interference technology®

2016 EMC SYMPOSIUM HANDY REFERENCE GUIDE



JULY 25-29, 2016
OTTAWA, CANADA

9 Symposium Overview
16 Technical Program
25 Exhibit Hall Map
26 Product Finder
46 Technical Committees
47 Global University

YOUR PORTABLE GUIDE TO THE IEEE INTERNATIONAL SYMPOSIUM ON EMC

interferencetechnology.com

Does your antenna supplier do *all* this?



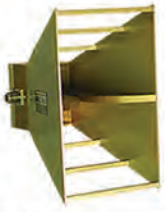
	Your Supplier	A.H. Systems
Design / build their own?		✔
99% in stock now?		✔
Next day, on-time delivery?		✔
Over a hundred items to choose from?		✔
Portable antenna kits?		✔
Equipment still working after 40 years?		✔
Over 80 years of experience?		✔
Personal technical support?		✔
Personal Customer Service?		✔
Global support network?		✔

A.H. Systems does ***all*** of this, ***all*** of the time because we are the EMI test Antenna Specialists. We do not build "Boxes". We do not build "Systems". We do design and build the highest quality, most accurate EMI test antennas (20 Hz - 40 GHz).

It may be more convenient to buy everything from one supplier, but remember "Your test system is only as good as the antenna you put in front of it!"



Log Periodics
80 MHz - 7 GHz
13 Models



DRG Horns
170 MHz - 40 GHz
6 Models



All in one small package
20 Hz - 40 GHz



Biconicals
20 MHz - 18 GHz
7 Models

The Antenna Specialists



Innovation Quality Performance

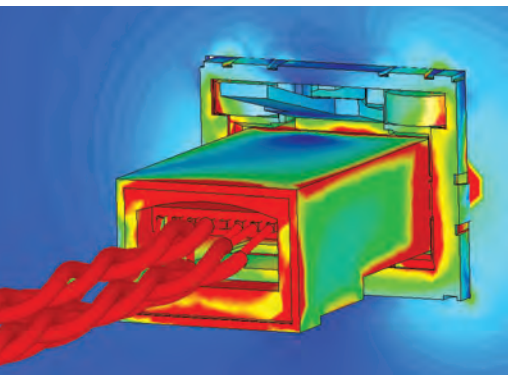
Phone: (818)998-0223 ♦ Fax (818)998-6892
http://www.AHSystems.com

A.H. Systems



Make the Connection

Find the simple way through complex EM systems with CST STUDIO SUITE



Components don't exist in electromagnetic isolation. They influence their neighbors' performance. They are affected by the enclosure or structure around them. They are susceptible to outside influences. With System Assembly and Modeling, CST STUDIO SUITE helps optimize component and system performance.

Involved in EMC/EMI analysis? You can read about how CST technology is used for EMC/EMI analysis at **www.cst.com/emc.**

If you're more interested in microwave components or signal integrity analysis, we've a wide range of worked application examples live on our website at **www.cst.com/apps.**

Get the big picture of what's really going on. Ensure your product and components perform in the toughest of environments.

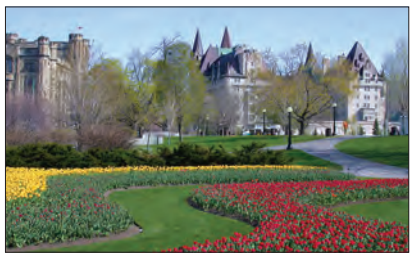
Choose CST STUDIO SUITE –
Complete Technology for 3D EM.

CST

CONTENTS









6 **Welcome from Ken Wyatt**

9 **Symposium Overview**

TECHNICAL PROGRAM

15 At A Glance

16 Monday

20 Tuesday

24 Exhibit Hall Map Key

25 Exhibit Hall Map

26 **Product Finder**

30 Wednesday

36 Thursday

42 Friday

46 Technical Committees

47 Global University

48 **Index Of Advertisers**

interference technology
THE INTERNATIONAL JOURNAL OF ELECTROMAGNETIC COMPATIBILITY

Chief Media Officer
Graham S. Kilshaw

Senior Technical Editor
Kenneth Wyatt

Content Manager
Geoffrey Forman

Assistant Marketing Manager
Christopher Bower

Senior Business Development Manager
Janet Ward

Business Development Manager
Todd Rodeghiero

Marketing Coordinator
Erica Osting

Production Specialist
Evan Barr

Editorial Assistant
Shannon O'Connor

Graphic Designer
Christopher Bower

Administrative Manager
Eileen M. Ambler

ITEM MEDIA

USA
1000 Germantown Pike, F-2
Plymouth Meeting, PA 19462
Phone: (484) 688-0300
Fax: (484) 688-0303
E-mail:
info@interferencetechnology.com
www.interferencetechnology.com

CHINA, TAIWAN, HONG KONG
ACT International
Mainland China - Linda Li, +86-21-62511200
Email: lindaL@actintl.com.hk
Hong Kong - Mark Mak, +85-22-8386298
Email: markm@actintl.com.hk

JAPAN
e-OHTAMA, LTD.
Midori Hamano, +81-44-980-2092
Email: m-toshima@e-ohtama.jp

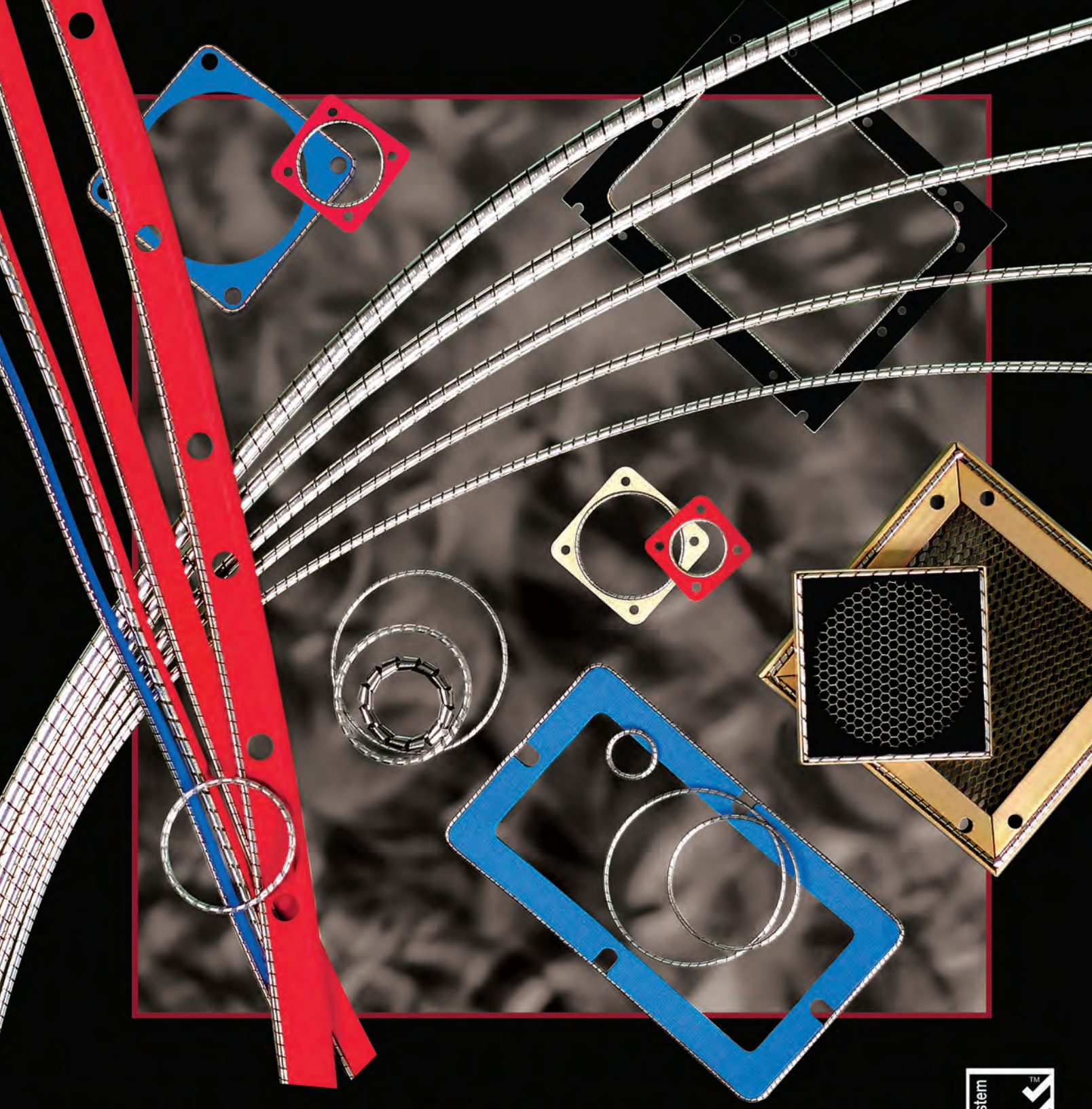
ITEM MEDIA endeavors to offer accurate information, but assumes no liability for errors or omissions. Information published herein is based on the latest information available at the time of publication. Furthermore, the opinions contained herein do not necessarily reflect those of the publisher.

ITEM™, **InterferenceTechnology™** and **InterferenceTechnology.com™** are trademarks of ITEM MEDIA and may not be used without express permission. ***ITEM***, ***InterferenceTechnology*** and ***InterferenceTechnology.com*** are copyrighted publications of ITEM MEDIA. Contents may not be reproduced in any form without express permission.
Copyright © 2016 • ITEM Media • ISSN 0190-0943



Photo Credits:Top "Bicycling at Wildwood Recreation Site, Welches - horizontal - 281" by Mt. Hood Territory is licensed under CC BY 2.0 by Eugene Kim is licensed under CC BY 2.0 **Middle** "NC State capital, Downtown Raleigh, NC" by James Willamor is licensed under CC BY 2.0 **Bottom** "Raleigh, North Carolina" by James Willamor is licensed under CC BY 2.0

EMC SYMPOSIUM 2016



The Inspiration in EMI Shielding

Visit our Website to request Free Samples, an EMI Educational DVD, Technical Assistance, & NEW EMI Shielding Catalog & Design Guide.

Certified System

ISO 9001
AS9100

Spira™

www.spira-emi.com

(818) 764-8222 info@spira-emi.com

All Products Made in the USA

Welcome from **KEN WYATT**



HELLO, AND WELCOME to the 2016 IEEE International Symposium on EMC! We hope you'll be able to use this handy guide to the symposium while you're here. This year, the symposium is being held in the beautiful city of Ottawa, the capital of Canada, where you'll get a true taste of European architecture, culture, and ambiance. Ottawa is not only the center of Canadian Parliament, but a center of technology and space research, as well. With the many museums, restaurants, and other sights, you'll have plenty to keep you busy.

Situated near the confluence of the Ottawa, Gatineau and Rideau Rivers, Ottawa is also known for the Rideau Canal, a world heritage site, with its many bike and walking trails. In the winter when it freezes over, I'm told the townspeople ice skate to work.

Ottawa is also the headquarters of the Royal Canadian Mounted Police (RCMP), also known as the "Mounties". A few years ago, I had the privilege of touring the headquarters and photographing one of their "Musical Rides" where the riders perform complex maneuvers in an arena.

We'll miss the peak of the spectacular tulip gardens throughout the city, which bloom in late April and early May, but you'll enjoy sightseeing around the city center with many unique shops and restaurants - an easy walk from the hotel.

Taking the short walk across the Ottawa River via the Alexandra Bridge, takes you into the province of Quebec, and you'll see all the signs now feature French. You'll also find yourself near the Canadian Museum of History with the attached IMAX Theater – whose technology was designed in Canada and the very first one built. You'll also have a unique view back to Parliament Hill.

As for the symposium, there will be plenty to keep us busy. Again, it will be combined with the Signal and Power Integrity Symposium, as well as a have special focus on military and space programs. The program will be packed as usual with a myriad of papers, workshops, Global University, youth and young professionals programs, social events and tours. There should be something for everyone.

The keynote speaker during the Tuesday plenary session (8:30 to 10:00 AM) will be Dr. Robert Scully, from NASA Johnson Space Lab, who will speak on "EMC in 2016 and Beyond: What Is It and Why Do We Care?"

Please take time to visit the many exhibitors, along with several first-timers, as they are major sponsors of the symposium. Also, take a moment to stop by the ITEM Media table, as I'd love to meet you!

Kenneth Wyatt,
Sr. Technical Editor,
Interference Technology

EMC 2016 SYMPOSIUM COMMITTEE

GENERAL CHAIR
Kris Hatashita

VICE GENERAL CHAIRS
Qiubo Ye | Wahab Almuhtadi

CO-CHAIRS, MARKETING
Mike Violette | Ashleigh O'Connor

CONFERENCE MANAGEMENT
John Vanella

CHAIR, TRADE SHOW & EXHIBITS
Peter Patterson

CHAIR, COMPANION & SOCIAL EVENTS
Holly Hatashita

SECRETARY
Leili Shafai

CHAIR, FINANCE & TREASURER
Kin Sze

VICE FINANCIAL CHAIR
Raed Abdullah

CHAIR, PUBLICATIONS
John Rohrbaugh

WEBSITE/DESIGN
Kelly Scott-Olson

CHAIR, ARRANGEMENTS
Rhonda Rodriguez

CHAIR, REGISTRATION
Bronwyn Brench

CHAIR, YOUNG PROFESSIONALS
Caroline Chan

CO-CHAIRS, VOLUNTEERS
W Lunscher | Robert Davis

INTERIM SECRETARY
Mark Kuisma | Rami Abielmona
John Simpson | Mohamed Bakr

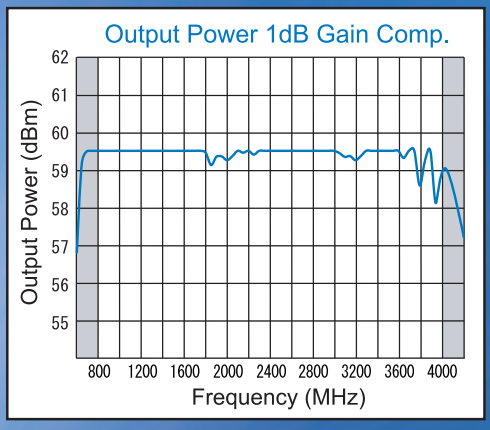
ALL SOLID STATE RF POWER AMPLIFIER for EMC

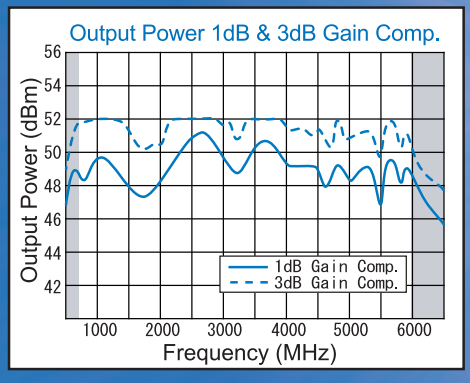


Best for
Radiated immunity testing and Radar pulse immunity testing of Automotive electronics.

GA801M402 Series

GA801M402-5959R
800MHz～4GHz 800W 1BAND





Best for
Radiated immunity testing of Consumer Electrical and Electronic equipments.



GA701M602 Series

GA701M602-5350R
700MHz～6GHz 100W 1BAND

These products and the technology used in these products are subject to Japanese export license.
R&K requires detailed information about the ultimate end user. We appreciate your understanding and corporation.

· R&K Broadband RF POWER AMPLIFIERS LINE UP

Series	Frequency	Output Power
A009K251	9kHz～250MHz	25W～12kW
A009K401	9kHz～400MHz	25W～500W
A080M102	80MHz～1GHz	10W～4kW
A501M272	500MHz～2.7GHz	5W～120W
A801M202	800MHz～2GHz	10W～2kW
NEW GA801M402	800MHz～4GHz	10W～800W
GA102M252	1GHz～2.5GHz	50W～2kW
NEW GA701M602	700MHz～6GHz	10W～200W
GA252M602	2.5GHz～6GHz	10W～250W



www.rk-microwave.com

R&K Company Limited
721-1 Maeda,Fuji-City,Shizuoka-Pref.416-8577 Japan
TEL:+81-545-31-2600 FAX:+81-545-31-1600 E-mail:info@rkco.jp

SCHURTER
EMC Solutions











SCHURTER offers an extensive selection of products that ensure electromagnetic compliance (EMC). Our goal is to make selecting the right product an easy process for a wide range of applications.

- Power Line Filters for 1- and 3-Phase Systems (Power Entry Modules and Discrete Line Filters)
- Multiple Stage Filters
- Filters Designed for AC and DC Applications
- Current Ratings up to 2500 A @760 VAC; 2300 A @ 1200 VDC
- Higher Ambient Temperature Rating up to +100°C, with Corresponding Deratings
- Applications including renewable energy systems, motor drives, stepper motor controls, UPS systems, drive systems, motor controls.
- Discrete Chokes and Pulse Transformers
- Custom Filter Design Services
- UL and ENEC Approvals

Learn more at
schurter.com/emc_news

SCHURTER
ELECTRONIC COMPONENTS



EMC SYMPOSIUM
OVERVIEW

OTTAWA, CANADA
JULY 25-29, 2016

THIS SECTION IS PROUDLY SPONSORED BY

ar®

rf/microwave instrumentation • modular rf • receiver systems • ar europe

WELCOME TO OTTAWA AND THE 2016 IEEE SYMPOSIUM on Electromagnetic Compatibility. This Symposium Overview is designed to give you a day-by-day summary of the technical, social, and educational programs available to attendees of the IEEE EMC Symposium and their families. Use it to plan your days and nights and get the maximum benefit of five days plus of non-stop immersion in everything EMC.*

SUNDAY, 24 JULY

- 8:00 AM – 6:00 PM Exhibitor Move-In

MONDAY, 25 JULY

ID	Time	Session Name	Format	Room
MO-AM-1 MO-PM-1	8:30am - 5:30pm	Fundamentals of EMC	Tutorial	Room 214
MO-AM-2 MO-PM-2	8:30am - 5:30pm	Military EMC	Tutorial	Room 205
MO-AM-3	8:30am - 12:00pm	Development Activities for IEEE P370 Standard - Electrical Characterization of Printed Circuit Board and Related Interconnects at Frequencies up to 50 GHz	Workshop	Room 206
MO-AM-4	8:30am - 12:00pm	Application of Reverb Chambers	Tutorial	Room 207
MO-AM-5	8:30am - 12:00pm	Measurement Uncertainty - Challenges and Solutions	Tutorial	Room 208
MO-AM-6	8:30am - 12:00pm	State-of-the-art Research and Education in Electromagnetic Information Security	Tutorial	Room 215
MO-PM-3	1:30pm - 5:30pm	Automotive EMC - Future Standards Updates and New Test Methodologies	Tutorial	Room 206



MONDAY, 25 JULY *contd.*

ID	Time	Session Name	Format	Room
MO-PM-4	1:30pm - 5:30pm	The Role of the IEC Advisory Committee on EMC (ACEC) in Coordinating IEC EMC Activities	Tutorial	Room 207
MO-PM-5	1:30pm - 5:30pm	Introduction to EMI Modeling Techniques	Tutorial	Room 208

TUESDAY, 26 JULY

ID	Time	Session Name	Format	Room
PLENARY	8:30am - 10:00am	Electromagnetic Compatibility in 2016 and Beyond: What Is It and Why Do We Care?	Plenary Session	Room 215
	10:00am - 12:00pm	Radiated Emissions as Function of Common Mode Current	Exp. and Dem.	Rear of Exhibit Hall
	10:00am - 12:00pm	Minimizing Magnetic Field Susceptibility Through the Proper Use of Static and Low Frequency Magnetic Shielding	Exp. and Dem	Rear of Exhibit Hall
	10:00am - 12:00pm	Time Domain Site VSWR Measurements	Exp. and Dem	Rear of Exhibit Hall
	10:30am - 11:30am	Ask the Experts: EMC	Special Event	Exhibit Theatre
TU-AM-1	10:30am - 12:00pm	Emission Measurements	Technical Session	Room 205
TU-AM-2	10:30am - 12:00pm	Modeling of Reverberation Chambers	Technical Session	Room 207
TU-AM-3	10:30am - 12:00pm	Cables and Connectors	Technical Session	Room 206
TU-AM-4	10:30am - 12:00pm	ESD	Technical Session	Room 208
TU-AM-5	10:30am - 12:00pm	Advancements in Numerical Methods for Signal and Power Integrity (Part 1)	Technical Session	Room 214
TU-AM-6	10:30am - 12:00pm	EMI Risk Management	Special Session	Room 215
TU-PM-1A	1:30pm - 3:00pm	Wireless EMC and Wireless OTA Measurement	Panel Discussion	Room 205
TU-PM-2	1:30pm - 5:30pm	Computational Electromagnetics (Part 1)	Technical Session	Room 207
TU-PM-3	1:30pm - 4:00pm	Environmental Considerations and Electromagnetic Design Aspects of Space-borne Vehicles (Part 1)	Special Session	Room 206
TU-PM-4	1:30pm - 5:30pm	HEMP/IEMI and EM Information Leakage	Technical Session	Room 208
TU-PM-5	1:30pm - 5:30pm	Advancements in Numerical Methods for Signal and Power Integrity (Part 2)	Technical Session	Room 214
TU-PM-6	1:30pm - 5:30pm	High Speed Link Design	Technical Session	Room 215
	2:00pm - 4:00pm	Using Simulated EMC Instrument to Develop, Edit, and validate EMC Test Routines	Exp. and Dem	Rear of Exhibit Hall
	2:00pm- 4:00pm	Troubleshooting EMI with Near Field Probes and VSWR Bridges	Exp and Dem.	Rear of Exhibit Hall
	2:00pm - 4:00pm	ETSI EN 300 328 V1.8.2 and ETSI EN 301 893 V1.7.2 Clarified Requirements and Synchronized Power Sensor Demonstration	Exp. and Dem	Rear of Exhibit Hall
TU-PM-1B	3:30pm - 5:30pm	Which Simulation Tool is Best for Which Application?	Panel Discussion	Room 205
TU-PM-7	3:30pm - 5:30pm	Military EMC	Panel Discussion	The Westin: Confederation III

*All events are subject to change. Check www.emc2016usa.emcss.org and the Registration Area daily for updates.

Break Through The Power Barrier With AR's New 10,000 Watt Amplifier



Introducing Our New 10000W1000A CW Solid State Class A Amplifier From 80 To 1000 MHz

AR's old power barrier of 4000 watts has now been obliterated. AR has created a new 10,000-watt CW amplifier leaving every competitor far behind.

This revolutionary 10,000-watt amplifier gives you all the power you need for testing large objects that require enormous field strengths. It also gives you more efficiency and a lower cost of ownership, too.

