

EMC 2015 JOINT IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY AND EMC EUROPE



EMC 2015

DRESDEN, AUGUST 16-22

"Where Baroque meets High-Tech..."



Dresden, Germany

August 16 - 22, 2015

www.emc2015.org

FINAL PROGRAM

The Premier Symposium for EE Professionals Specializing in EMC



TOP RATED TECHNICAL EVENTS

Hear from industry experts regarding important topics during the numerous papers, presentations, sessions, workshops, and more.



PROFESSIONAL NETWORKING

Gather and connect with like-minded professionals, leaders, and experts at the exciting planned social events across the five days of symposium.



INTERNATIONAL EXHIBITION

Visit the exhibit floor to experience, and explore current technologies, products, and services from over 60 Global EMC solutions providers.

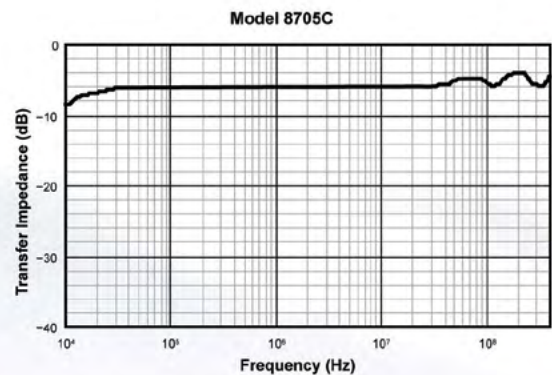
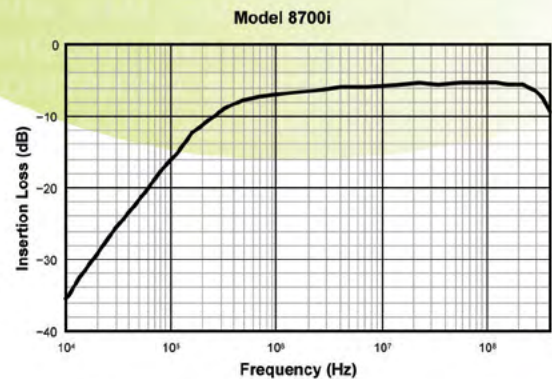
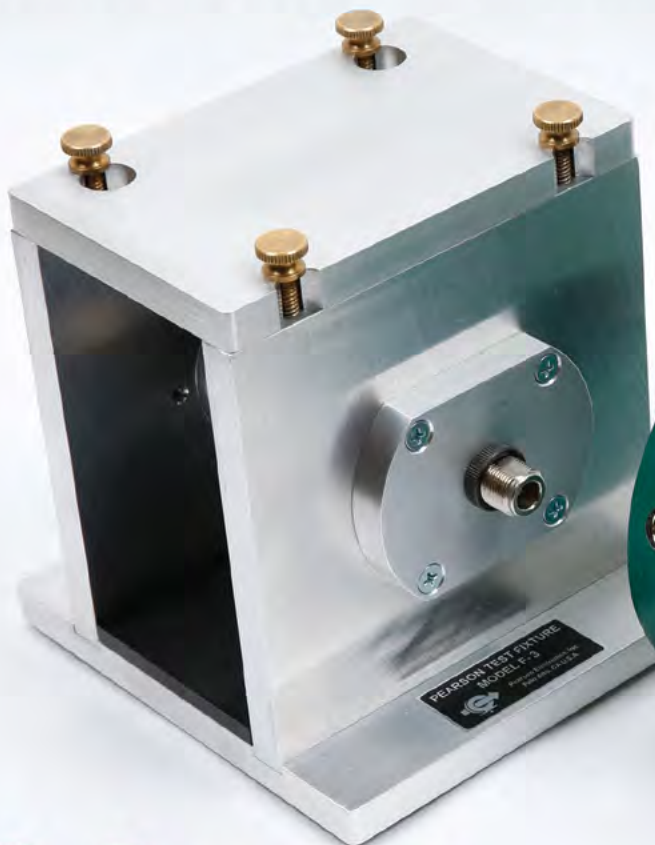


EMC PROBES

MIL-STD-461 AND RTCA/DO-160 TESTING

8700i Injection Probe 8705C Current Probe F-3 Calibration Fixture

- MIL-STD-461 and RTCA/DO-160 Testing
- Designed for CS114/115/116
- Compact probe design with 2.0 inch aperture
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"Where Baroque meets High-Tech..."

Welcome to the premier event in EMC!

EMC 2015 JOINT IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY AND EMC EUROPE

August 16-22, 2015 in Dresden, Germany

The International IEEE EMC Society and EMC Europe welcomes you to the heart of Europe in the beautiful Baroque city of Dresden, Germany. We are glad you have joined us for this unique event aimed to connect EMC experts, like you, from around the globe. The year's Symposium features top-rated technical events, numerous professional networking opportunities, and an international exhibition.

We hope you will enjoy all that we have planned for you across the next five days of symposium!

EVENT HIGHLIGHTS



KEYNOTE SPEAKER

Tuesday, 18 Aug | 0900 - 1030

We are pleased to welcome Prof. Dr. Siegfried Fiebig, CEO of Volkswagen Sachsen GmbH.

DEDICATED AUTOMOTIVE EMC TRACK

Wednesday, 19 Aug | 0820 - 1740

Dresden is the Capital of Saxony, Germany, an area known and celebrated for automotive engineering excellence. With smart car technology on the rise, the reliance on electronic components further drive the need for identifying, addressing, and resolving potential electromagnetic interference.

EMC YOUNG PROFESSIONALS LUNCHEON

Wednesday, 19 Aug | 1200 - 1430

Meet with peers from around the globe to discuss relevant challenges and best practices. Enjoy lunch as you network with like-minded professionals and make new connections that will last a lifetime.

WOMEN IN COMPLIANCE LUNCHEON


Thursday, 20 Aug | 1200 - 1330

Connect and learn from other engineering professionals about the benefits of promoting and encouraging women in the compliance workplace.

AWARDS LUNCHEON

Friday, 21 Aug | 1200 - 1400

With over 400 papers submitted, the 2015 EMC Symposium and EMC Europe Awards Luncheon is anticipated to be a celebration of valuable contributions and the thoughtful technical minds behind them. Be sure to plan to attend this sit down luncheon and celebrate your fellow peers and colleagues.



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GAUSS INSTRUMENTS

"Where Baroque meets High-Tech..."

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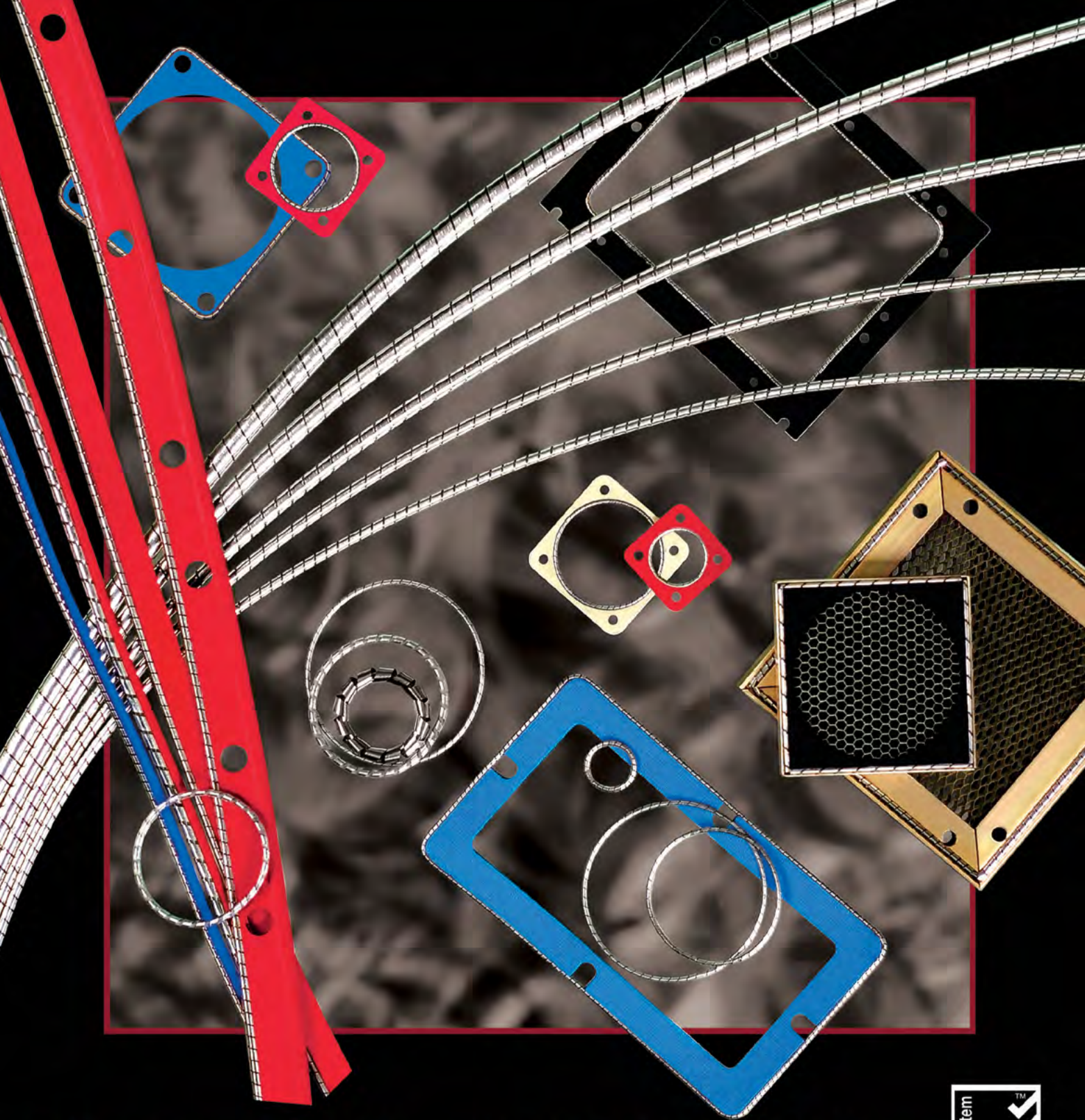


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DEAR FRIENDS AND COLLEAGUES,

Welcome to Germany, the land of Johann Wolfgang von Goethe and Friedrich Schiller, the land of Heinrich Hertz and Albert Einstein, the land of culture and science. Welcome to Dresden, the city of freestone and silicon, the city of destruction and reconciliation, the city where Baroque meets High-Tech.

For the first time we will have a Joint IEEE International Symposium on Electromagnetic Compatibility and EMC Europe where two of the leading international EMC symposia team up for the EMC event of the year. The Symposium Organizing Committee worked hard on combining the best elements of both conferences together and you will certainly like the result. You will enjoy a full 5-day program with technical sessions from Tuesday to Thursday and workshop and tutorial sessions over the entire week. The grand opening ceremony on Tuesday morning will include a keynote presentation from Prof. Siegfried Fiebig, CEO of Volkswagen Sachsen. Of course, the technical program is accompanied by a technical exhibition from Tuesday to Thursday. Please note that we decided to move the Awards Luncheon to Friday due to the overwhelmingly large number of excellent papers we received, which were selected following a two-stage review process.

The venue of the symposium is the International Congress Center Dresden. The Congress Center is located along the Elbe River only a few minutes by foot from historical city center of Dresden. Our symposium is a perfect fit for the Congress Center ensuring short distances between sessions and the exhibit hall and thus excellent networking opportunities. The Maritim headquarters hotel is adjacent to the Congress Center and located in a meticulously renovated and heritage listed municipal warehouse Especially if you have never been to Dresden before, you should also have a look at our exclusive tour program.

Enjoy the unique atmosphere of Volkswagen's "Gläserne Manufaktur" where the Volkswagen Phaethon and Bentley are assembled in an open and transparent building. You'll see this impressive venue during the Tuesday evening Welcome Reception. And don't forget to bring your EMC 2015 beer coaster that you hopefully saved for this event. Some good German beer and other beverages are waiting for you.

Save your best suit or dress for the Symposium Gala at the Westin Bellevue Ballroom on Wednesday evening. We have an exquisite gala dinner and live music planned for your enjoyment.

I look forward to meeting you at the Joint IEEE EMC Symposium and EMC Europe 2015 in the wonderful city of Dresden in August.

Hans Georg Krauthäuser
EMC Dresden 2015 General Chair




PROF. HANS GEORG
KRAUTHÄUSER, TECHNISCHE
UNIVERSITÄT DRESDEN

WELCOME FROM THE GENERAL CHAIR



General Information

SCHEDULE AT A GLANCE

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
0800	CONCURRENT SESSIONS	OPENING SESSION	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS
0900					
1000	BREAK	BREAK & EXHIBITS	BREAK & EXHIBITS	BREAK & EXHIBITS	BREAK
1100	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS
1200	BREAK	BREAK & EXHIBITS	BREAK & EXHIBITS	BREAK & EXHIBITS	AWARDS LUNCHEON
1300					
1400	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS
1500	BREAK	BREAK & EXHIBITS	BREAK & EXHIBITS	BREAK & EXHIBITS	BREAK
1600	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS
1700	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS	CONCURRENT SESSIONS
1800	NETWORKING OPPORTUNITIES	WELCOME RECEPTION	GALA	<i>Thank you for attending!</i> 	
1900					
2000					

REGISTRATION

Registrants will be required to wear badges to access the various sessions. Some of the programs require an additional fee such as Global University and some of the social events.

REGISTRATION HOURS

Sunday	1400 - 1700
Monday	0730 - 1700
Tuesday	0730 - 1700
Wednesday	0730 - 1700
Thursday	0730 - 1700
Friday	0730 - 1130

COURSES

The technical program is scheduled to run from 0820 - 1800, Monday through Friday. The sessions, workshops and tutorials will take place in the Konferenzraum and Seminarraum Rooms, see the schedule for specific details.

EXHIBITS

Exhibits and Table Tops are located in the Hall Level.

EXHIBIT HOURS

Tuesday	 0900 - 1730
Wednesday	 0900 - 1730
Thursday	 1000 - 1700

SPEAKER READY ROOM

Speakers and chair persons are welcome to use the Speaker Ready room to prepare for presentations, experiments, or demonstrations.

Monday through Friday | 0700 - 1700
Konferenzraum 7

PROCEEDINGS

To download the proceedings, please visit:
<http://www.emc2015.emcss.org>

PERSONAL SCHEDULER

To map out your attendance to the workshops, tutorials, technical sessions, and more, please visit:
<http://emc.confex.com/emc/emc2015/schedule/index.cgi>

CERTIFICATE OF PARTICIPATION

A Certificate of Participation may be used to officially document attendance at the Symposium. Please check in at the Registration Desk to request your personal certificate and to verify your name and affiliation. If you have any questions, please send an email to hatice.altintas@vde.com.

CHILDREN AND COMPANIONS

Children and companions are allowed to visit the Exhibit Hall and as otherwise noted in your registration. Children under the age of 18 years old should be accompanied by an adult.





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MEET THE SYMPOSIUM COMMITTEE

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Heyno Garbe
Leibniz Universität Hannover

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IBM
Stefan Dickmann
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Colin Brench
Amphenol

SPECIAL TRACK AUTOMOTIVE

Matthias Richter
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General Motors

EXHIBITS

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Christian Groß
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University of Twente
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Performance Computing(IHPC)

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SPECIAL ADVISOR TO IEEE EMC SOCIETY

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GENERAL INFORMATION

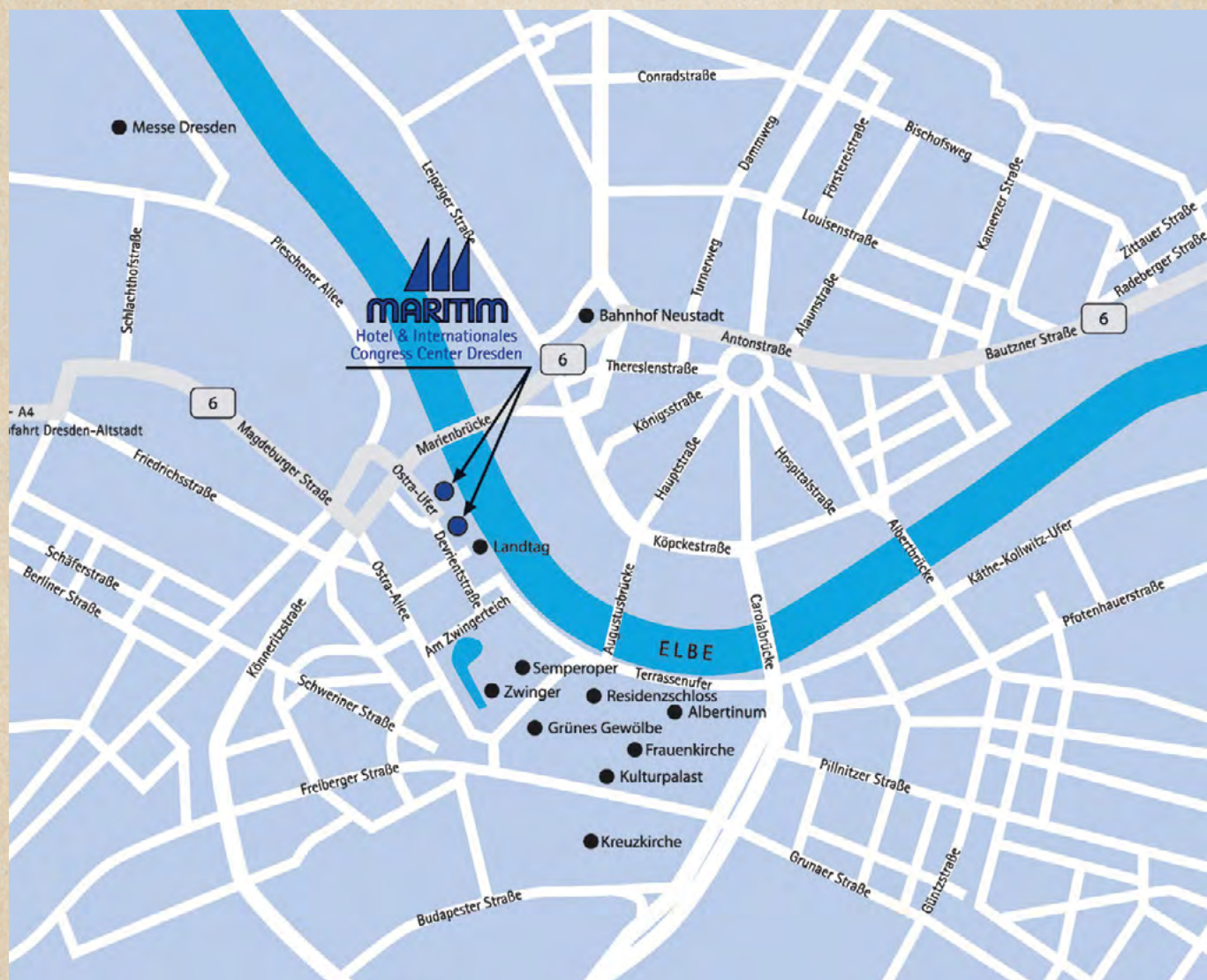


EMC 2015

DRESDEN, AUGUST 16-22

Getting Around Dresden

GETTING AROUND DRESDEN



DINING ATTRACTIONS

ITALIENISCHES DÖRFCHEN

Theaterplatz 3, 01067 Dresden, Germany

GRIECHISCHES RESTAURANT ACHERON

Königstraße 5A, 01097 Dresden, Germany

KASTENMEIERS GMBH & CO. KG

Tzschirnerplatz 3-5, 01067 Dresden, Germany

ESTANCIA STEAKHOUSE

Fetscherstraße 30, 01309 Dresden, Germany

SOCIAL TOURS

DRESDEN ON TOUR

Sunday, 16 August
1400 - 1600

PRICE PER PERSON: EUR 39,00

Starting in the city center, enjoy a stroll through "Großer Garten", as well as the Transparent Factory. Drive along the riverside and into the residential district to enjoy a coffee break with a local treat.



TREASURE CHAMBER DRESDEN

Monday, 17 August
1330 - 1630

PRICE PER PERSON: EUR 39,00

Enjoy a walk through the historical heart of Dresden to admire the city's most beautiful and important sights. Admire the Theaterplatz square and Opera House. Then tour the Royal Palace and later enjoy the many masterpieces within.



RIVER CRUISE TO PILLNITZ PALACE

Tuesday, 18 August
1400 - 1730

PRICE PER PERSON: EUR 59,00

Take a ride aboard Dresden's classic puffing steamer, and enjoy the breathtaking riverscape views from rich green meadows to enchanting. Castles, across the Blue Wonder bridge and upon the Pillnitz Palace.



MEISSEN AND THE PORCELAIN

Wednesday, 19 August
1000 - 1630

PRICE PER PERSON: EUR 89,00

Begin with a coach ride into the cradle of Saxony, the 1000-year old city of Meissen. Have lunch in a traditional restaurant then visit the Meissen porcelain factory. Observe the beautiful vineyards and cozy historic area under preservation order.



WINERY SCHLOSS WACKERBARTH

Thursday, 20 August
1400 - 1630

PRICE PER PERSON: EUR 50,00

Ride to Radebul to find the Schloss Wackerbarth, a glittering property once court to Augustus the Strong. View the baroque gardens and castle at this fine establishment known as the first transparent vineyard. Try wine making first-hand!



COMPANION CLUB

To enjoy one or more of these tours, join fellow companions at the symposium by registering for the Companion Club. This is an excellent opportunity to meet new people and catch up with old friends!

Visit emc2015.org/companion-club for complete tour details and to register.



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DRESDEN, AUGUST 16-22

Networking Opportunities



© Volkswagen Die Gläserne Manufaktur

WELCOME RECEPTION

TUESDAY, 18 AUGUST | 1830 – 2100

Volkswagen's "Die Gläserne Manufaktur"

Kindly supported by the Volkswagen Sachsen GmbH

Come join us at Volkswagen's "Die Gläserne Manufaktur" for a unique evening of food and beverage in a modern setting! The factory is located 2.5 km from the Maritim hotel, near the "Großer Garten", and can be reached easily by tram numbers 11 and 4 in approximately 30 minutes. (A free tram ticket is included in the 5-Day technical registration.)

One ticket for the Welcome Reception is included in all 5-Day technical registrations and the Companion Program registration. All others may purchase a ticket to the Welcome Reception as an add-on to their registration.

- Adult ticket price: 60-€ (70€ after July 20)
- Junior* ticket price: 30-€ (45€ after July 20)
- Children under age 8 are free**

At "Die Gläserne Manufaktur" visitors, customers and anyone with an interest in Volkswagen can observe first hand as Volkswagen's luxury class comes into being and enjoy top-class gastronomy and an extensive range of cultural events. Indeed, this is where car manufacturing becomes an immediate communicative event; this is where innovative technology meets cultural vitality.



GALA BANQUET

WEDNESDAY, 19 AUGUST | 1900 – 2200

The Westin Bellevue

Kindly supported by ETS-Lindgren

Please join us in one of the largest ballrooms in Dresden on Wednesday, evening for a night of entertainment, the traditional passing of the EMC Europe Symposium Banner, as well as an exciting raffle drawing for a great prize!

The gala is hosted in one of the most beautiful hotels in Dresden, due to the stunning views of Dresden's famous baroque landmarks. The Westin is an approximate 20 minute walk from the International Congress Center and Maritim host hotel, or a short taxi ride.

One ticket for the Gala Dinner is included in all 5-Day technical registrations, EXCEPT student registrations. All others may purchase a ticket to the Gala Dinner as an add-on to their registration.

- Adult ticket price: 80-€ (90€ after July 20)
- Junior* ticket price: 60-€ (70€ after July 20)
- Children under age 8 are free**

ETS-LINDGREN
An ESCO Technologies Company

* A junior is considered Ages 8-17. Tickets are inclusive.

** Children under age 8 are free, but must be accompanied by a registered adult.

"Where Baroque meets High-Tech..."

NETWORKING OPPORTUNITIES

AWARDS LUNCHEON

FRIDAY, 21 AUGUST | 1200 – 1400

TERRASSENEBENE

The Awards Luncheon will be the last formal opportunity to gather 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.

One ticket for the Awards Luncheon is included in all 5-Day technical registrations. All others may purchase a ticket to the Awards Luncheon as an add-on to their registration.

- Adult ticket price: 40-€ (48€ after July 20)
- Junior* ticket price: 20-€ (48€ after July 20)
- Children under age 8 are free**

ANTICIPATED AWARDS

- President's Memorial Award
- Hall of Fame Award
- Honored Member Award
- Sustained Service to the EMC Society Award
- Richard R. Stoddart Award for Outstanding Performance
- Laurence G. Cumming Award for Outstanding Service
- Fellow Award
- Technical Achievement Award
- James C. Klouda Memorial Scholarship Award
- Richard B. Schulz Best Transactions Paper Award
- EMC 2015 Best Symposium Paper
- EMC 2015 Best Student Paper
- Symposium Chair Award
- Certificate of Appreciation
- Certificate of Acknowledgment
- Certificate of Recognition

CHAPTER CHAIR

DINNER AND SOCIAL

MONDAY, 17 AUGUST | 1730 – 2030

SEMINARRAUM 6

On Monday evening, a social session will precede the dinner to give the Chapter Chairs the opportunity to meet with the other Chapter Chairs and their Angels. A dinner will be served following the social session. After dinner, an interactive brainstorming session will conclude the meeting. This session is intended 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. In addition to 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.

CHAPTER CHAIR LUNCH AND TRAINING

THURSDAY, 20 AUGUST | 1200 – 1400

SEMINARRAUM 1

On Thursday afternoon, the Chapter Chair Training Session will provide a forum for focused training to the Chapter Chairs. This will provide the Chapter Chairs with the opportunity to discuss their chapter issues and get group feedback as well as meet other Chapter Chairs from around the world. The Chapter Coordinator will also share important, resourceful information from IEEE headquarters and the EMC Society Board of Directors. Lunch will be included at this event.

