

2026 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY, SIGNAL & POWER INTEGRITY



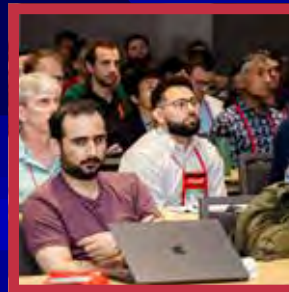
FINAL PROGRAM



**THREE
KEYNOTE
SPEAKERS**



**EXHIBIT
HALL**



**TECHNICAL
PROGRAM
DETAILS**



**EDUCATION
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WELCOME FROM ZHONG CHEN THE 2026 EMC+SIPI GENERAL CHAIR



Welcome to the 2026 IEEE International Symposium on Electromagnetic Compatibility, Signal and Power Integrity!

On behalf of the IEEE EMC Society, I am pleased to invite you to join us for our annual Symposium from August 3-7, 2026, in vibrant downtown Dallas, Texas. With its thriving tech community and dynamic energy, Dallas offers an ideal setting for a week dedicated to EMC, Signal Integrity, and Power Integrity.

Consider this Symposium your professional “sabbatical”—a chance to recharge your skills with the latest design and measurement techniques. Our comprehensive technical program features a wide range of in-depth sessions, including paper sessions where researchers present their latest findings. You will also find popular programs like the Henry W. Ott Fundamentals of EMC Tutorial, the Clayton R. Paul Global EMC University, and the Global Signal Integrity and Power Integrity University, where international experts will share their insights and expertise.

You will also find hands-on workshops, standards sessions, experiments, demonstrations, and an expansive technical exhibition. Special events in the exhibit hall are designed to foster direct engagement between attendees and industry leaders. Additionally, the open Standards Committee meetings provide a unique opportunity to hear directly from those shaping future standards. If you have questions about standards, this is the perfect venue to get answers face-to-face.

The Symposium will be held at the Hilton Anatole Dallas, located just four miles from Love Field and 17 miles from Dallas-Fort Worth International Airport. With over 1,600 guest rooms, multiple restaurants, and spacious meeting and exhibition spaces, the venue offers convenience and comfort under one air-conditioned roof. You will also have access to amenities such as an indoor pool, a lazy river, and a complimentary water park!

Stay connected by visiting our website regularly or subscribing to our newsletter for updates delivered directly to your inbox.

We look forward to welcoming you to Dallas! If you have any questions, feel free to reach out to us at symposiuminfo@emcss.org.

*Zhong Chen
General Chair, 2026 IEEE International Symposium on
Electromagnetic Compatibility, Signal & Power Integrity (EMC+SIPI)*

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Tuesday, August 4
2:00 - 4:00PM

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www.dfwairport.com/explore/transportation/



DALLAS LOVE FIELD
www.dallas-lovefield.com/passenger-services/ground-transportation



DALLAS AREA RAPID TRANSIT (DART) LIGHT RAIL

DART connects you to most of Dallas' entertainment districts, Kay Bailey Hutchison Convention Center Dallas, American Airlines Center, DFW International and Love Field airports, as well as Trinity Railway Express (TRE). For information on the stops and operating times [CLICK HERE](#).



MCKINNEY AVENUE TROLLEY

Hop on the McKinney Avenue Trolley that takes you through Downtown, The Dallas Arts District and Uptown. Look for the "M-Line" maroon sign that's located at all the stops along the route, and track the trolley to see when its near.

TRAVEL INFORMATION

SELF-PARKING:

Hourly rates may vary beginning at \$30 + tax
Overnight: From \$40 + tax

VALET PARKING:

Daily Visitor Rates May Vary from \$40 + tax
Overnight Rates May Vary from \$40 + tax
Oversize Vehicles extra

LOCAL AIRPORT

Dallas Fort Worth Airport - www.dfwairport.com
Dallas Love Field - www.dallas-lovefield.com

AIRPORT TRANSPORTATION

For transportation options to and from the Dallas Fort Worth Airport visit:
www.dfwairport.com/explore/transportation

FOR TRANSPORTATION OPTIONS TO AND FROM DALLAS LOVE FIELD VISIT:

<https://www.dallas-lovefield.com/passenger-services/ground-transportation>

TRAVEL VISA INFORMATION

United States citizens do not need a U.S. visa or passport for travel to Dallas, Texas. If you are not a US citizen, you may need a visa for entry into the US.

Once you register for the conference, you can request a letter indicating that you will be attending the conference.

For additional information regarding visas and/or passports, please visit <http://travel.state.gov/>

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STAY N' PLAY CHALLENGE MAP

Visit with and collect stickers from participating exhibitors throughout the hall.



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INDUSTRY NEWS & RESOURCES

Announcements & More

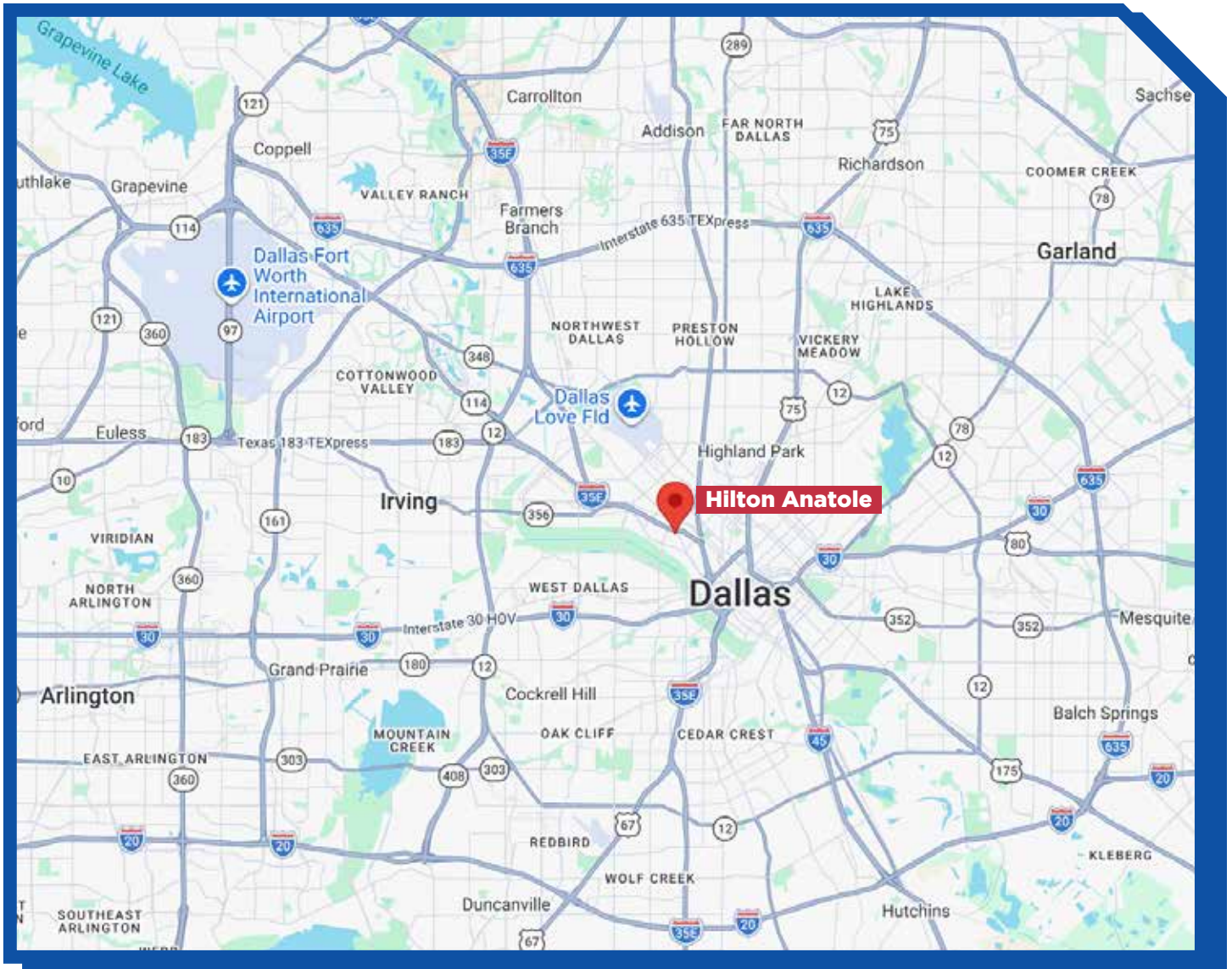
ENGINEERING GUIDANCE

Practical information from trusted experts.

DOWNTOWN DALLAS MAP

Hilton Anatole: 2201 N Stemmons Fwy Dallas, Texas 75207 USA**Phone:** +1 214-748-1200

It is easy to get to the resort at 2201 North Stemmons Freeway (I-35E), only 20 minutes from the Dallas/Ft. Worth International Airport and 10 minutes from Dallas Love Field Airport. You can find a Super Shuttle, ride share, or taxi from the airport, or rent a car.

**EXPLORE DALLAS:**

Hilton Anatole is just northwest of downtown Dallas along I-35E.

The following activities are near the resort:

Dallas Zoo: Only six miles from the resort, explore the lands and animals of the renowned Dallas Zoo.

Shopping: Find unique antiques at Uncommon Market or fashions at the many popular malls in Dallas.

Arts Districts: Discover art galleries, cafes, shopping and more at The Bishop Arts District and the Dallas Arts Districts. Explore more paintings and sculpture through the famous Hilton Anatole resort collection.

Dallas World Aquarium: From penguins to crocodiles and many more, learn about animals from all over the world at the Dallas World Aquarium. Explore the expansive DWA conservation efforts and lush habitats.

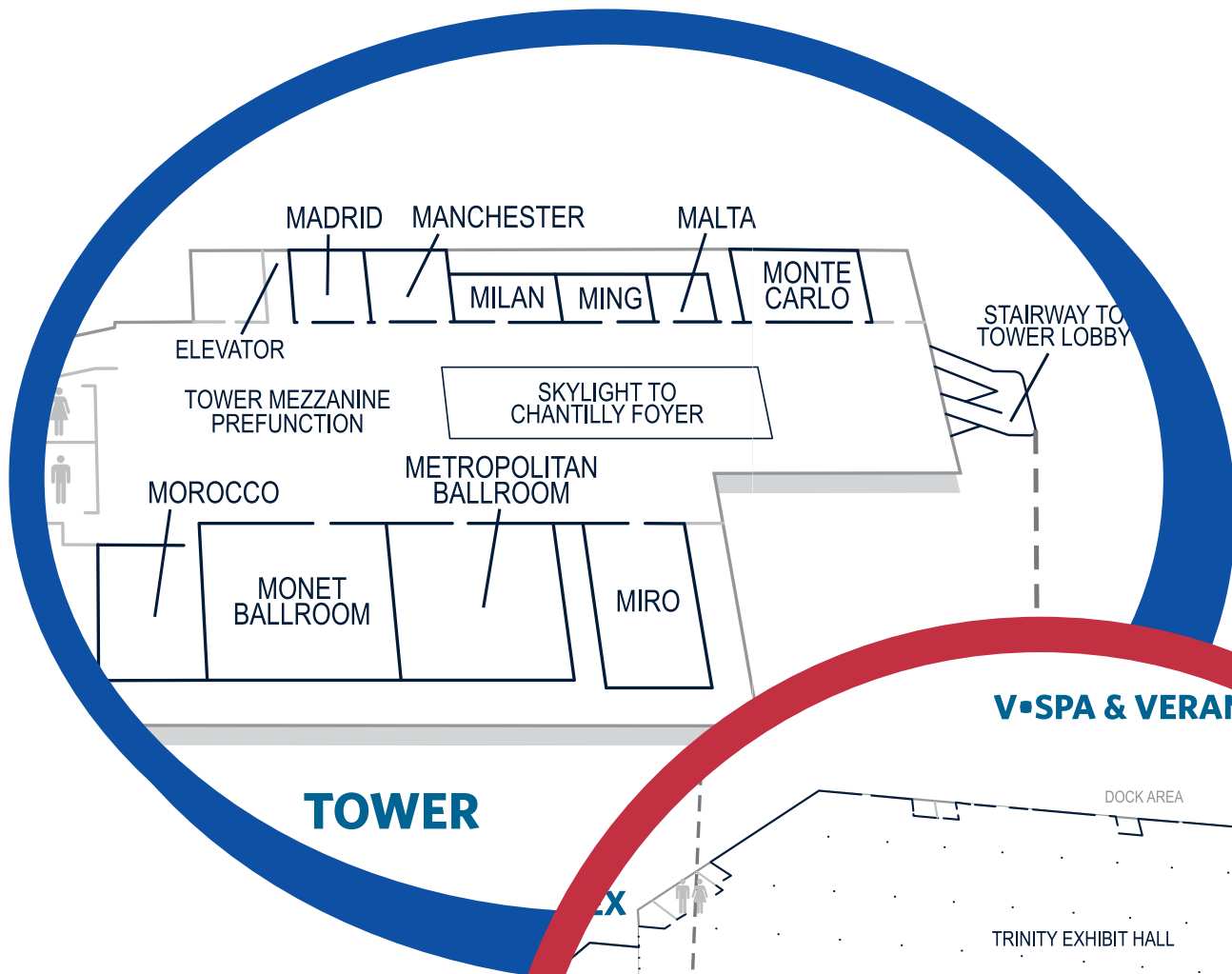
Medieval Times: Sleep like royalty and experience a medieval show of the ages! Medieval Times is a family dinner theater featuring staged medieval-style games, sword-fighting, and jousting.

RESORT ACTIVITIES:

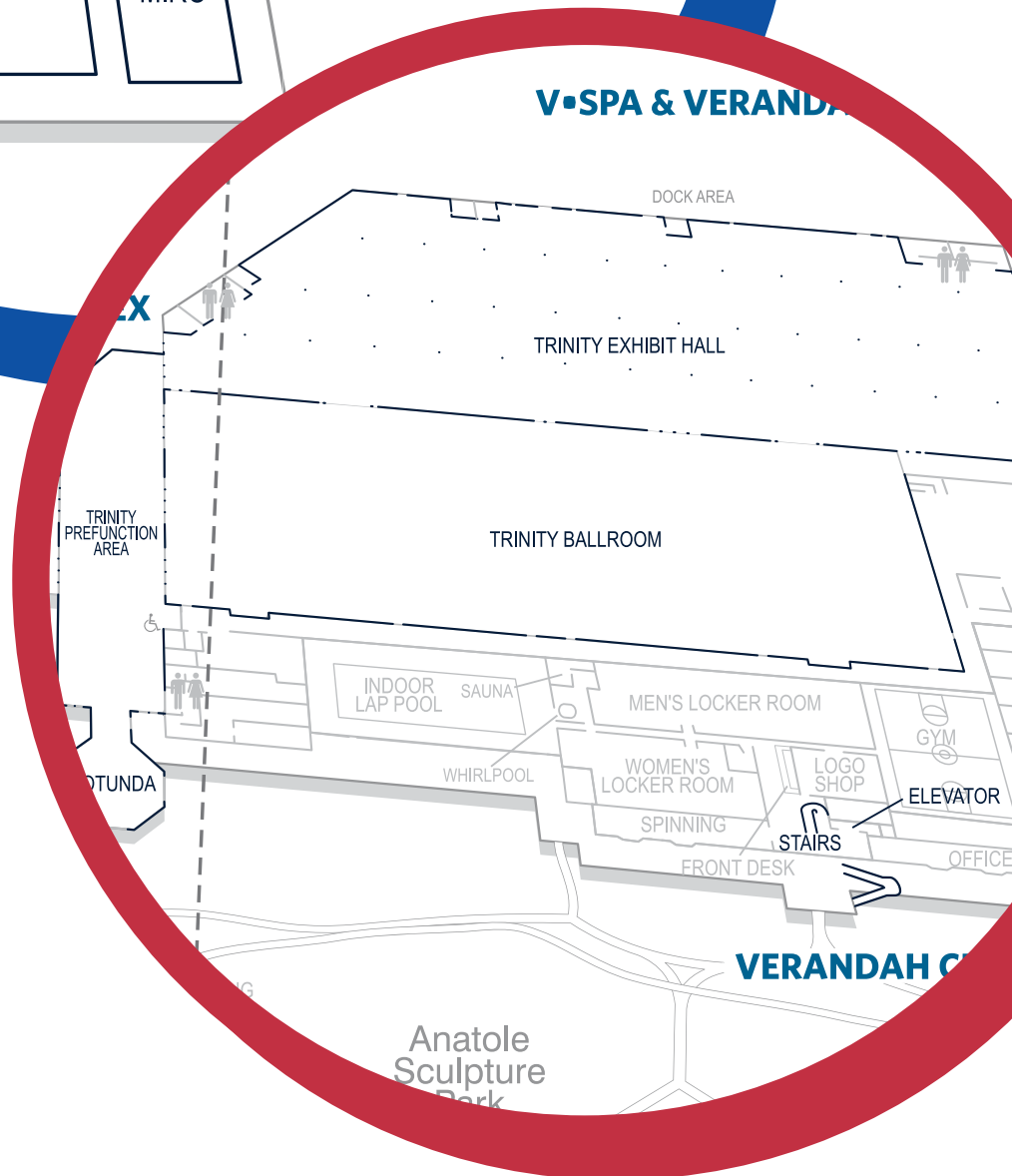
Resort Pools: In addition to our indoor pools, your family will love our outdoor pool complex, complete with a lazy river, two waterslides, a swim-up bar, Leisure Cove, kid splash pad, cabana rentals, activities for the family, and JadeWaters Grill & Bar.

Topgolf Swing Suite: Experience a new way to play! The Topgolf Swing Suite houses the most advanced golf and interactive gaming simulator with a variety of virtual games, paired with comfortable lounge seating and food and beverage service. Located in the Grand Atrium – grab a bay and choose your game today.

Spa & Wellness: Amp up or wind down: with an 80,000-square-foot gym and full-service spa, we have what you need to keep your mind and body healthy.



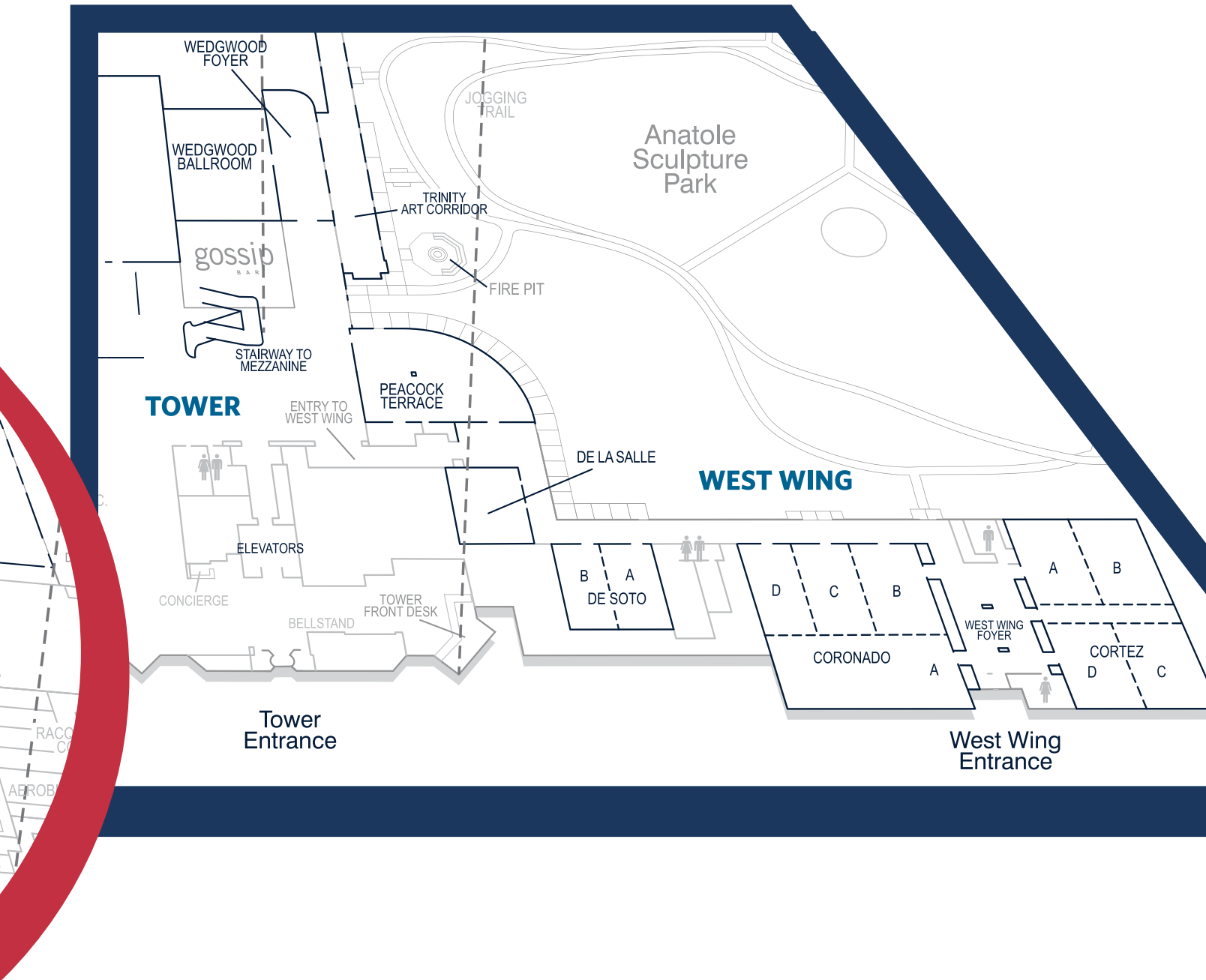
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SCHEDULE AT A GLANCE



	MONDAY, AUGUST 3	TUESDAY, AUGUST 4	WEDNESDAY, AUGUST 5	THURSDAY, AUGUST 6	FRIDAY, AUGUST 7
7:00 AM	*Speaker Breakfast (7:00 AM - 8:30 AM, Monday - Friday)			Team EMC Bike Ride (6:45 AM)	*Speaker Breakfast
8:00 AM				*Speaker Breakfast	
8:30 AM					
9:00 AM	Workshops & Tutorials	Keynotes - Brian Kent and Howard Heck 8:00 AM - 9:30 AM	Keynote - Hans Schantz 9:00 AM - 10:00 AM	Technical Papers	Workshops & Tutorials
10:00 AM	Break	Break	Break	Break	Break
11:00 AM	Workshops & Tutorials	Technical Papers	Technical Papers	Technical Papers	Workshops & Tutorials
12:00 PM	YP Luncheon	Exhibit Hall Open: 9:30 AM - 6:30 PM	Past President's Luncheon	Awards Luncheon	Break
1:00 PM	Chapter Chair Training Session		Break	Break	
2:00 PM	Workshops & Tutorials		Workshops & Tutorials	Technical Papers	Workshops & Tutorials
3:00 PM	Break		Break	Break	Break
4:00 PM	Workshops & Tutorials		Workshops & Tutorials	Technical Papers	Workshops & Tutorials
5:00 PM			Women in Engineering 4:00 PM - 5:30 PM	Technical Tour 2:00 PM - 5:00 PM	
6:00 PM		Welcome Reception 5:00 PM-6:30 PM			
7:00 PM		After the Welcome Reception YP Event 6:30 PM - 9:30 PM	Evening Gala at Gilley's Dallas 7:00 PM - 10:00 PM	EXHIBIT HALL SCHEDULE TUESDAY, AUGUST 4 Exhibits Open: 9:30 AM - 6:30 PM Welcome Reception: 5:00 PM - 6:30 PM WEDNESDAY, AUGUST 5 Exhibits Open: 10:00 AM - 5:00 PM THURSDAY, AUGUST 6 Exhibits Open: 10:00 AM - 12:00 PM	
8:00 PM					
9:00 PM					
10:00 PM					



STANDARDS WEEK:

For more information about Standards Week, please visit page 160

CLAYTON R. PAUL GLOBAL UNIVERSITY

(Pre-Registration Required)
 Tuesday: 1:00 PM - 5:00PM
 Wednesday: 8:00 AM - 5:30PM
 Thursday: 8:00 AM - 12:00PM

GLOBAL SIGNAL INTEGRITY AND POWER INTEGRITY (SIPI) UNIVERSITY

(Pre-Registration Required)
 Tuesday: 1:00 PM - 5:00PM
 Wednesday: 8:00 AM - 5:00PM
 Thursday: 8:00 AM - 12:00PM

AEROSPACE MID CAREER TRAINING

(Pre-Registration Required)
 Friday: 8:15 AM - 5:00 PM

YOUTH TECHNICAL PROGRAM

Wednesday, August 5, 2026
 1:00 PM - 3:30 PM

EXHIBIT HALL ACTIVITIES

Ask the Experts Panel Discussions

Tuesday, August 4, 2026 1:30 PM - 3:00 PM
 Wednesday, August 5, 2026 10:30 AM - 12:00 PM

Experiments and Demonstrations

Tuesday, August 4, 2026 10:00 AM - 12:00 PM
 Wednesday, August 5, 2026 10:00 AM - 12:00 PM
 2:00 PM - 4:00 PM 2:00 PM - 4:00 PM

Thursday, August 6, 2026
 10:00 AM - 12:00 PM

Student EMC Hardware Design Competition

Tuesday, August 4, 2026
 2:00 PM - 3:00 PM, Trinity Exhibit Hall

Student Paper Contest Poster Session

Tuesday, August 4, 2026
 3:00 PM - 3:30 PM

Poster Session

Wednesday, August 5, 2026
 9:30 AM - 11:30 AM



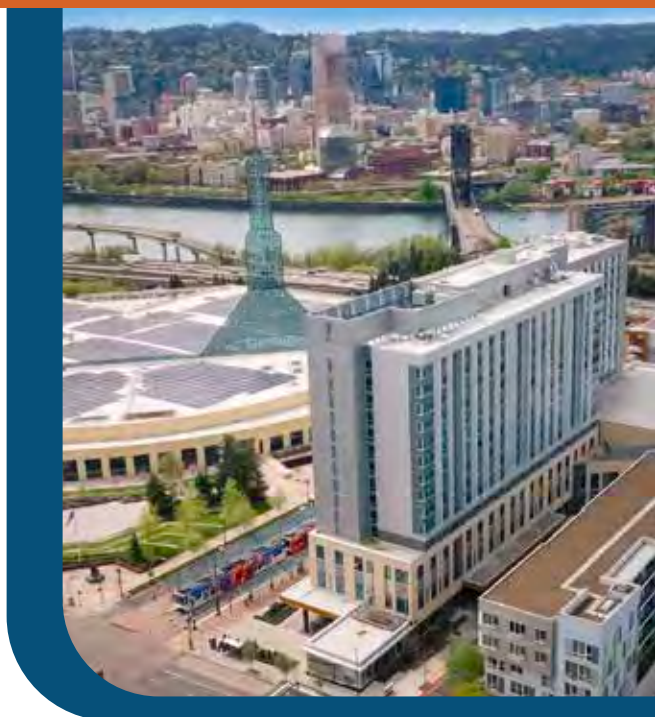
GET READY FOR EMC+SIPI 2027 SYMPOSIUM IN PORTLAND, OREGON!

Portland is a city where innovation, history, and natural beauty come together. Oregon is home to many notable EMC+SIPI companies in the Portland “Silicon Forest,” which support technology advancement and growth across the USA. It is also known as the City of Roses for its International Rose Test Garden. It is home to many historic sites like the End of the Oregon Trail Museum, Fort Vancouver, and Portland Chinatown Museum. It supports the 5,200-acre Forest Park, one of the largest urban forests in the United States with beautiful hiking and walking paths.

Join us in Portland as we dive into new topics that will further develop our understanding of EMC and SIPI principles, allow us to grow our connections with each other, and check out what the city has to offer.

Hyatt Regency Portland, the Symposium host hotel, is connected to the venue, Oregon Convention Center, across from the downtown rivers.

We are honored to invite you to a vibrant city rich in culture, history, and technology as you journey through EMC+SIPI 2027.





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The IEEE EMC Society has been at the pivot point of engineering technology for over a half-century. With a long history of developments in Electromagnetic Compatibility and Electromagnetic Environmental Effects, the Society brings sharp focus to methods and practices for proper performance of energy, electrical, communications, information technology and wireless systems. The Society promotes information sharing through regional chapters and international symposia. Collaboration across the research, design, test, regulatory and media industries has helped shape the world as we know it.



LEADING EDGE INFO

- EMC Measurements
- Signal & Power Integrity
- EMI Control
- EMC Management
- Low Frequency EMC
- Computational Electromagnetics
- High Power Electromagnetics
- Electromagnetic Environments
- Smart Grid EMC
- Regulatory Requirements for EMC, ESD, EMI, and SIPI

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WELCOME FROM BENOIT DERAT 2026 TECHNICAL PROGRAM CHAIR



Welcome to the 2026 IEEE International Symposium on Electromagnetic Compatibility, Signal and Power Integrity (EMC+SIPI).

On behalf of the Technical Program Committee, I am delighted to welcome you to Dallas, Texas, and to the Hilton Anatole in the Dallas Design District. I hope to meet many of you during a week of technical exchange, practical learning, and conversation with colleagues across the EMC and SIPI community.

I encourage you to attend the special sessions, traditional paper sessions, and the poster session in the exhibit hall. There is much to learn from the latest work of our colleagues. Attend, ask questions, and be challenged. The poster sessions will again provide a valuable one-on-one format and time to visit exhibitors before joining the classroom sessions.

This year's program emphasizes PCB and chip-level EMC, military and space EMC challenges, EMC and SIPI for data centers and high-speed digital applications, and AI/ML methods for EMC and SIPI simulation and measurement.

Four special sessions will examine active areas in our field: "Achieving Power Integrity with AI/ML," "AI Agents and Generative Tools for EMC and SIPI Applications," "Electromagnetic Compatibility Challenges and Safety of Medical Devices in Clinical Environments," and "Electromagnetic Information Security against Leakage and Interference Threats."

We are honored to feature three keynote speakers. Brian M. Kent will revisit the 1967 USS Forrestal carrier disaster. Howard Heck will address 400+G per lane pluggable I/O signal-integrity challenges and design considerations. Hans G. Schantz will discuss electromagnetism, quantum mechanics, and his provocative perspective in "Where Physics Went Wrong."

For deeper study, consider one of more than thirty workshops or tutorials. Tutorials provide practical instruction, while workshops offer discussion and interaction. The Experiments and Demonstrations program, with twenty live demos, gives attendees a hands-on look at EMC and SIPI concepts in action. Engage with the presenters, then bring those ideas back to your colleagues.

Our "Ask the Experts" panels will address military and space EMC challenges and real-world EMC problem solving. Technical Committee meetings are open to all attendees and offer a direct way to learn more about the EMC and SIPI community, serve the Society, and share your expertise.

For foundational training, the program includes the Clayton R. Paul Global EMC University, Global SIPI University, and Henry W. Ott Fundamentals of EMC Tutorial.

I am confident that the breadth and depth of this year's technical program will provide a valuable experience for you regardless of where you are in your career and whether you are in academia or industry. It will also be a chance to build your professional network, to catch up with old friends, and to make new ones. See you in Dallas.

Sincerely,
Benoit Derat
Technical Program Chair, EMC+SIPI 2026

INTRODUCING THREE KEYNOTE PRESENTATIONS DURING EMC+SIPI 2026!

3

Three renowned speakers join us for the EMC+SIPI 2026 Symposium to share their expert knowledge and first-hand experiences in the pursuit of education and a chance to share their passion in EMC and SIPI which has sparked profound technological advancements in the field.

Learn about each speaker and their unique achievements.



Was it the Radar? Respectfully Revisiting the 1967 US Navy USS Forrestal Carrier Disaster

Brian M. Kent

*Ph.D., Fellow, IEEE, AMTA, Private Consultant, RF/EO/
Technology, Centerville, OH, USA*

In 1967 the United States Navy Carrier USS Forrestal (CVA-59) was preparing for wartime missions over North Vietnam. The ship was preparing to launch more than 20 fully armed A-4 Skyhawk and F-4 Fighter jets, all fully fueled and armed. At 10:51 am, an un-commanded F-4 Zuni Missile launched on the deck, striking a neighboring A-4 and starting a fire and explosions. Quenching the fire nearly capsizes the ship, which is saved through the heroics of the sailors aboard. The US Navy conducted a thorough accident investigation, hundreds of follow-up technical articles in the aerospace and NASA literature, including current EMI design books, blaming the initiation event on EMI from on the on-board AN/SPS-43VHF search radar. **But is that what really happened?**

DATE: Tuesday, August 4
TIME: 8:00 AM – 8:45 AM
LOCATION: Trinity Ballroom

400+G per Lane Pluggable I/O Interface Signal Integrity Challenges & Design Considerations

Howard Heck
TE Connectivity

This presentation discusses the signal integrity related challenges that the industry faces as we scale pluggable I/O interfaces to 448G. We will begin by outline desired electrical characteristics (insertion loss, reflections cross-talk) for passive channels. We then describe the ways in which physical structures and manufacturing consider may limit the scalability of existing channel component and discuss the implications on the choice of modulation scheme for 448G operation. The limitations suggest that new approaches are needed, and we will describe one such approach that can provide an optimized solution that overcomes the challenges that exist with existing channel structures.



DATE: Tuesday, August 4
TIME: 8:45 AM – 9:30 AM
LOCATION: Trinity Ballroom



How Electromagnetism and Quantum Mechanics Work, and Where Physics Went Wrong

Hans G. Schantz
nou Systems, Inc.

This talk presents the central thesis of the Fields & Energy Project: electromagnetism is not best understood as the action of a single entity, the photon, endowed with the mutually contradictory properties of localized particle and non-localized wave. Instead, electromagnetic phenomena emerge from the interaction of two distinct elements: spatially extended fields that behave as waves, and energy that, in the quantum limit, is transferred in discrete amounts. Fields guide energy; energy does not constitute the field.

DATE: Wednesday, August 5
TIME: 9:00 AM – 10:00 AM
LOCATION: Trinity Ballroom

**CLICK TO VIEW THE SPEAKER
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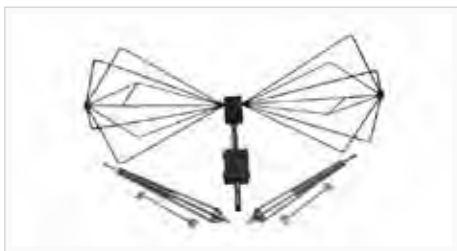
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SCHEDULE AT A GLANCE

ROOM	Coronado A	Coronado B	Coronado C	Coronado D	Cortez A	Cortez B	Cortez C	Cortez D
8:30 AM	8:30 AM - 5:00 PM TUTORIAL (WT_A1) Henry W. Ott Fundamentals of Electromagnetic Compatibility	8:30 AM - 5:00 PM WORKSHOP (WT_A5) Advanced EMI Troubleshooting Techniques	8:30 AM - 5:00 PM WORKSHOP (WT_S1) Global EMC Regulations and Standards	8:30 AM - 5:00 PM WORKSHOP (WT_M4) Building Engineering Instinct: Technical Judgment, Communication, and Career Strategy	8:30 AM - 5:00 PM WORKSHOP (WT_M1) Military EMC	8:30 AM - 12:00 PM WORKSHOP (WT_S3) Characterization of Shielding CCA from DC to 40GHz: The New Standard & What's Next ?	8:30 AM - 12:00 PM TUTORIAL (WT_A6) Application of Reverb Chambers	8:30 AM - 12:00 PM TUTORIAL (WT_A2) Introduction to Modeling/Simulation Techniques
10:00 AM	REFRESHMENT BREAK							
10:30 AM	↓	↓	↓	↓	↓	↓	↓	↓
12:00 PM	LUNCH BREAK							
1:30 PM	↓	↓	↓	↓	↓	1:30 PM - 5:00 PM TUTORIAL (WT_A4) Basic EMC Measurements	1:30 PM - 5:00 PM TUTORIAL (WT_D1) EMC in Power Electronics	1:30 PM - 5:00 PM TUTORIAL (WT_V2) EMC Implications in Manned and Unmanned Vehicles - Autonomy in Automotive and Other Industries
3:00 PM	REFRESHMENT BREAK							
3:30 PM	↓	↓	↓	↓	↓	↓	↓	↓
5:00 PM	↓	↓	↓	↓	↓	↓	↓	↓
ADDITIONAL STANDARDS SESSIONS, WORKING GROUPS AND TECHNICAL COMMITTEES For Collateral Meetings, please see page 165								


STANDARDS WEEK:

 For more information about Standards Week, please visit [page 160](#)
Registration/Info Desk

7:00 AM - 5:00 PM

Speakers Breakfast

 Hilton Anatole, De Sota - 7:00 - 8:30 AM
 (Breakfast Only on the Day of Presentation)

Companion Lounge

 Crow's Office - Mezzanine Level, Hilton Anatole Hotel - 8:00 AM - 5:00 PM
 (Registered Companions Only)

Chapter Chair Training and Luncheon

Hilton Anatole, Monet - 12:00 - 1:30 PM

Young Professionals Luncheon

Hilton Anatole, Miro 12:00 - 1:30 PM (Ticketed Event)

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TIMES.**



WT_A1
TUTORIAL**HENRY W. OTT FUNDAMENTALS OF
ELECTROMAGNETIC COMPATIBILITY****8:30 AM - 5:00 PM****Room: Coronado A****Sponsored by Education Committee****Chair:**Patrick DeRoy, *Analog Devices Inc***Co-Chair:**Matt Juszczuk, *Collins Aerospace***ABSTRACT:**

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 signal and power integrity (SIPI) and electromagnetic compatibility (EMC) requirements. The tutorial will present the foundational ideas from physics and mathematics and will demonstrate the engineering approaches to help the attendees to successfully design, evaluate, diagnose, and/or solve EMI problems. The main objective of this tutorial is to provide a learning opportunity for those that are new to EMC as well as provide a review of the basics to those who already have some experience in this area.

PLANNED SPEAKERS & TOPICS**Introduction to Fields and Coupling**John C. McCloskey
*EMC-Closkey, USA***Grounding vs. Current Return**Todd Hubing
*LearnEMC, USA***Transmission Lines and Signal Integrity**Eric Bogatin
*University of Colorado Boulder, USA***PCB Decoupling**Chulsoon Hwang
*Missouri University of Science and Technology, USA***Conducted EMI: Root Causes and Mitigations**Niek Moonen
*Universiteit Twente, Netherlands***The Unintentional Antenna: The Root Cause of
Radiated EMI Problems**Lee Hill
*SILENT Solutions LLC & GmbH, USA***Transient Susceptibility**Matt Juszczuk
*Collins Aerospace, USA***EMC in Systems**Karen Burnham
EMC United, USA

WT_A5
WORKSHOPADVANCED EMI TROUBLESHOOTING
TECHNIQUES

8:30 AM - 5:00 PM

Room: Coronado B

Chair:Min Zhang, *Mach One Design EMC***Co-Chair:**Kenneth Wyatt, *Wyatt Technical Services LLC***ABSTRACT:**

When facing EMC test failures, design engineers are often required to diagnose and troubleshoot EMI issues quickly and effectively. Without a solid understanding of EMC fundamentals, however, EMI troubleshooting can become a daunting and time-consuming task. Historically, the specialised equipment needed for this work demanded significant financial investment—manageable for large, established companies but often prohibitive for small or early-stage startups.

Recent advances in test and diagnostic technologies have changed this landscape. Engineers can now access highly capable troubleshooting tools at much lower cost, making effective EMI diagnostics more accessible than ever. Yet, the core challenge remains: How do we troubleshoot EMI efficiently? In other words, how do we rapidly identify the root cause of emissions, or pinpoint weaknesses that lead to immunity and susceptibility failures?

This workshop brings together leading global experts to present advanced, practical, and field-proven EMI troubleshooting techniques applicable to emissions, immunity/susceptibility, and transient issues. Attendees will gain valuable hands-on insights, including:

Approaches for quickly identifying noise sources:

- Practical diagnostic workflows
- Techniques for low-noise design and noise mitigation
- Troubleshooting methods applicable to PCBs, cables, enclosures, and large systems

These techniques are novel, unique, and validated through years of real-world engineering work by recognised specialists. Whether you work in commercial, industrial, medical, defence, or space electronics, you will find the methods presented in this workshop directly applicable and highly impactful.

PLANNED SPEAKERS & TOPICS**Advanced EMI Troubleshooting**Min Zhang
*Mach One Design EMC, United Kingdom***You Are Failing EMC Tests, But Are You Testing the Right Thing, the Right Way?**Karen Burnham
*EMC United Inc, USA***A Three-Step Process for Radiated Emission Troubleshooting Success**Kenneth Wyatt
*Wyatt Technical Services LLC, USA***Troubleshooting EMI in Power Electronics: From Sub-100 W to Multi-Megawatt Systems**Min Zhang
*Newcastle University, United Kingdom***Black Box DUT: How to Solve the Problem of Unknown Disturbance Paths During Immunity Tests**Konstantin Uhle-Wettler
*Langer EMV-Technik GmbH, Germany***Bench Top Troubleshooting Radiate Immunity**Kenneth Wyatt
*Wyatt Technical Services LLC, USA***Was That a Useful Modification? A Powerful Strategy for Quickly Evaluating the Effectiveness of Countermeasures During Immunity Tests**Konstantin Uhle-Wettler
*Langer EMV-Technik GmbH, Germany***Troubleshooting EMI in the Time Domain**Min Zhang
Newcastle University, United Kingdom

**WT_S1
WORKSHOP**

GLOBAL EMC REGULATIONS AND STANDARDS

8:30 AM - 5:00 PM

Room: Coronado C

Sponsored by TC-1 EMC Management



Chair:

Henry Benitez, *University of Portland
College of Arts and Sciences*

ABSTRACT:

This workshop will address global electromagnetic regulations, standards, and product compliance activities. Representatives and experts will present on topics to include the FCC, TCB's, FDA, NIST MRA's and Lab Accreditations. Standards representatives and experts will discuss standards to include CISPR, IEC, ANSI, IEEE and others pertinent for product EMC compliance.

PLANNED SPEAKERS & TOPICS

Introduction to the SACCom Workshop on Global Regulations and Standards

Henry Benitez
IEEE, USA

FCC EMC Compliance and Radio Certifications

Bob DeLisi², William H. Graff¹
¹Mesa Community College, USA; ²UL LLC, USA

Review of CISPR 12, CISPR 36, and CISPR 25

Craig Fanning
Elite Electronic Engineering, Inc., USA

ANSI c63.9 Update

Nick Garinger
Intel Corporation, USA

IEEE EMC-S Standards

Karen Burnham
EMC United, USA

Roles of EMC Standards in Medical Device Evaluation

Yasaman Ardeshipour
US Food and Drug Administration, USA

Accreditation Bodies - A2LA, ANAB, and NVLAP

Megan McConnell¹, Randy Long², Amanda McDonald³
¹American Association for Laboratory Accreditation, USA; ²ANSI National Accreditation Board, United States; ³National Institute of Standards and Technology, USA



Photo by Richard Georgerian

WT_M4
WORKSHOP**BUILDING ENGINEERING INSTINCT:
TECHNICAL JUDGMENT, COMMUNICATION,
AND CAREER STRATEGY****8:30 AM - 5:00 PM****Room: Coronado D****Sponsored by TC-8 Aeronautics and Space EMC****Chair:**Phillip Miller, *RATLR***Co-Chair:**Nika Amralah, *Department of National
Defence***ABSTRACT:**

The purpose of this workshop is to present tools, skills, and techniques useful to Early Career Engineers, Engineers early in their EMC careers, and Engineers seeking to accelerate their career advancement. This workshop will share best practices for tailoring requirements to projects, building capabilities for an effective EMC test laboratory, improving communication, leadership, and career ownership. Join us to learn how to realize the career you've always wanted as the engineer you've always wanted to be!

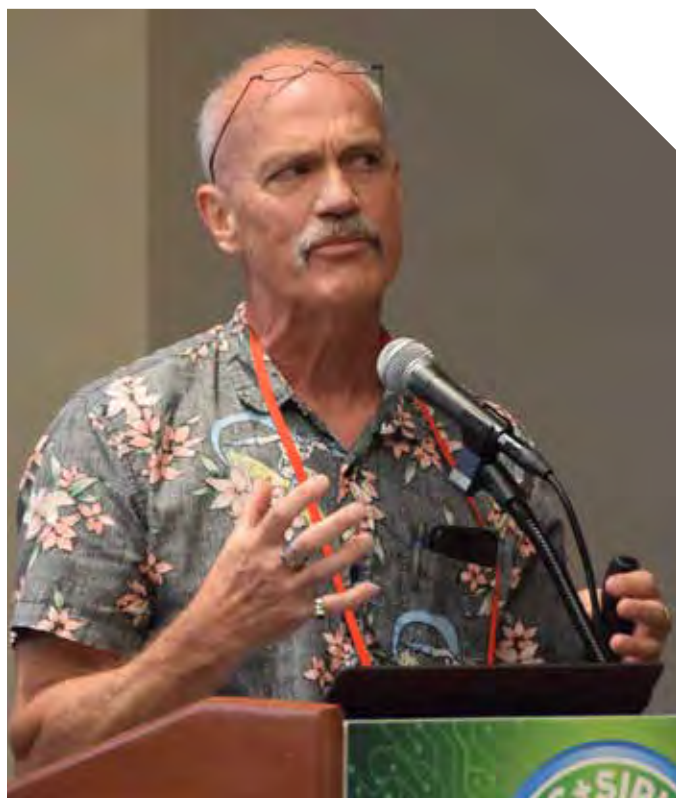
PLANNED SPEAKERS & TOPICS**Why EMC is Important in the Design Process**Bob Scully
*NASA, USA***How to Tailor EMC Test Requirements for Optimal Results**Gregory Hiltz
*Quality Engineering Test Establishment, Canada***DIY EMI Lab: Building Your In-House Test Capabilities**Manuel Martin Soriano
*Anduril Industries, USA***Becoming An Internal EMC Consultant Within A Large Company**Jim Lukash
*Lockheed Martin Space Systems, USA***Career Transmogrification in Aerospace EMC - How to Give Effective Presentations**John C. McCloskey
*EMC-Closkey, USA***Getting Published: Self and Industry Publication Secrets for Profit and Standing**Kenneth Wyatt
*Wyatt Technical Services LLC, USA***Effective Influence**Phillip Miller
*RATLR, USA***Directing Your EMC Career: Making Deliberate Career Choices**Nika Amralah
*Department of National Defence of Canada, Canada***Affability of E3 Engineers - Managing Multiple Stakeholders with Technical Detail and Understanding Skillsets**Dean F. Landers
*Lockheed Martin, USA***Knowledge Transfer - Building Engineering Instinct: Technical Judgment, Communication, and Career Strategy**Stephanie Zajac
Johns Hopkins University Applied Physics Laboratory, USA

Photo by Richard Georgerian

**WT_M1
TUTORIAL**

MILITARY EMC

8:30 AM - 5:00 PM

Room: Cortez A

Sponsored by TC-3 Electromagnetic Environment



Chair:

Carl Hager, *NSWC Dahlgren*

Co-Chair:

Finbarr O'Connor, *Huntington Ingalls Industries Inc*

ABSTRACT:

Achieving electromagnetic compatibility with military equipment, systems, and platforms requires significant expertise and effort. EMC must be considered at all lifecycle stages and involves first characterizing the operational electromagnetic environment (EME), then design/testing military systems at various stages of production, assembly and integration and coordination of Spectrum in operational environments. Numerous Military EMC standards and handbooks have been developed for electromagnetic environmental effects (E3) measurements and analysis to reduce the risk of equipment and systems failing to meet their operational performance requirements due to detrimental E3. The tutorial will focus on various considerations for Military EMC applications including Electromagnetic Interference (EMI), Electrostatic Discharge (ESD), Hazards of Electromagnetic Radiation to Ordnance (HERO), Electromagnetic Pulse (EMP), Lighting, Spectrum Sharing, etc.

The objective of this tutorial is to enhance our attendees' knowledge and understanding of key aspects of Military EMC that will help them in the performance of their jobs. The tutorial will cover a broad range of Military EMC topics. The first half of the morning session will consist of three requirements-based presentations, and the afternoon session consists of four EMC Testing and Measurements topics.

PLANNED SPEAKERS & TOPICS

MIL-STD-461 Updates & Status

Finbarr O'Connor
Huntington Ingalls Industries Inc, USA

Electrostatic Discharge (ESD) to Ordnance Technical Agent

Phillip Melton
Naval Surface Warfare Center, USA

A New Standard for Military Aircraft Components Lightning Direct Effect Qualification

Frederick William Heather
IEEE (Retired US Navy), USA

Preparing and Executing a Successful E3 Qualification Test Program

Mark Waller, Landon Riley Carroll
Redstone Arsenal, USA

Hardware vs. Software: Optimizing Integration Methodologies for Electromagnetic Pulse (EMP) Field Measurements

Tiffany Morisak
US Navy Integrated Battlespace Simulation and Test Department (IBST), USA

Review of Near Strike Lightning Electric Field Requirements in MIL-STD-464D: Part 2

Tiffany Morisak
Naval Air Systems Command, USA

Evolution of HERO Testing Methods for an Increasingly Complex Electromagnetic Environment

Greg Hiltz
Canadian Armed Forces, Canada

Accurately Determining the CCF for Aircraft Reverberation EME Using Measurement Uncertainty Analysis

Kin Y. Sze
Quality Engineering Test Establishment (QETE), Canada

Speed-Up, and Increase Quality (Reproducibility), of your EMI Measurements Drastically Using Reverberation Chambers

Frank Leferink
University of Twente, Netherlands

Filters for Use in Military & Space Applications

Randy J. Jost
Utah State University, USA

Spectrum Sharing and System Spectral Efficiency Considerations

Sarah A. Seguin
The Aerospace Corporation, USA

WT_S3
WORKSHOP

CHARACTERIZATION OF SHIELDING CCA FROM DC TO 40GHZ: THE NEW STANDARD & WHAT'S NEXT?



8:30 AM - 12:00 PM

Room: Cortez B

Sponsored by TC-1 EMC Management

Chair:

Charles Jullien, *Safran Electrical and Power*

Co-Chair:

Huadong Li, *Molex LLC*

ABSTRACT:

This workshop will present the upcoming P2855 standard for characterizing the shielding effectiveness of cable/connector assemblies from DC to 40 GHz. This standard proposes recommended measurement techniques for evaluating and specifying the shielding effectiveness of cable/connector assemblies to control electromagnetic interference (EMI). It thus enables product compliance with current government, regulatory, and customer requirements and ensures the electromagnetic compatibility (EMC) of the system. The standard also provides measurement techniques for evaluating and specifying the shielding capabilities of cable/connector assemblies to reduce electromagnetic energy coupling between these assemblies. Emphasis is placed on measurement techniques already incorporated into, or widely used in, commercial and military standards. A set of new methods to be incorporated into the standard will be presented. The first workshop is divided into topics such as magnetic shielding methods. A second speaker addresses the follow-up to this work and ideas for extending the methods along innovative paths such as the integration of environmental constraints or contact resistances in connectors.

The workshop is divided into topics as: Magnetic shield method, DC method, Triaxial method, Injection line method, Parallel plate method, Localized injection method, Anechoic chamber method, G-TEM cell method, Reverberation chamber, Shielding Effectiveness Measurands, Environmental testing.

The workshop will help the audience to properly test and design cables, connectors and their assemblies for product EMC.

PLANNED SPEAKERS & TOPICS

Introduction to P2855 Standard : Recommended Practices for the Electromagnetic Characterization of Cable/Connector Assembly Shielding Effectiveness in Frequency Range of Direct Current to 40 GHz

Charles Jullien¹, Huadong Li²¹Safran Electrical and Power, France; ²Molex LLC, USA

Shielding Effectiveness Measurands of Cables, Connectors, and Their Assemblies

Huadong Li

Molex LLC, USA

Environmental Influence on the Measurement of Transfer Impedance

Charles Jullien, Thomas Colleter

Safran Electrical and Power, France

Triaxial Method for Transfer Impedance Measurements on Shielded FlexPCBs

Jesper Lansink Rotgerink

NLR, Netherlands

Practical Methods to Design, Simulate, and Measure Magnetic Shielding for Connectors and Interconnect Assemblies in Low Intensity Magnetic Fields

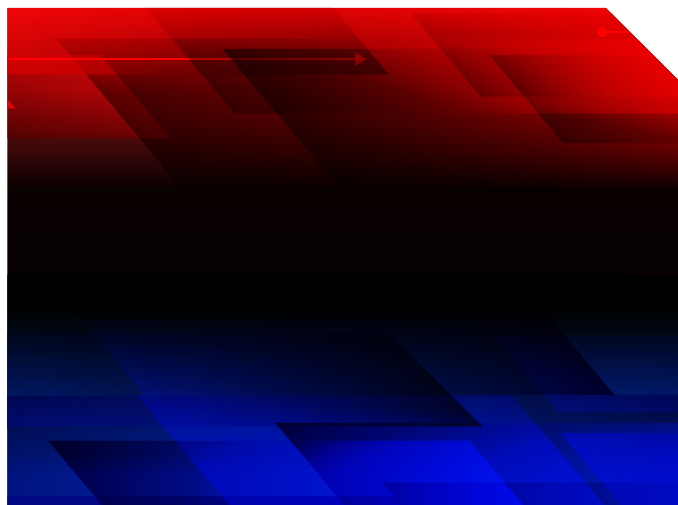
Eugene Mayevskiy

Rohde & Schwarz, USA

Simulation Analysis of Wave Propagation for Parallel-Plate Box Method for EMC

Gary Biddle

Samtec Inc, USA



WT_A6
TUTORIAL**APPLICATION OF REVERB CHAMBERS****8:30 AM - 12:00 PM****Room: Cortez C****Chair:**

Vignesh Rajamani, *Rohde & Schwarz United States, Inc.*

ABSTRACT:

This tutorial will provide an introduction to recent applications of reverberation chambers. It is intended to provide EMC engineers who are interested in applying reverberation chambers to various measurement issues and the extension of reverberation chambers to solve a variety of EMC problems.

This half-day tutorial provides a brief overview of Reverb Chamber (RC) theory, followed by recent applications of RCs. The tutorial material will be updated to reflect recent research results and implications. The format will be a conference presentation style (lecture) followed by questions moderated by the chairman. It is designed for both academics and people from industry who will be involved in radiated emission or immunity testing of commercial or military systems using reverberation chambers and will be valuable to personnel evaluating the use of reverberation chambers as a complement to or replacement for other types of radiated test facilities and for personnel who are trying to use statistical methods to characterize the electromagnetic environments.

PLANNED SPEAKERS & TOPICS**Reverberation Chamber Theory and Statistical Overview**

Chuck Bunting
Oklahoma State University, USA

EMC Standard Testing in Reverberation Chambers

Vignesh Rajamani
Rohde & Schwarz, USA

History of the Below-Deck EME Characterizations, and How it is Addressed in the MIL-STD's.

Carl Hager
NSWC Dahlgren, USA

Understanding the Highly Optimized Reverb Test Process

Garth D'Abreu
ETS-Lindgren, USA

Speed-Up, and Increase Quality (Reproducibility), of Your EMI Measurements Drastically Using Reverberation Chambers

Frank Leferink
Universiteit Twente, Netherlands

WT_A2
TUTORIALINTRODUCTION TO MODELING/
SIMULATION TECHNIQUES

8:30 AM - 12:00 PM

Room: Cortez D

Sponsored by TC-9 Computational Electromagnetics

Chair:

Bruce Archambeault, *Missouri University of Science and Technology*

ABSTRACT:

This tutorial will focus on the various simulation techniques, how they work, their strengths and weaknesses. The popular techniques of Finite-Difference Time-Domain (FDTD), Method of Moments (MoM), the Finite Element Method (FEM), and the Partial Element Equivalent Circuit technique will all be discussed with a focus on simulation in the real-world.

PLANNED SPEAKERS & TOPICS

The Finite-Difference Time-Domain Method for EMC & SI/PI Modeling

Flavia Grassi
Politecnico di Milano, Milan, Italy

Introduction to Finite Element Method

Charles Bunting
Oklahoma State University, USA

Introduction to Partial Element Equivalent Circuit

Bruce Archambeault, Albert Ruehli
Missouri University of Science and Technology, USA

Modeling with the Method of Moments

Lijun Jiang
Missouri University of Science and Technology, USA

DALLAS FUN FACTS

WHAT IS TEX-MEX?

Tex-Mex means “Texan” + “Mexican” which refers to the blend of American and Mexican culinary traditions as one distinctive style.

Mexican culture and food heavily influenced the evolution of Texas cuisine, and over time, American and Mexican cooking methods adapted to suit Texan tastes. Originating with the Tejano people, the hallmarks of Tex-Mex include yellow cheese, flour tortillas, ground beef, chili-based sauces, and plates served with rice and beans. In Texas, locals often say the best way to judge a Tex-Mex restaurant is by the queso and the salsa.

While you're in Dallas, experience Tex-Mex!



WT_A4
TUTORIAL**BASIC EMC MEASUREMENTS****1:30 PM - 5:00 PM****Room: Cortez D****Sponsored by TC-2 EMC Measurements****Chair:**Monrad Monsen, *Oracle***ABSTRACT:**

There continues to be those entering the EMC field who are performing measurement activity for both emissions and immunity. In addition, there are practitioners who want to get a second opinion to support what they are doing. They are all at least familiar with basic EMC immunity measurements methods that cover a wide range of electromagnetic phenomena. This tutorial will cover both emissions and immunity by highlighting the latest amendment to a major multimedia emissions standard and a selection of immunity testing standards for transients that are more difficult to implement. The transient discussion will also delve into signals that are high power in a very short time. Also included: a description of emission and immunity test sites, the sites that are becoming popular and their validation requirements, as well as an overview of test setups in these facilities.

PLANNED SPEAKERS & TOPICS**Basic Measurement Facilities**Dave Arnett
*Garmin International Inc, USA***CISPR 32 Edition 2.1**Dave Arnett
*Garmin International Inc, USA***Performing Immunity Testing to Transient Signals**Tom E. Braxton
*TEB EMC-EMI Consulting LLC, USA***Continuous Wave Immunity**Ross Carlton
*Gibbs and Cox Inc, USA***High Power Electromagnetics Test Facilities and Measurement Methods**William A. Radasky
Metatech Corporation, USA

WT_D1
TUTORIAL

EMC IN POWER ELECTRONICS

1:30 PM - 5:00 PM

Room: Cortez C

Chair:

Vignesh Rajamani, *Rohde & Schwarz United States, Inc.*

Co-Chair:

Niek Moonen, *Universiteit Twente*

ABSTRACT:

As SiC and GaN devices become increasingly prevalent in modern electronics, their fast-switching behavior introduces new electromagnetic compatibility (EMC) challenges at both inter- and intra-system levels. Beyond adhering to design rules, there is a growing need to investigate and understand the resulting electromagnetic interference (EMI). This workshop equips participants with the knowledge to link design choices to their EMI impact and to select appropriate measurement instruments and accessories for effective EMI analysis and qualification of power electronic devices and circuits.

PLANNED SPEAKERS & TOPICS

Introduction to EMC in Power Electronics and EMI Mitigation

Niek Moonen
Universiteit Twente, Netherlands

Noise Source Identification in Power Electronics Using EMI Measurement Tools

Patrick Mayer
Rohde & Schwarz, USA

Addressing PDN Noise and Stability Challenges with Oscilloscope-Based Impedance Analysis

Michael Schnecker
Rohde & Schwarz, USA

Measurement Driven EMI Mitigation: From Diagnosis to Verified Solutions

Vidal Gonzalez
Würth Elektronik eiSos GmbH & Co KG, Germany

Photo by Richard Georgerian

**WT_V2
TUTORIAL****EMC IMPLICATIONS IN MANNED AND
UNMANNED VEHICLES - AUTONOMY IN
AUTOMOTIVE AND OTHER INDUSTRIES****1:30 PM - 5:00 PM****Room: Cortez C****Chair:**Garth D'Abreu, *ETS-Lindgren***Co-Chairs:**Robert Kado, *Stellantis US*Craig Fanning, *Elite Electronic Engineering, Inc.***ABSTRACT:**

Global electric vehicle (EV) sales continues its upward trend with regional differences in growth rate across Asia, Europe, and the Americas, and as manufacturers continue to develop the advanced features that we have all become accustomed to, the challenges for the EMC test engineers remain as prevalent as ever. Advanced driver assistance systems (ADAS), automated driving systems (ADS) and autonomy are terms synonymous with sophisticated levels of sensor integration and computer control in the automotive industry, but many of these features are common to other vehicles under the classifications of drones, electric vertical takeoff and landing (eVTOL) vehicles, and others that have become increasingly popular. Although there are new standards and guidance documents published and others in development to help users navigate the increasingly extensive test scope associated with the broad umbrella of vehicles, some serve a regulatory purpose, and others introduce initiatives to help improve the reliability and efficiency of tests, applicable across multiple platforms.

In this tutorial, speakers will provide an update on the latest development in the automotive EMC standards, look at other standards and their use for other types of vehicles, and discuss options and other initiatives under consideration. We will also hear from manufacturers on the challenges that they face, and solutions that test equipment manufacturers are working on to help manufacturers meet their performance goals.

Our speakers have extensive experience in automotive EMC/RF/Wireless design and test, with some active technical contributors to international standards committees including IEEE, ISO, SAE, and CISPR.

