

# 2008 IEEE EMC SYMPOSIUM WORKSHOPS & TUTORIALS

**MONDAY, 18 AUGUST 2008**

(Events held at COBO Center unless otherwise noted.)

<p>8:30 AM TO 12:00 PM</p>	<p><b>MO-AM-1</b>                      <b>Room W2-65</b>  <b>Introduction to EMI Modeling Techniques</b>  <i>Chair: Charles Bunting</i></p> <p>This workshop will provide an introduction to all of the commonly used numerical EMC modeling techniques. It is intended to provide EMC engineers who are interested in learning the basics of these modeling techniques a fundamental understanding of all the different techniques, without the need for detailed math. Practicing modelers will also benefit from learning the fundamentals of modeling techniques they are currently not using. Each technique will be presented along with their strengths and weakness, so engineers can decide which techniques are appropriate for their types of problems.</p> <p><u>Description of Topics</u></p> <ul style="list-style-type: none"> <li>◆ The Transmission Line Method</li> <li>◆ Introduction to the Partial Element Equivalent Circuit Technique</li> <li>◆ The Finite-Difference Time-Domain Technique</li> <li>◆ Understanding the Finite Element Method</li> <li>◆ Introduction to the Method of Moments</li> </ul> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>◆ Dr. David Johns, Flomerics</li> <li>◆ Giulio Antonio</li> <li>◆ Dr. Bruce Archambeault, IBM</li> <li>◆ Dr. Charles F. Bunting, Oklahoma State University</li> <li>◆ Professor Ji Chen</li> </ul>	<p><b>MO-AM-2</b>                      <b>Room W2-67</b>  <b>Guide to Accreditation of EMC Laboratories in the US</b>  <i>Chair: Werner Schaefer</i></p> <p>The workshop is planned as a true exchange of information between laboratory personnel who are either considering to seek accreditation for their laboratory or who are already accredited. A formal outline of the workshop is prepared and can be followed. However, emphasis is placed on answering questions from the audience to ensure that the true interests of attendees are covered. The author, a lead assessor with A2LA, also manages the quality system for accredited laboratories and is actively participating in and contributing to national and international EMC and Quality standards work. The presenter's extensive background knowledge about RF and microwave test instrumentation allows for an indepth discussion of complex subjects as suitability of test equipment calibration services, test equipment suitability and measurement uncertainty calculations</p> <p><u>Presenter</u></p> <ul style="list-style-type: none"> <li>◆ Werner Schaefer, Cisco Systems</li> </ul>	<p><b>MO-AM-3</b>                      <b>Room W2-63</b>  <b>Automotive EMC High Power and Field Level Immunity Testing</b>  <i>Chairs: Vince Rodriguez and Janet O'Neil</i></p> <p>The workshop will present an overview of immunity testing, concentrating on the ISO 11451-2 standard for full vehicle as well as the ISO 11452-2 standard for vehicle components. The issues of generating and measuring high field levels will be addressed as well as selection criteria for the antennas, amplifiers and field probes used during high power testing. The test environment of an anechoic chamber and reverberation chamber will be reviewed (the reverberation chamber is also an approved approach for immunity testing) with an overview of performing a test in these environments. Finally, the impact of this high power testing on OEMs will be addressed by a representative from one of the "Big Three" automotive companies in the greater Detroit area.</p> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>◆ Garth D'Abreu, ETS-Lindgren</li> <li>◆ Hans-Peter Bauer, Rohde &amp; Schwarz</li> <li>◆ Vince Rodriguez, ETS-Lindgren</li> <li>◆ Keith Frazier, Ford Motor Company</li> </ul>
<p><b>12:00 PM LUNCH ON YOUR OWN</b></p>			
<p>1:30 PM TO 5:30 PM</p>	<p><b>MO-PM-1</b>                      <b>Room W2-63</b>  <b>Limitations of Simulation Techniques and Proper Model Validation for Both Signal Integrity and EMC</b>  <i>Chair: Dr. Bruce Archambeault</i></p> <p>As signal speeds increase into the Gbit/sec range, the use of modeling and simulation is more important than ever before and has become quite common in real-world product design. However, using the right tool for the right job has become critical, since all simulation techniques have limitations. This workshop will include a number of experts in different modeling and validation techniques. Each speaker will provide a presentation concerning different modeling techniques, their practical limitations and how to validate simulation results.</p> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>◆ Bruce Archambeault, IBM</li> <li>◆ Jim Drewniak, Missouri University of Science and Technology (formerly UMR)</li> <li>◆ Colin Brench, Southwest Research Institute</li> <li>◆ Chuck Bunting, Oklahoma State University</li> <li>◆ Jim Nadolny, Samtec</li> <li>◆ Jun Fan, Missouri University of Science and Technology</li> </ul>	<p><b>MO-PM-2</b>                      <b>Room W2-65</b>  <b>Basic EMC Measurements</b>  <i>Chair: Don Heirman</i></p> <p>This tutorial will provide an introduction to basic EMC measurements with a primary focus on emission testing. While intended for those new to these disciplines, the latest activity in national and international standards related to EMC measurements and standards will be presented. A special focus will be on measurements and associated issues above 1 GHz as well as measurement uncertainty. An open discussion will follow the presentations.</p> <p><u>Description of Topics</u></p> <ul style="list-style-type: none"> <li>◆ Emission Measurements for Tabletop Equipment</li> <li>◆ Emission Measurements for Floor-Standing Equipment</li> <li>◆ IEC Transient-Immunity Testing Overview</li> <li>◆ Immunity to Continuous RF Disturbances</li> <li>◆ Basic Measurement Sites, Methods, and Associated Errors</li> <li>◆ Selecting a Quality EMC Lab</li> <li>◆ Uncertainty Considerations in Stating Pass/Fail</li> </ul> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>◆ H. R. (Bob) Hofmann, Hofmann EMC Engineering</li> <li>◆ Thomas E. Braxton, Braxton EMC Consulting</li> <li>◆ John Maas, IBM</li> <li>◆ Don Heirman, Don HEIRMAN Consultants</li> <li>◆ Daniel D. Hoolihan, Hoolihan EMC Consulting</li> </ul>	<p><b>MO-PM-3</b>                      <b>Room W2-64</b>  <b>Advanced Topics for Antennas and Field Probes in Radiated Measurements</b>  <i>Chairs: Zhong Chen and Janet O'Neil</i></p> <p>This tutorial covers antenna and probe theory with a focus on advanced application specific topics relevant to EMC. It will address aspects of applications of antennas and field probes beyond those specified in typical manufacturer's data sheets. The discussions are concentrated on the usage of antennas and probes in testing to EMC industry standards. This tutorial will also provide the latest updates on ANSI and CISPR standards on antenna calibrations, and IEEE 1309 and IEC 61000-4-3 standards on probe calibrations.</p> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>◆ Zhong Chen, ETS-Lindgren, Texas</li> <li>◆ Dr. Vince Rodriguez, ETS-Lindgren, Texas</li> <li>◆ Mike Windler, Underwriters Laboratories, Northbrook, Illinois, chairman of ANSI ASC C63™ Subcommittee 1 (C63.4/C63.5)</li> <li>◆ Alexander Kriz, Austrian Research Centers (Seibersdorf, Austria), project leader for several antenna related programs in CISPR/A</li> <li>◆ Dennis Camell, National Institute of Standards and Technology, Boulder, Colorado, primary author of the 2007 IEEE International Symposium on EMC Best Paper titled "Free Space Antenna Factors through the Use of Time-Domain Signal Processing"</li> </ul>

# 2008 IEEE EMC SYMPOSIUM WORKSHOPS & TUTORIALS

(Events held at COBO Center unless otherwise noted.)

18 AUGUST 2008, MONDAY

<p><b>MO-AM-4</b>                      <b>Room W2-64</b>  <b>Basic Antenna &amp; Probe Use in EMC</b>  <i>Chair: Candace Suriano, PhD</i></p> <p>This workshop will provide an introduction to antenna and probe theory and application relevant to EMC. It will address fundamental principles of operation for various common antenna and field probe configurations covering the frequency spectrum associated with EMC testing.</p> <p>Introduction  <i>Candace Suriano, Suriano Solutions</i></p> <p>Fundamentals of Antennas and Probes  <i>Zhong Chen ETS-Lindgren</i></p> <p>Understanding Basic Techniques of Near Field/Far Field Analysis  <i>Qin Yu, Alcatel-Lucent</i></p> <p>Understanding Measurement and Noise Figure in EMC  <i>Tom Holmes, Agilent</i></p> <p>Antennas, Ferrites and Coax  <i>Paul Zdanowicz, Fair-Rite Products Corp.</i></p>	<p><b>MO-AM-5</b>                      <b>Room W3-45/46</b>  <b>Fundamentals of EMC</b>  <i>Chair: Daryl Beetner</i></p> <p>Organized by the EMC Society Education and Student Activities Committee, this tutorial is designed to present the basics of EMC to those who are new to the field of EMC, those who are seeking information on an aspect of EMC that they have not previously encountered, or those who desire a refresher on the proposed EMC topics.</p> <p>8:30am to 8:35am  <b>Introduction</b>  <i>D. Beetner, Missouri University of Science and Technology, Rolla, MO</i></p> <p>8:35am to 10:00am  <b>Current, if Not Obstructed, Will Always Flow in the "Path of Least Resistance"</b>  <i>Elya Joffe, K.T.M. Project Engineering, Hod Hasharon, Israel</i></p> <p>10:00am to 10:30am  <b>Break</b></p> <p>10:30am to 12:00pm  <b>Inductance and Capacitance in Electrical System Design</b>  <i>D. Beetner, Missouri University of Science and Technology, Rolla, MO</i></p>	<p><b>MO-AM-6</b>                      <b>Room W2-62</b>  <b>EMC and Wireless Devices</b>  <i>Chair: Dan Hoolihan</i></p> <p>This workshop will provide key information on EMC concerns as they pertain to present and future wireless/cellular phone technologies and associated packaging issues.</p> <p>The first part of this workshop will introduce and define the concept of Platform and Cellular Device RF/Microwave Interference. It will include presentations on the concept of RF/microwave EMI for wireless systems including measurement techniques, design methodologies and case studies to establish risks and determine mitigation requirements for platform and device-generated RF/microwave EMI.</p> <p>The second part of this workshop will address specific device issues particularly as they relate to radiated electromagnetic interference and immunity for modern communications systems including cell devices, as well as the impact of new communications device technologies and dynamic frequency selection. Additional specific case studies will be presented along with a focus on selected wireless technology, packaging considerations, spectrum and laboratory measurement methods.</p> <p><i>See Description of Topics and Presenters below.</i></p>	<p>8:30 AM  TO  12:00 PM</p>
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LUNCH ON YOUR OWN 12:00 PM

<p><b>MO-PM-4</b>                      <b>Room W2-67</b>  <b>iNARTE Exam Preparation</b>  <i>Chair: Brian Lawrence</i></p> <p>The iNARTE Examinations Preparation Tutorial is recommended for all who plan to take the NARTE Certification Examinations on August 22 at the conclusion of EMC 2008, and will also be of value to those who plan to attend The Global EMC University and who will want to later validate their new-found credentials. At the tutorial, we will advise attendees as to the format of the two part examinations, we will discuss the best approach to ensure success and will provide some working examples of typical exam questions.</p>	<p><b>MO-PM-5</b>                      <b>Room W3-45/46</b>  <b>Fundamentals of EMC continued</b>  <i>Chair: Daryl Beetner</i></p> <p>1:30pm to 3:00pm  <b>What is "Partial Inductance"?</b>  <i>Clayton Paul, Mercer University, Macon, GA</i></p> <p>3:00pm to 3:30pm  <b>Break</b></p> <p>3:30pm to 5:00pm  <b>Automotive EMC</b>  <i>Todd Hubing, Clemson University, Clemson, SC</i></p>	<p><b>MO-PM-6</b>                      <b>Room W2-62</b>  <b>EMC and Wireless Devices continued</b>  <i>Chair: Dan Hoolihan</i></p> <p><u>Description of Topics</u></p> <ul style="list-style-type: none"> <li>◆ EMI from licensed cell and wireless transmitters</li> <li>◆ EMI for unlicensed cell and wireless transmitters</li> <li>◆ Telecom Certification Body (TCB) issues with wireless/telecommunications devices</li> <li>◆ EMI and future wireless and cellular technologies</li> <li>◆ International and regulatory aspects of EMI and wireless/cellular devices.</li> </ul> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>◆ Dave Case, Intel</li> <li>◆ Mike Violette, Washington Labs</li> <li>◆ Kevin Slattery, Intel</li> <li>◆ Harry Skinner, Intel</li> <li>◆ Steve Berger, TEM Consulting</li> <li>◆ Andy Drozd, ANDRO Computational Solutions</li> <li>◆ Dan Hoolihan, Hoolihan EMC Consulting</li> </ul>	<p>1:30 PM  TO  5:30 PM</p>
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# 2008 IEEE EMC SYMPOSIUM WORKSHOPS & TUTORIALS

**FRIDAY, 22 AUGUST 2008**

(Events held at COBO Center unless otherwise noted.)

8:30 AM  
TO  
12:00 PM

**FR-AM-1** Room W2-67  
**EMC and Modern Power Electronic Systems**  
*Chair: Dr. Firuz Zare*

The purpose of this tutorial is to address basic and advanced concepts of EMC in modern power electronic systems, which help EMC experts analyze EMC problems of power electronics used in different applications. Introducing power electronics in details such as transformer and motor design, modulation strategy, and switching losses to EMC experts may open a new research area and help development engineers to find better solutions to minimize sources of EMI noise at the development phase and improve cost, size and performance of the system.

Description of Topics

- ♦ Power Electronics: Topologies, Applications, Pulse Width Modulation
- ♦ Major EMI Problems in Power Electronic Systems
- ♦ Active EMI Filters used in Motor Drives
- ♦ Methods to Predict and Minimize Conducted Emission Noise in Motor Drive Systems
- ♦ Important Feedback from EMC Experts to Development Engineers

**FR-AM-2** Room W2-65  
**Fundamentals of Signal Integrity**  
*Chairs: Prof. Tzong-Lin Wu (1) and Prof. James Drewniak (2)*

This tutorial will introduce the audience to the fundamental concepts of signal and power integrity for high-speed digital boards or packages and in particular the topics of High-speed Signal Link Path, SI/PI Modeling and Analysis, Jitter, Power Distribution Networks, Models of Active Devices, and Measurement for SI. The focus will be on the fundamental modeling and design concepts of signal and power integrity (SI and PI) for highspeed circuit systems.

Description of Topics

- ♦ High-speed Signal Link Path: Models and Analysis
- ♦ Jitter
- ♦ Power Distribution Networks
- ♦ Models of Active Devices
- ♦ Measurement for SI

Presenters

- ♦ Prof. James Drewniak, Missouri University of Science and Technology, USA
- ♦ Prof. David Pommerenke, Missouri University of Science and Technology, USA
- ♦ Prof. Tzong-Lin Wu, NTU, Taiwan
- ♦ Dr. Ben Beker, AMD Fellow, AMD
- ♦ Dr. Vittorio Ricchiuti, Technolabs, Italy

**FR-AM-3** Room W2-64  
**Aerospace Lightning Protections**  
*Chair: Fred Heather*

This tutorial will cover the area of lightning protection of aerospace vehicles. The tutorial will open with an introduction to lightning attachment to aircraft, and expand to address space vehicles and charge control. The tutorial will examine the indirect effects of modeling using TLM, complemented by the pitfalls and success of equipment level lightning testing, then conclude with a look at the direct effects of lightning to materials.

Description of Topics

- ♦ Aerospace Lightning
- ♦ Aircraft Lightning Attachment and Protection Introduction
- ♦ Space Vehicle Charge Control from Launch To Orbit
- ♦ Indirect Effect Modeling using TLM
- ♦ Pitfalls and Success of DO-160 Lightning Testing
- ♦ Direct Effects To Materials

Presenters

- ♦ Fred Heather, JSF JPO EEE Lead
- ♦ C. Larsson, SAAB Communication
- ♦ Diane Heidlebaugh, The Boeing Company
- ♦ Bob Scully, NASA Johnson Space Center
- ♦ Neal Kiely, BAES
- ♦ Andy Plumer, LTI

12:00 PM

**LUNCH ON YOUR OWN**

1:30 PM  
TO  
5:30 PM

**FR-PM-1** Room W2-63  
**The European EMC Directive 2004/108/EC: Conformance Requirements**  
*Chair: Chris Marshman*

This tutorial addresses the conformance requirements placed on manufacturers for CE Marking products to the EMC Directive. Directive 2004/108/EC will have been in force for 12 months by August 2008. This allows the opportunity for a timely review of issues that have arisen and observations on its application to be presented.

Description of Topics

- ♦ Mandatory requirement to perform an EMC assessment and use of harmonized standards
- ♦ Mandatory documentation requirements under 2004/108/EC for manufacturers
- ♦ Implications of harmonized standards and the 'presumption of conformity'
- ♦ Role of the Notified Bodies
- ♦ Need for Technical Documentation and Declarations of Conformity to be held in Europe by companies placing products on the EEA market
- ♦ Technical Documentation contents
- ♦ The ease with which member states can now carry out market surveillance/regulatory enforcement
- ♦ Requirements for fixed installations and their implications
- ♦ How 2004/108/EC has been applied since 20 July 2007

Presenter

- ♦ Chris Marshman, York EMC Services Ltd

**FR-PM-2** Room W2-67  
**The State of Electromagnetic Environments (EME)**  
*Chair: Dave Southworth*

This workshop will discuss the current state of knowledge for electromagnetic environments (EME). With the proliferation of wireless electronics, EME is evolving and expanding into areas previously considered "RF quiet". Major electromagnetic environments will be discussed as well as soliciting arenas that may not yet be assessed, but play a role in the future. The intent is to involve the audience prior to, during, and after the symposium. The session is soliciting data from participants on their local urban or operational EME. Please send your data to [strauss\\_ieee@verizon.net](mailto:strauss_ieee@verizon.net). The data will be presented and discussed during this session.

Description of Topics

- ♦ EME Standards
- ♦ Industrial EME
- ♦ Military EME
- ♦ Public common areas EME
- ♦ Unique stories of EME interference
- ♦ Urban EME

Presenters

- ♦ Dave Southworth (representing ANSI ASC C63™) and Bernd Jaekel
- ♦ Kimball Williams, Scott Lytle and Dr. Bill Strauss
- ♦ Dave Southworth, Matt Grenis, Fred Heather
- ♦ Keith Armstrong
- ♦ Doug Kramer

**FR-PM-3** Room W2-65  
**Practical EMI Filter Design**  
*Chair: Alexander Gerfer*

The workshop targets a practical approach to design rules for the designer who must accommodate EMI-filters. New simulation tools and improved simulation models will be reviewed to help find the best filter solution for a given noise problem. A practical filter measurement of different filter topologies will show how the filter reaction is on a practical PCB-board.

Description of Topics

- ♦ EMI Components: The real view on Capacitor, Inductor and Bead
- ♦ Simulation Models of Capacitor and Inductor, Chip-Bead
- ♦ The Current Dependent Simulation Model of Chip Beads
- ♦ EMI Filter Topologies
- ♦ Source and Load Impedances—How to Define?
- ♦ Simulation Software Tools
- ♦ Common Mode Choke
- ♦ Common Mode Choke Simulation Model
- ♦ Analysis of EMI Filters
- ♦ Layout
- ♦ Parasitics
- ♦ Comparison Measurement of Simulation

Presenters

- ♦ Dipl. Ing (FH) Alexander Gerfer
- ♦ Dipl. Ing. Michael Eckert

# 2008 IEEE EMC SYMPOSIUM WORKSHOPS & TUTORIALS

(Events held at COBO Center unless otherwise noted.)

22 AUGUST 2008, FRIDAY

<p><b>FR-AM-4</b> Room W2-63 <b>Basic to Advanced EMI Failure Analysis</b> <i>Chair: Dr. David Pommerenke</i></p> <p>This tutorial will help EMI engineers better understand and select a variety of methods for analyzing EMI failures in systems. The foundation of the methods will be explained and typical applications shown. The methodologies span from simple, well known methods such as current clamp measurements to complex methods such as near field scanning or correlation analysis and spectrogram analysis for broadband signals and tough cases in which multiple sources and antennas radiate on the same frequency. The novelty of this workshop will lay in the advanced EMI analysis methods, such as correlation analysis, spectrogram methods, and using mode stirred chambers (i.e. metalized tent) for EMI debugging.</p> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>♦ Tom Van Doren, Missouri University of Science and Technology</li> <li>♦ Doug Smith, D.C. Smith Consultants</li> <li>♦ Lee Hill, SILENT</li> <li>♦ David Pommerenke, Missouri University of Science and Technology</li> <li>♦ Simon Xu, Huawei</li> <li>♦ Kenji Araki, Sony</li> </ul>	<p><b>FR-AM-5</b> Room W2-62 <b>Automotive EMC</b> <i>Chair: Todd Hubing</i></p> <p>This workshop addresses EMC test and design issues of relevance to the automotive industry. It brings automotive EMC engineers from around the world together to provide updates on the many rapid changes in the automotive industry that affect automotive EMC.</p> <p>The first half-day of this workshop will focus on new automotive EMC challenges and design tools and techniques for automotive engineers. This will include talks on the impact of new automotive technologies, new design criteria, and an overview of the latest modeling tools available.</p> <p>The second half-day of this workshop will focus on automotive EMC test practices. It will address the automotive industry's problems associated with out-dated, OEM-specific EMC test procedures and the challenge of trying to use component-level test results to anticipate system-level EMC problems.</p> <p><i>Description of Topics and Presenters listed below.</i></p>	<p><b>FR-AM-6</b> Room W2-68 <b>Module Level EMI Measurements and Estimation</b> <i>Chairs: H. R. Hofmann (1) and Hiroshi YAMANE (2)</i></p> <p>This workshop describes the technical measurement methods for measuring emissions from module products to determine emission levels. Included in the requirements are measurement methods and evaluation of emission levels. These methods measure the applying area for the emission of modules.</p> <p><u>Description of Topics</u></p> <ul style="list-style-type: none"> <li>♦ Trend and outline of estimation for module level EMI measurements</li> <li>♦ TEM cell method for estimating the radiated electric field strength from PCB module</li> <li>♦ WBFC method for common mode current of 150U line</li> <li>♦ VDE method for the ground current using 1U resistance probe (contact)</li> <li>♦ MP method for the supply current using MP probe (non contact)</li> </ul> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>♦ Prof. Osami Wada, Kyoto University of Japan</li> <li>♦ Prof. Todd H. Hubing, Clemson University, USA</li> <li>♦ Mr. Rainer Gehrmann, Hewlett-Packard</li> <li>♦ Mr. Toshiki Shimasaki, NEC Engineering, Japan</li> </ul>	<p>8:30 AM TO 12:00 PM</p>
<b>LUNCH ON YOUR OWN</b>			
<p><b>FR-PM-4</b> Room W2-64 <b>Aircraft EMP Hardening Specifications and Measurement Methods</b> <i>Chair: William D. Prather</i></p> <p>This tutorial will address the approach to writing specifications for electromagnetic shields, especially electromagnetically shielded aircraft which require a different approach than that taken with a ground-based screen room or armored vehicle. The electromagnetic shielding specifications can be written in measurable engineering units, and if this is done correctly, the shield performance may be measured in an unambiguous fashion during design, verification, and subsequent maintenance.</p> <p><u>Description of Topics</u></p> <ul style="list-style-type: none"> <li>♦ EMP and EMP simulation</li> <li>♦ EMP coupling to aircraft</li> <li>♦ EM specifications and hardening elements</li> <li>♦ Shielding measurement techniques</li> </ul> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>♦ William Prather</li> <li>♦ Kurt Sebacher</li> <li>♦ Dr. Parviz Parhami</li> <li>♦ Peter Richeson</li> <li>♦ Dr. Lothar Hoeft</li> </ul>	<p><b>FR-PM-5</b> Room W2-62 <b>Automotive EMC continued</b> <i>Chair: Todd Hubing</i></p> <p><u>Description of Topics</u></p> <ul style="list-style-type: none"> <li>♦ Where We Stand Today With Automotive EMC Simulation</li> <li>♦ Component-Level Testing for System-Level Simulation</li> <li>♦ Automotive EMC Expert System Software</li> <li>♦ EMC Test Procedures for GPS and Other New Technologies</li> <li>♦ EMC Component and Vehicle Validation Considerations for Hybrid Electric Vehicles</li> <li>♦ Overview of Component Level EMC Characteristics for HEV Applications</li> </ul> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>♦ Stephan Frei, TU-Dortmund, Germany</li> <li>♦ Todd Hubing, Clemson University, USA</li> <li>♦ Roman Jobava, EMCoS Ltd., Tbilisi Georgia</li> <li>♦ Scott Mee, Johnson Controls, USA</li> <li>♦ Jody Nelson, Daimler AG, USA</li> <li>♦ Hiroki Funato and Liang Shao, Hitachi, Japan</li> </ul>	<p><b>FR-PM-6</b> Room W2-68 <b>Carbon Nanotube Technology for Next-Generation Nanointerconnects</b> <i>Chair: Prof. Maria Sabrina Sarto</i></p> <p>This tutorial will present and discuss the internationally most advanced "state of the art" in the field of next-generation nanointerconnects based on carbon nanotube technology. The tutorial will introduce the challenges of ITRS-2007 as regards to nanointerconnects, the fundamental concepts concerning carbon nanotubes, and the advanced modeling tools of carbon-nanotube nanointerconnects both in the frequency and in the time-domain.</p> <p><u>Description of Topics</u></p> <ul style="list-style-type: none"> <li>♦ Fundamentals of carbon nanotube technology</li> <li>♦ State-of-art of CNT-nanointerconnects technology</li> <li>♦ Overview of research project CATHERINE</li> <li>♦ Modeling approaches of electromagnetic properties of CNTnanointerconnects from nano- to macro-scale</li> <li>♦ Frequency-domain and time-domain analysis methods of CNTnanointerconnects</li> <li>♦ Issues related to experimental characterization methods</li> </ul> <p><u>Presenters</u></p> <ul style="list-style-type: none"> <li>♦ Prof. Sarto, Sapienza University, Italy</li> <li>♦ Dr. Tamburrano, Sapienza University, Italy</li> <li>♦ Prof. Massoud, Rice University, USA</li> <li>♦ Dr. Naeemi, Georgia Institute of Technology, USA</li> <li>♦ Dr. S. Kabir, Smoltek, Sweden</li> </ul>	<p>1:30 PM TO 5:30 PM</p>