NOTE: These are free events open to Chapter Chairs or their representatives. Please check with your Chapter Chair, as you can be the representative for your Chapter if your Chapter Chair cannot attend these events.



EMC 2015

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Networking Opportunities

EXCLUSIVE YOUNG PROFESSIONAL EVENTS

Did you receive your first professional degree (such as a Bachelor of Science) within the last 15 years? If you answered "yes", then you are a Young Professional! Please join us at these exciting events open ONLY to Young Professionals.

BIKE TOUR OF DRESDEN

MONDAY, 17 AUGUST | 1800 – 2000

This social event includes biking around Dresden. Our friendly tour guide will point out the highlights of Dresden as well as the best pubs (and those with the best prices!) so you can return later in the symposium week to enjoy with your colleagues. Price includes bike rental, helmet and tour guide. Meet at the symposium registration area at the International Congress Center at 5:40 PM. Note you **MUST BE REGISTERED IN ADVANCE** to ensure equipment availability.

LUNCH AND LEARN: ADVANCE YOUR CAREER

WEDNESDAY, 19 AUGUST | 1200 – 1430

SEMINARRAUM 2

Join us for an interactive Lunch and Learn event with speaker Martina Sabath on the important topic of "Body Language." Participants will be quizzed to determine the meaning of certain postures. You'll learn tips and techniques to improve your nonverbal communication skills and advance your career. You'll also learn what others may be really telling you with their body language so you can respond accordingly and get ahead.



Photo by Richard Georgerian

FOUNDERS AND PAST PRESIDENTS LUNCHEON

THURSDAY, 20 AUGUST | 1130 – 1330

LOUNGE/BLUE BAR

The Founders and Past-Presidents Luncheon will be held at the convention center. The Luncheon is by invitation only to the Founders of the EMC Society, Past-Presidents of the EMC Society, current members of the Board of Directors, and distinguished members of the European EMC Community. The luncheon is a chance for the old and the new to mix, exchanging experiences of the past, challenges of the future, and learning about the EMC profession. A sit down lunch is provided.

WOMEN IN COMPLIANCE LUNCHEON

THURSDAY, 20 AUG | 1200 – 1330

SEMINARRAUM 2

Connect and learn from other engineering professionals about the benefits of promoting and encouraging women in the electromagnetic compliance workplace. Kirsten Russell, a guest speaker from the IEEE Women in Engineering Society, will introduce the mission and works of the WIE and facilitate thoughtful discussion about the challenges, milestones, and future outlook.

“Where Baroque meets High-Tech...”

WELCOME FROM THE TECHNICAL CHAIR

On behalf of the Technical Program Committee and me, we welcome you to the 2015 Joint IEEE International Symposium on Electromagnetic Compatibility and EMC Europe in Dresden, Germany. This year we are pleased to have received more than 400 submissions from industry leaders, recognized professionals, and academia worldwide across a variety of topics and disciplines within EMC. It was a very hard job to select the most interesting papers for the symposium, but now you can see the result. Enjoy the quality lineup of thought-provoking, educational, and informational activities we have scheduled for you throughout these five days of symposium.

Heyno Garbe
Technical Program Chair



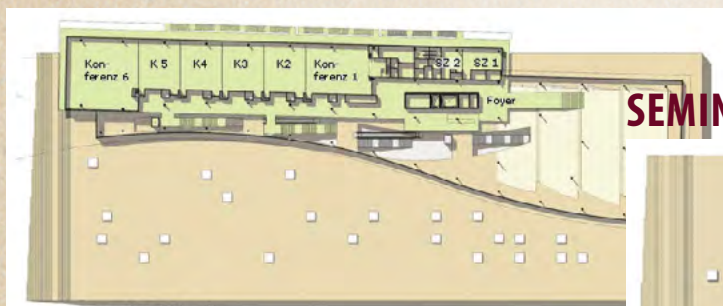
HEYNO GARBE
LEIBNIZ UNIVERSITÄT HANNOVER

TECHNICAL PROGRAM WELCOME

GETTING AROUND THE CONGRESS CENTER



KONFERENZRAUM LEVEL



SEMINARRAUM LEVEL





EMC 2015

DRESDEN, AUGUST 16-22

Technical Program

MONDAY 17 AUGUST

WS1 AND WS7 WORKSHOP 0830 – 1730 Konferenzraum 1	WS2 WORKSHOP 0830 - 1200 Konferenzraum 2	WS3 WORKSHOP 0830 - 1200 Konferenzraum 3	WS4 WORKSHOP 0830 – 1200 Konferenzraum 4
FUNDAMENTALS OF EMI/EMC	MODELING OF EMC PROBLEMS USING CONCEPT-II	APPLICATION OF REVERBERATION CHAMBERS	DETAILS OF THE FIRST PRACTICAL METHOD FOR RISK-MANAGING EMC
1000 - 1020, MORNING BREAK			
FUNDAMENTALS OF EMI/EMC	MODELING OF EMC PROBLEMS USING CONCEPT-II	APPLICATION OF REVERBERATION CHAMBERS	DETAILS OF THE FIRST PRACTICAL METHOD FOR RISK-MANAGING EMC
1200 - 1330, LUNCH BREAK			
WS1 AND WS7 WORKSHOP 0830 – 1730 Konferenzraum 1	WS8 WORKSHOP 1400 - 1730 Konferenzraum 2	WS9 TUTORIAL 1400 - 1730 Konferenzraum 3	WS10 TUTORIAL 1400 - 1730 Konferenzraum 4
FUNDAMENTALS OF EMI/EMC	COMPUTATIONAL ELECTROMAGNETICS AND MULTIPHYSICS METHODS FOR CHARACTERIZING COMPLEX EMC/EMI EFFECTS	POWER DISTRIBUTION DESIGN ON PCBS FOR EFFECTIVE EMI CONTROL	CALIBRATION OF EMC TEST FACILITIES AND MEASUREMENT INSTRUMENTATION
1530 - 1600, AFTERNOON BREAK			
FUNDAMENTALS OF EMI/EMC	COMPUTATIONAL ELECTROMAGNETICS AND MULTIPHYSICS METHODS FOR CHARACTERIZING COMPLEX EMC/EMI EFFECTS	POWER DISTRIBUTION DESIGN ON PCBS FOR EFFECTIVE EMI CONTROL	CALIBRATION OF EMC TEST FACILITIES AND MEASUREMENT INSTRUMENTATION

TUESDAY 18 AUGUST

TRACK A 1020 – 1740 Konferenzraum 1	TRACK B 1020 – 1740 Konferenzraum 2	TRACK C 1020 – 1650 Konferenzraum 3	TRACK D 1020 – 1135 Konferenzraum 4
KEYNOTE PRESENTATION 0900 - 1000			
1000 - 1020, MORNING BREAK			
Technical Session 1020 - 1200	Technical Session 1020 - 1135	Technical Session 1020 - 1200	Technical Session 1020 - 1135
CIRCUITS AND DEVICES	LOW FREQUENCY ELECTROMAGNETIC COMPATIBILITY I	EMC FOR EMERGING WIRELESS TECHNOLOGIES I	SMART GRID EMC
1200 - 1400, LUNCH BREAK			
Technical Session 1400 - 1515	Technical Session 1400 - 1540	Technical Session 1400 - 1540	SS1 Special Session 1400 - 1540
SHIELDING I	LOW FREQUENCY ELECTROMAGNETIC COMPATIBILITY II	EMC FOR EMERGING WIRELESS TECHNOLOGIES II	EM INFORMATION SECURITY AND COUNTERMEASURES
1530 - 1600, AFTERNOON BREAK			
Technical Session 1600 - 1740	Technical Session 1600 - 1740	Technical Session 1600 - 1650	SS1 Special Session 1600 - 1715
SHIELDING II	LOW FREQUENCY ELECTROMAGNETIC COMPATIBILITY III	EMC FOR EMERGING WIRELESS TECHNOLOGIES III	EM INFORMATION SECURITY AND COUNTERMEASURES

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TECHNICAL PROGRAM GUIDE

WS5 WORKSHOP 0830 – 1200 Konferenzraum 5	WS6 WORKSHOP 0830 - 1200 Konferenzraum 6	
NOVEL ABSORBER APPLICATIONS	NEW CHALLENGES AND TECHNIQUES IN SHIELDING AGAINST ELECTROMAGNETIC INTERFERENCE	
NOVEL ABSORBER APPLICATIONS	NEW CHALLENGES AND TECHNIQUES IN SHIELDING AGAINST ELECTROMAGNETIC INTERFERENCE	
WS11 TUTORIAL 1400 - 1730 Konferenzraum 5	WS12 TUTORIAL 1400 - 1730 Konferenzraum 6	SS2 SPECIAL SESSION 1400 - 1605 Seminarraum 1
COST IC 1407 “ACCREDIT” WORKSHOP: EMI CHALLENGES IN FUTURE COMPLEX MULTI- FUNCTIONAL (DIGITAL) SYSTEMS	SMART GRID EMC UPDATE	SHIELDING MEASUREMENTS: FROM LF TO MICROWAVE
COST IC 1407 “ACCREDIT” WORKSHOP: EMI CHALLENGES IN FUTURE COMPLEX MULTI- FUNCTIONAL (DIGITAL) SYSTEMS	SMART GRID EMC UPDATE	SHIELDING MEASUREMENTS: FROM LF TO MICROWAVE
TRACK E 1020 – 1715 Konferenzraum 5	WS13 TUTORIAL 1400 - 1730 Seminarraum 1	
Technical Session 1020 - 1200		
EMC MANAGEMENT		
Technical Session 1400 - 1515	WS13 Tutorial 1400 - 1730	
EMC IN COMMUNICATION SYSTEMS	BASIC EMC MEASUREMENTS	
Technical Session 1600 - 1715	WS13 Tutorial 1400 - 1730	
EM ENVIRONMENT	BASIC EMC MEASUREMENTS	



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Technical Program

WEDNESDAY 19 AUGUST

TRACK F 0820 – 1740 Konferenzraum 1	TRACK G 0820 – 1715 Konferenzraum 2	TRACK H 0820 – 1740 Konferenzraum 3	TRACK I 0820 – 1715 Konferenzraum 4
Technical Session 0820 – 1000	Technical Session 0820 – 1000	Technical Session 0820 – 1000	Technical Session 0820 – 1000
SYSTEM EMC PREDICTION I	REVERBERATION TESTING I	ADVANCED MODELS AND TIME DOMAIN METHODS I	SIGNAL AND POWER INTEGRITY I
1000 - 1020, MORNING BREAK			
Technical Session 1020 – 1135	Technical Session 1020 – 1200	Technical Session 1020 – 1200	Technical Session 1020 – 1200
SYSTEM EMC PREDICTION II	REVERBERATION TESTING II	ADVANCED MODELS AND TIME DOMAIN METHODS II	SIGNAL AND POWER INTEGRITY II
1200 - 1330, LUNCH BREAK			
Technical Session 1400 – 1540	Technical Session 1400 – 1540	Technical Session 1400 – 1515	Technical Session 1400 – 1540
FILTERS AND CONDUCTED COUPLING I	EMISSION MEASUREMENTS I	MODELING APPLICATIONS, INCLUDING REVERBERATION CHAMBERS I	SIGNAL AND POWER INTEGRITY III
1530 - 1600, AFTERNOON BREAK			
Technical Session 1600 – 1740	Technical Session 1600 – 1715	Technical Session 1600 – 1740	Technical Session 1600 – 1715
FILTERS AND CONDUCTED COUPLING II	EMISSION MEASUREMENTS II	MODELING APPLICATIONS, INCLUDING REVERBERATION CHAMBERS II	SIGNAL AND POWER INTEGRITY IV

THURSDAY 20 AUGUST

TRACK K 1020 – 1740 Konferenzraum 1	TRACK L 1020 – 1740 Konferenzraum 2	TRACK M 1020 – 1740 Konferenzraum 3	TRACK N 0820 – 1650 Konferenzraum 4
Technical Session 0820 – 10:00	Technical Session 0820 – 0935	Technical Session 0820 – 1000	Technical Session 0820 – 1000
FIELD - WIRE COUPLING & RADIATION I	IMMUNITY MEASUREMENTS I	MODELING APPLICATIONS AND UNCERTAINTY ANALYSIS IN SIMULATIONS I	SIGNAL AND POWER INTEGRITY V
1000 - 1020, MORNING BREAK			
Technical Session 1020 – 1135	Technical Session 1020 – 1135	Technical Session 1020 – 1200	Technical Session 1020 – 1135
FIELD - WIRE COUPLING & RADIATION II	IMMUNITY MEASUREMENTS II	MODELING APPLICATIONS AND UNCERTAINTY ANALYSIS IN SIMULATIONS II	SIGNAL AND POWER INTEGRITY VI
1200 - 1330, LUNCH BREAK			
SS4 Special Session 1400 – 1540	Technical Session 1400 – 1515	Technical Session 1400 – 1540	Technical Session 1400 -1540
EM FIELD INTERACTION WITH TRANSMISSION LINES	ANTENNAS	PRACTICAL APPLICATIONS OF NUMERICAL MODELING I	NANOTECHNOLOGY AND ADVANCED MATERIALS IN EMC I
1530 - 1600, AFTERNOON BREAK			
SS4 Special Session 1600 – 1740	Technical Session 1600 – 1740	Technical Session 1600 – 1740	Technical Session 1600 – 1650
EM FIELD INTERACTION WITH TRANSMISSION LINES	MEASUREMENT ANALYSIS	PRACTICAL APPLICATIONS OF NUMERICAL MODELING II	NANOTECHNOLOGY AND ADVANCED MATERIALS IN EMC II

“Where Baroque meets High-Tech...”

TECHNICAL PROGRAM GUIDE

AUTOMOTIVE TRACK 0820 – 1740 Konferenzraum 5	WS14 TUTORIAL 0830 – 1200 Seminarraum 1	WS15 TUTORIAL 1400 – 1730 Seminarraum 1
Technical Session 0820 – 1000	WS14 Tutorial 0830 - 1200	
HYBRID AND ELECTRICAL VEHICLES	UNMANNED AIRCRAFT SYSTEMS – EMC AND APPLICATIONS	
Technical Session 1020 – 1200	WS14 Tutorial 0830 - 1200	
ELECTRICAL POWERTRAIN	UNMANNED AIRCRAFT SYSTEMS – EMC AND APPLICATIONS	
Technical Session 1400 – 1515		WS15 Tutorial 1400 - 1730
ELECTRICAL POWER SUPPLY		EMC ISSUES RELATED TO POWER SYSTEM TECHNICAL PERFORMANCE
Technical Session 1600 – 1740		WS15 Tutorial 1400 - 1730
ANALYSIS AUTOMOTIVE SYSTEMS		EMC ISSUES RELATED TO POWER SYSTEM TECHNICAL PERFORMANCE
TRACK O 1400 – 1805 Konferenzraum 5	SS5 SPECIAL SESSION 0820 – 1200 Konferenzraum 5	WS16 TUTORIAL 0830 – 1200 Seminarraum 1
	Special Session 0820 – 1000	WS16 Tutorial 0830-1200
	INTENTIONAL ELECTROMAGNETIC INTERFERENCE (IEMI) PROTECTION OF CRITICAL INFRASTRUCTURES	NANOTECHNOLOGY APPLIED TO EMC
	Special Session 1020 – 1135	WS16 Tutorial 0830-1200
	INTENTIONAL ELECTROMAGNETIC INTERFERENCE (IEMI) PROTECTION OF CRITICAL INFRASTRUCTURES	NANOTECHNOLOGY APPLIED TO EMC
Technical Session 1400 -1540	SS3 Special Session 1400 - 1650	
HPEM TESTING AND ANALYSIS	EMC DIAGNOSTICS OF COMPLEX SYSTEMS	
Technical Session 1600 – 1805	SS3 Special Session 1400 - 1650	
IEMI PULSERS AND EFFECTS EVALUATIONS	EMC DIAGNOSTICS OF COMPLEX SYSTEMS	



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FRIDAY 21 AUGUST

WS18 AND WS23 WORKSHOP 0830 – 1730 Konferenzraum 1	WS19 and WS24 TUTORIAL 0830 - 1730 Konferenzraum 2	WS20 TUTORIAL 0830 - 1200 Konferenzraum 3	WS21 TUTORIAL 0830 - 1200 Konferenzraum 4
AUTOMOTIVE EMC	WORKING EMC ENGINEER SKILLS	MEASUREMENT UNCERTAINTY – CHALLENGES AND SOLUTIONS	IEC HPEM STANDARDIZATION UPDATE
1000 - 1020, MORNING BREAK			
AUTOMOTIVE EMC	WORKING EMC ENGINEER SKILLS	MEASUREMENT UNCERTAINTY – CHALLENGES AND SOLUTIONS	IEC HPEM STANDARDIZATION UPDATE
1200 - 1330, LUNCH BREAK			
WS18 AND WS23 WORKSHOP 0830 – 1730 Konferenzraum 1	WS19 and WS24 TUTORIAL 0830 - 1730 Konferenzraum 2	WS25 WORKSHOP 1400 - 1730 Konferenzraum 3	WS26 WORKSHOP 1400 - 1730 Konferenzraum 4
AUTOMOTIVE EMC	WORKING EMC ENGINEER SKILLS	DEBUGGING EMI TEST FAILURES	IEMI EFFECTS ON CRITICAL INFRASTRUCTURES: THE EUROPEAN PROJECT STRUCTURES
1530 - 1600, AFTERNOON BREAK			
AUTOMOTIVE EMC	WORKING EMC ENGINEER SKILLS	DEBUGGING EMI TEST FAILURES	IEMI EFFECTS ON CRITICAL INFRASTRUCTURES: THE EUROPEAN PROJECT STRUCTURES



Photo by Richard Georgerian

WS22.1 WORKSHOP 0830 - 1000 Konferenzraum 6	WS22.2 WORKSHOP 1030 - 1200 Konferenzraum 5	
REGULATORY REQUIREMENTS FOR WIRELESS SYSTEMS		
	ASSESSMENT AND APPROVALS FOR WIRELESS MODULE TECHNOLOGY	
WS27 TUTORIAL 1400 - 1730 Konferenzraum 5	WS29 TUTORIAL 1400 - 1730 Konferenzraum 6	
ESD: DATA CENTER ESD OCCURRENCE RATE, ESD TO DISPLAYS AND INTEGRATED ESD PCB IC CO-DESIGN	PRODUCT SAFETY ENGINEERING SOCIETY	
ESD: DATA CENTER ESD OCCURRENCE RATE, ESD TO DISPLAYS AND INTEGRATED ESD PCB IC CO-DESIGN	PRODUCT SAFETY ENGINEERING SOCIETY	

DEMOS AND EXPERIMENTS

Exhibit Hall | See Technical Program for Details

TUESDAY 1000 - 1600

WEDNESDAY 1000 - 1600

THURSDAY 1000 - 1600

POSTER SESSIONS

Terrassenebene | See Page 75 for Details

TUESDAY 1300 - 1400

WEDNESDAY 1300 - 1400

THURSDAY 1300 - 1400

Posters will be on display Tuesday through Thursday 1020 - 1800.



Photo courtesy of Karthik Vepuri

AWARDS LUNCHEON

Terrassenebene | See Page 15 for Details

FRIDAY 1200 - 1400

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MONDAY, 17 AUGUST

MONDAY



0830 - 1730

WS1/7 Fundamentals of EMI/EMC

0830 - 1200

WS2 Modeling of EMC Problems Using
CONCEPT-IIWS3 Application of Reverberation
ChambersWS4 EMC for Functional Safety / Risk-
managing EMC

WS5 Novel Absorber Applications

WS6 New Challenges and Techniques
in Shielding Against Electromagnetic
Interference

1400 - 1730

SS2 Shielding Measurements:
From LF to MicrowaveWS8 Computational Electromagnetics
and Multiphysics Methods for
Characterizing Complex EMC/EMI
EffectsWS9 Power Distribution Design on PCBs
for Effective EMI ControlWS10 Calibration of EMC Test Facilities
and Measurement InstrumentationWS11 EMI challenges in Future Complex
Multi-functional (Digital) Systems

WS12 Smart Grid EMC Update

FUNDAMENTALS OF EMI/EMC

WS1 and WS7 | Tutorial | 0830 -1730

Konferenzraum 1

SPONSORED BY ESAC

CHAIR: Arturo Mediano, *University of Zaragoza, Zaragoza, Spain*

This tutorial is an overview of many of the major topics that need to be considered when designing an electronic product or system without EMI/EMC problems. The tutorial will present the foundational ideas, without complex math, so attendants could be able to successfully design, evaluate, diagnose, and solve EMI/EMC problems. Main objective is to introduce novel engineers in the fundamentals of this complex subject and to attract experienced designers to a review of the basics.

Topics included in the Tutorial include emissions (both radiated and conducted), printed circuit boards (PCB), grounding, shielding, cables, filters and testing fundamentals.

1. 0830 | Introduction

Arturo Mediano, *University of Zaragoza, Zaragoza, Spain*
Welcome and presentation. Tutorial outline.

2. 0830 - 1000 | Radiated Emissions

Lee Hill, *Silent Solutions, Amherst, NH, USA*
A concise introduction to the generation of radiated emissions from electronic products, and the consequences of how we measure them. A discussion of the four noise paths.

3. 1030 - 1115 | Conducted Emissions

Lee Hill, *Silent Solutions, Amherst, NH, USA*
A discussion of how and why we measure conducted emissions. How to visualize differential-mode and common-mode noise currents as they travel through the artificial mains network. The principles behind separation of modes and how to make a practical diagnosis of the dominant mode at a given frequency. A discussion of some common causes of excessive differential- and common-mode conducted emissions failures, as well as some typical design and filter solutions.

4. 1115 - 1200 | PCB Layout for EMC Compliance

Bruce Archambeault, *Missouri University of Science and Technology, Rolla, Missouri, USA* and *IBM, Research Triangle Park, North Carolina, USA*
Good layout practices can make a huge difference in the PCB EMC performance. This talk will discuss some of the most important considerations.

5. **1400 - 1445 | Grounding**

Todd H. Hubing, *Clemson University International Center for Automotive Research*, Greenville, SC, USA

Proper ground is an essential aspect of design for EMC compliance. This presentation covers fundamental ground concepts and emphasizes the importance of differentiating functional grounds from functional current returns. A ground serves as a local voltage reference, while a current return provides a path for signal and power currents to return to their source. The concepts of proper ground structures and ground conductors are defined. Design rules for current returns are developed and compared to the rules for effective ground design.

6. **1445 - 1530 | Shielding**

Andy Marvin, *York EMC Services Ltd.*, York, United Kingdom
This presentation describes the basic principles of Electromagnetic screening.

7. **1600 - 1645 | Cables**

Todd H. Hubing, *Clemson University International Center for Automotive Research*, Greenville, SC, USA

Choosing the right cable for a given application is an important part of designing for EMC compliance. This presentation reviews various cable parameters such as impedance, imbalance, and attenuation that have an impact on EMC and signal integrity. It also discusses important properties of cable construction such as mechanical stiffness, chemical composition and cost. Cable shielding and connector options are reviewed, as well as methods for evaluating the effectiveness of cable and connector shields.

8. **1645 - 1730 | Filters for EMI-EMC**

Arturo Mediano, *University of Zaragoza*, Zaragoza, Spain
This topic will cover a review of the fundamentals of EMI/EMC filters including a basic classification and the review of usual topologies. Common components will be considered: capacitors, ferrites, three terminal capacitors, feed-through capacitors, and mains filters. How to evaluate a filter. How to destroy a filter. Key points for success.

MODELING OF EMC PROBLEMS USING CONCEPT-II

WS2 | Workshop | 0830 - 1200

Konferenzraum 2

CHAIR: Christan Schuster, *Technische Universität Hamburg-Harburg*, Hamburg, Germany

CO-CHAIR: Heinz-D. Brüns, *Technische Universität Hamburg-Harburg*, Hamburg, Germany

CONCEPT-II is a method of moments (MoM) solver based on a frequency domain formulation for the treatment of metallic and dielectric objects. The code is under continuous development at the Institute of Electromagnetic Theory at TUHH and free of charge for academic institutions and non-commercial applications. The workshop is intended to introduce the solver to the wider EMC community and instruct people on how to solve EMC problems using MoM. After a short overview of the code features a number of current CONCEPT-II users will report on how they apply the code to their EMC issues and what difficulties they met in doing so. A broad range of EMC topics will be covered along the way including highly resonant cavities, electromagnetic field coupling, impact of direct and indirect lightning strikes, radar cross section computations, evaluation of shielding effectiveness, low frequency problems in power circuits, and antenna modeling for magnetic resonance imaging. The workshop will be of high value for anyone looking for numerical solutions of challenging EMC problems and will encourage them to use a method of moments based tool. It will be specifically useful for EMC experts from universities and public research institutions that are interested in the application of a software tool that can handle a wide range of EMC problems – for free.