PLANNED SPEAKERS & TOPICS**EMC Standards and ADAS Applications**

Craig Fanning

*Elite Electronic Engineering, Inc., USA***EMC Challenges Across Different Vehicle Platforms**

Garth D'Abreu

*ETS-Lindgren, USA***Vehicle In the Loop: Testing for FMVSS 127**

John Gagnon

*dSPACE, USA***Simulations with ESD Protection Devices**

Andreas Hardock

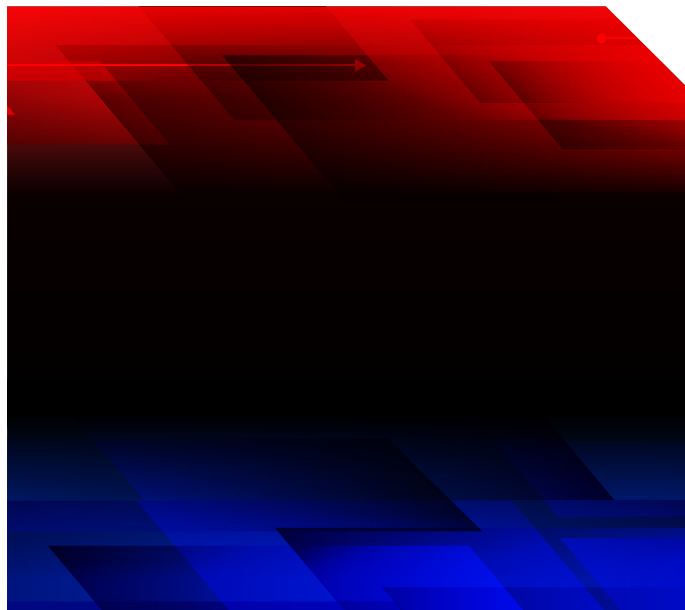
Nexperia, Germany



Photo by Richard Georgerian

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SCHEDULE AT A GLANCE

ROOM	Coronado A	Coronado B	Coronado C	Coronado D
8:00 AM	Keynote Presentation 8:00 AM - 9:30 AM, Trinity Ballroom			
9:30 AM				
10:00 AM	REFRESHMENT BREAK			
10:30 AM	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC2_1) EMC Measurements - Reverberation Chambers and Material Characterization	10:30 AM - 12:00 PM SPECIAL SESSION (SpS2_12) AI Agents and Generative Tools for EMC and SIPI Applications	10:30 AM - 12:00 PM TECHNICAL PAPERS (SC3_1) Machine Learning for Advanced Signal Integrity and Power Integrity (I)	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC11_1) Nanotechnology and Advanced Materials
12:00 PM	LUNCH BREAK			
1:30 PM	1:30 PM - 3:00 PM TECHNICAL PAPERS (TC2_3) EMC Measurements - Radiated Emissions	1:30 PM - 5:00 PM SPECIAL SESSION (SpS1_12) Electromagnetic Compatibility Challenges and Safety of Medical Devices in Clinical Environments	1:30 PM - 3:00 PM TECHNICAL PAPERS (SC3_2) Machine Learning for Advanced Signal Integrity and Power Integrity (II)	1:30 PM - 3:00 PM TECHNICAL PAPERS (TC11_2) Nanotechnology and Advanced Materials
3:00 PM	REFRESHMENT BREAK			
3:30 PM	3:30 PM - 5:30 PM TECHNICAL PAPERS (TC2_2) EMC Measurements - Shielding		3:30 PM - 5:00 PM TECHNICAL PAPERS (SC3_3) Machine Learning for Advanced Signal Integrity and Power Integrity (III)	3:30 PM - 5:30 PM TECHNICAL PAPERS (TC1_1) EMI: Standards and Protection Requirements
5:00 PM				
5:30 PM				

CLAYTON R. PAUL GLOBAL UNIVERSITY: 1:00 PM - 5:30 PM - Hilton Anatole, Morocco
(Pre-Registration Required)

GLOBAL SIGNAL INTEGRITY UNIVERSITY: 1:00 PM - 5:00 PM - Hilton Anatole, Manchester
(Pre-Registration Required)

EXHIBIT HALL ACTIVITIES

Grand Opening Ribbon Cutting at 9:30 AM

EXHIBITS OPEN: 9:30 AM - 6:30 PM

WELCOME RECEPTION: 5:00 PM - 6:30 PM

EXPERIMENTS & DEMOS: 10:00 AM - 12:00 PM, 2:00 PM - 4:00 PM, E&D Stages, Exhibit Hall

ASK THE EXPERTS PANEL: 1:30 - 3:00 PM, AtE Stage, Exhibit Hall

BEST STUDENT PAPER POSTER SESSION: 2:45 - 3:45 PM, Exhibit Hall

STUDENT EMC HARWARE DESIGN COMPETITION: 4:00 PM - 5:00 PM, Exhibit Hall

ADDITIONAL STANDARDS SESSIONS, WORKING GROUPS AND TECHNICAL COMMITTEES
For Collateral Meetings, see page 165



Cortez A	Cortez B	Cortez C	Cortez D	De Lasalle
Speakers: Brian M. Kent <i>Ph.D.</i> ; Howard Heck, <i>TE Connectivity</i>				
10:30 AM - 12:00 PM TECHNICAL PAPERS (TC10_9) S-Parameter & Data Validation	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC10_1) High-Speed Interconnects & SerDes (224/448 Gbps)	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC9_2) Simulation and Design with Measurement	10:30 AM - 11:30 AM TECHNICAL PAPERS (TC8_1) Magnetic Shielding and Cleanliness Techniques for Space Missions	
1:30 PM - 3:00 PM TECHNICAL PAPERS (TC10_10) Material Property Extraction	1:30 PM - 3:00 PM TECHNICAL PAPERS (TC10_2) DDR5 Memory Systems	1:30 PM - 3:00 PM TECHNICAL PAPERS (TC9_3) Modeling and Analysis with Experimental Validation of Complex Electromagnetic Environments	1:30 PM - 3:00 PM TECHNICAL PAPERS Sponsored by: TC-8 (TC8_2) Electromagnetic Coupling and Radiated Environments in Aerospace Systems	1:30 PM - 5:00 PM Sponsored By: TC-5 SPECIAL SESSION (SpS3) Electromagnetic Information Security Against Leakage and Interference Threats
3:30 PM - 5:00 PM TECHNICAL PAPERS (TC10_11) Coupling, Crosstalk & Boundary Conditions	3:30 PM - 5:00 PM TECHNICAL PAPERS (TC10_3) Advanced Packaging & Interposers	3:30 PM - 5:30 PM TECHNICAL PAPER (TC9_1) Modeling and Analysis of Cables and Interconnects	3:30 PM - 5:00 PM TECHNICAL PAPERS (TC5_2) Electromagnetic Pulse Coupling to Enclosures and Transmission Lines	


STANDARDS WEEK:

For more information about Standards Week, please visit page 160

Speakers Breakfast
Hilton Anatole, De Sota - 7:00 - 8:30 AM
 (Breakfast Only on the Day of Presentation)

Registration/Info Desk
7:00 AM - 5:00 PM
Companion Lounge
Crow's Office - Mezzanine Level, Hilton Anatole Hotel - 8:00 AM - 5:00 PM
 (Registered Companions Only)

Welcome Reception in the Exhibit Hall
Hilton Anatole, Trinity Exhibit Hall- 5:00 - 6:30 PM (Ticketed Event)
After the Welcome Reception" Social Event
Offsite - Bowl Games, 6:30 PM - 9:30 PM (Ticketed Event)

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PRESENTATION
TIMES.**



GLOBAL SIGNAL INTEGRITY AND POWER INTEGRITY (SIPI) UNIVERSITY

TUESDAY - WEDNESDAY - THURSDAY, AUGUST 4 - 6, 2026

The Organizing Committee of the 2026 IEEE International Symposium on Electromagnetic Compatibility and Signal & Power Integrity (EMC+SIPI) is planning to offer a high-quality, educational event encompassing Signal Integrity (SI) and Power Integrity (PI): the Global Signal Integrity and Power Integrity University.

Similar to the Clayton R. Paul Global EMC University that is held annually during the International Symposium, the intent is to offer two full days of lectures (Tuesday afternoon, all day Wednesday, and Thursday morning) carefully curated to cover basic and advanced concepts of SI & PI during the symposium week. SI & PI are gaining ever-growing attention due to the higher data rates and larger currents in modern high-speed digital systems. Industry requires skilled engineers with a background in these two disciplines to address the increasing complexity and challenges of electronic system design.

The IEEE EMC Society therefore decided to offer again – after the first two successful editions at the Symposium in Phoenix, Arizona (2024) and Raleigh, North Carolina (2025) – two full days of courses during the EMC+SIPI Symposium 2026 to bridge this gap. The mission of the Global SIPI University will be to give students, technicians, and engineers the opportunity to acquire SI & PI skills directly from experienced and well-known instructors from both industry and academia.

The program offers both lectures and practical demonstrations. The intent is to expand the discussion on the background concepts and to provide a more detailed presentation of advanced methods for addressing the current design challenges. Moreover, the demos will encompass the use of instruments typically employed for analysis, measurement and troubleshooting for signal and power integrity.

COURSE PRE-REQUISITES:

Electrical engineers with a professional background in EMC that want to dive into or broaden their skills in state-of-the-art signal integrity and power integrity.

Full symposium registration required in addition to the SIPI GU course fee.

RATE

\$380 (SOLD OUT)

LOCATION:

**Hilton Anatole,
Manchester**



Photo by Patrick Andre

Read the instructor bios and presentation abstracts:

2026.emcsi.org/programs/technical-programs/global-sipi-university

GLOBAL SIGNAL INTEGRITY AND
POWER INTEGRITY (SIPI) UNIVERSITY
SPEAKERS AND TOPICS

TUESDAY (AFTERNOON) 1:00PM - 5:00PM AUGUST 4, 2026

TIME	TOPIC	PRESENTER/INSTRUCTOR
1:00 - 1:30pm	Registration / Introduction	
1:30 - 2:15pm	Opening Session: Overview of High-Speed Signal Integrity (SI)	Bhyrav Mutnury (AMD)
2:15 - 3:00pm	Introduction to SI and PI: Evolution from the Basics to the Current Technology	Francesco de Paulis (Univ. L'Aquila)
3:00 - 3:30pm	Coffee Break / Networking	
3:30 - 4:15pm	Signal Integrity I: Transmission Line Effects, Lumped Effects, Passive Interconnect Design, Terminations and Reflections	John Golding (Siemens)
4:15 - 5:00pm	Signal Integrity II: How Interconnects Work: The Physics of Losses, Reflections, and Coupling	Yuri Shlepnev (Simberian)

WEDNESDAY (FULL DAY) 8:00AM - 5:00PM AUGUST 5, 2026

TIME	TOPIC	PRESENTER/INSTRUCTOR
8:30 - 9:15am	Signal Integrity III: S-params In the Eyes of the Beholder: Interconnect Design Considerations at 224 Gb/s and 448 Gb/s	Brandon Gore (Samtec)
9:15 - 10:00am	Signal Integrity IV: Measurements for Signal Integrity (VNA and TDR)	Matteo Cocchini (IBM)
10:00 - 10:30am	Coffee Break / Networking	
10:30 - 11:15am	Keynote: Powering AI Performance from Silicon to System: The Role of SIPI	Barry Katz (Mathworks)
11:15am - 12:00pm	Signal Integrity Demo I: Time Domain - Scope Measurements of the Impact of Transmission Line Effects and Reflections Demonstrating Ringing Noise, Time of Flight and Eye Diagrams	Eric Bogatin (Univ. Colorado)
12:00 - 1:30pm	Lunch Break / Networking	
1:30 - 2:15pm	Signal Integrity V: Simulation and Modeling of Signal Integrity for High-Speed Wired Communications	Renato Rimolo Donadio (TEC Costarica)
2:15 - 3:00pm	Signal Integrity Demo I: Frequency Domain - VNA (Calibration and Channel Analysis)	Paul Peterson (R&S)
3:00 - 3:30pm	Coffee Break / Networking	
3:30 - 4:15pm	Signal Integrity VI: Unmasking The DUT: Fixture De-Embedding Essentials	Giorgi Maghlakelidze (Nvidia)
4:15 - 5:00pm	Power Integrity I: Power Integrity Fundamentals	Dan Chirpich (Re:Build AppliedLogix)

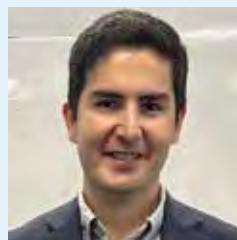
THURSDAY (MORNING) 8:00AM - 12:00PM AUGUST 6, 2026

TIME	TOPIC	PRESENTER/INSTRUCTOR
8:30 - 9:15am	Power Integrity II: VRM Basics, VRM Modeling, and IR Drop	Chulsoon Hwang (MS&T)
9:15 - 10:00am	Power Integrity III: Package and IC PDN, On-Chip VRM	Michael Hill (Intel)
10:00 - 10:30am	Coffee Break / Networking	
10:30 - 11:15am	Special Session: AI-Based Modeling and Optimization for Signal and Power Integrity	Majid Ahadi Dolatsara (Keysight Technologies))
11:15am - 12:00pm	Closing Session: Understanding Vias for Better SI and PI - 50+ Years of Physics-Based Modeling	Christian Schuster (TUHH)

CO-CHAIR: Francesco de Paulis
Univ. L'Aquila, L'Aquila, Italy

Francesco de Paulis (Senior Member IEEE) received the M.S. degree in Electrical Engineering in May 2008 from Missouri University of Science and Technology (formerly University of Missouri-Rolla), USA, and the Ph.D. degree in Electrical and Information Engineering in 2012 from the University of L'Aquila, L'Aquila, Italy. He is currently an Associate Professor at the Electromagnetic Compatibility and Signal Integrity Laboratory at the University of L'Aquila. His main research interests are in signal and power integrity, high

speed channel design and optimization, composite materials for shielding and absorption, RF interference in mixed-signal system, TSVs in silicon chips and interposers, antenna design and measurement techniques, remote fault detection in transmission lines, microwave design of electronic devices and systems for space applications.

CO-CHAIR: Majid Ahadi Dolatsara
Keysight Technologies

Dr. Majid Ahadi Dolatsara received his B.Sc. degree in electrical engineering from the K.N.Toosi University of Technology, Tehran, Iran, in 2013, and his M.Sc. degree in electrical engineering from the Colorado State University, Fort Collins, CO, USA, in 2016. He received his Ph.D. degree in electrical and computer engineering with a minor in computer science from the Georgia Institute of Technology, Atlanta, GA, USA in 2021, where he focused on development of machine learning based electronic design automation (EDA) tools for signal integrity and high-speed channels.

He has been with Keysight Technologies, Calabasas, CA, USA, since 2021, where he currently works as a senior machine learning R&D engineer developing ML-based modeling and optimization tools for EDA.

CLAYTON R. PAUL GLOBAL UNIVERSITY

ADVANCE YOUR EMC KNOWLEDGE AND CAREER WITH IN DEPTH CLASSES ON EMC AT THE IEEE EMC SOCIETY'S PREMIER EDUCATIONAL EVENT.

Chair: Dr. Todd Hubing

Professor Emeritus, Clemson University, IEEE Fellow, ACES Fellow, Past President, IEEE EMC Society

The 19th edition of Clayton R. Paul Global EMC University is an opportunity to learn from university faculty that are internationally recognized for outstanding EMC instruction. The first Global EMC University took place at the 2007 International Symposium on EMC in Honolulu. Dr. Clayton Paul invited EMC instructors from around the world to teach fundamental EMC topics as they would be covered in a university course. "Global EMC University" proved to be very popular and has been a fixture at every IEEE EMC symposium since then. In 2013, the IEEE EMC Society Education Committee renamed the event "Clayton R. Paul Global EMC University" and established strict standards for both the topics and instructors to ensure a high-quality educational experience.

Students attending this course can expect rigorous coverage of important EMC topics with plenty of opportunities to interact with the instructors. There is no exam, but students must attend all 16 hours of instruction to receive a course certificate.

PLEASE NOTE: The Clayton R. Paul Global University course content is intended for engineers who have been working in EMC and/or SIPI for several years and wish to be able to deepen their understanding. It is suggested that those who would like to attend will have already participated in the "Fundamentals Tutorial" held on Monday during the annual IEEE EMC Society Symposium week.



RATE:
\$380 (SOLD OUT)

LOCATION:
**Hilton Anatole,
Morocco**



Photo by Richard Georgerian

READ THE INSTRUCTOR BIOS

2026.emcsi.org/programs/technical-programs/global-university

CLAYTON R. PAUL GLOBAL UNIVERSITY SPEAKERS & TOPICS

The course begins with a short introduction followed by ten presentations that are designed to encourage attendees' questions. Attendees will have opportunities for discussions with the instructors.


SIGNAL SPECTRA

Dr. Flavia Grassi
Professor, Politecnico Milano


**NON-IDEAL BEHAVIOR
OF COMPONENTS**

Dr. Niek Moonen
Professor,
University of Twente, Netherlands


RADIATED EMISSIONS

Mr. Lee Hill
MSEE, Missouri University of Science & Technology
Founding Partner, SILENT Solutions LLC & GmbH
Adjunct Faculty, Worcester Polytechnic Institute (WPI)
Associate Tutor, University of Oxford


ELECTROSTATIC DISCHARGE

Dr. Daryl G. Beetner
Professor, Missouri University of Science & Technology
Director, Missouri S&T Electromagnetic Compatibility Laboratory
Director, NSF Center for Electromagnetic Compatibility


PCB DESIGN FOR EMC COMPLIANCE

Dr. Todd Hubing
Professor Emeritus, Clemson University
IEEE Fellow, ACES Fellow
Past President, IEEE EMC Society


EMC FILTERS

Dr. Frank Leferink
Professor, University of Twente
Technical Authority, THALES Nederland
IEEE Fellow


SHIELDING

Dr. Bogdan Adamczyk
Professor, Grand Valley State University (GVSU)
Director, Electromagnetic Compatibility Center


CROSSTALK

Dr. Michael Cracraft
Associate Professor, Rose Hulman Institute of Technology

TUESDAY (AFTERNOON) 1:00PM - 5:30PM AUGUST 4, 2026

TIME	TOPIC	PRESENTER/INSTRUCTOR
1:00 - 1:15pm	Registration and Introductions	
1:15 - 3:00pm	Non-Ideal Behavior of Components	Niek Moonen (University of Twente)
3:30 - 5:30pm	Signal Spectra	Flavia Grassi (Politecnico Milano)

WEDNESDAY (ALL DAY) 8:00AM - 5:30PM AUGUST 5, 2026

TIME	TOPIC	PRESENTER/INSTRUCTOR
8:00 - 10:00am	Crosstalk	Michael Cracraft (Rose Hulman Institute of Technology)
10:30am - 12:00pm	EMC Filters	Frank Leferink (University of Twente)
1:00 - 3:00pm	Radiated Emissions	Lee Hill (Worcester Polytechnic Institute)
3:30 - 5:30pm	Shielding	Bogdan Adamczyk (Grand Valley State University)

THURSDAY (MORNING) 8:00AM - 12:00PM AUGUST 6, 2026

TIME	TOPIC	PRESENTER/INSTRUCTOR
8:00 - 10:00am	Electrostatic Discharge	Daryl Beetner (Missouri S&T)
10:30 - 11:45am	PCB Design for EMC	Todd Hubing (Clemson University)
11:45am - 12:00pm	Closing Session	

**ED1
EXPERIMENTS &
DEMONSTRATIONS**

REGULATORY COMPLIANCE TESTING FOR WIRELESS MEDICAL DEVICES

10:00 AM - 12:00 PM

Room: E&D Booth 1

As the use of connected medical devices and internet of things (IoT) devices continue to increase, the challenges associated with regulatory compliance testing also increases. With higher speed chips, switching power supplies, cramped circuit layout, the EMC challenges can increase, and shift higher in frequency. Furthermore, the growing use of connected medical devices in mission-critical applications (operating rooms, remote health, implanted devices) means that the consequences of poor coexistence are more severe than ever before. It is crucial for medical device manufacturers to guarantee a seamless user experience and reliability of the device operating in environments with numerous competing wireless signals and to comply with ANSI C63.27 standard or guidance. Neglecting to consider unforeseen usage scenarios can expose vulnerabilities in the performance and resilience of the wireless devices. The absence of defined testing parameters and

unambiguous pass/fail benchmarks leads to irregular assessment, impeding the efficiency of quality evaluation. In this session, attendees will learn the challenges of wireless regulatory compliance testing, and understand the key guidance and standards associated with wireless coexistence testing, and EMI. Along with that, there is the question of do I need to test the certified module incorporated into my medical device. This presentation will address that, and demonstrate ways to quickly and accurately test the wireless device for compliance. Also new is the concern of cybersecurity of the medical device. The demos will include examples of co-existence testing; regulatory compliance testing for FCC and ETSI standards, and how to conduct cybersecurity testing on medical devices.

PRESENTERS:

Bill Koerner, *Keysight Technologies Inc.*

**ED2
EXPERIMENTS &
DEMONSTRATIONS**

ELECTROMAGNETIC COMPATIBILITY SIMULATIONS FOR AIR, SEA, AND GROUND PLATFORMS

10:00 AM - 12:00 PM

Room: E&D Booth 2

Sponsored by TC-9 Computational Electromagnetics

Electromagnetic compatibility (EMC) is a critical part of platform design in the defense industry. Numerical simulation for EMC problems - such as radiation or crosstalk at cable harnesses - can help to identify and analyze potential EMC issues at an early stage and find corrective actions. When designing complex systems, compliance with electromagnetic radiation hazard standards (e.g., ICNIRP 2020) must be ensured. In this demo, we will introduce electromagnetic simulation methods for cable

modelling (radiation/irradiation), shielding effectiveness, High Intensity Radiated Fields (HIRF) and Electromagnetic Pulse (EMP). We will also discuss the hazards of electromagnetic radiation to personnel (HERP), ordnance (HERO), and fuel (HERF) and how this can be estimated through numerical simulations.

PRESENTERS:

C.J. Reddy, *Siemens Digital Industries Software Inc*

ED6
EXPERIMENTS &
DEMONSTRATIONS**A DEEP DIVE INTO ISO11452-9
PORTABLE TRANSMITTER TESTING****10:00 AM - 12:00 PM****Room: E&D Booth 3**

This technical demonstration provides a comprehensive overview of the ISO 11452-9:2021 standard, highlighting critical updates and methodology shifts from the previous 2012 version. The presentation details the essential equipment configurations, calibration requirements, and verification protocols necessary for testing. A practical application of these standards is showcased through a live demonstration featuring RF test equipment and specialized EMC test software, providing attendees with insights into modern electromagnetic immunity testing.

PRESENTERS:Aaron Lutz, *Rohde & Schwarz, USA*Leonard Wilson, *Rohde & Schwarz, USA*ED15
EXPERIMENTS &
DEMONSTRATIONS**LIGHTNING ZONING OF AIRCRAFT PER ARP5414
AND THEIR APPLICATION IN MIL-STD-464D
TESTING FOR RADOMES AND OTHER LEADING
SURFACES OF AIRCRAFT.****10:00 AM - 12:00 PM****Room: E&D Booth 4****Sponsored by TC-5 High Power Electromagnetics**

This approach will also allow us to emphasize how these tests contribute to E3 design and mitigation strategies for lightning protection.

PRESENTERS:Christophor Hillyard, *Navy MWR Naval Air Station
Patuxent River*Tiffany Morisak, *Naval Air Systems Command*Michael Stone, *Naval Air Warfare Center Aircraft
Division*

TC2_1
TECHNICAL
PAPERSEMC MEASUREMENTS -
REVERBERATION CHAMBERS AND
MATERIAL CHARACTERIZATION

10:30 AM - 12:00 PM

Room: Coronado A

Sponsored by TC-2 EMC Measurements

Chair:

Monrad Monsen, *Oracle*

PLANNED SPEAKERS & TOPICS

**Statistics of Electromagnetic Fields within Complex
Nested Cavities Coupled by Various Wires & Apertures****BEST EMC PAPER FINALIST**

Marshall D. Sowell, Carl Hager

*Naval Surface Warfare Center, Dahlgren Division, USA***Abstract:** Previously, the two parameter K-distribution was derived and shown to model the statistics of coupled cavities for N independent and identical coupling mechanisms. However, practical applications may have non-independent and/or equivalent coupling mechanisms, and hence the previously derived two parameter K-distribution has been revised to account

for non-integer values of the shape parameter (leveraging the gamma vice the Erlang distribution in the derivation). An experimental study was performed with overmoded nested cavities when coupled by three different classes of test cases: mixed combinations of slotted apertures and wire penetrations, wire bundles, and 2-D apertures (both circular and rectangular). It is shown that the revised two parameter K-distribution provides a good fit for all test cases both with and without fully independent and/or equivalent coupling mechanisms. Additionally, it is shown for apertures that the sum of half-wavelength resonators that fit within each orthogonal dimension of the aperture determines the number of independent coupling mechanisms. Pearson's chi-squared and the Anderson-Darling goodness-of-fit tests were used to test the data against the K-distribution and exponential distribution, respectively, at a 95 % confidence.



Refined Maximum Power-Based Approach for EMI Measurements in Reverberation Chambers**BEST EMC STUDENT PAPER FINALIST**

Fushi Zhang^{1,3}, Vignesh Rajamani², Neelakantam Venkatarayalu³, Jens Medler⁴, Shuwen Li⁴, Danny Bennett²

¹Rohde & Schwarz Asia Pte. Ltd., Singapore; ²Rohde & Schwarz United States Inc., United States; ³Singapore Institute of Technology, Singapore; ⁴Rohde & Schwarz GmbH & Co. KG, Germany

Abstract: The electromagnetic interference (EMI) measurement of equipment under test (EUT) in a reverberation chamber (RC) has attracted increasing interest in recent years. This paper reproduces the EMI tests according to the maximum and average-received-power-based measurement methods in IEC 61000-4-21 and further investigates the associated challenges and practical implementation precautions. It is observed that the maximum received-power-based method exhibits dependency on the factors measured from the empty chamber validation test. It is identified as the primary issue addressed in this work. Based on a prior statistical analysis of RC characteristics, a refined

method for the maximum-power-based measurement is derived by incorporating the number of independent samples to reduce this dependency, thereby enabling a simplified test procedure. Experimental results demonstrate that the proposed refinement preserves the inherent strengths of higher measurement sensitivity while improving the agreement with the average-power-based measurement, leading to a more robust radiated power assessment in RC-based EMI measurements.

Broadband Characterization of Flexible Materials Using a Coaxial Structure

Joseph Stecher¹, Victor Khilkevich¹, Daniel Commerou¹, Xiaoning Ye²

¹Missouri University of Science and Technology, USA;

²Intel Corporation, USA



Photo by Richard Georgerian

**SPS2-12
SPECIAL
SESSION**

AI AGENTS AND GENERATIVE TOOLS FOR EMC AND SIPI APPLICATIONS

10:30 AM - 12:00 PM**Room: Coronado B****Sponsored by SC-3 Machine Learning and Artificial Intelligence in EMC and SIPI****Chair:**Karol Niewiadomski, *Universiteit Twente***Co-Chairs:**Hanzhi Ma, *Zhejiang University*Ling Zhang, *Zhejiang University***ABSTRACT:**

Electromagnetic Compatibility (EMC) and Signal/Power Integrity (SIPI) engineering face increasingly complex challenges as modern electronic systems operate at higher frequencies, integrate greater component densities, and demand enhanced performance within stringent regulatory frameworks. Traditional design methodologies and problem-solving approaches, while foundational, often require extensive computational resources, specialized expertise, and iterative processes that can significantly extend development cycles.

The emergence of artificial intelligence agents and generative AI tools presents unprecedented opportunities to revolutionize EMC/SIPI engineering practices. AI agents capable of autonomous decision-making and adaptive learning can streamline complex electromagnetic modeling, optimize design parameters, and predict interference patterns with remarkable efficiency. Generative AI technologies, including large language models and machine learning-based design tools, offer novel approaches to circuit layout optimization, filter design, shielding strategies, and regulatory compliance verification.

This special session will explore the transformative potential of AI-driven methodologies in addressing critical EMC/SIPI challenges. Topics of discussion will encompass the application of AI agents for automated electromagnetic simulation workflows, generative algorithms for optimal PCB routing and component placement, machine learning approaches to EMI/EMC prediction and mitigation, and intelligent design tools for signal/power integrity optimization. Additionally, the session will examine practical implementation strategies, validation methodologies, and the integration of AI tools within existing EMC/SIPI design environments.



PLANNED SPEAKERS & TOPICS

Benchmarking Closed-Weight LLMs on EMC Topics

Karol Niewiadomski, Lorenzo Barsotti, Niek Moonen
Universiteit Twente, Netherlands

Abstract: This study benchmarks several commercial LLMs on open-ended EMC problems to evaluate their knowledge and reasoning capabilities. We created a database of 163 questions from a standard EMC textbook, focusing on problems requiring numerical answers with units. Models were evaluated based on their ability to provide correct answers within 5% tolerance. Results show that even the best-performing model, Claude Opus 4.5, achieved only 42.2% accuracy. We analyzed the trade-off between model cost and accuracy, finding that more expensive models with reasoning capabilities generally perform better, though they consume significantly more output tokens. Token usage patterns reveal that smaller models follow instructions more strictly, while larger models with reasoning capabilities produce more verbose responses. The theoretical costs per million tokens generally aligned with actual experimental costs, with some exceptions. This preliminary study highlights significant limitations in current off-the-shelf LLMs for EMC engineering tasks, but also identifies opportunities for improvement through fine-tuning, better prompting strategies, and integration with external tools.

Autonomous Convergence Assessment of Computational Electromagnetics Using FSV (Feature Selective Validation)

Alistair Duffy

De Montfort University, United Kingdom

Abstract: The ability to allow a simulation to decide when to stop is of potential use in computational electromagnetics. Many of the approaches used, such as setting a number of iterations or imposing an energy threshold have the potential to stop too early, yielding unreliable results, or continue past the point of convergence, wasting resources. This paper explores Level 1 agentic behavior using FSV as the quantitative decision engine, based on a Perception-Assessment-Decision-Action (PADA) framework. The xDM metrics autonomously drive the stop/continue decisions during execution. This behavior is demonstrated using a simple 2D TLM cavity simulation. During the continuous monitoring, it identifies oscillatory non-convergent behavior. While an indicative rather than complete study, it establishes FSV as a strong contender for autonomous electromagnetic simulation workflows, particularly paving the way to Level 2 (adaptive) and Level 3 (learning-based) agents.



Photo by Karthik Vepuri

SC3_1
TECHNICAL
PAPERSMACHINE LEARNING FOR ADVANCED SIGNAL
INTEGRITY AND POWER INTEGRITY (I)

10:30 AM - 12:00 PM

Room: Coronado C

Sponsored by SC-3 Machine Learning and Artificial Intelligence in EMC and SIPI

Chair:

Lijun Jiang, *Missouri University of Science
and Technology*

Co-Chair:

Alistair Duffy, *De Montfort University*

PLANNED SPEAKERS & TOPICS

**A Novel 2.5D Image-Based S-Parameter Estimator
for PCB Via Using Deep Machine Learning and Q-Law
Compression**Hao-Han Hsu¹, YungChieh Yang², Chunghao Chen¹
¹Asustek Computer Inc, Taiwan; ²University of California
San Diego, USA

Abstract: A machine-learning assisted S-parameter estimator for printed circuit board (PCB) via is presented to predict return/insertion loss of via designs with arbitrary shapes. Layout images of multiple PCB layers are fed into a neural network composed of convolutional neural networks (CNNs) and fully connected neural networks (FCs) to generate differential return/insertion loss up to 20 GHz. A new pre-processing technique using Q-law compression is developed to emphasize the critical portion of the S-parameters. It significantly reduces the neural network loss and the required training epochs. The architecture of the proposed CNN/FC neural network is optimized in terms of network layer counts to minimize the loss and computer resources. It is demonstrated with a 10-layer stackup that the proposed machine learning approach can accurately predict the S-parameters of PCB via with arbitrary shapes and expand the solution space beyond parameterized models.

**Simultaneous Escape Routing Using Monte Carlo Tree
Search Based Reinforcement Learning For Differential
Nets**Davit Kharshiladze¹, Lily Qiu¹, Francis Smith², Natalia
Bondarenko², Hanqin Ye², Brice Achkir², Chulsoon Hwang¹
¹Missouri University of Science and Technology, USA;
²Cisco Systems Inc, USA

Abstract: In this work, we investigate the use of reinforcement learning (RL) based approach to simultaneous escape routing (SER)—the task of routing signal nets out of a dense pin array, while accounting for how and where neighboring pin arrays are placed. Here, we focus on SER for high-speed differential signal pairs, where pair coupling and symmetry constraints must be maintained during escape routing. RL-based learning agent is used to make high-level decisions of the SER whereas boundary escape routing is used to

handle manual routing steps. SER is computationally difficult: as problem size grows, the number of possible routing choices increases rapidly, so heuristic algorithms often fail to consistently find good solutions. To mitigate this difficulty, we implement Monte Carlo tree search (MCTS) based learning system, which helps the machine learning model strategize each routing step. Our approach learns the differential signal routing without any prior knowledge and develops high dimensional understanding of the problem.

**Deep Learning based Surrogate Model for Fast
S-Parameter Performance Verification**Dongryul Park¹, Hyunwoo Kim¹, Sungwon Park²,
Seunghyup Han², Bumhee Bae², Chulsoon Hwang³,
Seungyoung Ahn¹¹Korea Advanced Institute of Science and Technology,
Korea; ²Samsung Electronics, Korea; ³Missouri
University of Science and Technology, USA

Abstract: This paper proposes a deep learning based surrogate model for fast S-parameter performance prediction of PCB cables used in mobile devices. Conventional verification relies on repetitive electromagnetic (EM) simulations, which are time-consuming and require significant engineering resources. To address this issue, the proposed model replaces 2D EM simulations by leveraging the fast inference capability of deep learning. A dataset composed of randomly generated PCB cable 2D cross-sectional geometries and corresponding S-parameters is constructed, and preprocessing is applied to improve training efficiency and reduce both the output data size and its information content. A hybrid network architecture combining convolutional neural networks and attention mechanisms is designed to capture both local features and long-range global features. In addition, a curriculum learning strategy is introduced to mitigate learning bias arising from the wide dynamic range of S-parameter values. Experimental results show that the proposed model achieves accurate region-wise prediction while reducing inference time by approximately 99% compared to a conventional 2D EM simulator.

ANNOUNCING AN EMC SOCIETY MEMBERSHIP POP-UP!

Join us in the EMC Society Membership Booth #357 for a “Pop-Up” opportunity to discuss how to elevate your IEEE membership. Janet O’Neil, VP Member Services with the EMC Society Board of Governors, will be available with experts to provide answers to your questions on elevating your membership to Senior or Fellow status on

**Tuesday, August 4, from 1:00 to 2:00 pm and
Wednesday, August 5, from 11:00 am to 12:00 pm**

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**TC11_1
TECHNICAL
PAPERS**

NANOTECHNOLOGY AND ADVANCED MATERIALS

10:30 AM - 12:00 PM

Room: Coronado D

Sponsored by TC-11 Nanotechnology and Advanced Materials

Chair:

Marina Koledintseva, *The Boeing Company*,

Co-Chair:

Alessandro Giuseppe D'Aloia,
DIAEE - Sapienza University of Rome

PLANNED SPEAKERS & TOPICS

Investigation of a Material Design Methodology with Visualizing Target Properties Using Ultra-Lightweight Electromagnetic Wave Absorbers

Dan Suzuki¹, Kishio Hidaka¹, Saijian Aja¹, Eriko Kijima², Tomonaga Ueno², Motoshi Tanaka³, Shotaro Takahashi⁴, Yasushi Endo¹, Sho Muroga¹

¹Tohoku University, Japan; ²Nagoya University, Japan; ³Akita University, Japan; ⁴Nagoya Institute of Technology, Japan

Abstract: We proposed a methodology for establishing material design guidelines to enhance the performance of carbon nanotube (CNT)-based electromagnetic wave absorbers. Target values of effective complex permittivity and conductivity were derived using transmission-line theory and compared with experimentally estimated electromagnetic properties. The design space for a 5.0-mm-thick absorber was defined to achieve absorption levels exceeding 10 or 15 dB over the 27.5–29.5 GHz frequency band. The estimated electromagnetic properties of CNT-based composites were mapped onto this design space, revealing that the reduced effective conductivity is critical for improving absorption performance. Guided by this insight, materials with enhanced CNT dispersion were fabricated, resulting in improved absorption characteristics. These results validate the utility of the proposed method as a design tool for enhancing the absorption performance in millimeter-wave absorbers.

Effect of Raster Orientation on X-Band Shielding Effectiveness of Aerosol Jet Printed Films

BEST EMC PAPER FINALIST

Cannon Kilcrease, Md Shihab Shakur, Srikanthan Ramesh, Charles F. Bunting, Pavithrakrishnan Radhakrishnan
Oklahoma State University, USA

Abstract: This paper evaluates whether raster orientation affects the shielding effectiveness of multilayer aerosol jet printed conductive films. Rectangular films were printed on glass substrates using two raster configurations: (i) traces aligned parallel to the waveguide broad wall and (ii) traces aligned parallel to the narrow wall. For each configuration, films were fabricated to approximate target thicknesses of 1.5, 2.5, and 4.5 Qm. Shielding effectiveness was measured over the X-band using a WR-90 waveguide operating in the dominant TE₁₀ mode. The measurements show no dependence of shielding effectiveness on raster orientation across the investigated thickness range, indicating the formation of electrically continuous and effectively isotropic films. These results simplify process planning for aerosol jet printed shields by decoupling toolpath selection from shielding performance, enabling raster orientation to be chosen based on manufacturability, throughput, or surface quality considerations.

Inverse Design Method for Frequency Selective Surface Based on Physics-Informed Generative Models

BEST SIPI PAPER FINALIST

Weikai Luo, Da Li, Jinyan Ma, ErPing Li
Zhejiang University, China

Abstract: Over the past few years, deep learning has demonstrated promising capability in frequency selective surface (FSS) design. However, inverse design is often hindered by the intrinsic non-uniqueness of the problem, where a desired specification can be realized by multiple different configurations. To address this challenge, this paper proposes a physics-informed conditional Wasserstein generative adversarial network with gradient penalty (PI-WcGAN-GP) to model the conditional distribution of FSS responses under bandpass constraints. To ensure stable adversarial training and mitigate mode collapse, the Wasserstein distance with gradient penalty is leveraged as the optimization objective. Furthermore, a computationally efficient physics-guided smoothness regularization is incorporated into the generator loss to suppress non-physical oscillations and enforce realistic spectral continuity, while simultaneously constraining the output range for numerical robustness. The corresponding numerical results demonstrate that the proposed PI-WcGAN-GP exhibits more stable training dynamics while generating the conditional scattering responses with high physical consistency, thereby offering an efficient generative approach to alleviate non-uniqueness in traditional FSS inverse design.

TC10_9
TECHNICAL
PAPERS

S-PARAMETER & DATA VALIDATION

10:30 AM - 12:00 PM

Room: Cortez A

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Giorgi Maghlakelidze, *NVIDIA Corp*Hanfeng Wang, *Google Inc*

PLANNED SPEAKERS & TOPICS

Comparison of Numerical and Analytical Dispersion Relations with Subtractions for Sparse S-Parameters

Yu-Zhan Chen, Chiu-Chih Chou

National Central University, Taiwan

Abstract: This paper evaluates the causality error bounds of numerical and analytical dispersion relations for sparse S parameters. It is found that the numerical method may underestimate discretization errors, causing false positives; conversely, the analytical method may overestimate approximation errors, thus failing to detect true noncausality. For practical measurements, noise dominates, making both methods' error estimates comparable.

Evaluating the Quality of Computed TDR via High-to-Mid Frequency Data Comparison

Yu-Hua Chang, Chiu-Chih Chou

National Central University, Taiwan

Abstract: This paper presents an easy-to-implement methodology for verifying black-box time-domain reflectometry (TDR) computation. The idea is to cross-compare the TDR computed from original full-bandwidth data with its mid-frequency truncated counterpart. Through this comparison, we can objectively observe the stability of the TDR computation algorithm for capturing trace impedance, surge/droop level, and mitigation of Gibbs ripple, thus revealing potential numerical artifacts. Validation with simulated and measured data confirms the feasibility of this approach. Keywords—TDR accuracy, frequency truncation

Consistency Analysis of the IEEE 370 Preliminary Causality Metric Using Physics-Based Models

Hai-En Ma, Chiu-Chih Chou

National Central University, Taiwan

Abstract: This paper investigates the practical limitations of the IEEE 370 initial Causality Quality Metric (CQM_i) using physics-based simulated models and practical measurements. By cross-examining CQM_i scores against time-domain pulse and TDR responses, results reveal that the metric erroneously assigns near-perfect scores to non-causal simulated models, loses discriminative ability under significant time delays, and severely underrates reliable physical measurements. To prevent such misjudgments, integrating complementary approaches like time-domain validations is highly recommended.



Photo by Richard Georgerian

**TC10_1
TECHNICAL
PAPERS**

HIGH-SPEED INTERCONNECTS & SERDES (224/448 GBPS)

10:30 AM - 12:00 PM

Room: Cortez B

Sponsored by TC-10 Signal and Power Integrity

Chair:

Tao Wang, *Meta*

Co-Chair:

Matteo Cocchini, *International Business
Machines Corp*

PLANNED SPEAKERS & TOPICS

224 Gbps End-to-End Channel Optimization for High-Performance Computing System

Wenchang Huang¹, Siqi Bai², Ryan Hou², Shengxuan Xia²,
Songping Wu², Chulsoon Hwang¹

¹Missouri University of Science and Technology, USA;

²Rivos Inc, USA

Abstract: Next-generation high-performance computing (HPC) systems demand 224 Gbps PAM4 signaling, introducing significant signal integrity (SI) challenges within densely integrated compute trays. To address this, this paper presents a practical pre-layout topological co-design methodology for end-to-end channels across the package, open acceleration module (OAM), and universal base board (UBB). Two key innovations are introduced: (1) adopting an 85 ff trace impedance to improve matching to the effective impedance of capacitance-dominated regions such as C4 bumps and BGA, and (2) utilizing a PKG-OAM co-simulation framework to mitigate wave-port artifacts for high-resolution BGA via tuning. The optimized baseline channel achieves a 36.3 dB differential insertion loss (SDD21) at the 56 GHz Nyquist frequency. Validated against IEEE 802.3dj draft specifications, it delivers an Effective Return Loss (ERL) of 18.244 dB and a Channel Operating Margin (COM) of 6.136 dB, indicating sufficient margin to accommodate practical implementation effects, including crosstalk.

Ultra-Wideband Coplanar Stripline (CPS) Interconnects for 224/448-Gbps SerDes: Design and mm-Wave Performance Analysis

Kang Wook Kim¹, Byung Cheol Min¹, Dong Jae Go¹,
Mun Ju Kim¹, Abhijit Wander^{2,3}, Raheeq Darweesh²

¹Kyungpook National University, Korea; ²Amphenol
Communications Solutions, USA; ³Cisco Systems, USA

Abstract: As AI data center bandwidth requirements surge, the commercialization of 224 Gbps SerDes per lane and the development of next-generation 448 Gbps technologies are accelerating. At these data rates, the Nyquist frequency reaches 56 GHz and beyond, pushing Printed circuit board (PCB) interconnects into the mm-wave regime. Even with low-loss, high-performance substrates, maintaining adequate signal fidelity at and beyond the Nyquist frequency becomes increasingly difficult due to prohibitive insertion loss, imbalance, and mode-conversion effects. This paper

investigates an ultra-wideband PCB transmission structure based on planar coplanar stripline (CPS) to address these limitations. With an optimized transition from differential microstrip (DM) lines to CPS, the CPS-based interconnect can be readily manufactured using standard PCB processes, enabling broadband balanced signal propagation from DC to beyond 100 GHz. Full-wave simulations demonstrate significantly reduced insertion loss and enhanced common-mode rejection compared to conventional differential interconnects. The resulting improvement in effective signal-to-noise ratio (SNR) is shown to expand the feasible design space toward higher-order modulation schemes, such as PAM8, for future 448 Gbps SerDes applications.

Design and Analysis of Signal and Power Integrity in Chiplet Interface Channels for 1317 GB/s/mm Die-Edge Bandwidth

Jiwoon Moon, Jonghyeon Lee, Yuchul Jung, Taei Kim,
Uichan Kim, Youngwoo Kim
Sejong University, Korea

Abstract: In this paper, we present signal integrity (SI) and power integrity (PI) analysis for ultra-dense chiplet interconnects considering the interaction between routing topology and meshed-ground structures under realistic fabrication constraints. A 32 GT/s UCIe channel with 400 wires/mm routing density is analyzed using full-wave 3D electromagnetic simulations. The results show that SI performance strongly depends on routing budget allocation among signal width, spacing, and shielding width. Signal width-oriented routing reduces channel loss but significantly increases crosstalk (XT), whereas shielding-width-oriented routing achieves superior XT suppression and stable eye opening. In addition, increasing meshed ground defect size aggravates return current discontinuity, resulting in severe SI degradation beyond the D2 defect level. Power distribution network (PDN) analysis further shows that higher metal density effectively reduces PDN impedance and voltage ripple. These results provide practical SI/PI co-design guidelines for ultra-dense chiplet interconnects.

TC9_2
TECHNICAL
PAPERSSIMULATION AND DESIGN WITH
MEASUREMENT CORRELATION FOR
SYSTEM-LEVEL EMC

10:30 AM - 12:00 PM

Room: Cortez C

Sponsored by TC-9 Computational Electromagnetics

Chair:

Pavithrkrishnan Radhakrishnan, *Oklahoma State University*

Co-Chair:

Shaowu Huang, *Palo Alto Networks Inc*

ABSTRACT:

This session highlights simulation and design methodologies for system-level EMC with strong emphasis on measurement correlation. Contributions include domain decomposition techniques for large-scale systems, virtual twin frameworks aligned with IEC standards, and SIPI-based modeling of stray current effects in high-power racks. The session bridges simulation and real-world validation for compliance-driven design.

PLANNED SPEAKERS & TOPICS

EMC Modeling of Modular Multi Level HVDC
Converters using Domain DecompositionFernando Rodriguez Varela¹, Arne Schröder¹, Gustaf Sandberg²¹Hitachi Energy Switzerland Ltd, Switzerland; ²Hitachi Energy Sweden AB, Sweden

Abstract: In this paper, a simulation methodology for prediction of radio frequency emissions of high-voltage multi-level converter stations with improved computational efficiency is presented. It is based on splitting the computational model of a complete station into several subdomains. Radiated emissions are calculated by combining results for each subdomain, obtained from three dimensional, full-Maxwell solvers. Using circuit level simulations and convolution, the partial results of each subdomain are aggregated to compute the radiated emission by the converter. The proposed workflow is compared with conventionally used full-wave simulations of a complete High Voltage Direct Current (HVDC) station, showing reductions of computation times below 50%, while keeping the accuracy within typical measurement uncertainties, which paves the way for improving the efficiency of virtual station design.

A Computational Electromagnetics Based Virtual Twin
Framework for IEC Consistent EMC Assessment of
High-Speed InterconnectsSafal Sharma¹, Scott Piper², Ashraf Umar³, Haysam M. Kadry³¹Molex, LLC, India; ²Dassault Systemes, USA; ³Molex, LLC, USA

Abstract: Computational electromagnetics-based virtual twin framework is presented for connector-level EMC assessment of high-speed interconnects, aligned with IEC 62153-4-7 triaxial measurements. A high-fidelity virtual twin of the complete triaxial configuration demonstrates quantitative, metric-consistent simulation-measurement correlation for screening attenuation and coupling attenuation, enabling simulation-based IEC compliance evaluation. For early-stage design iteration, fixture-independent diagnostic metrics based on total radiated power, electromagnetic power flow and surface current density are introduced. These metrics are validated using measurements from connectors representing variations in shielding continuity and grounding density, supporting multi-case validation, where they correctly predict relative trends observed in standardized IEC test results. Additionally, sensitivity analysis demonstrates that millimeter-scale variations in triaxial fixture geometry can significantly influence measured responses, enabling separation of setup-induced effects from intrinsic connector EMC behavior.

High-Power Rack Stray Currents: EMC Exposure
Quantified Through SIPI ModelingMehdi Mechaik, Sajjad Ahmed
TE Connectivity Corporation, USA

Abstract: Non-isolated DC architectures in open racks merge logic ground, return, and chassis, creating uncontrolled return-current paths through steel, chassis, and cable shields. Voltage gradients drive stray currents that concentrate near the power shelf, overstressing connectors and degrading EMC and SIPI margins. This presentation shows these currents scale with rack power, introducing EMI exposure, crosstalk, power risk, and reliability limits. Effective mitigation requires connector derating, rack-wide current modeling, and selective grounding strategies.

**TC8_1
TECHNICAL
PAPERS**

MAGNETIC SHIELDING AND CLEANLINESS TECHNIQUES FOR SPACE MISSIONS

10:30 AM – 11:30 AM

Room: Cortez D

Sponsored by TC-8 Aeronautics and Space EMC

Chair:

Nika Amralah, *Department of National Defence*

Co-Chair:

Ashton Schessler, *Blue Origin LLC*

PLANNED SPEAKERS & TOPICS

Design, Fabrication, and DC Magnetic Emission Testing of Additively Manufactured (3D-Printed) Magnetic Shields

BEST EMC PAPER FINALIST

Katherine Dang, Pablo Narvaez, Samad Firdosy, Kevin Pham, Ian McKinley

Jet Propulsion Laboratory, USA

Abstract: Additively manufactured or 3D-printed magnetic shields were experimented and explored at the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL). The shields utilized additive manufacturing (AM) of soft magnetic alloys, such as Fe-80Ni-4MO and FeCo-2V, using blown powder laser directed energy deposition (DED). Multiple magnetic shield designs were fabricated and underwent DC magnetic emissions testing to determine their shielding effectiveness. This included three prototype shields, a multi-material shield, and a shield for a cryocooler. A comparison was also made between a 3D-printed magnetic shield and a manufacturer-built Mu-metal shield.

Magnetic Cleanliness Assessment of the Mars 2020 Perseverance Rover for Sample Paleomagnetism and Implications for Future Mars Sample Return Missions

Chi-Chien Nelson Huang¹, Katherine Dang¹, Boyan Kartolov¹, Pablo Narvaez¹, John Trinh¹, Benjamin P. Weiss²

¹Jet Propulsion Laboratory, USA; ²Massachusetts Institute of Technology, USA

Abstract: This paper presents a post-launch evaluation of the magnetic cleanliness compatibility of the Mars 2020 Perseverance rover with collected Martian samples and discusses implications for future Mars Sample Return missions. Due to magnetic cleanliness requirements not being fully propagated through project-level environmental requirement flowdown during development, a retrospective magnetic assessment using bounding assumptions and conservative analytical methods was needed. The primary objective was to estimate the probability of high magnetic fields and their potential impact rather than to establish compliance through direct verification. The assessment included magnetic material audits, characterization of high-risk magnetic sources, evaluation of integration and test magnetic environments, and development of candidate end-to-end magnetic compatibility test approaches. The analyses indicate a low likelihood that the samples were exposed to magnetic fields exceeding the 0.5 mT (5 Gauss) threshold during mission operations. The methodology and resulting lessons learned provide a practical electromagnetic compatibility assessment framework for future Mars sample return missions.



Photo by Patrick Andre

ASK
THE
EXPERTSASK THE EXPERTS PANEL DISCUSSION:
WAR STORIES FROM THE TRENCHES

1:30 PM – 3:00 PM

Room: AtE Stage, Exhibit Hall

Chair:

Jacob Dixon, *International Business Machines Corp, Rochester, MN, USA*
Karen Burnham, *EMC United Inc, Denver, CO, USA*

This open-mic style panel gives EMC engineers a chance to share real-world problem-solving stories from the field. The messier and more hard-won, the better. Think of it as peer-to-peer learning wrapped in a little friendly competition. The format is deliberately informal. No slides, no polished presentations, just engineers sharing the kind of stories that (usually!) only get told in hallways and over drinks, now on the stage!

With a strict 5 minute speaking limit, stories are expected to center around:

- A gnarly EMC problem encountered during design, development, or debug
- The clever or novel application of EMC principles to crack it
- Bonus points for: unexpected root causes, novel application of theory into practice, embarrassing mistakes that turned into breakthroughs, or solutions that shouldn't work in the lab, but do in real life

An award will go to the story with the most audience interest! Come one and all to learn, share, and teach!

ASK THE EXPERTS
SPONSORED BY

TC2_3
TECHNICAL
PAPERSEMC MEASUREMENTS -
RADIATED EMISSIONS

1:30 PM - 3:00 PM

Room: Coronado A

Sponsored by TC-2 EMC Measurements

Chair:

Dave Arnett, *Garmin International Inc*

Co-Chair:

Monrad Monsen, *Oracle*

PLANNED SPEAKERS & TOPICS

**Estimation of 10 m Radiated Emissions from
Measurements at 3 and 5 m Using Source
Reconstruction**Shivali Singh, Milad Rezaei, Lijun Jiang, Daryl Beetner
Missouri University of Science and Technology, USA

Abstract: The ability to measure radiated emissions at 10 m, as required by many compliance standards, is often limited by the cost of large semi-anechoic chambers. Predicting these emissions from measurements made closer to the device (e.g. at 3 m) is limited, however, particularly at low frequencies where far-field conditions are difficult to achieve. In this work, a source reconstruction method (SRM) is presented to predict radiated emissions far away from the device under test (DUT) using emissions measurements made much closer to the device. The method estimates equivalent electric and magnetic current distributions on a surface enclosing the DUT through an iterative inverse procedure that does not

require phase information. The reconstructed sources are then used in a forward radiation model to predict the electromagnetic fields at the larger distance. Fields predicted far away from a DUT were compared against reference simulations and measured data, and demonstrated good agreement in both the magnitude and spatial distribution of the radiated fields. In both cases, the peak radiated fields at the larger distances were found within less than a 1 dB error. These results indicate that the proposed approach can be used to reliably estimate radiated emissions at greater distances than might be allowed by the size of the available semi-anechoic chamber. This source reconstruction method provides a practical and effective tool for assessment of radiated emissions for EMC compliance.

DALLAS FUN FACTS

TEXAS STATE FLOWER: THE BLUEBONNET

The bluebonnet is the official flower of Texas and was adopted by the Texas state legislature in 1901. The vibrant sapphire blue petals are said to resemble the bonnets worn by pioneer women to shield them from the sun.

Bluebonnets typically germinate in the fall and then peak in mid to late April and can often be seen blooming in fields and roadsides throughout central and south Texas. They are not hard to spot as their centers typically have white or yellow spikes and the flower can grow to around 1 foot tall.

The origins of the Bluebonnet is chalked full of myths, legends, and quirky stories, but the flower remains one of the most beloved and recognizable symbols of the great state of Texas. The plants determination to come back, year after year, despite soil and weather conditions, is symbolic of the resilient people who call Texas their home.

**Extrapolation Method for Predicting Unmeasurable Radiation from Partial Measurements**

Milad Rezaei¹, Ben Kim², Jeremy Chinn², Jaswanth Vutukury², Daryl Beetner¹, Lijun Jiang¹

¹Missouri University of Science and Technology, USA;

²Meta Platforms, Inc., USA

Abstract: Because of the rapid increase in the size of electronic systems, some require operating conditions where power requirements cannot be satisfied by standard EMC/EMI measurement facilities. A multi-radiator system with many similar radiating units may require so much power that measuring the radiation of a fully loaded system becomes impractical. One possibility is to use radiation data from a partially filled system to predict the radiation of a fully loaded system. This work proposes a radiation extrapolation method to address this challenge. It is based on the phaseless source reconstruction method (SRM) using measured radiation from only one of several units in the system. Equivalent sources are first obtained from a single active radiator, then corrected using measurements of two active radiators to account for inter-element coupling. The corrected equivalent currents are replicated at the locations of the remaining radiators, and random phases are assigned to model the total radiated emission without further measurements. The proposed method is evaluated using full-wave simulations and experimental measurements at 350 MHz and 6 GHz, showing accurate prediction of system level radiation with average errors below 1 dB at peak emission points.

Radiated Emission Measurement in FAR Using VHF-LISN for AC Mains Cable Termination

Kunihiro Osabe, Nobuo Kuwabara, Shinichi Okuyama, Hidenori Muramatsu, Toshiki Shimasaki
VCCI Council, Japan

Abstract: Radiated emission measurements in a FAR adopt a CMAD as the mains cable termination device in some product standards. However, for a 3-wire mains cable including Protective Earth, CMAD cannot ensure reproducible measurement results. In this case, there is no termination effect in CMAD because the disturbance current between the two lines (Live and Neutral) and the PE line is in the differential mode. Therefore, this article proposes a method for terminating power mains cables using a VHF-LISN that requires a ground connection for radiated emission measurements at FARs where a ground connection is not possible. Simulations were conducted to predict what problems would occur if the VHF-LISN were not grounded at the FAR. This paper proposes two methods to ensure measurement reproducibility without grounding the VHF-LISN, and the results have been experimentally confirmed.



SPS1_12
SPECIAL
SESSIONELECTROMAGNETIC COMPATIBILITY
CHALLENGES AND SAFETY OF MEDICAL
DEVICES IN CLINICAL ENVIRONMENTS

1:30 PM - 5:00 PM

Room: Coronado B

Chair:Ji Chen, *University of Houston***Co-Chair:**Ananda Kumar, *US Food and Drug
Administration***ABSTRACT:**

The increasing complexity of medical devices and their widespread use in electromagnetically challenging clinical environments—such as MRI suites, operating rooms, and intensive care units—raise critical electromagnetic compatibility (EMC) and safety concerns. This Special Session focuses on emerging EMC challenges for medical devices, including susceptibility to electromagnetic fields, unintended coupling mechanisms, device–tissue interactions, and risk mitigation strategies. The session aims to bring together researchers, clinicians, device manufacturers, and regulatory experts to discuss recent advances in modeling, testing, and standards development related to medical device EMC. Topics will include both experimental and computational approaches, realworld incident analyses, and regulatory perspectives to ensure safe and reliable device operation in clinical settings.

PLANNED SPEAKERS & TOPICS**Evaluation of B1⁺ Field Perturbations By Medical Implants Across Anatomical Regions**Xiaotian Wang, Jiarui Lu, Zhongrui Wang,
Jianfeng Zheng
University of Houston, USA

Abstract: This paper presents a systematic investigation of the B1⁺ field perturbations caused by medical implants under magnetic resonance imaging (MRI). Numerical simulations compared B1⁺ fields in human models with and without implants across ten anatomical regions, with two representative implants studied for each region. The results show that the spatially averaged B1⁺ field varies by less than 5% for almost all cases, indicating that although large local perturbations may occur near implants, the global transmit B1⁺ field remains largely stable for RF power calibration.

Magnetic Resonance Imaging: a Challenging EMC Environment for Active Implantable Medical DevicesMichael Steckner
MKS Consulting, USA

Abstract: A brief overview of the three magnetic fields that create a Magnetic Resonance Image (MRI), which pose significant EMI/EMC challenges to equipment brought into its Faraday cage preserve, and the significant safety concerns for implanted patients. Testing determines tolerable exposures and are specified in product documentation. Emerging clinical needs are identified.



Effect of Electrode Geometry on Proximity Enhancement of Electrically Long AIMDs

Krishna K. Kurpad, Paul S. Stadnik, Jeffrey A. Von Arx
Micro Systems Engineering Inc, USA

Abstract: The lead electrodes of electrically long active implantable medical devices (AIMD), individually labeled MRI conditionally safe, that are placed in close proximity to each other but traverse substantially different paths to the target tissue may cause significant enhancement in tissue deposited RF power when the AIMDs are exposed to MRI RF electromagnetic fields. ISO/TS 10974:2018 requires additional MRI RF safety assessment when the spacing between such electrodes is less than 20 mm. In this work, we investigate the influence of electrode geometry on the minimum safe spacing between said electrodes conditional upon the available safe margin for MRI RF induced tissue heating. We propose a numerical simulation method to determine the unconditionally safe minimum spacing between any two such electrodes.

Effect of Feedthrough Wire Impedance in Transfer Function Model in MR Safety

Hongbae Jeong, Joshua Guag, Ananda Kumar
US Food and Drug Administration, USA

Comparison of Computational Methods for EM Safety Assessment of MRI

Ananda Kumar¹, Luisa Fleig², Tolga Goren², Hongbae Jeong¹

¹US Food and Drug Administration, USA; ²IT'IS Foundation, Switzerland



Photo by Richard Georgerian

SC3_2
TECHNICAL
PAPERSMACHINE LEARNING FOR ADVANCED SIGNAL
INTEGRITY AND POWER INTEGRITY (II)

1:30 PM - 3:00 PM

Room: Coronado C

Sponsored by SC-3 Machine Learning and Artificial Intelligence in EMC and SIPI

Chair:

Alistair Duffy, *De Montfort University*

Co-Chair:

Hanzhi Ma, *Zhejiang University*

PLANNED SPEAKERS & TOPICS

**Imitation Learning-Based Routing Optimization for
Chiplet Interconnects in Advanced System-in-Package
(SiP)**

Hyunwoo Kim, Seunghun Ryu, Dongryul Park,
Sanguk Lee, Seonghi Lee, Seungyoung Ahn
Korea Advanced Institute of Science and Technology, Korea

Abstract: This paper presents an imitation learning-based routing optimization framework for chiplet interconnects in system-in-package (SiP). The proposed framework employs a hierarchical architecture where a ConvGRU-based U-Net policy network predicts waypoints while the A* algorithm handles detailed pathfinding, effectively reducing the action space. The policy network is trained via behavioral cloning on expert routing solutions generated by a negotiation-based routing algorithm, achieving high prediction accuracy. Experimental evaluation across diverse test cases demonstrates superior performance compared to random search, simulated annealing, and A*-only approaches in both routing quality and computational efficiency. By replacing iterative optimization with neural network inference, the framework significantly reduces design time while exhibiting strong generalization across various bump map configurations, demonstrating practical viability for advanced SiP design automation.

**Differential Via Modeling Using Transfer Learning
Framework****BEST SIPI PAPER FINALIST**

Shruti Sawant¹, Mehdi Mousavi¹, Davit Kharshiladze¹,
Srinath Penugonda², Sathvika Bandi¹, Manish Mathew¹,
Kevin Cai², Shameem Ahmed², Bichen Chen³, Granthana
Rangaswamy³, Santosh Pappu³, Lijun Jiang¹, Chulsoon
Hwang¹

¹EMC Laboratory, Missouri University of Science and
Technology, USA; ²Cisco Systems Inc., USA; ³Meta
Platforms Inc., USA

Abstract: Accurate differential via modeling is essential for signal integrity analysis of high-speed interconnects. While full wave electromagnetic solvers provide high-fidelity characterization, the computational cost of generating large parametric datasets limits their use in machine-learning-based models, often requiring tens of thousands of simulations. This paper presents a transfer learning approach that significantly reduces reliance on full-wave simulation data by leveraging analytical via models. Despite their computational efficiency, the accuracy of analytical models decreases at higher frequencies. The neural network estimator is first pretrained using a large analytically generated dataset to learn fundamental electromagnetic behavior, and subsequently fine-tuned using a small number of full-wave simulations to bridge deviation of analytical models from full wave simulator output. An encoder-decoder architecture is employed to predict frequency-dependent insertion loss (IL) and return loss (RL). A customized loss function is designed for to capture different trends in IL and RL. The proposed approach achieved mean absolute errors of 0.06 dB for IL and 0.33 dB for RL up to 100 GHz, while reducing the required number of full wave simulations by over 99% compared to conventional end-to-end training. These results demonstrate that transfer learning enables accurate and scalable differential via modeling with substantially reduced computational cost.

Surrogate-Assisted Amortized Neural Optimization of DDR5 Decision Feedback Equalization

Julian Withöft¹, Werner John^{1,2}, Emre Ecik¹, Ralf Brüning³, Jürgen Götze¹

¹Technische Universität Dortmund, Germany;

²Pyramide2525, Germany; ³Zuken GmbH, Germany

Abstract: Design space exploration (DSE) and pre-layout signal integrity (SI) analysis of high-speed printed circuit board (PCB) interconnects is often limited by the computational cost of iterative equalizer tuning. This makes it challenging to provide the PCB designer with real-time link feasibility checks during the pre-layout design phase. This paper introduces an amortized neural optimization (ANO) framework for fast decision feedback equalizer (DFE) configuration in DDR5 interconnects. The proposed method utilizes a dual network architecture. Firstly, a differentiable neural surrogate predicts post-DFE eye contours from PCB and equalizer parameters. Secondly, an amortized neural optimizer learns a global policy that maps channel parameters directly to near-optimal DFE settings by backpropagating through the frozen surrogate to effectively exploits its gradient information. In contrast to black-box optimization methods, which require iterative evaluation for each new channel instance, the ANO amortizes the optimization cost during training, enabling near-instantaneous inference for new channels. Validation across the 45-dimensional channel parameter space shows that the method achieves consistent eye-height (EH) improvements across receivers, while closely matching the genetic algorithm (GA) performance. Optimization time is reduced from tens of seconds to milliseconds, while remaining consistently low even for large batches of channel inputs. Unlike iterative optimization methods, whose runtime scales with the number of channel instances evaluated, the proposed amortized inference approach performs batched evaluations, which enables rapid exploration of large pre-layout design spaces.



Photo by Richard Georgerian

**TC11_2
TECHNICAL
PAPERS**

NANOTECHNOLOGY AND ADVANCED MATERIALS

1:30 PM - 3:00 PM

Room: Coronado D

Sponsored by TC-11 Nanotechnology and Advanced Materials

Chair:

Marina Koledintseva, *The Boeing Company*

Co-Chair:

Alessandro Giuseppe D'Aloia,
DIAEE - Sapienza University of Rome

PLANNED SPEAKERS & TOPICS

High-Speed Voltage Clamping by Granular Metals for Arrester Devices

Matthew M. Landi, Tyler C. Bowman, Matthew P.H. Oliveira, Frank A. McKay, Simeon J. Gilbert, Laura B. Biedermann
Sandia National Laboratories, USA

Absorber Performance Measurements

Paul Dixon, Vedashree Chaphekar
Qnity Electronics, USA

DALLAS FUN FACTS

DALLAS ARBOREUM AND BOTANICAL GARDEN

The 66-acre Dallas Arboretum and Botanical Garden is globally acclaimed for its beauty and architecture, receiving awards for the magnificent displays of greenery. View the pecan groves, magnolias, crape myrtles, cherry trees, and azaleas as you wander. One of the notable features of the Dallas Arboretum is that you don't need to leave the premises for meals, as many restaurants and cafés are incorporated into the design of the gardens. Explore the gardens and have a leisurely day in Dallas!



TC10_10
TECHNICAL
PAPERS

MATERIAL PROPERTY EXTRACTION

1:30 PM - 3:00 PM

Room: Cortez A

Sponsored by TC-10 Signal and Power Integrity

Chair:

Tao Wang, *Meta*

Co-Chair:

Chulsoon Hwang, *Missouri University of Science and Technology*

PLANNED SPEAKERS & TOPICS

Extraction of Surface Roughness and Dielectric Properties for High-Speed Digital Channels Using Bayesian OptimizationSeungtaek Jeong, Hyunwook Park, Hanfeng Wang
Google LLC, USA

Abstract: In this paper, a systematic methodology for extracting surface roughness parameters and dielectric properties is proposed and verified. The extraction methodology integrates high-precision S-parameter measurements with an optimization approach utilizing Bayesian Optimization. By minimizing the discrepancy between the measured and simulated insertion loss of a stripline interconnect, the proposed method accurately determines the Huray roughness for copper layer, and dissipation factor (D_f) parameters for the dielectric layer. The physical validity of the extracted parameters is demonstrated by the excellent correlation between electromagnetic (EM) simulations and vector network analyzer (VNA) measurements up to 20 GHz on a practical test vehicle.

Inconsistency Between Existing Common Dielectric Models and Measured ValuesChun-Che Huang, Chiu-Chih Chou
National Central University, Taiwan

Abstract: In high-speed link design, the Djordjevic-Svensson (DS) model is commonly employed in conjunction with vendor-provided datasheet data points for broadband dielectric modeling. However, we found that selecting different data points for anchoring results in a systematic deviation, thus questioning the validity of the DS model. Furthermore, to increase model flexibility, we transitioned to a Multi-Debye model with higher degrees of freedom. Yet, unexpected results are still observed. These findings demonstrate an inherent conflict between the existing models (both DS and Debye) and the vendor-provided datasheets. In the context of high-speed signal transmission, this inconsistency can lead to design misjudgments and significantly increase the uncertainty in compliance testing, making it difficult for researchers to make rapid and reliable design decisions.

Multimode Dielectric Characterization of a Cooling Liquid Using a Cylindrical Cavity ResonatorMehdi Mousavi¹, Chaofeng Li¹, Reza Asadi¹, Yejun Kim¹, Xiaoning Ye³, Kai Wang², DongHyun (Bill) Kim¹, Lijun Jiang¹, Victor Khilkevich¹¹*Missouri University of Science and Technology, USA;*²*Intel Corporation, USA*

Abstract: Accurate dielectric properties of low-loss cooling liquids are required for high-speed signal and power integrity analysis. This paper presents a practical multimode measurement method based on a cylindrical cavity resonator excited by magnetic loop probes. For a fully-filled homogeneous sample, the relative permittivity is extracted from the resonance-frequency ratio between empty and filled measurements. A closed-form dielectric loss tangent expression is derived from quality-factor decomposition and conductor loss frequency dependency and is validated by full-wave simulations including conductor surface roughness. Finally, permittivity and loss tangent values of a cooling liquid are reported at five resonant modes between 7.5 and 16.9 GHz using a single cavity.

TC10_2
TECHNICAL
PAPERS

DDR5 MEMORY SYSTEMS

1:30 PM - 3:00 PM

Room: Cortez B

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Matteo Cocchini, *International Business Machines Corp*
Junyong Park, *Kyung Hee University*

PLANNED SPEAKERS & TOPICS

Novel Clock Signal Topology with Directional Coupler for DDR5 Memory Modules

Seungjin Lee, Jonghoon J. Kim, Sewoong Choi,
Dongyeop Kim, Seongguk Kim, Yunho Lee, Kyoungsun Kim, Jeonghyeon Cho, Wonhwa Shin
Samsung Electronics Co., Ltd., Korea

Abstract: A novel clock (CLK) signal topology with directional coupler is proposed. The proposed topology effectively delivers the CLK signal to multiple DRAM devices at the data rates beyond 10 Gbps. Simulated results show that the 200-mV bandwidth of the AC response at last DRAM is significantly improved from 4.7 to 9.1 GHz compared with the conventional topology. In addition, the received CLK signal voltage at the last DRAM is improved substantially from 36.3 to 507 mV.

DDR5 Simulation Correlation, and the Impact of Channel, Crosstalk, and DFE

Yuanhong Zhao¹, Kinger Cai¹, Mikael Rien², Javier DeLaCruz¹

¹Arm Ltd, USA; ²Arm Ltd, France

Abstract: This paper correlates DDR5 channel behavior at 7200 Mbps and 6400 Mbps (simulation vs. measurement), with emphasis on byte-level insertion loss (IL), return loss (RL), crosstalk, and decision feedback equalization (DFE) impact. At 7200 Mbps, Byte0 consistently exhibits the most degraded eye opening due to worst-case IL and RL notching, and the highest PFEXT. At 6400 Mbps, internal 2D eye scans show that disabling DFE improves 1e-6 BER eye margin (ffi20% EH, ffi10% EW), highlighting non-intuitive equalization/noise interactions in board-dominated channels.

Signal Integrity Improvement of Command/Address Channels in DDR5 Fly-by Topology Based on Intentional Characteristic Impedance Mismatch

BEST SIPI PAPER FINALIST

Sungbum Kim, Siwook Park, Uichan Kim, Jonghyeon Lee, Yuchul Jung, Youngwoo Kim
Sejong University, Korea

Abstract: In this paper, we propose a design methodology based on intentional characteristic impedance mismatch to compensate for signal degradation in Command/Address (CA) channels of DDR5 fly-by topology. By adjusting the characteristic impedance in specific segments, we control the voltage waveform shape within the channel. Overshoot caused by reflections is exploited to secure signal margins. The proposed approach is evaluated through time-domain waveform and eye-diagram comparisons. Simulation results show that compared to a conventional design based on uniform characteristic impedance, the eye-diagram height for DRAM 1 improves from 0.13 V to 0.407 V an increase of approximately 213%. For DRAM 2, it increases from 0.232 V to 0.418 V, about 80%. In contrast, DRAM 3 and DRAM 4, which initially show less degradation, have limited improvements. These results demonstrate that intentional impedance mismatch in segments can effectively improve signal integrity (SI) in fly-by CA channels.

TC9_3
TECHNICAL
PAPERSMODELING AND ANALYSIS WITH
EXPERIMENTAL VALIDATION OF COMPLEX
ELECTROMAGNETIC ENVIRONMENTS

1:30 PM - 3:00 PM

Room: Cortez C

Sponsored by TC-9 Computational Electromagnetics

Chair:Shengxuan Xia, *Missouri University of
Science and Technology***Co-Chair:**Shaowu Huang, *Palo Alto Networks Inc***ABSTRACT:**

This session explores modeling and analysis of complex electromagnetic environments with experimental validation. Topics include statistical field behavior in enclosures, time-domain response of reverberant systems, and efficient simulation of reverberation chamber environments using plane-wave superposition. The work provides validated frameworks for predicting EMI behavior in highly complex settings.

PLANNED SPEAKERS & TOPICS**Field Statistics within a Conical Enclosure**

Evelyn A. Dohme¹, Jeff Kolski¹, Jillian Martinez¹, Arielle Frank², Paul Bremner², Thomas W. Hussey³
¹Sandia National Laboratories, USA; ²Robust Physics, USA; ³University of New Mexico, USA

Abstract: Sandia National Laboratories has a long-standing interest in the penetration of electromagnetic fields into resonant enclosures and has used a wide range of computational tools, both in-house and commercial, to simulate them. This work is part of an effort to evaluate the potential of computational statistical electromagnetic tools to contribute to this effort. Here we specifically compared an extensive experimental data set of coupling between multiple probes in a resonant conical enclosure to the prediction of statistical bounds based on the Robust Physics Stochastic code [1], though comparison is also made to a synthetic data set generated using the stochastic Green's function approach [2]. It is found that the statistical models accurately bound the observed experimental data though they predict greater variance than is observed.

Time Domain Statistics of Electric Field Response to Chirp Waveform Excitation in a Semi-Reverberant Environment - Using Statistical Wave Physics Simulation

Paul Bremner¹, Weitao Dai¹, Conor McKeever¹, Mazin Mustafa², James West³, Charles Bunting³
¹Robust Physics, USA; ²University of Minnesota Twin Cities, USA; ³Oklahoma State University, USA

Abstract: The wireless industry is interested in the statistics of signal propagating in an electric field; but most predictive models are empirical. The signal integrity industry is increasingly sensitive to externally radiated voltage noise, but also lacks rigorous probabilistic models for how reverberation amplifies and disperses the waveforms of electromagnetic interference (EMI). This paper develops a general probabilistic model for predicting the statistical limits of time electric field response in a reverberant field, to a deterministic waveform excitation. Validation of the model is shown for chirp excitation.

Plane Wave Superposition Modeling of the Statistical Electromagnetic Environment in an Ideal Reverberation Chamber Using FEM Solver

Derek Holloway, Pavithrakrishnan Radhakrishnan, Charles F. Bunting
Oklahoma State University, USA

Abstract: This paper investigates the superposition of plane waves method for simulating the statistical electromagnetic environment of an ideal reverberation chamber. An electromagnetic susceptibility test is modeled in a finite element method solver using a device-under-test comprising two monopole antennas mounted on finite ground planes. Random weighted complex coefficients are applied to deterministic responses obtained from individual incident plane waves propagating in directions determined by spectral sampling theory. This approach reproduces reverberation chamber statistics without explicitly modeling the chamber volume. The simulated mean induced current magnitude agrees closely with established reference results and captures the expected resonance behavior. Moreover, the exceedance probability converges to the theoretical Rayleigh value as the number of realizations increases, and the correlation results converge toward the expected behavior of a reverberation chamber as the number of plane waves increases, validating the proposed method.

**TC8_2
TECHNICAL
PAPERS**

ELECTROMAGNETIC COUPLING AND RADIATED ENVIRONMENTS IN AEROSPACE SYSTEMS

1:30 PM – 3:00 PM

Room: Cortez D

Sponsored by TC-8 Aeronautics and Space EMC

Chair:

Randy Jost, *Utah State University*

Co-Chair:

Stephanie Zajac, *Johns Hopkins University
Applied Physics Laboratory*

PLANNED SPEAKERS & TOPICS

Chip Level Sneak Path in Avionics and Potential for EMC Problems

Reinaldo J. Perez
IEEE, USA

Abstract: In the testing of a complex hardware subsystem consisting of multiple interconnected electronic hardware assemblies and in which such hardware assembly is also connected to test equipment for performance testing; performance degradation was observed. After extensive analysis and additional testing, it was observed that unintended “sneak circuits” were present. A sneak circuit is defined herein as an unintended mode of operation of a designed-in circuit(s) that impacts software, hardware, or a combination of hardware and software so that the designed-in circuit’s specific function(s) do not occur or occur in a degraded fashion. Very often sneak circuits involve and/or are also associated with grounding problems, as will be discussed in this paper, which affects integrated circuits or chips’ performance, hence the potential Electromagnetic Compatibility (EMC) implications.

Leakage Electromagnetic Field Suppression from Apertured Enclosures Using Ultra-Lightweight CNT Aerogel Absorbers

Sho Muroga¹, Dan Suzuki¹, Yugo Koishikawa¹, Saijian Ajia¹, Eriko Kijima², Tomonaga Ueno², Motoshi Tanaka³, Shotaro Takahashi², Yasushi Endo¹, Kishio Hidaka¹
¹Tohoku University, Japan; ²Nagoya University, Japan; ³Akita University, Japan; ⁴Nagoya Institute of Technology, Japan

Abstract: To reduce electromagnetic leakage from enclosure apertures in air mobility applications such as drones and eVTOLs, we propose an ultra-lightweight electromagnetic wave absorber using carbon nanotubes (CNTs). In this study, as a fundamental step toward constructing design guidelines for system-level noise suppression, we analytically predicted the shielding effectiveness (SE) of an enclosure aperture by modeling the absorber with its measured effective permittivity and conductivity. To validate this prediction, we fabricated an aluminum test enclosure simulating an avionics bay and measured the radiated noise intensity. The experimental results showed good agreement with the prediction, demonstrating a broadband SE of approximately 6 dB or more in the frequency band above 1 GHz. Furthermore, a separation analysis of the loss mechanism revealed that the conductive loss in the absorber is the dominant factor in the low-frequency range. These findings confirm the effectiveness of the ultra-lightweight absorber for air mobility applications and the utility of the proposed prediction model for system design.

Radiated Field By RF Emitters Toward A Payload During Fairing Jettisoning On A Space Launcher

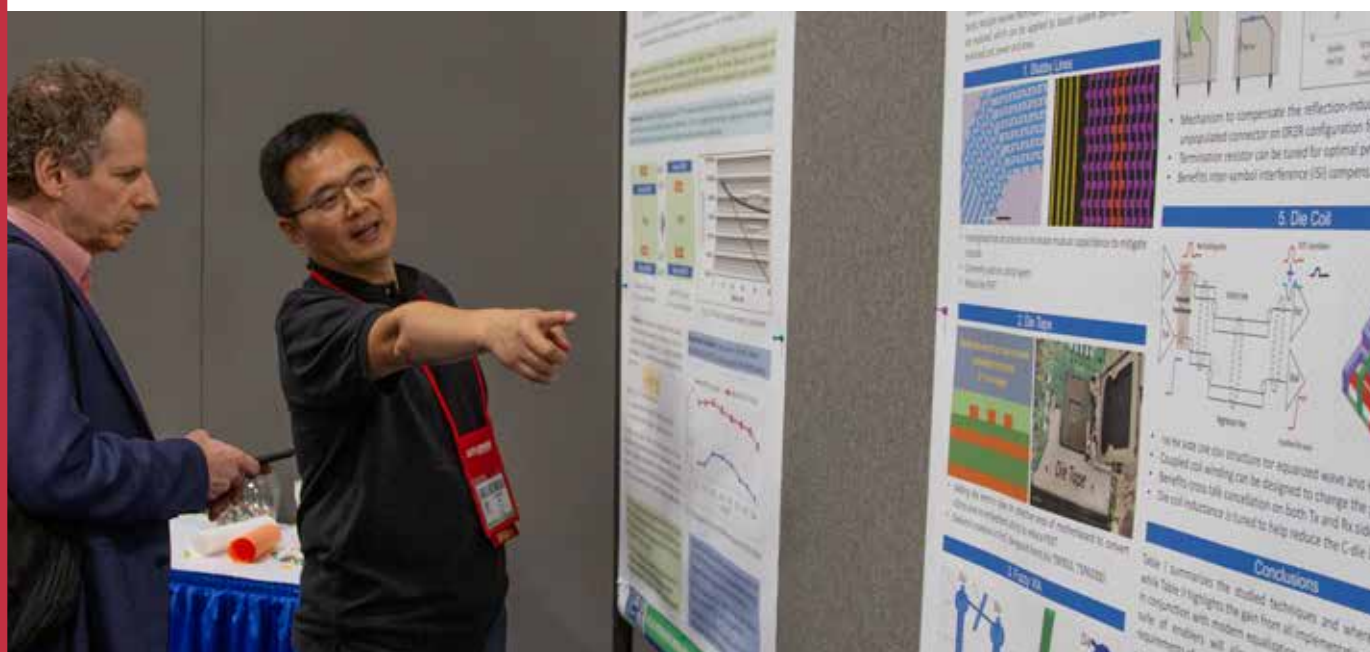
Florent Todeschini
ArianeGroup SAS, France

BEST STUDENT PAPER CONTEST POSTER SESSION

The Best Student Paper Contest recognizes and celebrates outstanding research contributions from students. The contest seeks to identify and reward innovative, high-quality research papers that demonstrate exceptional insight, originality, and academic rigor. Submissions are evaluated by a panel of experts from diverse academic fields, and winners receive a prestigious award during the award luncheon. Finalists will be invited to pitch their work during the Young Professional event, and present a poster during the conference as part of the final evaluation steps.

This contest aims to encourage and support the next generation of researchers and scholars, fostering a culture of academic excellence and intellectual growth.

**Join us to support our students and learn more
about their outstanding Technical Papers!**



**TUESDAY, AUGUST 4
IN THE EXHIBIT HALL 2:45 - 3:45 PM**

SPS3
SPECIAL
SESSIONELECTROMAGNETIC INFORMATION
SECURITY AGAINST LEAKAGE AND
INTERFERENCE THREATS

1:30 PM - 5:00 PM

Room: De Lasalle

Sponsored by TC-5 High Power Electromagnetics

Chair:

Yuichi Hayashi, Nara Sentan Kagaku Gijutsu
Daigakuin Daigaku Joho Kagaku Kenkyuka

Co-Chair:

Michael McInerney, *Consultant*

ABSTRACT:

As electronic devices become integral to critical infrastructure and daily life, ensuring physical layer security is paramount. This special session addresses the dual challenges of electromagnetic information security, specifically focusing on threats from passive information leakage and active electromagnetic interference. While advances in signal processing have refined leakage analysis, they have also enabled more precise injection and interference attacks. This session aims to bridge the gap between conventional EMC engineering and cybersecurity by exploring how electromagnetic emissions and interference characteristics can be exploited for attacks or utilized for defense. We will discuss cutting-edge research including advanced techniques for information reconstruction, sophisticated active electromagnetic injection attacks, novel methods for hardware assurance, and the integration of AI technology in electromagnetic security. The session brings together experts to define the forefront of evaluating risks and developing countermeasures against these evolving electromagnetic threats.

PLANNED SPEAKERS & TOPICS

Introduction to Electromagnetic Information Security
Against Leakage and Interference ThreatsYuichi Hayashi¹, William A. Radasky²¹Nara Sentan Kagaku Gijutsu Daigakuin Daigaku Joho
Kagaku Kenkyuka, Japan; ²Metatech Corporation, USA

Abstract: Electromagnetic (EM) information security addresses both passive and active threats arising from interactions between electronic systems and electromagnetic fields. Passive TEMPEST attacks covertly observe unintended EM emanations to reconstruct confidential information, while active EM attacks

intentionally irradiate targets to disturb, sense, or control devices, threatening confidentiality, integrity, and availability. Driven by high-speed digital interfaces and low-cost software-defined radios, EM-based attacks have rapidly diversified. This paper introduces a special session that organizes recent advances along a passive-active axis. On the passive side, advanced signal processing enables reconstruction from modern subsystems—including displays, audio, and digital microphones—even under low SNR and spread-spectrum clocking. On the active side, techniques such as Echo TEMPEST, dual-wave EM irradiation for data injection, software-defined active emissions, and cross-technology covert channels (e.g., TEMPEST-LoRa) demonstrate a clear shift from simple interference toward controllable interaction with target devices. These developments call for security-aware EMC evaluation beyond conventional shielding and filtering, including emission assessment under adversarial conditions, reproducible measurements, and anomaly detection. The special session shares recent progress on EM leakage and interference threats and promotes interdisciplinary discussion on their evaluation and mitigation.

Fundamental Study of Two-Stage Demodulation for Audio
Recovery from EM Leakage of Class-D AmplifiersSatoshi Oda, Taiki Kitazawa, Yuichi Hayashi
Nara Sentan Kagaku Gijutsu Daigakuin Daigaku, Japan

Abstract: Audio TEMPEST obtains audio information by receiving and analyzing electromagnetic (EM) radiation from audio devices and has primarily focused on leakage from class-AB amplifiers or pulse density modulation signals used in microphones. For such sources, the leakage spectrum contains audio information within a narrow band of several tens of kHz around a specific carrier; accordingly, prior work has applied amplitude/frequency demodulation with a narrow receiver bandwidth. In contrast, class-D amplifiers used in many audio devices employ pulse width modulation (PWM), which spreads the leakage spectrum across a wide bandwidth, making reconstruction with the same procedure difficult. To address this issue, we propose an audio information reconstruction method based on two-stage demodulation that assumes broadband observation. Specifically, first-stage AM demodulation captures PWM switching noise, and second-stage demodulation extracts fluctuations in pulse widths of PWM signals. Experiments on a filterless class-D amplifier show that the proposed method enables reconstruction of audio information over a wide frequency band and improves signal-to-noise ratio while maintaining consistent frequency characteristics of the reconstructed audio signal.

Anti-TEMPEST for TMDs via Correlation-Minimized
Readability-Preserving Bounded Color PerturbationJinhyeong Kim, Cheolheon Bae, DongWoo Kang,
Taesik Nam, Changhoon Lee, Jong-Gwan Yook
Yonsei University, Korea

Abstract: Text-centric screens with high-contrast glyphs are



among the most vulnerable contents in display TEMPEST. Despite their simple appearance, such screens can induce short-period repetition in HDMI transition-minimized differential signaling (TMDS) codewords, creating prominent and stable spectral peaks in leaked emissions. These peaks facilitate narrowband interception, reliable synchronization, and substantial SNR gain via phase-aligned coherent averaging, enabling readable reconstructions. We propose a rendering-level anti-TEMPEST method that applies bounded, readability-preserving color perturbations while explicitly discouraging deterministic TMDS repetition under raster scanning. For each pixel, the method searches within a bounded RGB neighborhood and selects a candidate whose TMDS symbol exhibits low-magnitude correlation with the immediately preceding symbol, reducing both repetition and near-perfect alternation. Consequently, dominant leakage peaks are suppressed and leakage energy is redistributed, lowering the effective narrowband SNR available to an eavesdropper. We validate the method in EMI/EMC chamber measurements using commodity HDMI equipment. We assess user-side readability via OCR on reference slides, and we quantify attackers' degradation using optical character recognition (OCR) on leakage-reconstructed images and spectral peak/dispersion metrics. Results show that the proposed method reduces peak prominence and degrades reconstruction readability even under coherent averaging with phase alignment, while preserving high reference OCR accuracy.

Joint Amplitude and Phase Analysis for Enhanced Key Recovery in Active Electromagnetic Analysis

Taiki Kitazawa, Daisuke Fujimoto, Yuichi Hayashi
Nara Institute of Science and Technology (NAIST), Japan

Abstract: Active electromagnetic analysis (EMA) poses a threat because it can recover secret keys from cryptographic devices by actively irradiating the device with electromagnetic (EM) waves and observing variations in internal impedance in the reflected waves through unavoidable physical interfaces, such as power or communication lines. In Active EMA, the impedance variations of interest are extremely small, and noise added along the propagation paths of the EM waves lowers the signal-to-noise ratio (SNR), thereby requiring a large number of traces for key recovery. Previous studies have mainly used the reflected-wave amplitude, although impedance variations may appear differently in the amplitude and phase of the complex reflection coefficient depending on the irradiation frequency and circuit configuration. Therefore, in this study, we experimentally examine differences in sensitivity between amplitude and phase, and assess whether their joint utilization improves the key-recovery performance of Active EMA. The results clearly demonstrated that, under identical measurement conditions, combining amplitude and phase information substantially improved the full-key success rate, i.e., secret-key recovery accuracy. This improvement indicates that amplitude and phase variations capture distinct yet mutually complementary leakage features of the impedance modulation.

ARARE: An Evaluation Board for Detecting Abnormal Aging Characteristics Using Electromagnetic Backscatter in I/O Circuits

Shugo Kaji, Daisuke Fujimoto, Yuichi Hayashi
Nara Institute of Science and Technology (NAIST), Japan

Abstract: Ensuring the authenticity of ICs in the semiconductor supply chain has become a critical issue due to global semiconductor shortages. Recycled ICs, recovered from discarded printed circuit boards, constitute a significant portion of counterfeit semiconductors; however, they are difficult to distinguish using only functional testing. Although

aging detection methods using dedicated circuits, such as ring oscillators, have been proposed, their applicability to commercial off-the-shelf ICs is limited because they require circuit implementation inside the IC. Thus, a method has been proposed that estimates aging degradation by applying ultra-high frequency band electromagnetic waves and measuring changes in the backscatter response from the IC's input/output (I/O) circuits, without adding any dedicated circuits. To use backscatter as a reliable aging degradation metric, it is essential to clarify which circuit components and degradation mechanisms contribute to the measured variations, and to verify their correspondence with stress conditions in a reproducible evaluation environment. This paper proposes the ARARE (Aging RF-backscatter Accelerated stress-testing Evaluation) board and measurement environment, capable of clarifying the causal factors underlying backscatter changes originating from I/O circuits. The ARARE board features independent control of stress conditions through separated power supplies for the core and I/O circuits, a minimal configuration to reduce peripheral circuit influence, and 50 ff matched high-frequency interfaces. We conducted accelerated stress testing with overvoltage and high temperature for a total of 115 hours using ARARE boards equipped with an Xilinx Artix-7 FPGA. By evaluating the temporal variation of the backscatter amplitude difference between High and Low output states at 666 MHz, we observed a larger change under accelerated stress conditions compared to normal operating conditions. These results suggest that the ARARE board is useful for validating the feasibility of backscatter-based aging degradation metrics.

Pin-Selective Contactless Data Injection into Multi-Line CMOS Interfaces using Dual-Wave IEMI

BEST EMC PAPER FINALIST

Masahiro Kinugawa¹, Yuichi Hayashi²

¹*Fukuchiyama Koritsu Daigaku, Japan;* ²*Nara Sentan Kagaku Gijutsu Daigakuin Daigaku Joho Kagaku Kenkyuka, Japan*

Abstract: This paper extends the prior dual-wave intentional electromagnetic interference (IEMI) technique—originally developed for deterministic, contactless bitstream injection into CMOS inputs—to achieve pin-selective control in multi-line interfaces. Conventional dual-wave approaches implicitly assume uniform electromagnetic susceptibility across an IC, thereby offering limited selectivity when multiple signal pins must be manipulated independently (e.g., data and clock lines in multi-wire serial buses). We first demonstrate that input pins on the same IC can exhibit distinct vulnerable frequency bands, primarily due to differences in package geometry, on-chip and lead-frame interconnects, and PCB trace transfer characteristics. Exploiting this pin-dependent frequency response, we construct a multi-tone radiated field that selectively includes carrier pairs associated with the target pin while avoiding frequency bands that couple strongly to non-target pins. Experiments conducted on a standard CMOS hex inverter IC (Toshiba TC74HC04AP) in a GTEM cell demonstrate that two inverter inputs can be controlled independently by selecting distinct dual-wave frequency-power conditions for each pin. Furthermore, by applying on-off keying (OOK) to the second carrier while continuously transmitting the first carrier, we successfully inject arbitrary bit sequences at 100 kbit/s into the target inverter output, with stable, reproducible results, while the non-target inverter remains unaffected. These results demonstrate the feasibility of pin-selective electromagnetic information injection targeting multi-line CMOS interfaces, highlighting a significant electromagnetic security concern for safety- and reliability-critical embedded systems.

**ED7
EXPERIMENTS &
DEMONSTRATIONS****CAPACITIVE AND INDUCTIVE CROSSTALK****2:00 PM - 4:00 PM****Room: E&D Booth 1, Exhibit Hall****Sponsored by TC-8 Aeronautics and Space EMC****ABSTRACT:**

Sooner or later, every EMC engineer will encounter a crosstalk problem. As with any EMC problem, the engineer must properly understand the nature of the coupling in order to provide an effective mitigation strategy. This demonstration will address the two major types of crosstalk, capacitive (electric field) and inductive (magnetic field). You will learn how to distinguish between these two types and how to apply appropriate mitigation strategies for either.

PRESENTER:

John McCloskey, *EMC-Closkey*

**ED11
EXPERIMENTS &
DEMONSTRATIONS****EMC CHAMBER
SIMULATION VS. MEASUREMENT****2:00 PM - 4:00 PM****Room: E&D Booth 2, Exhibit Hall****ABSTRACT:**

EMC chamber performance is validated using standardized tests such as Normalized Site Attenuation (NSA), site Voltage Standing Wave Ratio (sVSWR), and Field Uniformity (FU), as defined in ANSI, CISPR, and IEC standards. Meeting requirements such as 4 dB NSA and 6 dB sVSWR can be straightforward with unlimited space and budget, but real projects must balance building constraints, budget limits, quiet zone size, and absorber coverage. Because of these real-world tradeoffs, performance prediction is essential to optimize key design choices such as chamber size, geometry, absorber selection, and test setup. Accurate modeling is the foundation for reliable prediction and efficient design optimization. This demonstration includes three parts. First, we will provide an overview of the EMC chamber design workflow using simulation-driven optimization and show how accurate simulations help achieve target performance under practical constraints. Second, we will present a case study of a newly built 10 m EMC chamber, including a 3D model and a direct comparison between simulated results and measured validation data. Third, in the same 10 m chamber, we will demonstrate EMC radiated emissions testing using antenna mast solutions and compare their performance, including a linear mast, a fixed-height boresight mast, and a new-generation adjustable-height boresight mast. The demonstration will highlight the advantages of boresight over a linear mast, and the added benefits of adjustable-height boresighting for accurate and repeatable measurements across different test setups.

PRESENTERS:

Yibo Wang, Zhong Chen, *ETS-Lindgren*

ED9
EXPERIMENTS &
DEMONSTRATIONS**EFFECTIVE MEASUREMENTS USING
A MODERN EMI TEST RECEIVER****2:00 PM - 4:00 PM****Room: E&D Booth 3, Exhibit Hall****ABSTRACT:**

This workshop starts with an introduction to the basics of the EMI test receiver. Characteristics, differences to oscilloscopes or spectrum analyzers, as well as important parameters for a successful EMI measurement are highlighted. This serves as a basis for the following topics of the workshop and offers participants with different levels of knowledge the opportunity to attend this workshop. The technological development of EMI measurement technology and the outstanding advantages of modern instruments will be demonstrated. Modern EMI test receivers rely on the Fast Fourier Transform (FFT), which was only made possible by modern signal processing and high computing power. Large bandwidths not only ensure enormous measurement speed improvements, but also increase reliability, repeatability and offers unprecedented possibilities for analyzing the measurement objects. This will be examined in a practical way on the instrument as well as with external automation software. In addition, the workshop shows current measurement methods in practice that highlights the problem of high input levels and solutions to avoid false measurements or even costly damages to the device. The teaching of theory in this workshop is always supported by practical measurements and demonstrations directly on the instrument.

PRESENTER:Patrick Mayer, *Rohde & Schwarz, Germany*ED13
EXPERIMENTS &
DEMONSTRATIONS**GET THE BEST IMMUNITY TEST COVERAGE:
CLOSED-LOOP E-FIELD CONTROL IN
REVERBERATION CHAMBERS****2:00 PM - 4:00 PM****Room: E&D Booth 4, Exhibit Hall****ABSTRACT:**

The demo session will start with a brief introduction on the basics of reverberation chambers (RCs). Validation, radiated immunity as well as radiated emission testing are discussed.

We will bring a small, but fully working, stirred RC to the stage. Eight fast, synchronized electric-field probes will showcase real-time E-field strength measurements. Closed loop E-field control based on statistics is shown with different chamber loading. In a custom software, the audience can easily understand how the closed-loop control works. A demonstration using commercial EMC test automation software shows that the method is ready for day-to-day use. LUMILOOP's LSProbe E-field Probes enable accelerated measurements according to ISO 11451-5. The reverb chamber basics will also be visualized using live measurements, helping to quickly grasp how the invisible electric field behaves.

Learn on how to improve your EMC measurements. Save time and money while having a better test coverage!

PRESENTERS:Samuel Hildebrandt, *LUMILOOP GmbH*Lukas Oppermann, *LUMILOOP GmbH*

**TC2_2
TECHNICAL
PAPERS**

EMC MEASUREMENTS - SHIELDING

3:30 PM - 5:30 PM

Room: Coronado A

Sponsored by TC-2 EMC Measurements

Chair:

Ross Carlton, *Gibbs and Cox Inc*

Co-Chair:

Monrad Monsen, *Oracle*

PLANNED SPEAKERS & TOPICS

Impact of Shield Termination Integrity on Surge Coupling in Shielded Ethernet Interfaces

David Tang¹, Jianquan Lou¹, Haiying Liu¹, Adam Walb², Rangarajan Soundararajan²

¹Cisco Systems (China) R&D Co., Ltd., China; ²Cisco Systems, Inc., USA

Abstract: Shielded Ethernet interfaces are widely used in outdoor network equipment to improve electromagnetic robustness, yet surgerelated failures are still observed in field deployments. This paper investigates surge coupling behavior in shielded Ethernet cables under commonmode excitation consistent with EN 6100045. Circuitlevel simulations and experimental measurements using real equipment under a 1 kV surge are presented. Results show that proper shield bonding confines surge energy to the cable shield, limiting induced voltage on signal conductors to approximately 81 V, while loss of shield continuity increases the induced voltage to approximately 307 V. The findings highlight the critical role of RJ45 shield termination in surge immunity performance.

Practicability of the Shielding Effectiveness Method 'Wire Coupling' for In-Situ Measurements

Steffen Schulze¹, Saad Al-Hamid²

¹Wuerth Elektronik eiSos GmbH, Germany; ²Otto von Guericke University, Germany

Abstract: This paper extends the previously introduced wire-coupling-based method for measuring the shielding effectiveness of metallic enclosures to larger structures for frequencies up to 44 GHz and focuses on the usability for in-situ measurement. The approach uses simple straight wires for excitation and reception and enables fast substitution measurements without complex calibration. A larger electric control cabinet is investigated on-site, and the results are compared with the established antenna-based method, which is typically limited to 18 GHz. The comparison confirms the applicability of the wire coupling method at higher frequencies and indicates its suitability for realistic on-site shielding assessments beyond current standard limits.

Comparison of Shielding Effectiveness Measurement Between New 1 GHz Triaxial Cell and Reverberation Chamber

Katherine Valencia Salas^{1,2}, Habib Boulzazen¹, Fabien Ndagijimana³, Nizar Bechir², Moncef Kadi¹, Xavier Leron²
¹Normandie Univ, UNI Rouen, ESIGELEC, IRSEEM, France; ²Tenneco, France; ³Laboratory G2Ela, University of Grenoble, France

Abstract: This paper presents a comparison of two methods for measuring the transfer impedance of open sleeves used in cable shielding applications. The first method employs a newly developed 1 GHz triaxial cell, while the second method is based on measurements performed in a reverberation chamber. Both methods use identical samples under test, consisting of the same sleeves, ensuring a consistent basis for comparison. The objective of this work is to verify and validate the shielding effectiveness results obtained with the 1 GHz triaxial cell over the 200 MHz to 1 GHz frequency range.

The Impacts Of Various Structure Compositions On Enabling Differential Mode To Common Mode Conversions Of Shielded Propagating Currents

David Norte

BAE Systems, Inc., USA

Abstract: Regarding satellite platforms, structure typically represents the reference conductor upon which all voltages on the satellite are referenced. Since structure proliferates the entire spacecraft, its contribution to the overall mass of the satellite is notable. As such, many constructions of structure exist that attempt to both lower the mass of this reference as well as provide a low impedance reference throughout the satellite. In this paper, structure compositions that are commonly encountered on spacecraft, such as solid aluminum, or a honeycomb aluminum core with thin aluminum skins on the outer surfaces, as well as a honeycomb aluminum core with outer carbon fiber skins of varying thicknesses are empirically evaluated for enabling differential mode to common mode current conversions from a shielded balanced differential signal from 9 kHz up to 2.1 GHz.

SC3_3
TECHNICAL
PAPERSMACHINE LEARNING FOR ADVANCED SIGNAL
INTEGRITY AND POWER INTEGRITY (III)

3:30 PM - 5:00 PM

Room: Coronado C

Sponsored by SC-3 Machine Learning and Artificial Intelligence in EMC and SIPI

Chair:

Alistair Duffy, *De Montfort University*

Co-Chair:

Vladimir Okhmatovski, *University of
Manitoba*

PLANNED SPEAKERS & TOPICS

Multimodal Diagnosis for Automotive Wire Harnesses
With Varying Wire CountsShiyan Liu, Tadatoshi Sekine
*Shizuoka University, Japan*Working Volume Equivalence in Source-Stirred
Reverberation Chambers via Sensitivity MapsAnett Kenderes¹, Péter Tamás Benko², Szabolcs
Gyimóthy^{1,2}¹Budapesti University of Technology and Economics,
Hungary; ²Robert Bosch Kft., Hungary**Abstract:** This paper investigates working volume
equivalence in source-stirred reverberation chambers.
Sensitivity analysis is employed to assess the influence
of configuration parameters on field uniformity,

focusing on frequencies near the lowest usable frequency. Sobol' indices serve as sensitivity metrics, evaluated across frequency points and transmitting antenna positions representing the stirring steps. To reduce computational cost, full-wave simulations are replaced with surrogate models. Further efficiency is gained by minimising stirrer steps and frequency samples via adaptive kriging-based sampling. The required experimental design samples, i.e., the number of distinct configurations, is determined through convergence analysis.

Output Space Filling and Time Series Model for
Prediction of EMI Filter Attenuation SpectrumMasahiro Yoshida, Ryo Maekawa, Koichi Takeuchi,
Yoshitaka Toyota
*Okayama Daigaku, Japan***Abstract:** Surrogate models for EMI filter design often suffer from limited training data. To overcome this, we optimized the design parameter spacing to equalize the output spacing and adopted a Bidirectional Long Short-Term Memory (Bi-LSTM) model. These approaches significantly improved prediction accuracy, reducing the average and maximum mean squared errors (MSEs) by up to 91% and 96%, respectively.DALLAS FUN FACTS
FAMOUS TEXAS BBQ

BBQ has been a staple in Texas since the beef industry boomed after the Civil War in 1866. Between 1866 and 1885, approximately 10 million Texas longhorns were shipped to Chicago to serve the growing meat industry. Thanks to Spanish, German, Czech, and Polish influence, BBQ evolved from multiple practices such as smoking meat for preservation, sausage processing, and cooking on a grill over a charcoal pit.

Popularization of BBQ has grown all over the U.S. and the world, not only for preservation, but for flavor. Every region of Texas has its own style and favorite way to prepare BBQ. Dallas specifically has its own technique which blends Central Texas and East Texas methods. Try regional cuisine such as brisket candy and Texas Twinkies. Good BBQ is a measure of true Texas Pride!



**TC1_1
TECHNICAL
PAPERS**

EMI: STANDARDS AND PROTECTION REQUIREMENTS

3:30 PM - 5:30 PM

Room: Coronado D

Sponsored by TC-1 EMC Management



Chair:

Krzysztof Sieczkarek, *Lukasiewicz Research Network - Poznan Institute of Technology, Poland*

PLANNED SPEAKERS & TOPICS

High-Quality Substation's Design: The Protection from Electromagnetic Interference

Urban M. Peterlin

Elektroinstitut Milan Vidmar, Slovenia

Abstract: The paper aims to emphasize the importance of producing high-quality design documentation for a substation. The paper presents the main sources of interference in a substation that may adversely affect its safe, reliable, resilient, and sustainable operation. Assemblies, which are essential for the efficient performance of mitigation measures and are often insufficiently detailed during the design phase, but are important for preventing or at least reducing the penetration of electromagnetic interference, both unintentional and intentional, into sensitive equipment, are presented. A procedure for checking the adequacy of the documentation and the offer's design is given.

ANSI C63.10 (1 -18 GHz) Direct Antenna Conducted Emissions Proficiency Testing Misclassification Issues: Causes and Cures

Harry H. Hodes, Din D. Ng

EMC Proficiency Testing Services LLC, USA

Abstract: In this paper we present a detailed analysis of the misclassifications issues that arise from the misuse of the Normality-based Criteria when used for the Direct Antenna Conducted Emissions Proficiency Testing Measurements in the RF frequency range 1-18 GHz. More specifically, we address the case of ANSI C63.10 Direct Antenna Conducted Emissions Proficiency Testing (PT), where we had a high competency rate (i.e., >90% of the PT participants should have been graded as a "Pass") but where the use of the Normality-based Criteria arbitrarily and incorrectly placed a substantial number (~38%) of the participants in the "Warning" or "Fail" zone. In this case, its misapplication causes the Normality-based Criteria to "fall apart" in the sense that it failed to do what it was preset to do (which is to find $\leq 10\%$ failure rate among the PT participants). In contrast, the Empirical Bayesian-based Criteria yielded correct pass/fail classifications of EMC PT measurements.

ANSI C63.4 (1 -18 GHz) Radiated Emissions

Proficiency Testing Misclassification Issues: Causes and Cures

Harry H. Hodes, Din D. Ng

EMC Proficiency Testing Services LLC, USA

Abstract: In this paper we present a detailed analysis of the misclassifications issues that arise from the misuse of the Normality-based Criteria. Specifically, we address the issues that appear when the Normality-based Criteria is used for the classification of the quantitative Radiated Emissions Proficiency Testing Measurements results in the RF frequency range 1-18 GHz. More specifically, we address the case of ANSI C63.4 Radiated Emissions (RE) Proficiency Testing (PT), wherein we had a very high incompetency rate (i.e., ~48% of the participating Test Labs should have scored a "Fail" or at least been placed in the "warning Zone") but where the use of the Normality-based criteria arbitrarily and incorrectly graded a substantial number of them as a "Pass". In this case, the normality-based criteria did what it was preset to do, which is to find about 10% failure rate among the PT participants. Unfortunately, it fails to identify the remaining ~38% incompetent participants who were incorrectly given a "Pass" instead of a "Fail". In contrast, the Empirical Bayesian-based Criteria yielded correct pass/fail classifications.

TC10_11
TECHNICAL
PAPERSCOUPLING, CROSSTALK & BOUNDARY
CONDITIONS

3:30 PM - 5:00 PM

Room: Cortez A

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Daniel Commerou, *Missouri University of Science and Technology*
Seungtaek Jeong, *Google LLC*

PLANNED SPEAKERS & TOPICS

Crosstalk Sensitivity to Power Plane Boundary Conditions and Via Configurations

Srinath Penugonda, David Nozadze, Kartheek Nalla, Amendra Koul, Mike Sapozhnikov
Cisco Systems, Inc., USA

Abstract: This paper investigates the impact of various boundary conditions (BCs) on the crosstalk (XTALK) characteristics including a power plane. Understanding these effects is crucial for maintaining signal integrity in high-speed electronic designs. Our analysis reveals distinct behaviors of XTALK depending on the applied boundary condition. A floating power plane without an absorbing boundary condition is shown to induce significant resonances in XTALK due to cavity modes, leading to an overall increase in crosstalk levels, same for an open a BC. Conversely, implementing an absorbing boundary condition successfully eliminates these XTALK resonances. Furthermore, a low-resistance boundary condition (e.g., 0.1 mOhm BC) exhibits resonant behaviors like those observed with an open boundary condition. These findings highlight the critical trade-offs associated with different boundary condition strategies and underscore the importance of carefully selecting the appropriate BC to manage signal integrity challenges in floating power plane designs.

An Empirical Method to Account for Fringing Capacitance in Parallel Plane Resonators

Cody J. Goins, Victor Khilkevich, Daryl Beetner
Missouri University of Science and Technology, USA

Abstract: The power distribution network is a critical design point in multi-layer high frequency printed circuit boards. Typically, the power distribution network contains at least a single pair of power planes that are used for easy access to power and return nets throughout the board. At high frequencies, these planes start to act as a 2D cavity resonator. Models exist that allow calculation of an impedance matrix for the PDN. These models, however, apply a perfect magnetic conductor boundary at the cavity edges, neglecting the fringing field. Under certain conditions, such as having dielectrics extending past the planes, the edge effects need to be considered. Existing publications in the patch antenna design area, which is analogous to the plane pair structure, account for these edge effects only at the first resonant mode. This work proposes an empirical method to account for the edge effects regardless of the mode. The input impedance for a single port plane pair is calculated and compared to a full-wave simulation. Resonant frequencies are determined with at most 0.71 % of error for the first eight modes up to the TM03 mode.



Photo by Richard Georgerian

TC10_3
TECHNICAL
PAPERS

ADVANCED PACKAGING & INTERPOSERS

3:30 PM - 5:00 PM

Room: Cortez B

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Giorgi Maghlakelidze, *NVIDIA Corp*
Chulsoon Hwang, *Missouri University of
Science and Technology*

PLANNED SPEAKERS & TOPICS

Comparative Analysis of Organic Substrate and RDL Interposer for High-Speed D2D Interconnects

Junhyuk Cho, Chungju Kim, Taisik Yang, Yongseok Kang
LG Electronics Inc, Korea

Abstract: Chiplet based systems require low latency, energy efficient die to die (D2D) interconnects within a package, where the packaging channel strongly impacts timing and voltage margins. This paper compares an organic substrate package and a redistribution layer (RDL) interposer for D2D channels at 12 Gbps using both simulation and measurement. By using the same die and the same D2D physical layer (PHY) in both implementations, the comparison primarily reflects the effect of the package interconnect medium. For short in-package D2D routes, the RDL interposer provides a clearer timing margin benefit in eye width (EW). As routing reach increases, the EW advantage becomes smaller, while eye height (EH) shows a stronger dependence on channel reach and loss. Four representative channel topologies, Short, Cross, Long, and Snake, are evaluated. Eye opening margins are quantified by EW and EH using consistent eye metric definitions under the same 12 Gbps operating condition. Measurement metrics are obtained through the on chip eye readout flow. In measurement, the RDL interposer provides a larger timing margin improvement for shorter routes, and improves worst case EW from 55% to 70% for Short and from 65% to 74% for Cross, while the improvement narrows to 57% to 59% for Long and 58% to 60% for Snake, indicating convergence toward substrate performance with a small remaining benefit.

112-GHz Insertion-Loss Characterization and TGV Power-Delivery Analysis of a Glass-Core AI Server Package

Satoru Kuramochi, Masaya Tanaka
Dainippon Insatsu Kabushiki Kaisha, Japan

Abstract: Glass-core substrates are promising for 448G-class AI server packages due to their low dielectric loss. This paper reports measured insertion-loss characterization of a glass-core GSG transmission line up to 112 GHz, corresponding to the Nyquist frequency of 224-Gbaud PAM4 signaling. The measured S21 is -2.75 dB at 56 GHz, -3.10 dB at 67 GHz, and -4.25 dB at 112 GHz. DC power-delivery capability of filled through-glass vias (TGVs) is evaluated under a 10 °C thermal constraint and a 2% IR-drop budget (0.8 V supply). The results confirm sufficient SI and PI margin for glass-based AI server packaging.

Signal Integrity Analysis of 64 Gb/s Chiplet Interconnections in Panel-Level RDL Interposers Considering Surface Roughness

Jonghyeon Lee¹, Jongseon Jeong¹, Jiwoon Moon¹, Yuchul Jung¹, Siwook Park¹, Jimin Kwon², Youngwoo Kim¹

¹Sejong University, Korea; ²Ulsan National Institute of Science and Technology (UNIST), Korea

Abstract: In this paper, we analyze the signal integrity (SI) of panel-level redistribution layer (RDL) interposer-based chiplet interconnections (CI) considering routing topology and surface roughness to examine the impact of process-induced surface roughness on the reliable operation of high-speed chiplet systems. AC resistance from surface roughness is described by the Huray surface roughness model (HSRM). The analysis is performed using full electromagnetic (EM) simulations. In high wire-density chiplet interfaces, GS patterns are required for crosstalk suppression to meet the universal chiplet interconnect express (UCIe) specification. However, when surface roughness is considered, the insertion loss of the voltage transfer function (VTF) increases across the entire frequency band under 64 Gb/s operating conditions. As a result, the eye-diagram width and height are reduced by 17.4% and 49.2%, respectively, leading to a violation of the UCIe specification. These results demonstrate the need to jointly consider routing topology and surface roughness in high-speed panel-level RDL interposer-based CI.

TC9_1
TECHNICAL
PAPERSMODELING AND ANALYSIS OF CABLES AND
INTERCONNECTS

3:30 PM - 5:30 PM

Room: Cortez C

Sponsored by TC-9 Computational Electromagnetics

Chair:Chiu-Chih Chou, *National Central University***Co-Chair:**Shaowu Huang, *Palo Alto Networks Inc***ABSTRACT:**

This session presents modeling and analysis techniques for understanding EMI mechanisms in cables and interconnects. Topics include realistic mode conversion in twisted pairs, fast analytical prediction of harness emissions, and the impact of test waveform parameters on induced interference. The work emphasizes physics-based insight and efficient methods for early-stage EMC design.

PLANNED SPEAKERS & TOPICS**Impact of CS114 Repetition Rate and Duty Cycle on the Induced Interference**

David Norte

BAE Systems, Inc., USA

Abstract: CS114 test campaigns do not always adhere to the repetition rate of 1 kHz and 50% duty cycle stated in the MIL-STD-461G EMC standard. This paper discloses the impacts of varying these baseband characteristics on the induced interferences on shielded digital interconnects.

Exact Edge Singularities in mmWave Interconnects: A Quasi-3D Schwarz-Christoffel Solver

Takahiro Yanagi

*Asteria X, Japan***Achieving Realistic Mode Conversion Levels in Numerical Cable Modeling of Unshielded Twisted Pairs for Automotive Ethernet**Sebastian Soldwisch¹, Shane Helstrom¹, Ryan French¹, Patrick Campbell¹, Patrick DeRoy², Mike Fredd²¹*Electro Magnetic Applications, Inc., USA;* ²*Analog Devices Inc, USA*

Abstract: Traditional approaches to modeling cables in 3D full-wave electromagnetic and 2D transmission line simulations neglect to capture mode conversion properly. The causes of mode conversion in an Automotive Ethernet cable are investigated and applied to FDTD (Finite Difference Time Domain) and transmission line hybridized simulations through two distinct methods to capture real-world non-idealities from the manufacturing process and installation of differential pair automotive ethernet. Simulation models with perfect symmetry artificially suppress mode conversion levels. Improving mode conversion levels in a cable model show distinct differences in the predicted radiated immunity and radiated emissions response compared to symmetric models

Estimating Radiated Emissions from Wire Harnesses with Bounding Analytical Models in PSpice

Russell C. Carroll

EMI Sleuth, USA

Abstract: This paper gives novel analytical equations and the corresponding simulation model implementation that can be used to estimate radiated emissions from harnesses routed over a ground plane such as in the MIL-STD-461G RE102 setup. The analytical models were derived for the near field and radiated emissions from the setup along with the impedance of wire due to radiation resistance. These analytical models use a bounding method that ignores the phase and impedance resonances that can underestimate the emissions. Being mathematically analytical these impedance and emission models can be used in non-linear time domain analysis or radiated emissions unlike existing piecewise linear models. The resonance from the RE102 rod antenna setup used below 30 MHz was included with empirical fitting. The PSpice emissions model was validated to bound experimental emissions from 1 MHz to 1000 MHz by at least 3 dB for the RE102 setup with an open load used below 30 MHz and a shorted load used at higher frequencies.

TC5_2
TECHNICAL
PAPERSELECTROMAGNETIC PULSE COUPLING TO
ENCLOSURES AND TRANSMISSION LINES

3:30 PM - 5:00 PM

Room: Cortez D

Sponsored by TC-5 High Power Electromagnetics

Chair:

William Radasky, *Metatech Corporation*

Co-Chair:

Akiyoshi Tatematsu, *Central Research
Institute of Electric Power Industry*

PLANNED SPEAKERS & TOPICS

3 D FDTD Simulation of Lightning Magnetic Fields
in a Reinforced-Concrete Building: Comparison with
MeasurementsAkiyoshi Tatematsu, Kensuke Teramoto
*Central Research Institute of Electric Power Industry,
Japan*

Abstract: Lightning electromagnetic pulses (LEMP) pose a significant threat to sensitive electronic devices installed in buildings. To protect such equipment from LEMP effects, it is essential to evaluate the electromagnetic fields inside the building. It is well known that, in reinforced concrete structures, reinforcing bars help attenuate internal electromagnetic fields. In this study, we constructed a reduced scale reinforced concrete building and injected a lightning impulse current into it to measure the resulting transient magnetic fields. We then modeled the experimental setup using the three dimensional finite difference time domain (FDTD) method and calculated the corresponding magnetic fields. The simulated results were compared with the measured waveforms for validation.

Characteristic Modes and the Generalized Admittance
Approach revisited for Aperture Coupling Analysis in
the Resonance RegionJulius Griesse, Frank Gronwald
*Universitat Siegen Fakultat IV Naturwissenschaftlich-
Technische Fakultat, Germany*

Abstract: The concept of characteristic modes and the generalized admittance approach were introduced at a time when computational resources were scarce. However, with the help of modern simulation software the concept of characteristic modes and the generalized admittance approach can be used to rather conveniently draw conclusions about scattering and coupling problems as part of classical Electromagnetic Pulse (EMP) analysis for complex systems. In this contribution the problem class of externally excited cavity-backed apertures is investigated, with an emphasis on resulting internal field strengths. It is well known that coupling into an enclosure can negatively affect shielding effectiveness and, in the worst case, lead to the excitation of internal cavity resonances and their associated field strengths that might disturb and damage sensitive components. To model and predict this type of effects, the concept of characteristic modes is combined with the generalized admittance approach in order to formulate an equivalent circuit problem. From the analysis of the equivalent circuit, five guidelines are derived. They contain features of characteristic modes that help to qualitatively describe the excitation of internal cavity resonances. The application and use of these guidelines is demonstrated through numerical simulation of a slotted rectangular cavity, illuminated by a plane wave.

Adaptive Stochastic Sampling for Statistical HPEM
Response AnalysisMario Echeverri Bautista
TNO, Netherlands

Abstract: Estimation of system responses is a key step in risk assessment for High Power Electromagnetics (HPEM) systems. System responses are typically obtained through extensive numerical simulations and complemented by measurements; however, high-fidelity EM simulations still demand significant computational resources. The inherent randomness and incomplete deterministic knowledge of system parameters motivate the use of statistical approaches. In this work, a smart stochastic sampling technique is explored that leverages existing EM simulation tools together with randomly described input parameters to construct a statistically sound characterization of system responses, while keeping computational demands under control. Numerical assessments are presented to validate the proposed approach.

The IEEE Electromagnetic Compatibility (EMC) Society invited student teams to participate in the **2026 Student Hardware Design Competition**, focused on developing practical skills in EMC measurement, analysis, and problem solving. This year's challenge asked students to characterize the electromagnetic compatibility (EMC) performance of a working electronic device — an Arduino-based system and to communicate results clearly and creatively.

The competition emphasizes real-world engineering practice: designing test setups, collecting meaningful data, interpreting results, and proposing or demonstrating mitigation techniques.

We are excited to announce the Top 3 Finalists and look forward to the competition at EMC+SIPI 2026. Join us to support the competing student teams!

Chair: Prof. Charles F. Bunting, *Oklahoma State University, OK, USA*

Co-Chair: Dr. Pavithrkrishnan Radhakrishnan, *Oklahoma State University, OK, USA*

Date: Tuesday, August 4, 2026

Time: 4:00 PM–5:00 PM

Location: Trinity Exhibit Hall (Trinity Complex)

TOP 3 FINALISTS

Team Name: Rose-Hulman Team 1

Members: Yejia Hao, Jiuzhou Lin and Yicheng Zhu

Supervisor Contact: Professor Michael Cracraft

Institution: Rose-Hulman Institute of Technology, Terre Haute, Indiana, USA

Team Name: WWE (World-Wide EMC)

Members: Yejun Kim, Hariharan Prabakar, Sathvika Bandi, Cody Goins, Ahyeon Lee

Supervisor Contact: Prof. Daryl Beetner

Institution: Missouri University of Science and Technology, Rolla, Missouri, USA

Team Name: Team Watt-erloo

Members: Jake Peters, Alanna Rudolph, Amirbahador Mansoori, Dhyey Bhatt

Supervisor Contact: Prof. George Shaker

Institution: University of Waterloo, Waterloo, Ontario, Canada



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INTERVIEW WITH
CHUCK BUNTING,
STUDENT HARDWARE
COMPETITION CHAIR**



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SCHEDULE AT A GLANCE

ROOM	Coronado A	Coronado B	Coronado C	Coronado D	Cortez A	Cortez B	Cortez C	Cortez D
9:00 AM	Keynote Presentation 9:00 AM - 10:00 AM, Trinity Ballroom Speaker: Hans G. Schantz, <i>nou Systems, Inc.</i>							
10:00 AM	REFRESHMENT BREAK							
10:30 AM	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC2_4) EMC Measurements - HERO and PIM	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC4_1) Techniques for Evaluating Shielding Effectiveness	10:30 AM - 12:00 PM TECHNICAL PAPERS (SC3_4) AI Agent for SI, PI, EMC, and EMI	10:30 AM - 12:00 PM TC9_4: Advanced Computational EMC Modeling: Statistical, Multiscale, and Data- Driven Methods	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC10_13) SI/PI for Emerging Technologies	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC10_4) High-Speed Via Design & Modeling		10:30 AM - 12:00 PM TECHNICAL PAPERS (TC5_1) Computation of Lightning Electromagnetic Pulse and Distribution Line Effects
12:00 PM	LUNCH BREAK							
1:30 PM	1:30 PM - 5:00 PM WORKSHOP (WT_M2) Aerospace EMC Workshop	1:30 PM - 5:00 PM TUTORIAL (WT_S6) Calibration of EMC Test Facilities and Measurement Instrumentation	1:30 PM - 5:00 PM WORKSHOP (WT_S2) Aerospace EMC Standards Updates Workshop	1:30 PM - 5:00 PM WORKSHOP (WT_O6) Recent Advances in Numerical Analysis Techniques for Lightning Transients in Power Systems and Electric Facilities	1:30 PM - 5:00 PM TUTORIAL (WT_O1) Lessons Learned Creating Reliable Computational Models for SI, PI and EMC Applications	1:30 PM - 5:00 PM WORKSHOP (WT_A3) Test and Measurement Fundamentals	1:30 PM - 5:00 PM TUTORIAL (WT_O3) Tutorial on Machine Learning	1:30 PM - 5:00 PM TUTORIAL (WT_V1) EMC, SI, and ESD Challenges in Automotive
3:00 PM	REFRESHMENT BREAK							
3:30 PM								
5:00 PM								

CLAYTON R. PAUL GLOBAL UNIVERSITY: 8:00 AM - 5:30 PM - Hilton Anatole, Morocco
(Pre-Registration Required)

GLOBAL SIGNAL INTEGRITY UNIVERSITY: 8:30 AM - 5:00 PM, Hilton Anatole, Manchester
(Pre-Registration Required)

EXHIBIT HALL ACTIVITIES

EXHIBIT HALL OPEN: 10:00 AM - 5:00 PM

POSTER SESSION: 9:30 AM - 11:30 AM

EXPERIMENTS & DEMOS: 10:00 AM - 12:00 PM, 2:00 PM - 4:00 PM, E&D Stages, Exhibit Hall

ASK THE EXPERTS PANEL: 10:30 AM - 12:00 PM, AtE Stage, Exhibit Hall

ADDITIONAL STANDARDS SESSIONS, WORKING GROUPS AND TECHNICAL COMMITTEES
For Collateral Meetings, see page 165

Speakers Breakfast

Hilton Anatole, De Sota - 7:00 - 8:30 AM

(Breakfast Only on the Day of Presentation)

Registration/Info Desk

7:30 AM - 5:00 PM

Companion Lounge

Crow's Office - Mezzanine Level, Hilton Anatole Hotel - 8:00 AM - 5:00 PM

(Registered Companions Only)

Past Presidents Lunch

Hilton Anatole, De Sota A - 12:00 - 1:30 PM (RSVP Required)

Youth Technical Program

Hilton Anatole, De Salle - 1:00 - 1:30 PM (RSVP Required)

Women in Engineering

Hilton Anatole, Madrid - 4:00 - 5:30 PM

Evening Gala

Offsite - Gilley's Dallas - 7:00 - 10:00 PM (Ticketed Event)

(Buses will start departing at 6:45 PM from the Hilton Anatole Hotel Grand Entrance.)



STANDARDS WEEK:

For more information about Standards Week,
please visit page 160

REFER TO THE
EMC+SIPI 2026
MOBILE APP FOR
INDIVIDUAL
PRESENTATION
TIMES.



P01
POSTER
SESSION

POSTER SESSIONS

9:30 AM - 11:30 AM

Poster Area, Exhibit Hall

PLANNED SPEAKERS & TOPICS

A Broadband Transparent Antenna for Application in Mobile Communication Systems

Zechen Li^{1,2}, Xingbao Lin², Youqian Su², Zibin Weng³
¹Hangzhou Institute of Technology, China; ²Xidian University, China; ³National Key Laboratory of Radar Detection and Sensing, Xidian University, China

Abstract: The present text introduces a broadband transparent antenna utilizing an Indium Tin Oxide (ITO) metal conductive film on a transparent PMMA substrate. Given the wide impedance bandwidth characteristics of microstrip-coupled feed wide-slot antennas, a planar wide-slot antenna design is chosen for the transparent antenna. On the upper surface of the PMMA substrate, a microstrip line with a fork-shaped tuning stub is crafted using an ITO metal conductive film, while the lower surface features a wide slot made of ITO metal conductive film. Finally, a novel capacitive-coupling method is employed to feed the transparent antenna at the feeding port. The ITO metal conductive film utilized in the antenna achieves a remarkable optical transmittance of 80%. Experimental tests on the fabricated antenna reveal a relative bandwidth of 84.6% (1.50-3.7 GHz). The antenna maintains stable gain across the entire operating frequency range, with measured gains of 8.83-9.95 dBi and radiation efficiencies of 87%-93% within the operating band. Quantitative comparison with existing transparent antennas demonstrates that these performance metrics represent significant improvements over previously reported designs. Furthermore, a systematic parametric analysis of the capacitive coupling feeding structure establishes critical design guidelines, including a strict assembly gap requirement of $C_{gap} < 0.05$ mm to ensure signal integrity. Placing the transparent antenna within signage not only conserves space but also minimizes its visibility.

Enhancing Power Transfer Efficiency and Stability in Dynamic Wireless Power Systems through Coil Structure Optimization

Tuan Kiet Le¹, Indranil Bhattacharya²
¹Tennessee Tech University, USA; ²Binghamton University, USA

Abstract: Although dynamic wireless power transfer (DWPT) has been commercialized in many designs, its application in electric vehicles (EVs) remains limited due to the challenges posed by power transmission efficiency and stability. This paper presents a comprehensive comparative analysis of three coil configurations for DWPT systems: traditional DD coil, Layered DD coil, and a novel proposed coil structure optimized through geometric constraints. The proposed coil design incorporates an overlapping area preservation property to minimize mutual inductance fluctuation as the receiver moves. Multi-objective optimization using genetic algorithms is employed to evaluate system performance across three key metrics: stability, ferrite core loss, and material cost. The simulation results demonstrate that the proposed coil system significantly outperforms conventional configurations. The proposed design maintains consistent optimal load resistance in different receiver positions, simplifying control system implementation while providing an optimal balance between high stability, moderate core losses, and reduced material usage compared to layered configurations.

EMI-Aware RC Snubber Optimization in Boost Converters Using Reinforcement Learning

Ali Ghaffarpour¹, Majid Mehrasa², Eduardo M. Rodrigues³
¹New York Institute of Technology, USA; ²The University of New Orleans, USA; ³INESC-ID, Instituto Superior Técnico, Universidade de Lisboa, Portugal

Signal and Power Integrity Co-Design of High-Speed Interposer Channel in Multi-Tower High-Bandwidth Memory (MT-HBM) Architecture Considering Power Supply Induced Jitter (PSIJ)

Youngsu Yoon, Seonguk Choi, Jiwon Yoon, Haeseok Suh, Keunwoo Kim, Junghyun Lee, Hyunjun An, Jaegeun Bae, Byeongmok Kim, Junho Park, Eunji Seo, Jounggho Kim
 Korea Advanced Institute of Science and Technology, Korea

Abstract: In this paper, a multi-tower high bandwidth memory (MT-HBM) architecture is proposed, and a comprehensive design for its high-speed interposer channel is presented. The MT-HBM architecture increases memory capacity by cascading multiple HBM stacks in series. While each HBM maintains its inherent bandwidth, the interposer channel between the GPU and HBM is required to support twice the bandwidth of a conventional interface to simultaneously access data from the cascaded stacks. To achieve a target data rate of 16 Gbps without increasing the I/O count, a high-speed interposer channel was designed using a reference-paired shielding (RPS) structure with a merged ground. Through a comparative case study, we optimized the signal-to-ground ratio to minimize signal degradation. Furthermore, a power distribution network (PDN) hierarchy with clock buffer and Tx I/O driver was designed to analyze the impact of simultaneous switching noise (SSN) and power supply induced jitter (PSIJ). By implementing decoupling capacitors, SSN was reduced by 55.7% (from 79 mV to 35 mV) and peak-to-peak PSIJ was suppressed to 4.38 ps. Finally, analyzing the optimized channel's eye-diagram validated the feasibility of MT-HBM interface, demonstrating an improved eye-width of 30.34 ps and an eye-height of 171 mV.

ISAR Imaging Technology Based on CS Algorithm and Frequency Extrapolation

Yuchen Dai, Minghua Hu, Xiongfei Long, Shurong Deng, Qisheng Pan, Zibin Weng
 The National Key Laboratory of Radar Detection and Sensing, Xidian University, China

Abstract: This study proposes an inverse synthetic aperture radar (ISAR) imaging method integrating compressed sensing (CS) with frequency extrapolation techniques to address imaging quality issues under conditions of missing echo data and limited system bandwidth. First, electromagnetic scattering data for a small ship model (0.14 m wide, 1.15 m long) are obtained through simulation. Subsequently, imaging comparisons are conducted using both back-projection (BP) and CS algorithms. Results demonstrate that under complete data conditions, the CS algorithm outperforms BP in side lobe suppression and image clarity. Furthermore, even under undersampled conditions with randomly missing partial data, the CS algorithm effectively reconstructs target images. Finally, frequency extrapolation based on the Geometric Diffraction Theory (GTD) model extends the signal bandwidth from 8-12 GHz to 8-16 GHz. After extrapolation, the CS algorithm maintains low sidelobes and high image quality while enhancing resolution. And this method is used on a large ship to verify the feasibility of the algorithm. This approach achieves super-resolution imaging under incomplete data and bandwidth constraints through algorithm-signal processing synergy, providing a viable technical pathway for practical engineering applications.

A High-Gain Scannable Fabry-Perot Antenna

Minghua Hu, Yuchen Dai, Zechen Li, Zibin Weng, Qisheng Pan, Shurong Deng
 The National Key Laboratory of Radar Detection and Sensing, Xidian University, China

Abstract: To achieve miniaturization, low cost, and high performance for outdoor Customer Premises Equipment, this paper proposes a Fabry-Perot resonant antenna design based on a 1x5 dual-polarized phased array feed. The design innovatively employs unit cells with positive phase gradients to construct a $4\lambda \times 4\lambda$ three-layer partially reflective surface, while integrating phase-correcting metasurfaces to effectively enhance the feed's directivity, significantly improving the antenna's gain and bandwidth. The simulation results show that a peak gain of 21.49 dBi is achieved at 26 GHz, with a 3-dB gain bandwidth of 2.35 GHz (covering 25.35 GHz to 27.7 GHz) and a beam scanning capability of 36°. Compared to the traditional full-coverage aperture 8x8 phased array, the proposed design reduces the number of required active T/R channels from 128 to just 10—a reduction of up to 92%—while maintaining comparable gain and superior bandwidth.

POSTER SESSIONS CONTINUED >

Design of a Transparent Transmitarray Antenna for Ku-Band

Shurong Deng, Qisheng Pan, Minghua Hu, Yuchen Dai, Zechen Li, Zibin Weng
The National Key Laboratory of Radar Detection and Sensing, Xidian University, China

Abstract: In contrast to traditional metallic transmission array antennas, this study designs a two-layer transparent transmission array antenna operating in the Ku-band (12–18 GHz). The transmission elements consist of two layers of Indium Tin Oxide (ITO) conductive film printed on the upper and lower opposing surfaces of a dielectric substrate. The dielectric substrate utilizes transparent PMMA material, enhancing both aesthetics and light transmission. Theoretical derivation demonstrates that employing circular polarization conversion and element rotation in the dual-layer structure achieves high transmission amplitude and full transmission phase coverage. A split-ring element has been designed as a practical example to validate this analysis, enabling 360° full transmission phase control and exceeding -1 dB transmission magnitude. Finally, a rectangular transparent transmission array antenna has been designed. The simulated peak gain of the designed transmitarray is 28 dB at 14.5 GHz with the aperture efficiency of 35.9 %, while the simulated 1 dB gain bandwidth is 7% (13.85–14.85 GHz). Keywords: transmission array, ITO conductive film, circular polarization conversion

GNSS Signal-Based Phase-Shift Control for Common-Mode Noise Reduction in Parallel-Connected Power Converters

BEST EMC PAPER FINALIST

Shotaro Takahashi¹, Ryosuke Kanbayashi², Motoshi Tanaka², Kishio Hidaka³, Saijian Ajia³, Yasushi Endo³, Tomonaga Ueno⁴, Sho Muroga⁴
¹Nagoya Institute of Technology, Japan; ²Akita University, Japan; ³Tohoku University, Japan; ⁴Nagoya University, Japan

Abstract: This study presents the concept of synchronizing two parallel-connected buck converters controlled by independent controllers using real-time information from the Global Navigation Satellite System (GNSS). Experiments demonstrate that the two buck converters achieve synchronization with tens of nanoseconds accuracy without requiring mutual communication. Next, a 180° phase-shift control is applied to the two buck converters, and the common-mode (CM) noise of the experimental system is measured. The experimental results confirmed that phase-shift control based on real-time information from the GNSS can shift peak frequencies of CM noise to higher frequencies in the frequency range from 150 kHz to 2 MHz.

Modeling and Analysis of Location-Dependent Power Supply Induced Jitter (PSIJ) Considering Spatially-Distributed Hierarchical PDN

Yuchul Jung, Uichan Kim, Yeji Kim, Sungbum Kim, Jonghyeon Lee, Jiwoon Moon, Youngwoo Kim
Sejong University, Korea

Abstract: This study investigates location-dependent power supply induced jitter (PSIJ) considering a spatially distributed hierarchical power delivery network (PDN). Physical separation between distributed interfaces, such as the controller and DRAM, introduces different parasitic resistance and inductance (R/L) characteristics along the power delivery path, resulting in location-dependent PDN impedance variations. To estimate the impact of PDN impedance variation on jitter behavior, a simplified first-order PSIJ modeling framework is presented by combining the extracted PDN impedance, switching current spectrum, and open-loop jitter transfer function (JTF) in the frequency domain. Simulation results show that the remote interface, which exhibits larger high-frequency impedance characteristics due to its PDN location, experiences relatively larger jitter variation under the same switching condition. The estimated PSIJ waveforms show trends consistent with SPICE-based eye-diagram analysis results. Although based on a simplified model, the proposed methodology provides a computationally efficient approach for comparatively analyzing the influence of location-dependent PDN impedance characteristics on PSIJ behavior.

An Accurate 2D FEM Solver for the Efficient RLGC Extraction in the Anisotropic Medium with Adaptive Skin-Depth

Tingyu Shi¹, Jiahuan Huang¹, Xiaoyan Xiong², Victor Khilkevich¹, Lijun Jiang¹
¹Missouri University of Science and Technology, USA; ²Cadence Design Systems Inc, USA

Abstract: A finite-element-method (FEM) solver is proposed for 2D transmission line cross-sections' RLGC extraction. RL solver and GC solver are built for the anisotropic medium. To handle the thin skin depth without remeshing the mesh, an adaptive skin-depth sampling process is used in the FEM formulation. Sparse matrix algorithms are further applied to accelerate the computation. The algorithms have been benchmarked against golden references and analytical results. Excellent correlations have been achieved for challenging cases in 2D parasitic extractions.

2x-Thru De-Embedding-Based Characterization of UCle-A Interconnects up to 50 GHz

Sungjin Lee¹, Daehee Park², Subin Jo¹, Heehwang Kim¹, Jonghyuk Jeong¹, Dongsu Kim², Seungil Jeung¹, Jaeyong Cho¹

¹Huwin, Korea; ²Korea Electronics Technology Institute, Korea

Abstract: As high-performance computing (HPC) demand increases, chiplet-based heterogeneous integration is widely used in artificial intelligence (AI) systems. The Universal Chiplet Interconnect Express (UCle) standard specifies signal-integrity (SI) targets for die-to-die (D2D) links, but direct measurement of fine-pitch interconnects is often limited by probing and access constraints. This paper reports the fixture-based SI characterization of a UCle-A-representative fine-pitch interconnect up to 50 GHz using the 2x-Thru de-embedding method. Coplanar Waveguide with Ground (CPWG) transmission lines are fabricated as verification structures to assess extraction accuracy. Measured results show that the de-embedded S-parameters agree well with direct measurements, with only small deviations across the 0-50 GHz range.

Double Reflective Microwave Ellipsometry

Jeson Chen, Casper Huang
Fu Jen Catholic University, Taiwan

Abstract: We present a compact tabletop ellipsometry platform that extends conventional optical ellipsometry into the microwave (MW) regime for non-destructive material characterization. Operating in the S-band (2-4 GHz), a quasi-optical setup with a concave reflective grid polarizer enables refractive index measurement of dielectric materials such as plastics and ceramics. The double-reflection geometry enhances polarization-dependent interaction while reducing system size and complexity. This approach provides a practical and scalable tool for electromagnetic compatibility (EMC)-relevant material characterization, including absorbers and dielectric components used in communication systems.

Bridging Cable-Level and System-Level Immunity

Kiran Kumar Dhani Reddy
Amazon, USA

A Design Methodology for High-Loading Differential Clock Signals in Multilayer Structures

Yun-Ho Lee^{1,2,3}, SoYoung Kim³, Yongjun Kwon³, Wonsuk Choi³, Woo-Jin Na³, So Young Kim¹

¹Sungkyunkwan University, Korea; ²Samsung Institute of Technology, Korea; ³Memory Business, Samsung Electronics, Korea

Abstract: High-loading channels in multilayer printed circuit board (PCB) structures pose persistent signal integrity (SI) challenges due to impedance discontinuities, and reflections induced by dangling vias and receiver loadings. This paper proposes a design methodology that intentionally exploits signal layer transitions to shorten the effective length of dangling vias, thereby suppressing stub-induced reflections without additional manufacturing steps. Simulation and measurement results demonstrate that the proposed approach significantly outperforms conventional topologies in preserving SI under high-loading conditions

Matrix-Free Time-Domain Finite Element Method for Electromagnetic-Thermal Co-Simulation

Yi-Yao Wang, Wenyan Yin, Qiwei Zhan
Zhejiang University, China

Dual-Triangle Spread Spectrum Modulation in Class-D Audio Amplifiers

Zhi Gao, Rong Rong, Dylan Yao, Lijun Chen, Xin Guo
Texas Instruments Inc, USA

Abstract: Electromagnetic interference (EMI) remains a critical challenge in the design of automotive Class-D audio amplifiers, significantly impacting system reliability and compliance with automotive electromagnetic compatibility (EMC) standards. Spread spectrum modulation (SSM) has emerged as an effective solution to reduce EMI levels by redistributing concentrated spectral energy across a broader frequency band. However, the selection of appropriate modulation schemes and parameters in audio amplifiers is complex, as designers must carefully balance EMI reduction performance with audio quality. In this study, a novel dual-triangle spread spectrum method is proposed to achieve significant EMI reduction in both average and peak energy levels without compromising audio performance.

POSTER SESSIONS CONTINUED >

Co-Optimizing Power and Thermal Integrity Using Heat Path Block and Silicon Capacitors

Jisoo Hwang^{1,2}, Kyojin Hwang³, Youngsang Cho²,
Jun So Pak², Heeseok Lee², SoYoung Kim¹
¹Sungkyunkwan University, Korea; ²Samsung Electronics
Co Ltd, Korea; ³Murata Manufacturing Co., Ltd., Korea

Abstract: Rising power densities in mobile application processors (APs) require concurrent optimization of power integrity (PI) and thermal integrity (TI). This work proposes an architecture-level PI/TI co-optimization strategy for fan-out wafer-level package (FoWLP)-based package-on-package (PoP) structures by combining a copper heat path block (Cu-HPB) with through-silicon-via (TSV)-linked silicon capacitors (Sicaps). In the proposed approach, thermal conduction and localized decoupling are physically separated and implemented using structures optimized for each function: the Cu-HPB provides a vertical heat removal path, while the Si-caps provide low-inductance local decoupling. Analysis results show a 45% reduction in maximum PDN impedance and up to 23% improvement in thermal resistance relative to a conventional FoWLP-based PoP structure. The proposed architectures provide an effective PI/TI co-optimization strategy for thermally constrained mobile AP packages.

Fabrication of an Ultra-Lightweight Electromagnetic Absorber for the Low-GHz Band

Eriko Kijima¹, Kishio Hidaka², Sho Muroga², Motoshi Tanaka³, Shotaro Takahashi⁴, Dan Suzuki², Tomonaga Ueno¹

¹Nagoya University, Japan; ²Tohoku University, Japan; ³Akita University, Japan; ⁴Nagoya Institute of Technology, Japan

Abstract: Ultra-lightweight materials based on carbon nanotubes (CNTs) are anticipated to serve as an effective countermeasure against electromagnetic interference (EMI). This study proposes a CNT-based ultra-lightweight material that exhibits effective electromagnetic wave absorption performance in the low GHz band by applying an insulating coating to the CNTs.

Discussion of Electromagnetic Interference Impacting Triboelectric Nanogenerator Use on the Lunar Surface

Eve M. Klopff

High Point University, USA

Abstract: Recent interest in lunar surface exploration has brought attention to the challenge of ensuring sufficient power is available to support ongoing scientific missions on the lunar surface. The complex electrical environment on the lunar surface can present unique challenges to the functionality of devices for energy harvesting. This paper presents a discussion of environmentally based sources of electromagnetic interference which are expected to impact the use of triboelectric nanogenerators on the lunar surface.

Investigation of Simplified Estimation of Electromagnetic Properties for a Plate-Type Absorber Using Waveguide Measurement

Motoshi Tanaka¹, Mayo Arai¹, Dan Suzuki², Shotaro Takahashi³, Tomonaga Ueno⁴, Sho Muroga²

¹Akita University, Japan; ²Tohoku University, Japan;

³Nagoya Institute of Technology, Japan; ⁴Nagoya University, Japan

Abstract: We propose a simplified method for estimating the electromagnetic properties of plate-type absorbers by combining waveguide measurement and transmission line theory. To validate this approach, we compared its results with an FEM simulation that rigorously considers leakage. The results showed the total loss term and the real part of the permittivity agreed with the FEM results within 20%.

Advanced Silicone Composites as Elastomeric Solutions for EMI/EMC Applications

Julia Sunderland, Dan Zhao, Joe Sootsman

Dow Performance Silicones, USA

Abstract: Advanced elastomeric materials for automotive, communication, and consumer electronics need to meet higher demands as devices miniaturize and operate at wider frequency ranges. Electrically conductive and absorbing silicones are ideal for shielding and grounding due to their tunable electric and mechanical properties. They are suitable as adhesives, sealants, coatings, encapsulants, and thermal interface materials in electromagnetic compatibility applications. The dispensable nature of silicone composites allows application on complex module geometries and provides greater housing design freedom.

Research on the Model of Electromagnetic Interference from Electric Drive System

Tianhong Tan, Tao Jiang

Harbin Engineering University, China

Abstract: The electric drive system is one of the “three core components” of electric vehicles. Its electromagnetic compatibility (EMC) performance has a critical influence on the reliability and safety of the vehicle. Due to the complex structure of electric drives, it is difficult to accurately identify the actual coupling paths of electromagnetic interference through measurement alone, making effective optimization challenging. To address this challenge, there is a need for a comprehensive electromagnetic model of electric drives, which can visually identify the coupling paths of electromagnetic disturbances and evaluate the influence of parasitic parameters, loop area, and other factors. Thereby, EMC design can be incorporated early in the development process to determine optimal solutions and enable proactive EMC engineering. This article showed a method for high degree of confidence and precision simulation modeling of electric drive system.

Analysis of Electromagnetic Radiation From Slots on Metal Plate Excited by Cable CurrentsHyun Ho Park¹, Jong Hwa Kwon²¹*The University of Suwon, Korea*; ²*Electronics and Telecommunications Research Institute, Korea*

Abstract: This paper proposes an analytical model for electromagnetic radiation from slots in a metal plate excited by cable currents using a magnetic dipole approximation. Equivalent magnetic dipole moments for common-mode and differential-mode excitations are derived to rapidly predict radiated fields above slot resonances without full-wave simulations.

EMI from Phased-Array Satellite Terminal Causing False Triggers of Maritime Optical Fire Alarms

Adarsh Mammen Verghese

Independent Researcher, USA

Abstract: This paper reports field observations and experimental validation of electromagnetic interference (EMI) affecting optical fire detection systems aboard a maritime vessel. Rebooting a phased-array satellite terminal at ~10 m separation reproducibly triggered optical fire alarms within ~30 s. The effect was observed across multiple detectors, ruling out localized faults and optical interference. The observed behavior is consistent with radiated coupling into detector wiring and nonlinear rectification in the detector front-end. This work highlights a previously unreported electromagnetic compatibility (EMC) interaction between low Earth orbit (LEO) satellite terminals and maritime fire detection systems.

Explainable AI-Driven Optimization of Surface Plasmon Resonance BiosensorsMd Saiful Islam¹, A.K.M. Sazzadul Alam², Mustafa Kutlu¹, Nasra Al Sharji¹, Shekhar Mahmud¹¹*Military Technological College, Oman*; ²*University of Houston, USA*

Abstract: This study investigates a graphene-transition metal dichalcogenide (TMD) surface plasmon resonance (SPR) biosensor for improving sensitivity and design interpretability. A multilayer Kretschmann configuration incorporating gold, graphene, and Molybdenum Disulfide (MoS₂) was analysed using finite-difference time-domain simulation and optimized using a genetic algorithm (an AI-based optimization technique) and interpreted via Shapley Additive Explanations (SHAP) analysis, an Explainable AI (XAI) method that quantifies the influence of each design parameter. The optimized configuration demonstrates a 25% improvement in sensitivity over conventional gold-only SPR sensors, a 15% reduction in full width at half maximum (FWHM), figure of merit (FOM) of 50 RIU⁻¹, detection accuracy of 1.8. SHAP analysis identified incidence angle and TMD thickness as most influential; the same genetic algorithm-SHAP framework can optimize multi-layer structures for EMC/SIPI applications.

**ED10
EXPERIMENTS &
DEMONSTRATIONS**

EMC ANALYSIS OF A DIGITAL PROTOTYPE OF AUTOMOTIVE HARNESS

10:00 AM - 12:00 PM

Room: E&D Booth 1, Exhibit Hall

ABSTRACT:

Radiated emissions or unwanted electromagnetic radiation is a major concern with any electrical or electronic device. In automotive and aerospace, cars and airplanes have several control units interconnected with cables. Considering the design cycle of an EV car, the wire harness design, the PCBs of the control units, the connectors, etc., are handled by different design groups. A unified workflow to exchange the data between these design groups to identify the EMC/EMI issues in the early design stages would eliminate a lot of re-work. This software demonstration presents such a workflow between Siemens Capital, HyperLynx and Feko. The wire harness designed in Capital Harness Designer can be exported through a special plug-in to the industry standard KBL file. This plug-in allows the cable cross-sections, paths, connectors,

shields, bundles, splices, material properties, etc., to be automatically imported into Feko. This eliminates the need to redefine the automotive harness details in Feko. The ECAD import functionality in Feko allows the PCBs designed in HyperLynx to be imported into Feko keeping the layered stack information intact. The schematic link functionality in Feko allows direct connection between the cable ports on the harness and the geometry ports on the PCB. This digital prototype would empower the engineers to perform an integrated EMC analysis and test various mitigation techniques, like modifying the cable route, changing the shielding parameters, etc. This workflow will be presented at the conference with live examples.

PRESENTERS:

Gopinath Gampala, *Siemens Digital Industries Software Inc., Germany*
C.J. Reddy, *Siemens Digital Industries Software Inc., USA*

**ED18
EXPERIMENTS &
DEMONSTRATIONS**

REVERBERATION CHAMBER TESTING VERSUS ANECHOIC CHAMBER TESTING FOR SYSTEM-LEVEL RADIATED IMMUNITY & RADIATED EMISSIONS - WHAT STATISTICAL WAVE PHYSICS SIMULATION CAN TELL US ?

10:00 AM - 12:00 PM

Room: E&D Booth 2, Exhibit Hall

ABSTRACT:

Reverberation Chamber testing for Radiated Immunity may only require one test - which might be a big time and cost saving over multiple test configurations in the Anechoic chamber. But what is the difference in electric field environments created in each case? And how to correctly define the statistical limits of reverberation chamber testing, so that they

reliably "enclose" the results from multiple Anechoic chamber test conditions? This session will demonstrate the use of new statistical wave physics SIMULATION software to simply and quickly answer these questions.

PRESENTER

Paul Bremner, *Robust Physics, USA*

ED16
EXPERIMENTS &
DEMONSTRATIONSLOW COST TOOLS FOR EMC
TROUBLESHOOTING

10:00 AM - 12:00 PM

Room: E&D Booth3, Exhibit Hall

Sponsored by TC-3 Electromagnetic Environment

ABSTRACT:

EMC troubleshooting often does not require the latest and greatest and most sensitive equipment. Many EMC issues are easy to detect, and after that you mostly need to monitor if the situation improves or gets worse with various configuration changes. This session introduces the audience to low cost measurement tools,

and ones you can make yourself, that can help you tackle EMC problems.

PRESENTER:

Karen Burnham, *EMC United*

ED8
EXPERIMENTS &
DEMONSTRATIONSCYLINDRICAL MODE FILTERED SVSWR
DEMONSTRATION

10:00 AM - 12:00 PM

Room: E&D Booth 4

ABSTRACT:

The Cylindrical Mode Filtered SVSWR (CMF SVSWR) is measured by placing the transmit antenna, typically a low gain omni-directional antenna, at the edge of the turntable and performing a single cut vector pattern measurement. The vector S21 as a function of turntable angle at each frequency is transformed to the spectrum domain, where a filter can be applied to mathematically remove the chamber effects. The SVSWR is derived by comparing the original pattern in the chamber to the “clean” filtered pattern. This CMF SVSWR provides a more comprehensive

evaluation of the EMC chamber quiet zone and can be readily measured without any special positioning fixtures. The demonstration will show an entire measurement process, including the post processing, which can be performed in real time. This new measurement technique is under consideration for the new draft standard ANSI C63.25.3 under development by the ANSC C63® committee for EMC test sites from 18 GHz to 40 GHz.

PRESENTERS

Zhong Chen, Yibo Wang
ETS-Lindgren, USA

ASK
THE
EXPERTS**ASK THE EXPERTS PANEL DISCUSSION:
EMERGING EMC CHALLENGES IN MILITARY
AND SPACE APPLICATIONS****10:30 AM – 12:00 PM****Room: AtE Stage, Exhibit Hall****Sponsored by: TC-8 Aeronautics and Space EMC and TC-3 EMC Environment****Organizers:**

Nika Amralah, *Department of National
Defence, Canada*

Robert Davis, *Lockheed Martin (Retired),
USA*

Carl Hager, *Naval Surface Warfare Center
Dahlgren, USA*

As modern military platforms and space systems become increasingly complex, EMC challenges are evolving just as quickly. This interactive “Ask the Experts” panel brings together technical leaders from government and industry to examine the emerging EMC issues shaping nextgeneration defense and aerospace technologies.

Panelists will address topics such as operating in dense RF environments, ensuring interoperability across multinational systems, EMC considerations for space, advanced platform design trends, and the unique test and evaluation needs associated with sophisticated missions. Attendees are invited to bring questions, or simply listen and learn, for an engaging discussion with experts working at the forefront of military and space EMC.

PLANNED PANELISTS:

Jim Lukash, *Lockheed Martin Space Systems,
USA*

Gregory Hiltz, *Quality Engineering Test
Establishment, Canada*

Finbarr O'Connor, *Huntington Ingalls Industries,
USA*

Mark Waller, *US Army Redstone Test Center,
USA*

Michael Stone, *NAVAIR Patuxent Naval Air
Station, USA*

**ASK THE EXPERTS
SPONSORED BY**

TC2_4
TECHNICAL
PAPERS

EMC MEASUREMENTS - HERO AND PIM

10:30 AM - 12:00 PM

Room: Coronado A

Sponsored by TC-2 EMC Measurements

Co-Chair:

Dave Arnett, *Garmin International Inc*

Co-Chair:

Monrad Monsen, *Oracle*

PLANNED SPEAKERS & TOPICS

An SDR-Based Alternative HERO Instrumentation Method for EID CharacterizationAbigail Mccrary, Saif Mostafa, Charles F. Bunting,
Pavithrakrishnan Radhakrishnan
Oklahoma State University, USA

Abstract: This paper presents an alternative instrumentation approach for characterizing coupling behavior relevant to Hazards of Electromagnetic Radiation to Ordnance testing. A custom printed circuit board fixture is used as a surrogate test structure to emulate electrically initiated device bridgewire behavior. A dual software-defined radio setup based on HackRF modules is used for S-band measurements. Multiple test-boards are explored to demonstrate repeatable coupling behavior. The proposed approach employs a flexible and low-cost platform for investigating coupling phenomena relevant to ordnance safety applications.

Horizontal LPDA (13-27 MHz) for Naval HERO / EMV Testing : Design, 3D Full-wave Simulation, and Experimental ValidationJuliette Reeder, Jack Hicks, Chuck F. Bunting,
Pavithrakrishnan Radhakrishnan
Oklahoma State University, USA

Abstract: This paper presents the design, numerical simulation, and experimental validation of a horizontally oriented log-periodic dipole antenna developed for naval assessments of hazards of electromagnetic radiation to ordnance and electromagnetic vulnerability testing. The antenna is designed to produce a uniform horizontally polarized electric field across a 40 ft. x 6 ft. x 6 ft. test volume at discrete operating frequencies within 13 MHz to 27 MHz range. The design is optimized using 3D full-wave method of moments simulations and is corroborated experimentally through reflection coefficient and near electric-field measurements. Two prototype antennas are fabricated to evaluate bandwidth, impedance matching, and structural trade-offs. Experimental results confirm electric-field uniformity within 33 dB throughout the prescribed volume at representative test frequencies, demonstrating the practical viability of the proposed horizontal log-periodic dipole antenna architecture.

Harmonics Based PIM Characterization for Sideband Spectrum EstimationHariharan Prabakar, Shengxuan Xia, Chulsoon Hwang
Missouri University of Science and Technology, USA

**TC4_1
TECHNICAL
PAPERS**

TECHNIQUES FOR EVALUATING SHIELDING EFFECTIVENESS

10:30 AM - 12:00 PM

Room: Coronado B

Sponsored by TC-4 Electromagnetic Interference Control

Chair:

Pavithrkrishnan Radhakrishnan,
Oklahoma State University

PLANNED SPEAKERS & TOPICS

On-Board Inverted-F Antenna for Near-Field Board-Level Shielding Evaluation: A Simulation Study

Lirim Koraqi^{1,2}, Pavithrkrishnan Radhakrishnan³, Tim Claeys¹, Johan Catrysse¹, Davy Pisssoort^{1,2}

¹ESAT-WaveCore, M-Group, KU Leuven, Belgium;

²Flanders Make@KU Leuven, Belgium; ³Oklahoma State University, USA

Abstract: This paper investigates the suitability of an on-board inverted-F antenna as a source within the SAE ARP 6248 stripline setup for characterizing the near-field shielding effectiveness of a board-level shield over the frequency range from 10 MHz to 10 GHz, based on full-wave simulations. In this context, it is examined whether the antenna behaves predominantly as an electric- or magnetic-field source. Six inverted-F antenna configurations are considered, spanning the transition from loop-like to monopole-like antennas. Key antenna geometric parameters are varied to characterize the source wave impedance, which is calculated using both the finite-difference time-domain method and the method of moments for cross-validation. The results show a strong correlation between wave impedance and shielding effectiveness. All inverted-F antenna configurations, except for the monopole-like case, act as low-impedance magnetic sources at lower frequencies, whereas the monopole-like configuration exhibits high-impedance electric behavior.

Shielding Effectiveness Variability: Experimental Study in Nested Chambers - Undermoded Regimes

Saif Mostafa, Derek Holloway, Chuck Bunting, Pavithrkrishnan Radhakrishnan
Oklahoma State University, USA

Abstract: This paper investigates the variability of shielding effectiveness in a nested reverberation chamber configuration under both undermoded (non-reverberant) and overmoded conditions. The study covers the frequency range from 290 MHz to 2 GHz, covering the transition from low modal density to highly reverberant behavior. Measurements were performed using two antenna polarization orientations: co-polarized and cross-polarized to assess their influence on the variability of shielding performance. A percentile-based approach using order statistics is adopted to accurately quantify the coverage of shielding effectiveness and its variability. The experiments analyzed the effects of

internal loading (using pyramidal absorbers) in both antenna configurations. Although the reverberant regime exhibits stable shielding behavior, the undermoded region exhibits substantial variability. The cross-polarized configuration, despite yielding a slightly lower absolute minimum shielding effectiveness, achieves significantly more consistent shielding coverage than the highly variable co-polarized configuration.

Low-Frequency E and H Shielding Characterization of Planar Materials Using PCB-based Dual-TEM Cell: A Study Using Numerical Simulations

Subramaniam S. Sankar¹, Pavithrkrishnan Radhakrishnan², Stanislav Kovar¹

¹Univerzita Tomase Bati ve Zline, Czechia; ²Oklahoma State University, USA

Abstract: This paper proposes a compact printed circuit board-based dual transverse electromagnetic fixture for the characterization of planar shielding materials under near-field conditions from 10 kHz to 1 GHz. The structure, consisting of a planar printed circuit board stack-up with SubMiniature version A coaxial connector launches, is evaluated using three-dimensional Finite Integration Technique simulations. The baseline configuration is first simulated without the material under test to verify transverse electromagnetic-like propagation behavior and to quantify intrinsic inter-cell coupling, which serves as the reference for the extraction of substitution-based shielding effectiveness. The method leverages electric- and magnetic-field-dominant coupling configurations to obtain separate electric- and magnetic-field shielding effectiveness using a single fixture and a two-port Vector Network Analyzer-compatible workflow, thereby improving repeatability by canceling fixture-dependent factors. Three hybrid shielding materials from [1] are used to validate the proposed technique. The measured results show a good level of agreement with the characterization method presented in [1]; especially for magnetic shielding effectiveness. However, minimal deviations are observed in the electric field shielding effectiveness relative to strip-line-based measurements, which can be attributed to material properties and the measurement setup.

SC3_4
TECHNICAL
PAPERS

AI AGENT FOR SI, PI, EMC, AND EMI

10:30 AM - 12:00 PM

Room: Coronado C

Sponsored by SC-3 Machine Learning and Artificial Intelligence in EMC and SIPI

Chair:

Hanzhi Ma, *Zhejiang University*

Co-Chair:

Karol Niewiadomski, *Universiteit Twente*

PLANNED SPEAKERS & TOPICS

Potential-to-Field Neural Network for Efficient Electric Field Prediction

BEST EMC STUDENT PAPER FINALIST

Yuhao Xu, Jiarui Qiu, Yining Jiang, Pengqi Fu, Yuxiang Tian, Hanzhi Ma
Zhejiang University, China

Abstract: Source reconstruction is a classical problem in electromagnetic interference (EMI) analysis of integrated circuits (ICs). Traditional reconstruction methods based on equivalent dipole arrays require repeated forward electric field evaluations during the inversion process, resulting in a significant computational bottleneck. This paper presents a Potential-to-Field Neural Network (PFNN) method, in which the electric potential of a single dipole is used as the learning target for the neural network. The total potential of an arbitrary dipole array is obtained through scalar superposition of individual dipole predictions, and the corresponding electric field is recovered via spatial gradient operations. Physics-informed constraints are incorporated to enforce the characteristic decay behavior of dipole radiation. Application results demonstrate that the proposed method achieves high-accuracy predictions while significantly reducing computation time, providing an effective and scalable forward solver for radiating source reconstruction tasks.

LLM-Based Signal Integrity Agent for High-Speed Link Analysis

Yuxiang Tian^{1,2}, Jiarui Qiu^{1,2}, Songjun Zhang^{1,2}, Xiaolei Zhu³, Hanzhi Ma^{1,2}¹ZJU-UIUC Institute, Zhejiang University, China; ²Zhejiang Key Laboratory of Intelligent Electromagnetic Control and Advanced Electronic Integration, China; ³College of Integrated Circuits, Zhejiang University, China

Abstract: With the continuous increase in electronic system integration and data transmission rates, signal integrity in high-speed links has become increasingly critical. Neural network-based surrogate models, including recurrent neural network (RNN), long short-term memory (LSTM), and gated recurrent unit (GRU) have been applied for fast signal integrity prediction, replacing time-consuming transient simulations. However, their performance heavily depends on manual selection of model architectures and hyperparameters. To address this challenge, this paper proposes a Large Language Model (LLM)-based signal integrity intelligent agent (SI-Agent) that can automatically design suitable surrogate model architectures for target high-speed links without human intervention. Validation on high-speed examples demonstrates that the proposed SI-Agent can automatically generate accurate surrogate models and exhibits strong adaptability across different link scenarios.

Intelligent Schematic Verification for EMC Design Using Agentic AI and Trusted Internal Design Data

Seshasai Dekkapati

Schneider Electric India Pvt Ltd, India

Abstract: Early stage schematic verification for electromagnetic compatibility (EMC), signal integrity (SI), and power integrity (PI) is critical to achieving first-pass compliance, yet it remains largely manual, experience-dependent, and constrained by access to confidential design knowledge. This paper presents an agentic AI-based schematic verification framework for early assessment of EMC emissions and immunity, including SI and PI compliance. The proposed approach employs a retrieval-augmented generation (RAG) model grounded exclusively in confidential internal knowledge bases, comprising approved schematics, validated design rules, and historical project data. Specialized AI agents analyze external interfaces and internal interconnections to identify emissions and immunity-critical risks and provide explainable, standards aware verification outcomes. The framework enables early detection of design weaknesses, reduces late-stage EMC rework, and supports secure adoption of AI-assisted verification in industrial electronic product development.

**TC9_4
TECHNICAL
PAPERS**

ADVANCED COMPUTATIONAL EMC MODELING: STATISTICAL AND DATA- DRIVEN METHODS

10:30 AM - 12:00 PM

Room: Coronado D

Sponsored by TC-9 Computational Electromagnetics

Chair:

Nikita Ambasana, *SimYog*

Co-Chair:

Shen Lin, *UIUC*

ABSTRACT:

This session presents advanced computational approaches for EMC analysis across complex systems and safety-related applications. Topics include statistical electromagnetic coupling in complex enclosures and machine-learning-assisted prediction methods for electromagnetic exposure and safety assessment.

PLANNED SPEAKERS & TOPICS

Deep Learning-Based Prediction of Implant-Induced pSAR1g Using Canonicalized |B1+| And Tissue Property Volumes

BEST EMC PAPER FINALIST

Jiarui Lu, Zhongrui Wang, Xiaotian Wang, Jianfeng Zheng
University of Houston, USA

Statistical Analysis of Electromagnetic Coupling to PCB-Cable Assemblies in Complex Enclosures

BEST EMC PAPER FINALIST

Shen Lin, Ge Cao, Zhen Peng
University of Illinois Urbana-Champaign, USA

Abstract: This paper presents a hybrid deterministicstatistical analysis framework for printed circuit boards (PCBs) with attached cables in complex enclosures. The framework combines the stochastic Green's function (SGF) representation of cavity-field statistics with an integral-equation formulation of the PCB-cable assembly, enabling efficient statistical prediction of induced voltages at critical PCB locations in electrically large, wave-chaotic environments. A representative application to an electronic speed controller (ESC) board inside a cylindrical cavity shows that the attached cable can significantly modify the induced-voltage statistics. The results demonstrate that cable coupling effects must be included for realistic electromagnetic interference assessment of PCB assemblies in complex enclosures.

DALLAS FUN FACTS

BILLY BOB'S TEXAS, THE WORLD'S LARGEST HONKY TONK

30 miles from the Hilton Anatole Dallas in Fort Worth is Billy Bob's Texas, the world's largest honky-tonk and historic country music dance venue operating since 1981. Countless country singers and band members have performed, played their hearts out on stage, and put their handprints in the wall of fame as a marker of their time at Billy Bob's. During your stay, view handprints and autographs from Garth Brooks, Willie Nelson, and Johnny Cash, and check out the large dance floor where scenes from *Over the Top* and *Baja Oklahoma* were filmed. Nothing captures the spirit of Texas quite like country music.



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TC10_13
TECHNICAL
PAPERS

SI/PI FOR EMERGING TECHNOLOGIES

10:30 AM - 12:00 PM

Room: Cortez A

Sponsored by TC-10 Signal and Power Integrity

Co-Chair:

Giorgi Maghlakelidze, *NVIDIA Corp*

Co-Chair:

Matteo Cocchini, *International Business
Machines Corp*

PLANNED SPEAKERS & TOPICS

Novel Multi-Domain Power Integrity Evaluation System
for Advanced PackagesSuresh Parameswaran, Thomas To, Nui Chong,
Jonathan Chang*Advanced Micro Devices Inc, USA*

Abstract: Demand for faster, higher-performance semiconductor chips continues to grow, driving increased power consumption. Modern FPGAs, GPUs, and AI processors can consume thousands of watts. Reliable power delivery is essential for these high-power chips; poor delivery degrades performance, causes heating, and shortens lifespan. Consequently, power integrity (PI) has become critical. Considering the Power Delivery Network (PDN) of chips and systems in detail is essential starting from the planning and architecture definition stages and should continue through the development phase as well. Several CAD solutions exist for the modelling and simulation of power delivery into chips and systems. It is necessary to complement simulations with actual silicon data-collection and analysis in order to produce optimal results. There are not many hardware solutions readily usable for this purpose. This paper describes the architecture, implementation, details of operation, programming aspects and usage model of a customized silicon chip that forms the heart of a system-level PI evaluation tool. The usage of the evaluation system in developing a PDN model is covered. While this chip has a simple implementation and is easy to program and use, it has substantial PDN evaluation capabilities. This chip is highly configurable and has the ability to do automated on-chip measurements through a test-friendly interface.

An Investigation into the Influence of Indirect
Lightning Strike Protection Devices on High-Speed
Signal TransmissionYaogen Li, Zhongyuan Zhou, Jinjing Ren
Southeast University, China

Abstract: This study introduces the development of an indirect lightning protection device aimed at preserving signal integrity in high-speed Low-Voltage Differential Signaling (LVDS) interfaces exposed to transient surges, thereby enhancing system-level electromagnetic compatibility. This paper employs a combined approach of experimental testing and simulation analysis to systematically evaluate the influence of transient voltage suppressor (TVS) and Transient Blocking Unit (TBU) devices on signal integrity from both time-domain and frequency-domain. In this paper, a TBU is deployed in series and a TVS in parallel, forming a two-stage protection scheme that achieves clamping and current limiting to ensure the safe transmission of LVDS signals. This paper demonstrates that appropriate TVS and TBU device selection and optimized PCB design can effectively mitigate their adverse effects on high-speed signal transmission. Specifically, time-domain simulations reveal well-defined eye diagrams, indicating minimal jitter and timing skew introduced by the protection devices, with experimental results aligning closely with simulations. In the frequency domain, measurements and simulations confirm that the protection devices introduce an insertion loss of approximately 1.5 dB within the operational frequency band, remaining within acceptable engineering tolerances. The primary contributions of this work are: (1) The design and implementation of a PCB-based indirect lightning protection scheme for LVDS high-speed signals, ensuring reliable signal transmission under the influence of protection devices; (2) The proposal of a miniaturized integration method for high-speed signal protection devices utilizing rigid-flex PCB technology, providing valuable reference guidance for high-speed PCB layout and routing in practical engineering applications. This study introduces the development of an indirect lightning protection device aimed at preserving signal integrity in high-speed

Low-Voltage Differential Signaling (LVDS) interfaces exposed to transient surges, thereby enhancing system-level electromagnetic compatibility. This paper employs a combined approach of experimental testing and simulation analysis to systematically evaluate the influence of transient voltage suppressor (TVS) and Transient Blocking Unit (TBU) devices on signal integrity from both time-domain and frequency-domain. In this paper, a TBU is deployed in series and a TVS in parallel, forming a two-stage protection scheme that achieves clamping and current limiting to ensure the safe transmission of LVDS signals. This paper demonstrates that appropriate TVS and TBU device selection and optimized PCB design can effectively mitigate their adverse effects on high-speed signal transmission. Specifically, time-domain simulations reveal well-defined eye diagrams, indicating minimal jitter and timing skew introduced by the protection devices, with experimental results aligning closely with simulations. In the frequency domain, measurements and simulations confirm that the protection devices introduce an insertion loss of approximately 1.5 dB within the operational frequency band, remaining within acceptable engineering tolerances. The primary contributions of this work are: (1) The design and implementation of a PCB-based indirect lightning protection scheme for LVDS high-speed signals, ensuring reliable signal transmission under the influence of protection devices; (2) The proposal of a miniaturized integration method for high-speed signal protection devices utilizing rigid-flex PCB technology, providing valuable reference guidance for high-speed PCB layout and routing in practical engineering applications.

Joint Modeling of Signal Integrity and Device Reliability for Memristor Crossbar Array-Based Neuromorphic Chip

Yining Jiang^{1,2,3}, Hanzhi Ma^{1,2,3}, Jiarui Qiu^{1,2,3}, Yiqin Xiang², Shuoxin Ji^{1,2,3}, Ye Shi², Er-Ping Li^{1,2,3}

¹College of Information Science and Electronic Engineering, Zhejiang University, China; ²ZJU-UIUC Institute, Zhejiang University, China; ³Zhejiang Key Laboratory of Intelligent Electromagnetic Control and Advanced Electronic Integration, Zhejiang University, China

Abstract: Memristor crossbar array-based neuromorphic chips have garnered wide attention for their advantages in faster in-memory computing and low power consumption. However, issues such as unstable device performance and high-density interconnects also challenge the signal transmission and reliability in neuromorphic circuits. Conventional modeling approaches, constrained by model limitations and complexity, are unable to achieve system-level co-simulation. This paper proposes a joint simulation framework integrating signal integrity and device reliability models in memristor crossbar array-based neuromorphic circuits. The damage to the circuit caused by parasitic effect, skin effect, device endurance, and retention is further proven and analyzed, contributing to the efficient design of large-scale neuromorphic circuit.

**TC10_4
TECHNICAL
PAPERS**

HIGH-SPEED VIA DESIGN & MODELING

10:30 AM - 12:00 PM

Room: Cortez B

Sponsored by TC-10 Signal and Power Integrity

Co-Chair:

Tao Wang, *Meta*

Co-Chair:

Chulsoon Hwang, *Missouri University of
Science and Technology*

PLANNED SPEAKERS & TOPICS

Simplified Design Approach for Via Transitions up to 67 GHz

Giorgi Tsintsadze¹, Reza Vahdani¹, James Drewniak¹,
Richard Zai²

¹Missouri University of Science and Technology, USA;

²Packetmicro, USA

A Novel Asymmetric Via Design For Crosstalk Mitigation Due to PCB Layer Misalignment

Hao-Han Hsu¹, Chin-Ning Hu², Hayden Huang²

¹Asustek Computer Inc, USA; ²Asustek Computer Inc,
Taiwan

Abstract: A novel asymmetric via design is presented to mitigate the crosstalk degradation introduced by PCB layer misalignment without increasing keep-out-distance and board size. An anti-pad recess of ~40 Qm is implemented asymmetrically to provide solid ground reference even in the presence of misalignment. Near-end and far-end crosstalk are studied up to 45 GHz and are improved by up to 10 dB while the impact to insertion loss, return loss, and via impedance are minimized. This design effectively mitigates the signal integrity degradation and relieves the routing congestion introduced by the manufacturing tolerance in the computer systems.

Enhanced Intrinsic Via Model of High-Speed Vias

BEST SIPI PAPER FINALIST

BEST SIPI STUDENT PAPER FINALIST

Sathvika Bandi¹, Manish K. Mathew¹, Shruti Sawant¹,
Kevin Cai², Shameem Ahmed², Chulsoon Hwang¹

¹Missouri University of Science and Technology, USA;

²Cisco Systems, Inc, USA

Abstract: An analytical via model is essential for swift and accurate via analysis and optimization. However, existing models often do not capture the via behavior accurately at higher frequencies. This paper presents a physics-based, high accuracy two-port analytical via model through shunt and series admittance definition. While shunt admittance has been studied rigorously in prior work, this paper introduces series admittance to accurately model parallel-plate behavior and incorporates barrel-antipad coaxial inductance due to current flowing through the barrel along plane thickness. Based on the two-port admittance formulation, we propose an enhanced intrinsic via (EIV) model that accurately correlates with the 3D finite element method (FEM) simulation up to frequencies as high as 150 GHz for a two-layer and multilayer via. This model enables efficient and accurate via analysis in high-speed interfaces.

TC5_1
TECHNICAL
PAPERSCOMPUTATION OF LIGHTNING
ELECTROMAGNETIC PULSE AND
DISTRIBUTION LINE EFFECTS

10:30 AM - 12:00 PM

Room: Cortez D

Sponsored by TC-5 High Power Electromagnetics

Co-Chair:

Akiyoshi Tatematsu, *Central Research
Institute of Electric Power Industry*

Co-Chair:

Michael McNerney, *Consultant*

PLANNED SPEAKERS & TOPICS

Computation of LEMPs with the CIP Method in the 2-D
Spherical Coordinate SystemJumpei Murakami, Yohei Tanaka, Yoshihiro Baba
Doshisha Daigaku, Japan

Abstract: This paper presents a numerical method for electromagnetic field calculation in a two-dimensional (2-D) spherical coordinate system using the constrained interpolation profile (CIP) method. The proposed method is applied to the analysis of lightning electromagnetic pulses (LEMPs) generated by a current wave propagating upward along a vertical lightning return-stroke channel. CIP computed waveforms of electric field agree well with corresponding waveforms computed using the finite-difference time-domain method.

Preliminary Analysis on Back-flashover Rates of
Transmission Lines Considering the Effect of Lightning
Electromagnetic PulseAkifumi Yamanaka, Kazuyuki Ishimoto, Akiyoshi
Tatematsu
Central Research Institute of Electric Power Industry, Japan

Abstract: Lightning strikes on transmission line (TL) towers can cause back-flashovers (BFOs) that can lead to interruptions in power transmission. It is highly important to evaluate the BFO rate (BROR) accurately and to implement an effective lightning protection design. Electromagnetic transient (EMT) analysis is one of the most widely used methods for estimating the BFOR. In this paper, we present an estimation of the BFOR by EMT analysis that incorporates the effect of the lightning electromagnetic pulse (LEMP); several studies have pointed out that LEMP can increase the insulator voltages of TL towers struck by lightning. According to the BFOR estimation for a 77 kV TL using the Monte Carlo procedure, the rate derived by EMT analysis considering the effect of LEMP is up to 4.5 times higher than that derived by the conventional EMT analysis neglecting the effect of LEMP. The analysis presented in this paper highlights the need for a further comprehensive study on BFOR estimation that accounts for the effect of LEMP.

Simulation Study on Lightning Overvoltage of
Distribution Lines of Southern China: Influence of
Cross-arm Connection

Xiao He, Yaping Du, Yuxuan Ding, Xiangen Zhao, Chakhung Yeung, Jingjie Ye
The Hong Kong Polytechnic University, Hong Kong

Abstract: Southern China suffers from frequent lightning activity, posing a severe threat to distribution networks. In many practical engineering applications, the metal crossarm of the concrete pole is not electrically connected to the internal reinforcing bars (rebars). Currently, there is a lack of systematic research on how this electrical connection affects the lightning protection performance of the line. This paper investigates the overvoltage levels of distribution poles under direct lightning strokes. The study uses the partial element equivalent circuit (PEEC) method combined with multiconductor transmission line (MTL) theory. Three configurations are analyzed: (1) crossarm connected to rebars, (2) crossarm insulated from rebars, and (3) crossarm grounded via a separate down-conductor. The simulation results indicate that without an electrical connection, the concrete layer between the crossarm and rebars is easily broken down by high voltage. Installing a separate down-conductor for the crossarm can reduce the voltage across the concrete. However, this measure has limitations. Even if the concrete withstands the initial voltage, the overvoltage across the insulator continues to rise. Once the insulator flashes over, the high potential is transferred to the crossarm, eventually causing the breakdown of the concrete layer.

**WT_M2
WORKSHOP**

AEROSPACE EMC WORKSHOP

1:30 PM - 5:00 PM

Room: Coronado A

Sponsored by TC-8 Aeronautics and Space EMC

Chair:

Carlos Aviles, *Northrop Grumman Corp*

Co-Chair:

Nika Amralah, *Department of National
Defence*

ABSTRACT:

This workshop discusses topics in Aerospace EMC, including design, development, and test for airplanes, helicopters, missiles, and spacecraft.

PLANNED SPEAKERS & TOPICS

System Verification - An EMC Engineer's Approach - E3

John La Salle
Northrop Grumman, USA

Aeronautical Power Chain: New Challenges for EMC Engineers

Charles Jullien
Safran Electrical and Power, France

Atmospheric and Environmental Effects on RF Signal Propagation for Aircraft EMC

Billy Gonzalez
Northrop Grumman Corp, USA

Addressing the Increasing Wireless Requirements for Commercial Aircraft and Aerospace Applications

Dennis Lewis
The Boeing Company, USA

Understanding Spacecraft and Aircraft Avionics Hardware for the Development of Appropriate EMC Requirements and Testing

Reinaldo J. Perez
Jet Propulsion Laboratory, USA

The EMC Impact of the Aerospace E3 Environment on Design, Testing, Maintenance and Operations

Randy J. Jost
Utah State University, USA

Design Philosophies for EMC-Hardened Aeronautics Platforms

Jinsoo Kim
Lockheed Martin Corporation Aerospace and Defense, USA

Lightning Strike Protection of Aircraft Integral Fuel Tanks

Eric Cramer, Bruce R. Crain
Northrop Grumman Corp, USA

WT_S6
TUTORIAL**CALIBRATION OF EMC TEST FACILITIES
AND MEASUREMENT INSTRUMENTATION****1:30 PM - 5:00 PM****Room: Coronado B****Chair:**Janet O'Neil, *ETS-Lindgren***Co-Chair:**Dennis Lewis, *The Boeing Company***ABSTRACT:**

This tutorial will present detailed information about the state of the art in calibration of EMC measurement equipment and test facilities required by many current international standards. Specific requirements and nuances that can challenge even the most experienced EMC practitioner will be discussed, and methods for practical implementation for real-world application will be shared with attendees. Speakers will include experts who are actively involved in using, writing and maintaining the standards in which the requirements are established. Material will be presented, representing activity within the related standards committees, including CISPR, ISO, ANSC C63® and IEEE. This tutorial will take a novel approach to equipment and facility calibration by delving into implementation of specific characteristics and requirements, as opposed to a general treatment of calibration. Calibration issues related to a variety of test facilities and measurement equipment and the associated standards will be included, including antennas per ANSI C63.5; field probes according to IEEE 1309; test sites used for antenna calibration and reference test sites, per revision being developed for CISPR 16-1-5 and future CISPR 16-1-6, C63.25.3. A new method will be shared that allows a more accurate and convenient method for LISN calibrations using a VNA.

Attendees can expect to improve their understanding of both the background of the latest requirements for calibration of EMC measurement equipment and facilities and practical aspects of performing or specifying the required calibrations.

PLANNED SPEAKERS & TOPICS

Antenna Calibration and Test Site Validation for Radiated Emissions from 18 GHz to 40 GHz: New Measurement Method Under Consideration by CISPR and ANSC C63® Standards

Zhong Chen
ETS-Lindgren, USA

Calibration of Field Probes for EMC Measurements (IEEE 1309)

Dennis Lewis
The Boeing Company, USA

New Calibration Method for Line Impedance Stabilization Networks (LISNs) Under Consideration by ANSC C63 and CISPR

Zhong Chen¹, Mike Heckrotte²
¹*ETS-Lindgren, USA*; ²*Consultant, USA*

Practical Aspects of Performing and Specifying Antenna and Field Probe Calibrations

Leon Enriquez
ETS-Lindgren, USA

**WT_S2
WORKSHOP****AEROSPACE EMC STANDARDS
UPDATES WORKSHOP****1:30 PM - 5:00 PM****Room: Coronado C****Sponsored by TC-8 Aeronautics and Space EMC****Chair:**Frederick Heather, *The Aerospace Corporation, USA***ABSTRACT:**

Prior to integrating any electronics component into a larger system, it is highly desirable to assess its performance under environmental conditions that are representative of those that may be encountered during its operation in the larger system. For any given family of platforms, a standardized test approach ensures that such tests are controlled, reliable, and repeatable while minimizing the risk of potential problems at integrated system level.

This workshop discusses the following EMC test standards used in aerospace applications:

P2838™/D20: Standard for Aerospace Vehicle Component Lightning Strike Direct Effects Qualification

RTCA DO-160: Environmental Conditions and Test Procedures for Airborne Equipment

SAE AE-4 EMC Standards for Aircraft

ANSI C63.25 Working Groups are submitting their draft standards for characterizing Semi-Anechoic Chambers (SAC), Reverb Chambers (RC), and Compact Antenna Test Ranges (CATR) for the frequency range from 18-40GHz. Unlike previous standards, these will include multiple methods for labs to balance time, equipment cost, and precision of their measurement. This talk will discuss the coming standards, the trade-offs in the methods, and the technology available to achieve the most appropriate data set for commercial and private labs.

ANSI C63.25 Standards for Characterizing Semi-Anechoic Chambers (SAC), Reverb Chambers (RC), and Compact Antenna Test Ranges (CATR)

MIL-STD-461: Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

AIAA S-121: Electromagnetic Compatibility Requirements for Space Equipment and Systems

SSC-T-008: Space Force Lightning Requirements

PLANNED SPEAKERS & TOPICS**Deep Dive into the IEEE Standard P2838™/D20 Draft Standard for Aerospace Vehicle Component Lightning Strike Direct Effects Qualification**Frederick W. Heather, Adrian Sun
*The Aerospace Corporation, USA***Updates to Revision H of RTCA DO-160 and EUROCAE ED-14 Environmental Conditions and Test Procedures for Airborne Equipment**Eric Stewart¹, Rebecca Morrison², Alex Milns³
¹Collins Aerospace, USA; ²RTCA Inc., USA; ³EUROCAE, France**40 GHz Chamber Validation**Phillip Miller
*RATLR, USA***MIL-STD-461 Updates & Uses**Finbarr O'Connor
*Huntington Ingalls Industries Inc, USA***Electromagnetic Compatibility Requirements for Space Equipment and Systems - AIAA-S-121A-2017 Status Report**Jim Lukash
*Lockheed Martin Space Systems, USA***SSC-T-008: Space Force Lightning Requirements**Adrian Sun
The Aerospace Corporation, USA

WT_06
WORKSHOPRECENT ADVANCES IN NUMERICAL ANALYSIS
TECHNIQUES FOR LIGHTNING TRANSIENTS IN
POWER SYSTEMS AND ELECTRIC FACILITIES

1:30 PM - 5:00 PM

Room: Coronado D

Sponsored by TC-5 High Power Electromagnetics

Chair:

Akiyoshi Tatematsu, *Central Research
Institute of Electric Power Industry*

Co-Chair:

Fernando Silveira, *Universidade Federal de
Minas Gerais*

ABSTRACT:

Lightning strikes may cause damages of power equipment and malfunction of electronic devices, and numerical analysis is essential for predicting transient phenomena and designing effective countermeasures to suppress overvoltages and prevent failures and disturbances of power equipment and electronic devices. This workshop will provide a comprehensive overview of recent advances in numerical transient analysis for lightning phenomena in power systems and related facilities. The objectives are (i) to present cutting-edge full-wave and circuit-theory-based simulation methodologies for lightning transients, (ii) to illustrate their applications to real-scale power transmission, distribution, and renewable-energy installations, and (iii) to highlight emerging techniques that enhance modeling accuracy, computational efficiency, and practical engineering applicability.

PLANNED SPEAKERS & TOPICS

Recent Advances in FDTD-Based Lightning Transient Analysis Techniques and its Application to Substations and Other Facilities

Akiyoshi Tatematsu
*Central Research Institute of Electric Power Industry,
Japan*

Recent Advances in the Hybrid Electromagnetic Model and its Application to the Assessment of the Lightning Performance of Transmission Lines

Fernando Silveira
Universidade Federal de Minas Gerais, Brazil

Development of Circuit-Theory-Based Lightning Transient Analysis Techniques and its Application to Distribution lines and Other Facilities

Akifumi Yamanaka
*Central Research Institute of Electric Power Industry,
Japan*

From Full-Scale EMT Simulation to Machine-Learning-Assisted Modeling of Lightning Transients in Wind Turbines

Eduard Shulzhenko
Technische Universität Ilmenau, Germany



Photo by Karthik Vepuri

WT_01
TUTORIALLESSONS LEARNED CREATING RELIABLE
COMPUTATIONAL MODELS FOR SI, PI AND
EMC APPLICATIONS

1:30 PM - 5:00 PM

Room: Cortez A

Sponsored by TC-9 Computational Electromagnetics

Co-Chairs:

Patrick DeRoy, *Analog Devices Inc*
Scott Piper, *Dassault Systemes Americas Corp*
Bruce Archambeault, *Missouri University of Science and Technology*

ABSTRACT:

This tutorial will expose the attendees to the lessons learned by a number of industry experts over the years. The goal being that the attendees will benefit from the, sometimes painful, learning experiences of the presenters. Computational tools are very powerful and simulation is invaluable to the modern design engineer but there is still an art to using these tools effectively. In all disciplines, hindsight is perfect and the opportunity to learn from others is a valuable resource. This tutorial will not only show lessons learned but also expose the attendees to fundamental ways of thinking through their models to better ensure success. Examples relevant for Signal Integrity, Power Integrity and Electromagnetic Compatibility design will be shared. The critical subject of Validation is covered, considering the full spectrum of electronics modeling and simulation from SPICE to 3D full-wave, to co-simulations. The approaches one can take with modern simulation tools, from fast 2D pre-layout simulations to full 3D "Virtual Twin" simulations (when appropriate) will also be discussed. Experiences in applying EM simulation tools for gaining insights into real-life shielding challenges will be covered. In addition, lessons learned correlating measurements and simulations will be discussed, with an emphasis on balancing the strengths and weaknesses of each.

PLANNED SPEAKERS & TOPICS

Model Validation

Bruce Archambeault
Missouri University of Science and Technology, USA

EMC Virtual Twins

Scott Piper
Dassault Systemes Americas Corp, USA

Cable Modeling Conundrums: Measurement Based Models and Statistical Analyses

Patrick DeRoy¹, Fengshun Tan¹, Flavia Grassi²
¹*Analog Devices Inc, USA*; ²*Politecnico di Milano, Italy*

Analysis of Fabric-over-Foam (FoF) Gasket Parameters on SE from 30 MHz to 40 GHz

Pavithrakrishnan Radhakrishnan
Oklahoma State University, USA



Photo by Richard Georgerian

WT_A3
WORKSHOP

TEST AND MEASUREMENT FUNDAMENTALS

1:30 PM - 5:00 PM

Room: Cortez B

Sponsored by Education Committee

Co-Chairs:

John McCloskey, *EMC-Closkey*Vignesh Rajamani, *Rohde & Schwarz USA, Inc.*Patrick Andre, *Andre Consulting, Inc.*

ABSTRACT:

EMI/EMC testing is crucial for ensuring that electronic devices perform reliably in their intended electromagnetic environment and don't interfere with other devices. Tests must be optimized to improve efficiency and reduce cost. Most importantly, the test engineer must have a thorough understanding of the test equipment and its capabilities is essential in order to ensure the robustness of the testing process and reliability of the results. In this half-day workshop, we will cover some fundamental concepts of testing accompanied by live demonstrations showcasing proper usage of oscilloscopes, spectrum analyzers, EMI receivers, and vector network analyzers (VNAs) for EMC measurements and debugging.

PLANNED SPEAKERS & TOPICS

Overview of Test and Measurement Concepts

John C. McCloskey
EMC-Closkey, USA

Practical Applications and Common Measurement Mistakes (and How to Avoid Them)

Patrick G. Andre
Andre Consulting, Inc., USA

Hands-On Demonstrations

Vignesh Rajamani
Rohde & Schwarz, USA

DALLAS FUN FACTS

WOOL

The roots of Texas's wool and mohair industry stretch back to the early 1700s, when Spanish missionaries and soldiers brought the first sheep and goats into the region.

Over the centuries, that small beginning grew into a major agricultural force. Today, Texas leads the nation in wool production, supplying more wool than any other state in the country.



**WT_03
TUTORIAL**

TUTORIAL ON MACHINE LEARNING

1:30 PM - 5:00 PM

Room: Cortez C

Sponsored by SC-3 Special Committee on Machine Learning and Artificial Intelligence in EMC and SIPI

Chair:

Lijun Jiang, *Missouri University of Science and Technology*

Co-Chairs:

Alistair Duffy, *De Montfort University*
Hanzhi Ma, *Zhejiang University*

ABSTRACT:

Machine learning is profoundly impacting the landscape of every technology domain, including signal integrity, power integrity, EMC, and EMI engineering. This tutorial is for entry-level audiences who are interested in machine learning. The topics in this tutorial will practically guide audiences through the fundamentals of machine learning methods, resources needed for using machine learning methods, and successful application examples for EMC society. The invited speakers are frontier experts who have practical experience in machine learning method development and applications. This tutorial will aim to draw broader attention and guide hands-on experiences of machine learning for EMC/EMI, SI and PI technologies. This special session is sponsored by IEEE EMC Special Committee SC3 "Machine Learning and Artificial Intelligence in EMC and SIPI" and welcomes audiences from all IEEE EMC Technical Committees.

PLANNED SPEAKERS & TOPICS

Prompt Engineering: How to Talk to AI ... Successfully

Alistair Duffy
De Montfort University, United Kingdom

Outlook of AI and ML-Assisted Signal Integrity and Power Integrity

Matteo Cocchini
International Business Machines Corp, USA

Machine Learning Assisted Power Integrity Solutions

Chulsoon Hwang
Missouri University of Science and Technology, USA

From Machine Learning Basics to EMC and SIPI: A Foundational Overview

Hanzhi Ma
Zhejiang University, China

AI/ML Augmentation of Hardware Compliance Processes

Samuel Connor
International Business Machines Corp, USA

Compressed Sensing for EMC Applications

Zhong Chen
ETS-Lindgren, USA

Mathematical and Physical Thinking Behind Machine Learning

Lijun Jiang
Missouri University of Science and Technology, USA

WT_V1
TUTORIAL**EMC, SI, AND ESD CHALLENGES IN
AUTOMOTIVE****1:30 PM - 5:00 PM****Room: Cortez D****Chair:**Andreas Hardock, *Nexperia***Co-Chair:**Sergej Bub, *Nexperia BV***ABSTRACT:**

Driven by the growing demand for high data processing, new high-speed interfaces are increasingly being adopted in the automotive industry, including Automotive SerDes (ASA) and Ethernet with data rates of 2.5 Gbps, 5 Gbps, and 10 Gbps. Automotive Ethernet, in particular, has gained significant traction since the introduction of 100BASE-T1 and 1000BASE-T1 in 2016. Today, Ethernet data rates beyond 10 Gbps are already being discussed for future automotive applications.

PLANNED SPEAKERS & TOPICS**SI/PI for High-Speed Interfaces**Venkat Satagopan
*NVIDIA Corp, USA***ESD Protection and ESD Simulation for Automotive Interfaces**Sergej Bub
*Nexperia BV, Netherlands***EMC Simulation of DC/DC Converters**Scott Piper
*Dassault Systemes Americas Corp, USA***EMC Optimizations of DC/DC Converters**Todor Arsenov
Nexperia, Netherlands

**ED12
EXPERIMENTS &
DEMONSTRATIONS****FAST CO-SIMULATION FOR BOTH EMC
AND SIGNAL INTEGRITY - TO 8 GHZ, 18
GHZ, 40 GHZ - USING NEW STATISTICAL
WAVE PHYSICS SIMULATION****2:00 PM - 4:00 PM****Room: E&D Booth 1, Exhibit Hall****Sponsored by TC-10 Signal and Power Integrity**

Session Abstract: Signal Integrity engineers may not realize that small radiation losses on a digital channel can still mean large radiation susceptibility to high levels of electromagnetic interference. Also, digital interconnects are typically installed in bounding enclosures with reverberant electric field conditions. Reverberation creates highly variable EMI levels which can only be predicted statistically - typically with a Min-Max dynamic range of 40 dB or more. So for increasingly high data rates and long digital interconnects on aircraft and automobiles, the EMC engineer becomes an important part of the signal integrity equation.

This demo session will use NEW statistical wave physics CO-SIMULATION to model the multiple radiation susceptibility paths of a digital interconnect, to predict eye diagrams and bit error rates on the digital interconnect and to interactively simulate signal integrity design solutions with a simple, mesh-free, system-level model that solves to 8/18/40 GHz in typically less than 60 seconds.

PRESENTER:Paul Bremner, *Robust Physics, USA***ED4
EXPERIMENTS &
DEMONSTRATIONS****TIME DOMAIN METHODS FOR MEASURING
POWER RAIL NOISE, STABILITY AND EMI****2:00 PM - 4:00 PM****Room: E&D Booth 2, Exhibit Hall**

Session Abstract: The increasing current levels required by the more powerful processors used in AI systems are pushing the limits of frequency domain methods for measuring impedance and stability. This demonstration will show time-domain methods for analyzing the worst-case voltage ripple under dynamic loading conditions. Included in the demonstration will be measuring PDN noise under dynamic load conditions with 100%-time coverage, power rail crosstalk, evaluating stability, and potential EMI sources.

PRESENTER:Michael Schnecker, *Rohde & Schwarz*

ED5
EXPERIMENTS &
DEMONSTRATIONS**COMPUTATIONAL MODELING AND
CHARACTERIZATION FOR SIGNAL INTEGRITY
AND POWER INTEGRITY: A COMPREHENSIVE
APPROACH FOR THE IEEE EMC/SIPI
CONFERENCE SOFTWARE DEMONSTRATION****2:00 PM - 4:00 PM****Room: E&D Booth 3, Exhibit Hall****Sponsored by TC-10 Signal and Power Integrity****ABSTRACT:**

Signal Integrity (SI) and Power Integrity (PI) are critical aspects of modern electronic system design. As devices become faster and more complex, the importance of ensuring reliable and efficient signal and power delivery across circuits increases significantly. This proposal aims to demonstrate a computational modeling and characterization framework that integrates cutting-edge simulation techniques for analyzing and improving SI and PI. Through a software demo, we will showcase how these

models can predict and resolve common issues such as signal degradation, crosstalk, electromagnetic interference (EMI), and power noise. The proposed demo will provide valuable insights for engineers and researchers seeking to enhance the performance of high-speed and high-frequency systems while adhering to the latest EMC regulations.

PRESENTERS

Shahid Ahmed, *TE Connectivity Corporation*
Aishah Shahid, *Princeton University*

ED4
EXPERIMENTS &
DEMONSTRATIONS**OPTIMIZING EMC DATA PROCESSING
AND REPORTING THROUGH SOFTWARE
AUTOMATION****2:00 PM - 4:00 PM****Room: E&D Booth 4, Exhibit hall****ABSTRACT:**

This demonstration presents a fully automated emissions testing workflow that converts raw electromagnetic interference (EMI) measurement data into a formatted test report in real time. Attendees are encouraged to bring their own hand-held devices—or use provided examples—to perform an emissions measurement. Using predefined measurement parameters, the automated system processes the acquired data, applies limit comparisons, and generates a standardized test report that is immediately printed and delivered to the participant as a physical souvenir.

The objective of this demonstration is to showcase how modern automation techniques can significantly reduce the time and effort traditionally required to move from measurement to documented results in EMC

testing. By integrating instrumentation control, data analysis, and report generation into a single workflow, the demonstration highlights opportunities to improve test efficiency, consistency, and repeatability in both laboratory and pre-compliance environments. The walk-up format of the demonstration emphasizes accessibility and real-world applicability.

The presenters represent a commercial EMC test lab principal engineer and a commercial EMC test software engineer who will share their expertise through case-studies highlighting novel applications and efficiencies using automated EMC software.

PRESENTERS

Ben Hodges¹, Ethan Swanson²
¹ETS-Lindgren Oy, Finland; ²Element Materials Technology, USA

mesago

emv

27 – 29.4.2027
STUTTGART, GERMANY

CREATING A COMPATIBLE FUTURE

Take the stage at Europe's top
event for electromagnetic
compatibility.





SCHEDULE AT A GLANCE

ROOM	Coronado A	Coronado B	Coronado C	Coronado D	Cortez A	Cortez B	Cortez C
8:30 AM	8:30 AM - 10:00 AM TECHNICAL PAPERS (TC5_3) Filters and Arresters for Electromagnetic Pulse Protection	8:30 AM - 12:00 PM SPECIAL SESSION (SpS1_34) Electromagnetic Compatibility Challenges and Safety of Medical Devices in Clinical Environments	8:30 AM - 4:30 PM SPECIAL SESSION (SpS4) Achieving Power Integrity with AI/ML	8:30 AM - 10:00 AM TECHNICAL PAPERS (TC12_1) WIRELESS EMC (II): Immunity, Coexistence & Environmental Effects	8:30 AM - 10:00 AM TECHNICAL PAPERS (TC10_14) Filters & Standards	8:30 AM - 10:00 AM TECHNICAL PAPERS (TC10_7) EMC, Radiation & Shielding	8:30 AM - 10:00 AM TECHNICAL PAPERS (TC7_1) EMI in Electrified Transport
10:00 AM	REFRESHMENT BREAK						
10:30 AM	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC2_5) EMC Measurements - PCB level assessments			10:30 AM - 12:00 PM TECHNICAL PAPERS (TC12_2) WIRELESS EMC (I): RF Interference and Desense	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC10_6) Transmission Line Physics & Routing	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC10_8) Simulation & Mathematical Modeling	10:30 AM - 12:00 PM TECHNICAL PAPERS (TC7_2) Data Center and Power Electronics EMC
12:00 PM	LUNCH BREAK						
1:30 PM				1:30 PM - 3:00 PM TECHNICAL PAPERS (TC9_6) Modeling and Simulation of Nonlinear, Multiphysics, and Data- Driven EMC Systems	1:30 PM - 3:00 PM TECHNICAL PAPERS (TC10_15) Data Analysis Methods	1:30 PM - 3:00 PM TECHNICAL PAPERS (TC10_5) Power Delivery Network (PDN) Optimization	
2:00 PM	2:00 PM - 3:30 PM TECHNICAL PAPERS (TC2_8) EMC Measurements - Impedance Measurements and Probes	2:00 PM - 3:30 PM TECHNICAL PAPERS (TC4_2) EMI Control: Filtering, Shielding, Absorber					
3:00 PM	REFRESHMENT BREAK?						
3:30 PM							
4:30 PM							

CLAYTON R. PAUL GLOBAL UNIVERSITY: 8:00 AM - 12:00 PM - Hilton Anatole, Morocco
(Pre-Registration Required)

GLOBAL SIGNAL INTEGRITY UNIVERSITY: 8:30 AM - 12:00 PM, Hilton Anatole, Manchester
(Pre-Registration Required)

EXHIBIT HALL ACTIVITIES

EXHIBIT HALL OPEN: 10:00 AM - 12:00 PM

EXPERIMENTS & DEMOS: 10:00 AM - 12:00 PM, E&D Stages, Exhibit Hall

ADDITIONAL STANDARDS SESSIONS, WORKING GROUPS AND TECHNICAL COMMITTEES
For Collateral Meetings, please see page 165



STANDARDS WEEK:

For more information about Standards Week,
please visit [page 160](https://www.2026.EMCSIPI.ORG)

Team EMC Bike Ride

6:45 AM

Meeting Point: Meet at the main entrance of Hilton Anatole Hotel by 6:45 AM

Speakers Breakfast

Hilton Anatole, De Sota - 7:00 - 8:30 AM

(Breakfast Only on the Day of Presentation)

Registration/Info Desk

8:00 AM - 5:00 PM

Companion Lounge

Crow's Office - Mezzanine Level, Hilton Anatole Hotel - 8:00 AM - 5:00 PM

(Registered Companions Only)

Awards Luncheon

Hilton Anatole, Trinity Ballroom - 12:00 - 1:30 PM (Ticketed Event)

Technical Tour

Rohde & Schwarz, Texas Production and Integration Center (TPIC), Coppell, TX 2:00 PM - 5:00 PM

Meeting Point: Meet in the Grand Entrance of the Hilton Anatole at 1:45 PM for a 2:00 PM departure.



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PRESENTATION TIMES.

**TC5_3
TECHNICAL
PAPERS**

FILTERS AND ARRESTERS FOR ELECTROMAGNETIC PULSE PROTECTION

8:30 AM - 10:00 AM

Room: Coronado A

Sponsored by TC-5 High Power Electromagnetics

Chair:

Michael McInerney, *Consultant*

Co-Chair:

William Radasky, *Metatech Corporation*

PLANNED SPEAKERS & TOPICS

Using Common Mode Three Phase Power Filters for HEMP Mitigation

Sergio N. Longoria
ETS-Lindgren Inc., USA

Abstract: This paper examines the performance limitations of common-mode (CM) three-phase power filters compared with differential-mode (DM) filters when exposed to high-energy electromagnetic disturbances such as High-Altitude Electromagnetic Pulse (HEMP).

Circuit Modeling of Granular Metal Arresters for Nanosecond Transients

BEST EMC PAPER FINALIST

Tyler Bowman, Matthew Landi, Laura Biedermann
Sandia National Laboratories, USA

Abstract: This work investigates SPICE modeling of granular metal-based devices for the conduction of nanosecond transients typically associated with high-altitude electromagnetic pulse events. A Mo-SiNx granular metal sample with 0.30 metal fraction was measured for voltage-based conductivity up to 2 MV/cm. Empirical fits of the Ohmic and tunneling regimes of the device were then applied and converted into a voltage-based resistance model in SPICE for pulse response analysis of both a basic circular transmission line and wagon wheel topology. Transient modeling showed some voltage clamping behavior for samples with shorter conductive paths relative to the device area, and additional sensitivity modeling showed means of improving future device design for nanosecond transient response.

Practical Application of Physics-Based TVS Models

Yejun Kim¹, Daniel Szanto¹, Tingyu Shi¹, Mehdi Mousavi¹, Sergej Bub², Steffen Holland², Daryl Beetner¹

¹*Missouri University of Science and Technology, USA;*

²*Nexperia Germany GmbH, Germany*

Abstract: System-level ESD (SEED) simulations require accurate representation of both the excitation waveform and the behavior of the protection device. This work applies a previously developed physics-based snapback model of a transient voltage suppressor (TVS) to on-and off-chip ESD protection devices which demonstrate a double-snapback-like behavior and whose characteristics do not precisely meet the physics captured by the original TVS model. Measured VF-TLP generator waveforms were used to reconstruct an “ideal” stimulus for simulations and ensure accurate model tuning and SEED results. The double snapback behavior observed in measurements was evaluated through multiple variants of the TVS model. SEED results show that capturing the double snapback behavior of the TVS device, even roughly, significantly improves prediction of the quasi-static and peak currents and voltages in SEED simulations. A simple analysis procedure is given to help the engineer decide which characteristics are most important to capture when models of the on- and off-chip ESD protection cannot capture all behaviors and to roughly predict the level of ESD event which will trigger the TVS device, pulling current away from the IC.



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2027 JOINT EMC EUROPE & INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY, SIGNAL & POWER INTEGRITY

Call for Papers

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Topics of Interest

- Machine Learning and Artificial Intelligence
- Smart Grid EMC
- EMC Management
- EMC Measurement
- EMC Environment
- EM Interference Control
- High Power Electromagnetics
- Spectrum Engineering
- Electrical System and Power Electronics
- Aeronautics and Space EMC
- Computational Electromagnetics
- Signal and Power Integrity
- Nanotechnology and Advanced Materials
- EMC Wireless Technology

AUTHOR SUBMISSION SCHEDULE



Submission Portal Opens	1 Dec. 2026
Special Session Proposals	25 Jan. 2027
Paper Submission Deadline	22 Feb. 2027
Workshop & Tutorial Proposal Submission Deadline	22 March 2027
Notification of Paper Acceptance	26 April 2027
Reduced Registration Fee	31 May 2027
Final Paper Submission	31 May 2027
Exhibition Application	21 June 2027

EMC Europe 2027 Symposium: 23-27 August 2027



www.emceurope2027

Guidance for authors:

Submission must be done here:
www.conftool.org/emceurope2027
To submit the contribution, a new account has to be registered or an existing authors account has to be used

SPS1_34
SPECIAL
SESSION

ELECTROMAGNETIC COMPATIBILITY CHALLENGES AND SAFETY OF MEDICAL DEVICES IN CLINICAL ENVIRONMENTS

8:30 AM - 12:00 PM**Room: Coronado B**

ABSTRACT:

The increasing complexity of medical devices and their widespread use in electromagnetically challenging clinical environments—such as MRI suites, operating rooms, and intensive care units—raise critical electromagnetic compatibility (EMC) and safety concerns. This Special Session focuses on emerging EMC challenges for medical devices, including susceptibility to electromagnetic fields, unintended coupling mechanisms, device-tissue interactions, and risk mitigation strategies. The session aims to bring together researchers, clinicians, device manufacturers, and regulatory experts to discuss recent advances in modeling, testing, and standards development related to medical device EMC. Topics will include both experimental and computational approaches, realworld incident analyses, and regulatory perspectives to ensure safe and reliable device operation in clinical settings.

PLANNED SPEAKERS & TOPICS

Topics of Interest to Inform Revisions of ISO 14117, ISO 10974, and ANSI/AAMI PC76

James Kippola¹, Paul S. Stadnik², Michael Steckner³, Tim Langeslay⁴, Ladan Bulookbashi⁵, Seth Seidman⁶, Shiloh Sison⁷

¹Boston Scientific Corporation, USA; ²Micro Systems Engineering Inc, USA; ³MKS Consulting, USA; ⁴Medtronic Inc, USA; ⁵AAMI, USA; ⁶Food and Drug Administration, USA; ⁷Abbott Laboratories Inc, USA

Abstract: Topics to guide revisions of ISO 14117, ISO 10974, and ANSI/AAMI PC76 standards are identified with the goal of addressing new electromagnetic interference (EMI) sources, magnetic resonance imaging (MRI) technologies and implant configurations. Key needs include source specific EMI tests, requalifying MRI methods from ~0.5-7T and addressing MRI of patients with mixed vendor active implantable medical devices, abandoned cardiac leads, epicardial leads, and subcutaneous arrays.

RF-induced Heating of Shorted Electrodes for Active Implantable Medical Device at 1.5 T

Genting Zeng¹, Ebrahim Farshad¹, Lingfei Zhang¹, Mir Khadiza Akter¹, Jeffrey Tsang², Ji Chen¹

¹University of Houston, USA; ²Saluda Medical Pty Ltd, Australia

Abstract: In this work, a clinically available spinal cord stimulation (SCS) system with a 60-cm lead containing 12 electrode contacts was modified to investigate its impact on RF-induced heating. Specifically, configurations in which wires were in contact at three representative locations—near the distal end, mid-lead, and proximal end—were examined. Electrode-specific transfer functions were computed and combined with the tangential incident electric field along clinically relevant trajectories within a virtual human model (Duke) to assess in vivo lead-tip heating. The results show that the highest mean and peak temperature rises can be up to approximately 1.6 times greater than those of the intact system.



Photo by Richard Georgerian

Numerical and Experimental Evaluation of RF-Induced Heating from Titanium Mesh under 7 T MRI System Using a Four-Channel Dipole Array

Ibne Hasan Emon¹, Seung Min Lee², Qingyan Wang¹, Steven Wright², Ji Chen¹

¹University of Houston, USA; ²Texas A&M University, USA

Abstract: This work presents a numerical and experimental evaluation of radio-frequency (RF)-induced heating of titanium mesh in a 7 T MRI system using a four-channel transmit dipole array. Full-wave electromagnetic simulations at 298 MHz were performed in a tissue-mimicking gel phantom to localize regions of high electric field strength. Conductive titanium rods of different lengths were used to determine the peak heating near the resonant length. Titanium mesh implants of different sizes were then placed at the identified high-field locations to evaluate RF-induced heating. Thermal simulations were coupled with electromagnetic power deposition. Experimental phantom measurements using fiber-optic temperature probes validated the numerical predictions, with relative deviations of approximately 20-27%. The results demonstrate a strong dependence of RF-induced heating on implant geometry and placement and support a practical framework for conservative RF safety screening of conductive implants in ultra-high-field magnetic resonance imaging systems.

Electric Current Density Distribution During Electroconvulsive Therapy

Kenneth Castleman¹, Mingtao Du¹, Kunlin Li¹, Yuhui Xu¹, Nahyun Kim¹, Qianhui Ye², Zixiang Xiong², Fatima Merchant¹, Ji Chen¹

¹University of Houston, USA; ²Texas A&M University, USA

Magnetic Resonance Equipment Single-Fault Failures: Implications for Active Implants

Michael C. Steckner

MKS Consulting, USA

Abstract: Medical electrical equipment (MEE) will occasionally malfunction. These failure modes are to be anticipated and mitigated via risk management. Failure modes of MEE combinations (e.g. pacemaker within Magnetic Resonance Imaging (MRI)) may require additional mitigations. MRI failure modes of potential concern for Active Implantable Medical Devices (AIMDs) are identified, outputs characterized, failure rates assessed, and existing mitigations noted. Analysis suggests that existing MRI mitigations for un-implanted patients, and AIMD mitigations developed for MRI exposures, provide sufficient risk management.

Assessment of Small Loop Windowing Method for Low frequency Magnetic Field Immunity Testing

Yasaman Ardeshirpour, Joshua Guag, Seth Seidman, Howard Bassen

US Food and Drug Administration, USA

Abstract: Low-frequency magnetic field immunity testing is commonly conducted using a small-radiating coil together with the windowing method per IEC 61000-4-39:2017. This study evaluates this approach's applicability for sources with larger radiating coils than the standard-specified small-coils. The results indicate windowing method with small-radiating loops is primarily suitable for simulating larger real-world sources whose magnetic fields do not extend deeply from the transmitting loop and when the receiving loop of equipment under test (EUT) is smaller than IEC 61000-4-39 recommended coils. Therefore, spatial distribution of the actual electromagnetic source, including the field width and depth, and the size of the circuits and wires of EUT and their depth should be considered before selecting a small-radiating loop for immunity testing of EUT.

SPS4
SPECIAL
SESSION

ACHIEVING POWER INTEGRITY WITH AI/ML

8:30 AM - 4:30 PM

Room: Coronado C

Sponsored by TC-10 Signal and Power Integrity

Chair:Chulsoon Hwang, *Missouri University of Science and Technology***Co-Chair:**Ling Zhang, *Zhejiang University***ABSTRACT:**

Achieving power integrity (PI) across the PCB, package, and silicon over multiple power domains of differing logic levels and functionalities remains a challenging and unsolved problem. Mature and proven commercial analysis tools for post-layout assessment are accurate and well-established. However, PI design and layout remain a trial-and-error process that requires considerable experience, effort, and engineering time to achieve successfully on modern high-speed designs. Locating the power net on a given layer(s) within the stackup, location of decoupling capacitors, values of capacitors, number, and achievable frequency range, are typical design parameters over the PCB and package. Mitigating undesired resonances resulting from interconnects and capacitances is critical. Currently, the physics of charge delivery across a power distribution network is well known, and optimization approaches for achieving a target impedance have been reported in the literature. However, PI design for modern systems that might include a sub-milli ohm target impedance for high-current ICs requiring hundreds of decoupling capacitors that must accommodate hundreds of routing channels, or mobile designs with numerous different power domains and limited space for decoupling, as well as other challenges remain unresolved with a proven design methodology or guidelines.

AI/ML algorithms are proving to be a powerful tool for challenging PI problems. In recent years, AI/ML algorithms have achieved unprecedented success in various complex tasks due to their outstanding ability to fit complex functions. PI design with hundreds of decoupling capacitors required in modern electronic circuits is a time-consuming and tedious process that cannot be well addressed by conventional optimization approaches or commercial tools. AI/ML algorithms, such as deep learning and deep reinforcement learning, have recently demonstrated great potential in solving complex PI problems without human intervention, such as decoupling capacitor optimization and pre-layout power distribution network design. The incorporation of AI/ML in PI design has the potential to significantly reduce the PI design cycle and promote the advancement of artificial intelligence-assisted electronic design automation (EDA) tools. However, the reusability and generalization performance of the trained AI/ML algorithms in different scenarios is one of the biggest challenges in this direction. Moreover, the reliability of AI/ML algorithms in finding the optimal solution when optimizing a tremendous search space still demands continuous research. Therefore, a special session about AI/ML algorithms in PI design, which may contribute to new ideas and solutions to the above challenges, is essential and meaningful.



PLANNED SPEAKERS & TOPICS

Cost-Effective Hierarchical PDN Target Impedance Optimization Using PSIJ-Driven Deep Reinforcement Learning for Multiple Power Rails in a PCIe Gen6 SSD

Chulhee Cho, Hyeonggi Lee, Youngjun Ko, Sungjin Yoon, Seonho Um, Jinwook Song, Kyungsuk Kim, Sunghoon Chun
Samsung Electronics Co Ltd, Korea

Abstract: This paper presents a deep reinforcement learning (DRL)-based, pre-layout framework for multi-PDN target impedance optimization that simultaneously satisfies PSIJ constraints while minimizing cost, area, die decoupling capacitance, and parasitic margin trade-offs. Coupled multi-rail behavior is modeled using a modular Y-parameter-based cascading method, and a physics-informed generalized input representation is employed to encode frequency-domain characteristics, PDN topology, parasitic effects, on-die parameters, and performance objectives. The optimization is carried out using a Transformer-based actor-critic architecture trained with Proximal Policy Optimization (PPO), enabling stable learning and strong generalization across varying current profiles and jitter sensitivity conditions. Experimental results show that the proposed approach consistently meets PSIJ targets with power integrity performance comparable to genetic algorithm (GA) optimization, while achieving orders-of-magnitude reduction in turn-around time (TAT) through one-shot inference, making it suitable for cost-aware, shift-left PDN design.

Generative AI-Driven Placement of Decoupling Capacitors for Power Integrity Compliance

Nima Ghafarian Shooaei¹, Werner John^{1,2}, Ralf Brüning³, Jürgen Götze¹

¹*Technische Universität Dortmund, Germany;*
²*PYRAMIDE2525, Germany;* ³*EMC Technology Center Paderborn, Zuken GmbH, Germany*

Abstract: This paper presents a generative artificial intelligence framework for an automated synthesis of power delivery networks (PDNs) of printed circuit boards (PCBs), specifically addressing the optimal type and placement of decoupling capacitors (decaps) on the boards. To overcome the computational bottlenecks of traditional iterative optimization, a Conditional Wasserstein Generative Adversarial Network with Gradient Penalty (cWGAN-GP) has been employed to generate placement configurations conditioned on specific component counts. The candidates are subsequently validated for Target Impedance (TI) compliance using a pre-trained Artificial Neural Network (ANN) acting as a fast surrogate model. Experimental results demonstrate that the framework effectively scales from limited datasets to discover novel, TI-compliant designs with minimal component counts which were absent from the training data. This approach significantly accelerates the design process, enabling the synthesis of high-performance PDN solutions in minutes without relying on time-intensive physics-based simulations.

Improvement of ML Based Fast Impedance Matrix Prediction for Subsequent PCB Decoupling

Jan Hessling¹, Haran Manoharan², Nikoloz Kharshiladze², Chulsoon Hwang², Christian Schuster¹

¹*Technische Universität Hamburg, Germany;* ²*Missouri University of Science and Technology, USA*

Abstract: This work investigates the requirements for machine learning (ML) based printed circuit board (PCB) impedance matrix prediction tools for subsequent decoupling. The reliable integration of ML-driven impedance prediction and decoupling capacitor (decap) placement is a cornerstone for fully automated decoupling of PCBs, leading to significant speed-ups in the design of power delivery networks (PDNs). Here a problem was detected regarding the required quality of data-based models. The accuracy demanded from modeling techniques must be determined with regard to the entire processing toolchain. While the prediction of self and transfer impedances in the frequency range from 1 MHz to 1 GHz shows high accuracy, the resulting decoupled input impedance can deviate significantly from simulation results, if proper conditions are not met. Hence, the investigation of this problem is a prerequisite for the combination of already existing fast impedance prediction and automated decoupling tools. It is shown that the accuracy of self and transfer impedance predictions within the frequency range of up to 50 MHz is crucial for the decoupling. An improvement to the impedance prediction tool is proposed and a threshold for the accuracy of the impedance prediction is found.

Efficient Power and Thermal Integrity Co-Optimization in Fan-Out Wafer-Level Package Using Multi-Objective Bayesian Optimization

Jisoo Hwang^{1,2}, GiWon Kim³, HyunJoon Jeong³, Myunghoon Lee⁴, Ki Wook Jeong⁴, SoYoung Kim^{1,2,3}

¹*Sungkyunkwan University, South Korea;* ²*Samsung Electronics Co., Ltd., South Korea;* ³*Sungkyunkwan University, South Korea;* ⁴*Synopsys Korea, South Korea*

Abstract: Advanced packages for mobile application processors (APs) require simultaneous power integrity (PI) and thermal integrity (TI) optimization due to increasing power density and routing constraints. This work presents a multiobjective Bayesian optimization (MOBO) framework that cooptimizes decoupling capacitor (decap) allocation and floorplanning using a hybrid evaluation engine. A physics-based PDN evaluator and an artificial neural network (ANN) thermal surrogate replace expensive conventional simulations, enabling rapid design-space exploration. The proposed system demonstrates superior efficiency in achieving a balanced PI/TI trade-off, exhibiting faster convergence and enhanced optimization performance compared to the traditional genetic algorithm (GA) and random search baselines. This methodology is particularly critical for next-generation low-profile AP packages where PI and TI trade-off is increasingly severe.

Genetic Algorithm (GA) Based TSV Placement Optimization for HBM Considering DC IR Drop

Byeongmok Kim¹, Chaemin Yang¹, Jiwon Yoon¹, Junho Park¹, Jaeyeun Bae¹, Youngsu Yoon¹, Eunji Seo¹, Haeyeon Kim², Hyunsik Kim², Taeil Bae², Inchul Jeong², Jounggho Kim¹
¹Korea Advanced Institute of Science and Technology, Korea; ²SK hynix Inc, Korea

Abstract: This paper proposes a genetic algorithm (GA)-based through-silicon via (TSV) placement optimization method for high bandwidth memory (HBM) to address DC IR drop in high-stack 3D configurations. The proposed framework employs a graph-based power distribution network (PDN) model combined with Modified Nodal Analysis (MNA), enabling accurate voltage distribution calculation across all stacked layers with computational efficiency through caching mechanisms. For various design constraints including cell regions and peripheral keep-out zones, the proposed method optimizes TSV placement through six evolutionary stages. The fitness function penalizes both the total IR drop exceeding specifications and the number of violation points to guide strategic TSV placement. For verification, the proposed method is applied to a 12-Hi HBM3E configuration with a 20X20 grid, optimizing 140 TSVs from 280 available positions under realistic design constraints. The optimized placement strategically positions TSVs to establish low-resistance power delivery paths, minimizing reliance on high-resistance metal layers. The proposed GA-based approach achieves 5% better fitness score compared to random search (RS) and simulated annealing (SA) baselines with similar computational time, demonstrating superior optimization capability through guided evolutionary search.

Beyond Grids: Scalable and Precise PDN Impedance Prediction via Multi-Task Graph Neural Networks

Keunwoo Kim, Junghyun Lee, Byeongmok Kim, Youngsu Yoon, Haeseok Suh, Jounggho Kim
Korea Advanced Institute of Science and Technology, Korea

Abstract: In this paper, we propose a scalable and geometry-aware Graph Neural Network (GNN) framework for the rapid and precise prediction of Power Delivery Network (PDN) impedance. Unlike traditional grid-based deep learning methods that suffer from resolution-dependency and fixed input dimensions, our approach models PDN structures as a graph using a Star-Ring hybrid topology. This representation enables the handling of arbitrary geometries and varying physical scales without the loss of spatial fidelity. We constructed a comprehensive dataset of 10,000 verified samples, equally partitioned into four configurations based on vertex count (4 and 8) and physical scale (± 10 mm and ± 100 mm). To enhance predictive accuracy, we employ a multi-task learning strategy where the simultaneous prediction of resonance frequencies serves as an auxiliary physical hint, effectively guiding the GATv2-based encoder to capture complex electromagnetic behaviors. Verification against full-wave EM simulations demonstrates that the proposed framework achieves high precision across drastically different board sizes without architecture modification. Notably, the model delivers a staggering 99.9996% reduction in computational time, with an average inference time of 4.2122 ms compared to 1,200 seconds for conventional solvers. By establishing a unified graph-based representation, this work provides a scalable alternative to iterative simulations and suggests a foundational path toward a "PDN Foundation Model" for next-generation high-speed electronic design automation (EDA).



Photo by Richard Georgerian



Physics-Aware Tensor Learning for Data-Efficient Multi-Port Power Distribution Network Analysis

BEST SIPI STUDENT PAPER FINALIST

Junghyun Lee, Hyunjun An, Seungjae Lee, Keunwoo Kim, Youngsu Yoon, Byeongmok Kim, Haeseok Suh, Junho Park, Jaegeun Bae, Chaemin Yang, Gwantaek Lee, Joungho Kim

Korea Advanced Institute of Science and Technology, Korea

Abstract: In this paper, we propose a physics-aware tensor representation learning framework for ultra-multi-port power distribution network (PDN) analysis, addressing the dual challenges of the curse of dimensionality (CoD) and the lack of physical interpretability in conventional data-driven approaches. Traditional matrix-based approaches and generic machine learning models typically struggle with the $O(N^2)$ complexity of massive impedance tensors and often act as black-box models that fail to explain underlying electromagnetic (EM) mechanisms. To overcome these limitations, our method employs Tucker decomposition to factorize the high-dimensional data into a compact core tensor and interpretable factor matrices. This approach not only achieves dramatic data compression—reducing complexity to a near-linear $O(N)$ scale—but also explicitly disentangles spatial coupling patterns and spectral resonance modes, effectively performing a blind source separation of cavity physics. Validated on an interposer PDN using a reliability-aware focal learning scheme, the proposed framework demonstrates high-fidelity reconstruction of resonance peaks and robust latent feature extraction capabilities. This work establishes a scalable, interpretable foundation for next-generation explainable artificial intelligence (XAI)-assisted power integrity (PI) design.

Holistic Optimization of Package Substrates in Multiple Power Domain 3D-ICs using Hierarchical Reinforcement Learning

Seunghun Ryu¹, Seonghi Lee¹, Sanguk Lee¹, Hyunwoo Kim¹, Dongryul Park¹, Jinwook Lee¹, Seokbeom Yong², Sangsub Song², Seungyoung Ahn¹

¹*Korea Advanced Institute of Science and Technology, Korea*; ²*Samsung Electronics Co Ltd, Korea*

Abstract: According to the demand for compact footprint design of mobile application processor (AP), 3D-ICs are adopted to achieve dense layout, while enabling low power consumption through multiple power domain (MPD). However, the MPD systems introduce unpredictable power noise and PDN design challenges. Package-driven design with early PDN planning can be a promising solution; however, package substrate involves diverse and interdependent components, including package plane, decap, microvia, and BGA, resulting in a large combinatorial design space. This paper proposes a hierarchical reinforcement learning (HRL) framework that decomposes complex multi-stage optimization into sub-tasks with localized rewards, enabling efficient learning. In addition, a unit cell-based modeling method is introduced for the rapid evaluation of simultaneous switching noise (SSN) for 3D package substrate structures. The proposed method demonstrates strong generalization across various initial layouts and switching current profiles, and outperforms conventional optimization techniques and flat reinforcement learning (RL) approaches while achieving SSN suppression, electromigration (EM) reliability, and reduced BGA-level partial PDN impedance.

Graph Attention Network based Reinforcement Learning (GAT-RL) for Spiral Through-Silicon Via Placement Optimization in HBM considering Power Noise and Crosstalk Reduction

Youngsu Yoon, Joonsang Park, Keunwoo Kim, Seonguk Choi, Junghyun Lee, Hyunjun An, Jiwon Yoon, Haeseok Suh, Byeongmok Kim, Junho Park, Jaegeun Bae, Joungho Kim

Korea Advanced Institute of Science and Technology, Korea

Abstract: In this paper, we propose a graph attention network-based reinforcement learning (GAT-RL) method for optimizing spiral signal through-silicon via (TSV) and power/ground (P/G) TSV placement in high-bandwidth memory (HBM). Next-generation HBM demands higher data rate and TSV density for extreme memory bandwidth. Accordingly, spiral TSV is introduced to mitigate capacitive loss at high-frequency. However, placement optimization considering spiral structure has not been suggested due to geometric complexity. Therefore, we formulate this problem as a Markov decision process (MDP) and leverage GAT to capture spatial relationships among different TSV types. The proposed method optimizes signal integrity (SI) by maximizing spiral signal TSV block separation and improves power integrity (PI) by promoting P/G TSV interleaving. Experimental results demonstrate that GAT-RL outperforms genetic algorithm (GA) and random search (RS) in both solution quality and computational cost. Furthermore, 3D EM simulations and SPICE validate that GAT-RL achieves the lowest crosstalk and power noise among all methods.

PDN Design Agent Auto-Modeling Framework with BO-Based Hyperparameter Optimization for Multi-Package DRAM Modules

Jaeyoung Shin^{1,2}, Jonghoon Kim², HyunJoon Jeong¹, Sunghoon Chun², SoYoung Kim¹

¹*Sungkyunkwan University, Korea*; ²*Memory Business, Device Solution Division, Samsung Electronics, Korea*

Abstract: This paper proposes a Bayesian Optimization (BO)-based auto-modeling framework for a package-wise multi-objective Q-learning PDN decap design agent in multi-package DRAM modules. Each DRAM package is treated as an independent objective with its own Q-table, and learning terminates only when the target impedance is satisfied for all packages. A BO-based auto-modeling agent evaluates design quality, decap count, and runtime using 100 Latin Hypercube Sampling (LHS) cases and 20 BO-generated cases. For an 8-package DDR5 DIMM, the proposed method reduces package-to-package impedance variation from 33% to 0.1% at 1 MHz and from 50% to 18% at 10 MHz. Among the tested strategies, BO with LHS shows the most consistent convergence to the highest design agent score.

**TC12_1
TECHNICAL
PAPERS**

WIRELESS EMC (II): IMMUNITY, COEXISTENCE & ENVIRONMENTAL EFFECTS

8:30 AM - 10:00 AM

Room: Coronado D

Sponsored by TC-12 EMC for Emerging Wireless Technologies

Co-Chairs:

Gang Feng, *Fidus Systems*
Wenchang Huang, *Missouri University of Science and Technology*

PLANNED SPEAKERS & TOPICS

Radiated Immunity Enhancement Techniques For Wireless Rechargeable Energy Storage Systems

Saranraj Karuppuswami, Aseim Elfrgani,
Md Rayhan Khan
General Motors Company, USA

Abstract: In this paper, several techniques are investigated to improve the radiated immunity of the wireless communication network within the battery electric vehicle's rechargeable energy storage system (RESS). These techniques improve the overall performance of the wireless network and prevent external jamming or interference. The techniques investigated are (i) steel grid vent, (ii) metal coated thermal barrier or blanket, and (iii) conductive screws/joints along the perimeter. A numerical study of standalone and combination of (i), (ii), and (iii) is presented that shows significant improvement to the immunity of the system and enhances the security as well as robustness of battery diagnostics communication network within the RESS.

Concept of Using RF Stirrers to Improve the Reading Range of RFID Systems

Krzysztof Sieczkarek^{1,2}, Adam Mackowiak¹,
Tomasz Warzynski¹

¹*Lukasiewicz - Poznan Institute of Technology, Poland;*

²*EMC Pro, Poland*

Abstract: The article presents concept, design and build of the test set-up to conduct research using the RF reflection effect to improve the readability of tags used in RFID (Radio-Frequency IDentification) systems. The reason for this work was the well-known fact that RFID tag readability decreases in the presence of obstacles, such as water, metal, or external electromagnetic interference.

Emission Monitoring in a Radio Dynamic Zone

William F. Young, Patricia Larkoski, Curtis Watson,
Erick Caspers, Jim Doty, Andrew J. Michael, Eric Powell
The MITRE Corporation, USA

Abstract: Successful adoption of Radio Dynamic Zones (RDZs) rely on long-term, in-situ demonstrations. To this end, the RDZ Knowledge and Integration Toolkit (RDZ-KIT) seeks to protect spectrum incumbents and experimental performers from harmful interference or disruption during initial deployment. RDZ-KIT sensors provide the ability to independently assess spectrum science research, offering insights and data for further development. We investigate edge-node bounding box and correlation detection analysis for monitoring dynamic spectrum sharing activity.



Photo by Karthik Vepuri

**TC10_14
TECHNICAL
PAPERS**

FILTERS & STANDARDS

8:30 AM - 10:00 AM
Room: Cortez A
Sponsored by TC-10 Signal and Power Integrity
Chair:

 Giorgi Maghlakelidze, *NVIDIA Corp*

PLANNED SPEAKERS & TOPICS

Impedance-Optimized Channel Design for High-Speed Underminated UCle Interconnects

 Yijia Ni, Li Zhang, Zhiyuan Cheng, Qiang Cui, Haitao You
 Zhejiang University, China

Abstract: High-speed interconnects in chiplet systems present significant challenges to signal integrity (SI), especially at elevated frequencies. This paper proposes SI-enhanced channel designs tailored for unterminated high-speed interconnects within the UCle protocol. Guided by an impedance optimization methodology with an analytical model of voltage transfer function-based insertion loss, a channel impedance range of 30-40 ff is identified as optimal to overcome the limitations on maximum length or transmission rate typically imposed by SI constraints. Electromagnetic simulations demonstrate that the optimized channels significantly outperform the traditional 50 ff channel, offering superior mitigation of high-frequency loss and crosstalk. Consequently, this extends the maximum channel length by 25%, exhibiting robustness against process variations. Furthermore, the proposed channel meets SI requirements in an unterminated configuration even at a data rate of 48 GT/s, achieving a 75.88% improvement in eye opening.

Design of an Adjustable Multi-Stage Common-Mode Filter (AMS-CMF) for Ultra-Wideband Noise Suppression
BEST SIPI PAPER FINALIST

 Jinwook Lee, Seunghun Ryu, Sanguk Lee, Jaewon Rhee,
 Seungyoung Ahn, Jiseong Kim

Korea Advanced Institute of Science and Technology, Korea

Abstract: With data rates exceeding tens of Gbps, differential signaling in high-speed interconnects becomes increasingly vulnerable to common-mode (CM) noise arising from signal skew. This paper proposes an adjustable multi-stage common-mode filter (AMS-CMF) for ultra-wideband CM noise suppression in high-speed interconnects. The AMS-CMF incorporates a midstage structure that enhances the bandgap effect and induces inter-stage coupling, achieving stopband attenuation exceeding 20 dB across a 19.9 GHz bandwidth (10.5-30.4 GHz) while maintaining differential-mode signal integrity. Additionally, the unit-cell dimension-control technique reduces the overall filter length and enables improved compactness suitable for high-density packaging, which is difficult to achieve with conventional multi-stage filters. The filter performance is validated through 3D electromagnetic (EM) and circuit simulations in both frequency and time domains.

**TC10_7
TECHNICAL
PAPERS**

EMC, RADIATION & SHIELDING

8:30 AM - 10:00 AM

Room: Cortez B

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Lirim Koraqi, *Katholieke Universiteit Leuven*
Daniel Commerou, *Missouri University of
Science and Technology*

PLANNED SPEAKERS & TOPICS

Resistance Matrix Modeling of Radiation Emission and Susceptibility of Multi-Conductor Transmission Lines in Reverberant Enclosures

Weitao Dai, Paul Bremner, Conor McKeever
Robust Physics, USA

The Effectiveness of RF Absorption Materials

Tao Wang, Zian Gao, Brian Brecht, Nguyen Fabre
DIS Tech, USA

Abstract: Boosted by the hardware demands for the machine learning, AI, and data center, the signal delivery speed is unprecedented. 200 Gbps and above PAM4 high speed link design has become increasingly popular. This paper discusses the high speed link design details needed for 224 Gbps and many necessities concerns that are forgivable for low speed designs but not tolerable for high speed ones. Our testing coupon has demonstrated great correlation results after the mentioned details are carefully addressed throughout the design, modeling, and optimization process. This paper serves as a design guide for practical 224 Gbps signal delivery based on copper technology on the PCB boards.

Modelling of PCB Radiation Mechanisms and High Speed Digital Interconnects in Complex EMC Environments

Conor McKeever¹, Paul Bremner¹, Weitao Dai¹, Eric Bogatin², John Ladbury³, Timothy Clarke⁴, Charles Armstrong⁴, Tom Hussey⁴

¹Robust Physics, USA; ²University of Colorado Boulder, USA; ³NIST, USA; ⁴Air Force Research Laboratory, USA

Abstract: Accurate prediction of electromagnetic compatibility (EMC) behavior in modern electronic systems requires modeling approaches that consistently capture radiation coupling mechanisms in addition to complex electromagnetic environments. This paper presents a comprehensive modeling framework with particular emphasis on physics-based radiation models for PCB structures, including Green's function expansions that describe edge radiation in the presence of grounding vias, as well as slot and connector radiation mechanisms. These radiation models are embedded within a unified statistical and deterministic framework that incorporates reverberation-based statistical field representations and cable/PCB transfer functions. The combined approach links conducted and radiated interference mechanisms across a wide frequency range while remaining computationally efficient. Comparisons with experimental measurements demonstrate that the framework accurately captures the dominant radiation-driven coupling paths governing electromagnetic interference in realistic system-level configurations.



TC7_1
TECHNICAL
PAPERS

EMI IN ELECTRIFIED TRANSPORT

8:30 AM - 10:00 AM

Room: Cortez C

Sponsored by TC-7 Electrical Systems and Power Electronics EMC

Chair:

Petre-Marian Nicolae, *University of Craiova*

Co-Chairs:

Cong Li, *GE Aerospace*Niek Moonen, *Universiteit Twente*

PLANNED SPEAKERS & TOPICS

Transfer Function Methodology for Shaft-based Emissions in Electrified Vehicles

Nitin Parsa, Varittha Sanphuang, Ronald Missier, Keith Frazier

Ford Motor Company, USA

Abstract: This paper presents a transfer function methodology to analyze the shaft induced emissions and their noise propagation path in an electrified vehicle. Developed using subsystem and vehicle level measurements, the transfer function mathematically relates noise at the three phase terminals to the radiated emissions detected by the receiving antenna during testing. Results show strong agreement between the direct chamber measurement and transfer function-based approach.

Subsystem Level EMI Simulation for Automotive Applications

Aasiya Sameen¹, Shamba Mitra¹, Nikita Ambasana¹, Suchetha Pittala¹, Surender Elumalai², Jay Pandya², Arun Nair², Anjay Prasad², Jan Carsten Hansen³, Bibhu Prasad Nayak³¹*Simyog Technology Pvt. Ltd, India;* ²*Mercedes-Benz**Research and Development India Private Limited, India;*³*Graz University of Technology, Austria*

Modeling and Evaluation of Conducted and Radiated Interference from Pantograph-Catenary Arcs at High-Speed Railway Electric Phase Division

BEST EMC PAPER FINALIST

Ke Huang, Yang Yang, Feng Zhu

Southwest Jiaotong University, China

Abstract: Due to phase division in traction power supply systems, electric multiple units (EMUs) experience pantograph-catenary (PC) arc as the pantograph transitions from the energized section to the neutral section, resulting in both conducted and radiated electromagnetic interference. The arc induces severe train-body (TB) voltage fluctuations, which may exceed the 2 kV withstand limit and threaten onboard equipment, while simultaneously generating broadband electromagnetic radiation that may interfere with nearby electronic facilities in the railway environment. This paper presents a unified modeling and evaluation framework for both conducted and radiated interference. An integrated equivalent circuit model of the traction power supply grid, EMUs, and arc is developed, in which the key coupling paths affecting TB voltages are comprehensively considered. Time-domain simulations provide arc currents and TB voltages for conducted interference assessment, while radiated emissions are subsequently derived. Field measurements further validate the radiation analysis, showing that, relative to the common section, arc-induced radiation is markedly enhanced and exhibits broadband characteristics spanning 0.9-1200 MHz.



Photo by Richard Georgerian

ED14
EXPERIMENTS &
DEMONSTRATIONS**IMPACT OF CABLE LENGTH, PARASITIC CAPACITANCE, AND WINDING CONFIGURATION ON IMPEDANCE MEASUREMENTS OF CABLE FERRITES****10:00 AM - 12:00 PM****Room: E&D Booth 1, Exhibit Hall****Sponsored by TC-4 Electromagnetic Interference Control****ABSTRACT:**

Accurate impedance characterization of cable ferrites is essential for selecting the appropriate suppression component in electromagnetic compatibility (EMC) applications. However, measurement accuracy can be significantly affected by the test setup, particularly the properties of the cable used during the evaluation. This demonstration investigates how cable length, routing, and associated parasitic capacitance influence impedance measurements of cable ferrites across frequency. Through practical examples, we show how longer cables introduce resonant behaviors that distort the expected impedance profile, potentially leading to incorrect component selection. In addition, the

demo compares the impact of different numbers of turns on the ferrite core and highlights how this interacts with material characteristics. Using samples of various ferrite materials, we examine their complex permeability curves and illustrate how material choice determines suppression performance over frequency. The session aims to provide attendees with a deeper understanding of best practices for reliable ferrite impedance measurements, emphasizing how test setup optimization and material knowledge contribute to achieving consistent and meaningful EMC results.

PRESENTER

Gustavo Perez, *Wurth Elektronik eiSos GmbH & Co KG*

ED17
EXPERIMENTS &
DEMONSTRATIONS**PCB MEASUREMENT AND SIMULATION VALIDATION USING A NANOVNA AND A COMMUNITY-BASED EM SOLVER****10:00 AM - 12:00 PM****Room: E&D Booth 2, Exhibit Hall****Sponsored by TC-9 Computational Electromagnetics****ABSTRACT:**

This Experiments & Demonstrations (E&D) session presents a hands-on PCB measurement workflow using an affordable vector network analyzer (NanoVNA), combined with electromagnetic (EM) simulation-based validation.

Printed circuit board (PCB) test structures will be measured using a NanoVNA, and representative frequency-domain results such as S-parameters will be obtained. Community-based (free) numerical EM simulations of the corresponding configurations will then be used to validate the measured results, highlighting agreement, modeling assumptions, and sources of discrepancy.

Based on this validation, the demonstration will further show how EM simulation can be used to extend analysis beyond what can be practically measured during a live session, providing additional insight into PCB behavior. The session emphasizes the complementary roles of measurement and simulation, with a particular focus on simulation as a tool for validation and future design exploration.

PRESENTERS

Johnny Himbele, *Tanager*
Patrick DeRoy, *Analog Devices Inc.*
Louann Mlekodaj, *Shure, Inc.*

ED20
EXPERIMENTS &
DEMONSTRATIONS**UNDERSTANDING NEAR-FIELD PROBE CONCEPTS
AND DESIGN THROUGH SIMULATION,
MEASUREMENT, AND COMPARISON****10:00 AM - 12:00 PM****Room: E&D Booth 3, Exhibit Hall****ABSTRACT:**

This demonstration combines simulation and measurement to examine the physics and practical design of near-field sniffer probes. Full-wave electromagnetic simulations are used to illustrate key near-field coupling mechanisms and to guide the design of low-cost, do-it-yourself (DIY) probe geometries. The simulated behavior is correlated with measurements from fabricated probes, and performance is

compared with commercially available near-field probes. Techniques for quantifying probe frequency range and for integrating probes with low-noise amplifiers (LNAs) are demonstrated. The session concludes with a live demonstration of optimized probe designs and near-field measurements, reinforcing the connection between simulation, theory, and practice.

PRESENTERClint Patton, *GoEngineer*ED19
EXPERIMENTS &
DEMONSTRATIONS**TAMING MAGNETIC CHAOS: NEXT GEN
NANOCRYSTALLINE & FERRITE ABSORBERS
FOR LOW-FREQUENCY EMI****10:00 AM - 12:00 PM****Room: E&D Booth 4, Exhibit Hall****Sponsored by TC-7 Electrical System and Power Electronics EMC****ABSTRACT:**

Low-frequency magnetic interference remains one of the most difficult challenges in modern electronic systems, especially in applications involving Wireless Power Transfer (WPT), NFC, and tightly integrated electronics. Traditional ferrite-based magnetic absorbers, such as flexible absorber sheets and flexible sintered ferrite sheets, have long been the industry's workhorses for mitigating magnetic coupling, suppressing resonances, and stabilizing near-field behavior. Their high permeability and predictable frequency response make them indispensable in many designs, yet they reach intrinsic limits when broader bandwidth, thinner form factors, or stronger low-frequency suppression are required. This experiment introduces a next-generation nanocrystalline magnetic absorber designed to extend EMI suppression performance into regions where ferrite materials begin to struggle. By leveraging stacked ultra-thin nanocrystalline layers with exceptionally high permeability and low coercivity, this new material exhibits

superior absorption in the low-frequency domain while avoiding the reflections, detuning effects, and integration constraints commonly encountered with metallic shielding solutions. The session will present a comparative study between nanocrystalline absorbers and established magnetic absorber solutions, including permeability behavior, frequency response, mechanical characteristics, and impact on the overall electromagnetic environment. Practical demonstrations will show how these materials perform in real-world wireless applications, such as an NFC communication setup and a wireless power transfer system, emphasizing how absorber-based shielding can stabilize resonant circuits without degrading coil efficiency. By combining ferrite heritage with nanocrystalline innovation, this work highlights a new path forward in achieving broadband, low-intrusion EMI control for next-generation wireless designs.

PRESENTERVictor Martinez Garcia, *Wurth Elektronik eiSos GmbH & Co KG*

**TC2.5
TECHNICAL
PAPERS**

EMC MEASUREMENTS - PCB LEVEL ASSESSMENTS

10:30 AM - 12:00 PM

Room: Coronado A

Sponsored by TC-2 EMC Measurements

Chair:

Monrad Monsen, *Oracle*

PLANNED SPEAKERS & TOPICS

High-Frequency PDN Characterization of a PCB using Optical Isolation up to 1 GHz Frequency

BEST EMC PAPER FINALIST

Aishwarya Gavai^{1,3}, Jan C. Hansen²

¹*Indian Institute of Science, India*; ²*Institute of Electronics, Austria*; ³*Mercedes-Benz Research and Development India, India*

Abstract: Accurate high-frequency characterization of power distribution networks (PDNs) on complex printed circuit boards (PCBs) is crucial for predicting electromagnetic emission behavior near the integrated circuit (IC) chip. Conventional tip probing methods with the Vector Network Analyzer (VNA) introduce unintended current loops between the measurement setup and the PCB ground planes, distorting the s-parameter response. This paper proposes an optically isolated injection setup to break the RF return path between the measurement instrument and the PCB, thereby ensuring a common-mode isolation at high frequencies. The approach is demonstrated on a commercial STM32 microcontroller board, where the PDN transfer function is measured up to 1 GHz with the IC removed. In addition, the PDN and probe coupling are modeled using combined full-wave 3D electromagnetic and circuit simulations. Measured and simulated results show good correlation up to 1 GHz, validating the proposed methodology for accurate PDN characterization.

An Approach for Current Source Reconstruction in Underdetermined Conducted EMI Systems via Null-Space Completion

Aishwarya Gavai^{1,3}, Jan C. Hansen²

¹*Indian Institute of Science, India*; ²*Institute of Electronics, Austria*; ³*Mercedes-Benz Research and Development India, India*

Abstract: Reconstructing on-board EMI sources from sparse voltage measurements is a fundamental challenge in PCB-level conducted-emission analysis. In practical systems, the number of accessible measurements is often smaller than the number of active IC noise sources, yielding an underdetermined inverse problem with a nontrivial nullspace. Conventional least-squares solutions are therefore non-unique and may fail to recover dominant but weakly observed sources. This paper formulates IC noise reconstruction as a structured inverse problem and proposes a nullspace-completion framework that incorporates physically motivated priors to recover missing source components. The approach is demonstrated on a canonical two-IC circuit and validated on a realistic STM32-based PCB model. Parametric studies examine the effects of source strength, LISN coupling asymmetry, and regularization, providing practical guidance for EMI source identification with sparse measurements, including implications for effective measurement placement.

Measured Crosstalk Induced Onto UTP Circuits From Patch Heaters

David Norte

BAE Systems, Inc., USA

Abstract: Patch heaters are often used to provide temperature control within regions of a space vehicle. Oftentimes, due to space constraints, it is necessary to route unshielded circuits either directly across a patch heater or next to it. In this case, crosstalk can occur during the Turn-ON and Turn-OFF events. This paper extracts the induced crosstalk from typically encountered patch heaters onto unshielded twisted pair circuits.

TC12_2
TECHNICAL
PAPERSWIRELESS EMC (I): RF INTERFERENCE AND
DESENSE

10:30 AM - 12:00 PM

Room: Coronado D

Sponsored by TC-12 EMC for Emerging Wireless Technologies

Chair:

Harry Skinner, *Intel Corporation*

Co-Chairs:

Chaofeng Li, *Qualcomm Inc*Jiahuan Huang, *Missouri University of
Science and Technology*

PLANNED SPEAKERS & TOPICS

Multi-Layer Frequency-Selective Surface Design for RF
Interference MitigationDaniel L. Commerou¹, Suho Lee¹, Jin Sub Oh¹, Victor
Khilkevich¹, Yuanzhuo Liu², Rohit Sammeta², Jagan
Rajagopalan², Chulsoon Hwang¹¹Missouri University of Science and Technology, USA;²Amazon Lab126, USA

Abstract: This paper presents a space-constrained frequency-selective surface (FSS) approach for mitigating RF interference in highly integrated systems with locked design constraints. The dominant coupling path between an external noise source and a victim antenna is identified using Poynting vector backtracking, enabling targeted mitigation. A space constrained FSS is designed and evaluated. Simulation and measurement results across multiple test benches, including a full device implementation, demonstrate mean attenuation of 4-5 dB and peak attenuation approaching 9 dB in Wi-Fi bands. Compared to a broadband absorber of equal size, the designed FSS provides significantly improved attenuation efficiency.

PMIC-Induced RF Desensitization Analysis in a Remote
Device

BEST EMC PAPER FINALIST

BEST EMC STUDENT PAPER FINALIST

Wenchang¹, Shengxuan Xia¹, Xuechen Huang²,
Guangqiang Jiang², Chulsoon Hwang¹¹Missouri University of Science and Technology, USA;²Axonics Inc, USA

Abstract: The noise generated by PMIC can potentially cause radio frequency (RF) desensitization issues due to suboptimal PCB layout and power distribution network (PDN) design. This paper systematically identifies and analyzes the RF coupling from the PMIC to the RF antenna in a remote device. Based on the near-field scanning results, the reconstructed equivalent dipole moment is substituted into the reciprocity theorem to validate the coupling mechanism. As multiple coupling paths exist, coupling path visualization is utilized to understand the coupling mechanism and identify the dominant coupling path. Building on the validated coupling mechanisms, an optimized PCB layout and improved PDN are proposed to mitigate coupling noise from the PMIC to the RF antenna by over 6 dB in measurement and simulation.

Intermodulation Effects of Devices Combined with
Radio Equipment - Test Procedures and Challenges
According to CISPR 32 and IEC 61000-6-3Florian Hubert^{1,2}, Markus W. Wohlrath³, Thomas
Zitzelsberger⁴, Christian Paulwitz⁵, Stephan Kloska⁶,
Jochen Guethe³, Karl-Heinz Schraink³¹Technical University of Applied Sciences Wuerzburg-
Schweinfurt, Germany; ²Siemens Healthineers AG,
Germany; ³Siemens AG, Germany; ⁴TQ-Systems GmbH,
Germany; ⁵TDK Electronics AG, Germany; ⁶VDE Testing
and Certification Institute, Germany

TC10_6
TECHNICAL
PAPERS

TRANSMISSION LINE PHYSICS & ROUTING

10:30 AM - 12:00 PM

Room: Cortez A

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Junyong Park, *Kyung Hee University*Kinger Cai, *Arm Ltd*

PLANNED SPEAKERS & TOPICS

Serpentine Traces Can be Faster Than Straight: Measurements, Physical Explanations, and Implications for High Speed PCB Design**BEST SIPI PAPER FINALIST**Sean S. Hwang¹, Kevin Cai¹, Felen Fu², Kai Li², Yan Li², Bidyut Sen¹¹Cisco Systems, Inc., USA; ²Cisco Systems, Inc., China

Abstract: Laboratory measurements on PCB coupons show that serpentine stripline routing using bends can exhibit shorter flight time than a straight segment of the same length and width. This paper explains the counterintuitive result from first principles, and quantifies the effect with two simple closed-form models that provide lower and upper bounds on the shortened electrical path through a right angle bend. VNA measurements on flight time difference on equal length straight vs. serpentine pairs lie strictly between these bounds. We give a first principle explanation rooted in skin effect and current/field redistribution at bends (finite edge crowding), and we provide design recommendations for skew budgets in modern high speed digital links where meeting the timing margin is becoming increasingly challenging.

A Study on The Influence of Woven Material Variation on Signal Integrity CharacteristicsChangChih Liu, KuoLiang Chao, Peiwen Huang
Taiwan Union Technology Corporation, Taiwan

Abstract: When differential pairs are routed on copper-clad laminate (CCL) substrates, transmission line rotation is commonly employed to mitigate skew. However, due to the dielectric constant (Dk) mismatch between glass fibers and resin, a periodic variation in the effective dielectric constant is introduced along the signal propagation path. As a result, strong signal reflections occur at certain frequencies, leading to pronounced insertion loss degradation. In addition to the dominant insertion loss notch induced by reflections, practical transmission lines exhibit supplementary notch phenomena. This paper employs a stripline configuration embedded in 1067 woven glass fabric to elucidate the underlying mechanism causing a differential signal pair to experience a secondary notch at 23.92 GHz, distinct from the primary notch at 31.78 GHz.

Effects of Modal Phase-Velocity Mismatch on Signal Skew Compensation in a Differential PairDong Jae Go¹, Byung cheol Min¹, Mun Ju Kim¹, Abhijit Wander^{2,3}, Raheeq Darweesh², Kang Wook Kim¹¹Kyungpook National University, Korea; ²Amphenol Communications Solutions, USA; ³Cisco Systems Inc., USA

Abstract: In ultra-high-speed digital transmission, signal skew has emerged as a critical signal integrity challenge, contributing to electromagnetic interference and increased burden on receiver equalization and clock-recovery circuitry. In differential interconnects, intra-pair length differences such as those introduced by routing corners cause timing skew between the two conductors, resulting in differential-to-common-mode conversion. To mitigate this effect, conventional design practice employs length-matching structures placed near the source of mismatch. However, in non-homogeneous transmission lines such as differential microstrip, the phase velocities of the differential and common modes differ due to their distinct effective dielectric constants. As a result, conventional length-based skew compensation becomes ineffective, especially in tightly-coupled cases. In contrast, a differential stripline supports a TEM mode in which the differential and common modes propagate with identical phase velocities, enabling effective skew compensation for intra-pair length mismatches. This paper investigates the underlying electromagnetic mechanisms governing modal phase-velocity mismatch and its impact on skew compensation, using full-wave 3D electromagnetic simulations, system-level eye-diagram analysis, and measurements on fabricated structures.

TC10_8
TECHNICAL
PAPERS

SIMULATION & MATHEMATICAL MODELING

10:30 AM - 12:00 PM

Room: Cortez B

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Hanfeng Wang, *Google Inc*Daniel Commerou, *Missouri University of
Science and Technology*

PLANNED SPEAKERS & TOPICS

**Progress in Decompositional Electromagnetic Analysis
of Digital Interconnects**

Yuriy Shlepnev

Simberian Inc., USA

Abstract: In the realm of PCB and packaging interconnect design, electromagnetic analysis tools have transitioned from optional to essential over the last two decades, as data rates soared beyond 6 Gbps. Today, with standard data rates eclipsing 6 Gbps and reaching thresholds of 448 Gbps, these tools are indispensable for designing reliable interconnects. The goals of the interconnect analysis are simple: identify interconnects that may fail at the target data rate and allow troubleshooting and fixing the problem. The most efficient approach to such pass-fail analysis is the Decompositional Electromagnetic Analysis (DEA). It allows separation of the signal degradation factors for faster analysis and troubleshooting. This paper outlines the basic elements of DEA, discusses conditions for its accuracy and underscores its significance in the future of interconnect design.

**SEE: Fast and Accurate Transient Simulation and
Eye Diagram Prediction for Non-Linear High-Speed
Signaling Systems via Word-Level Waveform Stitching
and Dynamic Programming**Karthik V. Aadithya, Pranita Kerber, Ian J. Timmins
Sandia National Laboratories, USA

Abstract: As data rates have exploded, modern high-speed links and signaling systems have become increasingly non-linear. The combined impact of non-linear distortions produced by transmit (TX) and receive (RX) side circuitry, together with linear dispersions produced by the channel (CHA) in between, makes the design, modeling, analysis, simulation, and verification of these systems extremely challenging. In this paper, we propose SEE, a computational technique to quickly and accurately simulate and analyze modern high-speed links, even in the presence of strong non-linearities. SEE works by first gathering the given system's responses

(eg, via SPICE simulations) to several short input bit sequences, called words. Having done so, SEE is able to predict the system's response to any arbitrarily long sequence of input bits, simply by "stitching together" appropriate features from the gathered word responses. Thus, SEE can perform fast transient simulation of the given system, achieving close to SPICE-level accuracy at a fraction of SPICE's computational cost. Moreover, SEE's waveform stitching heuristic is amenable to word-level analysis via dynamic programming, which allows SEE to produce detailed and accurate eye diagrams for the given system analytically, ie, without brute force transient simulation. We validate SEE by applying it to both single-ended and differential gigabit-rate signaling systems featuring non-linear drivers.

**IBIS-AMI Modeling of Re-Driver Circuits via
Deconvolution-Based Impulse Response Extraction**Sanguk Lee¹, Seonghi Lee¹, Zhiping Yang², Hyunwoo Kim¹, Seungyoung Ahn¹, Chulsoon Hwang³¹*Korea Advanced Institute of Science and Technology, Korea;* ²*PCB Automation, USA;* ³*Missouri University of Science and Technology, USA;*

Abstract: As data rates increase, signal integrity (SI) degradation becomes more severe, necessitating the use of repeaters such as redrivers and retimers. Accurate SI evaluation of end-to-end link including repeaters requires transistor-level simulation to capture nonlinear behavior; however, extremely long transient periods make such simulations prohibitively time-consuming. While IBIS-AMI models can provide fast simulation alternatives, building IBIS-AMI model requires deep understanding of circuit behavior. This paper proposes a deconvolution-based IBIS-AMI modeling methodology for fast and accurate system-level SI simulation. The proposed approach extracts the impulse response from steady-state waveforms using least-squares deconvolution and integrates it into the IBIS-AMI framework. The mock-up circuit was configured for validation. The proposed method demonstrated excellent agreement with transistor-level simulations, achieving maximum errors of 6.6% for eye-height and 1.1% for eye-width while providing a 167x speedup. This approach enables efficient SI evaluation without requiring any understanding of circuit behavior by using only the extracted input/output waveforms of the redriver circuit.

**TC7_2
TECHNICAL
PAPERS**

DATA CENTER AND POWER ELECTRONICS EMC

10:30 AM - 12:00 PM

Room: Cortez C

Sponsored by TC-7 Electrical Systems and Power Electronics EMC

Chair:

Petre-Marian Nicolae, *University of Craiova*

Co-Chairs:

Cong Li, *GE Aerospace*

Niek Moonen, *Universiteit Twente*

PLANNED SPEAKERS & TOPICS

Return Current Distribution Challenges and EMC Implications in Open Rack Architectures

Mehdi Mechaik

TE Connectivity Corporation, USA

Abstract: Non-isolated DC architectures in open-rack systems merge logic ground, return, and chassis, enabling uncontrolled return-current paths through rack steel, enclosures, and cable shields. Small voltage gradients drive stray currents that concentrate near the power shelf, reducing EMC and SIPI margins and stressing connectors. This presentation analyzes these mechanisms in non-isolated open racks using FEM simulations and electromagnetic field plots.

Multiphysics Electromagnetic 3D Analysis of Full-Rack Busbar Assembly For AI Data Centers

Shahid Ahmed, Mehdi Mechaik, Hal Loket, Cody Grimshaw, Howard Heck, Sajjad Ahmed

TE Connectivity Corporation, USA

Abstract: As AI workloads push racks into multi-kilowatt, variable switching, high current operation, the

server rack becomes an electromagnetically complex structure rather than merely a passive enclosure. High-power busbars, narrow dielectric spacing, and rapidly switching converters introduce strong parasitic coupling, elevated electric-field stress, and stray current behavior that traditional models cannot predict. Grounding choices determine surface current flow and common mode noise, while rack cavities and nearby metallic structures act as resonators that couple energy at converter harmonic frequencies. These effects grow more severe in emerging, densely populated AI architectures. This study shows that full rack, multiphysics electromagnetic (EM) modeling is essential to ensure EMC integrity and safe operation in next generation AI data center racks.

A One-Stage Numerical Integration Method for EMT Simulations of Power Electronic Converters

Yohei Tanaka, Yoshihiro Baba

Doshisha Daigaku, Japan

Abstract: Electromagnetic transient (EMT) simulations are widely used to analyze power electronic converters. A numerical integration method based on magnetic flux and electric charge was previously proposed to simplify the handling of switching events in EMT simulations. This work demonstrates the applicability of the method to the analysis of a three-phase pulse-width modulation (PWM) inverter. Simulation results confirm that the approach can be effectively applied to the analysis of practical power electronic converters.

DALLAS FUN FACTS

A TRIBUTE TO JOHN F. KENNEDY

Located 2.5 miles from the Hilton Anatole in Dealey Plaza National Historic Landmark District is the Sixth Floor Museum, which chronicles John F. Kennedy's life and assassination. View the extensive collection of items related to Kennedy's assassination and 1960s culture, learn about the Texas School Book Depository building, and read the memory book with personal messages written by friends and family of JFK. In addition to the museum is the Memorial Plaza, an open tomb and sculpture which creates a special illusion to honor JFK.



2026 International Workshop on Advanced Interconnects

<http://wai-emc.com/wai2026> Nov 4-6, 2026 Hangzhou, China



Welcome to WAI 2026! This is the third **International Workshop on Advanced Interconnects (WAI)** to be held in Hangzhou, China, **Nov. 4 to 6, 2026**. The workshop will specially address the latest development and innovations on signal integrity (SI)/power integrity (PI) and electromagnetic interference (EMI) of advanced interconnects, including integrated circuits, IC packages, PCB, and cable connector, etc., and will serve as a broad exchange platform for both academia and industry.

You are warmly invited to submit a paper on your latest research results. Accepted full papers will be submitted for inclusion into IEEE Xplore subject to meeting IEEE Xplore's scope and quality requirements.

Technical Topics

The topics include but not limited to the following technical areas:

- **Advanced Interconnects and Packaging**
- **Signal and Power Integrity**
- **Electromagnetic Interference and Compatibility (EMI/EMC)**
- **Electrostatic Discharge (ESD) and Reliability**
- **Multiphysics Integrity**
- **Modeling, Simulation, and Design Methodologies**
- **AI and Intelligent EDA Technologies**
- **Measurement, Testing, and Validation**
- **RF, Microwave, Antennas, and Emerging Applications and Systems**

Instructions of submissions

The submission requires 1-page abstract or 3-page full paper. Both abstracts and full papers must follow IEEE conference paper templates, and can be submitted through <http://wai-emc.com/wai2026/submission>.

Special session or workshop/tutorial: Please send your proposal directly to gao.sp@nuaa.edu.cn or li-da@zju.edu.cn.

Authors of high-quality abstracts paper or full papers will be invited to submit the extended papers to the **IEEE Transactions on Signal and Power Integrity**!

Important Dates

- | | |
|---|---------------|
| ➤ Special session/workshop proposal | Jul. 31, 2026 |
| ➤ Full paper submission deadline | Aug. 31, 2026 |
| ➤ Abstract paper submission deadline | Aug. 31, 2026 |
| ➤ Notification of paper/abstract acceptance | Sep. 20, 2026 |
| ➤ Final paper submission date | Sep. 30, 2026 |

Information: If you need invitation letter for visa application or have other questions, please contact Prof. Ling Zhang at lingzhang_zju@zju.edu.cn

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zhoujiefeng@nuaa.edu.cn

Exhibition Chair:

Qiusen He
DetoolTech Ltd
heqiusen@detooltech.com

Call for Paper



浙江大学
ZHEJIANG UNIVERSITY



**TC9_6
TECHNICAL
PAPERS**

MODELING AND SIMULATION OF NONLINEAR, MULTIPHYSICS, AND DATA-DRIVEN EMC SYSTEMS

1:30 PM - 3:00 PM

Room: Coronado D

Sponsored by TC-9 Computational Electromagnetics

Chair:

Shaowu Huang, *Palo Alto Networks Inc*

Co-Chair:

Shengxuan Xia, *Missouri University of
Science and Technology*

ABSTRACT:

This session brings together advanced modeling and simulation techniques for electromagnetic compatibility (EMC), spanning multiphysics, nonlinear system behavior, and AI-assisted approaches. It covers matrix-free time-domain co-simulation and coupled electromagnetics with thermal and mechanical effects, including Lorentz-force-induced PCB vibration. The session also addresses nonlinear EMC phenomena in power electronic systems through physics-based SPICE modeling of switching dynamics and susceptibility in BLDC motor drives. In addition, it explores data-driven methods such as deep learning for RF safety prediction. Overall, the contributions highlight the growing importance of integrated, multiphysics, and AI-enhanced methodologies for accurate EMC analysis and design.

PLANNED SPEAKERS & TOPICS

**A Nonlinear Circuit Modeling Framework for EM
Susceptibility Analysis of BLDC Motor Drives**

Samuel Jung, Adam Tsouchlos, Praveen Madan, Jacob Johnson, Zhen Peng
University of Illinois Urbana-Champaign, USA

**Auto-Tuning/Fitting of Diode SPICE Models for SEED
Simulations**

Daniel Szanto¹, Tingyu Shi¹, Seyedmehdi Mousavi¹, Daryl Beetner¹, Jianchi Zhou², Narayana Balu², Jing Zhou², Darryl Kostka²
¹*Missouri University of Science and Technology, USA;*
²*Apple Inc, USA*

Abstract: System-efficient ESD design (SEED) requires accurate modeling of nonlinear devices such as transient voltage suppressors (TVS). Manual tuning of TVS models for compatibility with SEED tools like CST Studio is time consuming and tedious. This paper presents a framework for automatically creating tuned models for non-snapback and snapback-type TVS devices based on their quasi-static IV curve data. We propose a model-optimized tuning process, taking advantage of known diode equations and direct correlations between model tuning parameter and IV characteristics. Our framework accelerates the model development cycle, improving model parameter convergence time while preserving accuracy. Results on both ideal and non-ideal measurements validate the approach. The ability of the tool to find representative parameters for non-snapback devices was validated against 100 simulations with a Latin Hypercube sampling of the relevant parameters and showed no more than 2.97% error between measured and simulated quasi-static IV curves and was also shown to work on non-ideal real data. The results for the SCR structure TVS model show results error within 3.17%.

**A Multiphysics Approach for Simulating Lorentz Force Induced Vibration in PCBs**

Tianze Kan, Sameer Jape

Synopsys Inc, USA

Abstract: PCBs are widely used in consumer electronics devices to connect electronic components, transferring power and signals. With modern devices becoming increasingly compact and demanding more power, PCBs must carry higher currents, producing higher magnetic fields. Moreover, magnets for latching or actuation are located close to PCB, generating strong magnetic fields. Due to high currents and strong magnetic fields, Lorentz forces arise in PCBs, which in turn cause vibration. To fully understand the issue and guide the PCB design, we propose a multiphysics simulation method using commercial CAE tools.

Electromagnetic analysis is performed and Lorentz force densities in all layers of the PCB are calculated. Structural harmonic analysis is then conducted for vibration. The proposed method provides valuable guidance for PCB design and will effectively address the vibration issue.

The Impact of Differential Mode to Common Mode Current Conversions on the Radiated EMI from Digital Interconnects and Satellite Payloads

David Norte

BAE Systems, Inc., USA

Abstract: One of the most commonly encountered interconnections is between two physically separated chassis, where the two chassis are interconnected through a shielded cable, and where both chassis are electrically bonded to a grounding reference. With this interconnection, a ground loop is formed between the two chassis, the shielded cable, and the ground reference. In this case, it is of interest to understand the radiated emissions from this loop when high-speed differential digital signals propagate inside the shielded cable. Differential mode to common mode conversions enable the coupling of the inner shielded differential signal currents to appear on the outer surface of the shield, after which they circulate around the ground loop and radiate into the surrounding environment. This paper discusses mathematical models that extract the induced shield currents as well as the associated radiated emissions from the loop when modelling the digital transmission as a level 6 differential pseudorandom bit sequence (PRBS) at 150 Mbps and with a 3.0 m or a 1.0 m shielded cable.



Photo by Richard Georgerian

TC10_15
TECHNICAL
PAPERS

DATA ANALYSIS METHODS

1:30 PM - 3:00 PM

Room: Cortez A

Sponsored by TC-10 Signal and Power Integrity

Chair:

Junyong Park, *Kyung Hee University*

Co-Chairs:

Seungtaek Jeong, *Google LLC*

PLANNED SPEAKERS & TOPICS

Robust S-Parameter Conversion from Frequency-Dependent RLGC Parameters

BEST SIPI PAPER FINALIST

BEST SIPI STUDENT PAPER FINALIST

You-Jie Chung¹, Chiu-Chih Chou¹, Arthur Lin², David Chen²¹National Central University, Taiwan; ²NVIDIA Corporation, Taiwan

Abstract: With the trend of shrinking product life cycles, optimizing the design time of high-speed interconnect has become even more crucial nowadays. At the pre-layout stage, conversion from RLGC to S-parameters is a frequently employed technique in SI engineering. Classical methodologies using ABCD matrix transformations as an intermediate step are already widely adopted in practical applications. However, in cases with long traces, significant numerical instabilities and non-physical oscillations have been observed at high frequencies when utilizing the conventional RLGC-to-ABCD-to-S conversion. This paper investigates the root cause of this phenomenon, identifying it as catastrophic cancellation occurring during the ABCD matrix transformation. To address this, this article first presents a stabilized modification of the conventional algorithm. Subsequently, a robust new method based on modal decomposition is proposed. Experiments have demonstrated that the proposed methods successfully eliminate high-frequency artifacts and achieve excellent agreement with Ansys Q2D (2D Extractor) simulations. In addition, the results are validated to be causal, thus providing a reliable solution for signal integrity analysis.

Solving Linear Systems to Evaluate Harmonic Parameters by Using Wavelets, Revisited

Ileana Diana Nicolae, Petre-Marian Nicolae, Marian-Stefan Nicolae

University of Craiova, Romania

Abstract: The paper presents an improved version of a technique developed by the authors, used to evaluate the parameters of harmonics with both odd and even orders clustered to nodes from the 7-th level of a Wavelet Packet Tree. The initial algorithm can only evaluate the parameters of lower order odd order harmonics. This paper is concerned with the set of harmonic orders {3,4,5,6,7,9} and is based on wavelet decompositions/recompositions, guided by Wavelet Packet subtrees and optimized functions. Using wavelets, an approximation of the obtained signal is computed as a superposition of the studied harmonics. Linear systems are solved by considering sets of 12 points from the test signals. The solutions are refined by considering criteria such as “limited range of values”, “zero imaginary parts”, etc. Tests on artificial signals yielded accurate results. The newly introduced metrics allow decisions to be made regarding the reliability of the results. The proposed technique is mainly useful for real signals from power applications where the highest non-zero even harmonic order is 6.

CALL FOR PAPERS



The 10th edition of IEEE RADIO will be held from 26th to 29th October 2026 in Cape Town, South Africa. The aim of the conference is to discuss recent developments, theories and practical applications covering the whole scope of radio frequency engineering, including radio waves, antennas, propagation and electromagnetic compatibility.

Prospective authors are invited to submit original contributions on their latest research activities. Student papers are strongly encouraged. IEEE RADIO 2026 will feature three **Best Student Paper Awards**, a **Young Scientist Award** and an **Industrial Engineering Paper Award**. Proposals for special sessions, workshops and tutorials are welcome. A panel of distinguished researchers will deliver keynote speeches/invited talks on recent technology trends and advances.

IEEE AP-S will offer some student travel grants to attend the conference.

Topics of the conference

- | | |
|-------------------------------------|---|
| 1. Antenna theory | 12. Radio astronomy |
| 2. Wave propagation and scattering | 13. Remote sensing |
| 3. Electromagnetic compatibility | 14. High-power devices and techniques |
| 4. Analytical and numerical methods | 15. Instrumentation and measurement techniques |
| 5. Smart antennas and arrays | 16. Medical and industrial applications of electromagnetic fields |
| 6. RF components and systems | 17. Modeling, simulation, computer aided design |
| 7. Wireless communication systems | 18. Electronic packaging and integration |
| 8. Biological effects | 19. Metamaterials and other novel materials |
| 9. Wireless power transfer | 20. Wireless sensor networks |
| 10. Devices and circuits | 21. Any other relevant topic |
| 11. Nanotechnology | |

Language and Venue

The **working language** will be **English**.

The conference will be held in **Cape Town, South Africa**.

**Important information**

Submission of 2 to 4 pages paper: **15th June 2026**

Proposals for tutorials, special sessions, workshops: **30th June 2026**

Contact: radio2026@radiosociety.org

Website: <http://www.radiosociety.org/radio2026>

TC10_5
TECHNICAL
PAPERSPOWER DELIVERY NETWORK (PDN)
OPTIMIZATION

1:30 PM - 3:30 PM

Room: Cortez B

Sponsored by TC-10 Signal and Power Integrity

Co-Chairs:

Kinger Cai, *Arm Ltd*Junyong Park, *Kyung Hee University*

PLANNED SPEAKERS & TOPICS

A Die-Package Power Integrity Model within the Trust Region for the PDN Optimization on PCBsKe Tao¹, Matteo Cocchini², Matthew S. Doyle², Dylan Grace², Samuel Connor², Faye E. Squires¹, Albert E. Ruehli¹, Francesco de Paulis³, Lijun Jiang¹¹Missouri University of Science and Technology, USA;²International Business Machines Corp, USA; ³University of L'Aquila, Italy

Abstract: PCB power delivery network (PDN) design often uses the ICs and packages mounted on PCB to complete the PCB power integrity (PI) optimization. In the chip--package--board system, the PDN model on ICs and Packages are needed but often not available to PCB designers. This paper provides a new network matrix interpretation that yields new closed-form expressions for the BGA-node current and voltage. Through open-terminated and short-terminated network quantities and their relationships, it becomes possible to separate the die-package PDN from PCB PDN in the system's power integrity optimization. An impedance-dominance trust condition is identified under which the PCB variations only cause minor perturbations to the BGA current. Hence, within this trust region, the die-package subsystem can be replaced by a current source at the BGA node with a transient waveform independent from PCB designs. This equivalence provides a reusable approximation for PCB-side analysis and avoids repeated die-package re-simulation during PCB optimization under the stated trust condition. This newly proposed idea is validated using a lumped equivalent-circuit PI model and a realistic model extracted from a real multiport PCB layout. The results are highly consistent with expectations. This method simplifies the die-package PI model to one current source that is weakly dependent on PCB PDNs within the trust region, which can facilitate PCB design and optimization under the stated assumptions

A Statistical Qualification of PDN Impedance Considering Aging and Temperature Effects on Decoupling CapacitorsShruti Sawant¹, Faye Squires¹, Sam Connor², Matthew Doyle², Matteo Cocchini², Dylan Grace², Francesco De Paulis³, Lijun Jiang¹¹Missouri University of Science and Technology, USA;²IBM, USA; ³University of L'Aquila, Italy

Abstract: Power distribution network (PDN) impedance qualification is traditionally performed using nominal decoupling capacitor specifications, neglecting the effects of temperature variation and long-term aging. However, electrical parameters of multilayer ceramic capacitors (MLCCs), including equivalent series resistance (ESR), equivalent series inductance (ESL), and effective capacitance, exhibit systematic drift due to thermal expansion, dielectric temperature coefficients, and aging-induced degradation. This paper presents a unified analytical framework for modeling temperature- and aging-dependent variations of decoupling capacitor parameters and quantifying their impact on PDN impedance. Closed-form expressions for ESR, ESL, and capacitance are derived using coefficient of thermal expansion (CTE) and temperature-coefficient-of-capacitance (TCC) formulations, and combined with empirical aging models to capture long-term parameter drift. The resulting models are incorporated into a statistical PDN simulation flow and validated against MC analysis over frequency, temperature, and aging conditions. Results at elevated temperature (100°C) demonstrate close agreement between analytical mean impedance predictions and MC-derived means for both fresh and aged capacitors. Long term aging is shown to produce a frequency-dependent increase in PDN impedance, driven primarily by capacitance degradation and ESR growth, with measurable shifts in resonance magnitude and location. The proposed methodology enables efficient, uncertainty-aware PDN impedance qualification without reliance on computationally intensive MC simulations, providing a practical framework for robust PDN design under realistic operating and lifetime conditions.

Design-Rule Aware Pre-Layout Resource Evaluation and Planning for Power Delivery Networks**BEST SIPI PAPER FINALIST**

Sandesh Paudel, Lijun Jiang

Missouri University of Science and Technology, USA

Abstract: Power delivery network (PDN) design is fundamentally constrained by limited plane area, via density, and decoupling resources imposed by design rules. It is very difficult to plan and predict the pre-layout PDN performance when no layout has been placed. For the package design in the pre-layout stage, the die information is also very limited. How to allocate layout resources for multiple PDNs and predict their performance limits without having the layout is one unsolved challenge. This paper presents a design-rule aware framework for pre-layout resource estimation of the PDN performance. We argue it's the design rule and available layout resources that control the final possible performance of PDNs. It can be shown that the via inductance is saturated to a special value controlled by design rules. With the via inductance bounded by the design rule, available power-plane area resources can be allocated using game theory to match the projected importance of each power net. All these are done when there is little information about the design. The analysis is further extended to quantify the decoupling limit of package decoupling capacitors by identifying the dominance of plane spreading inductance. It yields a pre-layout bound on usable decap count with the keep-out design rule in mind. These bounds define the minimum achievable PDN impedance in the pre-layout stage under given design-rule constraints. It enables early PDN design feasibility and risk assessment in the design planning stage.

Behavioral Model of Rapid Load-transient Response in a Multiphase Voltage Regulator ModuleJiahuan Huang¹, Hanyu Zhang¹, Hanfeng Wang², Wei Shen², Lihui Cao², Seungtaek Jeong², Chulsoon Hwang¹¹*Missouri University of Science and Technology, USA;*²*Google Inc, USA*

Abstract: A modeling method used in voltage regulator modules (VRMs) for extreme load-transient response is introduced. The proposed VRM behavioral model in this paper captures a voltage-triggered modulation enhancement mechanism that dynamically adjusts the pulse-width modulation to mitigate excessive output voltage drop across the power delivery network during fast load transients. Successful validation is demonstrated for both slow and rapid load-current scenarios, with voltage drop protection activated under rapid loading.

TC2.8
TECHNICAL
PAPERSEMC MEASUREMENTS -
IMPEDANCE MEASUREMENTS AND PROBES

1:30 PM - 3:30 PM

Room: Coronado A

Sponsored by TC-2 EMC Measurements

Chair:

Monrad Monsen, *Oracle*

PLANNED SPEAKERS & TOPICS

Analysis of the Hereward Active Current Probe
Employing Bifilar Feedback and Sense Windings

BEST EMC PAPER FINALIST

James McLean

TDK R&D Corp., USA

Abstract: The Hereward active Current Probe (HCP) exhibits an improved response compared to a conventional passive current probe (CP). The HCP is a 3-winding transformer employing negative feedback and requires feedback and sense windings which are wound in a bifilar fashion. Previous analyses of the HCP have involved two approximations: (1) The magnetic coupling between all three windings was assumed to be unity and (2) The distributed capacitance between the feedback and sense windings was neglected. Here, for the first time, we provide a comprehensive analysis of the HCP based on a recently-published model for a distributed, bifilar winding having common-mode (CM) coupling to a third winding. This analysis includes the effects of the distributed capacitance of the bifilar windings and of imperfect magnetic coupling. We provide a discussion of magnetic coupling in the HCP based on the physical constraints on the inductance matrix. The non-unity magnetic coupling and the inter-winding capacitance of the bifilar windings are shown to be necessarily interrelated. It is shown that undesirable peaks in the ideally flat magnitude of the transfer impedance of the HCP occur at the frequencies at which the length of the bifilar windings is an odd-integer multiple of the quarter wavelength of the differential mode (DM) of the bifilar winding. This limits the high frequency performance of the HCP to less than the fundamental DM quarter-wave frequency of the bifilar winding.

Impedance Measurement of a High Voltage (HV)
Battery PackNitin Parsa, Ahalya Srikanth, Eric Poirier, Varittha Sanphuang, Ronald Missier
Ford Motor Company, USA

Abstract: This paper presents a measurement methodology for extracting the impedance of high voltage (HV) battery pack using a network analyzer. Individual cell impedance was measured to estimate and validate the overall battery pack against direct measurements. Results demonstrate that the direct battery pack impedance is influenced by internal Y-capacitance, a factor that is not captured by cell level impedance highlighting the necessity of direct pack-level characterization for accuracy.

Measurement Characterization of a Pair of CISPR25-
Compliant HV LISNsChiu-Chih Chou¹, Yu-Sheng Li², Tzong-Lin Wu², Ying-Fan Chen³¹National Central University, Taiwan; ²National Taiwan University, Taiwan; ³Delta Electronics Inc, Taiwan

Abstract: This paper presents a practical measurement setup and selected S parameter results of a pair of CISPR25-compliant HV LISNs. The motivation of the study is that, while LISNs are specified in CISPR25 up to 100 MHz, the use of them for CE and RE testing is up to much higher frequencies, even to GHz. Hence, measurement-based characterization of the LISNs used for CE/RE testing is important for the repeatability and predictability of the test results



Photo by Richard Georgerian

TC4_2
TECHNICAL
PAPERSEMI CONTROL: FILTERING, SHIELDING,
ABSORBER

1:30 PM - 3:30 PM

Room: Coronado B

Sponsored by TC-4 Electromagnetic Interference Control

Chair:

Lirim Koraqi, *Katholieke Universiteit Leuven*

Co-Chair:

Charles Jullien, *Safran Electrical and Power*

PLANNED SPEAKERS & TOPICS

A Space-Efficient Common-Mode Noise Filter
Integrated Within BGA Pad Structures for PCIe Gen
5/6 ApplicationsJunsik Park, Chunghyun Ryu, Nam-Su Kim, Byungjin
Bae, Sunghoon Chun*Samsung Electronics Co Ltd, Korea*

Abstract: This paper proposes a compact BGA-Under-Pad (BUP) common-mode (CM) filter, strategically integrated within the printed circuit board (PCB) stack-up directly beneath the BGA pads to effectively suppress CM noise in high-speed differential interconnects. To investigate the operational principles of the BUP structure, a high-fidelity equivalent R-L-C circuit model was developed, where the parasitic parameters were extracted using the ANSYS Q3D Extractor and subsequently validated through a hybrid co-simulation approach with the 3-D full-wave electromagnetic solver, ANSYS HFSS. The signal integrity performance of the proposed BUP CM filter was comprehensively evaluated under 32-Gbps Non-Return-to-Zero (NRZ) differential signaling environments. Measurement results demonstrate that the BUP CM filter achieves a significant CM noise reduction of more than -12.07 dB at 32 GHz, precisely targeting the double Nyquist frequency of PCIe Gen 5/6 applications. Importantly, this substantial noise suppression was observed with minimal impact to the differential-mode signal quality, offering a space-efficient solution for high-speed signaling systems.

CAE Based Methodology to Evaluate Shielding
Effectiveness of High Voltage Shielded ConnectorsVarittha Sanphuang, Ahalya Srikanth, Nitin Parsa,
Ronald Missier*Ford Motor Company, USA*

Abstract: This paper discusses a CAE (Computer Aided Engineering) methodology to evaluate the shielding effectiveness (SE): DC resistance (RDC) and transfer impedance (Zt) of high voltage (HV) connectors used in electrified vehicles (EVs). The simulation results are validated with test data.

Experimental Study of Average Absorption Cross
Section Measurement Linearity and Sensitivity in a
Reverberation Chamber

BEST EMC PAPER FINALIST

Mehmet F. Cengiz¹, Robert Vogt-Ardatjew¹, Niek
Moonen¹, Frank Leferink^{1,2}¹*Universiteit Twente, The Netherlands;* ²*THALES
Nederland B.V., The Netherlands*

Abstract: This work presents an experimental study on the linearity and minimum measurable level of the average absorption cross section using a vibrating intrinsic reverberation chamber. Since it is often more convenient to measure small absorber samples, the study examines how sample size affects result reliability and whether the expected linear scaling holds in practice. The average absorption cross section is derived from changes in the chamber quality factor, making experimental verification necessary for accurate estimation of absorber effects. Measurements show that doubling the absorber surface area results in an approximately doubled normalized average absorption cross section, confirming the expected linear scaling for three different absorber types with minor fluctuations. Measurement sensitivity was investigated by reducing absorber size until statistical uncertainties became dominant. Increasing the number of measurement samples enabled stable and repeatable results, supporting accurate estimation of absorber quantity during the design stage and helping reduce costly trial and error in absorber development and application planning.

2027 Asia-Pacific International Symposium on Electromagnetic Compatibility

May 17-21, 2027

Jeju Island, Republic of Korea

ABOUT THE SYMPOSIUM

The 2027 Asia-Pacific International Symposium on Electromagnetic Compatibility (APEMC 2027) will be held in [Jeju Island, Republic of Korea, from May 17 to 21, 2027](#). The symposium aims to share recent advances in all aspects of EMC in the Asia-Pacific region, to respond to the EMC requirements for all rising technologies, and to link up the international EMC community closely. We warmly invite all prospective authors and experts to submit original papers on their latest research findings and outcomes. We also welcome proposals for focused sessions, industrial forums, workshops, and tutorials.

SYMPOSIUM TOPICS

- EMC Management and Standards
- EMC Measurements and Instrumentation
- Electromagnetic Environment and Low Frequency EMC
- Transient EMC and High Power Electromagnetics
- Power System EMC, Smart Grid, and Power Electronics
- System-Level EMC and Protection
- Transportation and Aerospace EMC
- Antenna and Wave Propagation
- IC and Electronic Packaging EMC
- Signal and Power Integrity (SI/PI)
- EMC in Emerging Wireless Technologies (5G/6G, IoT, WPT)
- Computational Electromagnetics & Multiphysics
- Biomedical Electromagnetics & EMF Safety
- Nanotechnology and Advanced Materials for EMC
- Artificial Intelligence (AI) in EMC
- Others

IMPORTANT DATES

- | | |
|---|-----------------------------------|
| • Proposal for Special Session | September 15, 2026 |
| • Proposal for Workshop & Tutorial | October 16, 2026 |
| • Regular Paper Submission* | November 30, 2026 |
| • Notification of Acceptance | February 01, 2027 |
| • Final Manuscript Submission | February 16, 2027 |

** Authors have options to submit a full-length paper (3-4 pages) or a 1-page abstract.*

<https://apemc2027.org>



SCHEDULE AT A GLANCE

ROOM	Coronado A	Coronado B	Coronado C	Coronado D	Cortez A	Cortez B	Cortez C	Cortez D
8:30 AM	8:30 AM - 12:00 PM WORKSHOP (WT_04) Advances in Computational Electromagnetics for Signal and Power Integrity Analysis of Multi-Die 2.5D/3D IC Packages	8:30 AM - 12:00 PM WORKSHOP (WT_D6) 5G and Frontiers of Medical Devices	8:30 AM - 5:00 PM TUTORIAL (WT_D5) Lessons Learned for High Voltage Electrical Systems in Aviation	8:30 AM - 5:00 PM WORKSHOP (WT_M3) TC-11/TC-8 Nanotechnology and Advanced Materials for Aerospace EMI/EMC/E3	8:30 AM - 5:00 PM WORKSHOP (WT_05) When Open Source Meets SIPI/EMC	8:30 AM - 12:00 PM TUTORIAL (WT_D3) Electromagnetic Shielding: Bridging Design, Characterization, and Standards	8:30 AM - 12:00 PM WORKSHOP (WT_02) EMI/EMC Simulation and Diagnosis Methodology in Semiconductor Design Process Flow	8:30 AM - 12:00 PM TUTORIAL (WT_S5) Product Safety Engineering Society (PSES) Tutorial; Product Safety Compliance and Global Market Access
10:00 AM	REFRESHMENT BREAK							
10:30 AM								
12:00 PM	LUNCH BREAK							
1:30 PM	1:30 PM - 5:00 PM TUTORIAL (WT_07) Benchmarking and Reproducibility in Computational and Experimental Characterization of Electronic Packages for Signal and Power Integrity	1:30 PM - 5:00 PM WORKSHOP (WT_V3) Automotive EMC: Simulation, Measurement, Good Practice and Test Implementation					1:30 PM - 5:00 PM WORKSHOP (WT_D4) Signal and Power Integrity Trade-offs in Glass-Based AI Server Packages with UCle and Co-Packaged Optics for Energy-Efficient Systems	
3:00 PM	REFRESHMENT BREAK							
3:30 PM								
5:00 PM								

AEROSPACE MID CAREER TRAINING: 8:15 AM - 5:00 PM- Hilton Anatole, Manchester
 (Pre-Registration Required)

ADDITIONAL STANDARDS SESSIONS, WORKING GROUPS AND TECHNICAL COMMITTEES
 For Collateral Meetings, please see page 165



STANDARDS WEEK:

For more information about Standards Week, please visit [page 160](#)

**REFER TO THE
EMC+SIPI 2026
MOBILE APP FOR
INDIVIDUAL
PRESENTATION
TIMES.**



Speakers Breakfast

Hilton Anatole, De Sota - 7:00 - 8:30 AM

(Breakfast Only on the Day of Presentation)

Companion Lounge

Crow's Office - Mezzanine Level, Hilton Anatole Hotel - 8:00 AM - 5:00 PM

(Registered Companions Only)

AEROSPACE MID-CAREER TRAINING

THIS TRAINING PROVIDES AN OPPORTUNITY TO ADVANCE YOUR KNOWLEDGE OF AEROSPACE ELECTROMAGNETIC COMPATIBILITY (EMC) ASSOCIATED WITH TRANSITIONING FROM ENTRY LEVEL AEROSPACE ENGINEER TO A MID-CAREER AEROSPACE ENGINEER.

This is the inaugural offering of the Aerospace Mid-Career Training. Participants in this training will have the opportunity to interact with experts who have worked in the Aerospace industry for 15 to 30+ years and have contributed to the advancement of EMC practices specifically developed to address the challenging environments and conditions that aerospace vehicles must operate within. They will also have the opportunity to ask questions of the presenters on how they navigated their careers, from entry level engineers to senior level engineers, and how to manage the transition into and through mid-career in the Aerospace Industry.

PLEASE NOTE: The Aerospace Mid-Career Training technical content is intended for engineers who have been working in Aerospace EMC and/or Signal Integrity Power Integrity (SIPI) for several years and wish to deepen their understanding of the subject area, or who have worked in EMC for many years in other areas and wish to transition into the Aerospace area. Training participants are strongly encouraged to attend the Military EMC TC-3 Tutorial held all day Monday as well as the Aerospace in EMC TC-8 Workshop held on Wednesday afternoon. Further, it is assumed that all participants will have attended the Fundamentals of EMC Tutorial offered each year on the Monday of the symposium week. The planning for the Training and this Tutorial and Workshop has been coordinated so that there will be little overlap in presentation content, with the Mid-Career Training covering specific topic areas in greater depth.

The course size is strictly limited to encourage interaction between the presenters and participants. Registration will be confirmed on a first-come, first-served basis.

**LOCATION:
HILTON ANATOLE,
MANCHESTER**

\$190 (SOLD OUT)



Read the instructor bios and presentation abstracts:

2026.emcsi.org/programs/technical-programs/aerospace-mid-career-training

AEROSPACE SPEAKERS


**TRANSITIONING FROM EARLY
CAREER TO MID-CAREER
AEROSPACE EMC ENGINEER**
Randy J. Jost

 IEEE Life Senior Member, Ball Aerospace (Retired),
 Adjunct Professor at Utah State University

E³ REQUIREMENTS AND PROCESSES
David Novotny

SpaceX


E³ VEHICLE DESIGN AND INTEGRATION
John McCloskey

EMC-Closkey, NASA (Retired)


**E³ AVIONICS / PAYLOADS:
UNDERSTANDING SPACECRAFT AND
AIRCRAFT AVIONICS HARDWARE FOR THE
DEVELOPMENT OF APPROPRIATE EMC
REQUIREMENTS AND TESTING**
Reinaldo "Ray" Perez

Jet Propulsion Laboratory (Retired).


E³ SYSTEMS ANALYSIS
Paul Bremner

Robust Physics


E³ SYSTEMS TEST AND VALIDATION
John La Salle

Northrop Grumman

Past President, IEEE EMC Society


**E³ SYSTEMS TEST AND VALIDATION:
EVALUATION OF INTERFERENCE PATH
LOSS ON LARGE COMMERCIAL AIRCRAFT
USING STATISTICAL METHOD**
Dennis Lewis

The Boeing Company

ORGANIZERS:
Janet O'Neil, ETS-Lindgren
John La Salle, Northrop Grumman
Randy Jost, Utah State University
Dennis Lewis, The Boeing Company
FRIDAY 8:15AM – 5:00PM AUGUST 7, 2026

TIME	TOPIC	PRESENTER/INSTRUCTOR
8:15am – 8:30am	Introduction to Workshop	Janet O'Neil (ETS-Lindgren) John La Salle (Northrop Grumman)
8:30am – 9:15am	Transitioning from Early Career to Mid-Career Aerospace EMC Engineer	Randy J. Jost (Ball Aerospace - Retired)
9:15am – 10:00am	E ³ Requirements and Processes	David Novotny (SpaceX)
10:00am – 10:30am	Coffee Break / Networking	
10:30am – 11:15am	E ³ Vehicle Design and Integration	John McCloskey (EMC-Closkey)
11:15am – 12:00pm	E ³ Avionics / Payloads	Ray Perez (Jet Propulsion Laboratory - Retired)
12:00pm – 1:30pm	Lunch	
1:30pm – 2:15pm	E ³ Systems Analysis	Paul Bremner (Robust Physics)
2:15pm – 3:00pm	E ³ Systems Test and Validation	John La Salle (Northrop Grumman)
3:00pm – 3:30pm	Coffee Break / Networking	
3:30pm – 4:15pm	E ³ Systems Test and Validation	Dennis Lewis (The Boeing Company)
4:15pm – 5:00pm	Questions / Panel Session	

WT_04
WORKSHOP**ADVANCES IN COMPUTATIONAL
ELECTROMAGNETICS FOR SIGNAL AND
POWER INTEGRITY ANALYSIS OF MULTI-DIE
2.5D/3D IC PACKAGES****8:30 AM - 12:00 PM****Room: Coronado A****Sponsored by TC-9 Computational Electromagnetics****Chair:**Feng Ling, *Xpeedic***Co-Chair:**Vladimir Okhmatovski, *University of
Manitoba***ABSTRACT:**

The rapid adoption of 2.5D/3D integration, chiplet-based architectures, and advanced packaging technologies has fundamentally transformed the landscape of signal integrity (SI), power integrity (PI), and electromagnetic compatibility (EMC). The introduction of dense interposers, through-silicon vias (TSVs), micro-bumps, high-bandwidth memory (HBM), and ultra-short die-to-die interconnects has pushed electromagnetic interactions into regimes where traditional modeling assumptions and design abstractions are no longer adequate.

Addressing these emerging challenges increasingly requires advanced computational electromagnetics (CEM) methods that are both rigorous and scalable, capable of handling large, multi-scale, and multi-physics systems while remaining compatible with practical design workflows. Recent progress in full-wave solvers, fast algorithms, domain decomposition, and model order reduction has opened new opportunities to bridge fundamental EM theory with system-level SI/PI analysis in complex multi-die environments.

This workshop brings together leading researchers from academia (University of Manitoba, Ghent University, Missouri University of Science and Technology) and experts from industry (Intel) as well as EDA tool developers (Cadence, Xpeedic, CEMWorks) to present and discuss recent advances in computational electromagnetics and their applications to signal and power integrity analysis of multi-die 2.5D/3D IC packages. Topics will span

from numerical methods and modeling techniques to real-world design case studies, with an emphasis on translating EM rigor into actionable engineering insight. The workshop aims to foster cross-disciplinary dialogue and to identify open challenges and future research directions at the intersection of computational EM, SI/PI, and advanced system integration.

PLANNED SPEAKERS & TOPICS**SI Challenges and Solutions of Advanced Packaging
for Co-Packaged Optics in AI Datacenters**Zhichao Zhang, Kemal Aygün, Dekang Chen, Yalong Gu,
Zhiguo Qian, Saikat Mondal
*Intel, USA***Machine Learning Models for SI/PI Analysis in
Advanced IC Package Design**Xiaoyan Xiong
*Cadence, USA***Integral-Equation-Based EM Solver for Signal Integrity
Analysis in 2.5D/3D Advanced Packaging**Jonatan Aronsson
*CEMWorks Inc., Canada***Single-Source DSA-EFIE Techniques for Broadband
Lossy Interconnect Modeling**Martijn Huynen, Vladimir Okhmatovski, Daniël De Zutter,
Dries Vande Ginste
*Ghent University, Belgium***Uncertainty Characterization for Power Integrity and
Signal Integrity**Lijun Jiang, Shruti Sawant
*Missouri University of Science and Technology, USA***Rigorous Full-Wave Analysis of Finite Dielectric
Regions and Conductor Loss in 3D Interconnect
Models with Surface Volume Surface Electric Field
Integral Equations**Vladimir Okhmatovski
*University of Manitoba, Canada***Advances in Signal and Power Integrity Analysis for
Multi-Die 2.5D/3D IC Designs**Feng Ling
Xpeedic, USA

WT_D6
WORKSHOP

5G AND FRONTIERS OF MEDICAL DEVICES

8:30 AM - 12:00 PM

Room: Coronado B

Chair:

Susanna Mosleh, *National Institute of Standards and Technology*

Chair:

Mohamad Omar Al Kalaa, *Inovectrum*

ABSTRACT:

Emerging 5G deployments are changing the RF environment in which medical devices operate and, in some cases, exposing them to new coexistence and electromagnetic compatibility (EMC) issues that are not well covered by common immunity and wireless coexistence verification profiles. As hospitals roll out private cellular, indoor small cells, distributed antenna systems, and new 5G-enabled workflows, medical equipment may operate in denser, more dynamic spectra and be even closer to emitters than many legacy assumptions reflect. This workshop ties what's being deployed in and around hospitals to the failure mechanisms we may observe when testing and debugging devices, with an emphasis on building test setups that are repeatable in the lab and still representative of clinical use. The workshop will also address emerging 5G connectivity paths used for remote and mobile care and what they imply for coexistence, immunity testing, and compliance evidence.

We will bring together medical device EMC/coexistence engineers, test labs, wireless and system engineers, device manufacturers, and regulators for a technical discussion of what is changing, where failures tend to hide, and how to validate robustness without over-testing or chasing unrealistic cases.

PLANNED SPEAKERS & TOPICS**Connecting the Dots Between Mobile Communication Standards and Medical Device EMC**

Omar Al Kalaa
Inovectrum, USA

5G Emerging Technologies and EMC Performance for Medical Devices (IEC 60601-1-2:2020)

Bob DeLisi
UL LLC, USA

The Challenges of Immunity Testing Against 5G NR Threats

David Schaefer
Element Materials Technology, USA

The Digital Common Ground of Tomorrow

Phillip Miller
RATLR, USA

5G in Hospital Environments: EMC, Coexistence, and Practical Considerations for Medical Devices

Segun Adeniji
Philips Medizin Systeme Boblingen GmbH, Germany



Photo by Richard Georgerian

**WT_D5
TUTORIAL**

LESSONS LEARNED FOR HIGH VOLTAGE ELECTRICAL SYSTEMS IN AVIATION

8:30 AM - 5:00 PM

Room: Coronado C

**Sponsored by TC-7 Electrical System and Power Electronics EMC,
TC-8 Aeronautics and Space EMC**



Chair:

Cong Li, *GE Aerospace*

Co-Chair:

Niek Moonen, *Universiteit Twente*

ABSTRACT:

This EMC tutorial is part of the IEEE EMC Society REACHES (Roadmap for EMC in Aerospace High-voltage Electrical Systems) initiative, jointly sponsored by IEEE EMCS TC7 (Electrical System and Power Electronics EMC) and TC8 (Aeronautics and Space EMC).

As the aviation industry transitions toward More Electric Aircraft (MEA) and hybrid-electric propulsion, the integration of high-voltage (HV) systems introduces unprecedented Electromagnetic Compatibility (EMC) challenges. Driven by the urgent need to reduce atmospheric emissions, these propulsion technologies demand significantly higher power levels. This shift necessitates optimal source placement and energy management, alongside the optimization of wiring harnesses to maintain system efficiency. Increased currents and voltages directly impact cable sizing, insulation, and connection systems—factors that significantly increase overall system mass and generate higher radiated electromagnetic fields that pose risks to sensitive equipment.

This tutorial provides a comprehensive examination of lessons learned from recent aviation electrification projects. It addresses critical issues such as high-speed switching noise from motor controllers, HV cable insulation degradation, and the evolving requirements of RTCA DO-160G (and the upcoming DO-160H) and MIL-STD-461G for HV architectures. Attendees will gain insights into advanced filtering, shielding strategies, and the emerging capabilities required of modern EMC test labs to validate these high-power systems. By bridging the gap between theoretical EMC

principles and practical airframer experiences, this session offers a roadmap for achieving airworthiness in the next generation of electrified flight.

PLANNED SPEAKERS & TOPICS

High Voltage (HV) Aviation Electrical System EMC Challenges and Opportunities

Cong Li¹, Niek Moonen²

¹GE Aerospace, USA; ²Universiteit Twente, Netherlands

DO-160G & MIL-STD-461G Considerations for New HV Aviation Systems

Finbarr O'Connor¹, Daren Nerad²

¹Huntington Ingalls Industries Inc, USA; ²Wisk Aero, USA;

Lessons Learned from HV System Integration and Flight Testing

Daren Nerad

Wisk Aero, USA

EMC of Power Chain Equipment

Charles Jullien, Vincent Melchor

Safran Electrical and Power, France

Monitoring HV Cable Insulation Degradation and Electrical Phenomenon in Aerospace

Charles Jullien

Safran Electrical and Power, France

Crosstalk Analysis from HV Powerlines to Existing Data Networks

Jesper Lansink Rotgerink

Royal NLR - Netherlands Aerospace Centre, Netherlands

Advanced EMC Filter Designs and Shielding for MW-Scale Systems

Fang Luo

Stony Brook University, USA

HVDC Bus Transient Testing – What to Consider for Military and Aircraft Applications

Craig Fanning

Elite Electronic Engineering, Inc., USA

WT_M3
WORKSHOPNANOTECHNOLOGY AND ADVANCED
MATERIALS FOR AEROSPACE EMI/EMC/E3

8:30 AM - 5:00 PM

Room: Coronado D

Sponsored by TC-11 Nanotechnology and Advanced Materials,
TC-8 Aeronautics and Space EMC**Chair:**Marina Koledintseva, *The Boeing Company,*
*Saint Louis, MO***Co-Chair:**Nika Amralah, *Department of National*
*Defence***ABSTRACT:**

Currently, there is a lot of interest in design and application of nanomaterials and various advanced materials for aerospace technology. These materials allow for solving numerous problems in Aerospace Engineering, including electromagnetic interference (EMI) control, electromagnetic compatibility (EMC) at the system level, and protection against various electromagnetic environmental effects (E3). In this Workshop, presentations will focus on physics, technology, characterization, and EMI/EMC/E3 applications of new advanced materials, including nanomaterials, metamaterials, advanced magnetic materials, and various composites. Such novel materials with advanced electromagnetic, mechanical, thermal and other important for aerospace engineering properties are perspective for design of EMI shielding and filtering structures, as well as various electromagnetic wave absorbers.

PLANNED SPEAKERS & TOPICS**Fundamentals on Electromagnetic Absorbing and Shielding Materials for Aerospace Applications**

Paul Dixon

*Qnity Electronics, USA***New Methods in Electromagnetic Materials Characterization: Computational EM Inversion with Specialized Probes**

John W. Schultz

*Compass Technology Group, USA***Materials and Structural Design of Polymer Composite Absorbers for Aerospace EMC**

Dandan Zhang

*University of Michigan, USA***Materials and Structural Design of Polymer Composite Absorbers for Aerospace EMC**

Victor Khilkevich

*Missouri University of Science and Technology, USA***Silicones for Highly Demanding Applications in Aerospace, Aviation and Defense**

Julia Sunderland

*The Dow Chemical Company, USA***Analysis of Fabric over Foam (FoF) Gasket Parameters on SE from 30 MHz to 40 GHz**

Pavithrakrishnan Radhakrishnan

*Oklahoma State University, USA***Materials and Structural Design of Polymer Composite Absorbers for Aerospace EMC**

Dandan Zhang

*University of Michigan, USA***Ferrite- and Ferromagnetic-Based Materials in Aerospace EMI and EMC**

Marina Y. Koledintseva

*The Boeing Company, MO, USA***Superconductive Transmission Lines in Earthbound Aerospace Applications with Insights on Skin - Effect Electromagnetic Issues**

Clifford M. Krowne

Ashlawn Energy, USA

WT_05
WORKSHOP

WHEN OPEN SOURCE MEETS SIPI/EMC

8:30 AM - 5:00 PM

Room: Cortez A

Sponsored by TC-9 Computational Electromagnetics

Chair:

Giorgi Maghlakelidze, *NVIDIA Corp*

Co-Chair:

Yansheng Wang, *Meta Platforms Inc*

ABSTRACT:

Open source could transform how the SIPI/EMC community collaborates, innovates, and solves design challenges. From Linux to RISC-V to much of AI development, open-source projects have proven that community-driven development delivers powerful, flexible, and cost-effective solutions. But what does this mean for signal and power integrity engineers?

This workshop explores why open source matters for our field: community support ensures you're never solving problems alone; free tools lower barriers to entry; customization lets you extend standard offerings to meet specific needs; and broader participation drives ecosystem growth and standardization.

Now in its third year, this workshop brings together maintainers, contributors, and users of open-source SIPI/EMC projects to showcase new tools and share practical insights: What motivates creators to open-source their work? How do you sustain a contributor community? How do these tools improve real-world designs?

Attendees will discover tools they can apply immediately, gain inspiration to launch their own projects, and learn how to become effective contributors.

PLANNED SPEAKERS & TOPICS

PDN Before Layout: Resource Evaluation and Feasibility Checks Under Design Rules

Lijun Jiang

*Missouri University of Science and Technology, USA***ViaCap: Open-Source Modeling of Via Capacitance**

Srinath Penugonda

*Cisco Systems Inc, USA***Auto-Mate + OpenSIPI: A Trusted AI Agent for S-Parameter Extraction and Reporting**

Yansheng Wang

*Meta Platforms, Inc.***Introduction to the IEEE 802.3 Channel Operating Margin Open Source Project**

Howard Heck

*TE Connectivity Corporation, USA***Responsible Agentic Coding: Enabling End-to-end Open Source IEEE370 Stack with Octave-RF**

Giorgi Maghlakelidze

*NVIDIA Corp, USA***EMerge: A Full Wave FEM EM Solver in Python**

Robert Fennis

*EMerge Software, Netherlands***From Code to Product Engineering: PyAEDT Redefining SI/PI/EMC Simulation Workflows**

Massimo Capodiferro

*Synopsys Inc, USA***The SI/PI-Database for PCB-Based Interconnects: Why, How, and What For?**

Christian Schuster

*Technische Universität Hamburg Studiendekanat Elektrotechnik Informatik und Mathematik, Germany***Open Source in SIPI/EMC: Panel Discussion**Yansheng Wang², Giorgi Maghlakelidze¹¹*NVIDIA Corp, USA*; ²*Rivos Inc., USA*

WT_D3
TUTORIAL**ELECTROMAGNETIC SHIELDING:
BRIDGING DESIGN, CHARACTERIZATION,
AND STANDARDS****8:30 AM - 12:00 PM****Room: Cortez B****Sponsored by TC-4 Electromagnetic Interference Control****Chair:**Lirim Koraqi, *Katholieke Universiteit Leuven***Co-Chair:**Pavithrkrishnan Radhakrishnan, *Oklahoma State University***ABSTRACT:**

The increasing integration of power electronics, high-speed digital systems, sensors, and communication technologies in modern engineering applications is intensifying electromagnetic interference (EMI) challenges across a wide frequency range. From low-frequency (LF) magnetic fields generated by power conversion systems to high-frequency (HF) radiated emissions affecting sensitive electronics, electromagnetic disturbances pose growing risks to system performance, reliability, and safety. As electronic systems become increasingly compact and functionally dense, electromagnetic shielding has become a critical design element for ensuring electromagnetic compatibility (EMC) across a wide range of applications, including transportation, industrial automation, aerospace, and medical systems.

This tutorial provides a unified perspective on electromagnetic shielding in modern electronic systems. It addresses the optimization of shielding in complex, highly integrated platforms by examining EMC challenges and practical design strategies. Widely used shielding elements, such as cables, are discussed with emphasis on how shielding effectiveness (SE) is characterized in practice and how the measurement setup influences the resulting SE values. The tutorial further addresses the challenges of reliably characterizing LF magnetic shielding under near-field conditions, the use of electromagnetic absorber materials to enhance enclosure-level shielding, and an overview of relevant shielding standards and their role in ensuring reliable and reproducible

characterization. Active EMI mitigation techniques applicable to such systems are also introduced, thereby completing the link between shielding design, characterization, and standards across a broad range of applications. In addition, the integration of the Safe-and-Sustainable-by-Design (SSbD) approach into shielding solutions is discussed, focusing on key factors such as electromagnetic safety, weight, volume, mechanical strength, and cost.

The tutorial also presents contributions from the Doctoral Network (DN) PARASOL project, funded by the Marie Skłodowska-Curie Actions (MSCA) under the Horizon Europe (HE) framework. These contributions illustrate a multidisciplinary approach that integrates EMC materials engineering, system safety engineering, and SSbD principles in the development of electromagnetic shielding solutions.

PLANNED SPEAKERS & TOPICS**Cable Shielding Measurements: From a Simple Setup to a More Complex One**

Charles Jullien

*Safran Electrical and Power, France***Effect of Absorber Materials on the Shielding Effectiveness of Enclosures**

Mehmet Faruk Cengiz

*Universiteit Twente, Netherlands***Overview of Recent IEEE Shielding Standards**

Pavithrkrishnan Radhakrishnan

*Oklahoma State University, USA***Understanding EMC Challenges in Electric Mobility: Shielding and High-Frequency Noise**

Karen Burnham

*EMC United, USA***Toward Accurate Low-Frequency Shielding Characterization of Planar Materials**

Lirim Koraqi

*Katholieke Universiteit Leuven, Belgium***Areas of EMI/EMS Improvements Applicable to Capacitive Touch Applications**

Subramaniam Saravana Sankar

Univerzita Tomase Bati ve Zline, Czechia

**WT_02
WORKSHOP**

EMI/EMC SIMULATION AND DIAGNOSIS METHODOLOGY IN SEMICONDUCTOR DESIGN PROCESS FLOW

8:30 AM - 12:00 PM

Room: Cortez C

Chair:

Rajen Murugan, *Texas Instruments, Inc.*

Co-Chair:

Dipanjn Gope, *Simyog Technology*

ABSTRACT:

EMI/EMC issues drive approximately 30% of verification-stage failures, representing billions in lost revenue across the electronics industry. The traditional compliance approach—building physical prototypes for laboratory testing—creates expensive re-design cycles, market delays, and significant business risk. Progressive semiconductor companies are now leveraging simulation-based methods to identify and resolve EMC issues early in the integrated circuit product design process.

This tutorial delivers a proven simulation and diagnosis framework for achieving first-pass EMI/EMC compliance while minimizing system-level failures. Core topics include:

- Conducted Emission (CISPR25 CE Voltage and Current Method)
- Radiated Emission (CISPR25 RE)
- Bulk Current Injection (ISO-11452-4 open and closed-loop)
- Radiated Immunity (ISO-11452-2)

PLANNED SPEAKERS & TOPICS

Need for Digital EMI/EMC Front-Loading in Semiconductor Design Process Flow

Rajen M. Murugan
Texas Instruments, Inc., USA

Conducted and Radiated Emission Modeling and Simulation for power Semiconductor Devices

Jie Chen
Texas Instruments Inc, USA

EMI/EMC Simulation and Diagnosis Methodology in Semiconductor Design Process Flow

Nikita Ambasana
Simyog Technology, India

Future Directions in Model-Based Simulation Methodology for Semiconductor Design Process

Dipanjn Gope
Indian Institute of Science, Bangalore, India



Photo by Richard Georgerian

WT_S5
TUTORIAL

PRODUCT SAFETY ENGINEERING SOCIETY (PSES) TUTORIAL; PRODUCT SAFETY COMPLIANCE AND GLOBAL MARKET ACCESS

8:30 AM - 12:00 PM**Room: Cortez D**

WORKSHOP FROM IEEE



SISTER SOCIETY OF IEEE EMCs

Chair:

Grant Schmidbauer, *British Columbia Institute of Technology*

ABSTRACT:

The goal of most companies is not to only design products to be safe, perform according to customer demands, and to meet regulatory requirements, it is to sell those products globally. While your product must comply with the EMC and SIPI requirements, there are a myriad of other technical requirement that must also be considered to facilitate the sale of the product.

The plan for this tutorial is to delve into some of the “other technical requirements” that products must comply with, including product safety requirements (ie, concepts such as fire, shock, mechanical, temperature, and radiation); and then once your products are compliant, we will discuss the commercialization of the product through obtaining the many country approvals that are needed in order to legally sell the product around the world.

This tutorial should be attended by product realization managers, design engineers, test technicians, product regulatory personnel, project managers, marketing personnel, and others interested in learning more about product safety and global market access requirements.

PLANNED SPEAKERS & TOPICS**Compliance 101: The Basics of Product Safety and Global Regulatory Compliance**

Brunno Covolan
Intertek USA Inc, USA

Compliance 201 - the Basic Requirements for Any Product

John Allen
Product Safety Consulting, Inc., USA, Thermo Fisher Scientific Inc, USA

PSES Tutorial, Global Market Access

Grant Schmidbauer
British Columbia Institute of Technology, Canada

PSES Tutorial -Part 3: Global Market Access

Grant Schmidbauer
British Columbia Institute of Technology, Canada



Photo by Richard Georgerian

WT_07
WORKSHOP**BENCHMARKING AND REPRODUCIBILITY IN
COMPUTATIONAL AND EXPERIMENTAL
CHARACTERIZATION OF ELECTRONIC PACKAGES
FOR SIGNAL AND POWER INTEGRITY****1:30 PM - 5:00 PM****Room: Coronado A****Chair:**

Vladimir Okhmatovski, *University of
Manitoba*

ABSTRACT:

Tutorial features talks on current initiatives to form benchmarks for characterization of electronic packages. Six available benchmarks representing typical cases for signal and power integrity analysis and varying in complexity from simple microstrip line to a full package model are intended to serve as standardized cases for testing performance and accuracy of the modeling tools are discussed with emphasis on two latest benchmarks. While the benchmarks consisting of CAD model files as well as simulated and measured network parameters are publicly available and described in the accompanying manual, the emphasis in this tutorial is made on challenges encountered in creating measured data, development of modeling capabilities in the computational tools essential for accurate and expedient electromagnetic analysis of the benchmarks, and common practices going into matching of the simulated to measured data. Ongoing efforts towards standardization of densely packed interconnects for die-to-die interfacing on advanced packages also known as heterogeneous integration are also addressed.

PLANNED SPEAKERS & TOPICS**Introduction to SIPI benchmarking initiative of IEEE
EPS TC-EDMS**

Vladimir Okhmatovski
University of Manitoba, Canada

**Evaluating Solver Performance on the IEEE EPS
Benchmark Models**

Jonatan Aronsson
CEMWorks Inc., Canada

**New Power Integrity Benchmark for Low Impedance
Structures**

Istvan Novak
Samtec Inc, USA

Package RF Filter Benchmark

Michael Hill
Intel, USA

**Benchmark of Interconnects in Multi-Die
Heterogeneous Integration System**

Feng Ling
Xpeedic, USA



Photo by Richard Georgerian

WT_V3
WORKSHOP**AUTOMOTIVE EMC: SIMULATION,
MEASUREMENT, GOOD PRACTICE AND
TEST IMPLEMENTATION****1:30 PM - 5:00 PM****Room: Coronado B****Chair:**Martin Wiles, *MVG World***ABSTRACT:**

This workshop on Automotive EMC covers a wide range of relevant topics on EMC for Electric Vehicles from simulation, measurement good practice and test implementation.

Automotive EMC Testing for eMobility will cover the implementation of testing for Component (eMotor and eBattery) and eVehicle level as well as EV Charger with and without vehicle.

Reverberation chambers provide fast, repeatable, wide-band EMC testing for today's complex vehicles. They offer uniform fields, reduced setup sensitivity, and strong alignment with standards like ISO 11452-11, making them an efficient, scalable alternative to traditional EMC chambers.

P2855 is a forthcoming standard that defines how to characterize the shielding effectiveness of cable/connector assemblies from DC up to 40 GHz. It outlines recommended measurement techniques and specification methods to assess how well these assemblies control EMI and support compliance with government, regulatory, and customer EMC requirements. The workshop introduces the standard's scope and highlights several new test methods that will be included.

Advances in computational electromagnetics are enabling Digital Twins and AI-driven simulations to play a major role in automotive EMC. The talk covers numerical simulation of key EMC issues—such as radiation, cable-harness crosstalk, and powertrain emissions—and introduces digital-twin approaches for understanding component- and vehicle-level immunity tests. It also includes simulation of CISPR standards to support more predictive, efficient EMC evaluation

Cabling is a major source of electromagnetic noise in electric vehicles and a common cause of failures in CISPR 12, 25, and 36 tests. This talk explains how cable design, routing, and shield bonding influence vehicle-level EMC performance and outlines key strategies for improving cable assemblies to meet regulatory EMC requirements.

PLANNED SPEAKERS & TOPICS**Automotive EMC Testing for eMobility**Martin A.K. Wiles
*MVG World, United Kingdom***Importance of Cabling in EMC Success for EVs**Karen Burnham
*EMC United, USA***P2855, the New Standard for a Characterization of
Shielding CCA from DC to 40GHz**Charles Jullien
*Safran Electrical and Power, France***Enhancing Automotive EMC Testing with
Reverberation Chambers**Vignesh Rajamani
Rohde & Schwarz, USA

WT_D4
WORKSHOP**SIGNAL AND POWER INTEGRITY TRADE-OFFS
IN GLASS-BASED AI SERVER PACKAGES WITH
UCIE AND CO-PACKAGED OPTICS FOR ENERGY-
EFFICIENT SYSTEMS****1:30 PM - 5:00 PM****Room: Cortez C****Sponsored by TC-9 Computational Electromagnetics****Chair:**

Satoru Kuramochi, *Dainippon Insatsu
Kabushiki Kaisha*

ABSTRACT:

This workshop focuses on signal and power integrity challenges in heterogeneous AI server packages using glass substrates. As high-speed SERDES PCIe links are required to operate well into the tens of gigahertz, the choice of interconnect structure becomes a critical design factor.

A comparative study using insertion loss data up to 40 GHz is presented for metallized through-glass vias (TGVs) and GSG coplanar transmission line structures. The results illustrate the impact of glass substrate architecture on high-speed signal transmission and highlight key differences between Glass Core Substrate and Glass Interposer approaches.

Through practical comparison and discussion, participants will gain insight into SI trade-offs, interconnect selection, and package-level design considerations for energy-efficient AI server systems with co-packaged optics.

PLANNED SPEAKERS & TOPICS**Signal and Power Integrity Trade-offs in Glass-Based AI Server Packages with UCIE and Co-Packaged Optics for Energy-Efficient Systems**

Satoru Kuramochi
Dainippon Insatsu Kabushiki Kaisha, Japan

Development of Glass Core Multi-Layer-Buildup Substrate with TGV

Shingo Hayashibe
Shinko Electronics, Japan

Metallization Technology of Glass Core Substrates for Reliable Power Delivery in AI Packages

Tomoya Sawada
OKUNO CHEMICAL INDUSTRIES, Japan

Power Integrity Analysis of Glass-Based AI Server Packages: TGV Length Effects and Core vs. Interposer Comparison

Hiroki Sakata
DNP America, USA

Laser-Based Manufacturing Technologies: Enabling Glass-Based AP and CPO

Nils Anspach
LPKF Laser & Electronics SE, Germany

DALLAS FUN FACTS
SKY VIEWS IN THE REUNION TOWER

See the spectacular views of the city from Dallas's Reunion Tower. Built in 1978, the 470ft tower contains 259 exterior LED lights to shine in the night and bring the Dallas skyline to life. Full meals are offered within the sphere at the 2024 and 2025 Michelin recommended restaurant, Crown Block, with floor-to-ceiling windows and seating over 200.





Microwaves, Antennas and Propagation Conference - 2026

December 14-18, 2026

Venue :

Indian Institute of Management Nagpur

Plot No.1, Sector 20,MIHAN (Non-SEZ),

Nagpur- 441108, Maharashtra, India



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Ashwin Kothari

Professor Visvesvaraya National
Institute of Technology (VNIT)
Nagpur, Maharashtra, India

M. V. Kartikeyan

Professor and Director Indian
Institute of Information Technology
Design and Manufacturing,
Kancheepuram, Tamil Nadu, India

Convenor

Puneet Kumar Mishra

Head Electrical Integration
Section - 3, U R Rao Satellite
Centre (URSC), Indian Space
Research Organization (ISRO)
Bangalore, Karnataka, India

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Centre (URSC), Indian Space
Research Organization (ISRO)
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IEEE EMC President

Microwave technology and antennas play a pivotal role in modern wireless communications, defence and space technologies. In order to support advancements in these fields, the IEEE Microwave Antennas and Propagation Conference (MAPCON) is a joint flagship conference of IEEE Microwave Theory & Technology (MTT) and IEEE Antenna Propagation (AP) societies in India. This mega-annual event of the radio frequency (RF), microwave, and antenna community provides an international platform to researchers, working professionals, academicians, and industries to showcase their state-of-the-art research/technologies to co-workers/peers. MAPCON 2026, the 5th edition of the conference will be held from 14th to 18 December 2026 at sprawling campus of Indian Institute of Management, Nagpur, Maharashtra, India. Nagpur city located at the heart of India, is well known as Orange city, Tiger Capital and Zero mile of India. The Conference is co-organized by the IEEE MTT-S and AP-S Nagpur Chapters. MAPCON 2026 will feature technical sessions, poster sessions, special sessions, keynote/plenary/invited talks, workshops, and tutorials. Focused tracks on Young Professionals, Women in Engineering, SIGHT, Student design contests, Start-Up India, India Semiconductor Mission, and Aerospace & Defence Industry Focus, etc. which will add to the technical breadth of the conference. Eminent professionals from international space and defence establishments, National Research Organizations, academia, and industries will deliver expert talks and tutorials and organize special sessions related to recent developments in these domains.

●●●● CALL FOR PAPER ●●●●

Authors are invited to submit their original research work in the form of a technical paper (3-4 pages) in the following areas (but not limited to). Detailed instructions on submission can be found on our conference website.

●●●● TOPICS OF INTEREST ●●●●

- TC-1 : RF & Microwave Components, Circuits and Systems**
- TC-2 : Antennas & Propagation**
- TC-3 : Electromagnetic Theory, Metamaterials and Metasurfaces**
- TC-4 : Thz & Photonics Technologies**
- TC-5 : 5G/6G Research and Beyond**
- TC-6 : Measurement Techniques**
- TC-7 : Electromagnetics in Biology & Medicine**
- TC-8 : Electromagnetic Environment and Interference**
- TC-9 : Wireless Power Transfer and Energy and Energy Harvesting**
- TC-9 : Emerging Technologies and Applications**

●●●● KEY DATES ●●●●

April 02, 2026

Paper Submission Starts

August 03, 2026

Paper Submission Deadline

September 05, 2026

Notification of Paper Acceptance

September 30, 2026

**Camera Ready Submission
Deadline**

December 14 -18, 2026

Conference Date



For more information, kindly visit website: ieeemapcon.org or email: info.ieeemapcon2026@gmail.com
website: ieeemapcon.org

Organized by:

IEEE MTT-S & AP-S Nagpur Chapter and IEEE Maharashtra Section

BEST EMC PAPER FINALISTS

TUESDAY, AUGUST 4, 2026

TC2_1

EMC Measurements - Reverberation Chambers and Material Characterization

Room: Coronado A

10:30 AM: Statistics of Electromagnetic Fields Within Complex Nested Cavities Coupled by Various Wires & Apertures

Marshall D Sowell, Carl Hager, IV
Naval Surface Warfare Center, Dahlgren Division, United States

TC11_1

Nanotechnology and Advanced Materials

Room: Coronado D

11:00 AM: Effect of Raster Orientation on X-Band Shielding Effectiveness of Aerosol Jet Printed Films
Cannon Kilcrease, Md Shihab Shakur, Srikanthan Ramesh, Charles F. Bunting, Pavithrakrishnan Radhakrishnan
Oklahoma State University, United States

TC8_1

Magnetic Shielding and Cleanliness Techniques for Space Missions

Room: Cortez D

10:30 AM: Design, Fabrication, and DC Magnetic Emission Testing of Additively Manufactured (3D-Printed) Magnetic Shields

Katherine Dang, Pablo Narvaez, Samad Firdosy, Kevin Pham, Ian Mckinley
Jet Propulsion Laboratory, California Institute of Technology, United States

SPS3

Electromagnetic Information Security Against Leakage and Interference Threats

Room: De Lasalle

1:30 PM: Pin-Selective Contactless Data Injection into Multi-Line CMOS Interfaces Using Dual-Wave IEMI

Masahiro Kinugawa¹, Yuichi Hayashi²
¹*Fukuchiyama Koritsu Daigaku, Japan*; ²*Nara Sentan Kagaku Gijutsu Daigakuin Daigaku Joho Kagaku Kenkyuka, Japan*

WEDNESDAY, AUGUST 5, 2026

PO1

Poster Session

Room: Poster Area

9:37 AM: GNSS Signal-Based Phase-Shift Control for Common-Mode Noise Reduction in Parallel-Connected Power Converters

Shotaro Takahashi¹, Ryosuke Kanbayashi², Motoshi Tanaka², Kishio Hidaka³, Saijian Ajia³, Yasushi Endo³, Tomonaga Ueno⁴, Sho Muroga⁴
¹*Nagoya Institute of Technology, Japan*; ²*Akita University, Japan*; ³*Tohoku University, Japan*; ⁴*Nagoya University, Japan*

TC9_4

Advanced Computational EMC Modeling: Statistical and Data-Driven Methods

Room: Coronado D

10:30 AM: Deep Learning-Based Prediction of Implant-Induced pSAR1g Using Canonicalized |B1+| And Tissue Property Volumes

Jiarui Lu, Zhongrui Wang, Xiaotian Wang, Jianfeng Zheng
University of Houston, United States

TC9_4

Advanced Computational EMC Modeling: Statistical and Data-Driven Methods

Room: Coronado D

11:00 AM: Statistical Analysis of Electromagnetic Coupling to PCB-Cable Assemblies in Complex Enclosures

Shen Lin, Ge Cao, Zhen Peng
University of Illinois Urbana-Champaign, United States

BEST EMC PAPER FINALISTS

THURSDAY, AUGUST 6, 2026

TC5_3

Filters and Arresters for Electromagnetic Pulse Protection**Room: Coronado A****9:00 AM: Circuit Modeling of Granular Metal Arresters for Nanosecond Transients**Tyler Bowman, Matthew Landi, Laura Biedermann
Sandia National Laboratories, United States

TC7_1

EMI in Electrified Transport**Room: Cortez C****9:30 AM: Modeling and Evaluation of Conducted and Radiated Interference from Pantograph-Catenary Arcs at High-Speed Railway Electric Phase Division**Ke Huang, Yang Yang, Feng Zhu
Southwest Jiaotong University, China

TC2_5

EMC Measurements - PCB Level Assessments**Room: Coronado A****10:30 AM: High-Frequency PDN Characterization of a PCB Using Optical Isolation up to 1 GHz Frequency**Aishwarya Gavai^{1,3}, Jan Carsten Hansen²
¹Indian Institute of Science, India; ²Institute of Electronics, Austria; ³Mercedes-Benz Research and Development India, India

TC12_2

WIRELESS EMC (I): RF Interference and Desense**Room: Coronado D****11:00 AM: PMIC-Induced RF Desensitization Analysis in a Remote Device**Wenchang Huang¹, Shengxuan Xia¹, Xuechen Huang², Guangqiang Jiang², Chulsoon Hwang¹
¹Missouri University of Science and Technology, United States; ²Axonics Inc, United States

TC2_8

EMC Measurements - Impedance Measurements and Probes**Room: Coronado A****2:00 PM: Analysis of the Hereward Active Current Probe Employing Bifilar Feedback and Sense Windings**James McLean
TDK R&D Corp., United States

TC4_2

EMI Control: Filtering, Shielding, Absorber**Room: Coronado B****3:00 PM: Experimental Study of Average Absorption Cross Section Measurement Linearity and Sensitivity in a Reverberation Chamber**Mehmet Faruk Cengiz¹, Robert Vogt-Ardatjew¹, Niek Moonen¹, Frank Leferink^{1,2}
¹University of Twente, The Netherlands; ²THALES Nederland B.V., The Netherlands

BEST SIPI PAPER FINALISTS

TUESDAY, AUGUST 4, 2026

TC11_1

Nanotechnology and Advanced Materials

Room: Coronado D

11:30 AM: Inverse Design Method for Frequency Selective Surface Based on Physics-Informed Generative Models

Weikai Luo, Da Li, Jinyan Ma, ErPing Li
Zhejiang University, China

SC3_2

Machine Learning for Advanced Signal Integrity and Power Integrity (II)

Room: Coronado C

2:00 PM: Differential via Modeling Using Transfer Learning Framework

Shruti Sawant¹, Mehdi Mousavi¹, Davit Kharshiladze¹, Srinath Penugonda², Sathvika Bandi¹, Manish Mathew¹, Kevin Cai², Shameem Ahmed², Bichen Chen³, Granthana Rangaswamy³, Santosh Pappu³, Lijun Jiang¹, Chulsoon Hwang¹

¹EMC Laboratory, Missouri University of Science and Technology, United States; ²Cisco Systems Inc., United States; ³Meta Platforms Inc., United States

TC10_2

DDR5 Memory Systems

Room: Cortez B

2:30 PM: Signal Integrity Improvement of Command/Address Channels in DDR5 Fly-By Topology Based on Intentional Characteristic Impedance Mismatch

Sungbum Kim, Siwook Park, Uichan Kim, Jonghyeon Lee, Yuchul Jung, Youngwoo Kim
Sejong University, Korea

WEDNESDAY, AUGUST 5, 2026

TC10_4

High-Speed Via Design & Modeling

Room: Cortez B

11:30 AM: Enhanced Intrinsic via Model of High-Speed Vias

Sathvika Bandi¹, Manish K. Mathew¹, Shruti Sawant¹, Kevin Cai², Shameem Ahmed², Chulsoon Hwang¹

¹Missouri University of Science and Technology, United States; ²Cisco Systems, Inc, United States

THURSDAY, AUGUST 6, 2026

TC10_14

Filters & Standards

Room: Cortez A

9:00 AM: Design of an Adjustable Multi-Stage Common-Mode Filter (AMS-CMF) for Ultra-Wideband Noise Suppression

Jinwook Lee, Seunghun Ryu, Sanguk Lee, Jaewon Rhee, Seungyoung Ahn, Jiseong Kim
Korea Advanced Institute of Science and Technology, Korea

TC10_6

Transmission Line Physics & Routing

Room: Cortez A

10:30 AM: Serpentine Traces Can Be Faster than Straight: Measurements, Physical Explanations, and Implications for High Speed PCB Design

Sean S. Hwang¹, Kevin Cai¹, Felen Fu², Kai Li², Yan Li², Bidyut Sen¹

¹Cisco Systems, Inc., United States; ²Cisco Systems, Inc., China

TC10_15

Data Analysis Methods

Room: Cortez A

2:00 PM: Robust S-Parameter Conversion from Frequency-Dependent RLGC Parameters

You-Jie Chung¹, Chiu-Chih Chou¹, David Chen², Arthur Lin²

¹National Central University, Taiwan; ²NVIDIA Corporation, Taiwan

TC10_5

Power Delivery Network (PDN) Optimization

Room: Cortez B

2:30 PM: Design-Rule Aware Pre-Layout Resource Evaluation and Planning for Power Delivery Networks

Sandesh Paudel, Lijun Jiang
Missouri University of Science and Technology, United States

BEST EMC STUDENT PAPER FINALISTS

TUESDAY, AUGUST 4, 2026

TC2_1

EMC Measurements - Reverberation Chambers and Material Characterization

Room: Coronado A

11:00 AM: Refined Maximum Power-Based Approach
for EMI Measurements in Reverberation Chambers

Fushi Zhang^{1,3}, Vignesh Rajamani², Neelakantam
Venkatarayalu³, Jens Medler⁴, Shuwen Li¹,
Danny Bennett²

¹Rohde & Schwarz Asia Pte. Ltd., Singapore; ²Rohde &
Schwarz United States Inc., United States; ³Singapore
Institute of Technology, Singapore; ⁴Rohde & Schwarz
GmbH & Co. KG, Germany

WEDNESDAY, AUGUST 5, 2026

SC3_4

AI Agent for SI, PI, EMC, and EMI

Room: Coronado C

10:30 AM: Potential-to-Field Neural Network for
Efficient Electric Field Prediction

Yuhao Xu, Jiarui Qiu, Yining Jiang, Pengqi Fu, Yuxiang
Tian, Hanzhi Ma
Zhejiang University, China

THURSDAY, AUGUST 6, 2026

TC12_2

WIRELESS EMC (I): RF Interference and Desense

Room: Coronado D

11:00 AM: PMIC-Induced RF Desensitization Analysis
in a Remote Device

Wenchang Huang¹, Shengxuan Xia¹, Xuechen Huang²,
Guangqiang Jiang², Chulsoon Hwang¹
¹Missouri University of Science and Technology, United
States; ²Axonics Inc, United States

BEST SIPI STUDENT PAPER FINALISTS

WEDNESDAY, AUGUST 5, 2026

TC10_4

High-Speed Via Design & Modeling

Room: Cortez B

11:30 AM: Enhanced Intrinsic via Model of High-Speed
Vias

Sathvika Bandi¹, Manish K. Mathew¹, Shruti Sawant¹,
Kevin Cai², Shameem Ahmed², Chulsoon Hwang¹
¹Missouri University of Science and Technology, United
States; ²Cisco Systems, Inc, United States

THURSDAY, AUGUST 6, 2026

SPS4

Achieving Power Integrity with AI/ML

Room: Coronado C

8:30 AM: Physics-Aware Tensor Learning for
Data-Efficient Multi-Port Power Distribution
Network Analysis

Junghyun Lee, Hyunjun An, Seungjae Lee, Keunwoo
Kim, Youngsu Yoon, Byeongmok Kim, Haeseok Suh,
Junho Park, Jaegun Bae, Chaemin Yang, Gwantaek
Lee, Joungho Kim
Korea Advanced Institute of Science and Technology,
Korea

TC10_15

Data Analysis Methods

Room: Cortez A

2:00 PM: Robust S-Parameter Conversion from
Frequency-Dependent RLCG Parameters

You-Jie Chung¹, Chiu-Chih Chou¹, David Chen²,
Arthur Lin²
¹National Central University, Taiwan; ²NVIDIA
Corporation, Taiwan

STANDARDS WEEK is a combination of talks, tutorials, workshops, panel sessions, and demonstrations that will inform us about new developments in international EMC and Signal Integrity/Power Integrity (SIPI) standards. You can also attend one of the many standards committee meetings and/or working group meetings during the Symposium week to learn more about the standards process, and how you can get involved. These meetings are open to all. Step up and serve your community and share your expertise!



DON'T MISS THE EMC+SIPI 2026 STANDARDS WEEK SESSIONS

- (WT_M1) Military EMC
- (WT_S1) Global EMC Regulations and Standards
- (WT_S3) Characterization of Shielding CCA From DC to 40GHz: The New Standard & What's Next?
- (WT_V2) EMC Implications in Manned and Unmanned Vehicles - Autonomy in Automotive and Other Industries
- (TC1_1) EMI: Standards and Protection Requirements
- (WT_S2) Aerospace EMC Standards Updates Workshop
- (WT_S6) Calibration of EMC Test Facilities and Measurement Instrumentation
- (WT_D3) Electromagnetic Shielding: Bridging Design, Characterization, and Standards
- (WT_D5) Lessons Learned for High Voltage Electrical Systems in Aviation

STANDARDS HAPPY HOUR

THURSDAY, AUGUST 6

4:00 - 6:00 PM

LOCATION: Monet

Open to all who join us for one of the Standards Meetings this week, while supplies last.

Come join us for a chance to mingle and network with professionals who care about standards and technical excellence just as much as you do. As thanks to everyone who sits around a U-shaped conference table for an hour or two, we'd like to provide you with a more relaxed and informal setting to chat. Drinks and heavy appetizers will be available with ticket.

Standards meetings are available remotely via WebEx for those unable to attend in person.

Meeting URL: <https://ieeewebex.com/ieeewebex>

Password: EMC2026

Meeting ID: Listed in schedule below

MEETING/EVENT NAME	ROOM	DATE	START TIME	END TIME	WEBEX NUMBER
IEEE Standards Activities Coordination Committee Meeting	Metropolitan	Monday, August 3	12:00 PM	1:30 PM	2341 797 9714
New Computational Electromagnetic Standard	Milan	Tuesday, August 4	7:00 AM	8:00 AM	2346 997 5374
1848 Renewal Working Group	Milan	Wednesday, August 5	8:00 AM	9:30 AM	2342 218 5584
Shielding Standards Continuity Group Meeting (with focus on IEEE 299 and 299.1)	Monet	Wednesday, August 5	8:00 AM	10:00 AM	2344 236 7061
IBIS Summit	Miro	Thursday, August 6	8:00 AM	12:00 PM	2347 486 6950
PAR 2838 WG	Ming	Thursday, August 6	10:00 AM	12:00 PM	2340 181 7043
SDECom Meeting	Ming	Thursday, August 6	2:00 PM	4:00 PM	2341 985 9710
Standards Happy Hour	Monet	Thursday, August 6	4:00 PM	6:00 PM	



CALL FOR SUBMISSIONS

The IEEE EMC Society is seeking original, unpublished papers covering all technologies that are affected by EMC, Signal & Power Integrity

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Join us IN-PERSON in Portland, Oregon. Share your insight, ask questions, learn from the experts/innovators and see new products at the 2027 IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity. Your published paper will be seen by thousands in the EMC community and across the wide array of disciplines that look to the IEEE EMC Society for technical guidance. In addition, your paper will be uploaded to IEEE Xplore® and receive the exposure and recognition that brings.

THE COMMITTEE PROPOSES SPECIAL TOPIC AREAS:

Chip-level EMC; Urban Air Mobility (UAM) and EMC requirements; Emerging EMC challenges in Military and Space applications; EMC and SIPI for Data Centers and High-Speed Interconnect; AI/ML application to EMC and SIPI problems.

Special Sessions are unique and dedicated sessions on a specific topic with 4-6 page Traditional Papers. Each paper presents a facet of the specific topic. These sessions can be created by working with the Technical Committees. If interested, you should discuss this with one of the Technical Committees to act as the sponsor.

Abstract-Reviewed Papers are an alternative to the 4-6-page Traditional Paper that enables Authors to present their work without the burden of writing a full manuscript. Abstract-Reviewed Papers have a later submission deadline and only require an extended abstract (approximately one page in length).

Poster Papers are Traditional Papers for which the Author chooses to present their work in an interactive, poster session instead of the typical classroom style presentation.

Workshops & Tutorials are an option for authors covering a fundamental topic, a complex project, or a large dataset. Presentation proposals are submitted instead of a journal paper, and presentation materials (PowerPoint slides) are collected after the proposal is accepted.

Experiments & Demonstrations are for contributors who prefer to share their work as live experiments or demonstrations.

TOPICS OF INTEREST

- TC-1: EMC Management** - Personal & Laboratory Accreditation, EMC Education & Awareness, Legal Issues
- TC-2: EMC Measurements** - Techniques, Test Instrumentation & Facilities, Standards and Regulations, Measurement Uncertainty
- TC-3: EMC Environment** - Signal Environment, Atmospheric & Manmade Noise, Characterization
- TC-4: EM Interference Control** - Shielding, Gaskets, Cables, Connectors, Grounding & PCB Layout
- TC-5: High Power Electromagnetics** - ESD & Transients, EMP, IEMI & Lightning, Geomagnetic Storm EMC
- TC-6: Spectrum Engineering** - Characterization and Modeling, Design, Adaptive Interference Mitigation
- TC-7: Electrical System and Power Electronics EMC** - Power EMC, Conducted Emissions, Power Conversion, Transportation & Electric Vehicles, Grid
- TC-8: Aeronautics and Space EMC** - Aircraft, Atmospheric Environment, Drones, Spacecraft, Missiles
- TC-9: Computational Electromagnetics** - Modeling & Simulation, Multi-Physics Techniques, Tools, and Applications
- TC-10: Signal and Power Integrity** - Interconnects - Modeling & Characterization, Crosstalk, Jitter, Noise
- TC-11: Nanotechnology & Advanced Materials** - Nanomaterials & Nanostructures, Smart Materials
- TC-12: EMC Wireless Technologies** - EMC Planning/Testing/Specifications, Wireless Coexistence
- SC-3: Machine Learning and Artificial Intelligence in EMC and SIPI** - Deep Neural Networks, Support Vector Machines, Gaussian Process Regression, Bayesian Optimization

KEY DATES

NOVEMBER 20, 2026:

Submission Deadline for Special Session Proposals

DECEMBER 25, 2026:

Submission Deadline for Traditional and Special Session Papers

JANUARY 15, 2027:

Submission Deadline for Workshops & Tutorials and Experiments & Demonstrations Proposals

FEBRUARY 5, 2027:

Notification of Acceptance/Rejection for Traditional and Special Session Papers

FEBRUARY 19, 2027:

Submission Deadline for Abstract-Reviewed Papers

FEBRUARY 19, 2027:

Notification of Acceptance/Rejection for Workshops & Tutorials and Experiments & Demonstrations

MARCH 5, 2027:

Submission Deadline for Revised Traditional and Special Session Papers

APRIL 8, 2027:

Notification of Acceptance/Rejection for Traditional, Abstract-Reviewed, and Special Session Papers

MAY 7, 2027:

Submission Deadline for Final Papers and Workshop & Tutorial Presentations (Registration Required)

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Are you passionate about high-tech electronics, communications systems, and cutting-edge testing technologies? Don't miss this exclusive technical tour of the R&S Texas Production and Integration Center (TPIC) in Coppell!

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- Cable manufacturing
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Get an exclusive look at R&S body scanners used for security screening in airports, public buildings, and high-security environments. Discover how these systems detect concealed objects safely and effectively — without physical contact.

Over-the-Air (OTA) Chamber & Wireless Innovation

If you are a wireless engineer interested in Over-the-Air (OTA) test chambers and evolving wireless testing requirements, this tour is for you. Gain insight into wireless testing strategies supporting 5G and Wi-Fi 6E, and see how TPIC is preparing for the future of wireless communications and advanced compliance testing.

Join us for a behind-the-scenes look at engineering excellence in action at Rohde & Schwarz.

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Date: Thursday, August 6, 2026 • 2:00 – 5:00 PM

Location: Texas Production and Integration Center (TPIC)
Coppell, TX

Hosted by: Rohde & Schwarz

Cost: \$35 (**SOLD OUT**)

Ticket price includes bus transportation to/from the Hilton Anatole Hotel to the TPIC and some refreshments. Tickets are limited and will be sold on a first-come, first-served basis. Comfortable walking shoes are highly recommended.



WORKING GROUPS, COLLATERAL MEETINGS & SOCIAL EVENTS

Times are subject to change. Please confirm the meeting schedule on the website, in the final program, and on the mobile app closer to the symposium start date.

Technical Committees, Standards, and EdCom meetings are available remotely via WebEx for those unable to attend in person.

Meeting URL:

<https://ieee.webex.com/ieee>

Password: EMC2026

Meeting ID:

Listed in schedule below

SUNDAY, AUGUST 2

Meeting/Event Name	Room	Start Time	End Time	Type	Attendees	Webex Meeting ID
EMC Society Board of Governors' Meeting	Miro	9:00 AM	5:00 PM	Other	Pre-Registration	

MONDAY, AUGUST 3

Meeting/Event Name	Room	Start Time	End Time	Type	Attendees	Webex Meeting ID
Speaker Breakfast	De Sota	7:00 AM	8:30 AM	Other	Speakers Only	
Technical Advisory Committee (TAC) Meeting #1	Metropolitan	7:00 AM	8:30 AM	Technical Services		2334 239 7566
IEEE Standards Activities Coordination Committee Meeting	Metropolitan	12:00 PM	1:30 PM	Standards Services		2341 797 9714
Young Professionals Luncheon	Miro	12:00 PM	1:30 PM	Social Event	Pre-Registration	
Chapter Chair Training Session and Luncheon	Monet	12:00 PM	1:30 PM	Member Services	Invitation Only	2340 266 9358

TUESDAY, AUGUST 4

Meeting/Event Name	Room	Start Time	End Time	Type	Attendees	Webex Meeting ID
Speaker Breakfast	De Sota	7:00 AM	8:30 AM	Other	Speakers Only	
TC-2 EMC Measurements Committee Meeting	Metropolitan	7:00 AM	9:00 AM	Technical Services		2333 205 8227
New Computational Electromagnetic Standard	Milan	7:00 AM	8:00 AM	Standards Services		2346 997 5374
TC-8 Aeronautics and Space EMC Committee Meeting	Monet	12:00 PM	1:00 PM	Technical Services		2331 693 4035
TC-7 Electrical Systems and Power Electronics EMC Committee Meeting	Metropolitan	12:00 PM	1:30 PM	Technical Services		2336 937 2013
TC-9 Computational Electromagnetics Committee Meeting	Miro	12:00 PM	1:30 PM	Technical Services		2348 160 4143
Welcome Reception	Trinity Exhibit Hall	5:00 PM	6:30 PM	Social Event		
Young Professionals "After the Welcome Reception" Social Event	Offsite-Bowl Games	6:30 PM	9:30 PM	Social Event	Pre-Registration	

WEDNESDAY, AUGUST 5

Meeting/Event Name	Room	Start Time	End Time	Type	Attendees	Webex Meeting ID
Speaker Breakfast	De Sota	7:00 AM	8:30 AM	Other	Speakers Only	
TC-1 EMC Management Committee	Ming	7:30 AM	9:00 AM	Technical Services		2345 039 1187
TC-12 EMC for Emerging Wireless Technologies Committee Meeting	Miro	8:00 AM	9:00 AM	Technical Services		2346 898 0821
1848 Renewal Working Group	Milan	8:00 AM	9:30 AM	Standards Services		2342 218 5584
Shielding Standards Continuity Group Meeting (with focus on IEEE 299 and 299.1)	Monet	8:00 AM	10:00 AM	Standards Services		2344 236 7061
Renewal WG for IEEE P1309 on Field Probe and Sensor Calibration	Ming	10:00 AM	11:30 AM	Standards Services		2346 286 6286
Recommended Practices for the Electrical Characterization of Metal Contacts from DC to Radio Frequency	Miro	12:00 PM	1:30 PM	Standards Services		2331 269 8295
Past Presidents Luncheon	De Sota A	12:00 PM	1:30 PM	Other	Invitation Only	
TC-10 Signal and Power Integrity Committee Meeting	Monet	12:00 PM	1:30 PM	Technical Services		2330 910 1620
TC-11 Nanotechnology and Advanced Materials Committee Meeting	Ming	12:00 PM	1:30 PM	Technical Services		2344 778 4047
TC-5 High Power Electromagnetics (HPEM) Technical Committee Meeting	Metropolitan	12:00 PM	1:30 PM	Technical Services		2335 661 0027
Youth Technical Program	DeLaSalle	1:00 PM	3:30 PM	Social Event	Pre-Registration	
Women in Engineering Event	Madrid	4:00 PM	5:30 PM	Member Services		
Gala Dinner	Offsite-Gilley's Dallas	7:00 PM	10:00 PM	Social Event	Pre-Registration	

THURSDAY, AUGUST 6

Meeting/Event Name	Room	Start Time	End Time	Type	Attendees	Webex Meeting ID
Team EMC Bike Ride	Main Entrance	6:45 AM		Other	Pre-Registration	
Speaker Breakfast	De Sota	7:00 AM	8:30 AM	Other	Speakers Only	
TC-6 Spectrum Engineering Committee Meeting	Metropolitan	7:30 AM	8:30 AM	Technical Services		2333 882 6639
TC-4 Electromagnetic Interference Control Committee Meeting	Monet	7:30 AM	9:00 AM	Technical Services		2349 522 6480
TC-3 Electromagnetic Environment Committee Meeting	Ming	8:00 AM	10:00 AM	Technical Services		2332 128 8592
T-EMC, T-SIPI, L-EMCPA Associate Editor Meeting	Milan	8:00 AM	10:00 AM	Communication Services		2337 901 3551
IBIS Summit	Miro	8:00 AM	12:00 PM	Standards Services		2347 486 6950
PAR 2838 WG	Ming	10:00 AM	12:00 PM	Standards Services		2340 181 7043
Awards Luncheon	Trinity Ballroom	12:00 PM	1:30 PM	Social Event	Pre-Registration	
SC-3 Special Committee on Machine Learning and AI in EMC and SIPI Committee Meeting	Metropolitan	2:00 PM	2:30 PM	Technical Services		2332 135 9132
SDECom Meeting	Ming	2:00 PM	4:00 PM	Standards Services		2341 985 9710
EMC-S PerCom Meeting	Milan	2:00 PM	3:00 PM	Communication Services		2342 775 8778
Standards Happy Hour	Monet	4:00 PM	6:00 PM	Standards Services	Invitation Only	
EMC Society Board of Governors' Meeting	Miro	6:00 PM	8:00 PM	Other	Pre-Registration	

FRIDAY, AUGUST 7

Meeting/Event Name	Room	Start Time	End Time	Type	Attendees	Webex Meeting ID
Speaker Breakfast	De Sota	7:00 AM	8:30 AM	Other	Speakers Only	
Technical Advisory Board (TAC) Meeting 2	Miro	7:00 AM	8:30 AM	Technical Services		2330 498 0012

EMC SOCIETY TECHNICAL COMMITTEES - BUILD YOUR EXPERTISE AND YOUR CAREER

No matter where you are in the industry, at some point you will deal with an EMC issue. Maybe a device is causing interference or maybe it's vulnerable to radio-frequency fields. Maybe a device crashes or resets after an electrostatic discharge. Maybe you've been looking for help explaining an EMC problem to your customer or your boss. All of these things happen. **Become part of the solution.**

The **IEEE EMC Society's Technical Committees (TCs)** convene to set EMC standards & practices and develop tools for success. Covering topics ranging from professional development to nanotechnology, the TCs are volunteer consensus groups that build our industry's foundations. Join remotely or in-person and help form important technical practices.

Find your place among these forward-looking committees. Join a TC today and set standards, explore emerging technology and help develop programs and create the tools that you and your industry need.

If you are interested in joining a committee, please complete the TC/SC Interest form.

www.emcs.org/technical-committees/tc-sc-interest-form

WORKING GROUPS AND TECHNICAL COMMITTEE MEETINGS

The EMC Society has many working groups and committees that are tackling the wide range of functions of the society's mission. The working groups primarily come out of the EMC Society Standards activities developing new EMC Standards and revising existing standards. Standing and special committees are formed to address a broad range of needs, ranging from interfacing with other industry organizations to dealing with the administration of the society. All of these meetings are open to everyone (unless listed otherwise). Join them for breakfast, breaks, lunch or dinner. Learn what other EMC members are working on and influence how the society operates.

COLLATERAL MEETINGS

With so many people attending this pinnacle event from across the globe, it's a perfect opportunity for groups other than the EMC Society to hold meetings in parallel to the Symposium. Be sure to check out the schedule to find out about the numerous collateral meetings and who can participate. The EMC Society is neither responsible for nor endorses any of these collateral meetings and discourages any meetings from conflicting with the technical and networking programs of the Symposium.

**If you would like to schedule a meeting, please contact:
Taylor Lineberger - t.lineberger@ieee.org**



Photo by Richard Georgerian

TC 1 EMC Management

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 to these Best Practices and Methodologies.

TC 2 EMC Measurements

The committee reviews the adequacy of measurement procedures and measurement instrumentation specifications for radiated and conducted emission and immunity tests. Also discussed is the rationale for product emission limits and immunity test levels including performance requirements. The committee also supports EMC standards and procedures that deal with measurements and their uncertainty and how they are interpreted and applied.

TC 3 Electromagnetic Environment

The charter of TC3, the Technical Committee on Electromagnetic Environment is to encourage research on the:

- 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 Control

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

This committee is concerned with the effects and protection methods for electronic equipment and systems for all types of high power and other electromagnetic threat 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

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 Electrical Systems and Power Electronics EMC

This technical committee is concerned with low-frequency EMC including Power Quality in electric power systems. The committee is focusing on 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 8 Aeronautics and Space EMC

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.

TC 9 Computational Electromagnetics

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 and Power Integrity

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

TC 11 Nanotechnology and Advanced Materials

IEEE EMC-S TC-11 Charter is focused on *engineering and scientific aspects* related to **nanotechnology and advanced materials for EMC**. This *includes engineering of new materials, their modeling, manufacturing, characterization, and applications of nanomaterials and nanodevices for EMI mitigation and EMC*. This is an **interdisciplinary area**, combining physics, chemistry, materials science & engineering, electromagnetics, and eventually EMC.

TC-11 deals with modelling, simulation and experimental characterization of nanomaterials and nanodevices for EMC applications. Nanotechnology is the understanding and controlling of matter at atomic and molecular scale, as well as creating artificial materials with nano-size dimensions (3D, 2D, and 1D). Nanotechnology has already found its way into various EMC applications. New materials such as single- and multi-phase composites filled with nanoparticles, nanotube and/or nanofibers have been designed and tested for gaskets and absorbing screens with outstanding performance and capabilities. Innovative nanostructured shields have shown multifunctional properties and higher efficiency than commonly used materials. Nanowires for high-speed interconnects and high-density integrated systems, could replace copper in the near future, but require adequate modelling and simulation approaches for signal integrity and also to avoid electromagnetic interference problems.

TC 12 EMC for Emerging Wireless Technologies

This committee is concerned with the EMC design, analysis, modeling, measurement, and testing aspects of emerging wireless products, such as Internet of Things and 5th Generation of Wireless Communication. 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
- EMC and OTA 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 for Autonomous cars, Phased Array, and others.

SC 3 Machine Learning and Artificial Intelligence in EMC and SIPI

The presence of machine learning, AI and deep learning are increasingly pervasive. The impact on EMC, SI and PI is changing thought processes and engineering practice.

This Special Committee is concerned with all aspects of machine learning, artificial intelligence and deep learning as it applies to the Society's Field of Interest. It is not limited to any specific aspect of the Society but recognizes that machine learning and related approaches have relevance across the entire spectrum of Society activities.

The role of the committee is to:

- Act as forum for experts researching machine learning and associated technologies
- Provide education and training opportunities for EMC, SI and PI engineers
- Identify and communicate needs within the community, supporting the interaction between problem holders and solution providers.
- Promote standardization activities associated with the impact of machine learning on the Society's Field of Interest.

Standards Advisory and Coordination Committee (SACCom)

The IEEE EMC Society Standards Advisory and Coordination Committee is responsible for providing technical liaison between the IEEE EMC Society Standards Development Committee and various non-IEEE entities involved with EMC standards activities.

In particular, the SACCom will include the following:

- Propose to the EMCS board of directors (BOD), the appointment of representatives to various non-IEEE standards developing entities.
- To monitor the activities of various non-IEEE standards developing organizations with a view toward making recommendations to the EMCS board of directors on any required coordination of those activities within the society.
- To communicate and coordinate with non-IEEE standards developing activities and the EMCS Standards Development Committee on matters relating to the development of EMC related standards.

Standards Development and Education Committee (SDECom)

The IEEE EMC Society Standards Development and Education Committee is responsible for guiding the development of IEEE EMC Standards, the training of those involved in the standards making process and the education of the EMC Society community on all aspects of EMC Standards. The IEEE EMC Society is the primary international developer of fundamental test, measurement and verification standards for EMC.

Education Committee (EdCom)

This committee's mission is to promote EMC education related activities of the IEEE EMC Society. Our vision is to provide opportunities for individuals and organizations involved with electrotechnology and products to become aware of EMC at levels consistent with their needs, and our goals are to establish an awareness of EMC fundamentals throughout industry and academia as well as to enhance EMC education through the development of improved education techniques, materials, opportunities, and communications.



MEET AND NETWORK WITH LIKE-MINDED INDIVIDUALS AT OUR SOCIAL EVENTS

WELCOME RECEPTION

The EMC+SIPI 2026 Welcome Reception will be held in the Exhibit Hall at Trinity Exhibit Hall on Tuesday.

One ticket to this event is included in all 5-Day technical registrations, Companion Program and exhibit hall registrations.



Photo by Patrick Andre

Location: Exhibit Hall,
Trinity Exhibit Hall

Date: Tuesday, August 4, 2026

Time: 5:00 – 6:30 PM

Cost: No Charge



Network with your peers and other top industry professionals throughout the week during numerous planned events!

EVENING GALA EVENT

Saddle up for a true Texas experience at our off-site event hosted at Gilley's Dallas—the legendary home of honky-tonk charm, live music, and big-hearted Southern fun. We're taking over one of Dallas's most famous venues for a night packed with great food, cold drinks, lively entertainment, and plenty of room to unwind.

Kick back with colleagues, try your hand at classic Texas line dancing, or just listen to great live music! This is your chance to experience Dallas the way locals do—bold, warm, and unforgettable.

Location: Gilley's Dallas

Date: Wednesday, August 5, 2026

Time: 7:00 – 10:00 PM; Buses will start departing at 6:45pm from the Hilton Anatole Hotel Grand Entrance.

Cost: \$120

AWARDS LUNCHEON

The Awards Luncheon is a wonderful opportunity to recognize achievements and network with families and EMC professionals from academia, industry, government, military, and retired sectors. The event will start off with a catered sit-down meal. Afterwards, the EMC Society will take time to recognize members and non-members for their contribution to the Society and for professional excellence.

Location: Trinity Ballroom

Date: Thursday, August 6, 2026

Time: 12:00 PM – 1:30 PM

Cost: \$70

Photo by Patrick Andre

Photo by Richard Georgerian

CHAPTER CHAIR TRAINING SESSION AND LUNCHEON

The Chapter Chair Training Session provides a forum for focused training to the Chapter Chairs, the opportunity to discuss chapter issues and get group feedback. Additionally, the session gives the Chapter Chairs the opportunity to meet other Chapter Chairs from around the world and for the Chapter Coordinator to disseminate important information from IEEE headquarters and the EMC Society Board of Governors. A Social Session will precede the Luncheon to give the Chapter Chairs the opportunity to socialize with the other Chapter Chairs and their Angels.

The Luncheon will be served at the end of the Social Session. Besides a great meal, each Chapter Chair or their representatives will have the opportunity to share what their chapter has been doing for the past year. After the Luncheon, an interactive brainstorming session will conclude the meeting. This session is intended to allow participants to exchange information and new ideas for effective chapter management, as well as to discuss best practices and suggestions for future development and growth of the EMC chapters.

Location: Monet

Date & Time: Monday, August 3, 2026 • 12:00 – 1:30 PM

Cost: Free for Chapter Chairs

This is a free event open to Chapter Chairs or their representatives. Please check with your Chapter Chair, as you can be that representative for your chapter if your Chapter Chair cannot attend this event



Photo by Karthik Vepuri

PAST PRESIDENTS LUNCHEON

The Luncheon is open to Past-Presidents of the EMC Society, and current members of the Board of Directors. The luncheon is a chance for the old and the new to mix, exchanging experiences of the past and challenges of the future relative to the EMC profession. A sit-down lunch is provided. Past-Presidents should inform the Chair of the History Committee (danhoolihanemc@aol.com) of their interest in attending so there will be seating and food available for all.



Photo by Jerry Ramie

Location: De Sota A

Date: Wednesday, August 5, 2026 • 12:00 – 1:30 PM

TEAM EMC

Ready to explore Dallas on two wheels with your fellow EMC Members? We're excited to announce that the plans for our 13th Annual TEAM EMC Bike Ride are officially underway!

This fun, leisurely morning ride is open to riders of all skill levels. It's the perfect opportunity to get some exercise, enjoy the fresh air, and experience the beautiful area in a whole new way.

BIKE RENTAL SHOPS AND MORE DETAILS:

<https://2026.emcsi.org/programs/social-events/team-emc/>



Photo by Susanne Vogel

Meeting Location: Meet at the main entrance of
Hilton Anatole Hotel by 6:45 AM

Date & Time: Thursday, August 6, 2026 • 6:45 AM

IEEE EMC SOCIETY WOMEN IN ENGINEERING (WIE) EVENT

IEEE Women in Engineering (WIE) is a global network dedicated to advancing women in engineering and science. Join us during the EMC+SIPI 2026 Symposium for a networking and enrichment event to connect, learn, and share experiences with the EMC community.

This free event includes guest presentations, networking, and a closing celebration. Refreshments will be provided.

Location: Madrid
Date: Wednesday, August 5
Time: 4:00-5:30pm
Cost: Free

**Everyone is welcome
- men and women -
to attend the special presentations!**



TIME	TOPIC	PRESENTER/INSTRUCTOR
4:00pm	Welcome	Tara Kellogg (ETS-Lindgren)
4:05 pm	GUEST PRESENTATION #1 Launching Your EMC Career: A Blueprint for Young Engineers	Ms Nika Amralah (Canadian Department of National Defence)
4:35 pm	Break & Networking Exercise	
4:50 pm	GUEST PRESENTATION #2 Navigating a Trailblazing Career: A Female Air Force Leader and Educator's Journey	Colonel Carey J. Jones (Air Force)
5:20 pm	Closing Toast & Refreshments to Celebrate WIE!	
5:30 pm	Adjourn	



Photo by Karthik Vepuri

EMC Society would like to invite all Young Professionals (BS within 15 years) and Undergraduates to our Networking Events at the 2026 EMC+SIPI.



YOUNG PROFESSIONALS LUNCHEON

All YPs (BS degree within 15 years) are invited for lunch and socializing at our “YP Luncheon” event. We’ll also be highlighting the Best Student Paper (EMC and SIPI) Candidates and announcing the call for 2027 EMC Society YP Ambassadors at this event.

At the 2026 Symposium, and back by popular demand, we’re excited to host “EMC+SIPI KAHOOT!” — a fun twist on EMC+SIPI Jeopardy. This high-energy session is a great way to deepen your EMC+SIPI knowledge while enjoying a relaxed, welcoming atmosphere to connect with fellow YPs and seasoned professionals.

Stay tuned to the Dallas Symposium website for additional details and make plans to join us! Meet other young members of the EMC Society, build your network, and learn alongside experts.

Location: Hotel Hilton Anatole, Miro

Date: Monday, August 3, 2026

Time: 12pm - 1:30 PM

Registration Fee: \$30 registration, Includes Lunch

Space is limited so please register during your symposium registration.



"AFTER THE WELCOME RECEPTION" EVENT

Come enjoy yourself “After the Welcome Reception” at our Tuesday evening social event. This is a great opportunity to continue the conversations and fun from the Welcome Reception into the rest of the evening. Relationships formed in the EMC Society can lead to future collaborations and will provide valuable contacts when you need a friend to bounce ideas off!

Please register in advance during your symposium registration process. Limited space is available.

Location: Bowl Games, 139 Turtle Creek Blvd Suite 120

Date: Tuesday, August 4, 2026

Time: 6:30 pm - 9:30 PM

Registration Fee: \$30 registration, Includes 2 drink tickets, shared appetizers and fun games

Space is limited so please register during your symposium registration.



SOUND SCIENCE: CRAFT A SPEAKER FROM EVERYDAY MATERIALS!

Engineering combines creativity, curiosity, and scientific thinking to transform ideas into technologies that shape our everyday lives—from the electronics in our phones to the systems that power music and communication. In this program, students will explore the science of sound and discover how electricity, magnetism, and thoughtful engineering design work together to turn simple signals into the sounds we hear every day.

Open to children ages 6-19.

Due to IEEE legal requirements, parents are required to escort their children and stay for the duration of the activity.

Please pre-register via the Registration portal or check onsite at the registration desk to see if there are any openings for additional participants.

Location: De La Salle Room
Date: Wednesday, August 5, 2026
Time: 1:00 – 3:30 PM
Registration Fee: FREE



Companion Lounge is in the Crow's Office on the Mezzanine Level of the Hilton Anatole Hotel. Hours are Monday-Friday from 8:00 AM - 5:00 PM during the Symposium

The Companion Club is your chance to meet new people and catch up with old friends. You may register for the Companion Club as a part of the technical attendee's registration or separately.

Paid Companion Club members are welcome to visit the beautiful Companion Suite open from 8am - 5pm, Monday through Friday. Breakfast vouchers will be provided for the Companion Club participants for the restaurant in the hotel.

This year, the EMC+SIPI Symposium offers two attractive group Companion Tours/Events. However, you don't have to be registered for the Companion Club to participate in a tour/event.

If you register for the Companion Club, you may sign up for the tours/events with your own registration. Otherwise, you may purchase tours/events through the technical attendee's registration; there will be a drop-down space to add your name.

Join your technical attendee at any of our Social Events for more fun and to meet more people. We have special prices for companions under the age of 18. Tickets to the Welcome Reception on Tuesday, a great networking time for all, are included in all Companion Club registrations. The Evening Gala on Wednesday is also a fun event, and companions are invited to register for this event separately in their Companion Club or technical attendee's registration.

For the younger crowd, our ever popular Youth Technical Program is back once again to amaze all companions and guests aged 6 to 19. This program will again be free of charge, but please register early to be assured of a project kit. Registration for each young person can be made either through your own Companion Club registration or the technical attendee's registration. Your children do not need to be registered in the Companion Club to sign up for the Youth Technical Program. Open to children ages 6-19. Due to IEEE legal requirements, parents are required to escort their children and stay for the duration of the activity. Please pre-register via the Registration portal or check onsite at the registration desk to see if there are any openings for additional participants. A minor release form will need to be completed and submitted before obtaining a badge for anyone under the age of 18.

JOIN THE BREAKFAST CLUB

Would you like to invite your technical attendee to join you for breakfast in the Companion Suite? **"Breakfast Club"** tickets may be purchased by the technical attendee as an option for each day breakfast is desired. Tickets must be purchased at a minimum 24 hours in advance to ensure adequate seating and catering.

Join fellow companions at the symposium by registering for the Companion Club. This is an excellent opportunity to meet new people and reconnect with old friends! Adult or youth (ages 8 to 17) companions who are pre-registered may go directly to the registration desk to obtain their Companion Registration Badge..

This will include:

- Name badge that will allow you access to the Companion Suite and Exhibit Hall (during regular hours)
- Breakfast voucher for the restaurant for four days
- Gift bag with goodies
- One ticket to the Tuesday evening Welcome Reception
- Any tour/event or social event tickets you may have purchased

Youths (ages 8-17) who are registered for the Junior Companion Club are welcome in the Companion Suite with an adult Companion Club member. Children under age 8 do not receive a gift bag but will be admitted free if accompanied by a registered adult Companion Club member.

We look forward to seeing everyone in Dallas on August 3-7, 2026.

Conference attendees, make sure you tell your companions about the Companion Club Tours/Events and sign them up early when you register for the Symposium.

COMPANION CLUB RATES: \$200

Children under 8: No charge

A LA CARTE TOURS ARE AVAILABLE:
2026.emcsi.org/programs/companions-tours/companion-tours

DALLAS HIGHLIGHTS TOUR

Experience the best of Dallas on this dynamic city tour!

Join a knowledgeable Tour Guide as you uncover the city's rich history, thriving arts scene, striking architecture, and key JFK landmarks. Enjoy plenty of photo opportunities, engaging stories, and stops in some of Dallas's most distinctive neighborhoods. It's an ideal way to explore, learn, and fall in love with the city's unique character.

STOPS INCLUDE:

- West End Historic District: Where Dallas Began
- JFK Assassination Site: Walk Through History
- Pioneer Plaza: A Tribute to Texas Heritage
- Downtown Dallas: Iconic Landmarks and Art
- Klyde Warren Park: Urban Oasis
- Margaret Hunt Hill Bridge: Architectural Marvel
- Dallas Arts District: A Cultural Hub
- Victory Park: Where Sports and Culture Meet
- Uptown Dallas: Historic Trolleys and Modern Culture
- Highland Park: Scenic Splendor
- Southern Methodist University: History and Art



Date: Tuesday, August 4, 2026
Time: 9:00am - 1:00pm
Cost: \$90 per guest
Includes: Transportation, Tour Guide

FORT WORTH HIGHLIGHTS TOUR

Explore Fort Worth: Where the Spirit of the American West Still Thrives.

Journey into the storied world of Cowboys, Cattle, and Railroads—the forces that shaped this dynamic city and helped define the legendary West.

STOPS INCLUDE:

- Sundance Square: A Downtown Gem
- Uncover Fort Worth's Western Heritage
- Sid Richardson Museum: Art of the American West
- JFK in Fort Worth: A Historic Connection
- The Fort Worth Stockyards: Step into the Old West
- Daily Longhorn Cattle Drive: A Living Tradition
- Cowboy Experiences: Ride, Tour, and Explore
- Mule Alley: Fort Worth's Western Legacy
- Historic Saloons and Hotels
- Billy Bob's: The World's Largest Honky-Tonk
- Shopping and Souvenirs: Western Wear and More
- John Wayne Experience: A Legendary Life
- Iconic Fort Worth: Beyond the Stockyards



Date: Wednesday, August 5, 2026
Time: 9:00AM - 2:00PM
Cost: \$95 per guest
Includes: Transportation, Tour Guide

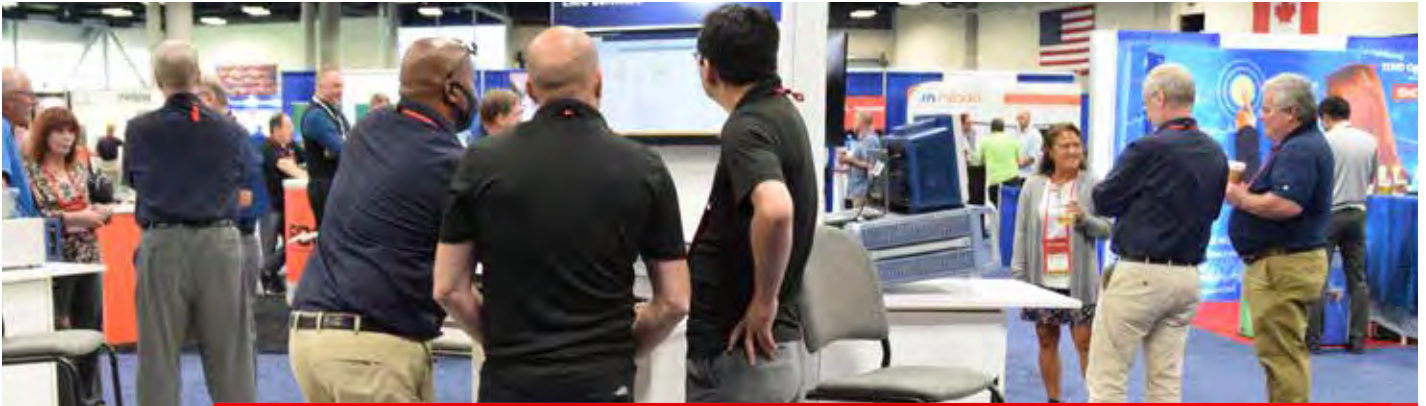


Photo by Richard Georgerian

EXPLORE THE EXHIBIT HALL AND LEARN ABOUT NEW TECHNOLOGIES, INSTRUMENTATION AND SOLUTIONS THAT SERVICE THE INDUSTRY

WHAT'S HAPPENING IN THE EXHIBIT HALL?

- Explore and learn from over a hundred top suppliers
- Attend “Ask the Experts” panels and get your questions answered
- Enjoy Experiments, Demonstrations and Poster Sessions
- Visit exhibitor booths to participate in raffles and daily prizes
- Play the Exhibitor Scavenger Hunt!

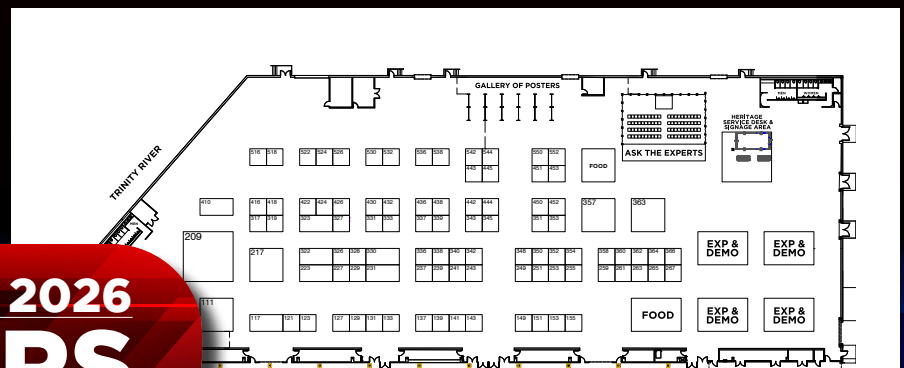
INTERESTED IN EXHIBITING?

We welcome the opportunity to have your organization join us as an industry partner and exhibit at this year's Symposium.

To learn more about exhibiting and sponsorship opportunities, or to reserve your space today visit:

2026.emcsi.org/exhibitors-sponsors

EXHIBIT HALL IS LOCATED IN HILTON ANATOLE TRINITY HALL



**MEET THE EMC+SIPI 2026
EXHIBITORS**

DISCOVER OUR EXHIBITORS!

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* Please welcome our first-time exhibitors

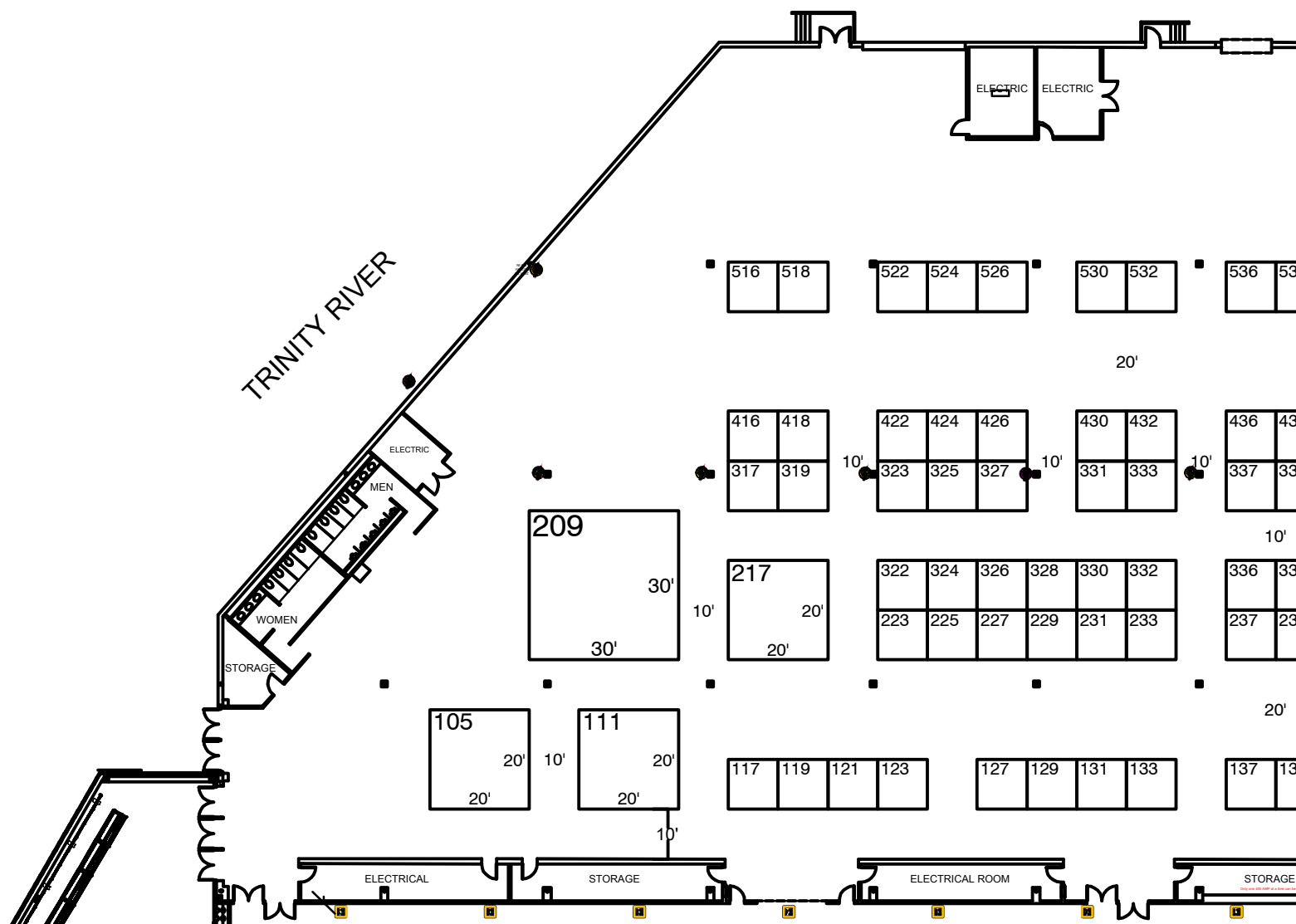


EXHIBIT HALL ACTIVITIES

ASK THE EXPERTS PANEL DISCUSSIONS

Tuesday, August 4, 2026: 1:30 PM - 3:30 PM

Wednesday, August 5, 2026: 10:30 AM - 12:00 PM

EXPERIMENTS AND DEMONSTRATIONS

Tuesday, August 4, 2026: 10:00 AM – 12:00 PM / 2:00 PM – 4:00 PM

Wednesday, August 5, 2026: 10:00 AM – 12:00 PM / 2:00 PM – 4:00 PM

Thursday, August 6, 2026: 10:00 AM – 12:00 PM

STUDENT EMC HARDWARE DESIGN COMPETITION

Tuesday, August 4, 2026: 2:00 PM - 3:00 PM, Trinity Exhibit Hall

STUDENT PAPER CONTEST POSTER SESSION

Tuesday, August 4, 2026: 3:00 PM - 3:30 PM

POSTER SESSION

Wednesday, August 5, 2026: 9:30 AM - 11:30 AM

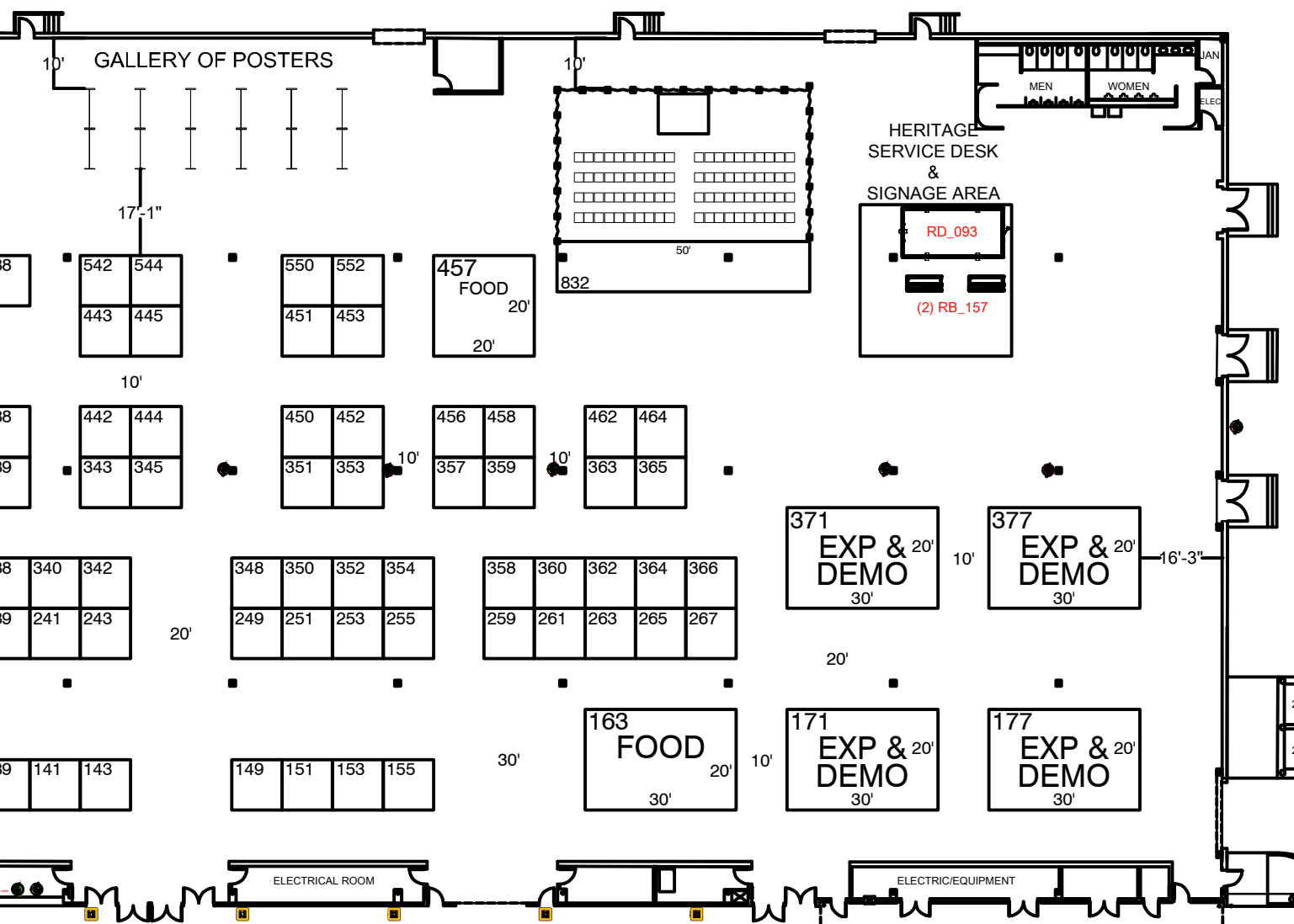


EXHIBIT HALL SCHEDULE

TUESDAY, AUGUST 4

Exhibits Open: 9:30 AM - 6:30 PM

Welcome Reception: 5:00 PM - 6:30 PM

WEDNESDAY, AUGUST 5

Exhibits Open: 10:00 AM - 5:00 PM

THURSDAY, AUGUST 6

Exhibits Open: 10:00 AM - 12:00 PM



ABSOLUTE EMC LLC

Booth 111

<http://absolute-emc.com>

Absolute EMC LLC brings decades of EMC expertise in testing, standards, and equipment. We partner with top manufacturers-Haefely, BOLAB Systems, Montena Technologies, YIC Technologies, EMC Instruments, EMZER, Lumiloop, HILO/TEST, Schloder EMV-Systems, Schwarzbeck, Tekbox, and mk messtechnik-to deliver superior products. Guided by our founder's commitment to excellence, we offer expert advice to ensure the right choice the first time. We treat customers like family, prioritizing their needs. Our portfolio includes impulse generators, ESD, surge, EFT, lightning, EMP, HIRF, RF test systems, turnkey projects, test tables, EUT supports, coax, antennas, preamps, LISNs, fiber-optic interfaces, cameras, and more.



ADVANCED TEST EQUIPMENT RENTALS

Booth 322

<http://www.atecorp.com>

Advanced Test Equipment Rentals (ATEC) is a leading provider for EMC and EMI test solutions, offering an extensive inventory of equipment designed for compliance with industry standards such as MIL-STD-461, IEC 61000, ISO 7637, and more. With over 40 years of expertise, ATEC supports testing for radiated and conducted immunity, emissions, transient disturbances, and RF susceptibility across aerospace, defense, automotive, and medical device industries. Trusted by EMC engineers, compliance labs, and manufacturers, ATEC ensures quick and easy access to the tools needed for precise and efficient electromagnetic compatibility testing.

AlbatrossProjects ALBATROSS PROJECTS

Booth 351

<http://www.albatross-projects.us>

Albatross Projects is one of the leading global (OEM) manufacturers of anechoic chambers and shielded rooms for various applications in EMC, antenna testing, and high-frequency technology. Our expertise lies in the development, design, and realization of test environments to verify the electromagnetic compatibility or antenna performance of your products according to national and international requirements. Available offerings: EMC Chamber solutions; Wireless Chambers for millimeter wave, 5G, Wi-Fi, and Bluetooth; RF Shielded Enclosures; Antenna Performance Chambers; Chamber Relocations or Modification Services; Pyramidal Anechoic Absorber solutions; RF Chamber components. Tell us what you need - we'll have the solution.



AMBER PRECISION INSTRUMENTS, INC.

Booth 436

<http://www.amberpi.com>

Amber Precision Instruments is the IC, module and system level EMC/EMS evaluation tool manufacturer and solution provider equipped with unique combination of IC level and system level expertise. We develop and manufacture most components and accessories in-house (probes, software, mechanical parts, etc.) to ensure performance as well as quality. Combining advantages of measurement and simulation to better understand EMC behavior of electronics is our ultimate goal.



American Association for Laboratory Accreditation (A2LA)

Booth 426

<http://a2la.org>

A2LA is the largest multi-discipline accreditation body in the U.S., with over 45 years of experience providing internationally recognized accreditation services. A2LA's world-class accreditation services encompass testing and calibration laboratories, medical testing laboratories, inspection bodies, proficiency testing providers, reference material producers and product certifiers. Over 4,000 organizations have been accredited by A2LA in numerous fields and industries. Visit A2LA.org.



AMPLIFIER RESEARCH/AMETEK CTS

Booth 323

<http://www.ametek-cts.com>

AMETEK CTS unites the key EMC and RF amplifier industry leaders EM TEST, TESEQ and Amplifier Research in a single powerhouse. We are a leading manufacturer of test and measurement instrumentation for electromagnetic compatibility (EMC) testing, producing a broad range of conducted and radiated EMC compliance testing systems and RF amplifiers. We serve a wide range of industries, including automotive, consumer and industrial electronics, medical equipment, telecommunications, defense, and avionics.



ANSI National Accreditation Board

ANSI NATIONAL ACCREDITATION BOARD (ANAB)

Booth 143

<http://www.anab.org/>

ANAB accredits calibration and testing labs, forensic test and calibration service providers, inspection bodies, police crime units, reference material producers, and proficiency test providers.

ANAB provides accreditation to ISO/IEC 17025.

Our customers value the skill of our employees and assessors in providing fast and helpful service. ANAB has a 97% customer retention rate.

ANSI-ASC C63 COMMITTEE ON EMC

Booth 362

<http://www.c63.org/>

The "ANSI C63" Committee is an 80-year old committee specializing in, originally, Radio Frequency Interference, and, now, Electromagnetic Compatibility. It is a Standards Development Organization whose published standards are co-approved by both the American National Standards Institute (ANSI) and the IEEE. Some of the Committee's standards are "incorporated by reference" into US law; for example, the Federal Communication Commission (FCC) Rules. The Main Committee meets twice a year. Some key standards include: C63.2, C63.4, C63.5, C63.10, C63.14, C63.17, C63.19, and C63.26.



ANTENNA MEASUREMENT TECHNIQUES ASSOCIATION (AMTA)

Booth 363D

<https://2024.amta.org/>

The Antenna Measurement Techniques Association (AMTA) is a non-profit, international organization dedicated to the development and dissemination of theory, best practices and applications of antenna, radar signature and other electromagnetic measurement technologies. Visit www.amta.org for more information.

Resonant Sciences is proud to host the 46th Annual Meeting and Symposium of the AMTA at the Northern Kentucky Convention Center in the greater Cincinnati, OH, USA area from October 27 - November 1, 2024.

Resonant Sciences cordially invites you to attend and participate in this annual event.

AMTA 2024 is the premier conference dedicated to the field of antenna & related measurements.



APEX TEST LABS

Booth 432

<https://apextestlabs.com>

Your Trusted Partner in Electrical Testing Excellence Delivering precision, reliability, and innovation in electrical component testing and certification services. From Automotive EMC/ENV/REL to Wireless RF and more. Apex Test Labs is your one-stop-shop for comprehensive testing solutions. Based in Auburn Hills, Michigan.

BOLAB[™] BOLAB SYSTEMS

Booth 133

<http://www.bolab-systems.com>

Bolab Systems develops and manufactures specialised testing systems for automotive electrical systems. We enable automotive manufacturers and suppliers to achieve faultless component, subsystem and whole vehicle performance in compliance with exacting industry standards.



BRADEN SHIELDING SYSTEMS

Booth 137

<https://www.bradenshielding.com>

Braden Shielding Systems provides facility solutions for global electromagnetic compatibility (EMC) by creating controlled environments necessary for testing electronic devices in today's world. We supply high quality, EMC turnkey facilities with on-time, on-budget performance. Servicing commercial and government customers, our products & services include: RF Shielded Enclosures - Modular and Welded; EMC Chambers - Compact, 3m, 5m, 10m; CISPR 25 Automotive Test Chambers; MIL 461 and DO160 Test Chambers; Free Space Chambers for wireless testing and antenna pattern measurements. As the manufacturer of shielded components with 40+ years in business, we can offer the lowest price with the highest quality!

Canfigure. **CANFIGURE, INC.**

Booth 345

<http://www.canfigure.net>

Canfigure is a flexible platform designed to support complex engineering environments with strong configuration, test, and lifecycle management. It provides end-to-end traceability across requirements, designs, test cases, results, and defects, helping teams maintain accurate baselines and control changes with confidence. Engineering workflows can be automated and tailored to match organizational processes, improving consistency and reducing manual effort. Canfigure also supports structured test planning and execution, enabling clear visibility into verification progress and product quality. With its modular architecture and integration capabilities, Canfigure unifies engineering data and processes, strengthening quality, compliance, and development efficiency across technical teams.

CERGEN CERGEN GMBH

Booth 251

<http://www.cergen.com>

Cergen GmbH is a global manufacturer of magnetic components and EMC filter solutions, serving the automotive, e-mobility, and renewable energy industries. With production facilities in China and Hungary, Cergen supplies nanocrystalline, ferrite, and other magnetic cores, common-mode chokes, and custom EMC filtering solutions engineered to meet demanding qualification standards. Backed by deep materials science and EMC expertise, Cergen partners with customers from early design through series production, delivering reliable, high-performance components for power electronics applications worldwide.



CEVIANS **CEVIANS**

Booth 129

<http://www.cevians.com>

Cevians is a trusted provider of rugged display, optical, and Night Vision Imaging System (NVIS) solutions for aerospace, defense, and mission-critical applications. With over 40 years of experience and a high level of vertical integration, we design and manufacture custom TFT-LCD modules, rugged display assemblies, optical systems, and NVIS-compliant solutions for military aviation, ground vehicles, naval platforms, and mission systems. Our products are engineered to operate reliably in demanding environments and support stringent military and aerospace requirements, including EMI/EMC-sensitive applications.

Learn more at www.cevians.com



CHANGZHOU PIONEER ELECTRONIC CO., LTD

Booth 353

<http://www.emc-emi.com>

EMCPIONEER is a professional manufacturer dedicated to anechoic chambers, RF shielding rooms and related accessories EMI/EMC filters, RF doors, Honeycomb vent, Knitted wire mesh etc. Focusing on electromagnetic shielding, EMC testing and R&D test environments, we provide reliable, customizable solutions for electronics, communications and high-tech industries. Adhering to international standards and quality control, we serve global customers with stable performance and professional service. As an enterprise committed to the global market, we look forward to strengthening cooperation and achieving mutual development with partners at the IEEE EMC+SIPI.



CKC LABORATORIES, INC.

Booth 453

<http://www.ckc.com>

Founded in 1973, CKC Laboratories offers customer centered EMC testing, EMI testing and EMC Design Consultation services. Our customer service oriented laboratory staff is composed of technically expert EMC engineers and technicians. EMI testing services include FCC, CE, Automotive, Medical, Aerospace, Military and other global market requirements.



COM-POWER CORPORATION

Booth 317

<http://www.com-power.com>

Com-Power Corporation has been a trusted name in EMC test instrumentation for over 35 years, designing and manufacturing a complete line of EMI antennas, LISNs, current probes, comb generators, preamplifiers, power amplifiers, and immunity test systems from our facility in Costa Mesa, California. Our products meet the requirements of FCC, CISPR, EN, MIL-STD-461, RTCA DO-160, and automotive EMC standards, with NIST-traceable calibration and a three-year warranty on every unit. From the AB-900A biconical to the ACL-6000 CombiLog and our APF-5060 magnetic field generator, Com-Power delivers reliable, compliance-grade hardware backed by responsive US-based engineering support. Visit us at the symposium.



COPPER MOUNTAIN®
TECHNOLOGIES

COPPER MOUNTAIN TECHNOLOGIES

Booth 452

<http://www.coppermountaintech.com>

Copper Mountain Technologies (CMT) pioneered metrology-grade USB VNAs in 2011 and continues to drive industry change through customer-focused solutions including a broad range of vector network analyzers, calibration kits, and accessories.

We offer the best customer value through an unparalleled combination of price, performance, and portability which has expanded VNA use to new industries and applications. Our expert engineers work as an extension of your team, helping users complete unique and complex projects. The Indianapolis-based company has an R&D center and service center in Cyprus, and sales offices in Singapore, London, and Miami.



CRFE

CORNES RF ENGINEERING

CORNES RF ENGINEERING

Booth 536

<http://www.mwf.co.jp/en/>

Cornes RF Engineering (CRFE, also known as Microwave Factory in Japan) provides total-solution RF, microwave, and mmWave measurement systems. We leverage our engineering know-how to design, manufacture, and integrate advanced turnkey testing environments.

Offerings:

- EMI Design Rule Checker & Suppression Support Software
- Anechoic Chambers, Shielded Rooms & RF Absorbers
- Advanced Positioners
- Turnkey EMC, 5G OTA, CATR, & NFFF Test Solutions
- Custom Measurement Software & RF Accessories

Headquartered in Yokohama, Japan, we serve high-tech sectors such as Automotive, Telecom (5G/6G), Aerospace & Defense. CRFE helps customers navigate global standards and accelerate time-to-market as a proud member of the Cornes Technologies group.



CPI ELECTRON DEVICE BUSINESS

Booth 237

<http://www.cpii.com/tmd>

CPI TMD Technologies Division (CPI TMD) is one of the world's leading manufacturers of microwave power sources, high-voltage power supplies and transmitters for radar, electronic warfare, communications, industrial testing and scientific applications. CPI TMD's specialty is innovative, custom solutions for some of the industry's most challenging applications.

CPI TMD offers a unique range of microwave power modules, traveling wave tubes, high-voltage power supplies, as well as rugged amplifiers and instrumentation amplifiers for radar, electronic warfare, communications and electromagnetic compatibility (EMC) testing, scientific and medical applications. CPI TMD's products are optimized for use on airborne, ground based and shipboard platforms.



D.L.S. ELECTRONIC SYSTEMS, INC.

Booth 326

<http://www.dlsemc.com>

DLS Electronic Systems offers one of the largest Compliance Testing operations in North America, with 16 EMC testing chambers, plus two open field sites, Product Safety testing laboratory, and environmental testing services. ANAB accredited to ISO 1702, we operate in three locations, two in Wheeling, IL and one in Genoa City, WI. We have one of the largest staff of certified INARTE testing engineers of any testing organization. D.L.S. regularly supports MIL STD 461, MIL STD 810, MIL STD 202, MIL STD 704, MIL STD 1399, RTCA DO 160, UL, EN, IEC, ISTA, ILAC, ASTM, and ANSI requirements. www.dlsemc.com



DASSAULT SYSTÈMES SIMULIA

Booth 366

<http://www.3ds.com/simulia>

Dassault Systèmes SIMULIA reveals the world we live in through realistic simulation of product, nature & life. We provide high-value end-to-end industry processes for digital engineering that employ state-of-the-art connected multidisciplinary-multiscale simulation applications. With SIMULIA, customers can reduce testing, increase confidence & quality, and get to market faster using always-available virtual worlds for discovery and testing.



Booth 363G

<https://www.designcon.com>

DesignCon is the premier high-speed communications and system design conference and exposition, offering industry-critical engineering education in the heart of electronics innovation - Silicon Valley.

Attend the expertly curated 14-track conference created by engineers for engineers featuring technical paper sessions, tutorials, and industry panels covering all aspects of chip, board, and systems design. Browse exhibits with hundreds of new products and technologies in the expo hall, attend educational sessions in the Chiphead Theater, see interactive demos, and network with high-caliber industry professionals at multiple social functions.

Join us in Santa Clara, CA, January 28-30, 2025!



Booth 337

<http://www.interfaxsystems.com>

Now you can SEE high frequency electromagnetic fields. There are high demands for electromagnetic compatibility (EMC) of electronic products. The Detectus solutions are measurement systems with which the designers can measure the intensity and the location of a radiation source at a component level. The results of such a measurement can be shown as two or three dimensional colored maps.

Langer EMV offer Near Field Probes (E & H field), Development System Disturbance Emissions, Pre-compliance EMC test and measuring devices, Measure Disturbance Immunity Systems and more.



ELECTRO MAGNETIC APPLICATIONS, INC. (EMA)

Booth 249

<http://www.ema3d.com>

EMA is a leading developer of technologies for engineering simulation. EMA's engineering specialty is in applied electromagnetics. In this domain, EMA provides software and services to promote the design, certification, and performance of our customers' products. The company has been in business for over 40 years and is one of the pioneers in using electromagnetic simulation to solve challenging electromagnetic problems on complex platforms.



ELEMENT MATERIALS TECHNOLOGY

Booth 342

<http://www.element.com>

Element specializes in providing a comprehensive range of materials and product qualification testing, consulting, and certification services. Our network includes over 6,700 Engaged Experts operating out of 188 facilities in more than 30 countries across multiple industry sectors. Service offering includes EMC, Wireless, Product Safety Testing and Certification. With an extensive roster of accreditations and international recognition coupled with unparalleled service and facilities, Element is your testing partner for both materials and product qualification testing.



ELITE ELECTRONIC ENGINEERING, INC.

Booth 354

<http://www.elitetest.com>

Founded in 1954, Elite Electronic Engineering, Inc. is a full-service electromagnetic compatibility/interference (EMC/EMI), environmental stress, and photometric testing laboratory. We are the premier test provider for the aerospace, military, automotive, heavy equipment, electronics, and telecommunications industries. Elite is recognized worldwide as a leader in product qualification, compliance testing, and consulting services. Few laboratories offer our combination of expert engineers, state-of-the-art equipment, and cutting-edge test facilities all in one location.



ELITE RF

Booth 418

<http://www.eliterfllc.com>

Established in 2014 by former Motorola engineering leaders, Elite RF has set a very high standard in designing and manufacturing solid-state RF power amplifiers and high-power microwave generators for off the shelf availability and custom design solutions. With our in-house engineering team and a quality controlled 22,000-sf manufacturing facility, our core strength lies in our commitment to collaborative engineering, robust designs, high manufacturing quality, and on-time delivery. Here, we're dedicated to boosting your operational performance, aiming to provide you with a significant competitive advantage in the rapidly evolving RF landscape.



ESDEMC TECHNOLOGY

Booth 253

<https://www.esdemc.com>

ESDEMC Technology develops, manufactures, and markets ESD and EMC-related products. We are devoted to delivering creative, flexible, and cost-effective ESD and EMC solutions, as well as top-level consulting services, including TLP, HBM, CDM, and latch-up systems. We also offer customized design services to satisfy all of our customers' needs.



ETS-LINDGREN INC.

Booth 209

<http://www.ets-lindgren.com>

ETS-Lindgren designs, manufactures and installs EMC/EMI, RF/Microwave, MIMO/OTA test and measurement systems and components. Our patented technology has resulted in many milestones: the world's first CTIA Authorized Test Lab and the first oversize RF shielded sliding door for full vehicle test chambers. Our full line of EMP/IEMI products is the first to be independently tested and certified. Services include calibration at our A2LA accredited calibration lab. For more information, visit us at www.ets-lindgren.com.



EXEMPLAR GLOBAL

Booth 227

<http://exemplarglobal.org>

For more than 30 years, Exemplar Global, a not-for-profit organization, has serviced and supported the conformity assessment industry. Our mission is to promote best practices, certify people and training organizations, and to promote professional development. INARTE, an Exemplar Global company, extends this mission by offering professional certifications to qualified engineers and technicians in the fields of telecommunications, electromagnetic compatibility/ interference (EMC/EMI), product safety (PS), electrostatic discharge control (ESD), and wireless systems installation.



EXODUS ADVANCED COMMUNICATIONS

Booth 343

<http://www.exoduscomm.com>

Exodus Advanced Communications designs and manufactures high-power solid-state RF and microwave amplifiers for EMC, radar, electronic warfare, and communications applications. Their solutions cover a broad frequency range from HF through millimeter-wave, supporting both broadband and band-specific requirements. Exodus amplifiers are engineered for high efficiency, reliability, and precise control, making them ideal for EMC and signal integrity testing environments. With scalable designs and rapid customization capabilities, Exodus delivers flexible RF power solutions that integrate seamlessly into test systems and mission-critical platforms, supporting demanding performance requirements across commercial and defense applications.



FAIR RITE PRODUCTS CORP.

Booth 255

<http://www.fair-rite.com>

Fair-Rite Products Corp. is a leading manufacturer of ferrite components, serving industries such as automotive, telecommunications, consumer electronics, and power management. With over 65 years of expertise, Fair-Rite provides innovative ferrite solutions for EMI suppression, power applications, and signal integrity. Their extensive product line includes toroids, beads, cores, and custom-engineered components designed to enhance electronic performance. Committed to quality and customer support, Fair-Rite operates state-of-the-art facilities in the U.S., ensuring precision manufacturing and engineering excellence. Whether standard or custom solutions, Fair-Rite partners with customers worldwide to optimize designs and improve efficiency in an ever-evolving technological landscape.



FARADAY DEFENSE CORPORATION

Booth 239

<http://www.faradaydefense.com>

Faraday Defense provides RF-shielded enclosures and individual bags for a wide variety of applications related to engineering, testing, law enforcement, and military applications. Many of our solutions offer a large deal of customization for specific applications. Stop by our booth to discuss how we may be able to help you with shielding and input/output connections for your RF needs, as well as our lineup of EMP-hardening electronics!



FISCHER CUSTOM COMMUNICATIONS, INC.

Booth 217

<https://www.fischercc.com>

EMC Test and Measurement Instruments

FLEXCOMPUTE

FLEXCOMPUTE

Booth 444

<http://flexcompute.com>

Flexcompute is a physics intelligence company that turns the laws of physics into a shared brain for engineers and agents to design, optimize, and operate real-world systems. With a platform that combines GPU-native multiphysics simulation, geometry-native reasoning, and neural memory that continuously learns from every simulation and test, Flexcompute dramatically reduces the latency to physics insight. Used across aerospace, automotive, energy, and advanced manufacturing, Flexcompute enables engineers to focus on design while achieving lower cost, reduced energy use, and faster iteration. The mission is to make hardware innovation just as easy as software through physics intelligence.



GAUSS INSTRUMENTS[®] INTERNATIONAL GMBH

Booth 223

<http://www.gauss-instruments.com>

GAUSS INSTRUMENTS manufactures highest performance EMC test equipment and provides advanced EMI test solutions and instrumentation pushing your product development and testing capabilities ahead, and speeding up your time to market cycles. GAUSS offers a wide range of solutions from DC to 44 GHz for all kind of test requirements - full-compliance as well as pre-certification or even customized solutions perfectly fitting to your specific requirements pushing your testing capabilities ahead.

Driven by our ultimate mission: Smarter testing for smarter products.

Global Validity

GLOBAL VALIDITY

Booth 352

<http://www.globalvalidity.com>

Experience the next level of Global Market Access where technology and people meet to deliver a predictable country certification journey. Global Validity specializes in obtaining mandatory country certifications for device manufacturers in every country and territory worldwide. We prioritize project control and security to get your products to market faster and with less risk. Whether you're looking to expand your business globally or bring new products to a single market, we're

here to help.



HV TECHNOLOGIES, INC.

Booth 117

<http://www.hvtechnologies.com>

HV TECHNOLOGIES, Inc. (HVT), founded in 1998 in Manassas, Virginia, is a prominent supplier of High Voltage (HV) and Electromagnetic Compatibility (EMC) test equipment, offering decades of experience and dedication in serving the EMC and electronic equipment industries.

IEEE 2027 INTERNATIONAL SYMPOSIUM ON EMC AND SIPI

In the Foyer near Registration

<https://2027.emcsipi.org/>

EMC+SIPI 2027 leads the industry in providing state-of-the-art education on EMC and Signal Integrity and Power Integrity techniques. The IEEE EMC Society is seeking original, unpublished papers covering all technologies that are affected by EMC, Signal & Power Integrity. Join us in Portland, Oregon to share your insight, ask questions, learn from the experts/innovators and see new products at the 2027 IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity. Your published paper will be seen by thousands in the EMC community and across the wide array of disciplines that look to the IEEE EMC Society for technical guidance. In addition, it will be uploaded to IEEE Xplore with the exposure and recognition that brings.



Antennas and Propagation Society

IEEE ANTENNAS AND PROPAGATION SOCIETY

Booth 363E

<http://aps.ieee.org>

The field of interest of the AP-S includes: antennas, including analysis, design, development, measurement, standards and testing; radiation, propagation, and the interaction of electromagnetic waves with discrete and continuous media; and applications and systems pertinent to antennas, propagation, and sensing, such as applied optics, millimeter- and submillimeter-wave techniques, antenna signal processing and control, radio astronomy, bioelectromagnetics, and propagation and radiation aspects of terrestrial and space-based communication, including wireless, mobile, satellite, and others.



Booth 357

<http://www.emcs.org>

The IEEE Electromagnetic Compatibility Society is the world's largest organization dedicated to the development and distribution of information, tools and techniques for taming electromagnetic interference beasts. The society's field of interest includes standards, measurement techniques and test procedures, instrumentation, equipment and systems characteristics, interference control techniques and components, education, computational analysis, and spectrum management, along with scientific, technical, industrial, professional or other activities that contribute to this field.

Explore the many benefits of EMC Society membership, from being part of the Young Professionals, the many Standards resources, Distinguished Lecturer and engagement at the local Chapter level. Join today and give your career a much-needed zap!



IEEE EMC Society Sister Society Booth

Booth 363

<https://www.emcs.org/about-us/partnerships/sister-societies/>

The EMC Society has a vision to increase cooperation and awareness of global EMC issues that are essential to the continued development of safe and reliable electronic systems and devices, to increase the participation of individual members of the IEEE EMC Society with global partners, and to facilitate the growth and support of emerging and expanding technologies. Through Sister Society Agreements, possible collaboration in the areas of membership, publications, technical meetings, and various joint activities are promoted.

Visit the following IEEE EMC Society Sister Society online listings to learn more:

- IEEE Product Safety Engineering Society (PSES)
- IEEE EMC Society Standards (ESDA)
- Antenna Measurement Techniques Association (AMTA)
- IEEE Antennas and Propagation Society
- IEEE Microwave Theory and Technology Society (MTT-S)
- DesignCon

IEEE EMC SOCIETY STANDARDS

Booth 357

<https://www.emcs.org/standards/>

IEEE EMC Standards Development is comprised of several subgroups, SDECom, SACCom and SETCom. Come see us at booth 225 for more information in regards to standards development and education.

IEEE EMC SOCIETY HISTORY COMMITTEE

Booth 357

<https://www.emcs.org/about-us/history/>

The EMC Society is responsible for recording and maintaining the historical records of the EMC Society. That includes photos and papers as well as equipment artifacts. The Committee has digitized old EMC Symposium records and has distributed them via USB memory sticks and CDs.



Booth 357

<https://www.emcs.org/benefits-of-joining-emcs/ieee-emc-young-professionals/>

Get involved with IEEE EMC Society Young Professionals and be a part of an international community, whose members are interested in elevating their professional image, expanding their global network, connecting with peers locally and giving back to their community.

Benefits of Membership:

- Career Resources
- Essential Technical Information
- Professional Development
- Networking and Mentoring
- Community Programs



MTT-S
IEEE MICROWAVE THEORY
& TECHNOLOGY SOCIETY

IEEE MICROWAVE THEORY AND TECHNOLOGY SOCIETY (MTT-S)

Booth 363F

<http://www.mtt.org>

The IEEE Microwave Theory and Technology Society (MTT-S) is a transnational society with more than 13,000 members and 200 chapters worldwide. MTT-S promotes the advancement of microwave theory and its applications, including RF, microwave, millimeter-wave, and terahertz technologies. It is an all-volunteer society, driven to excellence by its leadership and with the active participation of all its world-wide members. The activities sponsored by the MTT-S include a broad spectrum of conferences, workshops, technical committees, chapter meetings, publications and professional education programs. Our principal publications and conferences are peer-reviewed and recognized as top of the class.

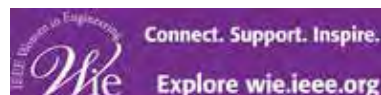


IEEE PRODUCT SAFETY ENGINEERING SOCIETY

Booth 363B

<http://ewh.ieee.org/soc/pses/>

The IEEE Product Safety Engineering Society focuses on the theory, design, development and practical implementation of product safety engineering methodologies and techniques for equipment and devices.



IEEE WOMEN IN ENGINEERING

Booth 357

<https://www.emcs.org/benefits-of-joining-emcs/women-in-engineering-wie/>

IEEE Women in Engineering (WIE) is the largest international professional organization dedicated to promoting women engineers and scientists and inspiring girls around the world to follow their academic interests to a career in engineering. The mission of IEEE WIE is to inspire, engage, encourage, and empower IEEE women worldwide.

IN COMPLIANCE Magazine

IN COMPLIANCE

Booth 410

<https://incompliancemag.com>

In Compliance connects engineers, technical professionals, and industry leaders with the insights needed to design, test, certify, and bring products to market. Through expert-led content, standards updates, regulatory news, and practical engineering guidance, we cover EMC, RF, ESD, product safety, and global compliance requirements. Visit incompliancemag.com to access technical resources, read through past issues, discover industry solutions, and redeem your free subscription for ongoing insight from the compliance engineering community.



Total Quality. Assured.

INTERTEK

Booth 127

<http://www.intertek.com/emc/>

With one of the largest global network of EMC Testing labs, Intertek provides the capacity, proximity and engineering resources to streamline your EMC Compliance Testing process for any market you want to reach. Intertek is a leading Total Quality Assurance provider to industries worldwide. Our network of more than 1,000 laboratories and offices in more than 100 countries, delivers innovative and bespoke Assurance, Testing, Inspection, and Certification solutions for our customers. We deliver Total Quality Assurance expertise with precision, pace, and passion.



KEYSIGHT

Booth 123

<http://www.keysight.com>

At Keysight, we inspire and empower innovators to bring world-changing technologies to life. Serving as a global innovation partner, we deliver market-leading design, emulation, and test environments that help companies develop and deploy breakthroughs faster, with less risk, throughout the product life cycle. Our differentiated technologies, measurement expertise, and tailored solutions are built from a foundation of co-innovation with industry ecosystem leaders. With Keysight, engineers gather insights sooner, to build and go to market with confidence.



KIWA

Booth 442

<http://www.kiwa.co.uk>

Kiwa delivers comprehensive Testing, Inspection and Certification services across radio frequency and electrical products, as well as Construction, Fire Safety, Water, Energy and Agrifood. As a global organisation with over 10,000 employees in more than 40 countries, we support manufacturers, utilities, governments and institutions.

We provide an integrated compliance pathway, from advisory services and planning, to testing and certification for global target markets. Our UKAS-accredited laboratories offer EMC, Radio, Safety, Ingress Protection and Automotive testing, while our Global Market Access specialists deliver approvals, regulatory intelligence and certification management support, providing a seamless route to global market entry. Certainty, full circle.



LANGER
EMV-Technik

LANGER EMV-TECHNIK GMBH

Booth 338

<http://www.langer-emv.de/en/index/>

Langer EMV-Technik assists you through the world of EMC technology. We develop and manufacture innovative solutions for EMC diagnostics, troubleshooting, immunity testing, and IC security evaluation of electronic assemblies and systems. Our portfolio includes near-field probes, ESD and EFT test equipment, IC debugging and side-channel analysis tools, EMC software, and engineering services. For more than 30 years, we have supported engineers worldwide in improving EMC performance, product robustness, and hardware security. Visit our booth to discover practical solutions for compliance, reliability, and security.



LITTLE MOUNTAIN TEST FACILITY - THE BOEING COMPANY

Booth 265

<http://www.boeing.com>

Located at Hill Air Force Base in Ogden, Utah, Little Mountain Test Facility (LMTF) is a premier U.S. Air Force site dedicated to simulating nuclear weapon environments. Since 1974, Boeing has partnered with the Air Force Nuclear Weapons Center to provide test, evaluation, operations, and maintenance services. LMTF supports critical programs including Minuteman III sustainment, nuclear modernization, re-entry vehicles, and long-range standoff weapons. This state-of-the-art facility ensures the survivability and reliability of the U.S. nuclear deterrent throughout its lifecycle, serving both the Department of Defense and Department of Energy with unique nuclear hardness testing expertise.

LUMILOOP LUMILOOP GMBH

Booth 333

<http://lumiloop.de>

LUMILOOP is a German manufacturer of laser-powered electronic sensors. These are used wherever other systems are disturbed by high voltages and currents or electric and magnetic fields: In electromagnetic compatibility (EMC) and high-frequency (HF) measurement environments, near lightning conductors and high-voltage lines, or where there is a risk of explosion. LUMILOOP's key competence is the optical supply of sensor systems using lasers. In combination with patented opto-electronic components and the patented process for controlling the optical power, reliable, safe measuring systems are created. LUMILOOP combines this Power-over-Fiber (PoF) technology with state-of-the-art low-power electronic design.

[More Useful Videos](#)



MAURY MICROWAVE

Booth 339

<http://www.maurymw.com>

Maury Microwave is a trusted calibration, measurement, and modeling solutions partner that leverages measurement expertise to identify, create, and supply every single component from the smallest adapter to the largest test system. Customers can develop and validate the world's most advanced wireless communications systems through seamless lab integration and best-in-class solutions. Maury Microwave solutions for the EMC market include both components and turn-key solutions. Typical components are amplifiers, synthesizers, power sensors, couplers, adapters, cable assemblies and calibration kits. Turn-key characterization solutions include system integration and measurement software.

emv

Stuttgart, 27 – 29 April 2027

MESAGO MESSE FRANKFURT GMBH

Booth 364

<http://emv.mesago.com>

The EMV 2027, taking place from 27 - 29 April 2027 in Stuttgart, Germany is considered the central event for electromagnetic compatibility in Europe. With a wide range of exhibitors, a hands-on workshops, a unique concept, and a diverse program, the event offers valuable insights for professionals in the field. Experts and specialists from various technological sectors will come together to tackle the challenges of electromagnetic compatibility and develop future-oriented solutions. The EMV 2027 is the meeting point for all those involved in the integration of EMC in modern technology.



MICROWAVE VISION GROUP / MVG

Booth 330

<http://www.mvg-world.com>

MVG specializes in Antenna Measurements and EMC Testing Solutions. Particularly for EMC, we design, manufacture, supply and install shielded enclosures, anechoic chambers, shielded doors, absorbers and more. MVG can provide exceptional turnkey solutions for the most demanding EMC requirements. Our manufacturing knowledge from over 30 years of experience ensures you quality and durability in our products and expertise from our team.



NARDA SAFETY TEST SOLUTIONS

Booth 450

<http://www.narda-sts.it>

Since 1970 we design and manufacture EMC instruments and test systems under the well recognized brand "PMM, as well as measuring instruments and systems for assessing the exposure to electromagnetic fields. Worldwide support is assured by highly qualified Sales Partners. Quality system certified ISO 9001: 2015. Accredited Calibration Center LAT n. 00008, traceable on national and international standards.

We are part of the Narda Safety Test Solutions Group, a global leader that owns over 95% of the published patents for electromagnetic field testing equipment. Highly innovative solutions matching the highest standards of quality and reliability are the Company's trademarks.



NEMKO USA, INC.

Booth 259

<http://www.nemko.com>

Nemko serves as a comprehensive hub for compliance testing, certification, and global market access. With Nemko Direct, clients access major market certifications through a single point of contact. Services include EMC, Wireless, Electrical Safety, and Environmental testing. Pre-compliance reliability testing to aid in design-to-deployment success. Nemko offers US and Canadian NRTL Safety certification, CB certification, and is a TCB for several regions including the US, Canada, Taiwan, and more. It also provides international telecom and type approval certifications for over 150 countries. Operating in 24 locations globally, Nemko assures timely testing, inspection, and certification with Scandinavian reliability.



NEXIO INC

Booth 267

<http://www.nexiogroup.com>

NEXIO, founded in 2003, offers the market's widest range of electromagnetic automation test software. NEXIO develops the software range called BAT-EMC is a package of high-performance automation test software for a variety of electromagnetic compliance and RF testing requirements for all industries. Many accredited labs and top industries leaders are equipped with BAT-EMC. BAT-EMC is used in more than 20 countries (Germany, USA, China, Japan, Canada, Mexico...). other products !BAT-SCANNER (near field measurements), and BAT-ELEC (for burst, surge, transients, etc.).

Our key points are:

- Hardware independent & free drivers
- 30 years experience
- Support and maintenance
- Monitoring functions
- Automatic report



NEXPERIA SEMICONDUCTOR

Booth 445

<http://www.nexperia.com>

Nexperia is a leading expert in high-volume essential semiconductors, that are required in every electronic design. The company's extensive portfolio includes diodes, bipolar transistors, ESD protection, MOSFETs, GaN FETs and analog & logic ICs. Headquartered in the Netherlands, Nexperia ships +100 billion products annually, meeting automotive standards. Our industry-leading packages are recognized as benchmarks in efficiency - in size, power and performance. Nexperia has +12,000 global employees.



NOISEKEN - SHINYEI CORPORATION OF AMERICA

Booth 424

<https://www.sca-shinyei.com/noiseken/products>

For over 50 years from its foundation in 1975, Noise Laboratory has been focusing on immunity test equipment and related solutions.

Now their product lines include various types of immunity test equipment ranging from those conforming to IEC 61000-4 series standards, other international or national immunity standards and even to customer's in-house test standards. With their technology, numerous products passed the noise tests and are being delivered to consumers, enriching our society.



NOLATO-JABAR

Booth 141

<https://www.nolato.com/group-companies/nolato-jabar/>

Nolato's High performance silicone, EMI shielding products, and thermal interface products provide integrity and quality for performance-critical aerospace and telecommunication applications. These shielding products are manufactured to the M83528 standard of the DLA and maintain our standing on the QPL. We are an ITAR registered company maintaining both AS 9100 and ISO 14001 certifications. Nolato's non-conductive solid silicone and sponge Silicone products are available in a wide variety of specifications and standards which include: MIL, AMS, ASTM as well as other federal and commercial specifications, made in the USA.



OHTAMA CO., LTD.

Booth 438

<http://www.e-motorchamber.jp/>

Ohtama is a specialist of Magnetics technology and EMC Test. Now Ohtama is promoting EMC Test System "e-MotorChamber". e-MotorChamber has very special and unique LONG SINGLE SHAFT SYSTEM which is developed to meet CISPR25 Annex I. This shaft can handle 20,000RPM without any gear on.



OMICRON LAB

Booth 241

<http://www.omicron-lab.com/>

OMICRON Lab was established in 2006 and is meanwhile serving customers in more than 60 countries. Offices in America, Europe, East Asia and an international network of distributors enable a fast and extraordinary customer support.

OMICRON Lab products stand for high quality offered at the best price/value ratio on the market. The products' reliability and ease of use guarantee trouble-free operation. Close customer relationship and more than 30 years in-house experience enable the development of innovative products close to the field.



OPHIR RF

Booth 231

<http://www.ophirrf.com>

Ophir RF has been designing and manufacturing the finest High Power Class A RF Amplifiers for over 30 years.

- Frequencies from 10 KHz to 40 GHz.
- Power Levels from 1 W to 25 kW.
- All Ophir RF Solid State Amplifiers come with a 5-year Warranty.
- All Ophir RF Amplifiers are designed and manufactured in the USA.



PEARSON ELECTRONICS

Booth 328

<https://www.pearsonelectronics.com>

Pearson Electronics has the Probes and Clamps to assist with MIL-STD-461 measurements. The model 8700i injection probe and the 8705C current probe are designed for CS 114, 115 and 116, plus other EMC standards. Features include a 10 kHz to 400 MHz bandwidth, 100 watt input power rating for the 8700i, and a compact design which allows one fixture to hold both probes in support of MIL-STD-461G. Pearson Clamp on Current Probes meet all the lightning susceptibility test requirements for CS 117 and RTCA/DO160 with the ability to measure surge currents with amplitudes up to 500 kilo amps.



PPG CUMING-LEHMAN CHAMBERS

Booth 516

<http://www.ppg.com>

Cuming-Lehman Chambers specializes in the design, management, and construction of shielded anechoic test facilities "tailor made" to satisfy our customer's performance needs and personal preferences. Each customer's needs are unique; whether High Frequency or EMC related we can deliver best value.

CLCI has over 55 years of experience in construction and project management and over 35 years designing and building anechoic chambers.

Our parent company Cuming Microwave, (a world leader) offers a full line of microwave absorbers and dielectric materials.



QUELL CORPORATION

Booth 155

<https://www.eeseal.com>

Quell Corporation is a specialized manufacturer of advanced electronic noise suppression and shielding solutions for demanding industries such as aerospace, defense, and more. The company focuses on designing high-performance filters that turn your standard connector into a filtered connector in seconds and protects sensitive systems from EMI and RFI. With a strong emphasis on engineering precision and reliability, Quell delivers products that meet rigorous military and commercial standards helping to ensure signal integrity, system performance, and mission-critical functionality in complex environments. Backed by technical expertise and customer-focused support, Quell partners with engineers and organizations to solve noise mitigation problems.



RAYMOND EMC

Booth 149

<http://www.raymondemc.com>

Raymond EMC specializes in the engineering, design, fabrication, installation, and testing of custom radio frequency (RF) shielded enclosures, reverb, and anechoic chambers for military, government, automotive, high-tech, medical, medical, and industrial applications. Raymond EMC prides itself on being an industry leader in product quality, performance, and innovation while providing unmatched client care and product support. Products: Shielded Enclosures - Electromagnetic Compatibility (EMC) Chambers - Reverberation Chambers - Deployable Solutions - Shielded Doors - Shielded Cabinets - Anechoic Chambers Services: Chamber Relocation - Chamber and Shielded Enclosure Upgrades - Maintenance Programs - Consulting - Engineering - Installation - RF Testing



RELIANT EMC LLC

Booth 451

<http://www.reliantemc.com/>

Reliant EMC LLC is your top source for the EMC test equipment that will enable you to reduce cost and time by self testing and self certifying your products for Electromagnetic Compliance (EMC). Reliant EMC LLC provides cost effective and pragmatic solutions for EMC testing covering FCC/CE, IEC/EN, ANSI/VDE, MIL-STD, DO-160, CISPR/US, ISO/SAE, . Located in Signal Hill, California, and Antioquia, Colombia covering the Americas, Reliant EMC offers first class support for all of your Emission and Immunity Testing requirements.

RF Exposure Lab

RF EXPOSURE LAB

Booth 319

<https://www.rfexposurelab.com>

RF Exposure Lab, LLC is an independent, privately owned SAR Testing Lab. We are A2LA Accredited and have significant expertise in SAR Testing from both an industry and a laboratory environment. We provide SAR testing for companies and other test laboratories. We are located in Southern California.



RIGOL TECHNOLOGIES USA, INC.

Booth 348

<https://rigolna.com>

Rigol Technologies, founded in 1998 in Beijing, is a global leader in electronic test and measurement solutions. The company designs and manufactures oscilloscopes, spectrum analyzers, waveform generators, power supplies, and other advanced instruments used by engineers, researchers, and educators worldwide. With offices in China, the U.S., and Europe, Rigol serves customers in over 90 countries. Known for innovation and affordability, Rigol holds hundreds of patents and has earned recognition for advancing precision testing technology, helping accelerate product development and reduce costs across industries.

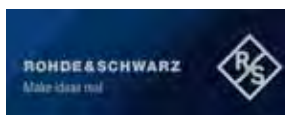
ROBUSTPHYSICS

ROBUSTPHYSICS

Booth 131

<http://www.robustphysics.com>

San Diego-based RobustPhysics has developed STOCHASTICA- an entirely new class of simulation software for system-level EMC design. Based on statistical wave mechanics, STOCHASTICA eliminates the need for detailed geometry and numerical meshing, providing FAST, INTERACTIVE solutions, enabling full system level EMC design to 10GHz and beyond. The software has been extensively validated experimentally under years of research funding by NASA, DARPA and NAVY. This is something NEW and DIFFERENT. Whether you are an EMC simulation specialist looking for faster/higher frequency tools; EMC Test engineer wanting to add simple but effective simulation to your toolset... come and evaluate this new technology



ROHDE & SCHWARZ USA, INC.

Booth 105

<http://www.rohde-schwarz.com>

Rohde & Schwarz is the leader in EMC testing and has been supplying EMC test equipment for over 50 years. Our test experts have been advising EMC standard authorities on T&M issues for decades. Rohde & Schwarz has a wide-ranging test equipment portfolio that is based on in-depth EMC compliance, precompliance, and debugging expertise and supports all relevant commercial, wireless, automotive, military and aerospace EMC standards. Rohde & Schwarz is a proven supplier of state-of-the-art EMC test solutions and a reliable service partner for our current products and our extensive back-catalog.



SAFETY & EMC MAGAZINE

Booth 350

<http://www.safetyandemc.com>

SAFETY & EMC magazine started the first publication from 1989, it's the unique official publication (CN 11-3452/TM, ISSN 1005-9776) synthetically introducing the safety and EMC technology of electronic and electric industry at present in China, which is supervised by Ministry of Industry and Information Technology of PRC and sponsored by China Electronic Standardization Institute. SAFETY & EMC started its English edition yearly, and erected the bridge for international academic communication, in 2008. Until now, its readers are more 500'000. Most of them are engineers, teachers and students; however, there are a lot of marketing and purchasing personnel becoming faithful readers.



SCHLEGEL ELECTRONICS MATERIALS, INC.

Booth 430

<http://www.schlegelemi.com/>

Schlegel Electronic Materials, Inc. manufactures EMI shielding and thermal management materials for electronics applications worldwide. Since 1987, the company has engineered conductive fabric-over-foam gaskets and materials that support electromagnetic compatibility and thermal control in complex electronic systems. Its portfolio includes shielding gaskets, conductive elastomers, RF absorber materials, and board-level solutions used in telecommunications, medical, military, and industrial applications. With manufacturing and technical support in North America, Europe, and Asia, Schlegel works with customers from design through production to address signal integrity, power integrity, shielding, and heat management requirements in high-speed electronic systems.



SIMYOG TECHNOLOGY

Booth 443

<http://www.simyog.com>

SimYog Technology develops Compliance-Scope®, a virtual EMI/EMC laboratory platform purpose-built for EMC simulation, diagnostics, and pre-compliance workflows. Unlike general-purpose EM solvers adapted for EMC analysis, Compliance-Scope® is specifically designed to model complete EMC test environments and standardized test setups using advanced hybrid simulation methods optimized for EMI/EMC applications. The platform helps engineering teams identify, diagnose, and resolve emissions and immunity issues earlier in the design cycle-reducing lab iterations and improving design confidence before compliance testing.



SPIRA MANUFACTURING CORP

Booth 358

<http://www.spira-emi.com>

Spira Manufacturing Corporation is at the forefront of EMI gasket innovation, design, and customer service. With over 40 years as experts in the field and using our uniquely patented spiral EMI gasket, we offer customers a range of EMI gaskets, shielded honeycomb filters, and other products. Our products are of the highest quality and reliability, built to meet your requirements for the life of a system. Spira's commitment to quality is demonstrated through our ISO-9001 and AS9100 certifications. Our products also meet requirements including REACH, ITAR, RoHS, DFAR, FCC, EC, HIRF, TEMPEST, DFAR, and others.



TÜVRheinland®

TÜV RHEINLAND NORTH AMERICA

Booth 416

<https://www.tuv.com/>

In North America, TÜV Rheinland operates coast-to-coast advanced testing facilities with dedicated EMC testing capabilities designed to support a wide range of products. Our experienced engineers work closely with clients to identify, troubleshoot, and resolve electromagnetic compatibility issues early in the development process, helping reduce risk, avoid costly redesigns, and prevent certification delays. With deep knowledge of global EMC requirements-including FCC, ISSED, and CE-related standards-we provide practical, efficient pathways to compliance. Combined with CE Marking and a comprehensive portfolio of testing and certification services, we help accelerate market access while maintaining the highest standards of safety, quality, and regulatory confidence.



TDK RF SOLUTIONS

Booth 331

<https://www.tdkrfsolutions.com>

TDK RF Solutions is a world leader in the design, development & manufacture of technical solutions for the EMC testing and Antenna measurement industries. We offer a complete range of solutions including automated test systems, anechoic chambers, RF absorber, antennas, software, RF filters, and a wide range of test products & accessories. We call it Total System Technology®, and it means TDK RF Solutions is your best choice of partner for proven solutions & services. TDK...attracting tomorrow!



TELEDYNE LECROY

TELEDYNE LECROY

Booth 340

<https://www.teledynelecroy.com/>

Teledyne LeCroy is a leading manufacturer of advanced oscilloscopes, protocol analyzers, and other test instruments that verify performance, validate compliance, and debug complex electronic systems quickly and thoroughly. Since its founding in 1964, the Company has focused on incorporating powerful tools into innovative products that enhance "Time-to-Insight." Faster time to insight enables users to rapidly find and fix defects in complex electronic systems.



TESTUPS, LLC

Booth 422

<http://www.testups.com>

TESTUPS specializes in providing end-to-end solutions in Electromagnetic Compatibility (EMC). Our offerings encompass test systems, chambers, calibration services, testing & certification, training, and consultancy, catering to industries such as automotive, avionics, medical, railway, consumer electronics, wireless technology, and machinery. Our vision at TESTUPS is to unleash the power of peaceful technology, fostering a fairer and more equitable world through innovation, integrity, and responsible testing. At TESTUPS, our mission is to ensure the safety and reliability of innovative technologies through rigorous testing, helping create a world where peaceful technology thrives and serves all fairly. We are specialised in Electromagnetic Compatibility (EMC)



THE EMC SHOP

Booth 229

<http://www.theemcshop.com>

The EMC Shop is an ISO 17025 accredited company, registered government contractor (Cage Code #7JDN6) and an established vendor in Exostar, Ariba and other purchasing networks for large companies. The EMC Shop brings the ease and convenience of online shopping to the electromagnetic compliance and test equipment market.



TRANSIENT SPECIALISTS

Booth 327

<http://www.transientspecialists.com>

Transient Specialists focuses on EMC test equipment rentals for a variety of applications, including commercial, automotive, and military. Our diverse inventory includes ESD simulators, transient generators, LISN, conducted RF test systems, and many others. We provide unparalleled support throughout the rental process, ensuring that testing is conducted efficiently without costly delays. Get fast deliveries of ISO 17025 calibrated test equipment from Transient Specialists.



UEMC, INC.

Booth 360

<https://uemcinc.com>

UEMC, Inc. designs and manufactures advanced EMI/EMC filtering and shielding products. Working with industry leaders, we deliver reliable, high-performance solutions for defense, medical, industrial, and secure communications applications. Our power and signal filters provide attenuation exceeding 100 dB from 10 kHz to 40 GHz, supporting currents up to 5000 A and voltages up to 25 kVAC.



UNI-TREND TECHNOLOGY US INC.

Booth 518

<http://uni-trendus.com>

Uni-Trend Technology (China) Co., Ltd. (UNI-T) is a leading Asian provider of test & measurement solutions, founded in 1988 and listed on STAR Market (688628) in 2021. With R&D centers in Dongguan, Chengdu & Changzhou, it offers reliable, certified instruments sold in 80+ countries, serving industrial, education and energy sectors globally.



VECTAWAVE

Booth 336

<http://www.vectawave.co.uk>

Vectawave Technology Ltd is a manufacturer of class A broadband power amplifiers for use in industrial, military and medical applications. Our amplifier range covers 10kHz-6GHz with powers up to 10kW. Vectawave have been designing and manufacturing power amplifiers for 29 years. These amplifiers, based on proven technology, are in daily use in EMC labs and test houses around the world. Most of our amplifiers have been designed to meet the specific needs of EMC applications.



WÜRTH ELEKTRONIK

Booth 243

<http://www.we-online.com>

Würth Elektronik offers sophisticated electronic components for a multitude of applications in all industrial sectors. For us, it's not the individual component that's most important - it's finding the solutions to problems. We're the reliable partner for our customers. With Würth Elektronik, customers realize electronic visions - we're on board from start to finish.



Photo by Patrick Andre

EMC+SIPI 2026 ONCE AGAIN COMBINES ELECTROMAGNETIC COMPATIBILITY AND SIGNAL & POWER INTEGRITY INTO ONE INSPIRING SYMPOSIUM

A full, 5-day attendee registration includes:

- Access to all of EMC+SIPI 2026
- Multiple days of EMC+SIPI original papers
- Five days of practical EMC+SIPI Workshops and Tutorials
- Experiments and Demonstrations of fundamental and advanced topics
- Exhibit Hall, showcasing the latest EMC+SIPI products and services
- Welcome Reception
- Gala Event
- Awards Luncheon
- Symposium Proceedings with all Workshop & Tutorial slide presentations and Technical papers

REGISTRATION TYPES

TECHNICAL ATTENDEE:

We offer 5-Day or 1-Day Registrations:

You have access to all EMC and SIPI paper sessions, Workshops & Tutorials, Experiments & Demonstrations, and the Exhibit Hall. There are also special events available, as well as Technical Committee Meetings, Standards Meetings, and networking opportunities.

- The 5-Day registration includes 5 days of technical sessions, 3 day pass to the exhibit hall, Symposium Record, and social events.
- The 1-Day registration includes 1 day of technical sessions, same day pass to the exhibit hall (if open), and the Symposium Proceedings.

EXHIBIT HALL ONLY:

This is an EMC+SIPI exhibition with many technical activities. For adult (age 18+) customers and clients of our exhibitors. **\$25/day**.

COMPANIONS/GUESTS:

Our Companions are family and friends of all ages who are accompanying a registered, technical attendee.

- **Companion Club:** This package will again include a gift, access to the Companion suite, 4 breakfasts in the restaurant, Exhibit Hall pass, and Welcome Reception ticket. Individual registrations are required. **Cost: \$200**

You may sign up your companion within your own registration or they may be registered separately for the [Companion Club](#).

EXHIBITOR:

All adult (age 18+) exhibitor staff, reps, and booth workers must register using the link and discount code sent to the Exhibitor/ Sponsor contact to receive an EXHIBITOR ribbon and early access to the Exhibit Hall. Anyone under age 18 must be accompanied by a registered adult and a minor release form submitted prior to obtaining a badge.

There are two badge types:

- **Technical Exhibitor:** receives a full, 5-Day Technical Registration plus EXHIBITOR ribbon.
- **Booth Staff:** receive 3-Day pass to the Exhibit Hall, with early access plus an EXHIBITOR ribbon and access to the welcome reception is included.

2026.emcsipi.org/registration

REGISTRATION INFORMATION

IMPORTANT REGISTRATION INFORMATION

AUTHORS: Symposium registration (IEEE Member or Non-Member) is required by at least one author, or the speaker, before the final paper submission deadline, 22 May 2026. Failing to meet this requirement will result in the paper not being published or presented – no exceptions. Your registration confirmation number will be needed for the final paper submittal.

[More details can be found on the AUTHOR/SPEAKER page](#)

ADVANCE REGISTRATION: You must be paid in full by midnight PDT, June 30, 2026 to receive the Advanced rates.

EMC SOCIETY MEMBERS: Special rate for full, 5-Day Technical Registrations only. Your membership must be in good standing and paid in full for 2026. If you are not a member and would like to become a EMC-S member, please [CLICK HERE](#) or call 1-800-678-IEEE. Please note that you must be a member at the time of registration to receive the member rate.

IEEE MEMBERS: Your membership must be in good standing and paid in full for 2026. Have your member number and current member grade ready when registering. If you are not a member and would like to become an IEEE member, please [CLICK HERE](#) or call 1-800-678-IEEE. Please note that you must be a member at the time of registration to receive the member rate.

SISTER SOCIETY MEMBERS: Members of IEEE EMC-S Sister Societies are eligible for the discounted EMC-S Member rate at the annual symposium. Contact the Registration Service to obtain this discount.

[View a list of the 2026 active Sister Society relationships.](#)

IEEE LIFE MEMBER: There is a further rate reduction for IEEE Life members. IEEE Life Membership is automatically bestowed upon an active IEEE member based on age and years of membership.

EMC-S HONORED MEMBER: You must be an EMC Society Honored Award recipient who was presented with this award in a prior year. No discount code is necessary to register; this is a special rate category.

EMC-S RETIRED OR UNEMPLOYED: EMC-S Retired or Unemployed. Special ADVANCE rate discount for retired / unemployed EMC Society members only. Have your last place of employment and the date of retirement or unemployment ready when registering.

COMPANY GROUP RATE: Sign up to request a company-wide discount code now! We will give each employee a special discounted rate which is roughly 35% off the non-member rate, and over 10% off the EMC-S Member rate! Send an email to: EMC@iplanitmeetings.com to receive your Company Discount Code.

Cost: Advance rate is \$785 each (Minimum of 8 employees)

FULL-TIME STUDENTS: Special rates for both IEEE members and non-members. You must be enrolled in a full time course of study at a college or university to register in the student categories. Have your college ID number and advisor's name & email ready when registering.

NOTE: Student 5-Day registration packages will include the Symposium Record and tickets to the Welcome Reception & Awards Luncheon. The Gala ticket, however, is NOT included, but may be purchased separately or awarded through volunteering at the symposium.

[More details at the EMC+SIPI 2026 Website
AUTHOR/PRESENTER page](#)

OTHER INFORMATION:

CERTIFICATE OF PARTICIPATION

A Certificate of Participation may be used to officially document attendance at the Symposium. A personalized certificate will be available at no charge to all registered Symposium attendees and participants. Please visit the Registration Desk to verify your name and affiliation and to pick up your certificate. If you have any questions, please email: emc@iplanitmeetings.com.

PAYMENT

Payment is due upon submittal of your registration. Payment can be made by:

- Check (in USD) made out to IEEE EMC+SIPI 2026, and mailed within 2 weeks.
- Credit Card: Visa, MasterCard, American Express, Discover Card.
- Wire Transfer: (Note: Banks usually charge a fee for wire transfers. These are the responsibility of the registrant.)
- Invoice (Government Purchase Order)

Payments by credit card will be charged immediately upon submission of registration. Checks and Wire Transfers must be received within two weeks of the registration date.

You may pay for Companion Club Registration along with your own registration, or via a separate credit card. If you need to pay for tours and social events separately, select "Check" as your payment method and then contact Registration Services at the number on your email confirmation.

CANCELLATION POLICY

For Registration and total order:

- Notice of cancellation must be received in writing via email, sent to emc@iplanitmeetings.com. A \$50.00 (USD) processing fee will be charged for registrations cancelled by June 14, 2026. For cancellations between July 1 and July 14, 2026, a 50% refund will be given. There will be no refunds after midnight PDT on July 14, 2026.
- If you applied for a Visa and it is denied, a full refund will be issued less a \$20 service charge.
- In the event of a full cancellation of the conference, IEEE and EMC Society are not responsible for, and will not reimburse, flight costs and other expenses incurred by the attendee

FOR SOCIAL EVENTS, TOURS AND EXTRAS ONLY

- Notice of cancellation of an individual "extra" item must be received in writing via email, sent to EMC@iplanitmeetings.com. A \$50.00 (USD) processing fee will be charged for registrations cancelled by June 30, 2026. There will be no refunds after midnight PDT on July 14, 2026.
- The EMC 2026 Symposium Committee reserves the right to cancel any tour that does not meet the minimum requirement. If a tour is cancelled, you will receive a full refund and will be contacted prior to the symposium.

THE EMC+SIPI 2026 TECHNICAL PROGRAM COMMITTEE

would like to extend our gratitude to this year's reviewers for their support of the Symposium and dedication to a high-quality technical program.

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Sandia National Laboratories

Rajalakshmi Alavanthan

Rajalakshmi Engineering College

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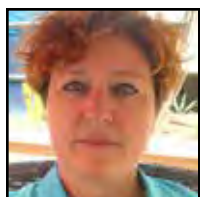
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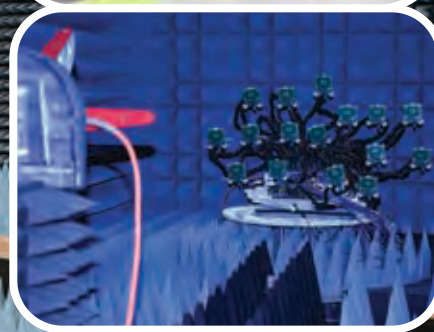
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