- 80-1000 MHz in a single band – save money by using fewer amplifiers
- Amplifiers with power levels from 1 to 10,000 watts
- 100% of rated power without foldback up to 2000 watts, 50% > 2000 watts
- Digital control panel provides local and remote control
- Performance & fault monitoring with remote access is standard
- No damage or oscillation with any magnitude and phase of source or load impedance

Break through the power barrier with the most powerful 80-1000 MHz amplifier in the world.

To learn more, visit us at www.arworld.us/10000W or for technical support call 800-933-8181.

Come See Us at IEEE EMC Ottawa
The Shaw Centre, Ottawa, Canada, July 25-29, 2016 – Booth 400

ISO 9001:2008 Certified

We don't just build great products.
We build great products that last.

BUILT TO LAST

rf/microwave instrumentation

Other ar divisions: modular rf • receiver systems • ar europe

USA 215-723-8181. For an applications engineer, call 800-933-8181.
In Europe, call ar United Kingdom +44 1908 282766 • ar France +33147917530 • ar Deutschland +49 6101 80270 0 • ar Benelux +31 172 423000

www.arworld.us
Download the AR RF/Microwave Mobile App: www.arworld.us/arApp

Copyright © 2016 AR.
The orange stripe on AR products is Reg. U.S. Pat. & TM. Off.

Time Is Money, Can You Afford To Lose Either?



Use Our MultiStar Multi-Tone Tester

EMC test accuracy is critical. But taking too long to test can be costly and it delays your time to market. With the speed of the revolutionary MultiStar Multi-Tone tester, you don't have to dwell on tedious EMC radiated immunity testing anymore.

Maximize your efforts during dwell time by testing multiple frequencies simultaneously, which increases testing speed, gets your product to market faster and eliminates costly chamber bottlenecks.

Mimic real world threats with the ability to expose EUT's to more than one frequency at a time. The MultiStar Multi-Tone Tester meets requirements of IEC 61000-4-3 and all associated standards.

So, if you believe lost time is lost money, don't dwell on it. Ask about our new MultiStar Multi-Tone Tester.
Amazing speed. Incredible accuracy.

To learn more, visit arworld.us/MultiTone or call us at 215-723-8181

Come See Us at IEEE EMC Ottawa
The Shaw Centre, Ottawa, Canada
July 25-29, 2016 – Booth 400

rf/microwave instrumentation

Other ar divisions:
modular rf • receiver systems • ar europe

USA 215-723-8181.
For an applications engineer, call 800-933-8181.
www.arworld.us

Copyright © 2016 AR. The orange stripe on AR products is Reg. U.S. Pat. & TM. Off.

WEDNESDAY, 27 JULY

ID	Time	Session Name	Format	Room
WED-AM-1	8:30am - 10:00am	Nanomaterials & Nanostructures	Technical Session	Room 205
WED-AM-2	8:30am - 10:00am	Numerical Methods and Analysis for Signal Integrity	Technical Session	Room 207
WED-AM-3	8:30am - 10:00am	Shielding, Gasketing & Filtering	Technical Session	Room 206
WED-AM-4	8:30am - 10:00am	Lightning and Power Effects	Technical Session	Room 208
WED-AM-5	8:30am - 10:00am	Electrical Characterization of High Speed Interconnects (Part 1)	Technical Session	Room 214
WED-AM-6	8:30am - 10:00am	Power Delivery and Jitter/Noise (Part 1)	Technical Session	Room 215
	9:30am - 11:30am	Transmission Line Effects on Filter Topology	Experiments and Demonstrations	Exhibit Hall Rear
	9:30am - 11:30am	Pulse Characteristics and Analyzer Architectures and Filter	Experiments and Demonstrations	Exhibit Hall Rear
	9:30am - 11:30am	Signal Processing and Test Methodologies for EMC Compliance	Experiments and Demonstration	Exhibit Hall Rear
	9:30am- 11:30am	Surveilling EFT in Micro-controlled Circuits	Experiments and Demonstrations	Exhibi Hall Rear
ATE-SIPI	10:30am - 11:30am	Ask the Experts: SIPI	Special Event	Exhibit Theatre
POSTERS	10:30am - 12:00pm	Poster Sessions	Posters	Rideau Canal Atrium
WED-PM-1A	1:30pm - 3:30pm	Aerospace Systems EMC	Panel Discussion	Room 205
WED-PM-2	1:30pm - 5:30pm	Wireless Coexistence	Technical Session	Room 207
WED-PM-3	1:30pm - 5:30pm	Circuit & System EMC Analysis	Technical Session	Room 206
WED-PM-5	1:30pm - 5:30pm	Electrical Characterization of High Speed Interconnects (Part 2)	Technical Session	Room 214
WED-PM-5-SIPI	1:30pm - 5:30pm	3D IC integration: SI/PI Modeling and Measurement	Technical Session	Room 208
WED-PM-6	1:30pm - 5:30pm	Power Delivery and Jitter/Noise (Part 2)	Technical Session	Room 215
	2:00pm - 4:00pm	Modeling of EMC Problems using CONCEPT-II	Experiments and Demonstrations	Rear of Exhibit Hall
	2:00pm - 4:00pm	Faster Emissions Troubleshooting of Intermittent and Co-located Narrowband, Broadband, and Wireless Signals Using Real-Time FFT Spectral Analysis	Experiments and Demonstrations	Rear of Exhibit Hall
	2:00pm - 4:00pm	Inductive Effects in Cables	Experiments and Demonstration	Rear of Exhibit Hall
WED-PM-1B	3:30pm - 5:30pm	ITE EMC Regulatory Intelligence to Market Products in B.R.I.C Countries	Panel Discussion	Room 205

THURSDAY, 28 JULY

ID	Time	Session Name	Format	Room
TH-AM-1	8:30am - 12:00pm	Antennas	Technical Session	Room 205
TH-AM-2	8:30am - 12:00pm	ESD Testing and Simulation	Special Session	Room 207

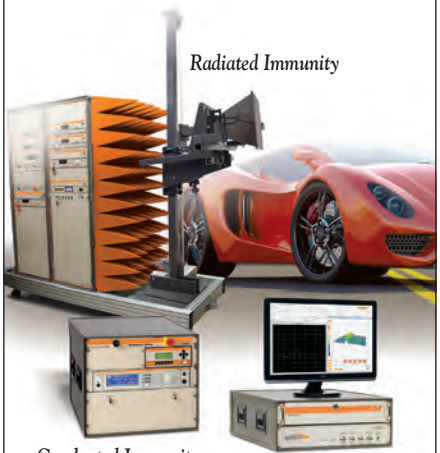
THURSDAY, 28 JULY *contd.*

ID	Time	Session Name	Format	Room
TH-AM-3	8:30am - 12:00pm	Terrestrial Electromagnetics of Aerospace	Special Session	Room 206
TH-AM-4	8:30am - 12:00pm	Computational Electromagnetics (Part 2)	Technical Session	Room 208
TH-AM-5	8:30am - 12:00pm	Passive Component Modeling and Measurement	Technical Session	Room 214
TH-AM-6	8:30am - 12:00pm	SI/PI/EMC Co-Simulation and Numerical Methods	Technical Session	Room 215
	9:30am - 11:30am	The Path of Least Impedance	Experiments and Demonstrations	Rear of Exhibit Hall
	9:30am - 11:30am	By Listening, Engineers Understand EMI Sources	Experiments and Demonstrations	Rear of Exhibit Hall
	9:30am - 11:30am	Shield Penetrating Conductors	Experiments and Demonstrations	Rear of Exhibit Hall
	9:30am - 11:30am	Modeling and Simulation of Cable Harness Radiation and Susceptibility for Automotive and Aircraft Structures	Experiments and Demonstrations	Rear of Exhibit Hall
TH-PM-1	2:30pm - 5:30pm	Immunity Measurements	Technical Session	Room 205
TH-PM-2	2:30pm - 5:30pm	High-Energy Transients and Measurement Technique	Technical Session	Room 207
TH-PM-3	2:30pm - 5:30pm	Robust System Performance Issues	Technical Session	Room 206
TH-PM-4	2:30pm - 5:30pm	Power Quality and conducted EMC in Power Electronics, Energy Efficient Technologies, including Electrical Drives	Technical Session	Room 208
TH-PM-5	2:30pm - 5:30pm	Active link, Optics and 5G	Technical Session	Room 214
TH-PM-6	2:30pm - 5:30pm	Numerical Modeling and Simulation Techniques	Technical Session	Room 215

FRIDAY, JULY 29

ID	Time	Session Name	Format	Room
FR-AM-1	8:30am - 12:00pm	Testing of Wireless Devices in the Modern World: Addressing Current and Future Performance Expectations	Tutorial	Room 205
FR-AM-2	8:30am - 12:00pm	Introduction to Medical EMC	Tutorial	Room 206
FR-AM-3	8:30am - 12:00pm	Basic EMC Measurements	Workshop	Room 207
FR-AM-4	8:30am - 12:00pm	Signal Integrity and Power Integrity Fundamental for Computer and Communication Systems	Tutorial	Room 208
FR-AM-5	8:30am - 12:00pm	EMC Consultants Toolkit	Workshop	Room 215
FR-PM-1	1:30pm - 5:30pm	Recent Developments and advanced measurements method in EMC for Emerging Wireless Technologies	Tutorial	Room 205
FR-PM-2	1:30pm - 5:30pm	Techniques and Measures to Manage Risks with Regard to Electromagnetic Disturbances	Workshop	Room 206
FR-PM-3	1:30pm - 5:30pm	Smart Grid Support and EMC Issues	Tutorial	Room 207
FR-PM-4	1:30pm - 5:30pm	Crosstalk - Theory, Modeling, Characterization, and Design Optimization	Tutorial	Room 208
FR-PM-5	1:30pm - 5:30pm	Calibration of EMC Measurement Instrumentation	Tutorial	Room 215

The Total EMC Source For Your Automotive Needs



AR's EMC solutions make complicated test processes easier and more accurate. Everything is simplified – calibration, testing processes, DUT troubleshooting, and generation of reports directly into convenient formats, such as Microsoft Word or Excel.

The Conducted Immunity (CI) platform offers flexibility to address any Bulk Current Injection (BCI) test method, as well as the ability to access components from the CI housing, such as the power meter and amplifier, to use in other test applications. With three Conducted Immunity Test Systems to choose from, you should never again have to perform laborious manual CI test procedures or worry about the accuracy of the results.

To learn more, visit arworld.us/totalEMC or call us at 215-723-8181

Come See Us at IEEE EMC Ottawa
The Shaw Centre, Ottawa, Canada
July 25-29, 2016 – Booth 400

ar®

rf/microwave instrumentation

Other ar divisions:
modular rf • receiver systems • ar europe

USA 215-723-8181.
For an applications engineer, call 800-933-8181.
www.arworld.us

Copyright © 2016 AR. The orange stripe on AR products is Reg. U.S. Pat. & TM. Off.

Why AR Solid State Pulsed Amplifiers Should Be On Your Radar



For automotive and military EMC radiated immunity susceptibility testing, as well as radar and communication applications, there is now a very attractive alternative to Traveling Wave Tube Amplifiers (TWTA's).

AR's new offerings include various frequency ranges and output power levels to meet several standards, or designs can be tailored to suit your specific application. These amplifiers feature a touchscreen control panel, GPIB interface, TTL gating, fault monitoring, and forced air cooling.

Features & Benefits For These Rugged Amplifiers Are:



- Octave Frequencies: 1-2 GHz and 2-4 GHz
- Narrowband Frequencies: 1.2-1.4 GHz & 2.7-3.1 GHz
- Power Levels: 1 kW to 150 kW
- Harmonic Distortion of -18dBc @ 1dB compression point
- Pulse Widths to 100 μsec. & Duty Cycles to 10%
- High Mean Time To Failure (MTTF)
- Mismatch Tolerance - Will operate without damage or oscillation with any magnitude and phase of source and load impedance.
- Numerous Applications Possible - Automotive, MIL STD 464, DO-160 and Military Radar

To learn more, visit www.arworld.us or call us at 215-723-8181.

Come See Us at IEEE EMC Ottawa
The Shaw Centre, Ottawa, Canada, July 25-29, 2016 – Booth 400

ISO 9001:2008 Certified

We don't just build great products.
We build great products that last.

BUILT TO LAST

rf/microwave instrumentation

Other ar divisions: modular rf • receiver systems • ar europe

USA 215-723-8181. For an applications engineer, call 800-933-8181.
In Europe, call ar United Kingdom +44 1908 282766 • ar France +33147917530 • ar Deutschland +49 6101 802700 • ar Benelux +31 172 423000

www.arworld.us
Download the AR RF/Microwave Mobile App: www.arworld.us/arApp

Copyright © 2016 AR.
The orange stripe on AR products is Reg. U.S. Pat. & TM. Off.

SUNDAY

7 am	8 am	9 am	10 am	11 am	Noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm
	Exhibitor Set Up											

MONDAY

7 am	8 am	9 am	10 am	11 am	Noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm
	Exhibitor Set Up											
			Break		Lunch			Break				
		Workshops & Tutorials					Workshops & Tutorials					
	Global University					Global University						
Technical Committee Meetings					Technical Committee Meetings						IEEE EMC Young Professionals Party	

TUESDAY

7 am	8 am	9 am	10 am	11 am	Noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm
			Exhibit Hall Open									
				Tech. Sessions			Technical Sessions					
			Experiments and Demos				Experiments and Demos					
			Break		Lunch			Break				
		PLENARY Session		Special Session			Special Session					
Technical Committee Meetings				Special Event	Technical Committee Meetings		Panel Session		Panel Session		EMC 2016 Welcome Reception (to 8pm)	

WEDNESDAY

7 am	8 am	9 am	10 am	11 am	Noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm
			Exhibit Hall Open									
	Technical Sessions							Technical Sessions				
				Poster Session								
		Experiments and Demos					Experiments and Demos					
			Break		Lunch			Break				
				Special Event			Panel Session					
Technical Committee Meetings					Technical Committee Meetings					Technical Committee Meeting	Gala Event (to 9:30pm)	

THURSDAY

7 am	8 am	9 am	10 am	11 am	Noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm
		Exhibit Hall Open			Exhibit Hall Move Out							
	Technical Sessions						Technical Sessions					
	Global University											
	Special Session											
		Experiments and Demos		Founders & Past Presidents Luncheon								
Team EMC Bike Ride					Technical Committee							
Technical Committee Meetings			Break		Lunch			Break				

FRIDAY

7 am	8 am	9 am	10 am	11 am	Noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm
	Exhibit Hall Move Out											
	Workshops & Tutorials						Workshops & Tutorials					
			Break		Lunch			Break				
Technical Committee Meetings												

MONDAY

Fundamentals of EMC

FULL-DAY TUTORIAL
MO-AM-1 and MO-PM-1, 8:30 AM - 5:30 PM, Room 214
SPONSORED BY:
IEEE EMCS Education Committee (EdCom)
CO-CHAIRS: Mark Steffka, General Motors Powertrain, Milford, Michigan, USA
Randy Jost, Ball Aerospace and Technologies Corporation, Westminster, Colorado, USA

This tutorial is an overview of many of the major topics that need to be considered when designing an electronic product or system to meet EMI/EMC requirements.

Planned Speakers and Topics

Introduction
Mark Steffka, General Motors Powertrain, Milford, Michigan, USA

Welcome and Presentation

Radiated Emissions
Lee Hill, Silent Solutions, Amherst, New Hampshire, USA

Conducted Emissions
Mark Steffka, General Motors Powertrain, Milford, Michigan, USA

PCB Design for EMI/EMC
Bruce Archambeault, Missouri University of Science and Technology, Rolla, Missouri, USA

Grounding
Todd H. Hubing, LearnEMC, Stoughton, Wisconsin, USA

Shielding
Robert Scully, NASA Johnson Space Lab, Houston, Texas, USA

Introduction to Electromagnetic Susceptibility (Immunity)
Tom Jerse, The Boeing Company, Seattle, Washington, USA

Filters for EMI/EMC
Arturo Mediano, University of Zaragoza, Zaragoza, Spain

Test and Measurement for EMC
Bogdan Adamczyk, Grand Valley State University, Grand Rapids, Michigan, USA

Military EMC

FULL-DAY TUTORIAL
MO-AM-2 and MO-PM-2, 8:30 AM - 5:30 PM, Room 205
CHAIR: L. Gregory Hiltz, Quality Engineering Test Establishment, Department of National Defence, Ottawa, Ontario, Canada

The tutorial will focus on new updates to MIL-STD-461G and NATO military standards, and specialized military topics including military system design requirements in view of new high power microwave threats, frequency spectrum management, EMC requirements for military aircraft, and in-flight use of RF Transmitting Portable Electronic Devices (TPEDs).

Planned Speakers and Topics

8:30 AM – 9:00 AM | ID 6977
MIL-STD-461G Highlights & Under-the-Radar Subtleties
Ken Javor, EMC Compliance, Huntsville, Alabama, USA

9:00 AM – 9:30 AM | ID 7092
MIL-STD-461G Personal Bourne Electrostatic Discharge Test CS118
Fred Heather, US Navy, Patuxent River, Maryland, USA

9:30 AM – 12:00 PM | ID 7093
MIL-STD-461G Indirect Effect Lightning Test CS117
Fred Heather, US Navy, Patuxent River, Maryland, USA

1:30 PM – 2:00 PM | ID 6994
NATO Electromagnetic Environmental Environment Standardization Activities
AJM (Edwin) van Bladel, Royal Netherlands Air Force (RNLAF), Dongen, Netherlands

2:00 PM – 2:30 PM | ID 6989
Introduction to NATO Allied Environmental Conditions and Tests Publication (AECTP) 250 and 500
AJM (Edwin) van Bladel, Royal Netherlands Air Force (RNLAF), Woensdrecht, Netherlands

2:30 PM – 3:00 PM | ID 6998
NATO Land Platform and System Verification and Testing: Allied Environmental Conditions and Tests Publication (AECTP) Series 500 Category 507
L. Gregory Hiltz, Quality Engineering Test Establishment, Department of National Defence Ottawa, Ontario, Canada

3:30 PM – 4:00 PM | ID 6958
Military System Design Requirements in View of Ultimate High Power Microwave Threat
Andrew S. Podgorski, ASR Technologies Inc., Ottawa, Ontario, Canada

4:00 PM – 4:30 PM | ID 7012
Inter-System EMC – The Canadian Department of National Defence (DND) and Spectrum Management
Major Christian René, DND Frequency Spectrum Management, Department of National Defence, Ottawa, Ontario, Canada

4:30 PM – 5:00 PM | ID 7019
EMC Requirements for Military Aircraft
Doug Munn, Department of National Defence, Ottawa, Ontario, Canada

5:00 PM – 5:30 PM | ID 6992
Evolution of Military and Civilian Radio Technology; In-Flight Use of RF Transmitting Portable Electronic Computing and Communication Devices as Avionics and Mission Equipment
Lorne Calles, Department National Defense, Ottawa, Ontario, Canada

Development Activities for IEEE P370 Standard - Electrical Characterization of Printed Circuit Board and Related Interconnects at Frequencies up to 50 GHz

HALF-DAY WORKSHOP
MO-AM-3, 8:30 AM - 12:00 PM, Room 206
SPONSORED BY: TC10
CO-CHAIRS: Samuel Connor, IBM Corporation, Research Triangle Park, North Carolina, USA
Xiaoning Ye, Intel Corporation, Hillsboro, Oregon, USA

The objective of this workshop is to provide an overview of IEEE P370's purpose and scope for attendees who were not previously aware of its existence and then to review current work activities of the standard project's three task groups (Test-fixture Design Criteria, De-embedding Verification, and S-Pa rameter Integrity and Validation).

Planned Speakers and Topics

8:30 AM - 8:45 AM | ID 7075
Overview of P370 Purpose, Scope, and Task Group Organization
Xiaoning Ye, Intel, Hillsboro, Oregon, USA,

8:45 AM – 9:30 AM | ID 6969
Discussion of Task Group 1 Activities – Test-Fixture Design Criteria
Jim Nadolny, Samtec, Inc., Mechanicsburg, Pennsylvania, USA

Continued on Page 18

NEW at HV TECHNOLOGIES

Booth #200

EMC - PARTNER

Compact, Creative, Robust, & Reliable Instruments since 1995

New - **Solutions to Avionics & MIL specs**; Single Coupler with large aperature, Touchscreen Automated, run entire test suite (all waveforms) non-stop.

Avionics - DO 160, CS 117, Boeing, Airbus

- ***New*** Model AVI3000 Single generator/coupler for all waveforms
- Now available for Rental in North America

MIL SPEC - CS 115/116

- ***New*** Model MIL3000 - Single coupler for all CS 115 & 116 all frequencies

CE Mark

- ***New*** IMU Series Multifunction up to 10 CE Mark tests
- Modular - User upgradeable using only a screwdriver

Too much to list here - See it all at Booth 200

montena

Pulsed High Voltage and RF Solutions

Providing Factory Standardized Products to Unique EMC Test Needs since 1978

NEMP - RS 105:

- Mobile - Same day Set Up, Test, Tear Down
- Fixed - for complete vehicle DUT's

300kV Helicopter ESD

Test Generators, IR Antennas for UWB HPEM, and more...

INCO systems

Precision positioning systems for EMC radiated immunity and emissions test applications.

- Turntables - Standard, Custom, Dynamometer
- Software/Free Standing Dynamometers
- Antenna Stands & Masts
- Nearfield Measurement Gantries
- Aircraft Positioning Systems
- Controllers

PONTIS

Monitoring Tests in Harsh EMC Test Environments Since 1989

- EMC Hardened Cameras
- EMC Hardened Audio
- CCTV and Audio Sytems
- Shielded Fiber Optic Converters

PRÂNA

Broadband Power Amplifiers

- **Solid State** - Reliable, predictable, stable
- **Class A** - designed for EMC Applications
- **Robust** - guaranteed power into any load mismatch
- **Modular Design** - Upgradeable for Power & Frequency
- **Quiet** - Fans only run when needed
- **Economical** - Top quality, value price, frugal power demand

GAUSS INSTRUMENTS

Demos in Booth 200!

NEW - Fastest Emissions Testers on the Planet

Putting the Turbo in EMC Since 2007

How Fast? How about **11 seconds instead of 9 hours** to perform CISPR emissions in q-p mode when compared to a traditional superhet based receiver?

How Does It Work? By implementing up to 16,000 receivers in quasi-peak mode with the latest FPGA and ADC technology combined with massive computing power.

Multi-Function with Several Operating Modes - Applicable to Conducted, Radiated, and Disturbance emissions measurements

- Full Compliance Receiver
- Real Time Spectrum Analyzer
- Full Compliance Real-Time Spectrogram
- AM/FM Demodulation
- APD (Amplitude Probablity Distribution) and Persistence
- CISPR 14 Click Rate Analyzer

Yes, It Complies and Always Has - Gauss Sits on the technical committee that writes and updates CISPR 16-1-1. Need we say more? MIL, Avionics, and most Automotive standards on board

HV TECHNOLOGIES, Inc.

Partners for HV and EMC Solutions

Stop by Booth #200

Since 1998 - Distributing, Supporting, & Servicing, EMC test solutions by creative, customer centric, independent manufacturers focused solely on crafting the most effective test instruments.

www.hvtechnologies.com
emcsales@hvtechnologies.com
+1-703-365-2330

9:30 AM – 10:45 AM | ID 7081
Discussion of Task Group 2 Activities – De-embedding Verification
Eric Bogatin, Teledyne LeCroy, Boulder, Colorado, USA

10:45 AM – 11:30 AM | ID 7089
Discussion of Task Group 3 Activities – S-Parameter Integrity and Validation
Mikheil Tsiklauri, Missouri University of Science and Technology, Rolla, Missouri, USA,
Jun Fan, Missouri University of Science and Technology, Rolla, Missouri, USA

11:30 AM – 12:00 AM
Summarize Key Developments and Discuss and Prioritize Next Steps for Each Task Group

Application of Reverberation Chambers
HALF-DAY TUTORIAL
MO-AM-4, 8:30 AM -12:00 PM, Room 207
CHAIR: Vignesh Rajamani, Exponent, Phoenix, Arizona, USA

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.

Planned Speakers and Topics

ID 7047
Rationale for RC Testing
Vignesh Rajamani, Exponent, Phoenix, Arizona, USA

ID 6996
Overview of Reverberation Chamber Theory
Chuck Bunting, Oklahoma State University (OSU), Stillwater, Oklahoma, USA

ID 6970
Electromagnetic Probability-of-Effect Assessment Tool for High-Power HERO/EMV testing
Justin Rison, Carl Hagar, and Greg Tait, Naval Surface Warfare Center, Dahlgren, Virginia, USA

ID 7035
Aerospace Applications of Reverberation Chamber Techniques for the Performance Assessment of Components and Systems
Dennis Lewis, Boeing, Seattle, Washington, USA

ID 7108
DO160G Chamber Calibration and Test Findings
Garth D'Abreu, ETS Lindgren, Cedar Park, Texas, USA

Measurement Uncertainty – Challenges and Solutions
HALF-DAY WORKSHOP
MO-AM-5, 8:30 AM - 12:00 PM, Room 208
CO-CHAIRS: Doug Kramer, ETS-Lindgren, Cedar Park, Texas, USA
Carlo Carobbi, University of Florence, Florence, Italy

This tutorial will provide an overview and discussion of measurement uncertainty to further the knowledge of this subject in the international EMC testing community.

Planned Speakers and Topics

ID 7015
The New, Second Edition of the Guide to Measurement Uncertainty – How the Evaluation of MU Will Evolve in the Future
Carlo F. M. Carobbi, University of Florence, Florence, Italy

ID 7049
Measurement Model Based Uncertainty Analysis for Antenna Calibrations
Zhong Chen, ETS-Lindgren, Cedar Park, Texas, USA

ID 7031
Everyday, Practical Tools for Measurement Uncertainty Evaluation in a Lab Environment
Dennis Lewis, The Boeing Company, Seattle, Washington, USA

ID 7067
An Introduction to the Microwave Uncertainty Framework at NIST
Perry Wilson, The National Institute of Standards and Technology (NIST), Boulder, Colorado, USA

State-of-the-art research and education in electromagnetic information security
HALF-DAY TUTORIAL
MO-AM-6, 8:30 AM - 12:00 PM, Room 215
SPONSORED BY: TC5
CHAIR: Yuichi Hayashi, Tohoku Gakuin University, Tagajo, Japan
CO-CHAIR: William A. Radasky, Metatech Corporation, Goleta, California, USA

This tutorial session focuses on the problem of reduced security concerning electromagnetic waves (electromagnetic information security), which has made attack detection particularly difficult at the physical level.

Planned Speakers and Topics

Introduction
Yuichi Hayashi, Tohoku Gakuin University, Sendai, Japan

ID 7085
Overview of EM Information Leakage from Cryptographic Modules
Josep Balasch, KU Leuven, Leuven, Belgium

ID 6974
Proactive and Reactive Countermeasures Against Passive and Active EM Attacks
Noriyuki Miura, Kobe University, Kobe, Japan

ID 7002
Estimation Method of EM Information Leakage from Cryptographic-Devices Embedded Circuit Boards
Kengo Iokibe, Okayama University, Okayama, Japan

ID 6954
EM Information Leakage Threats in Public Spaces
Yuichi Hayashi, Tohoku Gakuin University, Sendai, Japan

ID 6953
Education for Practical Hardware Security Technology
Naofumi Homma, Tohoku University, Sendai, Japan

EMC – Future Standards Updates and New Test Methodologies
HALF-DAY TUTORIAL
MO-PM-3, 1:30 PM - 5:30 PM, Room 206
CO-CHAIRS: Garth D'Abreu, ETS-Lindgren, Cedar Park, Texas, USA
Robert Kado, Fiat Chrysler Automobiles, Auburn Hills, Michigan, USA

In this tutorial, experts from industry and academia will share their latest research in automotive EMC to address emerging automotive trends.

Planned Speakers and Topics

ID 7013
An Overview of Automotive EMC Standards and Emerging Requirements
Craig Fanning, Elite Electronic Engineering, Downers Grove, Illinois, USA

ID 7088
EMC Chamber Design for Vehicle and Electronic Sub-Assemblies (ESA) Testing
Garth D'Abreu, ETS-Lindgren, Cedar Park, Texas, USA

ID 7086
Grounding in Automotive PCBs and Systems
Todd Hubing, Clemson University and LearnEMC, Stoughton, Wisconsin, USA

ID 7038
EMI Characterization of DC Power Devices and Motors
Flavio Canavero, Dipartimento di Elettronica, Politecnico di Torino, Torino, Italy

ID 7051
Update on Next Stage Certification Environment Sponsored by the USDOT for the 5.9 GHz DSRC Technology
Dmitri Khijniak, 7layers, Irvine, California, USA

The Role of the IEC Advisory Committee on EMC (ACEC) in Coordinating IEC EMC Activities
HALF-DAY TUTORIAL
MO-PM-4, 1:30 PM - 5:30 PM, Room 207
SPONSORED BY: TC2
CHAIR: Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

This tutorial is intended to inform researchers in the field of EMC of the oordination of EMC standards and activities in the International Electrotechnical Commission (IEC) by the IEC Advisory Committee on EMC known as ACEC.

Planned Speakers and Topics

ID 6943
What is ACEC?
William A. Radasky, Metatech Corporation, Goleta, California, USA

ID 6913
Recent Trends in CISPR and its Subcommittees
Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

ID 6946
Recent Trends in TC77 (EMC) and its Subcommittees
William A. Radasky, Metatech Corporation, Goleta, California, USA

ID 6947
Emission Control in the 2 kHz to 150 kHz Frequency Band
William A. Radasky, Metatech Corporation, Goleta, California, USA

ID 6948
EMC for E-mobility
William A. Radasky, Metatech Corporation, Goleta, California, USA

ID 6914
Recent Topics in IEC TC69 (Electrical Equipment in Medical Practice)
Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

ID 6915
TC106 Overview - Assessment of Human Exposure to EMF
Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

Introduction to EMI Modeling Techniques
HALF-DAY TUTORIAL
MO-PM-5, 1:30 PM - 5:30 PM, Room 208
SPONSORED BY TC9
CO-CHAIRS: Bruce Archambeault, Missouri University of Science and Technology, Rolla, Missouri, USA and IBM Corporation, Research Triangle Park, North Carolina, USA
Chuck Bunting, Oklahoma State University, Stillwater, Oklahoma, USA

This tutorial will provide an introduction to all of the commonly used numerical EMC modeling techniques.

Planned topics and speakers

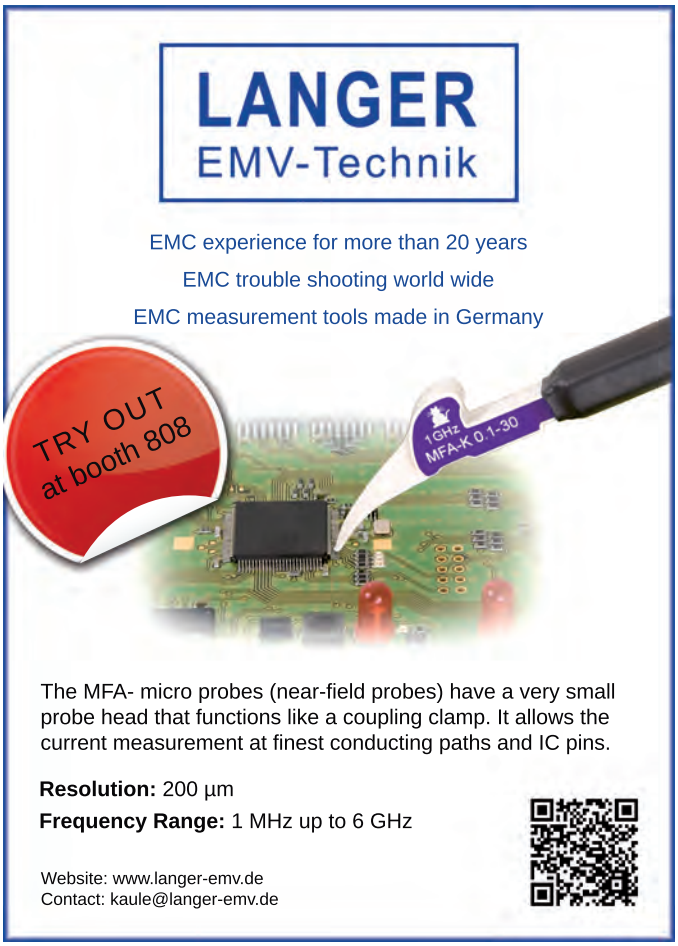
ID 7100
Introduction to the Transmission-Line Modeling Method (TLM)
David Johns, CST of America, Boston, Massachusetts, USA

ID 6925
Introduction to the Finite Difference Time-Domain (FDTD) Technique
Bruce Archambeault, Missouri University of Science and Technology, Rolla, Missouri, USA and IBM Corporation, Research Triangle Park, North Carolina, USA

ID 6995
Introduction to the Finite Element Method
Chuck Bunting, Oklahoma State University, Stillwater, Oklahoma, USA

ID 7026
An Introduction to the Method of Moments for Electromagnetic Calculations
Jim West, Oklahoma State University, Stillwater, Oklahoma, USA

ID 7039
Fundamentals of Finite Integration Technique (FIT): An Introduction to EMI Modeling Techniques
Tracey Vincent, CST of America, Boston, Massachusetts, USA



Electromagnetic Compatibility in 2016 and Beyond: What Is It and Why Do We Care?

Special Event PLENARY,
8:30 AM - 10:00 AM, Room 215

A growing number of managers are recognizing that EMC is and must be an integral part of the product, from start to finish. This is true across a broadening swath of industry, both commercial and military. This Symposium has several areas of focus that highlight different aspects of the discipline where such recognition is growing.

About Dr. Robert Scully

Bob holds a PhD from the University of Texas at Arlington in Electrical Engineering with strong emphasis in electromagnetics, is an IEEE Fellow, a registered Professional Engineer in the state of Texas, a licensed commercial (PG-12-27194) and amateur (KG5KVV) radio operator, holds various EMC certifications from the University of Missouri-Rolla (now Missouri University of Science and Technology) and iNARTE, and is a member of Tau Beta Pi and Eta Kappa Nu.

Radiated Emissions as a Function of Common Mode Current

Hardware Experiments and Demonstration,
10:00 AM - 12:00 PM, Rear of Exhibit Hall
Presenters: John McCloskey, Jen Roberts,
NASA/Goddard Space Flight Center,
Greenbelt, MD, USA

In this demonstration, a controlled current is applied to a wire above a ground plane, and the resulting electric field is measured.

Minimizing Magnetic Field Susceptibility Through the Proper Use of Static and Low Frequency Magnetic Shielding

Hardware Experiments and Demonstration,
10:00 AM - 12:00 PM, Rear of Exhibit Hall
Presenters: Pablo Narvaez, William Hatch,
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA

This hardware experiment/demonstration presents magnetic shielding methods similar to those applied on JPL hardware for typical magnetic cleanliness programs.

Time Domain Site VSWR Measurements

Hardware Experiments and Demonstration,
10:00 AM - 12:00 PM, Rear of Exhibit Hall
Presenter: Zhong Chen, ETS-Lindgren,
Cedar Park, Texas, USA

This demonstration shows the time domain measurement process of obtaining the site VSWR as called out in CISPR for test site validation.

Ask the Experts - EMC Panel

Special Event, 10:30 AM - 11:30 AM, Exhibit Theatre

This Ask the Experts Panel is a great opportunity to ask those difficult-to-answer questions!

Panelists include:

Lee Hill, SILENT Solutions LLC, Worcester Polytechnic Institute (WPI), Amherst, New Hampshire, USA
Mark Steffka, General Motors Powertrain, Milford, Michigan, USA
Bruce Archambeault, Missouri University of Science and Technology, Rolla, Missouri, USA and IBM Corporation, Research Triangle Park, North Carolina, USA
Farhad Rachidi, The Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland
Frank Sabath, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

Emissions Measurement

Technical Session, TU-AM-1,
10:30 AM - 12:00 PM, Room 205
Sponsored by TC-2
Co-chairs: Don Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA
Dave Arnett, Hewlett Packard, Vancouver, Washington, USA

10:30 – 11:00 AM | ID 6830

Employment of Microwave Absorbers for EMI/RFI Mitigations from High Speed Digital Buses with Signal Integrity Considerations

Mohammad Ali Khorrami and **Paul Dixon,** Laird, Randolph, Massachusetts, USA, Todd Steigerwald and Haris Chowdhry, Advanced Micro Devices Inc., Austin, Texas, USA

11:00-11:30 AM | ID 6383

Millimeter-wave Emissions Measurement Challenges for FCC Intentional Radiator Compliance

Mark Terrien, Keysight Technologies, Santa Rosa, California, USA

11:30 – 12:00 PM | ID 6500

Pitfalls in Measuring Discontinuous Disturbances with Latest Click Analyzers

Mario Monti, Elena Puri, and **Massimo Monti,** Elettronica Monti, Ponte a Egola, Italy

Modeling of Reverberation Chambers

Technical Session, TU-AM-2
10:30 AM - 12:00 PM Room 207
Co-chairs: Vignesh Rajamani,
Exponent, Phoenix, Arizona, USA
Albert Reuhli, Missouri University of Science and Technology,Winham, New Hampshire, USA

10:30 AM – 11:00 AM | ID 6451

Frequency- and Time-Domain Measurement of Reverberation Chamber Q: An In-Silico Analysis

James West, Vignesh Rajamani, and **Chuck Bunting,** Oklahoma State University, Stillwater, Oklahoma, USA

11:00 AM – 11:30 AM | ID 6719

Low Frequency Modeling for Electromagnetic Analysis of Arbitrary Anechoic Chambers

Zubiao Xiong and **Ji Chen,** University of Houston, Houston, Texas, USA, Zhong Chen, ETS-Lindgren, Cedar Park, Texas, USA

11:30 AM – 12:00 PM | ID 6656

Evaluation of Stirrer Efficiency Varying the Volume of the Reverberation Chamber

Luca Bastianelli, Franco Moglie, and **Valter Mariani** Primiani, Universit Politecnica delle Marche, Ancona, Italy

Cable and Connectors

Technical Session, TU-AM-3,
10:30 AM - 12:00 PM, Room 206
Sponsored by TC-4
Co-chairs: John Kraemer,
Rockwell Collins, Cedar Rapids, Iowa, USA
Karen Burnham, Ford Motor Company, Detriot, Michigan, USA

10:30 AM – 11:00 AM | ID 6298

Application of a Magnetic Near-Field Probe to the Differentiation of Defective Connections

Hiroki Funato and **Hideki Osaka,** Hitachi Ltd., Yokohama, Japan, Isao Hoda, Hitachi America, Ltd. Farmington Hills, Michigan, USA

11:00 AM – 11:30 AM | ID 6421

EMI Control Performance of the Absorbing Material for Application on Flexible Cables

Guangyao Shen, Qian Liu, Xiangyang Jiao, Ruijie He, and **Victor Khilkevich,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Paul Dixon, Yoeri Arien,** and **Mohammad Ali Khorrami,** Laird, Randolph, Massachusetts, USA

11:30 AM – 12:00 PM | ID 6718

Study of the Impact of Board Orientation on Radiated Emissions

Continued on Page 22



WHO PROVIDES EMC ON A GLOBAL SCALE?

THE WORLD'S SPEED IS OUR BEAT

AMETEK CTS operates internationally. Just like our corporate customers. And yet we are as small as our smallest regional customer, too. Either way, we're there for you – at full strength.

More at ametek-cts.com

emtest / TESEQ / MILMEGA / ifi

AMETEK®
COMPLIANCE TEST SOLUTIONS

Due to Common-Mode Currents on Attached Cables

Morten S. Rensen, Aalborg University and Bang & Olufsen a/s, Aalborg, and Struer, Denmark, **Kim Jensen,** Bang & Olufsen a/s, Struer, Denmark, **Todd Hubing,** LearnEMC, Stoughton, Wisconsin, USA

Electrostatic Discharge (ESD)

Technical Session, TU-AM-4,
10:30 AM - 12:00 PM, Room 208
Sponsored by TC-5
Co-chairs: David Pommerenke,
Missouri University of Science
and Technology, Rolla, Missouri, USA
Michael McInerney, US Army Corp of
Engineers, Champaign, Illinois, USA

10:30 AM – 11:00 AM | ID 6522

Measurement Techniques to Predict the Soft Failure Susceptibility of an IC without the Aid of a Complete Software Stack

Suyu Yang, Benjamin Orr, Yuandong Guo, Yilong Zhang, and **David Pommerenke,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Hideki Shumiya, Junji Maeshima, Taketoshi Sekine, Yuzo Takita,** and **Kenji Araki,** Sony EMCS Corporation, Tokyo, Japan

11:00 AM – 11:30 PM | ID 6574

An Alternative Air Discharge Test in Contact Discharge of ESD Generator Through Fixed Gap

Takeshi Ishida, Noise Laboratory Co. LTD, Sagamihara City, Japan and University of Electro-Communications, Tokyo, Japan, **Fengchao Xiao, Yoshio Kami, Shuichi Nitta,** University of Electro-Communications, Tokyo, Japan, **Osamu Fujiwara,** Nagoya Institute of Technology, Nagoya, Japan

11:30 AM – 12:00 PM | ID 6432

Fuzzy Based Risk Analysis for IT-System and Their Infrastructure

Tim Peikert and **Heyno Garbe,** Institute of Electrical Engineering and Measurement Technology, Leibniz Universität Hannover, Hannover, Germany. **Stefan Potthast,** Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

Advancements in Numerical Methods for Signal and Power Integrity (Part 1)

Technical Session, TU-AM-5,
10:30 AM - 12:00 PM, Room 214
Sponsored by TC-10
Co-chairs: Kai Xiao, Intel Corporation, Dupont, Washington, USA
Qing He, Oracle Corporation,
Santa Clara, California, USA

10:30 AM – 11:00 AM | ID 6742

A Fast Simulation Method to Measure the Circuit Nonlinearity

Jianfang Olena Zhu, Jun Liao, and **Adam Norman,** Intel Corporation, Hillsboro, Oregon, USA, Roman Meltser, Intel Corporation, Haifa, Israel

11:00 AM – 11:30 AM | ID 6584

A Fast Surface Method to Model Skin Effect in Transmission Lines with Conductors of Arbitrary Shape or Rough Profile

Utkarsh Patel and **Piero Triverio,** University of Toronto, Toronto, Ontario, Canada

11:30 AM – 12:00 PM | ID 6710

Analysis of Radiated Emissions from PCB using Broadband Green's Function Method

Shaowu Huang, Invensas Corporation, San Jose, California, USA, **Leung Tsang** and **Tien-Hao Liao,** University of Michigan, Ann Arbor, Michigan, USA

EMI Risk Management

Special Session, TU-AM-6,
10:30 AM - 12:00 PM, Room 215
Sponsored by SS3
Co-chairs: Davy Pissoort, KU Leuven, Technology Campus Ostend, Ostend, Belgium
Keith Armstrong, Cherry Clough Consultants Ltd, Stafford, United Kingdom

10:30 AM – 11:00 AM | ID 6811

How to Manage Risks with Regard to Electromagnetic Disturbances

Keith Armstrong, Cherry Clough Consultants Ltd, Stafford, United Kingdom

11:00 AM – 11:30 AM | ID 6851

Why is the IEEE Developing a Standard on Managing Risks Due to EM Disturbances?

Keith Armstrong, Cherry Clough Consultants Ltd, Stafford, United Kingdom, Davy Pissoort, KU Leuven, Technology Campus Ostend, Ostend, Belgium

11:30 AM – 12:00 PM | ID 6852

Non-Standardized Immunity Test Techniques to Help Manage Risks Caused by EM Disturbances

William A. Radasky, Metatech Corporation, Goleta, California, USA, **Keith Armstrong,** Cherry Clough Consultants Ltd., Stafford, United Kingdom

Wireless EMC and Wireless OTA Measurement

Panel Discussion, TU-PM-1A,
1:30 PM - 3:00 PM, Room 205
Organizer: Jun Fan, Missouri University of Science andTechnology, Rolla, Missouri, USA

This panel will cover a few of the hot topics including MIMO testing, product-level EMC debugging for wireless devices, noise coupling mechanisms and characterization, noise source modeling and interference estimation, wireless coexistence, etc.

Panelists include:

David Pommerenke, Missouri University of Science and Technology, Rolla, Missouri, USA
Kenji Araki, Sony EMCS Corporation, Tokyo, Japan
HakByeong Park, Samsung Electronics,
Suwon, South Koria
Harry Skinner, Intel Corporation,
Hillsboro, Oregon, USA
Yihong Qi, DBJ Technologies, Zhuhai, China
William Young, National Institute of Standards and Technology (NIST), Boulder, Colorado, USA

Computational Electromagnetics (Part 1)

Technical Session, TU-PM-2,
1:30 PM - 5:30 PM, Room 207
Sponsored by TC-9
Co-chairs: Shaowu Huang, Intel Corporation, DuPont, Washington, USA
Ouyang Gang, Intel Corporation, DuPont, Washington, USA

1:30 PM - 2:00 PM | ID 6446

Global Adjoint Sensitivity Analysis of Coupled Coils using Parameterized Model Order Reduction

Luca De Camillis and **Giulio Antonini,** Universita_degli Studi dell'Aquila, L'Aquila, Italy, **Francesco Ferranti,** Vrije Universiteit Brussel, Brussels, Belgium, **Albert E. Ruehli,** Missouri University of Science and Technology,
Rolla, Missouri, USA

2:00 PM - 2:30 PM | ID 6534

Electromagnetic Field Couplings for EMC Applications in FEM Simulation Environment

Istvan Bardi, Rickard Petersson, Flavio Calvano, and **Matthew Commens,** ANSYS, Inc., Canonsburg, Pennsylvania, USA

2:30 PM - 3:00 PM | ID 6562

Performance Evaluation of Feature Selective Validation in a Highly Resonant Environment

Rahul Bakore, Vignesh Rajamani, James West, and **Chuck Bunting,** Oklahoma State University, Stillwater, Oklahoma, USA

3:30 PM - 4:00 PM | ID 6615

A PCB-based Electrically Tunable Absorber with an Expanded Absorption Frequency Band

Eon-Seok Jo, Soo-Bean Cho, and **Dongho Kim,** Sejong University, Seoul, The Republic of Korea

4:00 PM - 4:30 PM | ID 6677

Simulation of LED Lighting System Under BCI Test Setup

Irina Oganezova, Tbilisi State University and EMCoS ltd., **Tbilisi, Georgia, Robert Kado,** Fiat Chrysler Automobiles (FCA), Auburn Hills, Michigan, USA, **Badri Khvitia,** EMCoS ltd. and Tbilisi State University, Tbilisi, Georgia, **Anna Gheonjian** and **Roman Jobava,** EMCoS ltd., Tbilisi, Georgia

4:30 PM - 5:00 PM | ID 6707

Numerical Study of SAR on Multi-Component Orthopaedic Hip Replacement System During MRI

Jianfeng Zheng, Dawei Li, and **Li Chen,** University of Houston, Houston, Texas, USA, Wolfgang Kainz, Center for Devices and Radiological Health, Food, and Drug Administration, Silver Spring, Maryland, USA

5:00 PM - 5:30 PM | ID 6717

RF Induced Heating Comparison Between in Vivo and in Phantom for 1.5T MRI

Ran Guo, Jianfeng Zheng, and **Ji Chen,** University of Houston, Houston, Texas, USA, Wolfgang Kainz, Center for Devices and Radiological Health, Food, and Drug Administration, Silver Spring, Maryland, USA

Environmental Considerations and Electromagnetic Design Aspects of Space-borne Vehicles

Special Session, TU-PM-3,
1:30 PM - 4:00 PM, Room 206
Sponsored by SC7
Co-chairs: Robert Scully, NASA Johnson Space Lab, Houston, Texas, USA
James Lukash, Lockheed Martin, Santa Clara, California, USA

1:30 PM - 2:00 PM | ID 6309

Analysis and Effects of Space Radiation Induced Single Event Transients

Reinaldo Perez, Jet Propulsion Laboratory, Pasadea, California, USA

2:00 PM - 2:30 PM | ID 6363

Surface Charging Simulations of an Orion-like Spacecraft in a Geosynchronous Space Plasma

Bryon Neufeld, Electro Magnetic Applications, Lakewood, Colorado, USA

2:30 PM - 3:00 PM | ID 6752

Electromagnetic Compatibility Design Implementation and Test of the SMAP Spacecraft to Meet Stringent L-Band Radiated Emissions Requirements

Chi-Chien Nelson Huang, Ali Ghaneh, Subha Comandur, Jet Propulsion Laboratory, Pasadena, California, USA

3:00 PM - 3:30 PM | ID 6881

EMC Testing on the Integrated Science Instrument Module (ISIM)

John McCloskey, NASA/Goddard Space Flight Center, Greenbelt, Maryland, USA

3:30 PM - 4:00 PM | ID 6763

Magnetic Shield Design Modeling and Validation for SWOT Spacecraft Ka-band Extended Interaction Klystron

Edward Gonzales and **Dalia Mcwatters,** NASA Jet Propulsion Laboratory, Pasadena, California, USA

HEMP/IEMI and EM Information Leakage

Technical Session, TU-PM-4,
1:30 PM - 5:30 PM, Room 208
Sponsored by TC-5
Co-chairs: Yuichi Hayashi,
Tohoku Gakuin University, Tgajyo, Japan
Frank Sabath, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

1:30 PM - 2:00 PM | ID 6474

Hirschman Optimal Transform Based Correlation Frequency Electromagnetic Analysis

Zhu Wang, Weiqing Huang, Degang Sun, Yan Wang, Changhai Ou, Juan Ai, and **Xinping Zhou,** University of Chinese Academy of Sciences, Beijing, China, Victor DeBrunner, Florida State University, Tallahassee, Florida, USA,

2:00 PM - 2:30 PM | ID 6524

Time Domain Measurement of Shielded Cables with Connectors

Edward Savage and **William A. Radasky,** Metatech Corporation, Goleta, California, USA, **Rick Williamson,** Aetna Insulated Wire and Cable, Virginia Beach, Virginia, USA

2:30 PM - 3:00 PM | ID 6268

Experimental Investigation on Higher Order Modes in Guided Wave Electromagnetic Pulse (EMP) Simulator

Rakesh Kichouliya and **Sandeep M Satav,** Research Centre Imarat, Hyderabad, India, **M. Joy Thomas,** Indian Institute of Science, Bangalore, India

3:30 PM - 4:00 PM | ID 6662

Interaction of High Power Electromagnetic Pulses with Power Cables and Electronic Systems

Rakesh Kichouliya, Research Centre Imarat, Hyderabad, India, **Joy Thomas,** Indian Institute of Science, Bangalore, India

4:00 PM - 4:30 PM | ID 6320

Computer LCD Recognition Based on the Compromising Emanations in Cyclic Frequency Domain

Jun Shi, Degang Sun, Meng Zhang, and **Dong Wei,** Chinese Academy of Sciences, Beijing, China, **Abbas Yongacoglu**, University of Ottawa, Ottawa, Ontario, Canada

4:30 PM - 5:00 PM | ID 6576

An Adaptive Singular Value Decomposition-based Method to Enhance Correlation Electromagnetic Analysis

Xinping Zhou, Degang Sun, Zhu Wang, Changhai Ou, Juan Ai, and **Chonghua Wang,** Chinese Academy of Sciences, Beijing, China, Victor Debrunner, Florida State University, Tallahassee, Florida, USA

5:00 PM - 5:30 PM | ID 6632

A New Efficient Interesting Points Enhanced Electromagnetic Attack on AT89S52

Changhai Ou, Zhu Wang, Degang Sun, Xinping Zhou and **Juan Ai,** Chinese Academy of Sciences Beijing, China

Advancements in Numerical Methods for Signal and Power Integrity (Part 2)

Technical Session, TU-PM-5,
1:30 PM - 5:30 PM,Room 214
Sponsored by TC-10
Co-chairs: Dan Jiao, Purdue, West Lafayette, Indiana, USA
Darryl Kostka, CST of America, San Matteo, California, USA

1:30 PM - 2:00 PM

Meshless Modeling for Electrical-Thermal Co-Simulation of IR-Drop Analysis

Tadatoshi Sekine and **Hideki Asai,** Shizuoka University, Hamamatsu-shi, Japan

2:00 PM - 2:30 PM

Addressing Planar Noise Coupling in Multilayer PCB Structures

Ihsan Erdin, Celestica Inc., Ottawa, Ontario, Canada, **Ram Achar,** Carleton University, Ottawa, Ontario, Canada

2:30 PM - 3:00 PM

Efficient Simulation for Large Scale Transistor Level Electrostatic Discharge Analysis and Simulation

Qing He, William Au, Alexander Korobkov, and **Subramanian Venkateswaran,** Oracle Corporation, Santa Clara, California, USA

3:30 PM - 4:00 PM

Fast Algorithm for Nonlinear Signaling Analysis

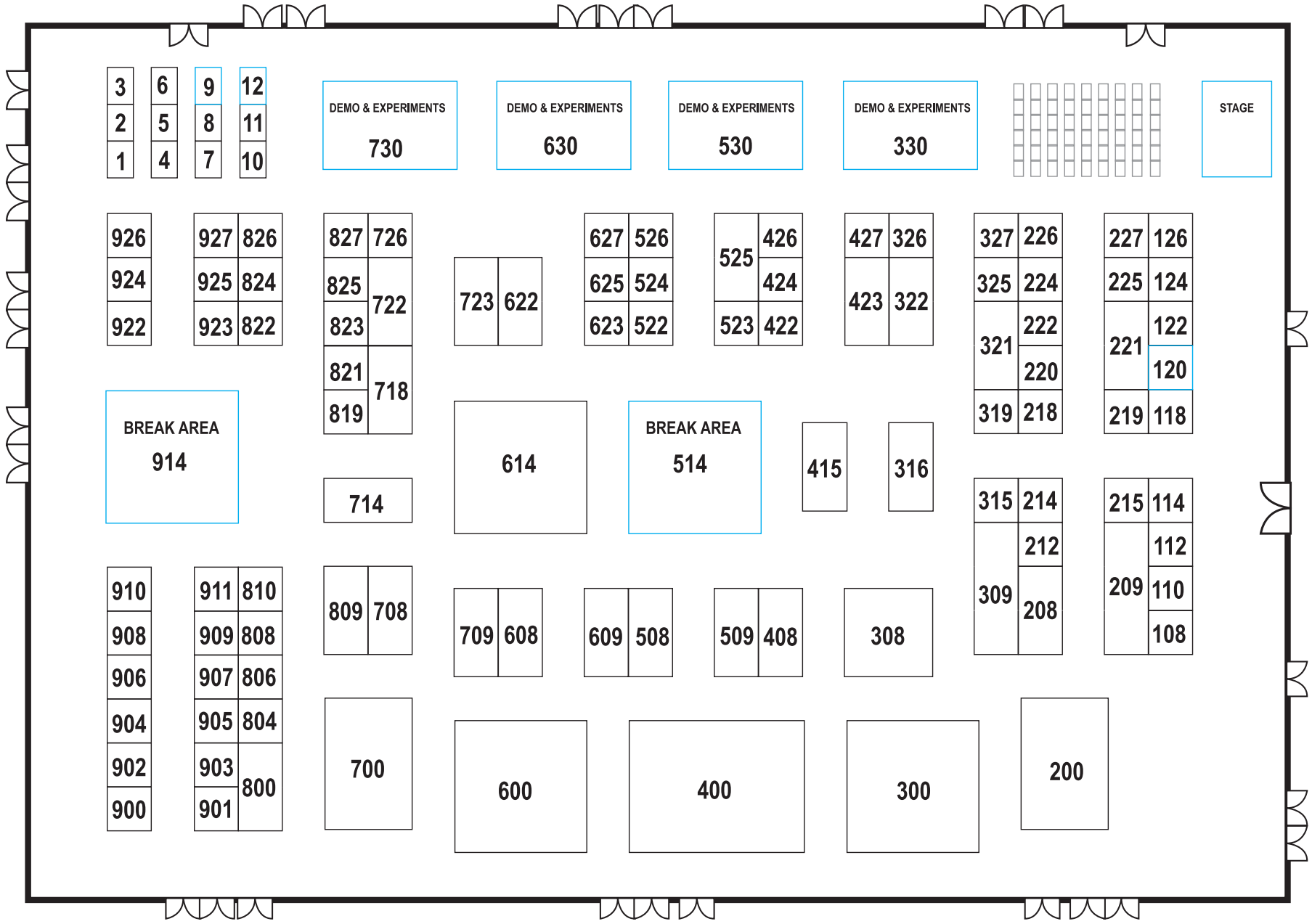
Dan Jiao, Purdue, West Lafayette, Indiana, USA
Jianfang Olena Zhu, Intel Corporation, Hillsboro, Oregon, USA

Continued on Page 28

EXHIBIT HALL MAP KEY

Booth		Booth		Booth	
823	A2LA - American Association for Laboratory Accreditation	627	ESD Guns	905	NTS
309	A.H. Systems, Inc.	219	Espresso Engineering	522	NVLAP
423	Advanced Test Equipment Rentals	600	ETS-Lindgren	114	Oak-Mitsui Technologies
609	AE Techron, Inc.	3	Exemplar Global	718	Ophir RF Inc.
415	Altair Engineering Inc.	901	Fair-Rite Products Corporation	325	Panashield, LLC A Braden Shielding Systems Company
224	Amber Precision Instruments, Inc.	327	Filconn Inc.	426	Pearson Electronics Inc.
614	Ametek CTS	700	Fischer Custom Communications, Inc.	8	PLP Technologies
922	Amphenol Canada	900	Gap Wireless	927	Pulse Power and Measurement Ltd (PPM)
508	Andro Computational Solutions	722	Gauss Instruments GmbH	427	Raymond EMC Enclosures Ltd
1	Anechoic Systems L.L.C.	112	General Test Systems, Inc.	523	Reliant EMC LLC
215	ANSI-ASC C63 Committee on EMC	622	HAEFELY HIPOTRONICS	108	Retlif Testing Laboratories
326	ANSI-ASQ National Accreditation Board d.b.a. Laboratory Accreditation Bureau	200	HV Technologies, Inc.	923	RF Exposure Lab
124	Apple Inc.	221	IEEE 2017 EMC SI Symposium	800	Rigol Technologies
424	Applied Physical Electronics, L.C.	220	IEEE Antenna and Propagation Society	300	Rohde & Schwarz
400	AR RF Microwave Instrumentation	209	IEEE EMC Society	6	Safety & EMC China
821	ARC Technologies, Inc.	212	IEEE EMC SOCIETY HISTORY COMMITTEE	319	Schlegel Electronic Materials Inc.
906	Astrodyne TDI	225	IEEE EMC Society Standards	708	Schmid & Partner Engineering AG
4	Bomatec International Corp.	5	IEEE PSES - Product Safety Engineering Society	122	Select Fabricators
810	Communications & Power Ind CPI	714	In Compliance Magazine	909	SGS North America Inc.
709	Com-Power Corportation	316	ITEM Media	902	Siepel
408	Comtest Engineering, Inc.	907	Jet Metal Technologies	926	Siglent Technologies
308	CST of America, Inc.	904	Jiangsu WEMC Technology Co., Ltd.	806	Spira Manufacturing
911	Cuming-Lehman Chambers, Inc.	903	KEMET Electronics	118	Sunol Sciences Corp.
819	D.L.S. Electronic Systems Inc.	608	Keysight Technologies	924	TDK-Lambda Americas-High Power Division
822	Dayton T. Brown, Inc.	804	Kitagawa Industries America, Inc.	625	Teledyne LeCroy
526	Detectus	808	Langer EMV-Technik GmbH	10	The IET / Stylus Publishing
726	Dexmet Corporation	723	Liberty Labs Canada, Inc.	422	Thermo Fisher Scientific
825	EE - Evaluation Engineering	227	Mesago Messe Frankfurt GmbH	524	TMD Technologies
809	Electro Magnetic Applications, Inc.	824	Michigan Scientific Corporation	208	Toyo Corporation
908	Electronics Test Centre	509	Microwave Vision Group	925	Transient Specialists, Inc.
315	Elite Electronic Engineering Inc.	226	mk-messtechnik GmbH	826	TUV Rheinland
222	EMCoS Ltd.	525	Narda-STS	126	TUV SUD America
827	EMI Solutions Pvt Ltd	321	NEC TOKIN America	7	V Technical Textiles, Inc./ Shieldex U.S.
322	Empower RF Systems	110	Nemko USA	910	Vectawave
214	EMSCAN	623	Nexio Technologies	11	WIE IEEE
2	ENR / Seven Mountains Scientific, Inc.	218	Northwest EMC, Inc.		

EXHIBIT HALL MAP



THIS SUPPLIERS PAGE

lists products and services offered by advertisers in this publication to help you find the EMC equipment, components and services you are looking for. For your convenience, we have also supplied each company's website, where contact information is located.

AMPLIFIERS

Advanced Test Equipment Rentals | www.atecorp.com
AMETEK | www.ametek.com
AR RF / Microwave Instrumentation | www.arworld.com
HV Technologies Inc. | www.hvtechnologies.com
IFI - Instruments for Industry | www.ifi.com
Microwave Vision Group | www.mvg-world.com
Milmega | www.milmega.co.uk
Ophir RF | www.ophiremc.com
R&K Company Limited | www.rk-microwave.com
Rohde & Schwarz, Inc. | www.rohde-schwarz-usa.com
TESEQ | www.teseq.com

ANTENNAS

Advanced Test Equipment Rentals | www.atecorp.com
A.H. Systems, Inc. | www.ahsystems.com
AMETEK | www.ametek.com
AR RF / Microwave Instrumentation | www.arworld.com
HV Technologies Inc. | www.hvtechnologies.com
Microwave Vision Group | www.mvg-world.com
Rohde & Schwarz, Inc. | www.rohde-schwarz-usa.com
TESEQ | www.teseq.com

MEDIA

EDICON 2016 | www.ediconusa.com
EspressoEngineering.tv | www.espressoengineering.tv
EMC Live 2016 | www.emclive2016.com
Interference Technology | www.interferencetechnology.com
Thermal Live 2016 | www.thermallive2016.com
Microwave Journal | www.microwavejournal.com

CABLES & CONNECTORS

Advanced Test Equipment Rentals | www.atecorp.com
A.H. Systems, Inc. | www.ahsystems.com
Langer EMV Technik | www.langer-emv.de
Schurter | www.schurter.com
Rohde & Schwarz, Inc. | www.rohde-schwarz-usa.com
Spira | www.spira-emi.com

COMPONENTS

Master Bond | www.masterbond.com
Schurter | www.schurter.com

FILTERS / FERRITES

Schurter | www.schurter.com

LIGHTNING AND SURGE

Advanced Test Equipment Rentals | www.atecorp.com
AMETEK | www.ametek.com
AR RF / Microwave Instrumentation | www.arworld.com

LIGHTNING AND SURGE *cont.*

EM TEST USA | www.emtest.com

ERIS | www.erisemcrf.com

HV Technologies Inc. | www.hvtechnologies.com
Master Bond | www.masterbond.com
Microwave Vision Group | www.mvg-world.com
Retlif Testing Laboratories | www.retlif.com
Rohde & Schwarz, Inc. | www.rohde-schwarz-usa.com
Schurter | www.schurter.com

TESEQ | www.teseq.com

SHIELDING

Master Bond | www.masterbond.com

Parkler Chomerics | www.chomerics.com
Retlif Testing Laboratories | www.retlif.com
Schurter | www.schurter.com

Spira | www.spira-emi.com

SOFTWARE

AMETEK | www.ametek.com
AR RF / Microwave Instrumentation | www.arworld.com

CST of America, Inc. | www.cst.com

Microwave Vision Group | www.mvg-world.com
Rohde & Schwarz, Inc. | www.rohde-schwarz-usa.com

TEST EQUIPMENT

Advanced Test Equipment Rentals | www.atecorp.com
A.H. Systems, Inc. | www.ahsystems.com

AMETEK | www.ametek.com
AR RF / Microwave Instrumentation | www.arworld.com
EM TEST USA. | www.emtest.com
ERIS | www.erisemcrf.com
HV Technologies Inc. | www.hvtechnologies.com

Langer EMV Technik | www.langer-emv.de
Microwave Vision Group | www.mvg-world.com
Ophir RF | www.ophiremc.com
R&K Company Limited | www.rk-microwave.com
Retlif Testing Laboratories | www.retlif.com

Rohde & Schwarz, Inc. | www.rohde-schwarz-usa.com
TESEQ | www.teseq.com

TESTING LABORATORIES

Retlif Testing Laboratories | www.retlif.com

TRAINING, SEMINARS, & WORKSHOPS

EDICON 2016 | www.ediconusa.com
EMC Live 2016 | www.emclive2016.com
TESEQ | www.teseq.com
Thermal Live 2016 | www.thermallive2016.com

4:00 PM - 4:30 PM

Modeling and Measurement of a Novel Shielding Design in Silicon Interposer

Yong-Sheng Li, Er-Ping Li, Peng-Fei Qin, Xing-Chang Wei, and **Wen-Yan Yin,** Zhejiang University, Hangzhou, China

4:30 PM - 5:00 PM

A Descriptor Form Implementation of PEEC Models Incorporating Dispersive and Lossy Dielectrics

Andreas Hartman and **Jonas Ekman,** Luleå University of Technology, Luleå, Sweden, **Giulio Antonini** and **Daniele Romano,** Universitàt degli Studi dell'Aquila, L'Aquila, Italy

5:00 PM - 5:30 PM

Coupling DGTD and Behavioral Macromodel for Transient Heterogeneous Electromagnetic Simulations

Huanhuan Zhang, The University of Hong Kong and Xidian University, Hong Kong and Xi'an, Hong Kong and China, **Lijun Jiang,** and **He Ming Yao,** The University of Hong Kong, Hong Kong, Hong Kong, **Yu Zhang,** Xidian University, Xi'an, China

High Speed Link Design

Technical Session, TU-PM-6,
1:30 PM - 5:30 PM, Room 215
Sponsored by TC-10
Co-chairs: Chunfei Ye, Intel Corporation, DuPont, Washington, USA
Gerardo Romo, Qualcomm Technology Inc., San Diego, California, USA

1:30 PM - 2:00 PM | ID 6444

Mode-Selective Periodic Transmission Line Filters to Reduce Radiated Common-Mode Emissions

Michael Cracraft, IBM Corporation, Poughkeepsie, New York, USA, **Samuel Connor,** IBM Corporation, Research Triangle Park, North Carolina, USA

2:00 PM - 2:30 PM | ID 6700

Variability Analysis of Crosstalk among Pairs of Differential Vias Using the Polynomial-Chaos and the Design of Experiments Methods

Yansheng Wang, Srinath Penugonda, Shuai Jin, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Ji Chen,** University of Houston, Houston, Texas, USA

2:30 PM - 3:00 PM | ID 6642

Optimum Properties of an EMI Absorber for Signal Integrity Applications

Zulfiqar Khan, 3M, St. Paul, Minnesota, USA

3:30 PM - 4:00 PM | ID 6701

Analytical Equivalent Circuit Modeling for Multiple Core Vias in a High-Speed Package

Shuai Jin and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Ji Zhang, Jane Lim, Kelvin Qiu,** and **Rick Brooks,** Cisco Systems, Inc., San Jose, California, USA

4:00 PM - 4:30 PM | ID 6798

Methods to Reduce Crosstalk in Flex Circuit and PCB

Gong Ouyang, Lu-vong T Phan, Kai Xiao, Intel Corporation, DuPont, Washington, USA

4:30 PM - 5:00 PM | ID 6806

High-Speed Bus Signal Integrity Compliance Using a Frequency-Domain Model

Si Win, Jose Hejase, Glen Wiedemeier, Daniel Dreps and **Joshua Myers,** IBM Corporation, Austin, Texas, USA, **Dale Becker,** IBM Corporation, Poughkeepsie, New York, USA, **Ken Willis, John Horner,** and **Ambrish Varma,** Cadence, Charlotte, North Carolina, USA

5:00 PM - 5:30 PM | ID 6845

Fiber Weave Impact on Crosstalk of High Speed Communication Channels in Glass Epoxy Packages

Ahmet Durgun and **Kemal Aygun,** Intel Corporation, Chandler, Arizona, USA

Using Simulated EMC Instruments to Develop, Edit, and Validate EMC Test Routines

Computer modeling and Simulation Demonstration,
2:00 PM - 4:00 PM, Rear of Exhibit Hall
Presenter: Joe Tannehill, ETS-Lindgren, Cedar Park, Texas, USA

This demonstration will show how instrument simulation can be used to setup system checks as well as validate actual EMC emissions and immunity tests.

Troubleshooting EMI with Near Field Probes and VSWR Bridges

Hardware Experiment and, Demonstration,
2:00 PM - 4:00 PM, Rear of Exhibit Hall
Presenter: Arturo Mediano, University of Zaragoza, Zaragoza, Spain

Discover how to use a Voltage Standing Wave Ratio (VSWR) bridge, a near field probe and a spectrum analyzer to find resonances in your electronic components, circuits, cables, PC boards, enclosures, etc.

ETSI EN 300 328 V1.8.2 and ETSI EN 301 893 V1.7.2 Clarified Requirements and Synchronized Power Sensor Demonstration

Hardware Experiment and Demonstration,
2:00 PM - 4:00 PM, Rear of Exhibit Hall
Presenter: Vic Hudson, ETS-Lindgren, Cedar Park, Texas, USA

This demonstration is created to enable the viewer to understand the ETSI EN 300 328 V1.8.2 and 301 893 V1.7.2 clarified requirements as well as show how synchronized power sensors meet the ETSI power measurements.

Which Simulation tool is best for which application?

Panel Discussion, TU-PM-1B,
3:30 PM - 5:00 PM, Room 205
Organizer: Bruce Archambeault, Missouri University of Science and Technology, Rolla, Missouri, USA

This panel will discuss the various simulation techniques and their strengths and weaknesses. Specific examples from the audience will be used to discuss which techniques might be more appropriate than other techniques.

Panelists include:

Chuck Bunting, Oklahoma State University, Stillwater, Oklahoma, USA
David Johns, CST of America, Framingham, Massachusetts, USA
Jim West, Oklahoma State University, Stillwater, Oklahoma, USA
Tracey Vincent, CST of America, Framingham, Massachusetts, USA

Military EMC

Panel Discussion, TU-PM-7,
3:30 PM - 5:00 PM, Westin: Conderation III
Organizer: Gregory Hiltz,
Quality Engineering Test Establishment, Ottawa

This panel discussion will focus on current topics of interest related to military EMC standards, EMC challenges with military hardware, emerging military, technologies and electromagnetic threats, etc.

Panelists include:

L. Greg Hiltz, Department of National Defence, Ottawa, Ontario, Canada
Frank Leferink, Thales Nederland B.V., Hengelo, Netherlands
Amy Pinchuk, InField Scientific Inc., Montreal, Quebec, Canada
Edwin van Bladel, Royal Netherlands Air Force (RNLAF), Dongen, Netherlands
Finbarr O'Connor, Alion Science and Technology, Philadelphia, Pennsylvania, USA
Fred Heather, US Navy, Patuxent River, Maryland, USA

BRIDGE THE GAP BETWEEN



Quality and Value: it is what we are all seeking but often difficult to achieve. That is why we will be searching the Globe for Solutions that allow you to maximize your budget effectiveness while maintaining the highest standards of quality that are required to keep your lab running day in and day out.

Our ESD and Transient Generator Products are Completely Self-Contained Instruments. No add-on Modules and External Auxiliary Boxes, allowing for faster setup and reduced opportunity for errors.

ERIS EMC & RF Instrumentation Solutions Offers Products For:

ESD	IEC 61000-4-2 & Automotive
EFT/Burst	IEC 61000-4-4
Surge	IEC 61000-4-5
Magnetic Field Testing	IEC 61000-4-8 & -9
Dips and Drops, Voltage Sag	IEC 61000-4-11
Automotive Transients	ISO 7636 & Custom Pulses
Oscillatory Wave Generators	IEC 61000-4-11 & 29

Additional Transient Generator Products are Available

ERIS

EMC & RF Instrumentation Solutions

Honesty In Instrumentation

Website: erisemcrf.com
Email: ksheperisemcrf@gmail.com
Phone: 215-220-9928

Nanomaterials and Nanostructures

Technical Session, WED-AM-1,
8:30 AM - 10:00 AM, Room 205
Sponsored by TC-11
Co-chairs: Alessio Tamburrano,
Sapienza University of Rome, Rome, Italy
Emmanuel Decrossas, California Institute of Technology, Pasadena, California, USA

8:30 AM - 9:00 AM | ID 6682
Wideband Radar Absorbing Panels with Lossy Multilayer Graphene and Carbon Nanofiber-Based Coating
Alessandro Proietti, Andrea Rinaldi, Alessio Tamburrano, Giovanni De Bellis, Maria Sabrina Sarto, Sapienza University of Rome, Rome, Italy

9:00 AM - 9:30 AM | ID 6686
Gyrotropic, Shielding and Sensing Low-Gigahertz Properties of Graphene Sheet Biased with Magnetic and Electric Static Fields
Alessandro Giuseppe D'Aloia, Marcello D'Amore, and **Maria Sabrina Sarto,** Sapienza University of Rome, Rome, Italy

9:30 AM - 10:00 AM | ID 6457
Evaluation of 3D Printing Technology for Corrugated Horn Antenna Manufacturing
Emmanuel Decrossas, Theodore Reck, Choonsup Lee, Cecile Jung-Kubiak, Imran Mehdi, and **Goutam Chattopadhyay,** California Institute of Technology, Pasadena, California, USA

Numerical Methods and Analysis for Signal Integrity

Technical Session, WED-AM-2,
8:30 AM - 10:00 AM, Room 207
Sponsored by TC-9
Co-Chairs: Kai Xiao, Intel Corporation, DuPont, Washington, USA
Zhiping Yang, Google, Santa Clara, California, USA

8:30 AM - 9:00 AM | ID 6225
Improve Electrical Performance of Interconnects Using Inkjet Printing
Shaowu Huang and **Kai Xiao,** Intel Corporation, DuPont, Washington, USA, **Xiaoning Ye,** Intel Corporation, Hillsboro, Oregon, USA

9:00 AM - 9:30 AM | ID 6295
Stable Simulation of Nonlinearly Loaded Lossy Transmission Lines with Time Marching Approach
Juan Becerra and **Farhad Rachidi,** Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, **Akiyoshi Tatematsu,** Central Research Institute of Electric Power Industry, Yokosuka, Japan, **Felix Vega,** National University of Colombia, Bogota, Colombia

9:30 AM - 10:00 AM | ID 6394
Analytical Bit-Error-Rate Analysis For Multi-tone Sinusoidal Jitter from Power Supply Noise
Yunhui Chu, Ritochit Chakraborty, and **Rob Friar,** Intel Corporation, Hillsboro, Oregon, USA, **Zibing Yang,** Intel Corporation, Hudson, Massachusetts, USA

Shielding, Gasketing, and Filtering

Technical Session, WED-AM-3,
8:30 AM - 10:00 AM, Room 206
Sponsored by TC-4
Co-chairs: Robert Davis, LMCO, Syracuse, New York, USA
Ross Carlton, National Instruments, Austin, Texas, USA

8:30 AM - 9:00 AM | ID 6285
A Gasket-Free Electromagnetic Shielding Structure for 2.4 GHz band Using Folded Quarter-Wavelength SIW Resonators
Satoshi Yoneda, Yuichi Sasaki, Naoto Oka, Yasuhiro Shiraki, and **Hideyuki Oh-hashi,** Mitsubishi Electric Corporation, Ofuna Kamakura, Japan

9:00 AM - 9:30 AM | ID 6546
Electromagnetic Shielding Properties of Spherical Polyhedral Structures Generated by Conducting Wires and Metallic Surfaces
Ali Aghabarati, Shabnam Ladan, Rouzbeh Moini, Simon Fortin, and **Farid Paul Dawalibi,** Safe Engineering Services & Technologies Ltd., Montreal, Quebec, Canada

9:30 AM - 10:00 AM | ID 6525
EMI Filter Design for Switching Voltage Regulator with Improved Thermal Stability
Jaejin Lee, Hao-han Hsu, and **Tod F. Schiff,** Intel

Lightning and Power Effects

Technical Session, WED-AM-4,
8:30 AM - 10:00 AM, Room 208
Sponsored by TC-5
Co-chairs: Marcos Rubinstein,
HEIG-Vd, Switzerland, Yverdonles-bains, Switzerland
Michael McInerney, US Army Corp of Engineers, Champaign, Illinois, USA

8:30 AM - 9:00 AM | ID 6603
On the Adequacy of Standardized Lightning Current Waveform for Composite Structures for Aircraft and Wind Turbine Blades
Farhad Rachidi, Alexander Smorgonskiy, and **Anastasios Vassilopoulos,** Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, **Nikolay Korovkin,** Petersburg State Polytechnic University, St.-Petersburg, Russia, **Marcos Rubinstein,** University of Applied Sciences Western Switzerland, Yverdon-les-Bains, Switzerland

9:00 AM - 9:30 AM | ID 6655
Simulation of Indirect Effects of Lightning on Aircraft Engine
Paula Aguilera and **Cyril Lair,** SNECMA, Villaroche, France, **Marc Helier** and **Muriel Darces,** Sorbonne Universites, Paris, France, **Francois Issac** and **Bastiaan Michielsen,** ONERA, The French Aerospace Lab, Toulouse, France

9:30 AM - 10:00 AM | ID 6540
Induced Disturbances by High Voltage Transmission Lines on Nearby Stationary Vehicles
Shabnam Ladan, Ali Aghabarati, Rouzbeh Moini, Simon Fortin and **Farid Paul Dawalibi,** Safe Engineering Services and Technologies Ltd., Montreal, Quebec, Canada

Electrical Characterization of High Speed Interconnects (Part 1)

Technical Session, WED-AM-5,
8:30 AM - 10:00 AM, Room 214
Sponsored by TC-10
Co-chairs: Mauro Lai, Intel Corporation, DuPont, Washington, USA
Tao Wang, Missouri University of Science and Technology, Rolla, Missouri, USA

8:30 AM - 9:00 AM | ID 6706
Crosstalk Associated with Solder Ball and/or Cutout-Hole on the Power/Ground Planes/Nets
Daniel Wu, Geoff Zhang, Yohan Frans, Chris Borrelli, Sarajuddin Niazi, Hong Shi, and **Ken Chang,** Xilinx Inc., San Jose, California, USA

9:00 AM - 9:30 AM | ID 6610
Bandwidth Improvement Technique for an Edge Mount SMA Launch Structure in Multilayer Boards
Chulsoon Hwang and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA **Muqi Ouyang,** Huazhong University of Science and Technology, Wuhan, China

9:30 AM - 10:00 AM | ID 6441
Analytical and Numerical Sensitivity Analyses of Fixtures De-Embedding
Bichen Chen, Mikheil Tsiklauri, Chunyu Wu, Shuai Jin and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Xiaoning Ye** and **Bill Samaras,** Intel Corporation, Hillsboro, Oregon, USA

Power Delivery and Jitter/Noise (Part 1)

Technical Session, WED-AM-6,
8:30 AM - 10:00 AM, Room 215
Sponsored by TC-10
Co-chairs: Zhiping Yang, Google, Santa Clara, California, USA
Jianmin Zhang, Altera Corporation, San Jose, California, USA

8:30 AM - 9:00 AM | ID 6611
Power Integrity with Voltage Ripple Spectrum Decomposition for Physics-based Design

Continued on Page 32

Your Trusted Amplifier Source For EMC Testing



Our Microwave Solid State, Class A Amplifiers Deliver 100% Rated Power Without Foldback

- Frequency coverage from 0.7 to 4.2 GHz and 0.7 to 6 GHz – Use fewer amplifiers for your system requirements
- Output power levels up to 1000 watts CW – Enough power for any application
- Best efficiency in its class – Save money due to lower current demands
- Harmonic performance > -20 dBc – Affords greater measurement accuracy
- No damage or oscillation with any magnitude or phase of source or load impedance

As the leader for over 45 years, AR products are backed by the best worldwide service and support team in the industry.

www.arworld.us/powerful

Come See Us at IEEE EMC Ottawa
The Shaw Centre, Ottawa, Canada, July 25-29, 2016 – Booth 400

ISO 9001:2008 Certified

We don't just build great products.
We build great products that last.

BUILT TO LAST

rf/microwave instrumentation

Other ar divisions: modular rf • receiver systems • ar europe

USA 215-723-8181. For an applications engineer, call 800-933-8181.
In Europe, call ar United Kingdom +44 1908 282766 • ar France +33147917530 • ar Deutschland +49 6101 80270 0 • ar Benelux +31 172 423000

www.arworld.us
Download the AR RF/Microwave Mobile App: www.arworld.us/arApp

Copyright © 2016 AR.
The orange stripe on AR products is
Reg. U.S. Pat. & TM. Off.

Chenxi Huang, Biyao Zhao, Ketan Shringarpure, Siqi Bai, Xiang Fang, Tamar Makharashvili, Albert Ruehli, Jun Fan, and **James Drewniak,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Hanqin Ye** and **Erping Li,** Zhejiang University, Hangzhou, China, **Ying S Cao,** and **Li Jun Jiang,** The University of Hong Kong, Hong Kong, Hong Kong, **Michael Cracraft,** IBM Corporation, Poughkeepsie, New York, USA, **Matteo Cocchini,** IBM Corporation, New York, New York, USA, **Samuel Connor** and **Bruce Archambeault,** IBM Corporation, Research Triangle Park, North Carolina, USA, **Quinn Gaumer, Stephen Scearce,** and **Brice Achkir,** Cisco Systems, Inc., San Jose, California, USA

9:00 AM - 9:30 AM | ID 6460

Top-layer Interconnect Inductance Extraction for the Pre-layout Power Integrity Using the Physics-based Model Size Reduction (PMSR) Method

Ying S. Cao and **Li Jun Jiang,** The University of Hong Kong, Hong Kong, Hong Kong, **Tamar Makharashvili, Albert Ruehli, Jun Fan,** and **James Drewniak,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Samuel Connor** and **Bruce Archambeault,** IBM Corporation, Research Triangle Park, North Carolina, USA

9:30 AM - 10:00 AM | ID 6647

Mobile AP GPU Power Distribution Network Simulation and Analysis based on Chip Power Model

Youngwoo Kim, Heegon Kim, Jonghyun Cho, and **Joungho Kim,** Korea Advanced Institute of Science and Technology (KAIST) Daejeon, The Republic of Korea, **Kibum Kang, Taisik Yang, Yun Ra,** and **Woohyun Park,** LG Electronics, Seoul, The Republic of Korea

Transmission Line Effects on Filter Topology

Hardware Experiment and Demonstration, 9:30 AM - 11:30 AM, Rear of Exhibit Hall
Presenter: Matthew Juszczyk, Rockwell Collins, Cedar Rapids, Iowa, USA

EMI Filter response is a function of load and source impedances. Electrically long wires (transmission lines) will present unmatched and varying impedances over a wide frequency range. A lowpass filter at one end of a transmission line will be modified to demonstrate these effects by observing the conducted emissions profile.

Pulse Characteristics and Analyzer Architectures and Filters

Hardware Experiment and Demonstration, 9:30 AM - 11:30 AM, Rear of Exhibit Hall
Presenter: Darren McCarthy, Rohde & Schwarz, Beaverton, Oregon, USA

Three EMC test methodologies are studied: Frequency Swept, Frequency Stepped and Time Domain Scan. We will demonstrate the details of each for a pulsed signal stimulus and provide insight for best measurement techniques for each method.

Signal Processing and Test Methodologies for EMC Compliance

Hardware Experiment and Demonstration, 9:30 AM - 11:30 AM, Rear of Exhibit Hall
Presenter: Bill Wangard, Rohde & Schwarz, Kildeer, Illinois, USA

In this section of the tutorial, we will focus on the architectural differences going from a frequency swept method to a frequency stepped method and the corresponding considerations of spectrum characterization with a focus on making compliance measurements for CISPR and MIL-STD-461G.

Surveilling EFT in micro-controlled circuits

Hardware Experiment and Demonstration, 9:30 AM - 11:30 AM, Rear of Exhibit Hall
Presenter: Lars Glaesser, Langer EMV-Technik GmbH, Bannewitz, Germany

In this demonstration we will show different methods to understand the EMC effects on the DUT. The participant will learn how to follow disturbance current paths, localizing weak spots and interpreting the measured results.

Ask the Experts - SIPI Panel

Special Event, 10:30 AM - 11:30 AM, Exhibit Theatre

This Ask the Experts Panel is a great opportunity to ask those difficult-to-answer questions! The panelists were selected to provide a broad range of experience and knowledge in the area of Signal and Power Integrity. No question is too simple or too hard! Bring your questions!

Panelists include:

Dale Becker, IBM Corporation, Poughkeepsie, New York, USA
Ram Achar, Carleton University, Ottawa, Ontario, Canada
Jun Fan, Missouri University of Science and Technology, Rolla, Missouri, USA
Xiaoning Ye, Intel Corporation, Hillsboro, Oregon, USA
Brice Achkir, Cisco Systems, Inc., San Jose, California, USA
Joungho Kim, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, The Republic of Korea

Poster Session

Browse posters and discover the scientific research and findings of your peers
10:30 AM - 11:30 AM, Rideau Canal Atrium

Aerospace Systems EMC

Panel Discussion, WED-PM-1A, 1:30 PM - 3:00 PM, Room 205
Organizer: Robert Scully, NASA Johnson Space Lab, Houston, Texas, USA

A panel of EMC aerospace experts thus offers a new and unique opportunity for conference attendees to engage and interact with these experts to ask questions and hold discussions about specific problems the attendees may have encountered in the past, are struggling with now, or may be confronted with in the future.

Panel members include:

Jim Lukash, Lockheed Martin, Santa Clara, California, USA
Dave Brumbaugh, Retired - The Boeing Company, Seattle, Washington, USA
Robert Scully, NASA Johnson Space Lab, Houston, Texas, USA
John Norgard, NASA Johnson Space Center, Houston, Texas, USA
John McCloskey, NASA/Goddard Space Flight Center, Greenbelt, MD, USA
Ray Perez, Jet Propulsion Laboratory, Pasadea, California, USA
Pablo Narvaez, Jet Propulsion Laboratory, Pasadea, California, USA

Wireless Coexistence

Technical Session, WED-PM-2, 1:30 PM - 5:30 PM, Room 207
Sponsored by TC-12
Co-chairs: Yihong Qi, DBJ Technologies, Zhuhai, China
Harry Skinner, Intel Corporation, Hillsboro, Oregon, USA

1:30 PM - 2:00 PM | ID 6633

Demultiplexing Spectrum-Sharing Field Sources with Distributed Field Probes

Daniel Kuester, Ryan Jacobs, Yao Ma, and **Jason Coder,** National Institute of Standards and Technology (NIST), Boulder, Colorado, USA

2:00 PM - 2:30 PM | ID 6687

Interference Characterization of Cellular IoT Modules based on BER Measurements

Zhaohai Jiang and **Walter Hansch,** Universitaet der Bundeswehr, Neubiberg, Germany, **Harald Gossner,** Intel Deutschland GmbH, Am Campeon, Munich, Germany, **David Pommerenke,** Missouri University of Science and Technology, Rolla, Missouri, USA

2:30 PM - 3:00 PM | ID 6790

Man Made Noise Measurement in Sweden

Björn Johansson and **Tore Tindgren,** Swedish Defence Research Agency (FOI), Linköping, Sweden

3:00 PM - 3:30 PM | ID 6692
Noise Coupling Path Analysis for RF Interference Caused by LCD Noise Modulation
Chulsoon Hwang, David Pommerenke, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Sunkyu Kong,** Korea Advanced Institute of Science and Technology (KAIST), Daejeon, The Republic of Korea, **Takashi Enomoto, Junji Maeshima,** and **Kenji Araki,** Sony EMCS Corporation, Tokyo, Japan

3:30 PM - 4:00 PM | ID 6823
Closed Loop Structure to Prevent Couplings on CMOS Process
Hsiao-Tsung Yen, Chich-Wei Lai, Chih-Yu Tsai, Cheng-Wei Luo, Yuh-Sheng Jean, Ta-Hsun Yeh, Po-Chih Wang, Ka-un Chan, and **Ying-His Lin,** Realtek Semi Conductor Company, Hsin-Chu, Taiwan

4:00 PM - 4:30 PM | ID 6622
Estimating the Near Field Coupling from SMPS Circuits to a Nearby Antenna Using Dipole Moments
Chunyu Wu, Yansheng Wang, Liang Li, Jingnan Pan, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Lijuan Qu** and **Joakim Eriksson,** Microsoft Mobile, Beijing, China

4:30 PM - 5:00 PM | ID 6237
Radio-Frequency Interference Estimation by Reciprocity Theorem with Noise Source Characterized by Huygens's Equivalent Source
Liang Li, Jingnan Pan, Chulsoon Hwang, Yaojiang Zhang, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Gyuyeong Cho,** and **Hark Byeong** Park, Samsung Electronics, Suwon, South Korea

Circuit and System EMC Analysis

Technical Session, WED-PM-3,
1:30 PM - 5:30 PM, Room 206
Sponsored by TC-4
Co-Chairs: Todd Hubing, LearnEMC, Stoughton, Wisconsin, USA
Mark Montrose, Montrose Compliance Services, Santa Clara, California, USA

1:30 PM - 2:00 PM | ID 6420
Investigation of Electromagnetic Field Coupling from DC-DC Buck Converters to Automobile AM/FM Antennas
Cyrous Rostamzadeh, Bosch, Plymouth, Michigan, USA, **Patrick DeRoy,** CST of America, Inc., Framingham, Massachusetts, USA, **Andreas Barchanski,** CST AG, Darmstadt, Germany, **Behrouz Abdolali,** Crouse. A Time Based Company, Tehran, Islamic Republic of Iran

2:00 PM - 2:30 PM | ID 6626
Electromagnetic Interference on Analog-to-Digital Converters from High-Power Wireless Power Transfer System for Automotive Charger
Sunkyu Kong, Bumhee Bae, Dong-Hyun Kim, Hongseok Kim, Chiuk Song, and **Joungho Kim,** Korea Advanced Institute of Science and Technology (KAIST), Daejeon, The Republic of Korea

2:30 PM - 3:00 PM | ID 6493
Study of the Effectiveness of Spatially EM-Diverse Redundant Systems under Reverberation Room Conditions
Andy Degraeve and **Davy Pissoort,** KU Leuven, Ostend, Belgium

3:30 PM - 4:00 PM | ID 6439
Study of Alien Crosstalk from a BroadR-Reach Protocol Based System
Tamar Makharashvili, James Drewniak, and **Daryl Beetner,** Missouri University of Science and Technology, Rolla, Missouri, USA, Brian Booth and Kerry Martin, John Deere, Moline, Illinois, USA

4:00 PM - 4:30 PM | ID 6438
Sensitivity Analysis of Cable Crosstalk to Uncertain Parameters Using Stochastic Reduced Order Models
Zhouxiang Fei, Yi Huang, Jiafeng Zhou, and **Qian Xu,** University of Liverpool, Liverpool, United Kingdom

4:30 PM - 5:00 PM | ID 6429
On-site, Quick and Cost-Effective Techniques for Improving the Performance of EMI Filters by Using Conducting Bands
Joaquin Bernal and **Manuel J.Freire,** University of Seville, Seville, Spain

5:00 PM - 5:30 PM | ID 6671
A 90 dB PSRR, 4 dBm EMI Resistant, NMOS-Only Voltage Reference Using Zero-VT Active Loads
David Cordova and **Pedro Toledo,** NSCAD and UFRGS, Porto Alegre, Brazil, **Eric Fabris, Sergio Bampi** and **Hamilton Klimach,** UFRGS, Porto Alegre, Brazil

Electrical Characterization of High Speed Interconnects (Part 2)

Technical Session, WED-PM-5,
1:30 PM - 5:30 PM, Room 214
Sponsored by TC-10
Co-Chairs: Jim Nadolny, Samtec, Mechanicsburg, Pennsylvania, USA
Eric Bogatin, Teledyne LeCroy, Longmont, Colorado, USA

1:30 PM - 2:00 PM | ID 6234
Compact Inductors Deembedded with Assymmetric Through-Only Structures
John Yan and **Arash Zargaran-Yazd,** Rambus Inc., Sunnyvale, California, USA

2:00 PM - 2:30 PM | ID 6468
Design and Analysis of Silicone Rubber-based TERAPOSER for LPDDR4 Memory Test
Jonghoon J. Kim, Heegon Kim, Daniel Hyunsuk Jung, Sumin Choi, Jaemin Lim, Junyong Park, Jiseong Kim, and **Joungho Kim,** Korea Advanced Institute of Science and Technology (KAIST), Daejeon, The Republic of Korea, **Dongho Ha** and **Michael Bae,** Silicone Rubber Contactor, Goyang, The Republic of Korea

2:30 PM - 3:00 PM | ID 6746
Assessing Techniques to Compare Signal Integrity Data for High Speed Interconnects
Alistair Duffy, De Montfort University, Leicester, United Kingdom of Great Britain and Northern Ireland **Gang Zhang,** Harbin Institute of Technology, Harbin, China, **C Luk,** Hirose Electric USA, San Jose, California, USA, **Eric Bogatin,** Teledyne LeCroy, Longmont, Colorado, USA, **Ching-Chao Huang,** AtaiTec Corporation, San Jose, California, USA

3:00 PM - 3:30 PM | ID 6277
Cost-Effective Characterization of Dissipative Loss of Printed Circuit Board Traces
Kai Xiao, Intel Corporation, DuPont, Washington, USA, **Xiaoning Ye,** Intel Corporation, Hillsboro, Oregon, USA, **Jimmy Hsu, Thonas Su,** and **Yuan-liang Li,** Intel Corporation, Taipei, Taiwan

4:00 PM - 4:30 PM | ID 6369
Eye Diagram Estimation of 8B/10B Encoded High- Speed Serial Link for Signal Integrity Test using Silicone Rubber Socket
Junyong Park, Jonghoon J. Kim, Heegon Kim, and **Joungho Kim,** Korea Advanced Institute of Science and Technology, Daejeon, The Republic of Korea, **Dongho Ha** and **Michael Bae,** Silicone Rubber Contactor, Goyang, The Republic of Korea

4:30 PM - 5:00 PM | ID 6702
Validating the Transmission-Line Based Material Property Extraction Procedure for Multilayer PCBs Using Simulations
Shuai Jin, Xiang Fang, Bichen Chen, Han Gao, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Xiaoning Ye,** Intel Corporation, Hillsboro, Oregon, USA

3D IC integration: SI/PI Modeling and Measurement

Technical Session, WED-PM-5-SIPI,
1:30 PM - 5:30 PM, Room 208
Sponsored by TC-10
Co-Chairs: Brice Achkir, Cisco Systems, Inc., San Jose, California, USA
Antonio Orlandi, University of L'Aquila, L'Aquila, Italy

1:30 PM - 2:00 PM | ID 6688
Preliminary Application of Machine-Learning Techniques for Thermal- Electrical Parameter Optimization in 3-D IC

Continued on Page 34

Sung Joo Park, Huan Yu, and **Madhavan Swaminathan,** Georgia Technology, Atlanta, Georgia, USA

2:00 PM - 2:30 PM | ID 6204

Extraction of the Parameters of the Coupling Capacitance Hysteresis Cycle for TSV Transient Modeling

Antonio Orlandi, Francesco de Paulis, Stefano Piersanti, and **Enza Pellegrino** University of L'Aquila, L'Aquila, Italy, **Joungho Kim,** Korea Advanced Institute of Science and Technology (KAIST), Daejeon, The Republic of Korea **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA

2:30 PM - 3:00 PM | ID 6694

Modeling Optimization of Test Patterns Used in De-embedding Method for Through Silicon Via (TSV) Pair in Silicon Interposer

Qian Wang, Nicholas Erickson, Jonghyun Cho, Chulsoon Hwang, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Francesco de Paulis, Stefano Piersanti,** and **Antonio Orlandi,** University of L'Aquila, L'Aquila, Italy, **Brice Achkir,** Cisco Systems, Inc., San Jose, California, USA

3:30 PM - 4:00 PM | ID 6511

Silicon Interposer Interconnect Structure Analysis 3D Full Wave Simulations and Measurements

Antonio Ciccomancini, CST of Italy, Milano, Italy **Darryl Kostka,** CST of America, San Matteo, California, USA, **Andy Heinig, Alexander Steinhardt,** and **Robert Trieb,** Fraunhofer IIS/EAS Dresden, Germany, **Matthias Troescher,** CST AG, Munich, Germany, **Andreas Henkel,** Rohde & Schwarz, Munich, Germany

4:00 PM - 4:30 PM | ID 6422

Eye-diagram Estimation and Analysis of High-Bandwidth Memory (HBM) Interposer Channel with Crosstalk Reduction Schemes on 2.5D and 3D IC

Sumin Choi, Heegon Kim, Daniel H. Jung, Jonghoon J. Kim, Jaemin Lim, Hyunsuk Lee, Kyungjun Cho, and **Joungho Kim,** Korea Advanced Institute of Science and Technology (KAIST), Daejeon, The Republic of Korea,

4:30 PM - 5:00 PM | ID 6616

Modeling and Analysis of High-Speed Through Silicon Via (TSV) Channel and Defects

Daniel H. Jung, Jonghoon J. Kim, Heegon Kim, Sumin Choi, Jaemin Lim, and **Joungho Kim,** Korea Advanced Institute of Science and Technology (KAIST), Daejeon, The Republic of Korea, **Hyun-Cheol Bae** and **Kwang-Seong Choi,** Electronics and Telecommunications Research Institute, Daejeon, The Republic of Korea

5:00 PM - 5:30 PM | ID 6566

High Bandwidth Low Power Interposer Interconnect Challenge,Design, and Validation in 3D Silicon Stacked Interconnect (SSI) Technology

Anna Wong, Gordon Tsui, Yong Wang, Boon Kai Soo and **Chong Ling Khoo,** Xilinx Inc., San Jose, California, USA

Power Delivery and Jitter/Noise (Part 2)

Technical Session, WED-PM-6,
1:30 PM - 5:30 PM, Room 215
Sponsored by TC-10
Co-chairs: A. Ege Engin, San Diego State University, San Diego, California, USA
Bill Chen, Yangtze Delta Region Institute of Tsinghua University, Beijing, China

1:30 PM - 2:00 PM | ID 6228

Noise Analysis of On-Chip Flexing Crossbars with a Geometric Model

Sertac Erdemir, Linkoping University, Linkoping, Sweden, **A. Yavuz Oruc,** University of Maryland, College Park, Maryland, USA

2:00 PM - 2:30 PM | ID 6339

Parameter for Near End Crosstalk Prediction in Twisted Pair Cables

Olusegun Ogundapo, American University of Nigeria and De Montfort University, Yola, and Leicester, Nigeria and United Kingdom, **Alistair Duffy,** De Montfort University, Leicester, United Kingdom, **Charles Nche,** American University of Nigeria, Yola, Nigeria

2:30 PM - 3:00 PM | ID 6527

Bursty Jitter in High-Speed I/O Due to Power-State Transition and Its Impact on Signal Integrity

Alaeddin Aydiner, Wei-kai Shih, Cheng Zhuo, Jason Kao, and **Raymond Law,** Intel Corporation, Hillsboro, Oregon, USA

3:00 PM - 3:30 PM | ID 6785

Signaling Margin Oriented LPDDR PDN Design with SIPI Synthesis Methodology

Kinger Cai and **Steven Ji,** Intel Corporation, Santa Clara, California, USA, **Marwan Dakroub,** and **Ritochit Chakraborty,** Intel Corporation, Portland, Oregon, USA

4:00 PM - 4:30 PM | ID 6828

High Frequency Noise Modeling of Switching Buck Voltage Regulators

Chunlei Guo, Intel Corporation, Folsom, California, USA, **Sergio Clavijo** and **Jiangqi He,** Intel Corporation, Chandler, Arizona, USA

4:30 PM - 5:00 PM | ID 6883

Effect of Power Noise Coupling Between Power Via and Signal Via and Its Relationship with Distance

Hank Lin, Bin-Chyi Tseng, and **Jackson Yen,** ASUSTek Computer Inc., Taipei, Taiwan

5:00 PM - 5:30 PM | ID 6796

Impact of Dynamic Power Supply Noise Induced by Clock Networks on Clock Jitter and Timing Margin

Yujeong Shim and **Dan Oh,** Altera Corporation, San Jose, California, USA

Modeling of EMC Problems Using CONCEPT-II

Computer modeling and Simulation Demonstration,
2:00 PM - 4:00 PM, Rear of Exhibit Hall
Presenters: Torsten Reuschel and **Jan Preibisch,** Technische Universitat Hamburg-Harburg, Hamburg, Germany

The demo is intended to instruct people on how to solve EMC problems using MoM. Attending will be of high value for anyone looking for numerical solutions of EMC problems and will give details on how to use a method of moments based tool.

Faster Emissions Troubleshooting of Intermittent and Co-Located Narrowband, Broadband, and Wireless Signals Using Real-Time FFT Spectral Analysis

Presenter: Lee Hill, SILENT Solutions LLC, Worcester Polytechnic Institute (WPI), Amherst, New Hampshire, USA

This presentation will use real-world noise sources including a motor controller, brush DC motor, digital clock sources, and Bluetooth transceivers to demonstrate how real-time spectrum analysis can make previously invisible signals appear perfectly visible and quantifiable.

Inductive Effects in Cables

Hardware Experiment and Demonstration,
2:00 PM - 4:00 PM, Rear of Exhibit Hall
Presenter: Jerry Meyerhoff,
JDM Labs LLC, Buffalo Grove,Illinois, USA

The laboratory objective: understand the practical implementation details of "cables" or "transmission lines" which are critical to EMC performance, as used between modules/units, across systems and within Printed Circuit Boards (PCBs).

ITE EMC Regulatory Intelligence to Market Products in B.R.I.C Countries

Panel Discussion, WED-PM-1B,
3:30 PM - 5:00 PM, Room 205
Organizer: Elizabeth Perrier, ORBIS Compliance LLC, Morgan Hill, CA

The focus of this Panel of Experts is to share with the audience, product compliance requirements for Electronics and ITE products in BRIC countries,as well as presenting recently published regulations affecting approvals.

Panelists include: Tina Ding, CSA Group, **Mark Maynard,** IEEE PSES Board of Directors President, **Elizabeth Perrier,** ORBIS Compliance LLC.

Our expertise takes you to the top.
EMC solutions from Rohde & Schwarz.

We provide everything you need for development, precompliance and compliance measurements to ensure successful EMC certification.

- Exceptionally fast EMI test receivers
- Efficient diagnostic tools for detecting EMI
- EMC software packages for interactive and fully automatic measurements
- Wide range of accessories for performing EMI measurements
- Compact and modular broadband amplifiers
- RF shielded chambers
- Complete EMC test systems

For more information, visit:
www.rohde-schwarz.com/ad/emc

Visit us at **EMC 2016**, booth 300

Technical Program Demonstration,
Wednesday July 27,
9:30 – 11:30 am

Pulse characteristics and analyzer architectures and filters



ROHDE&SCHWARZ

Antennas

Co-chairs: Bob Hoffman, Hofmann EMC Engineering, Naperville, Illinois, USA
Ghery Pettit, Pettit EMC Consulting, Olympia, Washington, USA

8:30 AM - 9:00 AM | ID 6415
An Evaluation of Using Small Biconical Antennas in Normalized Site Attenuation Measurements
Hironari Tanaka, VCCI Council / Ohtama Calibration Service Co., Ltd., Kawasaki, Japan, **Hiroyuki Shimanoe,** S-Tech Inc., Kawasaki, Japan, **Ikuo Makino,** Fujitsu General EMC Laboratory, Ltd., Kawasaki, Japan, **Hidenori Muramatsu,** VCCI Council, Tokyo, Japan

9:00 AM - 9:30 AM | ID 6672
A New Method to Calculate Phase Center Locations for Arbitrary Antenna Systems and Scenarios
Dominic Haerke and **Heyno Garbe,** Leibniz Universität Hannover, Hannover, Germany, **Prashant Chakravarty,** University of York, York, United Kingdom

9:30 AM - 10:00 AM | ID 6364
Limitations of Symmetry Test Method for Antennas as Specified in ANSI C63.5-2006 Standard
Anoop Adhyapak and **Zhong Chen,** ETS-Lindgren, Cedar Park, Texas, USA

10:30 AM - 11:00 AM | ID 6379
Saturation of Active Loop Antennas
Alexander Kriz, Seibersdorf Laboratories, Seibersdorf, Austria

11:00 AM - 11:30 AM | ID 6535
5G Wireless Communications (60 GHz Band) for Smart Grid - An EMC Perspective
Dheena Moongilan, Alcatel-Lucent, Murray Hill, New Jersey, USA

11:30 AM - 12:00 PM | ID 6537
Super Resolution Emission Source Microscopy using Water Immersion
Victor Khilkevich, Rajashree Ghorude, and **David Pommerenke,** Missouri University of Science and Technology, Rolla, Missouri, USA

ESD Testing and Simulation

Special Session, TH-AM-2, 8:30 AM - 10:00 AM, Room 207
Sponsored by TC5
Co-Chairs: Harald Gossner, Intel Deutschland GmbH, Neubiberg, Germany
Nate Peachey, Qorvo, Greensboro, North Carolina, USA

8:30 AM - 9:00 AM | ID 6880
Simulation of ESD Coupling into Cables Based on ISO 10605 Standard Using Method of Moments
Irina Oganezova, Tbilisi State University and EMCoS ltd., Tbilisi, Georgia, **Guangyao Shen, Sen Yang, David Pommerenke,** and **Victor Khilkevich,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Roman Jobava,** EMCoS ltd., Tbilisi, Georgia

9:00 AM - 9:30 AM | ID 6846
ESD to the Display Inducing Currents Measured Using a Substitution PC Board
Satyajeet Shinde, Shubhankar Marathe, Atieh Talebzadeh, Jianchi Zhou, and **David Pommerenke,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Yingjie Gan,** Wuhan University of Technology, Wuhan, China, **Pengyu Wei,** Microsoft Corporation, Beijing, China

9:30 AM - 10:00 AM | ID 6847
IEC 61000-4-2 ESD Test in Display Down Configuration for Cell Phones
Jianchi Zhou, Satyajeet Shinde, Yuandong Guo, Atieh Talebzadeh, Shubhankar Marathe, Ki-Hyuk Kim, and **David Pommerenke,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Yingjie Gan,** School of Science, Wuhan University of Technology, Wuhan, China

Terrestrial Electromagnetics of Aerospace

Special Session, TH-AM-3, 8:30 AM - 10:00 AM, Room 206
Sponsored by SC7
Co-chairs: Robert Scully, NASA Johnson Space Lab, Houston, Texas, USA
James Lukash, Lockheed Martin, Santa Clara, California, USA

8:30 AM - 9:00 AM | ID 6347
Electromagnetic Compatibility and Interference Practical Analyses for Beam Waveguide Ground Antennas
Fabio Pelorossi, Department of Information Engineering Electronics and Telecommunications (DIET), La Sapienza, Rome, Italy and European Space Operations Centre (ESOC) of the European Space Agency (ESA), Parmstadt, Germany, **Piermario Besso,** European Space Operations Centre (ESOC) of the European Space Agency (ESA), Darmstadt, Germany, **Lucianno Garramone,** Italian Space Agency (ASI), Rome, Italy

9:00 AM - 9:30 AM | ID 6519
TDOA Measurement for P-Static Source Location on Aircraft
Ivan Garcia-Hallo and **Gilles Peres,** Airbus, Toulouse, France, **Nathalie Raveu,** Unversité de Toulouse, Toulouse, France

9:30 AM - 10:00 AM | ID 6878
Investigation on Improvements in Lightning Retest Criteria for Spacecraft
Alex Terseck, ai Solutions, Kennedy Space Center (KSC), Florida, USA, **Dawn Trout,** NASA Kennedy Space Center (KSC), Florida, USA

10:00 AM - 10:30 AM | ID 6882
Evaluation of Transient Pin-stress Requirements for Spacecraft Launching in Lightning Environments
Dawn Trout, NASA Kennedy Space Center (KSC), Florida, USA, **Paul Edwards** and **Alex Terseck,** ai Solutions, Kennedy Space Center (KSC), Florida, USA

Computational Electromagnetics (Part 2)

Technical Session, TH-AM-4, 8:30 AM - 12:00 PM, Room 208
Sponsored by TC-10
Co-chairs: James West, Oklahoma State University, Stillwater, Oklahoma, USA
Samuel Connor, IBM Corporation, Research Triangle Park, North Carolina, USA

8:30 AM - 9:00 AM | ID 6272
Near-Field Measurements Based Source Reconstruction Approach for Radiated Emissions Prediction
Jun Li and **Xing-Chang Wei,** Zhejiang University, Hangzhou, China, **Jun Li,** Chinese Academy of Sciences, Beijing, China

9:00 AM - 9:30 AM | ID 6346
Application of Generalized Linear Models to Evaluate Nuclear EMP Tests
Lars Ole Fichte, Sven Knoth, and **Marcus Stiemer,** Helmut Schmidt University, Hamburg, Germany, **Stefan Potthast, Martin Schaarschmidt,** and **Frank Sabath,** Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

9:30 AM - 10:00 AM | ID 6414
Estimation of Interference between Antennas on Large Platforms Using Physics-based Truncation Model and Multi-level Fast Multipole Method
Huapeng Zhao, Jun Hu, and **Qun Wan,** University of Electronics Science and Technology of China, Chengdu, China, Zhizhang Chen, University of Electronics Science and Technology of China, Chengdu, China and Dalhousie University, Halifax, Nova Scotia, Canada **Siping Gao** and **Weijiang Zhao,** A*STAR Institute of High Performance Computing, Singapore, Singapore,

10:30 AM - 11:00 AM | ID 6542
Canonical Statistical Model for Maximum Expected Immission of Wire Conductor in an Aperture Enclosure
Paul Bremner, Robust Physics, Del Mar, California, USA, **Gabriel Vazquez, Dawn Trout,** and **Daniel Christiano,** NASA Kennedy Space Center, Cape Canaveral, Florida, USA

11:00 AM - 11:30 AM
ID 6583
Characterizing EMI Radiation Physics Corresponding to Distributive Geometry

Features Using the PEEC Method
Ying S. Cao and **Lijun Jiang,** The University of Hong Kong, Hong Kong, Hong Kong, **Yansheng Wang, Jun Fan, Albert Ruehli,** and **James Drewniak,** Missouri University of Science and Technology, Rolla, Missouri, USA

11:30 AM - 12:00 PM | ID 6696
Full-wave Modeling of Bulk Current Injection Probe Coupling to Multi-conductor Cable Bundles
Patrick DeRoy, CST of America, Inc., Framingham, Massachusetts, USA, **Scott Piper,** General Motors, Milford, Michigan, USA

Passive Component Modeling and Measurement

Technical Session, TH-AM-5,
8:30 AM - 12:00 PM, Room 214
Sponsored by TC-10
Co-chairs: Hanqiao Zhang, Intel Corporation, DuPont, Washington, USA
Marina Koledintseva, Missouri University of Science and Technology, Rolla, Missouri, USA

8:30 AM - 9:00 AM | ID 6740
S-Parameter Estimation Algorithm for Coaxial Ring Resonator
Jingnan Pan, Xu Gao, Chunchun Sui, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Zhiping Yang** and **Ken Wu,** Google, Mountain View, California, USA

9:00 AM - 9:30 AM | ID 6699
Differential Probe Characterization
Qian Wang, Yuanci Gao, Jun Fan, and **James Drewniak,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Richard Zai,** PacketMicro. Inc., Santa Clara, California, USA

9:30 AM - 10:00 AM | ID 6829
Near End Crosstalk Injection Designs for Far End Crosstalk Mitigation in Non-Interleaved Interconnects
Raul Enriquez, Kai Xiao, Beomtaek Lee, and **Carlos Lizalde Moreno,** Intel Corporation, Zapopan, Mexico

10:30 AM - 11:00 AM | 6768
An Indirect Measurement Method for Multiport S-Parameters with Reduced Number of Measurements **Noboru Maeda** and **Shinji Fukui,** Nippon Soken, Inc., Nishio, Japan, **Toshikazu Sekine** and **Yasuhiro Takahashi,** Gifu University, Gifu, Japan

11:00 AM - 11:30 AM | ID 6815
Optimization Design of The High Speed Loopback Channel
Tao Wang, Roger Sinsheimer, Brian Brecht, Roya Yaghmai, and Itay Kahaner, Teradyne, Agroua Hills, California, USA, **Michael Rothman, Benjamin Harding,** and **Roger Good,** Teradyne, Agoura Hills, California, USA

11:30 AM - 12:00 PM | ID 6844
Probe with Absorbing Materials
Shaowu Huang and **Kai Xiao,** Intel Corporation, DuPont, Washington, USA, **Xiaoning Ye,** Intel Corporation, Hillsboro, Oregon, USA

SI/PI/EMC Co-Simulation and Numerical Methods

Technical Session, TH-AM-6,
8:30 AM - 12:00 PM, Room 215
Co-chairs: Antonio Ciccomancini, CST of America, Framingham, Massachusetts, USA
Darryl Kostka, CST of America, San Matteo, California, USA

8:30 AM - 9:00 AM | ID 6229
Correlation of Crosstalk and Power Noise Induced Ringback and Jitter in an LPDDR Interface
Gerardo Romo, Scott Powers, tim Mchalka, Cheon Chai, and **Denny Kurniawan,** Qualcomm Technology Inc., San Diego, California, USA

9:00 AM - 9:30 AM | ID 6240
A Wideband Common-mode Suppression Filter Using Enhanced Coupled Defected Ground Structure
Yi-Hsien Lee and **Ding-Bing Lin,** National Taipei University of Technology, Taipei, Taiwan

9:30 AM - 10:00 AM | ID 6258
Common-Mode Noise Reduction of Bended Coupled lines by Using Time Compensation Technology
Ding-Bing Lin, Chung-Pin Huang, and **Chih-Hao Lin,** National Taipei University of Technology, Taipei, Taiwan, **Hsin-Nan Ke,** PEGATRON Corporation, Taipei, Taiwan, **Wen-Sheng Liu,** WIESON Technologies Co. Ltd., Taipei, Taiwan

10:30 AM - 11:00 AM ID 6470
2.5D Methodologies for Electronic Package and PCB Modeling: Review and Latest Development
En-Xiao Liu, Institute of High Performance Computing (IHPC), A*STAR Singapore, Singapore, **Xing-Chang Wei** and **Er-Ping Li,** Zhejiang University, Hangzhou, China

11:00 AM - 11:30 AM | ID 6568
A Novel Iterative Method for Approximating Frequency Response with Equivalent Pole/Residues
Venkatesh Avula and **Ata Zadehgol,** University of Idaho, Moscow, Idaho, USA, **Adam El-Mansouri, Fuad Badrieh,** and **Brent Keeth,** Micron Technology, Inc., Boise, Idaho, USA

11:30 AM - 12:00 PM | ID 6434
Design Space Exploration for Printed Circuit Board Vias Using Polynomial Chaos Expansion
Jan Preibisch and **Christian Schuster,** Hamburg University of Technology, Hamburg, Germany, **Piero Triverio,** University of Toronto, Toronto, Ontario, Canada

The Path of Least Impedance

Hardware Experiment and Demonstration,
9:30 AM - 11:30 AM, Rear of Exhibit Hall
Presenter: Matt Juszczyk, Rockwell Collins, Cedar Rapids, Iowa, USA

The effects of wire type (coaxial vs twisted pair), mutual inductance, and DC resistance
will be demonstrated over a broad frequency range.