1. **Modeling of EMC Problems Using CONCEPT-II – An Introduction**

H.-D. Brüns, *Technische Universität Hamburg-Harburg, Institute of Electromagnetic Theory*

2. **Efficient Simulation of the Stochastic Electromagnetic Field Coupling into Transmission Line Structures Using the Method of Moments**

M. Magdowski, R. Vick, *Otto-von-Guericke-Universität Magdeburg, Electromagnetic Compatibility Lab*

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3. **Analysis of a Hybrid Broadband Reverberation Chamber Antenna**
M. P. Robinson, I. D. Flintoft, G. Esposito, A. C. Marvin, L. Dawson, J. F. Dawson, *University of York, UK*
4. **Simulation of Lightning Strikes to the Peissenberg Tower using the Computer Code CONCEPT II**
F. Heidler, M. Manhardt, K. Stimper, *Universität der Bundeswehr München*
5. **Radar Cross Section Analysis of Aircraft using CONCEPT-II**
A. Schröder, *Institute of Applied Physics, University of Bern*
6. **Effects of Radomes on Antenna Radiation**
J. Lansink Rotgerink, J.J van Es, J. Verpoorte, *National Aerospace Laboratory NLR, Avionics Technology department*
7. **Calculation of Shielding Effectiveness of Wires and Avionics Boxes**
H. Schippers, J. Verpoorte, J. Lansink Rotgerink, *National Aerospace Laboratory NLR, Avionics Technology department*
8. **Calibration Procedures for Radiation Model Creation Based on Near Field Measurements**
D. Rinas, Zongyi Chen, S. Frei, *Technische Universität Dortmund, On-Board Systems Lab*
9. **Stochastic EMC Simulations for the Investigation of Real Cable Layouts**
D. Hamann, M.-B. Konerding, H. Garbe, *Leibniz Universität Hannover, Institute of Electrical Engineering and Measurement*
10. **Lightning Protection of Aircraft Systems Installed inside Composite Nose: Principal Analysis**
D. Krutílek*, J. Kučera**, Z. Raida*, Zdeněk Řezníček**, *: *Department of Radio Electronic, Brno University of technology, Brno, Czech Republic*, **: *Evektor, spol. s r.o., Kunovice, Czech Republic*
11. **Efficient Antenna Modelling by Using Multiport Moment Methods for Magnetic Resonance Imaging Coils**
C. Findeklee, *Philips Research Europe-Hamburg, Tomographic Imaging Department*
12. **Simulation of the Radiation of Large High Voltage Applications in the Frequency Range up to 10 MHz**
G. Seibert, M. Meeh, *Siemens, Erlangen, Germany*

APPLICATION OF REVERBERATION CHAMBERS

WS3 | Tutorial | 0830 -1200
Konferenzraum 3

CHAIR: Vignesh Rajamani, *Oklahoma State University, Stillwater, Oklahoma, USA*

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

This half-day tutorial provides a brief overview of Reverberation 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.

1. **Introduction – Rationale for RC Testing and Overview of Reverberation Chamber Theory**
Vignesh Rajamani and Chuck Bunting, *Oklahoma State University (OSU), Stillwater, Oklahoma, USA*
2. **Multiple Antenna Stirring for Reverberation Chambers**
Valter Mariani Primiani, *Polytechnic University of Marche, Ancona, Italy*
3. **Optimizing Reverb Chamber Design for DO160 Cat G and L**
Garth D'Abreu, *ETS Lindgren, Cedar Park, Texas, USA*
4. **Measurement of Antenna Noise Temperature in a Reverberation Chamber**
Andy Marvin, *University of York, UK*
5. **Flexible Testing**
Frank Leferink, *University of Twente, The Netherlands*
6. **Use of Reverberation Chambers in Design and Verification of Highly Shielded Systems**
Mats Backstrom, Technical Fellow, Electromagnetic Effects, Adj. Professor, *Royal Institute of Technology (KTH), Saab Aeronautics, Sweden*

DETAILS OF THE FIRST PRACTICAL METHOD FOR RISK-MANAGING EMC

WS4| Workshop | 0830 -1200

Konferenzraum 4

SPONSORED BY TC1

CHAIR: Keith Armstrong, *Cherry Clough Consultants Ltd*,
Brocton, Stafford, UK

Where safety risks can be increased by the effects of EMI on electronic equipment, EMC must be risk-managed for the full lifetime of the equipment/system/installation concerned, and so must take into account all reasonably foreseeable aging, wear, corrosion, faults, use and misuse. Overall risks of death from new projects are only acceptable at levels below 0.1% (1000ppm) per person per year, with most of the acceptable levels being set at or below 0.0001% (1ppm) per person per year. However, there are many possible contributors to this overall safety risk, and the proportion of the overall risk that is allocated to EMI causes is typically 1/10th of this, i.e. between a risk of death of 100ppm and 0.1ppm per person per year.

A consequence of the above is that no affordable time/cost of EMC immunity testing, at any test levels, can possibly provide the necessary design confidence required for compliance with the relevant safety risk management standards. Where the future EM environment is unknown (as it usually is), the traditional approach (e.g. as used by the military) is to use very rugged high-specification EM mitigation, designed to meet or exceed all possible environmental issues (shock, vibration, humidity, salt spray, temperature, EM disturbances, etc.). However, this 'big grey box' approach can be too large, heavy or costly for many modern safety critical systems, especially (for example) in road/air transportation, portable medical devices, mobile life-support equipment, etc.

This tutorial also describes a new approach, first published in August 2013, which (unlike the 'big grey box' approach) adds little to size, weight and cost. These two approaches can also be used to help manage non-safety risks associated with the use of electronics, including financial risks, mission-critical risks, high-reliability, etc.

1. Increasing Importance of EMC for Functional Safety

Davy Pisssoort, Assistant Professor KU Leuven – *KULAB*,
Research Group ReMI - Reliability in Mechatronics & ICT,
Oostende, Belgium

2. **General Overview of Approaches: a) 'Big Grey Box'; b) New Method**
Keith Armstrong, *Cherry Clough Consultants Ltd*,
Brocton, Stafford, United Kingdom
3. **Developments in all Related IEC and IEEE Standards**
Keith Armstrong, *Cherry Clough Consultants Ltd*,
Brocton, Stafford, United Kingdom
4. **Special Challenges for Medical EMC Standard IEC 60601-1-2**
Keith Armstrong, *Cherry Clough Consultants Ltd*,
Brocton, Stafford, United Kingdom
5. **Discussions of the Detailed Design Techniques and Measures for Increasing Resilience Against EMI, Using the New Practical Method**
Keith Armstrong, *Cherry Clough Consultants Ltd*,
Brocton, Stafford, United Kingdom
6. **Overall Discussions, Q & A**
Davy Pisssoort, Assistant Professor KU Leuven – *KULAB*,
Research Group ReMI - Reliability in Mechatronics & ICT,
Oostende, Belgium
7. **Technical Summary and Conclusions**
Keith Armstrong, *Cherry Clough Consultants Ltd*,
Brocton, Stafford, United Kingdom

TECHNICAL PROGRAM



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MONDAY, 17 AUGUST

NOVEL ABSORBER APPLICATIONS

WS5 | Tutorial | 0830 - 1200
Konferenzraum 5

CO-CHAIRS: Vincent Keyser, *ETS-Lindgren*, Cedar Park, Texas, USA; Stéphane Blanc, *Groupe UTAC Ceram*, Linas-Montlhéry, France; Janet O'Neil, *ETS-Lindgren*, Cedar Park, Texas, USA

This tutorial will look at new applications and developments in the use of RF and EMC absorber. Examples of new applications beyond the traditional EMC measurements will be presented. A wide range of emerging topics will be discussed, which includes using the latest absorber techniques for retrofitting existing anechoic chambers, high power applications of absorber, absorber designs for wireless applications, and EMC absorber floor placement per the latest industry standards. It will also include a review of the nuances inherent in floor absorber placement as called out in the CISPR 16 chamber standards and the new ANSI C63.4-2014, which is scheduled to be referenced by the FCC. Presenters active in the ANSI C63 and CISPR standards committees will explain the nuances and changes and how these affect test results.

In recent years there has been an increased need for high power radiated measurements in an anechoic chamber. Since absorber works by transforming electromagnetic energy into thermal energy, there is a concern that in the presence of high fields the absorber can exceed threshold or ignition temperatures. An absorber engineer will provide insight on thermal behaviors of absorber under EM field illumination and tips on selecting the right absorber for a given application.

With the considerable advances in absorber technology over the past 20 years, users of older anechoic lined chambers are considering the possibility of replacing the existing absorber with new absorber. The goal is to increase overall chamber performance while keeping costs down in utilizing the existing chamber. However, a project of this scope must be approached cautiously to ensure predicted performance is achieved and construction costs are within budget. Tips and tools to consider for successful chamber retrofits based on experience will be provided.

The long established automotive industry has been experiencing a transition from the traditional immunity and emission measurements required for certification, to the increasing implementation of new tests commonly associated with measuring the performance of wireless devices and antennas. As the number of antennas on a vehicle continues to increase, standardized tests have been introduced to

verify that vehicle operation is not affected by the on board communication. We will look at the recent trend for building a dual purpose chamber to satisfy EMC and wireless test requirements, as well as the impact on absorber design for a common use chamber.

- 1. The Increasing Need for Wireless Testing in the Automotive Industry – The Impact on Absorber Design and Test Antennas**
Garth D'Abreu, *ETS-Lindgren*, Cedar Park, Texas, USA
- 2. Investigating Floor Absorber Placement Implications for Testing per CISPR 16**
Drew Frana, *IBM*, Rochester, Minnesota, USA, Martin Wiles, *ETS-Lindgren*, Cedar Park, Texas, USA
- 3. Floor Absorber Placement Implications per the FCC's Recently Referenced ANSI C63.4-2014 – Why the increase in absorber floor coverage?**
Donald N. Heirman, *Don HEIRMAN Consultants*, Lincroft, New Jersey, USA
- 4. Retrofitting an Existing Chamber with New Absorber: Tips and Techniques to Ensure a Successful Project**
Stéphane Blanc, *Groupe UTAC Ceram*, Linas-Montlhéry, France
- 5. Absorber Requirements Comparison for Different Procedures of Anechoic Chamber Test Site Validation, Including ETSI**
Anders Mynster, *DELTA*, Denmark
- 6. RF Absorbers for High and Medium Power Applications**
Zhong Chen, *ETS-Lindgren*, Cedar Park, Texas, USA

NEW CHALLENGES AND TECHNIQUES IN SHIELDING AGAINST ELECTROMAGNETIC INTERFERENCE

WS6 | Tutorial | 0830 - 1200
Konferenzraum 6

CHAIR: Jorge Victoria Ahuir, *Würth Elektronik eiSos GmbH*, Waldenburg, Germany

CO-CHAIRS: Bernd Deutschmann, *Graz University of Technology*, Austria; Peter Reiser, *Visteon Electronics Germany GmbH*, Karlsruhe, Germany

Shielding is not only about "gasketing" seams and calculating apertures. With the wide spread of wireless technologies through higher and lower frequencies, the continuous miniaturization of electronic devices and the development of powerful EMC measurement and simulation tools, EMC shielding is more useful and more challenging than ever. Therefore engineers need today new knowledge, skills, materials and techniques to prevent/solve their electromagnetic interferences.

This half day tutorial will provide an updated, innovative and practical overview to EMI shielding challenges, including practical demonstrations with real examples, measurements and simulations.

- 1. IC Shielding with Soft Magnetics**
Bernd Deutschmann, *Teknisches Universität Graz*, Austria
- 2. NFC/RFID Selective Shielding**
Jorge Victoria, *Würth Elektronik eiSos GmbH*, Waldenburg, Germany
- 3. Shielding in Wireless Power Applications**
Jorge Victoria, *Würth Elektronik eiSos GmbH*, Waldenburg, Germany
- 4. New challenges and techniques in EMC Shielding**
Peter Reiser, *Visteon Electronics Germany GmbH*, Karlsruhe, Germany

SHIELDING MEASUREMENTS: FROM LF TO MICROWAVE

SS2 | Special Session | 1400 - 1605
Seminarraum 1

CHAIRS: Johan Catrysse¹ and Davy Pissoot¹, (1) Technology Campus Ostend, KU Leuven, Ostende, Belgium

1400 | ID 5072

Modelling the Micro-structure of Non-uniform Conductive Nonwoven Fabrics: Determination of Sheet Resistance

Andrew Austin¹, John Dawson¹, Ian Flintoft¹, Andrew Marvin², (1) University of York, York, United Kingdom, (2) York EMC Services, York, United Kingdom

1425 | ID 5348

Towards a Stripline Setup to Characterise the Effects of Corrosion and Ageing on the Shielding Effectiveness of EMI Gaskets

Davy Pissoot¹, Tim Claeys¹, Filip Vanhee¹, Johan Catrysse¹, Christian Brull², Bart Boesman¹, (1) Technology Campus Ostend, KU Leuven, Ostend, Belgium, (2) Schlegel Electronic Materials, Leffinge, Belgium

1450 | ID 5189

Differences Between NSA 94-106 and IEEE 299 LF Magnetic Shielding Measurements

Johan Catrysse¹, Davy Pissoot¹, Filip Vanhee¹, Salvatore Celozzi², (1) Technology Campus Ostend, KU Leuven, Ostend, Belgium, (2) Department of Astronautical, Electrical, and Energetic Engineering, Electrical Division, Sapienza University of Rome, Roma, Italy

1515 | ID 5193

Shielding Effectiveness of Anisotropic Materials: How to Measure?

Johan Catrysse¹, Davy Pissoot¹, Filip Vanhee¹, Tim Claeys¹, Andy Degraeve², (1) Technology Campus Ostend, KU Leuven, Ostend, Belgium, (2) KULEuven, T-echnologie campus Ostende, Ostende, Belgium

1540 | ID 5518

Shielding Effectiveness Measurements of Materials and Enclosures using a Dual Vibrating Intrinsic Reverberation Chamber

Hans Schipper¹ and Frank Leferink^{1,2}, (1) Thales Nederland B.V., Hengelo, Netherlands, (2) University of Twente, Enschede, Netherlands

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COMPUTATIONAL ELECTROMAGNETICS AND MULTIPHYSICS METHODS FOR CHARACTERIZING COMPLEX EMC/EMI EFFECTS

WS8 | Workshop | 1400 - 1730
Konferenzraum 2

CO-CHAIRS: Wen-Yan Yin, Zhejiang University, Hangzhou, China; Christian Schuster, Technische Universität Hamburg-Harburg, Germany

Numerical modeling for EMC/EMI problems remains a challenging task even with nowadays computational resources and off-the-shelf software tools. This workshop hosts a series of speakers that have made recent contributions to the field of computational electromagnetics and multiphysics methods applied to problems relevant to the EMC community. The presentations will give both a review of the state of the art in the respective fields and show recent progress. Topics that will be addressed include general computational electromagnetic and multiphysics methods, numerical efficiency, numerical accuracy, handling of complex problems, validation of simulation results, proper choice of methods, and application of numerical methods to EMC/EMI problems. The workshop is intended both for researchers active in numerical modeling and practitioners from the EMC community that want to learn about novel methods.

- 1. Finite-Difference Based Time-Domain Modeling for EMC/EMI Applications**
Zhizhang Chen, *Dalhousie University*, Halifax, Nova Scotia, Canada
- 2. High Performance Computing Method for Fast Simulating Complex Electromagnetic Environment Effects**
Zhou Haijing, *Institute of Applied Physics and Computational Mathematics*, Beijing, China
- 3. From Computational Electromagnetics to Multiphysics Methods for Characterizing High-power EMC/EMI Effects**
Wen-Yan Yin, *Zhejiang University*, Hangzhou, China
- 4. Solving Highly Resonant Structures Using a Fast Direct H Matrix Solver in the Method of Moments**
Alexander Vogt, *Technische Universität Hamburg-Harburg*, Germany
- 5. Using the Contour Integral Method for Solving Large EMC Problems on Printed Circuit Boards**
Christian Schuster, *Technische Universität Hamburg-Harburg*, Germany
- 6. Recent Advancements in Partial Element Equivalent Circuit (PEEC) Modeling**
Giulio Antonini, *University of L'Aquila*, Italy

POWER DISTRIBUTION DESIGN ON PCBS FOR EFFECTIVE EMI CONTROL

WS9 | Tutorial | 1400 - 1730
Konferenzraum 3
SPONSORED BY EMC SOCIETY TC 10

CO-CHAIRS: Bruce Archambeault, *Missouri University of Science & Technology*, Archambeault EMI Enterprises, Four Oaks, NC, USA; James Drewniak, *Missouri University of Science & Technology*, Rolla, MO, USA

This tutorial will focus on good Power Distribution Network (PDN) design to control EMI on Printed Circuit Boards (PCBs). Topics include how to develop realistic target impedance for the PDN, pre-layout and post layout analysis, as well as a number of case studies to show the best design approaches to minimize EMI noise between the power/ground-reference planes. Decoupling capacitor placement, relative positions of the capacitors, and capacitance values will all be considered for the optimum design. Understanding the limitations of the capacitors due to connection inductance, position, and power plane depth in the PCB stack up are vital to the overall optimization of the EMI performance of the PDN.

- 1. Power Integrity by Design using Physics-Based Models – Multilayer PCBs**
James Drewniak, *Missouri University of Science & Technology*, Rolla, MO, USA
- 2. Target Impedance and Transient Voltage Ripple Estimation**
Jun Fan, *Missouri University of Science & Technology*, Rolla, MO, USA
- 3. The Effect of Power Plane Depth in the PCB Stackup and Dielectric Thickness on PDN Performance**
Sam Connor, *IBM*, Research Triangle Park, NC, USA
- 4. PCB Effects for Power Integrity**
Bruce Archambeault, PhD, *Missouri University of Science & Technology*, Archambeault EMI Enterprises, Four Oaks, NC, USA

CALIBRATION OF EMC TEST FACILITIES AND MEASUREMENT INSTRUMENTATION

WS10 | Tutorial | 1400 - 1730
Konferenzraum 4

CHAIR: Doug Kramer, *ETS-Lindgren*, Cedar Park, TX, USA
CO-CHAIR: Thomas Kleine-Ostmann, *Physikalisch-Technische Bundesanstalt*, Braunschweig, Germany

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.

All new material will be presented, representing activity within the related standards committees, including CISPR, ISO, ANSI ASC 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; 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. Clarification will be provided about distinguishing LISNs and AMNs separately, since many engineers and technicians use these terms interchangeably. 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.

1. **Calibration of Field Probes for EMC Measurements**
Thomas Kleine-Ostmann, *Physikalisch-Technische Bundesanstalt*, Braunschweig, Germany
2. **Introduction to Calibration Methods: Calibration of LISNs and Current Probes for EMC Testing**
Doug Kramer, *ETS-Lindgren*, Cedar Park, TX, USA

3. **Electromagnetic Field Probe Calibrations and Antenna Efficiency Measurements Utilizing Reverberation Chambers**
Dennis Lewis, *The Boeing Company*, Seattle, WA, USA
4. **Time Domain sVSWR method for EMC radiated emission test sites > 1 GHz**
Zhong Chen, *ETS-Lindgren*, Cedar Park, Texas, USA
5. **An Overview of EMI Compliance Receiver Calibration**
Mark Terrien, *Keysight Technologies*, Santa Rosa, CA, USA
6. **Is Traceable Calibration of EMC Pulse Generators Possible?**
Anders Bergman, *SP Technical Research Institute of Sweden*, Borås, Sweden
7. **Antenna Calibration and Site Validation for Radiated Emissions Above 1GHz (CISPR 16-1-4, 16-1-5, 16-1-6)**
Martin Wiles, *ETS-Lindgren*, Stevenage, England, UK

**EMC 2015**

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MONDAY, 17 AUGUST

COST IC 1407 "ACCREDIT" WORKSHOP: EMI CHALLENGES IN FUTURE COMPLEX MULTI-FUNCTIONAL (DIGITAL) SYSTEMS

WS11 | Tutorial | 1400 - 1730**Konferenzraum 5****SPONSORED BY COST IC 1407**

CHAIR: Dave Thomas, *The University of Nottingham, Nottingham, UK*

The growth of Internet-enabled smart infrastructures underpinning virtually every sector of economic and social life requires complex, high performance and highly integrated miniature electronic systems. The electromagnetic interference will increase with the anticipated increase of clock speeds, frequency of operation and circuit density. Immunity levels will also decrease due to lower supply voltages and lower signal power levels. Traditionally, the potential EMI sources were assessed in the frequency domain assuming static emissions. This is not valid for multifunctional devices with many operating modes. New approaches that fully account for time dependence and uncertainty are needed.

The tutorial will present some state-of-the-art, unconventional methods and instruments in the realm of EMI prediction and assessment and will speculate on the challenges lying ahead and the feasible manners to approach them.

- 1. The Characterisation and Propagation of Stochastic Fields from Printed Circuit Boards**
D. Thomas, *The University of Nottingham, UK*
- 2. Multipole-Based Macro-Models for EMC and EMI System Analysis**
Bart Boesman, *KU Leuven, Belgium* A.T. de Hoop, I.E. Lager, *Delft University of Technology, The Netherlands*
- 3. Parametric Identification of Stochastic EMI Sources Based on Near-Field Measurements**
Y. Kuznetsov, A. Baev, and A. Gorbunova, *Moscow Aviation Institute, Russia*
- 4. Challenges in Near Field Scanning Real World Electronic Modules**
A.P. Mynster, *DELTA – Danish electronics, lights and acoustics, Denmark*

SMART GRID EMC UPDATE

WS12 | Tutorial | 1400 - 1730**Konferenzraum 6****SPONSORED BY SC1**

CHAIR: Donald N. Heirman, *Don HEIRMAN Consultants, Lincroft, New Jersey, USA*

Smart Grid EMC is so pervasive that almost all that are involved in devices and systems that are part of the Smart Grid will need to see the bigger picture of the acceptance of EMC considerations. The primary issue involves the immunity of products that are connected to the power grid. This tutorial will provide the status of several Smart Grid key organizations and activities on the need for EMC considerations, especially in the frequency range 2 kHz to 150 kHz. There continues to be a need for strong recommendations that EMC must be considered to ensure the proper operation of SG devices in the electromagnetic environment where they will be installed. The speakers are all involved in EMC aspects of the Smart Grid and are willing to answer questions on their presentations at the end of the presentations.

- 1. NIST Smart Grid, SG Interoperability Panel (SGIP 2.0), and the EM Interoperability Issues Working Group Activities**
Donald N. Heirman, *Don HEIRMAN Consultants, Lincroft, New Jersey, USA*
- 2. Low Frequency EMC Challenges in the Frequency Range 2 kHz to 150 kHz**
Jan Meyer, *Technische Universitaet Dresden, Institute of Electrical Power Systems and High Voltage Engineering, Dresden, Germany*
- 3. Immunity for Power Station and Substation Environments**
William Radasky, *Metatech Corporation, Goleta, CA, USA*

TUESDAY



0900-1000

Opening Session

1020 - 1740

Track A

1020 - 1200	Circuits and Devices
1400 - 1515	Shielding I
1600 - 1740	Shielding II

Track B

1020 - 1135	Low Frequency EMC I
1400 - 1540	Low Frequency EMC II
1600 - 1740	Low Frequency EMC III

Track C

1020 - 1200	EMC for Emerging Wireless Technologies I
1400 - 1540	EMC for Emerging Wireless Technologies II
1600 - 1650	EMC for Emerging Wireless Technologies III

Track D

10:20 - 1135	SC-1 Smart Grid EMC
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Track E

10:20 - 12:00	TC 1 EMC Management
1400 - 1515	TC 3 EMC in Communication Systems
1600 - 1715	TC 3 EM environment

1020 - 1800

Poster Sessions

1400 - 1715

SS-1	EM Information Security and Countermeasures
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1400-1730

WS13	Basic EMC Measurements
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OPENING SESSION

Keynote Session | 0900 - 1000
Konferenzraum 4-6

WE ARE PLEASED TO WELCOME PROF. DR. SIEGFRIED FIEBIG, CEO OF VOLKSWAGEN SACHSEN GMBH.

Prof. Fiebig holds a doctorate in mechanical engineering and is professor of production technology and logistics at Ostfalia University of Applied Sciences in Wolfsburg. Prof. Fiebig began his career with Volkswagen in Wolfsburg in 1978. After holding a number of different positions at the Salzgitter, Emden and Wolfsburg plants, he was appointed head of the logistics planning department at Volkswagen Brand Logistics in 1989, becoming head of logistics at the Volkswagen plant in Emden in 1994, then head of production in 1996 and acting head of the Emden plant in 1997. He was next appointed to the post of technical director and management spokesperson at the Volkswagen plant in Brussels in 1998, and was named head of the Emden plant in 2003. He was placed in charge of site management and became head of Golf production at Wolfsburg in 2007, before taking up the post as plant manager and head of vehicle production in Wolfsburg in 2008.



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- Not an existing IEEE member
- Received a 3-5 year degree from an accredited University
- Full paid up registration at the EMC 2015 Symposium
- MUST be redeemed at the IEEE EMC Society booth located in the Exhibit area
- Only applies to Technical Attendees

5 day registration fee includes a FREE membership in the IEEE and EMC Society from January 1, 2016 - December 31, 2016 for Non-IEEE Members and IEEE members that are presently not EMC Society members. This incentive must be redeemed at the IEEE EMC Society Booth located in the Exhibit Area.



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DEMONSTRATIONS AND EXPERIMENTS

1000-1600
Exhibit Hall

1000 - 1200 | ID H10

Electromagnetic Interactions in Electronic

Architectures: A Tutorial Case on a Mobile System
Jean-Marc Dienot, Labceem-LGP, Univ. P. Sabatier,
Tarbes, France

1000 - 1200 | ID H11

Wireless Power with Magnetic Shielding

Adrià Suárez Zapata, University of Valencia, Valencia, Spain

1000 - 1200 | ID H17

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

Lee Hill, SILENT Solutions, Amherst, USA

1400 - 1600 | ID H8

Transfer Impedance and current

Frits Buesink, University of Twente, Enschede, The Netherlands

1400 - 1600 | ID H9

Detecting and Solving EMC Problems in Large and Complex Industrial Installations

Werner Grommes, Institute for research and testing of the German Social Accident Insurance (IFA), Sankt Augustin, Germany

1400 - 1600 | ID H2

EMC Demo Box

Marcel van Doorn, Philips Innovation Services, Eindhoven, The Netherlands

TRACK A | 1020 - 1740 | Konferenzraum 1

CIRCUITS AND DEVICES

Technical Session | 1020 - 1200

SPONSORED BY TC4

CHAIR: John G. Kraemer, Rockwell Collins, USA

1020 | ID 5130

The Investigation of Frequency Modulation in Voltage-Controlled Oscillator due to Low Frequency Interference from Supply Voltage

Le Zhang, Xiao-Peng Yu and Er-Ping Li, Zhejiang University, Hangzhou, China

1045 | ID 5212

Increased EMI Immunity in CMOS Operational Amplifiers Using an Integrated Common-Mode Cancellation Circuit

Marco Grassi¹, Jean-Michel Redoute², and Anna Richelli¹, (1) University of Brescia, Brescia, Italy, (2) Monash University, Melbourne, Australia

1110 | ID 5315

On the Effectiveness of EMIRR to Qualify OpAmps

Marco Brignone, Franco Fiori, DET, Politecnico di Torino, Torino, Italy

1135 | ID 5653

Prediction of the Robustness of Integrated Circuits Against EFT/BURST

Susanne Bauer, Bernd Deutschmann, Gunter Winkler, Institute of Electronics, Graz University of Technology, Graz, Austria



Photo courtesy of Karthik Vepuri

TRACK A | 1020 – 1740 | Konferenzraum 1

SHIELDING I

Technical Session | 1400 - 1515

SPONSORED BY TC4

CHAIR: Frank Leferink, Netherlands^{1,2}, (1) University of Twente, Enschede, Netherlands, (2) Thales Nederland B.V., Hengelo, Netherlands

1400 | ID 5029

Suppression of End-fired Emission for a Miniaturized-Element Frequency Selective Shielding Surface with Finite Size Using EBG

Yimin Yu¹, Cheng-Nan Chiu², Yih-Ping Chiou¹, Tzong-Lin Wu¹, (1) Graduate Institute of Communication Engineering, National Taiwan University, Taipei, Taiwan, (2) Department of Electrical Engineering, Da-Yeh University, Changhua, Taiwan

1425 | ID 5475

Hole Inductance in Braided Cable Shields

Harmen Schippers¹, Jaco Verpoorte², (1) Avionics Technology, National Aerospace Laboratory, Marknesse, The Netherlands, (2) Marknesse, The Netherlands

1450 | ID 5486

Effect of Gland Quality on the Screening Effectiveness of Cable-Connector Assemblies

Patrick Deschênes¹, Rob Bijman¹, Frank Leferink^{1,2}, (1) Thales Nederland B.V., Hengelo, The Netherlands, (2) University of Twente, Enschede, The Netherlands

SHIELDING II

Technical Session | 1600 - 1740

SPONSORED BY TC4

CHAIR: Frank Leferink^{1,2}, (1) University of Twente, Enschede, Netherlands, (2) Thales Nederland B.V., Hengelo, Netherlands

1600 | ID 5527

External Scattering by Rectangular Cavities with Small Apertures

Jörg Petzold, Enrico Pannicke and Sergey Tkachenko, Otto-von-Guericke University, Magdeburg, Germany

1625 | ID 5552

Measurement of Radio Signal Propagation Through Window Panes and Energy Saving Windows

Per Ångskog^{1,2}, Mats Gösta Bäckström^{1,3}, Bengt Vallhagen³, (1) Dept. of Electromagnetic Engineering, KTH Royal Institute of Technology, Stockholm, Sweden, (2) Department of Electronics, Mathematics and Natural Sciences, University of Gävle, Gävle, Sweden, (3) Saab Aeronautics, Linköping, Sweden

1650 | ID 5581

A Study on Transmission Characteristics and Shielding Effectiveness of Shielded-Flexible Flat Cable for Differential-Signaling

Yoshiki Kayano, Akita University, Akita, Japan, Hiroshi Inoue, The Open University of Japan, Akita, Japan

1715 | ID 5744

Characterization of Cable Feedthrough by Measurements in Nested Reverberation Chambers and Comparison with Simple Theory

Jan Carlsson, Kristian Karlsson, Urban Lundgren, Electronics - EMC, SP Technical Research Institute of Sweden, Borås, Sweden



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TRACK B | 1020 – 1740 | Konferenzraum 2

LOW FREQUENCY ELECTROMAGNETIC COMPATIBILITY I

Technical Session | 1020 - 1135
SPONSORED BY TC7

CHAIR: Alexander van Deursen, Eindhoven University of Technology, David Thomas, University of Nottingham

1020 | ID 5439

Efficient Analysis and Reduction of Magnetic Near-Field-Coupling in Mixed Signal PCBs via the Reciprocity Principle

Andreas Mantzke¹, Marco Leone¹, and Thomas Fischer²,
(1) Theoretical Electrical Engineering, Otto-von-Guericke University of Magdeburg, Magdeburg, Germany, (2) Sivantos GmbH, Erlangen, Germany

1045 | ID 5655

Effects of Single Tone RF Interferences on Chopped Operational Amplifiers

Andrea Lavarda and Bernd Deutschmann, Institute of Electronics, Graz University of Technology, Graz, Austria

1110 | ID 5823

Benefits Of Multiphase Buck Converters In Reducing EME (Electromagnetic Emissions)

Guillaume Aulagnier¹, Kamel Abouda¹, Marc Cousineau², Eric Rolland¹, and Thierry Meynard², (1) Freescale Semiconductor, Toulouse, France, (2) University of Toulouse, LAPLACE Laboratory, Toulouse, France

LOW FREQUENCY ELECTROMAGNETIC COMPATIBILITY II

Technical Session | 1400 – 1540
SPONSORED BY TC 7

CHAIR: Alexander van Deursen, Eindhoven University of Technology, David Thomas, University of Nottingham

1400 | ID 5166

Filter for the Measurement of Supraharmonics in Public Low Voltage Networks

Matthias Klatt¹, Jan Meyer¹, Robert Wolf², Peter Schegner¹, and Bernhard Wittenberg³, (1) Institute of Electrical Power Systems and High Voltage Engineering, Technische Universität Dresden, Dresden, Germany, (2) Institute of Circuits and Systems, Technische Universität Dresden, Dresden, Germany, (3) Technology Innovation, Netze BW GmbH, Stuttgart, Germany

1425 | ID 5330

BEST SYMPOSIUM PAPER FINALIST 

Transfer Characteristic of a MV/LV Transformer in the Frequency Range Between 2 kHz and 150 kHz

Stefan Schöttke, Stephan Rademacher, Jan Meyer and Peter Schegner, Institute of Electrical Power Systems and High Voltage Engineering, Technische Universität Dresden, Dresden, Germany

1450 | ID 5617

Contributing Factors in the Final Performance of a Common Mode Choke

Anne Roc'h¹, Frank Leferink^{2,3}, (1) Electrical Engineering Faculty - Electromagnetics, Eindhoven University of Technology, Eindhoven, Netherlands (2) University of Twente, Enschede, Netherlands, (3) Thales Nederland B.V., Hengelo, Netherlands

1515 | ID 5641

Power System Series Resonance Studies by Modified Admittance Scan

Felix Kalunta, Frank Okafor, Osita Omeje, Electrical/Electronic Engineering Department, University of Lagos, Lagos, Nigeria.

TRACK B | 1020 – 1740 | Konferenzraum 2

LOW FREQUENCY ELECTROMAGNETIC COMPATIBILITY III

Technical Session | 1600 – 1740
SPONSORED BY TC7

CHAIR: Alexander van Deursen, Eindhoven University of Technology, David Thomas, University of Nottingham

1600 | ID 5192

EMI Modeling of Switching Circuits via Augmented Equivalents and Measured Data

Riccardo Trinchero¹, Igor Stievano¹, and Flavio Canavero²,
(1) DET, Politecnico di Torino, Torino, Italy, (2) Department of Electronics and Telecommunications, Politecnico di Torino, Torino, Italy

1625 | ID 5283

Prediction of the Conducted Emission Generated by the Electrified Railway Traction System

Kelin Jia and David Ribbenfjard, Bombardier Transportation Sweden AB, Västerås, Sweden

1650 | ID 5666

On Harmonic Source Identification In Power Distribution Network With Multiple Non-Linear Load

Osita Omeje, Frank Okafor and Felix Kalunta, Electrical/Electronic Department, University of Lagos, Lagos, Nigeria

1715 | ID 5738

DWT Analysis of High Order Harmonics Influence over Distorted Regimes with Fast Variable Loads

Ileana-Diana Nicolae¹, Petre-Marian Nicolae², and Ionut-Daniel Smarandescu², (1) Computer Science and Information Technology, University of Craiova, Craiova / Dolj County, Romania; (2) Electrical Engineering, Energetics, and Aeronautics, University of Craiova, Craiova / Dolj County, Romania

TRACK C | 1020 – 1740 | Konferenzraum 3

EMC FOR EMERGING WIRELESS TECHNOLOGIES I

Technical Session | 1020 - 1200
SPONSORED BY SC4

CHAIR: Robert Keibel, Airbus, Germany

1020 | ID 5142

Interference Test Method for Low-Power Wireless Sensor Networks

Ramiro Serra¹, Majid Nabi¹, (1) Eindhoven University of Technology, Eindhoven, The Netherlands

1045 | ID 5277

Measurement Validation for Radio-Frequency Interference Estimation by Reciprocity Theorem

Liang Li¹, Jingnan Pan¹, Chulsoon Hwang², Gyuyeong Cho², Hark Byeong Park², Yaojiang Zhang¹, and Jun Fan¹,
(1) EMC Laboratory, Missouri University of Science and Technology, Rolla, MO, USA (2) Samsung Electronics, Suwon, South Korea

1110 | ID 5516

Performance Estimation of DSSS Wireless Systems in Impulsive Interference

Sara Örn Tengstrand and Peter Stenumgaard, Robust Telecommunications, Swedish Defence Research Agency, Linköping, Sweden

1135 | ID 5553

Interference Impact on LTE from Radiated Emission Limits

Peter Stenumgaard¹, Kia Wiklundh², and Karina Fors¹,
(1) Robust Telecommunications, Swedish Defence Research Agency, Linköping, Sweden, (2) Robust telecommunications, Swedish Defence Research Agency, Linköping, Sweden



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TRACK C | 0820 – 1740 | Konferenzraum 3

EMC FOR EMERGING WIRELESS TECHNOLOGIES II

Technical Session | 1400 – 1540
SPONSORED BY SC4

CHAIR: Jun Fan, Missouri Institute of Science and Technology, USA

1400 | ID 5576

Using the Amplitude Variation of a Reverberation Chamber Channel to Predict the Synchronization of a Wireless Digital Communication Test System

Ray Tanuhardja¹, Luis Gonzalez², Chih-Ming Wang³, William Young⁴, Kate Remley⁵, John Ladbury⁶, (1)Telecommunication Engineering Group, University of Twente, Enschede, The Netherlands, (2)University of Colorado, Boulder, CO, USA, (3)Statistical Engineering Division, National Institute of Standards and Technology, Boulder, CO, USA, (4)Communications Technology Lab, National Institute of Standards and Technology, Boulder, CO, USA, (5)Electromagnetics Division, National Institute of Standards and Technology, Boulder, CO, USA, (6)RF Fields, National Institute of Standards and Technology, Boulder, CO

1425 | ID 5599

Impact of Different Interference Types on an LTE Communication Link using Conducted Measurements

Peter Ankarson¹, Jan Carlsson¹, Björn Bergqvist², Stefan Larsson³, and Markel Bertilsson¹, (1)Electronics - EMC, SP Technical Research Institute of Sweden, Borås, Sweden, (2)EMC, Volvo Car Corporation, Gothenburg, Sweden, (3)Hardware & Framework Verification, EMC, Volvo Group Trucks Technology, Gothenburg, Sweden

1450 | ID 5629

The Risk of Coexistence Problems Between DAB and DVB-T2 and Military Services at the 225-240 MHz Band

Kia Wiklundh¹, Karina Fors¹, and Peter Holm², (1)Robust Telecommunications, Swedish Defence Research Agency, Linköping, Sweden, (2)Swedish Defence Research Agency, Linköping, Sweden

1515 | ID 5634

Mitigation of Co-Channel Interference by Transmit Power Control

Patrik Eliardsson, Kia Wiklundh, Erik Axell and Peter Stenumgaard, Robust Telecommunications, Swedish Defence Research Agency, Linköping, Sweden

EMC FOR EMERGING WIRELESS TECHNOLOGIES III

Technical Session | 1600 – 1650
SPONSORED BY SC4

CHAIR: Jun Fan, Missouri Institute of Science and Technology

1600 | ID 5704

A Numerical Dosimetry Study of a wearable RFID Reader Antenna for Navy Personnel Localization

Tommaso Campi¹, Silvano Cruciani¹, Valerio De Santis², Stefano Di Francesco¹, Emidio Di Giampaolo¹, Ramona Di Pompeo¹, Mauro Feliziani¹, and Piero Tognolatti¹, (1)Dept. of Industrial and Information, Engineering and Economics, University of L'Aquila, L'Aquila, Italy, (2)Nagoya Institute of Technology, Nagoya, Japan

1625 | ID 5660

Electromagnetic Environment Mapping for the Assessment of Critical Wireless Services in ISM Bands

Patrik Eliardsson, Björn Gabrielsson, Mikael Alexandersson, Karina Fors and Peter Stenumgaard, Robust Telecommunications, Swedish Defence Research Agency, Linköping, Sweden

TRACK D | 0820 – 1740 | Konferenzraum 4

SMART GRID EMC

Technical Session | 1020 - 1135
SPONSORED BY SC1

CHAIR: Donald Heirman, Don HEIRMAN Consultants,
Lincroft, New Jersey USA

1020 | ID 5141 BEST SYMPOSIUM PAPER FINALIST 
**Impact of Rogowski Sensors on the EMC Performance of
MV Power Substations**

Christian Suttner¹, Stefan Tenbohlen¹, and Werner
Ebbinghaus², (1)Institute of Power Transmission and High
Voltage Technology, University of Stuttgart, Stuttgart,
Germany, (2)ABB AG, Ratingen, Germany

1045 | ID 5242
**Electromagnetic Time Reversal Applied to Fault
Detection: the Issue of Losses**

Gaspard Lugrin¹, Reza Razzaghi², Farhad Rachidi¹, Mario
Paolone³, (1)Electromagnetic Compatibility Laboratory,
The Swiss Federal Institute of Technology (EPFL), Lausanne,
Switzerland, (2) DESL, Swiss Federal Institute of Technology
(EPFL), Lausanne, Switzerland, (3)Electrical Engineering, Swiss
Federal Institute of Technology (EPFL), Lausanne, Switzerland

1110 | ID 5628
**Predicting Conducted Emissions of Multiple VSCs
Using Dimension Reduction Technique**

Preye Ivry¹, Oluwabukola Oke¹, Dave Thomas², and Mark
Sumner¹, (1)Department of Electrical and Electronics
Engineering, University of Nottingham, Nottingham,
United Kingdom, (2)Electrical Systems and Optics,
University of Nottingham, Nottingham, United Kingdom

TRACK E | 0820 – 1740 | Konferenzraum 5

EMC MANAGEMENT

Technical Session | 1020 - 1200
SPONSORED BY TC1

CHAIR: Friedrich-Wilhelm Trautnitz, Albatross Projects
GmbH, Germany

1020 | ID 5118
**A Novel Characterization Method for Cable
Ferrites Using a TEM-Waveguide Test Setup**

Moawia Al-Hamid¹, Marco Leone¹, Steffen Schulze², (1)
Theoretical Electrical Engineering, Otto-von-Guericke
University of Magdeburg, Magdeburg, Germany (2)
Wurth Elektronik eiSos GmbH & Co. KG, Waldenburg,
Germany

1045 | ID 5235
**Electromagnetic Compatibility Levels in Power
Plants and Substations**

Urban Metod Peterlin and Tomaz Zivic, Milan Vidmar
Electric Power Research Institute, Ljubljana, Slovenia

1110 | ID 5412
Tested Once, Forever Right?

Kai Borgeest, Aschaffenburg University of Applied Science,
Aschaffenburg, Germany

1135 | ID 5682
**On the Need of Certification in Computational
Electromagnetics based Engineering Services**

Sebastian Lange¹, Frank Sabath², and Martin
Schaarschmidt¹, (1)Scientific Computing, Bundeswehr
Research Institute for Protective Technologies and NBC
Protection, Munster, Germany, (2)Electromagnetic Effects
and HPEM, Bundeswehr Research Institute for Protective
Technologies and NBC Protection, Munster, Germany



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TRACK E | 0820 – 1740 | Konferenzraum 5

EMC IN COMMUNICATION SYSTEMS

Technical Session | 1400 – 1515

SPONSORED BY TC3

CHAIR: Pierre Degauque, Université de Lille/IEMN, Villeneuve d'Ascq, France, and Randy J. Jost, Ball Aerospace and Technologies Inc., USA

1400 PM | ID 5742

Influence of Modern Broadband Inhouse PLC Transmission on Short-Wave Reception

S. Battermann¹, and H. Garbe², (1) University of Applied Sciences Bielefeld, Minden, Germany, (2) Leibniz Univ., Hannover, Germany

1425 | ID 4924

A Novel Method for the Evaluation of Polarization and Hemisphere Coverage of HF Radio Noise Measurement Antennas

B. A. Witvliet^{1, 2}, E. Van Maanen², M. J. Bantum⁽¹⁾, C. H. Slump⁽¹⁾, and R. Schiphorst⁽¹⁾, (1) University of Twente, Enschede, The Netherlands, (2) Radiocommunications Agency Netherlands, Groningen, Netherlands

1450 | ID 5573

Determination of Radiated Emissions of an Electrically Large EUT: Simulation and Experiment

X. Wang and R. Vick, Otto-von-Guericke-University, Magdeburg, Germany

EM ENVIRONMENT

Technical Session | 1600 – 1715

SPONSORED BY TC3

CHAIR: Pierre Degauque, Université de Lille/IEMN, Villeneuve d'Ascq, France, and Randy J. Jost, Ball Aerospace and Technologies Inc., USA

1600 | ID 5763

Health Protection Reference Levels for Voltages and Currents in Typical Domestic Electrical Installations

L. Nuño, Polytechnic Univ. of Valencia, Valencia, Spain

1625 | ID 5579

Increasing Electromagnetic Compatibility of Contactless Inductive Flow Tomography

T. Wondrak¹, M. Ratajczak¹, T. Gundrum¹, F. Stefani¹, H. G. Krauthäuser², and R. T. Jacobs², (1) Magnetohydrodynamics, Helmholtz-Zentrum, Dresden, Germany, (2) Technical Univ. Dresden, Germany

1650 | ID 5644

BEST SYMPOSIUM PAPER FINALIST



Shielding Effectiveness of Screened Rooms with Line Feed-Throughs: A Semi-Analytical Approach

H. Karcoon¹, S. Parr¹, S. Dickmann¹, and R. Rambousky², (1), Helmut Schmidt Univ. / Univ. of the Federal Armed Forces, Hamburg, Germany, (2) Bundeswehr Research Institute for Protective Technologies, Munster, Germany

EM INFORMATION SECURITY AND COUNTERMEASURES

SS1 | Special Session | 1400 - 1715

CHAIRS: Yuichi Hayashi¹ and William Radasky², (1) Tohoku University, Sendai, Japan, (2) Metatech Corporation, Goleta, California, USA

1400 | ID 5261

Comparison of Electromagnetic Side-Channel Energy Available to the Attacker from Different Computer Systems

R. Callan, N. Popovic, A. Daruna, E. Pollman, A. Zajic, and M. Prvulovic, Georgia Tech, Atlanta, Georgia, USA

1425 | ID 5522

Security Simulation against Side-Channel Attack on Advanced Encryption Standard Circuit Based on Equivalent Circuit Model

K. Iokibe¹, T. Watanabe², and Y. Toyota¹, (1) Okayama University, Okayama, Japan, (2) Industrial Technology Center of Okayama Prefecture, Okayama, Japan

1450 | ID 5218

Advanced Fault Analysis Techniques on AES

K. Sakiyama, T. Machida, and A. Matsubara, The University of ElectroCommunications, Tokyo, Japan

1515 | ID 4969

Method for Estimating Fault Injection Time on Cryptographic Devices from EM Leakage

K. Nakamura, Y. Hayashi, N. Homma, T. Mizuki, and T. Aoki, Tohoku University, Sendai, Japan

1600 | ID 5211  BEST SYMPOSIUM PAPER FINALIST

Detection Method for Overclocking by Intentional Electromagnetic Interference

A. Nagao¹, Y. Okugawa¹, K. Takaya¹, Y. Hayashi², N. Homma², and T. Aoki², (1) NTT Energy and Environment Systems Laboratories, Musashino-shi, Japan, (2) Tohoku University, Sendai, Japan

1625 | ID 5769

Electromagnetic Circuit Fingerprints for Hardware Trojan Detection

J. Balasch, B. Gierlichs, and I. Verbauwhede, KU Leuven, ESAT/COSIC, Leuven, Belgium

1650 | ID 5378

Proactive and Reactive Protection Circuit Techniques Against EM Leakage and Injection

N. Miura, D. Fujimoto, and M. Nagata, Kobe University, Kobe, Japan

BASIC EMC MEASUREMENTS

WS13 | Tutorial | 1400 - 1730

Seminarraum 1

SPONSORED BY TC2

CHAIR: Donald N. Heirman, *Don HEIRMAN Consultants*, Lincroft, New Jersey

This tutorial will provide information on aspects beyond the test procedure needed in performing EMC tests by competent test labs. Included will be a discussion on the application of measurement uncertainty, measurement instrumentation and its calibration, and what constitutes an acceptable test laboratory. In addition, the standards processes for both the IEEE and the International Electrotechnical Commission (IEC) will be discussed followed by a review of selected IEEE EMC Society measurement standards needing participation to complete. Where appropriate, attendees will be asked questions as to what they learned and have an opportunity for extended questioning of the speakers' subjects at the end of the session.

1. **IEEE EMC Society and the International Electrotechnical Commission (IEC) Standardization Processes**
Donald N. Heirman, *Don HEIRMAN Consultants*, Lincroft, New Jersey, USA; Alistair Duffy, *De Montfort University*, England
2. **Measurement instrumentation and calibration (CISPR Measuring Receiver)**
Jens Medler, *Rohde & Schwarz*, Munich, Germany
3. **Tips on Selecting a Test Lab**
Dan Hoolihan, *Hoolihan EMC Consulting*, Lindstrom, Minnesota, USA
4. **Measurement Uncertainty--CISPR 16-4-2**
Manfred Stecher, *Rohde & Schwarz*, retired, Munsing/Ammerland, Germany

**EMC 2015**

DRESDEN, AUGUST 16-22

Technical Program

WEDNESDAY, 19 AUGUST

WEDNESDAY



0820 - 1740

Track F

0820 - 1000	System EMC Prediction I
1020 - 1135	System EMC Prediction II
1400 - 1540	Filters and Conducted Coupling I
1600 - 1740	Filters and Conducted Coupling II

Track G

0820 - 1000	Reverberation Testing I
1020 - 1200	Reverberation Testing II
1400 - 1540	Emission Measurements I
1600 - 1715	Emission Measurements II

Track H

0820 - 1000	Advanced Models and Time Domain Methods I
1020 - 1200	Advanced Models and Time Domain Methods II
1400 - 1515	Modelling Applications, including Reverberation Chambers I
1600 - 1740	Modelling Applications, including Reverberation Chambers II

Track I

0820 - 1000	Signal and Power Integrity I
1020 - 1200	Signal and Power Integrity II
1400 - 1540	Signal and Power Integrity III
1600 - 1715	Signal and Power Integrity IV

Automotive Track

0820 - 1000	Hybrid and Electrical Vehicles
1020 - 1200	Electrical Powertrain
1400 - 1515	Electrical Power Supply
1600 - 1740	Analysis Automotive Systems

0830 - 1200

WS14 Unmanned Aircraft Systems –
EMC and Applications

1020 – 1800

Poster Sessions

1400 - 1730

WS15 EMC Issues Related to Power System
Technical Performance

TRACK F | 0820 – 1740 | Konferenzraum 1

SYSTEM EMC PREDICTION I

Technical Session | 0820 – 1000

SPONSORED BY TC4

CHAIR: Todd H. Hubing, Clemson University International
Center for Automotive Research, Greenville, SC, USA

0820 | ID 5220

Systematic Hybrid Modeling Method for Analysis of Electromagnetic Susceptibility in Electronics System

Zaw Zaw Oo¹, Bui Viet Phuong¹, (1) Electronics & Photonics,
Institute of High Performance Computing, Singapore, Singapore

0845 | ID 5299

Investigation on the Propagation and Coupling in Aircraft using Absorbing Films

Rafael Rennó Nunes¹, Jens Schüür², (1) Institute of Flight
Systems, German Aerospace Center (DLR), Braunschweig,
Germany, (2) Institute for Electromagnetic Compatibility, TU
Braunschweig, Braunschweig, Germany

0910 | ID 5437

Numerical and Experimental Evaluation of Electromagnetic Coupling between Radiating Antenna Structures Inside a Computer Casing

Qi Wu, Alexander Vogt Vogt, Heinz-D. Brüns, Frank Gronwald,
Christian Schuster, Institut für Theoretische Elektrotechnik,
Technische Universität Hamburg-Harburg (TUHH),
Hamburg, Germany

0935 | ID 5538

The Controlled Stratification Method to Estimate Extreme Quantiles in the Field of EMC Modeling

Mourad Larbi¹, Philippe Besnier², Bernard Pecqueux³, (1)
Antennas and Microwave devices, Institute of Electronics and
Telecommunications of Rennes, Rennes, France, (2) IETR-
CNRS-Institut National des Sciences Appliquées de Rennes,
Rennes, France, (3) CEA, DAM, GRAMAT, Gramat, France

TRACK F | 0820 – 1740 | Konferenzraum 1

SYSTEM EMC PREDICTION II

Technical Session | 1020 – 1135

SPONSORED BY TC4

CHAIR: Todd H. Hubing, Clemson University International Center for Automotive Research, Greenville, SC, USA

1020 | ID 5543

Use of Frequency Selective Surfaces to Reduce Coupling between Antennas on Satellites

Ibrahim Türer, Space Systems Group, Turkish Aerospace Industries, Inc., Ankara, Turkey

1045 | ID 5817

Vulnerability and Coupling Behaviour of a TETRA Communication System to Electromagnetic Fields

Michael Camp¹, Juergen Schmitz¹, Markus Jung², (1) HPEM / Laser, Rheinmetall Defence, Unterlüß, Germany, (2) Rheinmetall Waffe Munition GmbH, Unterlüß, Germany

1110 | ID 5841

Application of Dipole-moment Model in EMI Estimation

Jingnan Pan¹, Liang Li¹, Xu Gao¹, Chulsoon Hwang², Gyuyeong Cho², Hark ByeongPark², Jun Fan¹, (1) EMC Laboratory, Missouri University of Science and Technology, Rolla, MO, (2) Samsung Electronics, Suwon, South Korea

FILTERS AND CONDUCTED COUPLING I

Technical Session | 1400 – 1540

SPONSORED BY TC4

CHAIR: Davy Pissoot, Technology Campus Ostend, KU Leuven, Ostende, Belgium

1400 | ID 4466

Cross Coupling between Lightning Conductor and Signal Lines within Rotor Blades

Matthias Hampe¹, Olaf Bernd², Michael Przybilla³, Birgit Wieland⁴ (1) Department of Electrical Engineering, EMC, Ostfalia, Wolfenbuettel, Germany, (2) WaveTec Engineering, Zinnowitz, Germany, (3) Rotorcraft, DLR - Institute of Flight Systems, Braunschweig, Germany, (4) Deutsches Zentrum für Luft- und Raumfahrt, Braunschweig, Germany,

1425 | ID 4567

Analysis of PIFA Antenna Coupling in Nearby Traces and Reduction with CSRRs in PCB at 2.45 GHz

Ignacio Gil, Raúl Fernández, Department of Electronic Engineering, Universitat Politècnica de Catalunya, Terrassa, Spain

1450 | ID 4971

Median Filters to Suppress Interference

Bruno Audone, EMC Consultant, Torino, Italy and Michele Borsero, INRIM, Torino, Italy

1515 | ID 5167

Simple and Cost-Effective Method for Improving the High Frequency Performance of Surface-Mount Shunt Capacitors Filters

Joaquin Bernal Mendez¹, Fisica Aplicada III¹, Manuel Freire Rosales², and Sebastian Ramiro³, (1) University of Seville, Seville, Spain, (2)Electronica y Electromagnetismo, University of Seville, Seville, Spain, (3) SkyLife Engineering, La Rinconada, Sevilla, Spain



EMC 2015

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TRACK F | 0820 – 1740 | Konferenzraum 1

FILTERS AND CONDUCTED COUPLING II

Technical Session | 1600 – 1740

SPONSORED BY TC4

CHAIRS: Davy Pissort, Technology Campus Ostend, KU Leuven, Ostende, Belgium

1600 | ID 5224

Mode Conversion and Transfer Characteristics of Conducted Disturbance to Ethernet Device from Power Supply Cable


Tohlu Matsushima¹, Osami Wada¹, Kazuhiro Takaya², Yuichiro Okugawa², (1)KyotoUniversity, Kyoto, Japan, (2)NTT Network Technology Laboratories, Musashino-shi, Japan

1625 | ID 5483

Unexpected Poor Performance of Presumed High Quality Power Line Filter

Niek Moonen¹, Frits Buesink¹, Frank Leferink^{1,2}, (1) University of Twente, Enschede, The Netherlands, (2) Thales Nederland B.V., Hengelo, The Netherlands

1650 | ID 5556

BEST SYMPOSIUM PAPER FINALIST 

Subminiature Common Mode Filter with Integrated ESD Protection

Tomas Hurtig, Leif Adelöw, Mose Akyuz, Mattias Elfsberg, Jens Werner¹, Jennifer Schütt², Guido Notermans², (1)Jade University of Applied Science, Wilhelmshaven, Germany, (2) NXP Semiconductors Germany GmbH, Hamburg, Germany

1715 | ID 5675

Extremity Crosstalk Protection Analysis on Twisted Cables

Charles Jullien, Jérôme Genoulaz and Michel Dunand, R&D, LABINAL POWER SYSTEMS, BLAGNAC, France

TRACK G | 0820 – 1740 | Konferenzraum 2

REVERBERATION TESTING I

Technical Session | 0820 – 1000

SPONSORED BY TC2

CHAIR: John Dawson, University of York, York, United Kingdom

0820 | ID 4464

BEST STUDENT PAPER FINALIST 

An Evaluation of the Independent Stirrer Positions in the Dresden Reverberation Chambers based on Field Homogeneity within a Defined Test Volume

Stephan Pfennig, Chair of Electromagnetic Theory and Compatibility, Technical University Dresden, Dresden, Germany

0845 | ID 4992

Analysis of a Simultaneously Clockwise and Counterclockwise Rotated Mode Stirrer in a Reverberation Chamber

Michael Gruber, Thomas Dengler, Alexander Knaak, Josef Knapp and Thomas Eibert, Lehrstuhl für Hochfrequenztechnik, Technische Universität München, Munich, Germany

0910 | ID 4967

On Measurement of Reverberation Chamber time Constant and Related Curve Fitting Techniques

Xiaotian Zhang, Martin Robinson, Ian Flintoft, Department of Electronics, University of York, York, United Kingdom

0935 | ID 5326

Vectorial Channel Sounding in a Reverberation Chamber – Measuring Dynamic Behaviour

Georg Zimmer¹, Robert Geise¹, Björn Neubauer¹, Jens Schüür², Achim Enders¹, (1)Institute for Electromagnetic Compatibility, University of Braunschweig, Braunschweig, Germany, (2) Institute for Electromagnetic Compatibility, TU Braunschweig, Braunschweig, Germany

TRACK G | 0820 – 1740 | Konferenzraum 2

REVERBERATION TESTING II

Technical Session | 1020 – 1200
SPONSORED BY TC2

CHAIR: Martin Robinson, University of York, York, United Kingdom

1020 | ID 5324

Quantitative Evaluation for Radio-frequency Effects of Electro-explosive Device

Juan Ye, Guilan Li and Longfei Zhao, Beijing Institute of Radio Metrology and Measurement, Beijing, China

1045 | ID 5344

Effect of Absorber Number and Positioning on the Power Delay Profile of a Reverberation Chamber

Luca Bastianelli¹, Luca Giacometti², Valter Mariani Primiani¹, and Franco Moglie¹, (1)Dipartimento di Ingegneria dell'Informazione, Università Politecnica delle Marche, Ancona, Italy, (2)Università Politecnica delle Marche, Ancona, Italy

1110 | ID 5618

An EMC Study on the Interoperability of the European Railway Network

Eva Karadimou and Rob Armstrong, York EMC Services, York, United Kingdom

1135 | ID 5566

Source Stirring Analysis in a Reverberation Chamber Based on Modal Expansion of the Electric Field

Emmanuel Amador, LME, EDF Lab, Moret sur Loing, France and Philippe Besnier, IETR-CNRS-Institut National des Sciences Appliquées de Rennes, Rennes, France

EMISSION MEASUREMENTS I

Technical Session | 1400 – 1540
SPONSORED BY TC2

CHAIR: Ghery Pettit, Pettit EMC Consulting, Olympia, Washington USA

1400 | ID 5371

Erroneous Practices in Measuring Discontinuous Disturbances

Mario Monti, Elettronica Monti, Ponte a Egola, Italy

1425 | ID 5519 **BEST STUDENT PAPER FINALIST** 

Extension of the Emission Measurements for Alternative Test Methods above 1 GHz for Unintentional Electromagnetic Radiators

Benjamin Menßen, David Hamann and Heyno Garbe, Institute of Electrical Engineering and Measurement Technology, Leibniz Universität Hannover, Hannover, Germany

1450 | ID 5717

Localization of Cyclostationary EMI Sources based on Near-Field Measurements

Anastasia Gorbunova, Andrey Baev, Yuri Kuznetsov and Maxim Konovalyuk, Theoretical Radio Engineering Department, Moscow Aviation Institute (National Research University), Moscow, Russia

1515 | ID 5102

Radiated Transient Interferences Measurement Procedure To Evaluate Digital Communication Systems

Marc Pous¹, Ferran Silva¹, Marco A. Azpúrua¹, (1) Universitat Politècnica de Catalunya, Barcelona, Spain; Grup de Compatibilitat Electromagnètica, Barcelona, Spain



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TRACK G | 0820 – 1740 | Konferenzraum 2

EMISSION MEASUREMENTS II

Technical Session | 1600 – 1715

SPONSORED BY TC2

CHAIR: Ghery Pettit, Pettit EMC Consulting, Olympia, Washington USA

1600 | ID 5057

The Time-Domain Performance of the Van Veen Loop

James McLean¹, Robert Sutton¹, Koji Takizawa², Akihiro Sato², Masataka Midori², Yuki Naito², (1)TDK R&D Corp., Cedar Park, TX, (2)TDK R&D Corp., Tokyo, Japan

1625 | ID 5135

Atom-Based Electric Field Measurements: An Initial Investigation of the Measurement Uncertainties

Christopher Holloway, NIST, Boulder, CO

1650 | ID 5476

BEST SYMPOSIUM PAPER FINALIST 

Experience on Proficiency Testing in Italy

Carlo Carobbi¹, Alessio Bonci¹, Marco Cati², Carlo Panconi³, Michele Borsero⁴, Giuseppe Vizio⁴, (1)Department of Information Engineering, Università degli Studi di Firenze, Firenze, Italy, (2)Powersoft S.p.A., Firenze, Italy, (3)Elettroingegneria, Pistoia, Italy, (4)INRIM, Torino, Italy

TRACK H | 0820 – 1740 | Konferenzraum 3

ADVANCED MODELS AND TIME DOMAIN METHODS I

Technical Session | 0820 – 1000

SPONSORED BY TC9

CHAIR: Frank Gronwald, Institut für Theoretische Elektrotechnik, Technische Universität Hamburg-Harburg (TUHH), Hamburg, Germany

0820 | ID 5059

A Heuristic Model for the Transmission Cross Section of Wire-mesh Covered Apertures

Ronny Gunnarsson, Saab Aeronautics, Linköping, Sweden and Mats Gösta Bäckström, Dept. of Electromagnetic Engineering, KTH Royal Institute of Technology, Stockholm, Sweden

0845 | ID 4576

Validation of a Flexible Causality Treatment for Transient Analysis of Nonlinearly Loaded Structures

Cheng Yang^{1,2}, Heinz-D. Brüns², Peiguo Liu¹, and Christian Schuster³, (1)Department of Electronic Science and Technology, National University of Defense Technology, Changsha, China, (2)Institut für Theoretische Elektrotechnik, Technische Universität Hamburg Harburg, Hamburg, Germany, (3)Institut für Theoretische Elektrotechnik, Technische Universität Hamburg-Harburg (TUHH), Hamburg, Germany

0910 | ID 5369

Capacity Extraction in Physical Equivalent Networks

Jan Hansen, AE/EMC3, Robert Bosch GmbH, Reutlingen, Germany and Carsten Potratz, CR/ARE1, Robert Bosch GmbH, Renningen, Germany

0935 | ID 5565

Parametric Interpolation using Physics-based Basis Functions

Alessandro Matteo Francavilla¹, Giorgio Giordanengo¹, Marco Righero¹, Giuseppe Vecchi², and Francesca Vipiana², (1)Antenna and EMC Lab, Istituto Superiore Mario Boella, Torino, Italy, (2)Antenna and EMC Lab, Politecnico di Torino, Torino, Italy

TRACK H | 0820 – 1740 | Konferenzraum 3

**ADVANCED MODELS AND TIME
DOMAIN METHODS II**

Technical Session | 1020 – 1200
SPONSORED BY TC9

CHAIR: Frank Gronwald, Institut für Theoretische Elektrotechnik, Technische Universität Hamburg-Harburg (TUHH), Hamburg, Germany

1020 | ID 5396

FDTD Transient Analysis of Grounding Grids. A Comparison of Two Different Thin Wire Models

Luis G Diaz¹, Céline Miry¹, Christophe Guiffaut², Alain Reineix², and Akiyoshi Tatematsu³, (1)LME, EDF R&D, Moret Sur Loing, France, (2)XLIM Laboratory, Limoges, France, (3) Electric Power Engineering Research Laboratory, Central Research Institute of Electric Power Industry, Yokosuka, Japan

1045 | ID 5458

A Stable Subgridding Finite Difference Time Domain Method on Multi-GPU Cluster

Jan Ritter¹, Magnus Benjes¹, Martin Murso¹, Daniela Wulf¹, and Sebastian Lange², (1)Airbus Defence and Space GmbH, Bremen, Germany, (2)Scientific Computing, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

1110 | ID 5710

Reduced-Order Models of VFETD/FDTD Algorithms for Optimized Nanomaterial EMC Applications Method

Nikolaos Kantartzis¹, Theodoros Zygidis², Christos Antonopoulos¹, and Theodoros Tsiboukis¹, (1)Electrical and Computer Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece, (2)Informatics and Telecommunications Engineering, University of Western Macedonia, Kozani, Greece

1135 | ID 5510

Method for Determining Region Boundaries for Transient Data Comparison using FSV

Gang Zhang¹, Alistair Duffy², Lixin Wang¹, Xiyuan Peng¹, and Bai Jinjun¹, (1)Harbin Institute of Technology, Harbin, China, (2)De Montfort University, Leicester, United Kingdom

**MODELING APPLICATIONS,
INCLUDING REVERBERATION
CHAMBERS I**

Technical Session | 1400 – 1515
SPONSORED BY TC9

CHAIR: Vignesh Rajamani, Oklahoma State University, Stillwater, OK, USA

1400 | ID 4979

Efficient Full-Wave Modeling of Radiative Near-Field Interactions in Semi-Anechoic Conditions

Gert-Jan Stockman, Department of Information Technology, Ghent University, Ghent, Belgium and Dries Vande Ginste, Department of Information Technology, Ghent University, Ghent, Belgium

1425 | ID 5106

Fast and Efficient Near-field to Near-field and Near-field to Far-field Transformation based on the Spherical

Wave Expansion

Bart Boesman¹, Davy Pissoot¹, Georges Gielen², and Guy Vandenbosch³, (1)Technology Campus Ostend, KU Leuven, Ostend, Belgium, (2)Elektrotechniek ESAT-MICAS, KU Leuven, Leuven, Belgium, (3)Electrical Engineering, KU Leuven, Leuven, Belgium

1450 | ID 5307

Finite Element Simulation of the Frequency Dependent Polarization of Biological Cells

Sebastian Böhmelt¹, Fabian Scharf¹, Michael Dudzinski¹, Marco Rozgic¹, Lars-Ole Fichte¹, and Marcus Stiemer², (1)Helmut Schmidt University, Hamburg, Germany, (2)Chair for Theory of Electrical Engineering, Helmut Schmidt University, Hamburg, Germany

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TRACK H | 0820 – 1740 | Konferenzraum 3

MODELING APPLICATIONS, INCLUDING REVERBERATION CHAMBERS II

Technical Session | 1600 – 1740
SPONSORED BY TC9

CHAIR: Vignesh Rajamani, Oklahoma State University, Stillwater, OK, USA

1600 | ID 5317**Experimental Validation of the Statistical Energy Analysis for Coupled Reverberant Rooms**Louis Kovalevsky¹, Robin S. Langley¹, Philippe Besnier², and Jerome Sol³, (1)University of Cambridge, Cambridge, United Kingdom, (2)IETR-CNRS-Institut National des Sciences Appliquées de Rennes, Rennes, France, (3)IETR-Institut National des Sciences Appliquées de Rennes, Rennes, France**1625 | ID 5764****Simulation Based Analysis of Field Correlation and Ergodicity of a Reverberation Chamber**David Sanchez¹, Michael Dudzinski², Marco Rozgic³, Sebastian Böhmelt², Lars-Ole Fichte², Marcus Stierner⁴, Julia Schiffner⁵, and Julia Schiffner⁵, (1)Helmut Schmidt University of the Federal Armed Forces Hamburg, Hamburg, Germany, (2)Helmut Schmidt University, Hamburg, Germany, (3)Department of the Theory of Electrical Engineering, Helmut Schmidt University of the Federal Armed Forces Hamburg, Hamburg, Germany, (4)Chair for Theory of Electrical Engineering, Helmut Schmidt University, Hamburg, Germany, (5)Mathematical Institute, Heinrich Heine University Düsseldorf, Düsseldorf, Germany**1650 | ID 5703****Uncorrelated Frequency Steps in a Reverberation Chamber: a Multivariate Approach**Gabriele Gradoni¹, Luca Bastianelli², Valter Mariani Primiani², and Franco Moglie², (1)School of Mathematical Sciences, The University of Nottingham, Nottingham, United Kingdom, (2)Dipartimento di Ingegneria dell'Informazione, Università Politecnica delle Marche, Ancona, Italy**1715 | ID 5197****A Cavity Green's Function Boundary Element Method for the Modeling of Reverberation Chambers: Validation against Measurements**

Michael Gruber and Thomas Eibert, Lehrstuhl für Hochfrequenztechnik, Technische Universität München, Munich, Germany

TRACK I | 0820 – 1740 | Konferenzraum 4

SIGNAL AND POWER INTEGRITY I

Technical Session | 0820 – 1000
SPONSORED BY TC10

CHAIR: Giulio Antonini, UAq EMC Laboratory, University of L'Aquila

0820 | ID 4841**Through Silicon Via Time Domain Crosstalk Modeling Considering Hysteretic Coupling Capacitance**Antonio Orlandi¹, Francesco de Paulis¹, Stefano Piersanti¹, Dong-Hyun Kim², Jonghyun Cho³, and Joung-ho Kim⁴, (1) Industrial and Information Engineering and Economics, University of L'Aquila, L'Aquila, Italy, (2)KAIST, Daejeon, South Korea, (3)KAIST Teralab., Daejeon, South Korea, (4)Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea**0845 | ID 4943****Modelling of Planar EBG Structure by Using Equivalent Circuit Method**Guang-xiao Luo¹, Er-ping Li², Xing-chang Wei², and Cui Xiang¹, (1)North China Electric Power University, Beijing, China, (2) Zhejiang University, Hangzhou, China**0910 | ID 5753****Predictive Method for Efficient Transmission Lines and Multilayered Power/Ground Planes Co-Modeling Using Multi-Conductor Transmission**Afef Bouchaala^{1,2}, Lionel Courau¹, Philippe Galy¹, Olivier Bonnaud², (1) STMicroelectronics, Crolles, France, (2) IETR UMR 6164, University of Rennes1, Rennes, France**0935 | ID 5295****Development of Electromagnetic Analytical Models for Substrate Noise Propagation in Integrated Circuits**Merc'e Grau Novellas¹, Ramiro Serra¹, Matthias Rose², (1) Eindhoven University of Technology, Department of Electrical Engineering, Eindhoven, The Netherlands, (2) NXP Semiconductors, High Tech Campus 46, Eindhoven, The Netherlands

TRACK I | 0820 – 1740 | Konferenzraum 4

SIGNAL AND POWER INTEGRITY II

Technical Session | 1020 – 1200
SPONSORED BY TC10

CHAIR: Giulio Antonini, UAq EMC Laboratory,
University of L'Aquila

1020 | ID 5445 BEST SYMPOSIUM PAPER FINALIST 

Conformal Equivalent Circuit Model and Leapfrog Alternating Direction Implicit Formulation for Fast Simulation of Power Delivery Network

Tadatoshi Sekine¹, and Hideki Asai², (1) Mechanical Engineering, Shizuoka University, Hamamatsu-shi, Japan, (2) Nanovision Research Division, Research Institute of Electronics, Shizuoka University, Hamamatsu-shi, Japan

1045 | ID 5587

Effective Current Distribution Analysis Method for Multiple-Transmission-Line(MTL) System with Arbitrary Conductor Number Variation

Chi-Hsuan Cheng, and Tzong-Lin Wu, Graduate Institute of Communication Engineering, National Taiwan University, Taipei, Taiwan

1110 | ID 5370 BEST SYMPOSIUM PAPER FINALIST 

Broadband Equivalent-Circuit Model for Non-Uniform Transmission Lines

Andreas Mantzke, Sebastian Südekum, Marco Leone, Otto-von-Guericke University, Magdeburg, Germany

1135 | ID 5229

A Novel Semi-Analytical Solution of Impedance of Grid-Type Power Distribution Network

Han-Qin Ye, Xing-Chang Wei and Er-Ping Li, Zhejiang University, Hangzhou, China

SIGNAL AND POWER INTEGRITY III

Technical Session | 1400 – 1540
SPONSORED BY TC10

CHAIR: Christian Schuster, Technische Universität Hamburg-Harburg (TUHH), Hamburg, Germany

1400 | ID 4581

Using Rectangular-Patches (RPs) to Reduce Far-End Crosstalk Noise and Improve Eye-Diagrams on Microstrip Helix Delay Line

Ding-Bing Lin¹, Chung-Pin Huang¹, Chih-Hao Lin¹, Hsin-Nan Ke², and Wen-Sheng Liu³, (1)Department of Electronic Engineering, National Taipei University of Technology, Taipei, Taiwan, (2)Department of No.1 EMC, R&D Center, PEGATRON Corporation, Taipei, Taiwan, (3)Department of Lab. and C.A.E., WIESON Technologies Co., Ltd., New Taipei, Taiwan

1425 | ID 5042

Generic Prediction of Crosstalk Between Shielded Wires

Jesper Lansink Rotgerink, J.H.G.J., and Harmen Schippers, Avionics Technology, National Aerospace Laboratory, Marknesse, Netherlands

1450 | ID 5071

Mitigating the Threat of Crosstalk and Unwanted Radiation when using Electromagnetic Bandgap Structures to Suppress Common Mode Signal Propagation in PCB Differential Interconnects

Christopher Kodama¹, Christopher O'Daniel¹, Joshua Cook¹, Francesco de Paulis², Michael Cracraft³, Samuel Connor⁴, Antonio Orlandi², and Edward Wheeler¹, (1)Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN, (2)Industrial and Information Engineering and Economics, University of L'Aquila, L'Aquila, Italy, (3)Systems Group, IBM Corporation, Poughkeepsie, NY, (4)Systems Group, IBM Corporation, RTP, NC

1515 | ID 5621

Coupling Study in Smart Power Mixed ICs with a Dedicated On-Chip Sensor

Veljko Tomasevic¹, Sonia Ben Dhia¹, Alexandre Boyer¹, Alexander Steinmair², Bernhard Weiss², Ehrenfried Seebacher², and Peter Rust², (1)ESE, CNRS LAAS, Toulouse, France, (2)ams AG., Oberpremstätten, Austria



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TRACK I | 0820 – 1740 | Konferenzraum 4

SIGNAL AND POWER INTEGRITY IV

Technical Session | 1600 – 1715
SPONSORED BY TC10

CHAIR: Christian Schuster, Technische Universität Hamburg-Harburg (TUHH), Hamburg, Germany

1600 | ID 4536

Measurement of High-Frequency Conductivity Affected by Conductor Surface Roughness Using Dielectric Rod Resonator Method

Toshiki Iwai, Diasuke Mizutani and Motoaki Tani, FUJITSU LABORATORIES LTD., Atsugi, Japan

1625 | ID 5595

A Study of Intensify the Power of Verification for Memory Worst Case Conditions through the SI Analysis

Chang-Ik Lee, Hyundai Mobis, Gyeonggi-Do, South Korea

1650 | ID 5761

Cost Competitive PI-SI Co-design for DDR Interfaces

Kinger Cai and Steven Ji, Intel Corporation, Santa Clara, CA



Photo courtesy of Janet O'Neil

AUTOMOTIVE | 0820 – 1740 | Konferenzraum 5

HYBRID AND ELECTRICAL VEHICLES

Technical Session | 0820 – 1000

CHAIR: Matthias Richter, Westsächsische Hochschule Zwickau, Germany

0820 | ID 4978

A Characterization of EM Coupling in a Fully Electric 4-wheel Drive Vehicle

I. Echeverria, M. Iglesias, F. Arteché, F. J. Piedrafita, Á. Pradas, ITAINNOVA, Zaragoza, Spain, F. J. Arcega, Universidad de Zaragoza, Zaragoza, Spain, J. de Smet, FLANDERS' DRIVE, Lommel, Belgium

0845 | ID 5610

The Effect of Fully Electric Vehicles on the Low Frequency Electromagnetic Environment

R. Armstrong, York EMC Services Heslington, York, United Kingdom, Dr. L. Dawson, University of York, York, United Kingdom, A. Rowell, York EMC Services Heslington, York, United Kingdom, A. Ruddle, MIRA Limited, Nuneaton, United Kingdom, C. A. Marshman, York EMC Services, York, United Kingdom

0910 | ID 5616

Testing of High Voltage Systems installed in Hybrid and Electric Vehicles

U. Reinhardt¹, J. Mooser¹, T. Artz, Mooser¹ (1) EMC Technik GmbH, Ludwigsburg, Germany

0935 | ID 5643

Automotive Industry's EMC Requirements for Voltage Ripple in the High Voltage System of Electrical Vehicles

B. Willmann, T. Rinkleff, M. Obholz, VOLKSWAGEN AG, Wolfsburg, Germany, R. Vick, Otto-von-Guericke-University, Magdeburg, Germany

AUTOMOTIVE | 0820 – 1740 | Konferenzraum 5

ELECTRICAL POWERTRAIN

Technical Session | 1020 – 1200

CHAIR: Matthias Richter, Westsächsische Hochschule Zwickau, Germany

1020 | ID 5173

Transient Simulation of the Low-Frequency and High-Frequency Behavior of Asynchronous Machines in SPICE

M. Krüger, M. Magdowski, R. Vick, T. Schallschmidt, Otto-von-Guericke-University, Magdeburg, Germany, T. Rinkleff, Volkswagen AG, Wolfsburg, Germany

1045 | ID 5182

Understanding Conducted Emissions from an Automotive Inverter Using Common-Mode Model

P. Hillenbrand, University of Stuttgart, Stuttgart, Germany, C. Keller, Robert Bosch GmbH, Stuttgart, Germany, S. Tenbohlen, University of Stuttgart, Stuttgart, Germany, K. Spanos, Robert Bosch GmbH, Stuttgart, Germany

1110 | ID 5205

Inverter Modeling Including Non-ideal IGBT Characteristics in Hybrid Electric Vehicle for Accurate EMI Noise Prediction

H. Shim, H. Kim, Y. Kwack, M. Moon, H. Lee, J. Song, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, B. Kim, E. Kim, Hyundai Kia Motors, Hwaseong, South Korea, J. Kim, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea

1135 | ID 5320

Investigations on the Shaft Currents of an Electric Vehicle Traction System in Dynamic Operation

S. Jeschke, H. Hirsch, S. Tsiapenko, University Duisburg-Essen, Duisburg, Germany

ELECTRICAL POWER SUPPLY

Technical Session | 1400 – 1540

CHAIR: M. P. Klingler, PSA Peugeot Citroën, Vélizy-Villacoublay, France

1400 | ID 5451

Feasibility of Estimating In-service Vehicle Occupant Exposure to Electrical Powertrain Magnetic Fields using Non-local Magnetic Field Measurements

A. Ruddle, MIRA Limited, Nuneaton, United Kingdom

1425 | ID 5466

Latest Development of the National and International EMC Standards for Electrical Vehicles and Their Charging Infrastructure

M. Maarleveld, J. Bärenfänger, EMC Test NRW GmbH, Dortmund, Germany, H. Hirsch, S. Jeschke, L. Wei, M. Trautmann, University of Duisburg-Essen, Duisburg, Germany, J. Heyen, A. Darrat, Volkswagen AG, Wolfsburg, Germany

1450 | ID 5485

High Frequency Impedance of Li-ion Batteries

S. Schoerle, Daimler AG, Böblingen, Germany, E. Hoene, Fraunhofer IZM Berlin, Germany, C. Spieker, University Kassel, Kassel, Germany, T. Doersam, Daimler AG, Böblingen, Germany, T. Waldmann, University Kassel, Kassel, Germany, K.-D. Lang, Fraunhofer IZM, Berlin, Germany

1515 | ID 5678

Optimum Coil Configuration of Wireless Power Transfer System in Presence of Shields

S. Cruciani, T. Campi, University of L'Aquila, L'Aquila, Italy, F. Maradei, Sapienza University, ROME, Italy, M. Feliziani, University of L'Aquila, L'Aquila, Italy



EMC 2015

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Technical Program

WEDNESDAY, 19 AUGUST

AUTOMOTIVE | 0820 – 1740 | Konferenzraum 5

ANALYSIS AUTOMOTIVE SYSTEMS

Technical Session | 1600 – 1740

CHAIR: Ariel Lecca, PSA Peugeot-Citroën, Vélizy-Villacoublay, France

1600 | ID 5187

Influence of Car Body Materials on the Common-Mode Current and Radiated Emissions Induced by Automotive Shielded Cables

M. Vincent, M. P. Klingler, PSA Peugeot Citroën, Vélizy-Villacoublay, France, Z. Riah, Technopôle du Madrillet Avenue Galilée, Saint-Etienne du Rouvray, France

Y. Azzouz, IRSEEM/ESIGELEC, Saint-Etienne du Rouvray, France

1625 | ID 5200

Device for Adjusting Electromagnetic Losses Inside a Reverberation Chamber - Application to Automotive Wireless Environment Simulations

A. B. Hadj Mabrouk, M. P. Klingler, PSA Peugeot Citroën, Vélizy-Villacoublay, France, H. Boulzazen, IRSEEM/ESIGELEC, Saint Etienne du Rouvray, France, M. Heddebaut, IFSTTAR, Villeneuve d'Ascq, France

1650 | ID 5298

Analysis of the Direct Radiation of EC Motors up to 10 MHz

U. Neibig, Robert Bosch GmbH, Stuttgart, Germany

1715 | ID 5834

BEST STUDENT PAPER FINALIST



Immunity of Modulation Schemes in Automotive Low Bitrate Power Line Communication Systems

A. Zeichner, S. Frei, S. A. Hassanpour Razavi, TU Dortmund, Dortmund, Germany

UNMANNED AIRCRAFT SYSTEMS – EMC AND APPLICATIONS

WS14 | Tutorial | 0830 - 1200

Seminarraum 1

SPONSORED BY SC6

CO-CHAIRS: Frank Sabath, Bundeswehr Research Institute for Protective Technologies and NBC-Protection, Munster, Germany; Thorsten Schrader, Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany

This workshop will discuss challenges which are associated with application of unmanned aircraft systems (UAS) in hazardous environment, including EMC aspects, hardening to high-power electromagnetic fields and flight management systems.

UAS are one of the most advancing platforms used for many applications in EMC, industrial inspection, scientific research and measurements, and disaster control and emergency management. With the advent of these systems secure operation of single or multiple flying systems may become an issue. Novel flight management systems, personal safety, EMC requirements and applications will be discussed.

1. WERAN - Interaction of Windturbines with Terrestrial Navigation Systems and Radar

Thorsten Schrader, *Physikalisch-Technische Bundesanstalt (PTB)*, Braunschweig, Germany, Jochen Bredemeyer, *Flight Calibration Services FCS GmbH*, Braunschweig, Germany, Christoph Stupperich, *steep GmbH*, Bonn, Germany, and Heyno Garbe, *Leibniz Universität Hannover*, Hannover, Germany

2. UAV-Based Measurement Platform for Precision Electromagnetic Field Measurements

Thorsten Schrader, Marius Mihalachi, Jan Rohde, Thomas Kleine-Ostmann, *Physikalisch-Technische Bundesanstalt (PTB)*, Braunschweig, Germany

3. Security and Averting of Danger from and for UAVs – Necessity of Robust Flight Management Systems and Sensors

Christian Kaiser, *COPTING GmbH*, Braunschweig, Germany

4. Security Detection and Tracking of Micro Aerial Vehicles (MAVs)

Michael Caris, *Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR*, Wachtberg, Germany

5. Define and Test Electromagnetic Immunity of UAS for First Responders

Christian Adami, Sebastian Chmel, Michael Jöster, Thorsten Pusch, and Michael Suhrke, *Fraunhofer Institute for Technological Trend Analysis (INT)*, Euskirchen, Germany

6. A Brief Introduction on the Susceptibility of UAS Against HPEM Threats

Stefan Potthast, *Bundeswehr Research Institute for Protective Technologies and NBC-Protection (WIS)*, Munster, Germany

DEMONSTRATIONS AND EXPERIMENTS

1000 - 1600
Exhibit Hall

1000 - 1200 | ID S3

EMC studies in Aeronautical Domain / Lightning Strike and Antenna Coupling Scenarios

Eddy Jehamy, Markus Schick, FEKO – Altair Engineering GmbH, Böblingen, Germany

1000 - 1200 | ID H3

Spectra of Digital Waveforms- Effects of the Rise/Fall Time, Duty Cycle, and Amplitude on the Frequency Content of Signals

Bogdan Adamczyk, Grand Valley State University, Grand Rapids, USA

1000 - 1200 | ID S2

Efficient Emission Analysis by Coupling 3D Full Wave Solvers with Circuit Simulation

Andreas Barchanski, CST-Computer Simulation Technology AG, Darmstadt, Germany

1400 - 1600 | ID H12

Radiated Emissions of Cables through Shielded Enclosure Seams and Effect of Time Rise/Fall on Clock Signals

Adrià Suárez Zapata, University of Valencia, Valencia, Spain

1400 - 1600 | ID H18

Measuring and Displaying the Surprising Impact of DC Bias on Impedance of EMI Suppression Ferrites

Lee Hill, SILENT Solutions, Amherst, USA

1400 - 1600 | ID H6

Time Domain Site VSWR Measurements

Zhong Chen, ETS-Lindgren, Cedar Park, USA

EMC ISSUES RELATED TO POWER SYSTEM TECHNICAL PERFORMANCE

WS15 | Tutorial | 1400 - 1730

Seminarraum 1

SPONSORED BY TC7

CHAIR: Dave Thomas, *The University of Nottingham*, Nottingham, United Kingdom

The increasing use of Internet enabled equipment and high performance power converters in power networks is making EMC in the power system environment more critical. It is also becoming important that engineers are aware of all the activities going on in the world associated with EMC to avoid conflict or gridlock in the development of new infrastructures. CIGRE has had a long tradition of working in the area of EMC in power systems and this workshop is aimed at informing the EMC community on the strength and breadth of this work to forge new liaisons and collaborations for the future.

1. **Introduction to CIGRE**
William Radasky, *Metatech Corporation*, Goleta, CA, USA
2. **WG C4.32 Understanding of the Geomagnetic Storm Environment for High Voltage Power Grids**
William Radasky, *Metatech Corporation*, Goleta, CA, USA
3. **WG C4.30 EMC in Wind Energy Systems**
WH Siew, *University of Strathclyde*, Glasgow, UK
4. **CIGRE WG C4.31 EMC between Communication Circuits and Power Systems**
Dave Thomas, *University of Nottingham*, Nottingham, UK



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THURSDAY



0820-1200

Track K

0820 - 1000 Field - Wire Coupling and Radiation I
1020 - 1200 Field - Wire Coupling and Radiation II

Track L

0820 - 0935 Immunity Measurements I
1000 - 1135 Immunity Measurements II
1400 - 1515 Antennas
1600 - 1740 Measurement Analysis

Track M

0820 - 1000 Modelling Applications and Uncertainty Analysis in Simulations I
1020 - 1200 Modelling Applications and Uncertainty Analysis in Simulations II
1400 - 1540 Practical Applications of Numerical Modelling I
1600 - 1740 Practical Applications of Numerical Modelling II

Track N

0820 - 1000 Signal and Power Integrity V
1020 - 1135 Signal and Power Integrity VI
1400 - 1540 Nanotechnology and Advanced Materials in EMC I
1600 - 1650 Nanotechnology and Advanced Materials in EMC II

SS5

Intentional Electromagnetic Interference IEMI Protection of Critical Infrastructures

0830-1200

WS16

Nanotechnology Applied to EMC

1020 – 1800

Poster Sessions

1400 - 1650

SS3

EMC Diagnostics of Complex Systems Room

1400 - 1740

SS4

EM Field Interaction with Transmission Lines

1400 - 1805

Track O

1400 - 1540 HPEM Testing and Analysis
1600 - 1805 IEMI Pulsers and Effects Evaluations

TRACK K | 0820 – 1740 | Konferenzraum 1

FIELD - WIRE COUPLING & RADIATION I

Technical Session | 0820 – 1000

SPONSORED BY TC4

CHAIR: Franco Fiori, Electronics, Politecnico di Torino, Torino, Italy

0820 | ID 4987

Susceptibility to EMI of a Battery Management System IC for Electric Vehicles

Orazio Aiello¹, Franco Fiori², Paolo Crovetto², (1) NXP Semiconductor - Automotive Business Unit, Nijmegen, Netherlands, (2) Electronics, Politecnico di Torino, Torino, Italy

0845 | ID 4955

BEST STUDENT PAPER FINALIST

Influence of Parasitic Elements on Radiated Emissions of a Boost Converter

Lars Middelstaedt¹, Andreas Lindemann¹, Moawia Al-Hamid², Ralf Vick², (1) Chair for Power Electronics, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany, (2) Chair for Electromagnetic Compatibility, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany

0910 | ID 5345

Equivalent Circuit Model of Frequency-Domain Responses With External Field

Bing Li, Junjun Wang, Xinwei Song and Donglin Su, Institute of EMC Technology, Beihang University, Beijing, China

0935 | ID 5490

Experimental Plane Wave and Random Field Coupling to Uniform and Nonuniform Transmission Lines

Robert Vogt-Ardatjew¹, Frank Leferink^{1,2}, (1) University of Twente, Enschede, Netherlands, (2) Thales Nederland B.V., Hengelo, Netherlands, Thales Nederland B.V., Hengelo, Netherlands

TRACK K | 0820 – 1740 | Konferenzraum 1

FIELD - WIRE COUPLING & RADIATION II

Technical Session | 1020 – 1135
SPONSORED BY TC4

CHAIR: Franco Fiori, Electronics, Politecnico di Torino, Torino, Italy

1020 | ID 5493

Study on the Reduction of Heatsink Radiation by Combining Grounding Pins and Absorbing Materials

Yoei Arien¹, Paul Dixon², Andy Degraeve³, Davy Pissoot⁴, and Mohammad Ali Khorrami², (1)Laird, Geel, Belgium, (2)Laird, Randolph, MA, (3)KULeuven, technologiecampus oostende, oostende, Belgium, (4)Technology Campus Ostend, KU Leuven, Ostend, Belgium

1045 | ID 5555

Layout modeling to predict compliance with EMC standards of power electronic converters

Anne-Sophie Podlejski¹, Arnaud Bréard², Christian Vollaire², Florent Morel³, Cyril Buttay⁴, and Eliana Rondon², (1) Laboratoire AMPERE, Université de Lyon - Ecole Centrale de Lyon, ECULLY, France, (2)Laboratoire Ampère, Ecullly, France, (3)Ampere laboratory - Ecole Centrale de Lyon, Ecullly, France, (4)Laboratoire Ampère, Villeurbanne, France

1110 | ID 5614

Field Coupling to Nonlinear Circuits in Resonating Structures

Thomas Wolfgramm¹, André Manicke¹, Hans Georg Krauthäuser¹, (1) Chair of Electromagnetic Theory and Compatibility, Dresden University of Technology, Dresden, Germany

1135 | ID 5731

Radiation of Input Decoupling Network for Switching DC-DC Converters


Raul Blečić^{1,2}, Renaud Gillon³, Bart Nauwelaers², and Adrijan Baric¹, (1)Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb, Croatia, (2)ESAT-TELEMIC, KU Leuven, Leuven, Belgium, (3)ON Semiconductor, Oudenaarde, Belgium

TRACK L | 0820 – 1740 | Konferenzraum 2

IMMUNITY MEASUREMENTS I

Technical Session | 0820 – 0935
SPONSORED BY TC2

CHAIR: Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey USA

0820 | ID 5368 BEST SYMPOSIUM PAPER FINALIST 

An Experimental Study of Electrostatic Discharge Immunity Testing for Wearable Devices

Takeshi Ishida¹, Shuichi Nitta¹, Fengchao Xiao², Yoshio Kami³, Osamu Fujiwara⁴, (1)Engineering dept., Noise Laboratory Co.,LTD, Sagamihara, Japan, (2)Comunication Engineering and Informations, University of ElectroCommunications, Tokyo, Japan, (3)Center of Industrial and Governmental Relation, University of Electro-Communications, Tokyo, Japan, (4) Nagoya Institute of Technology, Nagoya, Japan

0845 | ID 5417

Time-Domain Response of Bulk Current Injection Probes to Impulsive Stress Waveforms

Flavia Grassi, Giordano Spadacini and Sergio A. Pignari, Dept. of Electronics, Information and Bioengineering, Politecnico di Milano, Milan, Italy

0910 | ID 5491

Design and Fabrication of Miniature Parallel Strip Line in PCB Technology for Immunity Testing

Umberto Paoletti¹, Tatsuji Noma¹, Nobumasa Nishiyama², (1)Hitachi, Ltd., Yokohama Research Laboratory, Yokohama, Japan, (2)HGST Japan Ltd., Fujisawa, Japan



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TRACK L | 0820 – 1740 | Konferenzraum 2

IMMUNITY MEASUREMENTS II

Technical Session | 1020 – 1135

SPONSORED BY TC2

CHAIR: Donald Heirman, Don HEIRMAN Consultants, Lincroft, New Jersey USA

1020 | ID 5355

A new Conducted Immunity Test Device for Inter-laboratory Comparisons

Emrah Tas and Frédéric Pythoud, Laboratory EMC, Federal Institute of Metrology METAS, Bern-Wabern, Switzerland

1045 | ID 5721

Stripline Injection Cell for High Frequency BCI Tests

Guillaume Andrieu, OSA department, XLIM Laboratory, Limoges, France and Alain Reineix, XLIM Laboratory, Limoges, France

1110 | ID 5557

On the Validity and Statistical Significance of HEMP Test Standards

Lars Ole Fichte¹, Sven Knoth¹, Stefan Potthast², Frank Sabath², Marcus Stiemer¹, (1)Helmut Schmidt University, Hamburg, Germany, (2)Directorate 300, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

ANTENNAS

Technical Session | 1400 – 1515

SPONSORED BY TC2

CHAIR: Andrew Marvin, University of York, York, UK

1400 | ID 5374

BEST STUDENT PAPER FINALIST



Antenna Factor Determination of a Shielded Standard Loop Antenna

Nino Richter¹, Alexander Küllmer², Achim Enders², Axel Junge¹, (1)EMC Section, European Space Agency -ESTEC, Noordwijk, Netherlands, (2)Institute for Electromagnetic Compatibility, TU Braunschweig, Braunschweig, Germany

1425 | ID 5393

Contactless Calibration of Loop Antennas in Comparison to Traditional Methods

Alexander Küllmer¹, Nino Richter¹, Martin Lahme¹, Achim Enders¹, Axel Junge², (1)Institute for Electromagnetic Compatibility, TU Braunschweig, Braunschweig, Germany, (2)EMC Section, European Space Agency -ESTEC, Noordwijk, Netherlands

1450 | ID 5016

A Detailed Study on TEM Waveguides' Field Distribution and Efficiency

David Hamann¹, Heyno Garbe¹, Thorsten Pusch², Michael Suhrke², (1)Institute of Electrical Engineering and Measurement Technology, Leibniz Universität Hannover, Hannover, Germany, (2)Electromagnetic Effects and Threats, Fraunhofer Institute for Technological Trend Analysis INT, Euskirchen, Germany

TRACK L | 0820 – 1740 | Konferenzraum 2

MEASUREMENT ANALYSIS

Technical Session | 1600 – 1740
SPONSORED BY TC2

CHAIR: Jan Luiken ter Haseborg, Technical University
Hamburg-Harburg, Hamburg, Germany

1600 | ID 5464

**Prediction of Magnetic Field Radiation Using
Equivalent Current Distribution**

Yinliang Diao¹, Weinong Sun¹, Peter Sai-Wing Leung¹,
Timothy Yun-Ming Siu¹, Kwok Hung Chan², (1)City
University of Hong Kong, Hong Kong, Hong Kong, (2)Hong
Kong productivity council, Hong Kong, Hong Kong

1625 | ID 5648

**EMI-Receiver Simulation Model with Quasi-Peak
Detector**

Timucin Karaca, Bernd Deutschmann and Gunter Winkler,
Institute of Electronics, Graz University of Technology, Graz,
Austria

1650 | ID 5339

**Estimation of Absorber Performance Using
Reverberation Techniques and Artificial Neural
Network Models**

Corey Vyhldal¹, Vignesh Rajamani², Chuck Bunting²,
Praveen Damacharla³, Vijay Devabakhtuni³, (1)Electrical
and Computer Engineering, Oklahoma State University,
Stillwater, OK, (2)ECE, Oklahoma State University,
Stillwater, OK, (3)Department of Electrical Engineering and
Computer Science, University of Toledo, Toledo, Ohio, USA

TRACK M | 0820 – 1740 | Konferenzraum 3

**MODELING APPLICATIONS AND
UNCERTAINTY ANALYSIS IN
SIMULATIONS I**

Technical Session | 0820 – 1000
SPONSORED BY TC9

CHAIR: Gilles Peres, Airbus Group Innovations,
Toulouse, France

0820 | ID 4994 BEST SYMPOSIUM PAPER FINALIST 

**High Frequency Models of Toroidal Inductors for
EMC Filtering**

Felix Traub, Stanislav Skibin and Bernhard Wunsch, ABB
Switzerland AG, BadenDättwil, Switzerland

0845 | ID 5716

Mutual Couplings between EMI Filter Components

Gundars Asmanis¹, Deniss Stepins¹, Aivis Asmanis¹, and
Leonids Ribickis², (1)Latvian Electronic Equipment Testing
Center, Riga, Latvia, (2)Institute of Industrial Electronics,
Riga Technical University, Riga, Latvia

0910 | ID 5066

Field Uniformity in Radiated Field Immunity Tests

Bruno Audone, EMC Consultant, Torino, Italy, Roberto
Colombo, IMQ S.p.A., Milan, Italy and Michele Borsero,
INRIM, Torino, Italy

0935 | ID 5388

**A Novel Approach for Noise-Immunity Analysis
Using Channel Transfer Impedance on the Power
Delivery Network of a Large-Scale Integration Chip**

Sungwook Moon, Jihyun Lee and Jaeyoul Lee, System
LSI Business Division, Samsung Electronics Co. Ltd.,
Hwaseong-si, Gyeonggi-do, South Korea

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TRACK M | 0820 – 1740 | Konferenzraum 3

MODELING APPLICATIONS AND UNCERTAINTY ANALYSIS IN SIMULATIONS II

Technical Session | 1020 – 1200
SPONSORED BY TC9CHAIR: Gilles Peres, Airbus Group Innovations,
Toulouse, France**1020 | ID 5065****Uncertainty Evaluation of Conducted Emission
Measurements by Means of Conformal Mapping**Bruno Audone, EMC Consultant, Torino, Italy, Alberto
Francesco Finizio, Politecnico di Milano and Xi'an Jiaotong
University, Milan, Italy and Roberto Colombo, IMQ S.p.A.,
Milan, Italy**1045 | ID 5083****Uncertainty Analysis in EMC Simulation Based on
Stochastic Collocation Method**Bai Jinjun¹, Zhang Gang¹, Alistair Duffy, Chairman, IEEE EMC
Society Standards Development and Education Committee²,
and Wang Lixin¹, (1)Harbin Institute of Technology, Harbin,
China, (2) De Montfort University, Leicester, United Kingdom**1110 | ID 5612****Stochastic KRON's Model Inspired from the Random
Coupling Model**Chaouki Kasmi, Dr.¹, Olivier Maurice, Dr.², Gabriele Gradoni³,
Thomas Antonsen Jr.⁴, Edward Ott⁴, and Steven Anlage⁴,
(1)Wireless and Hardware Security Lab, French Network
and Information Security Agency, Paris, France, (2)
GERAC Electromagnétisme, Trappes, France, (3)School of
Mathematical Sciences, The University of Nottingham,
Nottingham, United Kingdom, (4)Institute for Research in
Electronics and Applied Physics, University of Maryland,
College Park, MD**1135 | ID 5691****Waveguide Simulation Approach for Transmission
Analysis of Reinforced Concrete Wall Structures**Simon Runke¹, Martin Zang², Joachim Streckert², Volkert
Hansen², and Markus Clemens¹, (1)Chair of Electromagnetic
Theory, Bergische Universität Wuppertal, Wuppertal, Germany,
(2)Bergische Universität Wuppertal, Wuppertal, Germany

PRACTICAL APPLICATIONS OF NUMERICAL MODELING I

Technical Session | 1400 – 1540
SPONSORED BY TC9CHAIR: Samuel Connor, IBM, Research Triangle Park, North
Carolina, USA**1400 | ID 5430****Characterisation of Radiated Fields from PCBs in the
Time Domain**Dave Thomas, Chris Smartt and Steve Greedy, Electrical
Systems and Optics, University of Nottingham,
Nottingham, United Kingdom**1425 | ID 5627****BEST SYMPOSIUM PAPER FINALIST** **Challenges of Time Domain Measurement of Field-field
Correlation for Complex PCBs**Chris Smartt¹, Dave Thomas¹, Hayan Nasser¹, Mohd
Baharuddin¹, Gabriele Gradoni², Grgor Tanner², and
Stephen Creagh², (1)Electrical Systems and Optics,
University of Nottingham, Nottingham, United Kingdom,
(2)School of Mathematical Sciences, The University of
Nottingham, Nottingham, United Kingdom**1450 | ID 5694****A Fast Prediction for Shielding Effectiveness of
Double Enclosures**Liping Yan¹, Xiang Zhao¹, Yong Kan¹, Changjun Liu¹, Kama
Huang¹, and Haijing Zhou², (1)College of Electronics and
Information Engineering, Sichuan University, Chengdu,
China, (2)Institute of Applied Physics and Computation
Mathematics, Beijing, China**1515 | ID 5447****Simulation of Conductive and Radiated Emissions from
Wiper Motor According to CISPR 25 Standard**Irina Oganezova^{1,2}, Robert Kado³, Badri Khvitia^{1,2},
Anna Gheonjian^{1,2} and Roman Jobava², (1)Tbilisi State
University, Tbilisi, Georgia, (2)EMCoS Ltd., Tbilisi, Georgia,
(3)Electromagnetic Compatibility (EMC), Fiat Chrysler
Automobiles (FCA), Auburn Hills, MI

TRACK M | 0820 – 1740 | Konferenzraum 3

**PRACTICAL APPLICATIONS OF
NUMERICAL MODELING II**

Technical Session | 1600 – 1740
SPONSORED BY TC9

CHAIR: Ronald Rambousky, Bundeswehr Research Institute for Protective Technologies and NBC-Protection (WIS), Munster, Germany

1600 | ID 5002

Delay-Rational Model of Lossy and Dispersive Multiconductor Transmission Lines

Maria De Lauretis, Computer Science, Electrical and Space Engineering, Luleå University of technology, Luleå, Sweden, Giulio Antonini, Dipartimento Ingegneria Industriale e dell'Informazione e di Economia, Università degli Studi dell'Aquila, L'Aquila, Italy and Jonas Ekman, Department of Computer Science, Electrical and Space Engineering, Luleå University of Technology, Luleå, Sweden

1625 | ID 5329

Efficient Analytical Calculation of the Plane Wave Coupling to Uniform Transmission Lines With Arbitrary Load Resistances in Time Domain

Mathias Magdowski and Ralf Vick, Chair for Electromagnetic Compatibility, Otto-von-Guericke-University, Magdeburg, Germany

1650 | ID 5814

Modeling the Influence of Corona Discharge on High-Voltage Surges Propagating along Transmission Lines using TLM

John Evans¹, Dave Thomas², and Steve Greedy², (1) University of Nottingham, Nottingham, United Kingdom, (2)Electrical Systems and Optics, University of Nottingham, Nottingham, United Kingdom

1715 | ID 5635

Coupled Arc Discharge Models in the TLM Method

Ahmed Elkalsh, Ana Vukovic, Phillip Sewell and Trevor Benson, University of Nottingham, George Green Institute for Electromagnetics Research, Nottingham, United Kingdom

TRACK N | 0820 – 1740 | Konferenzraum 4

SIGNAL AND POWER INTEGRITY V

Technical Session | 0820 – 1000
SPONSORED BY TC10

CHAIR: Bill Chen, Yangtze Delta Region Institute of Tsinghua University, China.

0820 | ID 5540

Compact Hybrid Open Stub EBG Structure for Power Noise Suppression in WLAN Band

Chi-Kai Shen, and Tzong-Lin Wu, National Taiwan University, Taipei City, Taiwan

0845 | ID 5375

Noise Immunity Design for Multilayer Printed Circuit Boards Using Electromagnetic Simulation

Mamoru Kamikura, Dr., Norihiko Akashi and Yuichiro Murata, Dr., Advanced Technology R&D Center, Mitsubishi Electric Corporation, Amagasaki, Japan

0910 | ID 5181

A Black-Box Measurement-Based Modeling Method for the RF Emission and Immunity Behavior of Integrated Circuits

Hugo Pues and Celina Gazda, Melexis, Tessenderlo, Belgium

0935 | ID 5625

Analysis of Intra-chip Digital Noise Coupling Path in Fully LTE Compliant RF Receiver Test Chip

Masahiro Yamaguchi¹, Peng Fan¹, Satoshi Tanaka¹, Sho Muroga, Dr.², and Makoto Nagata³, (1)Department of Electrical Engineering, Tohoku University, Sendai, Japan, (2)Department of Electrical and Electronic Engineering, National Institute of Technology, Toyota College, Toyota, Japan, (3)Graduate School of System Informatics, Kobe University, Kobe, Japan



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THURSDAY, 20 AUGUST


TRACK N | 0820 – 1740 | Konferenzraum 4

SIGNAL AND POWER INTEGRITY VI

Technical Session | 1020 – 1135

SPONSORED BY TC10

CHAIR: Bill Chen, Yangtze Delta Region Institute of Tsinghua University, China

1020 | ID 5156 BEST STUDENT PAPER FINALIST 

Conducted Emission Characteristics of CCM Boost Converter with SiC Schottky Barrier Diode

Takaaki Ibuchi and Tsuyoshi Funaki, Osaka University, Suita, Osaka, Japan

1045 | ID 5334

Susceptibility of Chopper OpAmps to EMI

Franco Fiori, DET, Politecnico di Torino, Torino, Italy

1110 | ID 5760

LF H-field immunity Surface Scan Method

Mart Coenen, BSc, Mgt, EMCMCC, Breda, Netherlands and Bharat Kathari, MSc, IBI Group, New Delhi, India



Photo courtesy of Janet O'Neil

NANOTECHNOLOGY AND ADVANCED MATERIALS IN EMC I

Technical Session | 1400 -1740

SPONSORED BY TC11

CO-CHAIRS: Sabrina Sarto, Sapienza University of Rome, Rome, Italy Marina Koledintseva, Oracle, EMC Hardware Design, USA

1400 | ID 5722

MWCNTs Nanocomposites for space applications

Marco Nicoletto¹, Demis Boschetti¹, Mauro Giorcelli² and Patrizia Savi², (1) Electrical System and EMC, Thales Alenia Space, Torino, Italy, (2) Politecnico di Torino, Torino, Italy

1425 | ID 5353

Optimal Terahertz Shielding Performances of Flexible Multilayer Screens Based on Chemically Doped Graphene on Polymer Substrate

Alessandro Giuseppe D'Aloia¹, Marcello D'Amore¹ and Maria Sabrina Sarto², (1) Sapienza University of Rome, Roma, Italy, (2) DIAEE, Sapienza University of Rome, Roma, Italy

1450 | ID 5048

Modeling of Multilayer Graphene (MLG)-Based Structures at Different Temperatures

Da-Wei Wang¹, Wen-Sheng Zhao², Wenchao Chen¹, Wen-Yan Yin Sr.³ and Hong-Ke Ma⁴, (1) Zhejiang University, Hangzhou, China, (2) Hangzhou Dianzi University, Hangzhou, China, (3) Centre for Optical and EM Research (COER), Zhejiang University, Hangzhou, China, (4) Science and Technology on High Power Microwave Lab, Institute of Applied Electronics, Mianyang, China

1515 | ID 5597

BEST STUDENT PAPER FINALIST 

Electromagnetic Shielding Properties of Nano Carbon Filled Silicone Rubber Composites

Joseph Vas and Joy Thomas, Indian Institute of Science, Bangalore, India

TRACK N | 0820 – 1740 | Konferenzraum 4

NANOTECHNOLOGY AND ADVANCED MATERIALS IN EMC II

Technical Session 1600 - 1650

SPONSORED BY TC11

CO-CHAIRS: Sabrina Sarto, Sapienza University of Rome, Rome, Italy Marina Koledintseva, Oracle, EMC Hardware Design, USA

1600 | ID 4993

Dynamically Reconfigurable Metamaterials for Shielding and Absorption in the GHz Range

Francesco de Paulis¹, Carlo Rizza², Alessandro Ciattoni³, Elia Palange⁴ and Antonio Orlandi¹, (1)Industrial and Information Engineering and Economics, University of L'Aquila, L'Aquila, Italy, (2)Department of Science and High Technology, University of Insubria, Como, Italy, (3)National Research Council, CNR-SPIN, L'Aquila, Italy, (4)Department of Physics and Chemistry, University of L'Aquila, L'Aquila, Italy

1625 | ID 5349

HF Characteristics of Laminated Structure Consisting of Negative Permittivity and High Permittivity Materials

Shinichiro Yamamoto¹, Masayoshi Okita¹, Kenichi Hatakeyama¹ and Takanori Tsutaoka², (1)Graduate School of Engineering, University of Hyogo, Himeji, Japan, (2) Graduate School of Education, Hiroshima University, Higashi-Hiroshima, Japan

INTENTIONAL ELECTROMAGNETIC INTERFERENCE (IEMI) PROTECTION OF CRITICAL INFRASTRUCTURES

SS5 | Special Session | 0820 – 1200

Konferenzraum 5

CHAIR: Frank Sabath, Bundeswehr Research Institute for Protective Technologies and NBC-Protection (WIS), Munster, Germany

0820 | ID 5020

IEMI-Testing of Electronic Systems in Critical Infrastructure

Ronald Rambousky¹, André Bausen², Sebastian Lange³ and Frank Sabath², (1)Electromagnetic Effects and HPEM, Bundeswehr Research Institute for Protective Technologies, Munster, Germany, (2)Electromagnetic Effects and HPEM, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany, (3)Scientific Computing, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany

0845 | ID 5354

Analysis of IEMI Effects on a Computer Network in a Realistic Environment

M. Kreitlow¹, H. Garbe², and F. Sabath¹, (1) Bundeswehr Research Institute for Protective Technologies and NBC-Protection (WIS), Munster, Germany, (2) Leibniz Universität Hannover, Hannover, Germany

0910 | ID 5459

HPEM Vulnerability of Radiation Meters Used in Security Relevant Scenarios

C. Adami, W. Berky, M. Joester, M. Suhrke and T. Pusch, Fraunhofer Institute for Technological Trend Analysis (INT), Euskirchen, Germany

0935 | ID 5495

Uncertainty Analysis in System-level Vulnerability Assessment for IEMI

C. Mao, Northwest Institute of Nuclear Technology, Xi'an, China

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1020 | ID 5551**A Fuzzy Approach for IEMI Risk Analysis of IT-Systems with Respect to Transient Disturbances**

T. Peikert¹, S. Potthast², and H. Garbe¹, (1) Leibniz Universität Hannover, Hannover, Germany, (2) Bundeswehr Research Institute for Protective Technologies and NBCProtection (WIS), Munster, Germany

1045 | ID 4889**Assessing the Likelihood of Various Intentional Electromagnetic Environments**

F. Sabath¹, and H. Garbe², (1) Bundeswehr Research Institute for Protective Technologies and NBC-Protection (WIS), Munster, Germany, (2) Leibniz Universität Hannover, Hannover, Germany

1110 | ID 5626**Method for Detecting Jamming Signals Superimposed on a Radio Communication- Application to the Surveillance of Railway Environments**

M. Heddebaut, V. Deniau, J. Rioult, G. Copin and S. Mili, COSYS, IFSTTAR, Villeneuve d'Ascq, France

1135 | ID 5449**The European Project STRUCTURES: Challenges and Results**

S. van De Beek¹, J. Dawson², L. Dawson², I. Flintoft², H. Garbe³, F. Leferink^{1,4}, B. Menssen³, N. Mora⁵, F. Rachidi⁵, M. Righero⁶, M. Rubinstein⁷, and M. Stojilovic⁷, (1) University of Twente, Enschede, Netherlands, (2) University of York, York, UK, (3) Leibniz Universität Hannover, Hannover, Germany, (4) Thales Nederland B.V., Hengelo, Netherlands, (5) Swiss Federal Institute of Technology, Lausanne, Switzerland, (6) Istituto Superiore Mario Boella, Torino, Italy, (7) University of Applied Sciences and Arts Western Switzerland, Yverdon-les-Bains, Switzerland

NANOTECHNOLOGY APPLIED TO EMC

WS16 | Tutorial | 0830 - 1200**Seminarraum 1****SPONSORED BY TC11****CHAIR:** Alessio Tamburrano, *Sapienza University of Rome, Rome, Italy*

Nanotechnology is the engineering of functional systems at the molecular and atomic scale and represents a technological revolution that is shaking scientific academia, industries, and almost all areas of society. Nanotechnology has the potential to develop many novel materials and devices with a vast range of applications. Over the last ten years several studies have been focused on carbon nanotubes, graphene nanoribbons, nanostructured multifunctional materials and single/ multi-phase composites filled with nanoparticles. The outstanding performance and capabilities of these novel materials have demonstrated a great impact in different EMC applications: signal integrity of electrical nano-interconnects and nano-vias for high speed electronics, multifunctional electromagnetic shields, lightweight and high performance radar absorbing materials, just to mention some examples.

The tutorial is intended to introduce EMC engineers and researchers to nanoscience and nanotechnology showing how fundamental EMC topics (like measurements, transmission line, shielding and protection) should be "revisited" at nanoscale. It will present new materials, devices and processes for EMC applications, with particular attention to theoretical modeling approaches, simulation methods and experimental characterization techniques.

The tutorial will provide participants with opportunities for professional development and the chance to gain a better understanding of nanotechnology and its implications in EMC issues. The tutorial will contribute to the development of a debate on the state-of-art as well as on future research possibilities.

1. Introduction to Nano-EMC*Alessio Tamburrano, Sapienza University of Rome***2. Modeling and Shielding Performances of Graphene-Based Multilayer Screens***M. D'Amore, Sapienza University of Rome***3. Graphene-Polymer Nanocomposites for Radar Absorbing Materials***M. S. Sarto, Sapienza University of Rome*

DEMONSTRATIONS AND EXPERIMENTS

1000-1600

Exhibit Hall

ID H7 | 1000 - 1200

Electrostatic Discharges (ESD)

Frits Buesink, *University of Twente, Enschede, The Netherlands*

ID H14 | 1000 - 1200

Capacitive and Inductive Coupling

Stefan Parr, Kai Rathjen, *Helmut-Schmidt-Universität, Hamburg, Germany*

ID H15 | 1000 - 1200

Radiated Emissions of Cables

Bob Scully, *NASA, League City, USA*

ID H13 | 1400 - 1600

Reducing Conducted Electromagnetic Interference

Stefan Parr, Kai Rathjen, *Helmut-Schmidt-Universität, Hamburg, Germany*

ID H4 | 1400 - 1600

Three tubes

Ramiro Serra, Alexander van Deursen, *Eindhoven University of Technology, Eindhoven, The Netherlands*

ID H5 | 1400 - 1600

Non-conservative Electric Field, a Demo for Courses on EMC and Electromagnetic Fields

Alexander van Deursen, *Eindhoven University of Technology, Eindhoven, The Netherlands*

TRACK 0 | 1400 – 1805 | Konferenzraum 5

HPEM TESTING AND ANALYSIS

Technical Session | 1400 – 1540

SPONSORED BY TC5

CO-CHAIRS: William Radasky¹, Frank Sabath², (1) Metatech Corporation, Goleta, California, USA, (2) Bundeswehr Research Institute for Protective Technologies and NBC-Protection (WIS), Munster, Germany

1400 | ID 5251

ESD Performance Evaluation of Powered High-Speed Interfaces

Sebastian Koch¹, Harald Gossner¹, Horst Gieser², and Linus Maurer^{2,3}, (1) Intel Deutschland GmbH, Neubiberg, Germany, (2) Fraunhofer-Einrichtung für Mikrosysteme und Festkörper-Technologien EMFT, München, Germany, (3) Universität der Bundeswehr München, Neubiberg, Germany

1425 | ID 5129

Using an In-line Uninterruptable Power Supply as TEMPEST 'Filter' for Naval Vessels

Frank Leferink^{1,2}, Hans Bergsma¹, (1) Thales Nederland B.V., Hengelo, The Netherlands; (2) University of Twente, Enschede, The Netherlands

1450 | ID 5420

Development of a Surge Simulation Code VSTL REV Based on the 3D FDTD Method

Akiyoshi Tatematsu, Electric Power Engineering Research Laboratory, Central Research Institute of Electric Power Industry, Yokosuka, Japan

1515 | ID 4500

EMC Analysis and Characterization of New Nanocomposite Laminates for Aeronautic

En-Xiao Liu¹, Bui Viet Phuong¹, Warintorn Thitsartarn², Chaobin He², and Jayven Yeo², (1) Electronics & Photonics Department, Institute of High Performance Computing (IHPC), A*STAR, Singapore, Singapore, (2) Synthesis & Integration, Institute of Materials Research and Engineering, A*STAR, Singapore, Singapore



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TRACK 0 | 1400 – 1805 | Konferenzraum 5

EMI PULSERS AND EFFECTS EVALUATIONS

Technical Session | 1600 – 1805
SPONSORED BY TCS

CO-CHAIRS: William Radasky¹, Frank Sabath², (1) Metatech Corporation, Goleta, California, USA, (2) Bundeswehr Research Institute for Protective Technologies and NBC-Protection (WIS), Munster, Germany

1600 | ID 5600 BEST SYMPOSIUM PAPER FINALIST 

Experimental Investigations on the Pulsed Power Switch of a HIRA based UWB System

Vijay Bhosale¹, Joy Thomas M.², D.C. Pande³, and Joseph Vas², (1) DRDO, LRDE, Bangalore, India, (2) Electrical Engineering, Indian Institute of Science, Bangalore, India, (3) ÉMI-EMC, LRDE, Bangalore, India

1625 | ID 5043

High Power Radiators and E-Field Sensors for Sub-Nanosecond Electromagnetic Pulses

Vladimir Fedorov, Lab. of Power EM-impacts, Joint Institute for High Temperatures of Russian Academy of Sciences, Moscow, Russia

1650 | ID 5258

Destructive High-Power Microwave Testing of Simple Electronic Circuit in Reverberation Chamber

Tomas Hurtig, Leif Adelöw, Mose Akyuz, Mattias Elfsberg, Anders Larsson and Sten E Nyholm, Swedish Defence Research Agency, Norra Sorunda, Sweden

BEST STUDENT PAPER FINALIST 

1715 | ID 5406

Effect of Pulsed Interference on an ASK Receiver

Stefan van De Beek¹, Silvo Jeunink¹ and Frank Leferink^{1,2}, (1) University of Twente, Enschede, The Netherlands, (2) Thales Nederland B.V., Hengelo, The Netherlands

1740 | ID 5766

Status and Progress of IEC SC 77C High-Power Electromagnetics Publications in 2015

William Radasky¹, Richard Hoad², (1) Metatech Corporation, Goleta, CA, USA, (2) QinetiQ, Farnborough, United Kingdom

EMC DIAGNOSTICS OF COMPLEX SYSTEMS

SS3 | Special Session | 1400 - 1650
Seminarraum 1

CHAIR: Vladimir Mordachev, Belarusian State Univ. of Informatics and Radioelectronics, Minsk, Belarus

There are numerous situations where the EM environment is extremely complex with large numbers of RF systems resulting in unintentional coupling. These systems may be onboard a ship, aircraft or orbital station and ground-based such as an airport or seaport.

Worst case behavioral modeling of system elements as well as specialized techniques for discrete and non-linear modeling is all needed to EMC analysis and diagnostics. Papers in this session will cover:

- Behavioral modeling of full complex systems and the elements that compose them.
- Worst case behavioral models of spurious coupling using highly efficient techniques
- Efficient measurement techniques and computer modeling for the extraction of critical element characterization that is necessary for the full analysis.

Large scale systems present extremely complex EMC challenges. This session will provide insight to methods and techniques that can be used to examine such cases in a practical and logical manner.

1400 | ID 5090

Worst-Case Estimation of Electromagnetic Background Near Ground Surface Created by Heterogeneous Radioelectronic Environment

Vladimir Mordachev, R&D Department, Belarusian state university of informatics and radioelectronics, Minsk, Belarus

1425 | ID 5093

Reduction of the Radiated Power of Cellular Base Stations on Urban Area at High Intrasystem EMC Requirements

Vladimir Mordachev, R&D Department, Belarusian state university of informatics and radioelectronics, Minsk, Belarus

1450 | ID 5308

Investigation of the Transmitter Susceptibility to Reverse Intermodulation by the Use of Double-Frequency Diagrams

Eugene Sinkevich, EMC R&D Laboratory, Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus

1515 | ID 5646

Computationally-Effective Worst-Case Estimation of Currents in Transmission Lines for EMC Diagnostics of Big Systems

Dzmitry Tsyantenka¹, Eugene Sinkevich¹, Yauheni Arlou¹, and Sergei Maly², (1)EMC R&D Laboratory, Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus, (2)The Faculty of Radiophysics and Computer Technologies, Belarusian State University, Minsk, Belarus

1600 | ID 5484

Computationally-Effective Wideband Worst-Case Model of Transmission Line Radiation

Dzmitry Tsyantenka¹, Yauheni Arlou¹, Eugene Sinkevich¹ and Sergei Maly², (1)EMC R&D Laboratory, Belarusian State University of Informatics and Radioelectronics, Minsk, Belarus, (2)The Faculty of Radiophysics and Computer Technologies, Belarusian State University, Minsk, Belarus

1625 | ID 5671

A Tool for Coexistence Planning in Complex Radio Communication Environments

Sara Linder¹, Kia Wiklundh¹, Peter Stenumgaard¹, Karina Fors¹ and Leif Junholm², (1)Robust Telecommunications, Swedish Defence Research Agency, Linköping, Sweden, (2)AL Command and Control, Swedish Defence Material Administration (FMV), Östersund, Sweden

EM FIELD INTERACTION WITH TRANSMISSION LINES

**SS4 | Special Session | 1400-1740
Konferenzraum 1**

CO-CHAIRS: Jürgen Nitsch, Otto-von-Guericke University, Magdeburg, Germany
Sergey Tkachenko, Otto-von-Guericke University, Magdeburg, Germany

Many different kinds of transmission lines, wiring structures, PCB, chip packages, etc. are used in modern electrical engineering and electronics. They serve for transmission of signals and energy. In addition to their useful functions they can be subject to the influence of various electromagnetic interference sources, both external and generated by adjacent devices. In this case, these elements work as passive antennas and scatterers. Moreover, the scattered current can propagate along the transmission lines to the ports of receivers and may enter the sensitive parts of electronics causing failure or even damage to the devices. The frequency range of the interferences can be larger than the working frequency range of the devices. To protect the sensitive electronics from pulse interferences it is useful to calculate the response in the time domain. These transmission lines are located in various environments: such as above a finite conducting ground, inside the enclosures of different geometrical shapes, and may include some shielding from external electromagnetic interferences. It was shown this circumstance can change the picture of coupling radically. The problem of the calculation of currents and voltages in transmission lines (with linear or non-linear loads) in complex environments is of great importance in EMC.

Existing numerical methods (Method of Moments, Transmission-Line Matrix Method, etc.) allow considering specific cases only, but do not describe general physical picture of the interaction. On the other hand, classical transmission line approximations for the lines as in free space as well as in resonators are applicable only for a restricted frequency range. This special session will examine the analytical description, mathematical and numerical approaches to the interaction of high-frequency electromagnetic fields with wire structures in free space and in cavities.



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1400 | ID 5407

On the Validity Limits of the Transmission Line Theory in Evaluating Differential-Mode Signals along a Two-Wire Line above a Ground Plane

Nicolas Mora¹, Gaspard Lugin¹, Farhad Rachidi², Isabelle Junqua³, Jean-Philippe Parmantier³, Sergey Tkachenko⁴, Marcos Rubinstein⁵, Markus Nyffeler⁶ and Pierre Bertholet⁶, (1)EMC Lab, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, (2)Electromagnetic Compatibility Laboratory, The Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, (3)DEMR/CEM, ONERA – The French Aerospace Lab, F-31055, Toulouse, France, (4)Chair of EMC, Otto-von-Guericke University, Magdeburg, Germany, (5) Institute for Information and Communication Technologies, University of Applied Sciences Western Switzerland, Yverdon-les-Bains, Switzerland, (6)HPE Laboratory, Federal Department of Defence-Armasuisse, Thun, Switzerland

1425 | ID 5658

Network Analysis of Full Wave Multi-conductor Transmission Lines

Fabian Ossevoth¹, Hans Georg Krauthäuser¹, Jürgen Nitsch², (1)Electromagnetic Theory and Compatibility, Technical University Dresden, Dresden, Germany, (2)Otto-von-Guericke University, Magdeburg, Germany

1450 | ID 5209

Application of Generalized Reflection and Transmission Coefficients to Inhomogeneous Conductors at High Frequencies

Ronald Rambousky¹, Jürgen Nitsch², Sergey Tkachenko² (1) Electromagnetic Effects and HPEM, Bundeswehr Research Institute for Protective Technologies, Munster, Germany, (2) Otto-von-Guericke University, Magdeburg, Germany

1515 | ID 5009

Analytic Approximation of Natural Frequencies of Bent Wire Structures above Ground

Felix Middelstaedt¹, Sergey Tkachenko², Ronald Rambousky³, Ralf Vick¹, (1) Technical University, Darmstadt, Germany, (2) Chair of EMC, Otto-von-Guericke University, Magdeburg, Germany, (3)Electromagnetic Effects and HPEM, Bundeswehr Research Institute for Protective Technologies, Munster, Germany

1600 | ID 5177

Numerical Simulation of the Stochastic Electromagnetic Field Coupling to Transmission Line Networks

Mathias Magdowski and Ralf Vick, Chair for Electromagnetic Compatibility, Otto-von-Guericke-University, Magdeburg, Germany

1625 ID 5367

Statistical Properties of Low Frequency Voltages Induced by a Plane-Wave Field Across the Terminal Loads of a Random Wire-Bundle

Giordano Spadacini, Flavia Grassi and Sergio A. Pignari, Dept. of Electronics, Information and Bioengineering, Politecnico di Milano, Milan, Italy

1650 | ID 5786

On the Derivation of Generalized Transmission Line Equations of Cylindrical Waveguides with Irregular Deformed Surfaces

Wolfgang Mathis, Elektrotechnik und Informatik, Leibniz Universität Hannover, Hannover, Germany and Richard Mathis, Physics, Universität Göttingen, Göttingen, Germany

1715 | ID 5528

AutoCAD Application for LPS, Grounding and EMC Problems

Dmitry Shishigin, Postgraduate student, Vologda, Russia, Nikolay Korovkin, Head of theoretical electrical engineering department, St.-Petersburg, Russia and Sergey Shishigin, Head of electrical engineering department, Vologda, Russia

FRIDAY



0830-1730

WS18 Automotive EMC

WS19/24 Working EMC Engineer Skills

0830-1200

WS20 Measurement Uncertainty – Challenges and Solutions

WS21 IEC HPEM Standardization Update

0830-1030

WS22.1 Regulatory Requirements for Wireless Systems

1030 - 1200

WS22.2 Assessment and Approvals for Wireless Module Technology

1400 - 1730

WS25 Debugging EMI Test Failures

WS26 Workshop on IEMI Effects on Critical Infrastructures: The European Project STRUCTURES

WS27 Integrated ESD PCB IC Codesign

WS29 Product Safety Engineering Society

AUTOMOTIVE EMC

WS18 and WS23 | Workshop | 0830 - 1730

Konferenzraum 1

SPONSORED BY TC2

CHAIR: Marco Klingler, *Peugeot Citroën Automobiles*, Vélizy-Villacoublay, France

Automotive electric / electronic systems are endlessly growing in complexity with a permanent constraint of a constant or reduced time-to-market. Therefore, there is a strong need to constantly improve the efficiency of the EMC related tasks throughout the entire development process, starting from the design phase until the full-vehicle validation phase. This workshop intends to present an overview of the most recent industrial advances in the field of automotive EMC design, modeling and simulation as well as in the field of automotive standards, testing and measurements. The presentations in this workshop will cover EMC issues at system, sub-system, equipment and component levels. In particular, topics addressed by the speakers will include hybrid power-train systems EMC analysis, antenna implementation, equipment design, printed-circuit-board optimization, and electric/electronic component characterization.

- 0830 - 0900 | Overview / State-of-the-Art and Challenges in Automotive EMC Standardization and Regulation**
Ariel Lecca, *PSA Peugeot-Citroën*, Vélizy-Villacoublay, France
- 0900 - 0930 | System Level EMC Simulations of an Automotive Radiated Immunity Configuration**
Anna Gheonjian¹, Irina Oganezova¹, Moncef Kadi², Xavier Bunlon³, (1) EM Consulting and Software, EMCoS Ltd., Tbilisi, Georgia, (2) IRSEEM / ESIGELEC, Rouen, France (3) Renault S.A.S., Guyancourt, France
- 0930 - 1000 | Advanced Methods for the Simulation of Immunity Behaviour of a Car Body in the Frequency Domain or Time Domain**
Markus Laudien, Frédéric Bocquet, *ANSYS*, France
- 1030 - 1100 | 1 Gbps on Unshielded Wiring Harnesses in an Automotive Environment**
Todd H. Hubing, *Clemson University International Center for Automotive Research*, Greenville, SC, USA



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5. **1100 - 1130 | Calculation of RF Interference from Coupled Shielded Hybrid Cables Utilizing Current Probe Measurements**
Peter Hahne¹, Martin Aidam², Andreas Ludwig², Xiaofeng Pan², Markus Schick³; (1) Ingenieurbüro Dr. Peter Hahne, Bad König, Germany, (2) Daimler AG, Germany, (3) Altair Engineering GmbH, Germany
6. **1130 - 1200 | EMC Analysis of Shielded Cables and Connectors for Power Transmission in Electric and Hybrid Electric Vehicle**
Stephan Frei, Abid Mushtaq, *TU Dortmund University*, Germany
7. **1400 - 1430 | EMC Simulation of a Variable Frequency Drive**
Andreas Barchanski, *CST AG*, Darmstadt, Germany
8. **1430 - 1500 | Prediction of Radiated Emission Levels for Automotive Products using EM Simulations**
Reddy V. Sreenivasulu, Jan Hansen, Peter Kralicek, Kranti Kumar ; Robert Bosch GmbH, Germany
9. **1500 - 1530 | Complexities of Resonance Influences on Automotive Sensor and Signal Lines**
Jean-Roger K. Kuvedu-Libla, *Delphi Electronics & Safety*, Bascharage, Luxembourg
10. **1600 - 1630 | EMI Characterization of DC Motors**
Flavio Canavero, Riccardo Trincherio, Igor Stievano, *Politecnico di Torino*, Torino, Italy
11. **1630 - 1700 | Reverberation Chambers for Vehicle Testing**
Martin Aidam, *Daimler AG*, Germany
12. **1700 - 1730 | Evolving Automotive EMC Testing**
Garth D'Abreu, *ETS-Lindgren*, Cedar Park, Texas, USA

WORKING EMC ENGINEER SKILLS

WS19 and WS24 | Tutorial | 0830 - 1730

Konferenzraum 2

SPONSORED BY TC1

CHAIR: Kimball Williams, Dearborn, MI, USA

Explore some of the more critical aspects of working as an EMC engineer that are of a non-technical nature. These skills are not taught in any engineering curricula but, can be critical to building a successful engineering career. In the AM and PM sessions leadership of the EMC Society will discuss seven of these factors than can make the difference between career success and the unfortunate alternative.

1. **Introduction: The 'Soft Skills', Who needs them?**
Kimball Williams, Dearborn, Michigan, USA
2. **Fundamentals of Leadership**
Elya Joffe, *IEEE EMC-Society President Emeritus, Electromagnetic Solutions, Ltd.*, Tel Aviv, Israel
3. **Human Factors in Advancing Your Engineering Career**
Bob Hofmann, *IEEE EMC-Society President Emeritus, Hofmann Engineering*, Chicago, Illinois, USA
4. **Writing a Transaction Paper**
John Norgard, *NASA Johnson Space Center*, Houston, TX, USA
5. **Effective Meetings**
Elya Joffe, *IEEE EMC-Society President Emeritus, Electromagnetic Solutions, Ltd.*, Tel Aviv, Israel
6. **Effective Presentations**
Bruce Archambeault, *Missouri University of Science and Technology*, Rolla, Missouri, USA and *IBM*, Research Triangle Park, North Carolina, USA
7. **Networking Skills**
Dan Hoolihan, *Hoolihan EMC Consulting*, Minneapolis, Minnesota, USA
8. **EMC for Business Managers**
Joanna Hill, EMC Consultant, *JPHill LLC*, Hazel Park, Michigan, USA

MEASUREMENT UNCERTAINTY – CHALLENGES AND SOLUTIONS

WS20 | Tutorial | 0830 - 1200

Konferenzraum 3

CO-CHAIRS: Doug Kramer, ETS-Lindgren, Cedar Park, Texas, USA
Carlo Carobbi, University of Florence, Italy
Janet O'Neil, ETS-Lindgren, Cedar Park, Texas, USA

In the near future, the evaluation of Measurement Uncertainty (MU) won't be the same as we have known since the first edition of the Guide to Uncertainty in Measurement (GUM) was published in 1993. Some important changes are indeed expected in the second edition of the GUM, tentatively scheduled for publication in 2016. Such changes are mainly required in order to make the GUM consistent with its supplements and address the very fundamental idea of probability. The scope of the presentation by Prof. Carobbi, in particular, will show how the new concepts will practically affect evaluation of MU.

There has been an increasing need for accredited calibration test services in the commercial EMC, military and aerospace test communities. Part of the accreditation process based on ISO 17025 is the determination of measurement uncertainty – a requirement that is often misunderstood or misinterpreted. This tutorial will provide an overview and discussion of measurement uncertainty to further the knowledge of this subject in the international EMC testing community.

Tips and tools will be provided to make those associated with measurement uncertainty educated and comfortable moving forward in this area.

- 1. Everyday, Practical Tools for Measurement Uncertainty Evaluation in a Lab Environment**
Dennis Lewis, *The Boeing Company*, Seattle, WA, USA
- 2. The New, Second Edition of the Guide to Measurement Uncertainty (GUM 2016) – How the Evaluation of MU will Evolve in the Future**
Carlo F. M. Carobbi, *University of Florence, Italy and member of the Joint Task Force between IEC TC 77 and CISPR on Measurement Uncertainty*
- 3. Measurement Model Based Uncertainty Analysis for Antenna Calibrations**
Zhong Chen, *ETS-Lindgren*, Cedar Park, TX, USA
- 4. Application of Test Instrumentation Uncertainty Data for Practical EMC Testing and Test Reports.**
Per Thåstrup Jensen, *DELTA, Denmark and member of IEC SC77B/WG10*

IEC HPEM STANDARDIZATION UPDATE

WS21 | Tutorial | 0830 - 1200

Konferenzraum 4

SPONSORED BY TC5

CHAIR: William Radasky, Metatech Corporation, Goleta, CA, USA

High power electromagnetic transients are in the news seemingly every day including the threats of high-altitude electromagnetic pulse (HEMP) produced by nuclear weapons detonated in space and high-tech electromagnetic weapons that can cause intentional electromagnetic interference (IEMI). Unfortunately there is a lot of misinformation in the press, and this tutorial will clarify the terms and the waveforms of interest. IEC SC 77C has been working since 1992 standardizing these environments and their coupling to cables and equipment, developing test methods for cables and equipment, and developing different protection methods for new and existing facilities that need to be protected from these threats. These main three aspects of the completed work will be reviewed for the attendees. In addition the work underway in the IEC today and the accomplishments of other organizations in this field will be reviewed. The scheduled speakers have been involved in this work for many years as officers and participants in the work of IEC SC 77C and will be able to answer all questions that may arise from their presentations.

- 1. HEMP and IEMI Scenarios and the Resulting Electromagnetic Waveforms**
William Radasky, *Metatech Corporation*, Goleta, CA, USA;
Richard Hoad, *QinetiQ Group plc*, Farnborough, UK
- 2. Description of Test Methods to Reproduce HEMP and IEMI Environment Waveforms in Order to Test Protective Devices, Equipment and Systems**
Richard Hoad, *QinetiQ Group plc*, Farnborough, UK;
William Radasky, *Metatech Corporation*, Goleta, CA, USA
- 3. Description of Methods to Protect Against HEMP and IEMI**
Richard Hoad, *QinetiQ Group plc*, Farnborough, UK;
William Radasky, *Metatech*, Goleta, CA, USA
- 4. Description of Standards Under Development in the IEC and a Review of the Standardization Work Accomplished and Underway in the ITU-T, the IEEE EMC Society and Cigré SC C4**
William Radasky, *Metatech Corporation*, Goleta, CA, USA;
Richard Hoad, *QinetiQ Group plc*, Farnborough, UK



EMC 2015

DRESDEN, AUGUST 16-22

Technical Program

FRIDAY, 21 AUGUST

REGULATORY REQUIREMENTS FOR WIRELESS SYSTEMS

WS22.1 | Workshop | 0830 - 1000
Konferenzraum 6

CHAIR: Mike Violette, *Washington Laboratories and American Certification Body*, McLean, Virginia, USA

An overview of the regulatory requirements for authorizing wireless devices in the USA, Canada, Europe and Japan. An explanation of the compliance routes applicable for different types of device and the testing requirements facing the product manufacturer and test lab.

Devices can typically be separated into categories or types, such as licensed transmitters and unlicensed transmitters. There also exists a mixture of compliance routes, such as certification, verification or declaration of conformity. In addition, each geographical region has its own testing and compliance process. The presentation will clarify the requirements and differences for each of the regions covered.

This presentation is important for wireless product manufacturers and anyone involved in the regulatory compliance process for wireless transmitters and receivers.

ASSESSMENT AND APPROVALS FOR WIRELESS MODULE TECHNOLOGY

WS22.2 | Workshop | 1030 - 1200
Konferenzraum 5

CHAIR: Michael Derby, *American Certification Body*, Hampshire, England, United Kingdom

An overview of the process for assessing or installing wireless transmitter, receiver and transceiver modules in the USA, Canada, Europe and Japan. The presentation will include an explanation of the process for authorizing the wireless module for regulatory compliance and also for installing a module into other host equipment.

There is a growing industry for pre-approved radio modules, supplied to the market as a product for incorporation into other host devices. The processes for authorizing these modules can vary greatly between the geographical regions covered in this presentation. In addition, the requirements and responsibilities placed on the installer of the pre-assessed module varies.

The presentation will clarify the requirements and differences for each of the regions covered.

This presentation is important to manufacturers of wireless module devices and also to manufacturers of equipment which integrate wireless modules. This presentation is also of interest to test labs and anyone involved in the regulatory compliance process for wireless modules or equipment incorporating modules; such as the M2M industry.

DEBUGGING EMI TEST FAILURES

WS25 | Workshop | 1400 - 1730

Konferenzraum 3

SPONSORED BY TC4

CHAIR: Ross M. Carlton, *National Instruments*, Austin, TX, USA

The workshop will begin with a presentation on the challenges of managing and leading troubleshooting efforts. These challenges can be as difficult to overcome unless they are addressed early and consistently. The presentation will illuminate potential problem areas and provide insight on techniques that can be tailored to any design environment.

The focus of the remaining presentation will be on debugging radiated RF emissions test failures. We will begin with finding the failure during a compliance radiated RF emissions measurement at an internal or external EMC lab. The presentation will focus on techniques and tools, typical fixes, and other insights for troubleshooting radiated RF emission failures using a compliance test facility, such as an open area test site or semi-anechoic chamber, where the availability of the test facility is limited due to scheduling or cost.

We then move to troubleshooting the failure on a workbench or at a pre-compliance test facility. The presentations will focus on system and PCB level techniques, primarily using near field probes. Utilizing these measurements to debug the failure and gain confidence in the product performance prior to another compliance test will be discussed. Demonstrations using specialized test fixtures as well as real-world products will enhance the learning experience.

1. **1400 - 1405 | Introduction**
Ross M. Carlton, *National Instruments*, Austin, Texas, USA
2. **1405 - 1450 | Leading and Managing EMI Troubleshooting**
John G. Kraemer, *Rockwell Collins*, Cedar Rapids, Iowa, USA
3. **1450 - 1530 | Troubleshooting Radiated Emissions Failures at the EMC Lab**
Ross M. Carlton, *National Instruments*, Austin, Texas, USA
4. **1600 - 1630 | Fast, Low-Cost Near-Field Benchtop Debugging Techniques**
Keith Armstrong, *Cherry Clough Consultants Ltd.*, Brocton, Stafford, United Kingdom
5. **1630 - 1700 | Real Examples of Debugging EMC Test Failures at the PCB Level**
Arturo Mediano, *University of Zaragoza*, Zaragoza, Spain
6. **1700 - 1730 | Panel Session**
All Presenters

IEMI EFFECTS ON CRITICAL INFRASTRUCTURES: THE EUROPEAN PROJECT STRUCTURES

WS26 | Workshop | 1400 - 1730

Konferenzraum 4

CHAIR: Marco Righero, *Istituto Superiore Mario Boella*, Torino, Italy

Security and quality of life in industrialized countries depend on continuous and coordinated performance of a set of infrastructures (energy systems, ICT systems, transportation, etc.) which can be therefore defined as critical infrastructures (CIs). STRUCTURES—Strategies for The improvement of critical infrastructure Resilience to Electromagnetic attackS—aims at analysing possible effects of electromagnetic (e.m.) attacks and, in particular, of intentional e.m. interference (IEMI) on such CIs, at assessing their impact for our defence and economic security, at identifying innovative awareness and protection strategies and at providing a picture for the policy makers on the possible consequences of an electromagnetic attack. The project started on the 1st of July 2012 and will be near its conclusion for EMC 2015 in Dresden. The workshop, featuring speakers from the involved partners, will give an account of the challenges faced by the consortium, will describe the techniques used to manage the different problems, and will present the outcomes of three years of investigations.

1. **General Introduction**
Aldo Bonsignore, *Ingegneria Dei Sistemi*, Roma, Italy
2. **The Beginning of the Project and Some Review**
Benjamin Menssen, *Leibniz Universität Hannover*, Hannover, Germany; Kai Rathjen, *Helmuth-Schmidt, Universität, Hamburg, Germany*
3. **Experimental Characterization of Critical Systems and Components**
Nicolas Mora, *Swiss Federal Institute of Technology (EPFL)*, Lausanne, Switzerland; Michael Camp, *Rheinmetall Waffe Munition GmbH*, Unterlueess, Germany
4. **Numerical Analysis**
Mario Antonelli, *Ingegneria Dei Sistemi*, Roma, Italy; Simon Runke, *Bergische Universität Wuppertal*, Wuppertal, Germany
5. **Protection Strategies**
Marcos Rubinstein, *University of Applied Science and Arts Western Switzerland (HES-SO)*, Yverdon-les-bains, Switzerland
6. **IEMI Detection Systems: A Low Cost IEMI Detector**
John Dawson, *University of York*, York, U.K. Werner Hirschi, *Montena technology sa*, Rossens, Switzerland
7. **Guidelines & Methodologies for Risk Assessment and Mitigation of IEMI**
Frank Leferink, *University of Twente, Enschede*, and *THALES, Hengelo*, The Netherlands Francesca De Simio, *Università Campus Bio-Medico di Roma*, Roma, Italy

**EMC 2015**

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Technical Program

FRIDAY, 21 AUGUST

ESD: DATA CENTER ESD OCCURRENCE RATE, ESD TO DISPLAYS AND INTEGRATED ESD PCB IC CO-DESIGN

WS27 | Tutorial | 1400 - 1730
Konferenzraum 5

CO-CHAIRS: David Pommerenke, *Missouri University of Science and Technology*, Rolla, Missouri, USA; Harald Gossner, *Intel*, Neubiberg, Germany

Data centers can save energy by using outside air for cooling. However, the energy saving is strongly reduced if moisture needs to be added to the air to avoid operating the data center at low humidity, such as 25% or 8%. In proposing a wider operating range of air intake relative humidity concern was raised that the ESD induced failure rate may increase to an unacceptable level. In a larger study the effect of humidity on ESD charge voltages and discharge currents was investigated. The flooring / shoe combination was varied for humidities from 8% to 45% between 5C and 38C. Further, charge creation by sitting up from a chair or removing a garment was included and charge creation by cable handling. The data set is analyzed by its maximal voltages, walking voltages and methods are shown to extrapolate the probability to higher voltage levels. It is concluded that the ESD induced failure rate will only increase by a factor of about 2-3 if the humidity is reduced from 25% to 8% for the worst case floor / shoe combination investigated. However, the risk of damaging voltage caused by other user action, such as sitting up from a chair is significant. Countermeasures such as conductive floors and shoes nearly eliminate any risk if the data center's equipment is ESD robust by IEC 61000-4-2 test standard at 4kV contact mode and 8kV air discharge.

ESD to displays can damage or upset the display. Throughout the cell phone, tablet and laptop industry this is a serious problem as possible user interface innovations are delayed by failing ESD robustness. This part of the workshop address ESD to displays by analyzing the test methods derived from the IEC 61000-4-2 standard showing that the "display down" test scenario is very severe and may not reflect any user scenario. Further it is shown that sparkles discharged to the glass area introduce large surface charges having sub-nanosecond rise times and many Ampere of current. Although no spark is visible damage and upset errors are common. The tutorial will explain test methods, simulation methods and how to visualize the charge distribution on the surface.

Efficient ESD design for system level ESD can only be achieved if board and device level protection circuitry match each other. Purpose of this tutorial is to provide an understanding of board/ IC interaction under IEC 61000-4-2 testing conditions and to discuss useful design strategies supported by appropriate tools. This is meant to be beneficial both for ESD engineers of ICs and board designers responsible for EMC/ESD compliant design of the system. While it has clearly been pointed out that even elevated IC level HBM targets are insufficient for achieving the required IEC 61000-4-2 ESD level, more attention has to be put to the detailed turn-on and clamping behavior of IC level and board level ESD protection components. High current characterization of board protection and IO circuit by TLP is a first step. This enables the board designer to assess the behavior of IC pins and select appropriate board protection elements. A first-time-right design optimization will be explained which based on high current models of board components and IC IOs and the numerical simulation of the protection network under ESD conditions.

Various test methods are available to evaluate the efficiency of implemented protection on board level quantitatively.

The course is divided into two parts, where one focuses on the general overview of failure mechanism and the protection design against hard fails, while the second one addresses soft fails and the typical ESD/EMC design strategies to protect against these. Also strategies for soft error root cause analysis are discussed. Methods for the characterization of ICs and PCBs responses to ESD induced soft errors by conducted and field coupling are shown.

- 1. Integrated ESD PCB IC Codesign**
Harald Gossner, Intel, Neubiberg, Germany
- 2. ESD: Data Center ESD Occurrence Rate and ESD to Displays**
David Pommerenke, Missouri University of Science and Technology, Rolla, Missouri, USA

PRODUCT SAFETY ENGINEERING SOCIETY

WS29 | Workshop | 1400 – 1730 | Seminarraum 7
SPONSORED BY IEEE PSES

CHAIR: Jan Swart, Phoenix, Arizona, USA

This workshop is an introductory event to introduce the Product Safety Engineering Society Symposium to be held in 2016. This workshop will introduce you to the IEEE Product Safety Engineering Society, product compliance and will also help product designers and safety engineers understand product failures.

Today's safety and compliance engineer's face challenges far different from just a few years ago. They are managing the safety and compliance of new exciting technologies which involve very complex products. Product compliance may be UL, CSA and IEC Standards, European Norms, EU Directives, RoHS, WEEE, REACH, higher scrutiny on recalls, a multitude of different country regulatory requirements and methods of claiming compliance, Prop65, Toy Safety, Hazard ID and Risk Assessments being incorporated into Standards, and so much more.

It is challenging to know the technical requirements, as well as stay on top of new test methods and the latest equipment, and also remain current on the latest Regulations, Laws, Directives, and other legal requirements.

This knowledge base has to cover the global marketplace, and we also have to be able to explain it to all the stakeholders, from designers to marketing and even corporate personnel. With all of that, the Product Safety Engineering Symposium has become more important than ever. We hope to provide all of our attendees with valuable presentations and papers targeted for each product category and track. We would also like to share our knowledge with Product Designers and new Compliance Engineers.

- 1. An Introduction to the Product Safety Engineering Society**
Elya B. Joffe
- 2. Electronic Product Component Failure Mechanisms**
Jan Swart, Ph.D., Phoenix, AZ
- 3. Linking Risk and Reliability—Mapping the Output of Risk Assessment Tools to Functional Safety Requirements for Safety Related Control Systems**
Douglas S. G. Nix, C.E.T., SM-IEEE*, Yuvin Chinniah, Ph.D., Federico Dosio, Ph.D., Mark Fessler, MS, FS Eng., Frank Schrever, B. App. Sc.

PROCEEDINGS



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www.apemc.org

May 18-21, 2016

2016 Asia-Pacific International Symposium on Electromagnetic Compatibility & Signal Integrity

After the resounding success of a series of APEMC Symposiums since 2006, and the increasing growth of signal integrity activities, the 7th APEMC will feature the topics of "Signal Integrity", and renamed as **Asia-Pacific International Symposium on Electromagnetic Compatibility / Signal Integrity & Technical Exhibition (APEMC&SI 2016)**, which will be held in Shenzhen, China, May 18 to 21, 2016. Shenzhen has been selected to host 7th APEMC not only because of its strategic location next to Hong Kong, but also because of its fabulous facilities and world-class electronic industry and research centers.

This event will continue the APEMC spirit and address the world-wide EMC community with a primary focus on the Asia-Pacific region. The 7th **APEMC will serve as a broad exchange platform for both academia and industry**. The symposium will recognize innovations and technology leaderships through **the Best Symposium Paper Award, the Best Student Paper Award**, and other recognitions. The symposium will cover the entire scope of electromagnetic compatibility, electromagnetic environment and signal integrity issues. Prospective authors are invited to submit original papers on their latest research results. We also solicit proposals for focused sessions, industrial forums, workshops and tutorials.

Symposium Topics

- EMC Management and Standards
- EMC Measurements and Environment
- Lightning
- High Power Electromagnetics
- ESD and ESD Protection Designs
- Smart Power Grid EMC
- System-Level EMC and Protection
- Automotive, Railway and Ship EMC
- Wireless Power Transfer EMC
- EM Immunity
- EMC in Space
- IC EMC
- Signal Integrity
- Power Integrity
- TSV for 3D System Integration
- Wireless Communication EMC
- Computational Electromagnetics
- Wearable devices & biomedical EMC
- Multiphysics and Nanotechnology
- EMC for 5G System

Important Dates

Proposals for special /focused sessions, workshops and tutorials, industrial forums	Oct. 16, 2015
Preliminary paper submissions (<i>3 pages PDF only</i>)	Dec. 5, 2015
Notification of acceptance	Jan. 29, 2016
Final paper submission	Mar. 9, 2016



Call for Papers



IEEE EMC
Shanghai
Chapter

Hong Kong
Chapter

TUESDAY, AUGUST 18 | 1300 – 1400 | TERRASSENEBENE

Posters will be on display from 1020 - 1800.

CHAIR: Mauro Feliziani, President International Steering Committee EMC Europe

- 4624 Investigation on the Effect of Impedance Changes in Broadband Antennas with Varying Antenna Height on Radiated Emission Measurement Below 1 GHz**
Shinichi Okuyama, Kakegawa EMC Center, NEC Platforms, Ltd., Kakegawa, Japan, Ikuo Makino, Fujitsu General EMC Laboratory, Ltd., Kawasaki, Japan, Hiroyuki Shimanoe, S-Tech Inc., Kawasaki, Japan and Hidenori Muramatsu, VCCI Council, Tokyo, Japan
- 4826 A Measurement System for Radiated Transient Electromagnetic Interference Based on General Purpose Instruments**
Marco Azpurua, Grup de Compatibilitat Electromagnètica, Universitat Politècnica de Catalunya, Barcelona, Spain, Ferran Silva, Universitat Politècnica de Catalunya, Grup de Compatibilitat Electromagnètica, Barcelona, Spain and Marc Pous, Universitat Politècnica de Catalunya, Barcelona, Spain
- 4858 Compensation Method for the Coupling Error Between the EUT and TEM Cell in E-field Probe Isotropic Calibration**
Huan Wang, Ph.D., China Academy of Information and Communications Technology, Beijing, China and Zhong Chen, ETS-Lindgren, Cedar Park, TX
- 5194 On the Quality of a Real Open Area Test Site**
Inès Barbary¹, Reiner Pape², Lars-Ole Fichte¹, Sebastian Lange³, Thomas Kleine-Ostmann², Thorsten Schrader², Martin Schaarschmidt³ and Marcus Stierner¹, (1)Helmut Schmidt University, Hamburg, Germany, (2)Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, (3)Scientific Computing, Bundeswehr Research Institute for Protective Technologies and NBC Protection, Munster, Germany
- 5250 Analytical Prediction of Common Mode Noise in a Source Stirred Reverberation Chamber**
Alfredo De Leo, Valter Mariani Primiani, Paola Russo and Graziano Cerri, Dipartimento di Ingegneria dell'Informazione, Università Politecnica delle Marche, