TARDE, USA.*
- SS19-3 Multi-Objective Parameter Optimization of a Series Hybrid Electric Vehicle Using Evolutionary Algorithms**  
Bingzhan Zhang; *Hefei University of Technology, China.*  
Zhihang Chen, Chris Mi, Yi Lu Murphey;  
*University of Michigan-Dearborn, USA.*
- SS19-4 Analysis and Modeling of a DC Hybrid Power System Testbed for Power Management Strategy Development**  
Yanhui Xie, Jing Sun, James Freudenberg,  
*University of Michigan, USA.*  
Chris Mi, *University of Michigan-Dearborn, USA.*

Coffee Break  
3:40 pm – 4:10 pm

- TF19-1 Design of Electric Vehicle Charging Management System**  
Letian Teng, Weiguo He, Chenggang Du,  
Hua Zhang, Chao Hu; *Shanghai Jiao Tong University, China.*
- TF19-2 Rapid Dynamical Pattern Recognition Used in Thermo Management of Hybrid Vehicle**  
Xihui Wang; *South China University of Technology, China.*
- TF19-3 Roadway Micro Energy Harvesting Analysis**  
Hassan Homami; *Parsons Brinckerhoff, USA.*



Thursday Sept 10<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 126*

**Title: Passive Components**

Chair: John M. Miller, Co-Chair: Shuo Wang

**SS25B-1 Basic Experimental Study on Helical Antennas of Wireless Power Transfer for Electric Vehicles by using Magnetic Resonant Couplings**

Takehiro Imura, Hiroyuki Okabe, Yoichi Hori, *University of Tokyo, Japan.*

**SS25B-2 A New Battery/Ultra-Capacitor Hybrid Energy Storage System for Electric, Hybrid and Plug-in Hybrid Electric Vehicles**

Jian Cao, Ali Emadi; *Illinois Institute of Technology, USA.*

**SS25B-3 Simulating the Load Sharing Between a Fuel Cell and Ultracapacitor interfaced Using a Boost Converter**

Aditya Govindarajan; *University of Texas at Austin, USA.*

**SS25B-4 Investigating Parasitic Capacitance Cancellation for EMI Suppression**

Shuo Wang, Fred Lee; *Virginia Tech., USA.*

Coffee Break

3:40 pm – 4:10 pm

**TF25B-1 Assessment of Behavior of Super Capacitor-Battery System in Heavy Hybrid Lift Truck Vehicles**

Noshin Omar, Joeri Van Mierlo; *Vrije Universiteit Brussel, Belgium.*

Frederik Van Mulders, Peter Van Den Bossche; *Industriële Wetenschappen en Technologie, Erasmus Hogeschool, Belgium.*

Thursday, Sept 10<sup>th</sup>, 2009

2:00 pm – 5:25 pm

*Venue: ROOM 127*

**Title: Fuel Cell Vehicle Modeling and Design**

Chair: Benjamin Blunier,

Co-Chair: Sheldon Williamson

- SS27-1 Dynamic Analysis of a Bi-Directional Switched Capacitor DC/DC Converter for Fuel Cell Vehicle Energy Storage Applications**  
Zahra Amjadi, Sheldon Williamson;  
*Concordia University, Canada.*
- SS27-2 Power Conditioning System for Fuel Cells for Integration to Ships**  
Leo Luckose, Herbert Hess, Brian Johnson;  
*University of Idaho, USA.*
- SS27-3 Genetic Algorithm based Optimal Powertrain Component Sizing and Control Strategy Design for a Fuel Cell Hybrid Electric Bus**  
Manu Jain, Chirag Desai, Sheldon Williamson; *Concordia University, Canada.*
- SS27-4 Supervisory Control Development of a Fuel Cell Plug-In Hybrid Vehicle**  
Andrew Meintz, Mehdi Ferdowsi, Kevin Martin; *Missouri University of Science and Technology, USA.*

Coffee Break

3:40 pm – 4:10 pm

- SS27-5 Intelligent Power Management (IPM) for Transient Recognition and Control of PEM Fuel Cell/Battery Hybrid System**  
Lakmal Karunaratne, John Economou, Kevin Knowles; *Cranfield University, UK.*
- SS27-6 Polymer Electrolyte Fuel cell Stack Emulator for Automotive Hardware-in-the-Loop Applications**  
Fei Gao, Benjamin Blunier, David Bouquain, Abdellatif Miraoui, Abdellah El-Moudni; *University of Technology of Belfort-Montbeliard, France.*

**SS27-7 Design and Tests of a High Efficiency Fuel Cell based Power Train**

Guillaume Wasselynck, Didier Trichet, Jean-Christophe Olivier; *IREENA-Polytechnic School of Nantes University, France.*

Bruno Auvity, Christophe Josset; *LTN-Polytechnic School of Nantes University, France.*

Philippe Maindru; *Lycée La Joliverie, France.*

Friday Sept 11<sup>th</sup>, 2009

8:30 am – 12:00 pm

Venue: ROOM 102

**Title: Vehicular Power Electronics and Motor Drives**

Chair: Charles Lizhi Zhu, Co-Chair: Xiaofeng Ding

- TS02E-1 Incorporating the Thermal Effects and Flux Setting in the Vehicular Drive System**  
Habib-Ur Rehman; *American University of Sharjah, UAE*
- TS02E-2 A Life Tester for Hybrid Vehicle E-Machine Systems**  
Xiaojiang Chen, Roger Thornton, Murray Edington, Russell Lewis; *Ricardo UK Ltd, UK.*
- TS02E-3 Generation of Very Low Frequency Beat Waves from Power Converters**  
Mathias Enohnyaket; *Lulea University of Technology, Sweden*
- TS02E-4 High-Temperature Silicon Carbide and Silicon on Insulator Based Integrated Power Modules**  
Alex Lostetter, Jared Hornberger, Brice McPherson, Bradley Reese, Robert Shaw, Marcelo Schupbach; *APEI, USA.*  
Brian Rowden, Alan Mantooh, Juan Balda; *University of Arkansas, USA*  
Takukazu Otsuka, Keiji Okumura, M. Miura; *Rohm Co. Ltd., Japan*

Coffee Break

10:00 am – 10:30 am

- TS02E-5 Characteristic Signature of Electromagnetic Emissions from Power Converters**  
Mathias Enohnyaket, Kalevi Hyyppae; *Lulea University of Technology, Sweden.*
- TS02E-6 Novel and Ruggedized Power Electronics for Off-Highway Vehicles**  
Brij Singh, Kent Wanner; *Phoenix International – A John Deere Company, USA.*

**TF02E-1 Functional Safety and the Development of Embedded Controls for Electrically Propelled or Power-Assisted Vehicles**  
Michael Staszal, *KUGLER MAAG CIE, USA.*

**TF02E-2 Dynamic Testing Platform Study of Electric Dynamometer based on Separately-Excited DC Generator**  
Ping-Ping Xu, Jian-Guo Song, Guang-Di Shen; *Beijing University of Technology, China*

Friday Sept 11<sup>th</sup>, 2009

8:30 am – 12:00 pm

*Venue: ROOM 110*

**Title: Advanced Vehicles**

Chair: Fang Z. Peng, Co-Chair: Pingan He

**TS03B-1 Parametric Design of Power-Split HEV Drive Train**  
Yongtao Yu, Huei Peng; *University of Michigan-Ann Arbor, USA.*  
Yimin Gao, *Texas A&M University, USA.*  
Qingnian Wang; *Jilin University, China.*

**TS03B-2 Front-and-Rear-Wheel-Independent-Drive Type Electric Vehicle (FRID EV) with the Outstanding Driving Performance Suitable for Next-Generation Advanced EVs**  
Nobuyoshi Mutoh, Yusuke Takahashi; *Tokyo Metropolitan University, Japan.*

**TS03B-3 Shift Schedule Optimization for Dual Clutch Transmissions**  
Yonggang Liu, Datong Qin; *Chongqing University, China.*  
Hong Jiang, Charles Liu; *Ford Motor Company, USA*  
Yi Zhang, Zhenzhen Lei; *University of Michigan-Dearborn, USA*

**TS03B-4 Development of a Test Bench for Integrative Evaluation of the Pneumatic ABS/TCS Performance**  
Liang Chu, Wanfeng Sun, Yong Fang, Mingli Shang, Jianhua Guo; *Jilin University, China.*  
Wenruo Wei, Minghui Liu, Jun Li; *FAW Group Corp., China.*

Coffee Break  
10:00 am – 10:30 am

**TS03B-5 Independent Control Algorithm for Regenerative Braking System of Hybrid Electric Vehicles**  
Liang Chu, Wanfeng Sun, Liang Yao, Yongsheng Zhang, Yang Ou; *Jilin University, China.*  
Wenruo Wei, Minghui Liu, Jun Li; *FAW Group Corp., China.*

**TS03B-6 Integrative Control Strategy of Regenerative and Hydraulic Braking for Hybrid Electric Car**  
Liang Chu, Wanfeng Sun, Liang Yao, Yongsheng Zhang, Yang Ou; *Jilin University, China.*  
Wenruo Wei, Minghui Liu, Jun Li; *FAW group corp., China*

**TF03B-1 Power Management System of a Hybrid Golf Cart**  
Max Saelzer, Roger Messenger, Ali Zilouchian, Amir Abtahi; *Florida Atlantic University, USA.*

Friday Sept 11<sup>th</sup>, 2009  
8:30 am – 12:00 pm  
*Venue: ROOM 111*

**Title: Advanced Vehicular Technology I**  
Chair: Zhenhua Jiang, Co-Chair: Weiguo Liu

**TS05E-1 Feedforward Algorithm: Wind Tunnel Airspeed Control**  
Matt Dahlgren; *Technology Group, Jacobs Engineering USA.*  
Rakan Chabaan; *Lawrence Technological University, USA.*

**TS05E-2 A “Corner Solver” for Motorcycles as a Tool for the Development of a Virtual Rider**

David Moreno Giner, Jian Kang, Michal Manka; *LMS International, Belgium.*

**TS05E-3 Design of base Station’s Vehicular Communication Network for Intelligent Traffic Control**

Sanjay Dorle, Preeti Bajaj; *G.H. Rasoni College of Engineering, Nagpur, India.*  
Avinash Keskar; *VNIT, Nagpur, India.*  
Megha Chakole; *Yeshwantrao Chavan College of Engineering, Nagpur, India.*

**TS05E-4 A Systems Engineering Approach for the Design Optimization of a Hydraulic Active Suspension**

Marco Gubitosa, Jan Anthonis, Nicolas Albarello; *LMS International, Belgium.*  
Wim Desmet; *Katholieke Universiteit Leuven, Belgium.*

Coffee Break  
10:00 am – 10:30 am

**TF05E-1 Digest of AMESim based Modeling about Hydraulic Control System of Hydraulic Retarder**

Jun Yan; *Wuhan Universit of Technology, China.*

**TF05E-2 Idling Natural Characteristic Analysis of the Torsion Absorber with Dual Mass Flywheel**

Xianjie Meng; *Shandong Univ of Tech, China.*  
Wenqiang Zhang; *Tongji University, China.*

Friday Sept 11th, 2009  
8:30 am – 12:00 pm  
*Venue: ROOM 116*

**Title: Advanced Vehicular Technology II**  
Chair: Gus Khalil, Co-Chair: Guangzhao Luo

**TS05F-1 Passive vs. Active AC-DC Power Conversion in Variable Frequency Aerospace Applications**

Novica Losic; *Honeywell Aerospace, Canada.*

- TS05F-2 Using Binary Method to Deal with the Problem of Visual BRT**  
Zi-Xue Du, Zhou-Zhou Xu, Zhong-Bo Peng, Xin Xie; *Chongqing Jiaotong University, China.*
- TS05F-3 Fuel Puddle Model and AFR Compensator for Gasoline-Ethanol Blends in Flex-Fuel Engines**  
Kyung-Ho Ahn, Anna Stefanopoulou; *University of Michigan, USA.*  
Mrdjan Jankovic; *Ford Research and Advanced Engineering, USA*
- TS05F-4 Switched Control of Interleaved Converters**  
Ilse Cervantes; *Hybrid System Lab. Applied Mathematics Division, IPICyT, Mali.*  
Angelica Mendoza-Torres, Rafael Garcia-Cuevas; *Hybrid System Lab. Applied Mathematics Division, IPICyT, Mexico.*  
Francisco Perez-Pinal; *Digital Technology Research Center: CITEDI, Mexico.*
- Coffee Break  
10:00 am – 10:30 am
- TS05F-5 Dynamic Characteristic Analyses of the Front- and Rear-Wheel Independent-Drive-Type Electric Vehicle (FRID EV) When the Drive System Failed during Running under Various Road Conditions**  
Nobuyoshi Mutoh, Yuki Nakano; *Tokyo Metropolitan University, Japan.*
- TS05F-6 An Algebraic-Summation-Based Phase-Locked Loop with Aerospace Applications**  
Novica Losic; *Honeywell Aerospace, Canada.*



**TF05F-1 Multi-Objective Optimization based on the Integration of Linear Physical Programming within Analytical Target Cascading**

Ting-Ting Wang, Xiao-Kai Chen; *Beijing Insititute of Technology, China.*

Yi Lin; *Beijing Automotive Technology Center, China*

Friday Sept 11<sup>th</sup>, 2009

8:30 am – 12:00 pm

*Venue: ROOM 117*

**Title: Thermal Phenomena in Vehicular Electronics**

Chair: Ephraim Suhir, Co-Chair: Michael O'Keefe

**SS06B-1 Impacts of Cooling Technology on Solder Fatigue for Power Modules in Electric Traction Drive Vehicles**

Michael O'Keefe, *National Renewable Energy Laboratory; USA.*

Andreas Vlahinos, *Advanced Engineering Solutions – Colorado, USA.*

**SS06B-2 Thermal Characterization of Microelectronic Devices Using Thermorefectance CCD Imaging**

Kerry Maize, James Christofferson, Ali Shakouri, *University of California, Santa Cruz – California, USA.*

**SS06B-3 Thermal Aspects of LED Automotive Headlights**

Daniel Donahoe, *1000 kilometers™ – Utah, USA.*

**SS06B-4 Micrometer-Width Damascene Copper Conductors at  $\geq 10$  MA/cm<sup>2</sup>**

David Read, Roy Geiss; *National Institute of Standards and Technology – Colorado, USA.*

Coffee Break

10:00 am – 10:30 am

**TF06B-1 Probabilistic Thermomechanical Reliability of Electronic Ceramic Substrates and Semiconductor Chips**  
Andrew Wereszczak, Timothy Kirkland, Hua-Tay Lin; *Oak Ridge National Laboratory, USA.*  
Osama Jadaan, *University of Wisconsin-Platteville – Tennessee, USA.*

Friday Sept 11<sup>th</sup>, 2009

8:30 am – 12:00 pm

*Venue: ROOM 120*

**Title: PHEV and the Smart Grid**

Chair: Ian Hiskens, Co-Chair: Ghanim Putrus

**SS14B-1 PHEV Fleet Data Collection and Analysis**

Shawn Midlam-Mohler, Sean Ewing, Vincenzo Marano, Yann Guezennec, Giorgio Rizzoni; *Ohio State University, USA.*

**SS14B-2 Evaluation of ZigBee Communication Platform for Controlling the Charging of PHEVs at a Municipal Parking Deck**

Preetika Kulshrestha, Kaushik Swaminathan, Mo-Yuen Chow, Srdjan Lukic; *North Carolina State University, USA.*

**SS14B-3 Achieving Controllability of Plug-In Electric Vehicles**

Ian Hiskens; *University of Michigan-Ann Arbor, USA.*  
Duncan Callaway; *University of California, Berkeley, USA.*

**SS14B-4 Similarities Between Vehicle-to-Grid Interfaces and Photovoltaic Systems**

Michael Ropp; *Northern Plains Power Technologies, USA.*

Coffee Break

10:00 am – 10:30 am

**TF14B-1 Model Development for Grid Interactive Vehicle Technology**  
Tony Markel, Michael Kuss; *National Renewable Energy Laboratory, USA.*  
Ewald Fuchs; *University of Colorado, USA.*

Friday Sept 11<sup>th</sup>, 2009  
8:30 am – 12:00 pm  
*Venue: ROOM 121*

**Title: Fault Diagnostics**  
Chair: Abul Masrur,, Co-Chair: Kevin Bai

**SS22-1 Particle and Kalman Filtering for Fault Diagnosis in DC Motor**  
Gerasimos Rigatos; *Unit of Industrial Automation, Industrial Systems Institute, Greece.*

**SS22-2 Implementation of a New Predictive Maintenance Methodology for Batteries. Application to Railway Operations**  
Miguel Gomez-Parra, Pilar Muñoz-Condes, Carlos Sancho, F. Javier Gonzalez-Fernandez and Ma Antonia G. San Andres; *Metro de Madrid S.A, Spain.*  
Jose Carpio, Rafael Guirado; *Spanish National University for Distance Education, Spain.*

**SS22-3 Fault Tolerant Control of Electric Power Steering Using Robust Filtering – Simulation Study**  
Smitha Cholakkal, Xiang Chen;  
*University of Windsor, Canada*

Coffee Break  
10:00 am – 10:30 am

**TF22-1 Inter-Line Dynamic Voltage Restore and Fault Current Limiter (IDVR-FCL)**  
Mehdi Firouzi, Mojtaba Pishvaie,  
F. Razavi, *University of Tafresh, Iran.*  
G.B. Gharehpetian, *Amirkabir University of Technology, Iran.*

**TF22-2 Using UPFC as Fault Current Limiter**  
Mehdi Firouzi, Mojtaba Pishvaie,  
F. Razavi, *University of Tafresh, Iran.*  
G.B.Gharehpetian, *Amirkabir University  
of Technology, Iran.*

Friday Sept 11<sup>th</sup>, 2009  
8:30 am – 12:00 pm  
*Venue: ROOM 126*

**Title: All Electric Vehicles**  
Chair: Zheng Chen, Co-Chair: John M. Miller

- SS24-1 Effect of Transmission Design on Electric Vehicle (EV) Performance**  
Qinglian Ren, Dave Crolla, Adrian Morris,  
*University of Sunderland, UK.*
- SS24-2 Evaluation of Lithium Iron Phosphate Batteries for Electric Vehicles Application**  
Frank Tredeau, Ziyad Salameh;  
*University of Massachusetts Lowell; USA.*
- SS24-3 Inductively Coupled Power Transfer for Continuously Powered Electric Vehicles**  
Zeljko Pantic, Sanzhong Bai, Srdjan  
Lukic, *North Carolina State University,  
USA.*
- SS24-4 Energy Efficiency in Electric Golf Carts: Evaluation and Comparison of Charging and Drive Technologies**  
Edward Kellogg, Jorge Araiza, Jr., Richard  
Cromie, Jordan Smith; *Southern  
California Edison, USA.*

Coffee Break  
10:00 am – 10:30 am

- SS24-5 An Overview of Hybrid Electric Vehicle Technology**  
Omonowo Momoh; *Prairie View A&M  
University; USA.*  
Michael Omoigui, *Obafemi Awolowo  
University; Nigeria.*

**TF24-1 Study on Key Technologies of Battery Electric Bus for Beijing Olympics**  
Wenwei Wang, Cheng Lin, Zhenpo Wang, Fengchun Sun; *Beijing Institute of Technology, China.*

Friday Sept 11<sup>th</sup>, 2009  
8:30 am – 12:00 pm  
*Venue: ROOM 127*

**Title: EMR and Other Graphic Descriptions**  
Chair: Walter Lhomme, Co-Chair: Jason Lai

- SS26-1 Control Strategies for an Electric Variable Transmission based Hybrid Electric Vehicle**  
Yuan Cheng, Shumei Cui, Ching Chuen Chan; *Harbin Institute of Technology, China.*
- SS26-2 The POG Technique for Modeling Planetary Gears and Hybrid Automotive Systems**  
Roberto Zanasi, Federica Grossi; *University of Modena and Reggio Emilia, Italy.*
- SS26-3 Comparison of the Two Series-Parallel Hybrid Electric Vehicles Focusing on Control Structures and Operation Modes**  
Keyu Chen, Walter Lhomme, Alain Bouscayrol; *University of Lille 1, France.*  
Alain Berthon; *University of Franche Comté, France.*
- SS26-4 Energy based Modeling of a 6-Wheel Drive Hybrid Heavy Truck**  
Loïc Boulon, Daniel Hissel, Marie-Cécile Péra; *University of Franche Comté, France.*  
Olivier Pape; *Nexter Systems, France.*  
Alain Bouscayrol; *University of Lille 1, France.*

Coffee Break  
10:00 am – 10:30 am

**SS26-5 Energetic Macroscopic Representation of a Multiple Architecture Heavy Duty Hybrid Vehicle**

Javier Solano-Martínez, Loïc Boulon,  
Daniel Hissel, Marie-Cécile Péra;  
*University of Franche Comté, France.*  
Michel Amiet; *Army General Direction,*  
*France.*

**SS26-6 Influence of the Clutch Model in a Simulation of a Parallel Hybrid Electric vehicle**

Tony Letrouve, Alain Bouscayrol, Walter  
Lhomme; *University of Lille 1, France.*

## Poster Sessions

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Thursday Sept 10<sup>th</sup>, 2009  
10:00 am – 1:00 pm

*Venue: Quad Room, Fairlane Center  
University of Michigan-Dearborn, 19000 Hubbard Drive,  
Dearborn, Michigan 48126-2638*

- PS01-1    A New Soft-Switched ZCZVT DC-AC Inverter**  
Khalil Rahimi; *Naghshejahan Higher Education Institute, Isfahan, Iran.*  
Ali Nazeran Motlagh, Majid Pakdel; *Tele-communication Company of Esfahan, Iran.*
- PS01-2    A Novel Soft-Switched Synchronous Buck Converter**  
Khalil Rahimi; *Naghshejahan Higher Education Institute, Isfahan, Iran.*  
Ali Nazeran Motlagh, Majid Pakdel; *Tele-communication Company of Esfahan, Iran.*
- PS01-3    A Multi-Output High Frequency Cycloinverter Operation for Induction-Heating Cooking Appliances – Harmonic Study**  
S.M.W. Ahmed, M.M. Eissa, M. Edress, T.S. Abdel-Hameed; *Helwan University, Helwan.*
- PS01-4    Experimental Investigation of Full Bridge Series Resonant Inverters for Induction-Heating Cooking Appliances**  
S.M.W. Ahmed, M.M. Eissa, M. Edress, T.S. Abdel-Hameed; *Helwan University, Helwan.*
- PS01-5    Sinusoidal PWM Control for Full-Bridge Series Resonant Inverters for Induction-Heating Cooking Appliances**  
S.M.W. Ahmed, M.M. Eissa, M. Edress, T.S. Abdel-Hameed; *Helwan University, Helwan.*
- PS01-6    Low Cost High Efficiency Power Generation**  
Lei Hao, Chandra Namuduri; *General Motors R&D Center, USA.*

- PS01-7**     **The Research on the Algorithm of Maximum Power Point Tracking in Photo Voltaic Array of Solar Car**  
Xiujuan Ma, Jiayu Wu, Yude Sun, Shiqiang Liu; *Harbin Institute of Technology, China.*
- PS01-8**     **Study on the Performance of Diesel Engines with Coal Water Slurry/Diesel Compound Combustion**  
Qiang Zhang; *Liaoning Technical University, China.*  
Dafeng Tian; *Fuxin Miming Company, China.*
- PS01-9**     **EV Energy Storage Monitoring System Based on Distribution Data Acquisition**  
Ren-Gui Lu, Lei Pei, Rui Ma, Jun-Lei Wei, Chun-Bo Zhu; *Harbin Institute of Technology, China.*
- PS01-10**    **Energetic Macroscopic Representation Based Modeling and Control for Battery/Ultra-Capacitor Hybrid Energy System in HEV**  
Haifang Yu, Rengui Lu, Tiecheng Wang, Chunbo Zhu; *Harbin Institute of Technology, China.*
- PS01-11**    **Design of Battery and Ultracapacitor Multiple Energy Storage in Hybrid Electric Vehicle**  
Xiaofei Liu, Qianfan Zhang, Chunbo Zhu; *Harbin Institute of Technology, China.*
- PS01-12**    **A Novel Space Vector Area Calculation Based Overmodulation Method**  
Rongfeng Yang, Gaolin Wang, Yong Yu, Dianguo Xu, C.C. Chan; *Harbin Institute of Technology, China.*
- PS01-13**    **Initial Position Estimation for Sensorless Surface-Mounted PMSM with Near-Zero Saliency at Standstill**  
Gaolin Wang, Rongfeng Yang, Wei Chen, Yong Yu, Dianguo Xu, C.C. Chan; *Harbin Institute of Technology, China.*



- PS01-14 Parameters Estimation of Induction Motor at Standstill Concerning the Nonlinearity of the System**  
Wei Chen, Dianguo Xu, Gaolin Wang, Yong Yu, C.C. Chan; *Harbin Institute of Technology, China.*
- PS02-1 A Single-Stage Soft-Switching Flyback Converter for Power-Factor-Correction Applications**  
Yeong-Chang Yan, Shih-Jen Cheng, Ching-Chun Chuang, Huang-Jen Chiu, Yu-Kang Lo; *National Taiwan University of Science and Technology, Taiwan.*  
Shann-Chyi Mou; *Ching-Yun University, Taiwan.*
- PS02-2 A Single-Stage High Efficiency High Power Factor LED Driver**  
Shih-Jen Cheng, Yeong-Chang Yan, Ching-Chun Chuang, Huang-Jen Chiu, Yu-Kang Lo; *National Taiwan University of Science and Technology, Taiwan.*  
Shann-Chyi Mou; *Ching-Yun University, Taiwan.*
- PS02-3 Common Mode Active Filtering Effects in induction Motor Drives for Application in Electric Vehicles**  
Maria Carmela Di Piazza, Antonella Ragusa, Gianpaolo Vitale; *CNR-ISSIA, Italy.*
- PS02-4 Design of High Efficient and High Density Integrated Magnetics for Interleaved DC-DC Boost Converter for Series Hybrid Electric Bus**  
Honnyong Cha, Craig Rogers, Xi Lu, Fang Zheng Peng; *Michigan State University, USA.*
- PS02-5 Power Semiconductor Loss Evaluation in Voltage Source IGBT Converters for Three-Phase Induction Motor Drives**  
Chris Edrington, Oleg Vodyakho, Mischa Steurer, S. Azongha, Fletcher Fleming; *Florida State University, USA.*  
Mahesh Krishnamurthy; *Illinois Institute of Technology, USA.*

- PS02-6 High-Performance Control of PMSM based on a New Forecast Algorithm with Only Low-Resolution Position Sensor**  
Dongbin Lu, Jing Gu, Jianqiu Li, Mingguo Ouyang, Yan Ma; *Tsinghua University, China.*
- PS02-7 Novel Primary High Voltage Traction Converter with Single-Phase Matrix Converter**  
Pavel Drabek, Martin Pittermann; *University of West Bohemia-Pilsen, Czech Republic.*
- PS02-8 Magnetic-Decoupling Feasibility and Function Validations of a Compound-Structure Permanent-Magnet Synchronous Machine Used for HEVs**  
Ranran Liu, Gang Chen, Ping Zheng, Chengde Tong, Yuan Cheng; *Harbin Institute of Technology, China.*
- PS02-9 ETO Light Multilevel Converter for Large Electric Vehicle and Hybrid Electric Vehicle Drives**  
Jun Li, Alex Huang, Subhashish Bhattacharya, Srdjan Lukic; *North Carolina State University, USA.*
- PS02-10 Research on Bridgeless Boost PFC with Soft-Switching**  
Shigong Jiang, Guihua Liu, Wei Wang, Dian-Guo Xu; *Harbin Institute of Technology, China.*
- PS02-11 Simulation of PMSM Field-Oriented Control based on SVPWM**  
Xudong Wang, Risha Na, Ning Liu; *Harbin University of Science and Technology, China.*
- PS02-12 Analysis of Series and Parallel Hybrid Bus Fuel Consumption on Different Edmonton Transit System Routes**  
Xingjian Liang, Chenyang Wang, C. Chapelsky, Don Koval, Andy Knight; *University of Alberta, Canada.*

- PS02-13**    **Fault Detection and Location of Open-Circuited Switch Faults in Matrix Converter Drive Systems**  
Sangshin Kwak; *Daegu University, Korea.*  
Taehyung Kim; *University of Michigan-Dearborn, USA.*
- PS02-14**    **The Study on the Synthetic Performance Evaluation Method of HEV Motor Propulsion System**  
Li Jiong, Wang Jun; *Academy of Armored Force Engineering, China.*
- PS02-15**    **Flux-Barrier Design Technique for Improving Torque Performance of Interior Permanent Magnet Synchronous Motor for Driving Compressor In HEV**  
Liang Fang, Jung-Pyo Hong; *Hanyang University, Korea*
- PS02-16**    **Characteristics and Radial Magnetic Force of Interior Permanent Magnet Synchronous Motor According to Pole/Slot Combinations**  
Soon-O Kwon, Jeong-Jong Lee, Tao Sun, Jung-Pyo Hong; *Hanyang University, Korea.*
- PS03-1**    **A Novel Control Scheme of Propulsion Motor for Integrated Powertrain of Electric Bus**  
Hong Fu, Guangyu Tian, Quanshi Chen; *Tsinghua University, China.*  
Yaobin Chen, *Indianapolis University-Purdue University Indianapolis, USA.*
- PS03-2**    **Motor Motion Control of Automobile Steer-By-Wire System in Electric Vehicles**  
Yu Lei-Yan, Yun Ping-Li; *China University of Petroleum, China.*
- PS03-3**    **Controlling Lunar Lander in Powered Descending Phase**  
Xiaofei Chang, Weiwei Yu, Jie Yan; *Northwestern Polytechnical University, China.*

- PS03-4 Design Of EPS Fail-Safe Strategy based on Motion State Observer**  
Lianbing Li, Bingshan Liu, Guowei Zhao, Hexu Sun; *Hebei University of Technology, China.*
- PS03-5 Driving Force Power Steering for the Electric Vehicles with Motorized Wheels**  
Li-Qiang Jin, Chuan-Xue Song, Chang-Jian Hu; *Jilin University, China.*
- PS04-1 Design and Investigation of a Modular Battery Simulator System**  
Andreas Thanheiser, Wolfgang Meyer, Dominik Buecherl, Hans-Georg Herzog; *Technische Universitaet Muenchen, Institute of Energy Conversion Technology, Germany.*
- PS04-2 Application of Flywheel System in Series Hybrid Transit Bus**  
Chenyang Wang, Xingjian Liang, C. Chapelsky, Don Koval, Andy Knight; *University of Alberta, Canada.*
- PS05-1 Traction Control of Hybrid Electric Vehicle**  
Shoubo Li, Chenglin Liao, Shanglou Chen, Lifang Wang; *Chinese Academy of Sciences, China.*
- PS05-2 Modeling of an Alternator using Stand Still Frequency Response Test**  
Lei Hao, Chandra Namuduri; *General Motors R&D Center, USA.*
- PS05-3 Some Considerations on the Simulation used to Design and Test a Urban Electric Traction Systems**  
Petre-Marian Nicolae, Ileana-Diana Nicolae, Lucian Mandache; *University of Craiova, Romania.*  
Viorel-Dumitru Vitan; *Politecnico di Torino, Italy.*

- PS05-4 Study on the Fuzzy Clustering Method of the Microtrips for Passenger Car Driving Cycles in Changchun**  
Shuming Shi, Guilin Zou, Li Liu, Hailin Kui, Di Wu; *Jilin University, China.*  
Chaosheng Huang, Minghui Liu; *FAW Group Corporation, China.*
- PS05-5 Design of a Bidirectional Buck-Boost DC/DC Converter for a Series Hybrid Electric Vehicle Using PSCAD/EMTDC**  
Daniel Northcott; *Westward Industries Ltd, Canada.*  
Shaahin Filizadeh; *University of Manitoba, Canada.*  
Adam Chevretil; *Manitoba HVDC Research Center, Canada.*
- PS05-6 PSpice Simulation of the Power Stage for a DC Brush Motors Using State of the Art Power MOSFETs**  
Marco Puerschel; *Infineon Technologies AG, Germany.*
- PS05-7 A Novel Direct Power Control Strategy based on Energy Interface Concept for Three-Level PWM Rectifier**  
Ting Lu, Zhengming Zhao, Yingchao Zhang, Liqiang Yuan, Zhihua Wang, Chongjian Li; *Tsinghua University, China*
- PS05-8 Improvements of the Design Method of Transient Driving Cycle for Passenger Car**  
Shuming Shi, Shuying Wei, Hailin Kui, Li Liu; *Jilin University, China.*  
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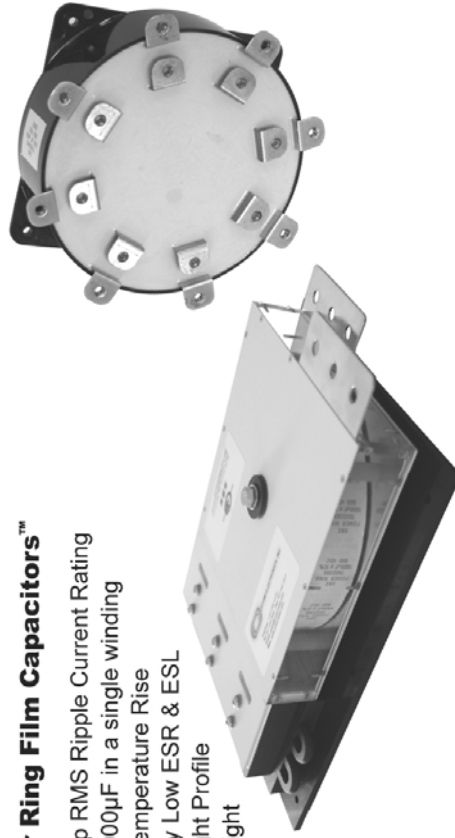


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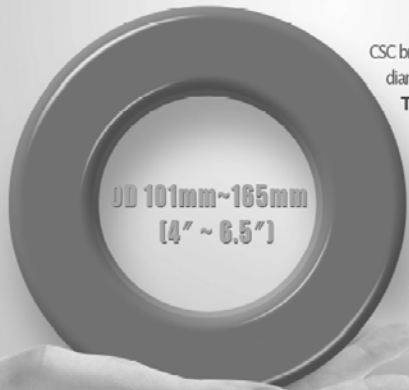
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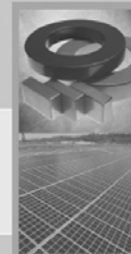
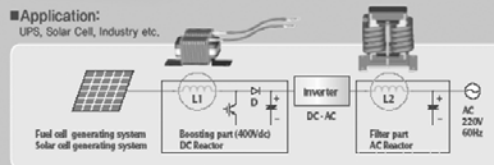
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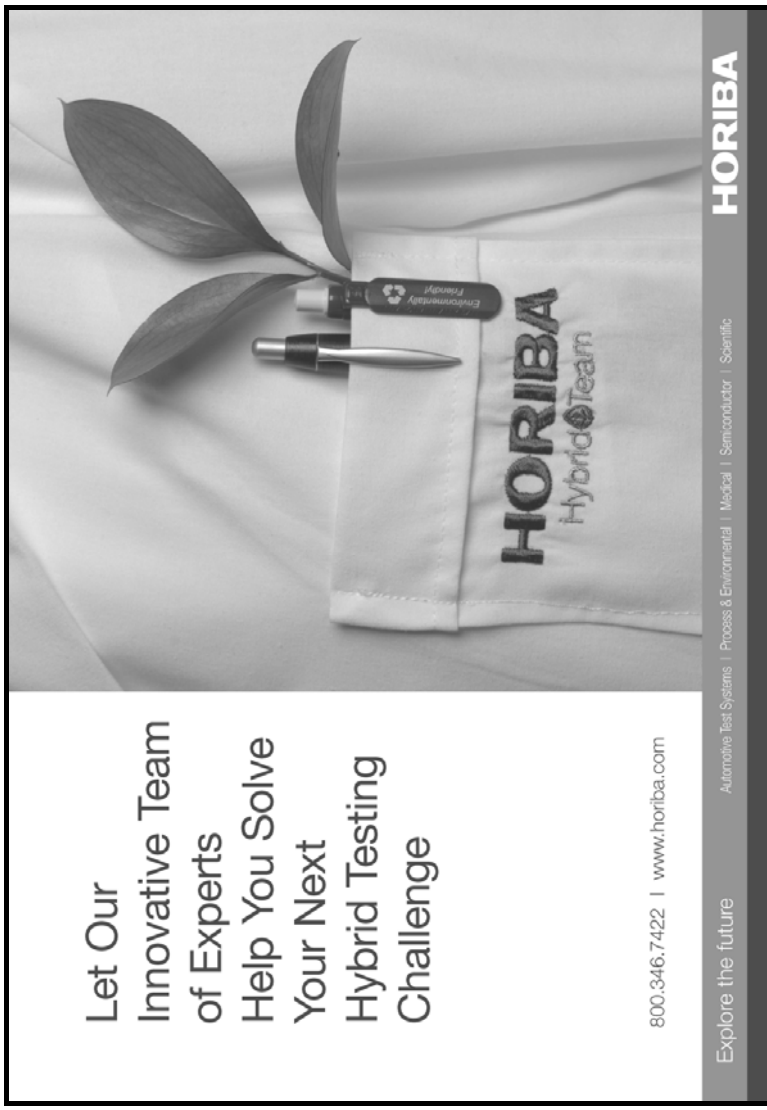
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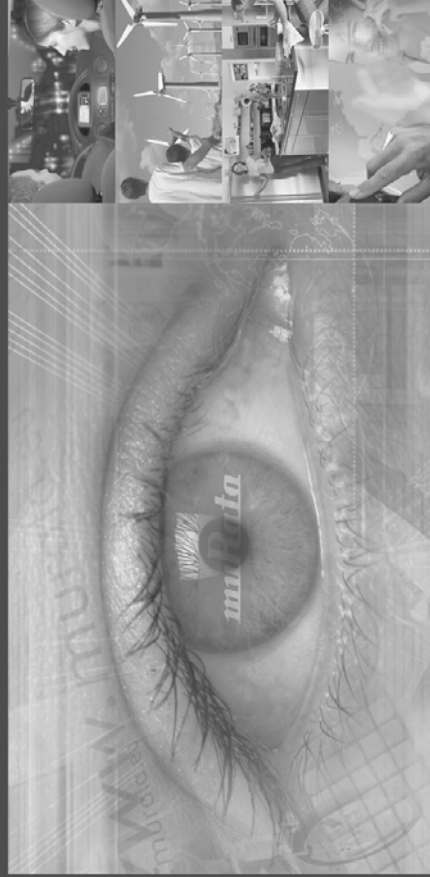
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