

MORNING SESSIONS  8:30 AM-NOON

**MONDAY INCLUDES:\***

**Workshops/Tutorials**

- Fundamentals of EMC
- Practical Radiated Measurements Using Antennas and Field Probes – Fundamental and Advanced Topics
- Power Quality and Low-Frequency EMC in Electrical Systems Including Smart Grid
- ESD and Lightning Testing Additions to MIL-STD-461G
- Introduction to EMI Modeling Techniques
- All About EMI Above 1 GHz
- How to Simplify Real-World Complex Systems into Realistic, Solvable and Accurate Models
- Application of Reverberation Chambers
- iNARTE Workshop (Page 56)

**Poster Paper Session 1**

- Display Board Preparation

**Exhibitor Set Up**

**Meetings**

- Technical Advisory Committee (Page 52)
- TC-6: Spectrum Management (Page 52)

**Other Events**

- Global University Reception (Page 54)
- Exhibitor Hospitality Night (Page 58)

**Tours**

- Billie Swamp Safari Eco-Tour (Page 60)
- Fort Lauderdale Duck Tour (Page 64)

\* All events are subject to change. Check [www.emc2010.org](http://www.emc2010.org) and the Registration Area daily for updates.

**Fundamentals of EMC**

MO-AM-1 | Full-day Tutorial | Room 223/222

Chair: Daryl Beetner, Missouri University of Science and Technology, Missouri, U.S.A.

**Abstract**

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.

**Planned Speakers and Topics**

1. **Introduction** [ 8:30-8:35 ]  
Daryl Beetner, Missouri University of Science and Technology, Missouri, U.S.A.
2. **Inductance and Partial Inductance, What's it all mean?** [ 8:35-9:30 ]  
Bruce Archambeault, IBM, U.S.A.
3. **PCB Design** [ 9:30-11:00, with break from 10-10:30 ]  
Daryl Beetner, Missouri University of Science and Technology, Missouri, U.S.A.
4. **Shielding** [ 11:00-Noon ]  
Frank Leferink, University of Twente, Netherlands
5. **Why and How to Ground Electrical Systems** [ 1:30-3 ]  
Tom Van Doren, Missouri University of Science and Technology, U.S.A.
6. **Transmission Lines and Crosstalk** [ 3:30-4:30 ]  
Flavio Canavero, Politecnico di Torino, Italy
7. **The Fundamentals of EM Measurements and Modeling** [ 4:30-5:30 ]  
Colin. Brench, Southwest Research Institute, U.S.A.

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**Practical Radiated Measurements Using Antennas and Field Probes - Fundamental and Advanced Topics**

MO-AM-2 | Full-day Tutorial | Room 221/220

Chair: Zhong Chen, ETS-Lindgren, Cedar Park, Texas, U.S.A.

**Abstract**

This tutorial is designed to be a full-day two-part tutorial. The morning session covers the basic theory and applications of EMC radiated measurements using antennas and field probes, and the afternoon session will cover more advanced topics. The morning session will introduce the basic theory and terminologies. Applications according to US and international standards will also be covered. The afternoon session covers more advanced topics. The morning session introduces the basic theory and terminologies. Applications according to U.S. and international standards are also covered. The afternoon session covers applications of antennas and field probes beyond those specified in typical manufacturer's data sheets. The discussions are concentrated on some specific aspects of antennas and probes in cali

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Booth 520

MORNING SESSIONS  8:30 AM-NOON

**Practical Radiated Measurements Using Antennas and Field Probes - Fundamental and Advanced Topics**

Continued from Page 16

bration and testing to EMC industry standards, such as background information and rationales for recent changes in the standards, and impacts of these changes on daily EMC measurements.

Other topics include time domain methods related to antenna calibration and usage, system integration and instrumentation considerations in antennas and probes applications. The implications of the antenna characteristics on EMC testing are discussed, including the nature and use of antenna factors, gain, radiation resistance, VSWR, etc. Uncertainty evaluations of the antenna and probe calibrations are considered, along with the implications of the uncertainties in typical end use situations. Applications of the antennas and probes in radiated emissions and immunity tests, as well as radiated site validation measurements are addressed, including those for measurements below and above 1 GHz. 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.

**Planned Speakers**

1. **Test Equipment Fundamentals**  
Werner Schaefer, Cisco Systems, California, U.S.A.
2. **Field Probe Basics**  
Zhong Chen, ETS-Lindgren, Texas, U.S.A.
3. **Introduction to Antennas**  
Vince Rodriguez, ETS-Lindgren, Texas, U.S.A.
4. **Basic Time Domain Analysis of Antennas Used for EMC**  
Robert Johnk, NIST, and Dennis Camell, Institute for Telecommunication Sciences, Colorado, U.S.A.
5. **Test Equipment Specifics**  
Werner Schaefer, Cisco Systems
6. **Advance Topics for EMC Measurements Using Field Probes**  
Zhong Chen, ETS-Lindgren
7. **Time Domain Analysis and Usage of Antennas for EMC II**  
Robert Johnk, NIST, and Dennis Camell, ITS
8. **Update on Antenna / Probe Standards and Applications**

Mike Windler, Underwriters Laboratory, Illinois, U.S.A.

**9. Antenna Calibration and Measurement Uncertainty**

Bob DeLisi, Underwriters Laboratory, New York, U.S.A.

**Power Quality and Low-Frequency EMC in Electrical Systems Including Smart Grid**

MO-AM-3 | Half-day Workshop | Room 209/210

Chair: Dr. Magnus Olofsson, Swedish National Electrical Safety Board, Kristinehamn, Sweden

Co-Chair: Dr. William A. Radasky, Metatech Corporation, California, U.S.A.

**Abstract**

The aim of the workshop is to elucidate the area of low-frequency EMC including its relation to Power Quality (PQ) in electric power systems. For efficient control and use of electric energy, electronics and power electronics are increasingly used within electrical systems. Examples of such technologies are solar and wind power, electric vehicles, variable speed drives and energy efficient luminaries. These technologies are also used in evolving Smart Grid applications. A basic performance of such modern electrical systems is EMC in the area of low frequency conducted disturbances. The workshop will focus on applications and standards for low-frequency EMC and how it is related to Power Quality in the view of future electric power systems including Smart Grid.

**Planned Speakers and Topics**

1. **Power Quality (PQ) and Low-Frequency EMC (LF EMC) – Definitions, Differences and Similarities**  
Dr. Magnus Olofsson, Swedish National Electrical Safety Board, Sweden
2. **Industrial Applications – PQ and LF EMC**  
Dr. Kai Sang Lock, PQR Consultants, Singapore
3. **How IEC Standards Deal with LF EMC and PQ**  
Dr. William A. Radasky, Metatech Corporation, California, U.S.A.
4. **Smart Grid and Renewables – Power Quality and LF EMC Issues and Opportunities**  
Dr. Alex McEachern, Power Standards Lab, California, U.S.A.

**ESD and Lightning Testing Additions to MIL-STD-461G**

MO-AM-4 | Half-day Workshop | Room 203/204

Chair: Fred Heather, NAVAIR, Maryland, U.S.A.

# Components to Complex Assemblies



**EMI Filters**



**Power  
Filters**



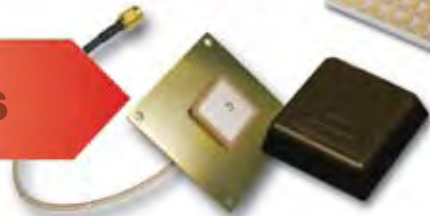
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MORNING SESSIONS  8:30 AM-NOON

**ESD and Lightning Testing Additions to MIL-STD-461G**

Continued from Page 18

Co-Chair: Manuel Rodriguez, U.S. Air Force ASC Wright-Patterson AFB, Ohio

**Abstract**

The future version MIL-STD-461G is considering adding ESD and Lightning requirement to the EMI Interface Standard. The purpose of this workshop is to gather industry insight and experience with these requirements for consideration. The agenda includes looking at a draft starting point and various speakers who will share their insights and expertise. The session will end with an open discussion between the panel of speakers and the attendees.

**Planned Speakers and Topics**

**1. Nearby Lightning Electromagnetic Field Environment**

Farhad Rachide, Swiss Federal Institute of Technology Electromagnetic Compatibility Laboratory, Laus-

anne, Switzerland & Marcos Rubinstein, University of Applied Sciences of Western Switzerland, Yverdon, Switzerland

**2. ESD Test Methods**

Finbarr O'Connor, Alion Science and Technology, Philadelphia, Pennsylvania, U.S.A.

**3. Experience of Testing to DO-160**

Josh Bakk, Rockwell-Collins, Cedar Rapids, Iowa, U.S.A.

**Introduction to EMI Modeling Techniques**

MO-AM-5 | Half-day Tutorial | Room 207/208

Chair: Chuck Bunting, Oklahoma State University, Oklahoma, U.S.A.

**Abstract**

This tutorial 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 weaknesses, so engineers can decide which techniques are appropriate for their types of problems. The format will be a conference presentation style (lecture) followed by questions moderated by the chairman. The chairman takes responsibility for weaving the threads of cohesiveness and dissimilarities between the methods.

**Planned Speakers and Topics**

**1. Overview of Electromagnetic Modeling Software**

Todd Hubing, Clemson University, Clemson, South Carolina, U.S.A.

**2. The Transmission Line Matrix (TLM) Method**

David Johns, CST of America Inc., Boston, Massachusetts, U.S.A.

**3. Introduction to the Partial Element Equivalent Circuit Technique**

Giulio Antonini, University of L'Aquila, L'Aquila, Italy

**4. The Finite-Difference Time-Domain Technique**

Sam Connor, IBM, Raleigh, North Carolina, U.S.A.

**5. Understanding the Finite Element Method**

Chuck Bunting, Oklahoma State University, Stillwater, Oklahoma, U.S.A.

**6. Introduction to the Method of Moments**

Ji Chen, University of Houston, Houston, Texas, U.S.A.

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AFTERNOON SESSIONS  1:30 PM-5:30 PM

**Fundamentals of EMC**

MO-PM-1 | Full-day Tutorial | Room 223/222

Chair: Daryl Beetner, Missouri University of Science and Technology, Missouri, U.S.A.

**Abstract**

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See Page 16 for planned speakers and topics.

**Practical Radiated Measurements Using Antennas and Field Probes - Fundamental and Advanced Topics**

MO-PM-2 | Full-day Tutorial | Room 221/220

Chair: Zhong Chen, ETS-Lindgren, Cedar Park, Texas U.S.A.

**Abstract**

This tutorial is designed to be a full-day two-part tutorial. The morning session covers the basic theory and applications of EMC radiated measurements using antennas and field probes, and the afternoon session will cover more advanced topics. The morning session will introduce the basic theory and terminologies. Applications according to US and international standards will also be covered. The afternoon session covers more advanced topics. The morning session introduces the basic theory and terminologies. Applications according to U.S. and international standards are also covered. The afternoon session covers applications of antennas and field probes beyond those specified in typical manufacturer's data sheets. The discussions are concentrated on some specific aspects of antennas and probes in calibration and testing to EMC industry standards, such as background information and rationales for recent changes in the standards, and impacts of these changes on daily EMC measurements.

Other topics include time domain methods related to antenna calibration and usage, system integration and instrumentation considerations in antennas and probes applications. The implications of the antenna characteristics on EMC testing are discussed, including the nature and use of antenna factors, gain, radiation resistance, VSWR, etc. Uncertainty evaluations of the antenna and probe calibrations are considered, along with the implications of the uncertainties in typical end use situations. Applications of the antennas and probes in radiated emissions and immunity tests, as well as radiated site validation measurements are addressed,

including those for measurements below and above 1 GHz. 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.

See Page 16 for planned speakers and topics.

**All About EMI Above 1 GHz**

MO-PM-3 | Half-day Tutorial | Room 203/204

Chair: Hiroshi Yamane, NTT Facilities, Inc./VCCI Council, Tokyo, Japan

Co-chair: H.R. Hofmann, Electromagnetic Compatibility Engineering, Naperville, Illinois, U.S.A.

**Abstract**

This tutorial will cover new national regulations, test site validation with SVSWR on radiated emission requirements above 1 GHz as well as design issues and solutions. Main objective is to share up-to-date information of key national regulations; how "over-1GHz" to be controlled, and to discuss test site validation with SVSWR with comprehensive test results as well as product design challenge and proposal. The national requirements are new and engineering discussion on practical test results for test site evaluation would give great help to the audience.

**Planned Speakers and Topics**

1. **FCC Emissions Tests Above 1 GHz for Digital Devices**  
Ghery S. Pettit, Intel Corporation, U.S.A.
2. **EMI Requirements Above 1 GHz in BSMI, Taiwan**  
Yung Chi Tang, BSMI, Taiwan
3. **EMI Measurements Above 1 GHz**  
Hiroshi Yamane, NTT Facilities Inc. (VCCI Tech SC Chair), Japan
4. **Setup Table for EMI Testing Above 1 GHz**  
Martin Wright, British Telecommunications, England
5. **Antennas for EMI Testing Above 1 GHz**  
Chiharu Miyazaki, Mitsubishi Electric (VCCI Tech SC), Japan

**How to Simplify Real-World Complex Systems into Realistic, Solvable, Accurate Models**

MO-PM-4 | Half-day Tutorial | Room 207/208

Co-Chair: Bruce Archambeault, IBM, North Carolina, U.S.A., & David Johns, CST, Massachusetts, U.S.A.

**Abstract**

This tutorial will introduce the audience to the techniques

## AFTERNOON SESSIONS 1:30 PM-5:30 PM

used to simplify real world complex systems into models for full wave simulation that are able to be solved with today's software tools, while maintaining the required accuracy to solve the problem of interest. Validation of these simplified models will also be discussed. This is similar to a tutorial in 2009 that was heavily attended. Many attendees indicated they would like to see the tutorial continued. There will be new material in the 2010 tutorial.

### Planned Speakers and Topics

1. **Simplification Process of a Complex System into a Useful Numerical Model**  
Frederico Centola, Apple Computer
2. **Model Partitioning for Solving Complex EMC Problems**  
Colin E. Brench, Southwest Research Institute, Texas, U.S.A.
3. **Partitioning, Transient Co-Simulation and Equivalent Sources in EMC/EMI Modeling**  
David P. Johns, PhD, CST of America
4. **Modeling and Simulation of High Voltage Cable Transfer Impedance for Automotive Electric Propulsion System RFI Reduction**  
Yeong Yoon and Hyok J. Song, HRL Laboratories, LLC, Malibu, California, U.S.A.
5. **Synthesis of Comprehensive Vehicle System EMI/EMC Model from Subsystem Models**  
Carl Baldwin, Lockheed Martin, U.S.A.
6. **Converting Complex Systems into a Series of Smaller Models and Combining Results**  
Bruce Archambeault, PhD, IBM Corporation, North Carolina, U.S.A.

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### Application of Reverberation Chambers MO-PM-5 | Half-day Tutorial | Room 209/210

Chair: Chuck Bunting, Oklahoma State University, Oklahoma, U.S.A.

#### Abstract

This tutorial will provide an introduction to recent applications of reverberation chambers. It is intended to provide EMC engineers who are interested in applying reverberation chambers to various measurement issues and the extension of reverberation chambers to solve a variety of EMC problems. The half-day tutorial provides a brief overview of RC theory, followed by recent applications of RCs. The format will be a conference presentation style (lecture) followed by questions moderated by the chairman.

### Planned Speakers and Topics

1. **Introduction – Rationale for RC testing**  
Vignesh Rajamani, Oklahoma State University, Oklahoma, U.S.A.
2. **Overview of RC Theory**  
Chuck Bunting, Oklahoma State University, Oklahoma, U.S.A.
3. **Models for Antennas in Reverberation Chambers**  
John Ladbury, National Institute of Science and Technology (NIST), Colorado, U.S.A.
4. **Characterization of EM Environments Using RC Techniques**  
Chuck Bunting and Vignesh Rajamani, Oklahoma State University, Oklahoma, U.S.A.
5. **Wireless Channel Modeling**  
John Ladbury, National Institute of Science and Technology (NIST), Colorado, U.S.A.
6. **Below-Decks EME: RF Propagation in Coupled Complex Cavities**  
Greg Tait, Naval Surface Warfare Center, Dahlgren, Virginia, U.S.A.


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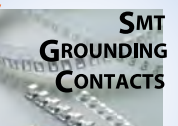
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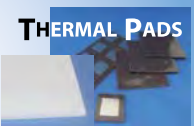
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