Continued on Page 38



INSPIRE • ENVISION • INNOVATE

EMC+SIPI

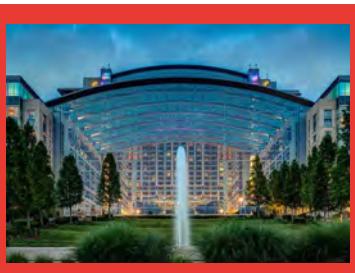
★ WASHINGTON, DC ★

AUGUST 7-11 • 2017

2017 IEEE INTERNATIONAL SYMPOSIUM ON

ELECTROMAGNETIC COMPATIBILITY, SIGNAL AND POWER INTEGRITY

EMC+SIPI



is the leading event to provide education of EMC and Signal and Power Integrity techniques to specialty engineers. The Symposium features five full days of innovative sessions, interactive workshops/ tutorials, experiments and demonstrations, and social networking events.

Join your colleagues August 7 – 11, 2017 at the EMC + SIPI Symposium in National Harbor, Maryland just outside of Washington D.C.

Gaylord National Resort & Convention Center
National Harbor, Maryland

CALL FOR PAPERS

Get Your Ideas Published!

EMC 2017 is a Technical Symposium. Technical Papers are the essence of our Technical Program. Original, unpublished papers on all aspects of EMC & SIPI are invited.

- **Preliminary Full Paper Manuscript:** November 1, 2016 - January 16, 2017
- **Notification of Acceptance:** February 21, 2017
- **Final Paper Due:** May 3, 2017

Call for Experiments & Demonstrations

Experiments and demonstrations utilize hardware and software to demonstrate a principle or phenomena of EMI/EMC. The presentations are informal and non-commercial; they are usually conducted in specific areas within the Exhibit Hall.

To schedule, contact:
Bob Scully - **bob.scully@ieee.org**
Sam Connor - **sconnor@ieee.org**

Call for Abstract Reviewed Papers

Abstract Reviewed Papers provide opportunities to exchange experiences and ideas. Only an abstract is required for initial submission, papers are included in the conference proceedings; however, these papers are not published in the IEEE XPlore.

Proposals Accepted: November 1, 2016 - February 21, 2017
Acceptance Notification: March 27, 2017
Final Paper Due: May 3, 2017

Call for Special Sessions

Special Sessions focus on areas of interest not addressed in Technical Papers. Acceptance criteria are the same as for Technical Papers.

Proposals Accepted: November 1, 2016 - December 20, 2016
Notification of Acceptance: January 8, 2017
Preliminary Papers Due: March 6, 2017
Final Papers Due: May 3, 2017

Call for Workshops & Tutorials

Workshops and Tutorials are informal, interactive educational presentations, typically addressing the practical side of understanding and solving EMC issues. These sessions are held on Monday and Friday.

Proposals Accepted: November 1, 2016 - January 16, 2017
Notification of Acceptance: February 21, 2017
Final Presentations Due: May 3, 2017

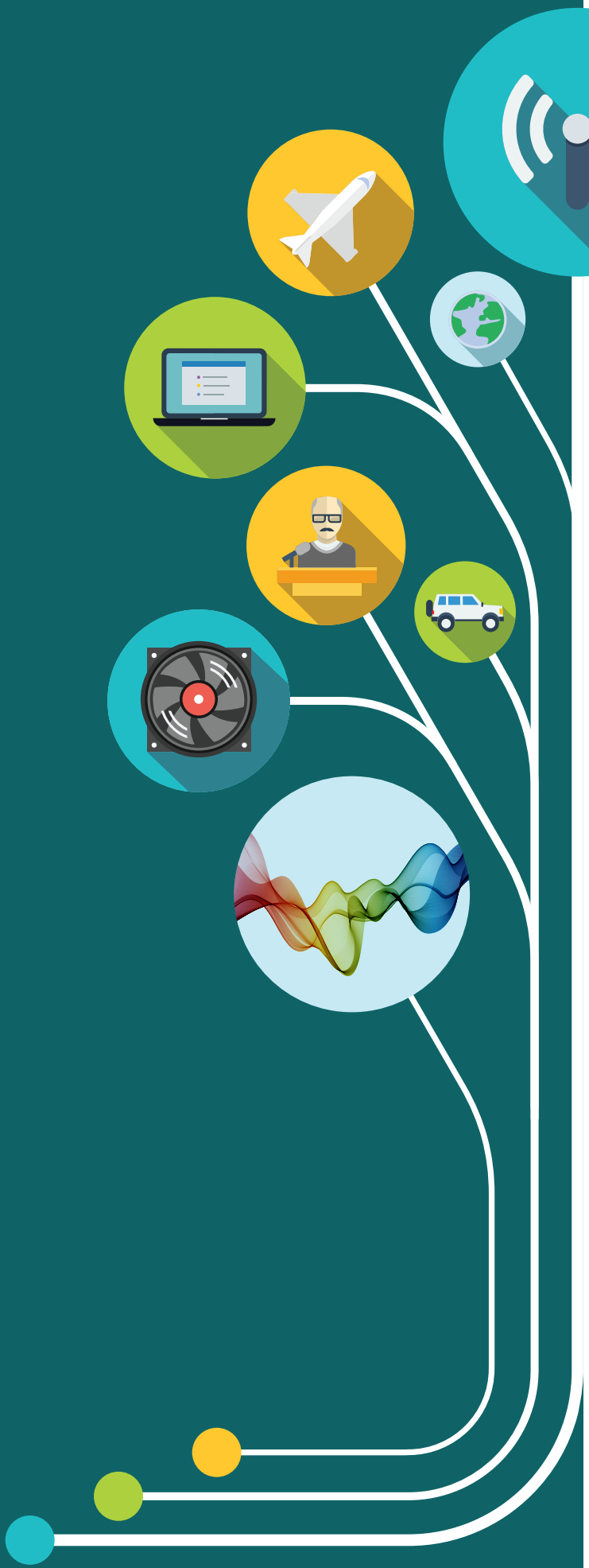
Commercial Vendor Demonstrations

Please note: Commercial Demonstrations are presented by vendors and are not committee reviewed.

To schedule, contact:
Mark Maynard – **mark.maynard@siemic.com**

IEEE | EMC SOCIETY®

www.emc2017.emcss.org



MARK YOUR CALENDAR

October 4-6, 2016

Join us for

THERMAL LIVE 2016

This free online event is an innovative concept in education and networking in thermal management. Created for electronics and mechanical engineers, it provides tools to learn the latest in thermal management techniques and topics.

Produced by Electronics Cooling® magazine, Thermal Live™ features webinars, roundtables, whitepapers, and new in 2016, live product demonstrations……

and yes, there really is no cost to attend!

www.thermallive2016.com

OPHIR RF
THE ART OF WIRELESS™



Most Comprehensive arrays of High-Power RF Systems in the industry. Core Products include RF Amplifiers from 10kHz to 40GHz, 1W to 24KW



sales@ophirrf.com • 310-306-5556
www.ophirrf.com

Your Source for

LISN's, Probes, Transient Generators, Loops, and Amplifiers



OPHIR EMC
a division of OPHIR RF
www.ophiremc.com

By Listening, Engineers Understand EMI Sources

Hardware Experiment and Demonstration,
9:30 AM - 11:30 AM, Rear of Exhibit Hall
Presenter: Arturo Mediano, University of Zaragoza, Zaragoza, Spain

In this demo, you will see some experiments with noise sources to understand how you can "listen and understand" them using near field probes.

Shield Penetrating Conductors

Hardware Experiment and Demonstration,
9:30 AM - 11:30 AM, Rear of Exhibit Hall
Presenter: John G. Kraemer PE, Rockwell Collins, Cedar Rapids, Iowa, USA

This demonstration will show the effects of conductors that penetrate a shield and provide insight as to how the degradation can be limited.

Modeling and Simulation of Cable Harness Radiation and Susceptibility for Automotive and Aircraft Structures

Computer modeling and Simulation Demonstration,
2:00 PM - 4:00 PM, Rear of Exhibit Hall
Presenter: Martin H. Vogel, Altair Engineering, Inc., Hampton, Virginia, USA

This simulation demonstration will teach how to model and simulate relevant scenarios, and will provide a refresher on transforming frequency-domain data to the time domain and vice versa.

Immunity Measurements

Technical Session, TH-PM-1, 2:30 PM - 4:30 PM, Room 205
Sponsored by TC-2
Co-Chairs: William A. Radasky, Metatech Corporation, Goleta, California, USA **Chuck Bunting,** Oklahoma State University, Stillwater, Oklahoma, USA

2:30 PM - 3:00 PM | ID 6431
Changes in a Printed Circuit Board's Absorption Cross Section Due to Proximity to Walls in a Reverberant Environment
Sarah Parker, Ian Flintoft, Andrew Marvin, John Dawson, Simon Bale and **Martin Robinson,** University of York, York, United Kingdom, **Ming Ye, Huawei, Kista, Sweden, Changyong Wan** and **Mengze Zhang,** Huawei, Shenzhen, China

3:00 PM - 3:30 PM | ID 6223
Minimum Upset/Failure Threshold Statistics of Devices for HERO/EMV Testing
Carl Hager, Justin Rison, and **Gregory Tait,** Naval Surface Warfare Center (NSWC), Dahlgren, Dahlgren, Virginia, USA

3:30 PM - 4:00 PM | ID 6605
Extension of the IEC 61000-4-20 Annex C to the Use of Arbitrary Transient Signals
Niklas Briest and **Heyno Garbe**, Leibniz Universität Hannover Hannover, Germany, **David Hamann,** Anglerweg 14b, Gifhorn, Germany, **Stefan Potthast,** Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster Germany

4:00 PM - 4:30 PM | ID 6322
Customized Compact Dielectric Lens to Improve Double-Ridge Horn Antenna Performance for Automotive Immunity EMC Test
Aidin Mehdipour and **Zhong Chen,** ETS-Lindgren, Cedar Park, Texas, USA, **Leo Matytsine,** Matsing Pte Ltd, Singapore, Singapore

High-Energy Transients and Measurement Technique

Technical Session, TH-PM-2, 2:30 PM - 4:00 PM, Room 207
Sponsored by TC-1
Co-chairs: Thomas Braxton, Shure Incorporated, Niles, Illinois, USA **Keith Armstrong,** Cherry Clough Consultants Ltd, Stafford, United Kingdom

2:30 PM - 3:00 PM | ID 6361
Accreditation of a NEMP Test Procedure: Approach, Measurement Technique, Uncertainty
Matthias Kreitlow, Gernot Schmidt, Frank Sabath, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

3:00 PM - 3:30 PM | ID 6690
Verifying MIL-STD-461G CS101 Using Frequency Domain Measurements on an Oscilloscope
Michael Schnecker, Rohde & Schwarz, Columbia, Maryland, USA

3:30 PM - 4:00 PM | ID 6385
Conducted Emission Profile Spectra Analysis Assessment of Impulse Transients
Larry Freeman, SNL, Melbourne, Florida, USA

Robust System Performance Issues

Technical Session, TH-PM-3,
2:30 PM - 4:00 PM, Room 206
Sponsored by SC-6
Co-chairs: Vignesh Rajamani, Exponent, Phoenix, Arizona, USA, **James West** and **Chuck Bunting,** Oklahoma State University, Stillwater, Oklahoma, USA

2:30 PM - 3:00 PM | ID 6327
Wireless Communication Problems in Energy-Efficient Building Construction
William Kuhn, Kansas State University, Manhattan, Kansas, USA

3:00 PM - 3:30 PM | ID 6722
Performance Test of Unmanned Aerial Systems Communication Links in Severe Multipath Environment
Jacob Dixon, Vignesh Rajamani, Chuck Bunting, Oklahoma State University, Stillwater, Oklahoma, USA

Power Quality and Conducted EMC in Power Electronics, Energy Efficient Technologies, Including Electrical Drives

Technical Session, TH-PM-4,
2:30 PM - 5:00 PM, Room 208
Sponsored by TC-7
Co-chairs: Dave Thomas, University of Nottingham, Nottingham, United Kingdom
Frank Leferink, Unversity of Twente, Enschede, Netherlands

2:30 PM - 3:00 PM | ID 6471
Estimation of Radiation Patterns from the Stator Winding of AC Motors Using Array Model
Hyeokjun Jo and **Ki Jin Han,** Ulsan National Institute of Science and Technology, Ulsan, The Republic of Korea

3:00 PM - 3:30 PM | ID 6578
On Harmonic Source Identification in Power Distribution Network with Multiple Non-linear Load
Osita Omeje and **Frank Okafor,** University of Lagos, Lagos, Nigeria

3:30 PM - 4:00 PM | ID 6716
Common Mode Current Prediction from a Power Converter with Attached Cables based on a Terminal Equivalent Circuit Model
Satyajeet Shinde, Abhishek Patnaik, Tamar Makharashvili, and **David Pommerenke,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Kohei Masuda,** Panasonic Corporation, Osaka, Japan

Active Link, Optics, and 5G

Technical Session, TH-PM-5,
2:30 PM - 5:00 PM, Room 214
Sponsored by TC-10
Co-Chairs: Zhichao Zhang, Intel Corporation, Chandler, Arizona, USA
Zhen Zhou, Intel Corporation, Santa Clara, California, USA

2:30 PM - 3:00 PM | ID 6408
Nanotube-based Antennas and Their Applications to Interconnects
Zhengfang Qian, Shenzhen University, Shenzhen, China

3:00 PM - 3:30 PM | ID 6625
EMI Coupling Paths in Silicon Optical Sub-assembly Package
Jing Li, Xiao Li, Ling Zhang, James Drewniak, and **David Pommerenke,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Xiangyang Jiao, Sukhjinder Toor,** and **Alpesh Bhobe,** Cisco Systems, Inc., San Jose, California, USA

3:30 PM - 4:00 PM | ID 6252
2x25G Low Power Optical IC for Thunderbolt Optical Cable Technology
Jerry Gao, Hengju Cheng, Hui-Chin Wu, Guobin Liu, Edmond Lau,Li Yuan, and **Christine Krause,** Intel Corporation, Santa Clara, California, USA

4:00 PM - 4:30 PM | ID 6665
Sub-THz Interconnect Channel for Planar Chip-to-Chip Communication
Bo Yu, Yu Ye, Xiaoguang Liu, and **Qun Jane Gu,** University of California Davis, Davis, California, USA

4:30 PM - 5:00 PM | ID 6697
PAM4 Signaling Considerations for High-Speed Serial Links
Nana Dikhaminjia, Jiayi He, Mikheil Tsiklauri, James Drewniak, and **Jun Fan,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Arun Chada** and **Bhyrav Mutnury,** Dell Inc., Round Rock, Texas, USA, **Brice Achkir,** Cisco Systems, Inc., San Jose, California, USA

Numerical Modeling and Simulation Techniques

Technical Session, TH-PM-6,
2:30 PM - 5:00 PM, Room 215
Sponsored by TC-10
Co-chairs: Olena Zhu, Intel Corporation, Santa Clara, California, USA
Roni Khazaka, McGill University, Montreal, Quebec, Canada
Yuriy Shlepnev, Simberian Inc., Las Vegas, Nevada, USA

2:30 PM - 3:00 PM | ID 6499
Modeling of Differential Striplines in Segmented Simulation of Printed Circuit Board Links
Torsten Reuschel, Miroslav Kotzev, David Dahl, and **Christian Schuster,** Hamburg University of Technology, Hamburg, Germany

3:00 PM - 3:30 PM | ID 6326
Practical Method for Modeling Conductor Roughness Using Cubic Close-packing of Equal Spheres
Lambert Simonovich, LAMSIM Enterprises Inc, Stittsville, Ontario, Canada

3:30 PM - 4:00 PM | ID 6520
Discrete Hilbert Transform Based Delay Causality Enforcement for Network Parameters
Mikheil Tsiklauri, Mikhail Zvonkin, Nana Dikhaminjia, Jun Fan, and **James Drewniak,** Missouri University of Science and Technology, Rolla, Missouri, USA

4:00 PM - 4:30 PM | ID 6539
Design Methodology for Behavioral Surface Roughness Model
Xinyao Guo, Han Gao, Guangyao Shen, Qion Liu, Victor Khilkevich, and **James Drewniak,** Missouri University of Science and Technology, Rolla, Missouri, USA, **Soumya De, Scott Hinaga,** and **Douglas Yanagawa,** Cisco Systems Inc., San Jose, California, USA

4:30 PM - 5:00 PM | ID 6392
SNEM: Full S-Parameter Synthesis From Near-End Measurement
Yunhui Chu and **Rob Friar,** Intel Corporation, Hillsboro, Oregon, USA, **Kai Xiao** and **Gong Ouyang,** Intel Corporation, DuPont, Washington, USA, **Yu Ho** and **Zhichao, Zhang,** Intel Corporation, Chandler, Arizona, USA, Beomtaek Lee, Intel Corporation, Santa Clara, California

Testing of Wireless Devices in the Modern World: Addressing Current and Future Performance Expectations

Half-day Tutorial, FRI-AM-1,
8:30 AM - 12:00 PM, Room 205
Co-chairs: Jari Vikstedt, ETS-Lindgren, Cedar Park, Texas, USA
Janet O'Neil, ETS-Lindgren, ETS-Lindgren, Cedar Park, Texas, USA

This tutorial will provide an overview and primer on testing modern wireless devices to verify performance and address the latest test challenges. Planned instructors include experts active in the RTCA DO-307, CTIA and ANSI ASC C63® standards committees on wireless devices.

Planned Speakers and Topics

ID 7029
Addressing the Increasing Wireless Requirements for Commercial Aircraft and Aerospace Applications
Dennis Lewis, The Boeing Company, Seattle, Washington, USA

ID 7097
Shared Spectrum: Implementation, Testing, and Verification Challenges
William Young, Communications Technology Laboratory, NIST, Boulder, Colorado, USA

ID 7084
OTA Testing Challenges of 60 GHz WiGig Devices
Jari Vikstedt, ETS-Lindgren, Cedar Park, Texas, USA

ID 7127
Adapting EMC Test Concepts to Emerging Wireless Test Requirements (and Vice-Versa)
Dan Kuester, Communications Technology Laboratory, NIST, Boulder, Colorado, US

Introduction to Medical EMC

Half-day, Tutorial, FRI-AM-2,
8:30 AM - 12:00 PM, Room 206
Chair: Darryl Ray, Darryl Ray EMC Consulting, Carlsbad, California, USA

Topics to be covered include the basics of the IEC 60601 family of standards and EMC requirements; FDA,, EU and other regulatory perspectives on medical EMC; and applying Essential Performance.

Planned Speakers and Topics

ID 6987
Basics of Medical EMC
Darryl Ray, Darryl Ray EMC Consulting, Carlsbad, California, USA

ID 7009
IEC 60601-1-2:2014
Harald Buchwald, CSA Group, Strasskirchen, Germany

ID 6984
Risk Management
Keith Armstrong, Cherry Clough Consultants Ltd, Brocton, Stafford, United Kingdom

ID 6997
IEC/TR 60601-4-2:2016
Darryl Ray, Darryl Ray EMC Consulting, Carlsbad, California, USA

ID 7054
Wireless Medical Device Testing
Greg Kiemel, Northwest EMC, Hillsboro, Oregon, USA

ID 7122
An FDA Perspective on EMC of Medical Devices
Jeff Silberberg, Food and Drug Administration, Silver Spring, Maryland, USA

Basic EMC Measurements

Half-day, Workshop, FRI-AM-3,
8:30 AM - 12:00 PM, Room 207
Sponsored by TC2
Chair: Don Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

This workshop will be an introduction to basic EMC measurements with a primary focus on emission testing but also including selected immunity test techniques.

Planned Speakers and Topics

ID 7041
Emission Measurements for Tabletop Equipment
Steve Koster, Washington Laboratories, Gaithersburg, Maryland, USA

ID 6973
Emission Measurements for Floor-Standing Equipment
H. R. (Bob) Hofmann, Hofmann EMC Engineering, Naperville, Illinois, USA

ID 7003
IEC Transient-Immunity Testing Overview
Thomas E. Braxton, Shure Incorporated, Niles, Illinois, USA

ID 7070
Immunity to Continuous RF Disturbances
John Maas, IBM Corporation, Rochester, Minnesota, USA

ID 6911
Basic Measurement Sites, Methods, and Associated Errors
Don Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

ID 7059
Selecting a Quality EMC Lab
Daniel D. Hoolihan, Hoolihan EMC Consulting, Lindstrom, Minnesota, USA

ID 6912
Uncertainty Considerations in Stating Pass/Fail
Don Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

Signal Integrity and Power Integrity Fundamental for Computer and Communication Systems

Half-day, Tutorial, FRI-AM-4,
8:30 AM - 12:00 PM, Room 208
Co-chairs: Chunfei Ye, Intel Corporation, Dupont, Washington, USA
Jiangqi He, Intel Corporation, Chandler, Arizona, USA

This tutorial will introduce concepts and design challenges in SI and PI, test and measurement approaches addressing SI and PI issues, and possible enablers that may improve SI and PI performance.

Planned Speakers and Topics

ID 7091
Fundamentals of Signal Integrity
Chunfei Ye, Intel Corporation, Dupont, Washington, USA

ID 7091
Challenges in High Speed Interconnect Characterization
Xiaoning Ye, Intel Corporation, Hillsboro, Oregon, USA

ID 7091
Server Platform Power Delivery Analysis and Design
Jiangqi He, Intel Corporation, Chandler, Arizona, USA

EMC Consultant's Toolkit

Half-day, Workshop, FRI-AM-5,
8:30 AM - 12:00 PM, Room 215
Chair: Jerry Meyerhoff, JDM Labs LLC, Buffalo Grove, Illinois, USA

Continued on Page 42

Attention: RF, Microwave, & High-Speed Digital Designers



EDI CON



2016

Registration is OPEN
for
EDI CON USA 2016
September 20-22, Hynes Convention Center, Boston, MA

Industry-Driven Technical Conference with:
- Technical Sessions
- Panels
- Workshops
- Short Courses
- Plenary & Keynote Talks

Exhibition features:
- 90+ Exhibitors
- Demonstrations
- Poster Sessions
- Hands On Training
- Networking

Come to EDI CON USA to find solutions, products, and techniques that you can put to immediate use in communication, defense, consumer electronics, aerospace, and medical designs.

Hot Topics: 5G, SOI, EMC/EMI, Test & Measurement, Modeling & Simulation, Signal Integrity, Power Integrity, EDA, Space-Qualified ICs, Ultra Low Power, MIMO, Radar, GaN, IoT

Register Online Today!
(Early Bird discount ends July 31, 2016)
http://www.ediconusa.com/registration.asp

www.ediconusa.com

Topics to be addressed include: Practical tools and skills in the following areas – Marketing and selfpromotion, acquiring low-cost equipment, developing a troubleshooting kit using new and low-cost DIY tools & probes, how to use social media marketing such as LinkedIn, to bring in business, networking practices, advertising, setting up your office, pricing your services, tracking your time, best business practices, how to present yourself professionally, tax & legal obligations and other issues (such as how to review contracts and non-disclosure agreements).

Planned Speakers and Topics

ID 6901
Marketing Yourself
Jerry Meyerhoff, JDM Labs LLC, Buffalo Grove, Illinois, USA

ID 7052
Networking, Branding & Providing Customer Value
Kenneth Wyatt, Wyatt Technical Services LLC, Woodland Park, Colorado, USA

ID 7048
Presenting Yourself Professionally
Patrick André, André Consulting Inc., Bothell, Washington, USA

ID 7053
Acquiring Test Equipment & Developing a Low-Cost EMC Troubleshooting Kit
Patrick André, André Consulting Inc., Bothell, Washington, USA, **Kenneth Wyatt,** Wyatt Technical Services LLC,Woodland Park, Colorado, USA

ID 6927
So You Want to be a Consultant?
Daryl Gerke, Kimmel Gerke Associates, LTP., Mesa, Arizona, USA
Panel Discussion: Audience Q&A

Recent Developments and Advanced Measurements Method in EMC for Emerging Wireless Technologies

Half-day, Tutorial, FRI-PM-1,
1:30 PM - 5:30 PM, Room 205
Sponsored by TC12
Co-chairs: Yihong Qi, DBJ Technologies, Zhuhai, China
Harry Skinner, Intel Corporation, Hillsboro, Oregon, USA
Jun Fan, Missouri University of Science and Technology, Rolla, Missouri, USA

This tutorial, sponsored by TC12 EMC for Emerging Wireless Technologies, will provide an overview of the issues and challenges, as well as the recent developments in modeling, measurements, test practices, and standards.

Planned Speakers and Topics

ID 6976
Current and Future Coexistence Challenges for Wireless Devices
Harry Skinner, Intel Corporation, Hillsboro, Oregon, USA

ID 7006
OTA for Certification, R&D and Mass Production
Lie Liu, General Test Systems, Shenzhen, China

ID 7045
Self-interference Cancellation
Eduardo Alban, Intel Corporation, Hillsboro, Oregon, USA

ID 7107
Radiated Two Stage Method for MIMO Throughput Test
Penhui Shen, General Test Systems, Shenzhen, China

ID 7094
4G LTE MIMO Test Methods
Ya Jing, Keysight, Beijing, China,

ID 7124
Interference Measurement on Wireless Network
Gao Feng, China Mobile, Beijing, China

Techniques and Measures to Manage Risks with Regard to Electromagnetic Disturbances

Half-day, Workshop, FRI-PM-2,
1:30 PM - 5:30 PM, Room 206
Sponsored by TC1
Chair: Keith Armstrong, Cherry Clough Consultants Ltd, Brocton, Stafford, United Kingdom

Where safety risks may be increased by the effects of EMI on electronic equipment, EMC must be risk-managed for the full lifetime of the equipment/system/installation concerned, and so must take into account all reasonably foreseeable aging, wear, corrosion, faults, use and misuse.

Planned Speakers and Topics

ID 6919
Risk-managing Electromagnetic Disturbances is Increasingly Important
Davy Pissoort, KU Leuven, Oostende, Belgium

ID 6975
Increasing Importance of EMC for Functional Safety
Davy Pissoort, KU Leuven, Oostende, Belgium

ID 6919
General Overview of Approaches: a) 'Big Grey Box'; b) New Method
Keith Armstrong, Cherry Clough Consultants Ltd, Brocton, Stafford, United Kingdom

ID 6919
Developments in Related IEC and IEEE Standards, and IET Codes of Good Practice
Keith Armstrong, Cherry Clough Consultants Ltd, Brocton, Stafford, United Kingdom

ID 6919
Special Challenges for Medical EMC Standard IEC 60601-1-2
Keith Armstrong, Cherry Clough Consultants Ltd, Brocton, Stafford, United Kingdom

ID 6919
Discussions of the Detailed Design Techniques and Measures for Increasing Resilience Against the Effects of EMI, Using the New Practical Method
Keith Armstrong, Cherry Clough Consultants Ltd, Brocton, Stafford, United Kingdom

Overall Discussions, Q & A
Davy Pissoort, KU Leuven, Oostende, Belgium

Technical Summary and Conclusions

Keith Armstrong, Cherry Clough Consultants Ltd, Brocton, Stafford, United Kingdom

Smart Grid Support and EMC Issues

Half-day, Tutorial, FRI-PM-3,
1:30 PM - 5:30 PM, Room 207
Sponsored by SC1
Chair: Don Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey, USA

This tutorial will review the latest Smart Grid (SG) EMC activities of key organizations and an example of an SG EMC working group on the topic.

Planned Speakers and Topics

ID 6942
Immunity for Power Station and Substation Environments
William A. Radasky, Metatech Corporation, Goleta, California USA

ID 6916
US Smart Grid Interoperability Panel (SGIP 2.0) and its Testing and

Certification Committee
Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey USA

ID 6917
Application of Selected EMC Standards by the SGIP Electromagnetic Interoperability Issues Working Group (EMIIWG)
Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey USA

ID 6924
EMC Between Communication Circuits and Power Systems in the Frequency Range 2-150 kHz
David Thomas, University of Nottingham, United Kingdom

Crosstalk – Theory, Modeling, Characterization, and Design Optimization

Half-day, Tutorial, FRI-PM-4, 1:30 PM - 5:30 PM, Room 208
Sponsored by TC9 and TC10
Co-chairs: Xiaoning Ye and **Kai Xiao,** Intel Corporation, Hillsboro, Oregon, USA

This tutorial will cover fundamentals of crosstalk, modeling, simulation, characterization of crosstalk, and design techniques for crosstalk reduction and mitigation.

Planned Speakers and Topics

ID 7004
Fundamentals of Crosstalk
Xiaoning Ye, Intel Corporation, Hillsboro, Oregon, USA

ID 7004
Crosstalk in Transmission Lines on a Printed Circuit Board
Kai Xiao, Intel Corporation, Hillsboro, Oregon, USA

ID 7004
Crosstalk in Vertical Path of High-speed Links
Kai Xiao, Intel Corporation, Hillsboro, Oregon, USA

ID 7004
Crosstalk Management Techniques in PCB Transmission Lines
Xiaoning Ye, Intel Corporation, Hillsboro, Oregon, USA

ID 7004
Inter-layer Crosstalk in Dual-stripline Design and Management Techniques
Kai Xiao, Intel Corporation, Hillsboro, Oregon, USA

Calibration of EMC Measurement Instrumentation

Half-day, Workshop, FRI-PM-5, 1:30 PM - 5:30 PM, Room 215
Co-chairs: Doug Kramer, ETS-Lindgren, Cedar Park, Texas, USA
Janet O'Neil, ETS-Lindgren, Cedar Park, Texas, USA

This tutorial will present detailed information about the state of the art in calibration of EMC measurement equipment required by many current international standards.

Planned Speakers and Topics

ID 7043
Traceability of Antenna Measurement and Introduction to Methods in CISPR 16-1-6 for Frequencies Below 1 GHz
David Knight, NPL, Middlesex, England, United Kingdom

ID 6982
Calibration of Field Probes for EMC Measurements (IEEE 1309)
Zhong Chen, ETS-Lindgren, Cedar Park, Texas, USA

ID 7098
Impact of the Cables and Connectors on LISN Calibration
Dennis Lewis, Boeing, Seattle, Washington, USA

ID 7114
Calibration of the Uniform Field for 61000-4-3 for Field Uniformity Above 1 GHz
Vic Hudson, ETS-Lindgren, Cedar Park, Texas, USA

ID 6971
EMI Compliance Receiver Calibration
Mark Terrien, Keysight Technologies, Santa Rosa, California, USA



TC 1 EMC Management

Wednesday, 7:30 to 9:00 AM, CC, Room 203

This committee is concerned with the development and dissemination of Best Practices and Methodologies for the successful leadership, supervision and guidance of EMC related activities. These Best Practices and Methodologies shall be structured so as to provide assistance to all managers, and engineers. Appropriate and convenient tools shall serve as a foundation for these Best Practices and Methodologies.

TC 2 EMC Measurements

Tuesday, 7:00 to 8:30 AM, CC Room 203

This committee is concerned with the measurement and instrumentation requirements in EMC standards and procedures and how they are interpreted. Also concerned with the adequacy of measurement procedures and measurement instrumentation specifications for radiated and conducted emission and susceptibility tests and the rationale for performance limits for these tests.

TC 3 Electromagnetic Environment

Wednesday, 7:00 to 9:00 AM, CC, Room 209

This committee is to encourage research in the following areas: electromagnetic environment (EME), development of standards for EME measurement and characterization, natural and man-made sources of electromagnetic environment that comprise this environment, effects of noise (unwanted portions of EME) on systems performance, effects of international civil and military standards intended to control man-made intentional and unintentional emissions of electromagnetic energy.

TC 4 Electromagnetic Interference

Wednesday, 12:00 to 2:00 PM, CC, Room 211

This committee is concerned with design, analysis, and modeling techniques useful in suppressing interference or eliminating it at its source. Bonding, grounding, shielding, and filtering are within the jurisdiction of this committee. These activities span efforts at the system, subsystem, and unit levels

TC 5 High Power Electromagnetics

Wednesday, 12:00 to 1:30 PM, CC, Room 203

This committee is concerned with the effects and protection methods for electronic equipment and systems for all types of high power electromagnetic environments. These environments include electromagnetic pulse (EMP), intentional EMI environments (i.e., narrowband and wideband), lightning electromagnetic currents and fields, electrostatic discharge and geomagnetic storms. In addition this committee deals with the commercial data security issue through electromagnetic information leakage activities. Interactions with subsystems, systems and platforms are included.

TC 6 Spectrum Engineering

Thursday, 7:00 to 8:15 AM, CC, Room 212

This committee is concerned with the analysis, design, and measurement techniques for intentional RF transmitting and receiving equipment to prevent interference and promote efficient spectrum use through technology and operational based approaches,such as software design, dynamic spectral allocation, waveform control, as well as frequency coordination and management procedures.

TC 7 Low Frequency EMC

Thursday, 7:00 to 9:00 AM, CC, Room 209

This committee is concerned with low-frequency EMC including Power Quality in electric power systems. The committee is focusing on the application of fundamental EMC concepts also to low-frequency conducted disturbances. EMC in power systems is expected to be increasingly important. This is due to increased use of electronics in renewables, electric vehicles, energy efficient technologies and Smart Grid applications.

TC 9 Computational Electromagnetics

Tuesday, 12:00 to 1:30 PM, CC, Room 210

This committee is concerned with broad aspects of Applied Computational Electromagnetic techniques which can be used to model electromagnetic interaction phenomena in circuits, devices, and systems. The primary focus is with the identification of the modeling methods that can be applied to interference (EMC) phenomena, their validation and delineating the practical limits of their applicability. Included are low and high-frequency spectral-domain techniques and time-domain methods.

TC 10 Signal/Power Integrity

Wednesday, 12:00 to 1:00 PM, CC, Room 210

This committee is concerned with the design, analysis, simulation, modeling and measurement techniques useful in maintaining the quality of electrical signals. These activities encompass all aspects of signal integrity from the integrated circuit level to the system level.

The newest technical topic area for the EMC Society, the topics include carbon nanotubes, composite materials, and other measurements, design, and analysis applications.

TC 11 Nanotechnology & Advanced Materials

Tuesday, 12:00 to 1:30 PM, CC, Room 209

TC 12 EMC for Emerging Wireless Technologies Charter

Tuesday, 8:00 to 9:00 AM, CC, Room 209

This committee is concerned with the EMC design, analysis, modeling, measurement, and testing aspects of emerging wireless products. The committee encourages research including but not limited to the following areas:

Innovative Wireless Component Design for System Integration: Wireless component design with integrated EMC functions and/or meeting certain EMC specifications.

Radio-Frequency Interference and De-sense: Characterization and mitigation of interference from digital circuits to wireless antennas.

Measurement & Testing of Wireless Systems: Development of methods and standards for wireless performance and compliance testing.

Wireless Coexistence: Interference control/mitigation among various wireless radios, as well as related testing methods and standard development

Wireless Product or Subsystem EMC: Wireless-specific EMC design

SC 1 Smart Grid

Wednesday, 5:45 to 6:30 PM, CC, Room 211

This special committee is concerned with coordination of the EMC Society activity on providing EMC principles for those organizations and associated documentation and specifications that address the efficient use of the AC power grid including the control of power entering and in some cases exiting a house or building.

SC 5 Power Electronics EMC

This committee is concerned with power electronics converters EMI/EMC issues. These are mainly, converters that use switching frequency schemes to control the output parameters, such as voltage and current. These converters, including inverters, can be found as an interface between the raw power and the electrical grid to provide the end-user with the desired operating power. Applications can range from grid-connected PV systems, wind farms, automotive, aerospace, and communication systems.

SC 6 Unmanned Aircraft Systems EMC

Tuesday, 12:00 to 1:00 PM, CC, Room 211

This committee is concerned with design, testing, modeling/simulation required for system level EMC for unmanned aircraft systems that will be engaged in all weather autonomous single and cooperative flight. Special emphasis is on spectrum management on intra and inter-system interactions (platform integration), mission specific data security and bandwidth requirements, and robust performance in the presence of high-intensity radiated fields (HIRF). Engagement in the development of standards will be a key role of this special committee.

SC 7 Aeronautics and Space EMC

Wednesday, 12:00 to 2:00 PM, CC, Room 211

This committee is concerned with EMI/EMC issues in aircraft, spacecraft & space launch vehicles, robotic and crewed. The space environment provides unique challenges in the design, development, test and operation of space systems to avoid EMI and achieve EMC. Aeronautics & space EMC covers a wide range of topics on the part, board, box, system, multi-system, planetary and interplanetary levels. The harshness of the atmospheric, launch and space environments necessitates a broader view of EMC issues than traditional terrestrial projects, often leading to creative methods and solutions that can benefit our society's efforts elsewhere on Earth.

CLAYTON R. PAUL GLOBAL UNIVERSITY

This year's Global University will include approximately 8 hours of instruction on EMC and 4 hours on SIPI related topics. Students are encouraged to participate in all of the other activities when they are not in class. Classes are taught by an international panel of educators, who have been selected for this program based on their reputation for excellence in areas of practical importance to EMC and SI PI engineers and their demonstrated ability to communicate effectively with students who are new to the field.

MONDAY, JULY 25

8:00 am - 9:00 am
EM COUPLING MECHANISMS
Professor Bogdan Adamczyk, Grand Valley State University, Michigan, USA Review of the 4 basic coupling EMC coupling mechanisms with examples including crosstalk in cables and circuit board structures.

9:00AM - 10:00 AM
SIGNAL SPECTRA
Professor Flavio Canavero, Politecnico di Torino, Italy Time-domain and frequency-domain representations of signals. Time-domain and frequency-domain measurements.

10:00 AM - 11:00 AM
NON-IDEAL BEHAVIOR OF COMPONENTS
Professor Arturo Mediano, University of Zaragoza, Spain High frequency parasitics and non-linear behavior of resistors, capacitors, inductors, ferrites and other common circuit components.

11:00 AM - 12:00 PM
RADIATED EMISSIONS
Lee Hill, Worcester Polytechnic Institute, USA and Silent Solutions, Amherst, New Hampshire, USA Radiated emissions testing and source modeling. Basic antennas theory.

1:00 PM - 2:00 PM
TRANSMISSION LINES
Professor Francesca Maradei, University of Rome, La Sapienza, Italy Basic transmission line theory with an emphasis on time-domain transmission lines.

2:00 PM - 3:00 PM
SHIELDING
Professor Emeritus Andy Marvin, University of York, United Kingdom Basic shielding theory, shielding materials and shielding effectiveness measurements.

3:00 PM - 4:00 PM
CONDUCTED EMISSIONS AND FILTERING
Mark Steffka, University of Michigan-Dearborn and General Motors, Dearborn, Michigan, USA Conducted emissions testing and source modeling. Basic filters.

4:00 PM - 5:00 PM
POWER INTEGRITY
Professor Tzong-Lin Wu, National Taiwan University Basic principles of power distribution and decoupling at the printed circuit board and system level.

THURSDAY, JULY 28

8:00 AM - 9:00 AM
SIGNAL INTEGRITY
Professor Jun Fan, Missouri Univ. of Science and Technology, Rolla, Missouri, USA Introduction to key concepts in the field of signal integrity including noise margins, jitter, eye diagrams, and signal integrity models and measurements.

9:AM - 10:00 AM
PCB AND SYSTEM
Design Professor Frank Leferink, University of Twente, Enschede, Netherlands Basics of printed circuit board and systems design for EMC applying the concepts introduced in the previous lectures.

10:00 AM - 11:00 AM
EM MODELING FOR EMC AND SI
Professor Emeritus Todd Hubing, Clemson University, USA Overview of modeling methods and tools available to engineers to aid in the EMC and signal integrity design of their products, with examples of effective and ineffective modeling approaches.

11:00 AM - 12:00 PM
QUESTION AND ANSWER SESSION
with Global University Instructors



INDEX OF ADVERTISERS

AH Systems ..... Inside Front Cover
Ametek CTS 21
AR RF/Microwave Instrumentation ..... 09, 10, 11, 12, 13, 14, 31, Inside Back Cover
Advanced Test Equipment rentals 45
CST - Computer Simulation Technology 03
EDICON USA 43
EMC Live – Test & Design Bootcamp 2016 ..... Back Cover
EMC + SIPI 2017 38
ERIS 29
HV Technologies, Inc 17
Langer EMV Technik 19
Master Bond 37
Microwave Vision Group 47
Ophir 40
R&K Company Limited 07
Retlif 48
Rohde & Schwarz 35
Schurter, Inc 08
Spira 05
Thermal Live 2016 39



ON-SITE OR IN-LAB...
- Three state-of-the-art labs.
- Dedicated, highly trained staff.
- Full engineering support.
- Fully accredited: 300+ EMC test methods.

Trust Retlif... For EMC and Lightning testing to national and international standards.

Trust Retlif... For shielded effectiveness testing, EMP, high level radiated susceptibility.

Trust Retlif... Leading military, aerospace, maritime and rail organizations have, since 1978.

RETLIF TESTING LABORATORIES

*Put us to the test.*SM

795 Marconi Avenue • Ronkonkoma, NY 1
TEL: (631) 737-1500 • FAX: (631) 737-149
www.retlif.com

NEW YORK • NEW HAMPSHIRE • PENNSYLVANIA
WASHINGTON D.C. • NORTH CAROLINA

We're In The Business Of Making Your Life Easier



4 kHz – 200 MHz System

10 kHz – 3 GHz System



RF Conducted Immunity Testing to IEC, Military & Automotive Standards

If you are tired of mixing and matching various components, try AR's complete line of RF Conducted Immunity Test Systems. We now make five fully configured and stand alone CI Systems from 4 kHz to 3 GHz with output powers designed to meet the latest commercial, custom and military standards.

Each CI System has the built-in flexibility to conduct standard and customized tests using our included user friendly software that can generate reports directly into Microsoft® Word or Excel.

Our job is to make your job easier.

To learn more, visit us at www.arworld.us/easier or for technical support call 800-933-8181.

Come See Us at IEEE EMC Ottawa
The Shaw Centre, Ottawa, Canada, July 25-29, 2016 – Booth 400

ISO 9001:2008 Certified

We don't just build great products.
We build great products that last.

BUILT TO LAST

rf/microwave instrumentation

Other ar divisions: modular rf • receiver systems • ar europe

USA 215-723-8181. For an applications engineer, call 800-933-8181.
In Europe, call ar United Kingdom +44 1908 282766 • ar France +33147917530 • ar Deutschland +49 6101 80270 0 • ar Benelux +31 172 423000

www.arworld.us
Download the AR RF/Microwave Mobile App: www.arworld.us/arApp

Copyright © 2016 AR.
The orange stripe on AR products is Reg. U.S. Pat. & TM. Off.



EMC LIVE® 2016

TEST & DESIGN BOOTCAMP

DEDICATED TO EMC PRE-COMPLIANCE AND COMPLIANCE TESTING... ALL FROM YOUR OFFICE CHAIR

NOVEMBER 16, 2016

tb.emclive2016.com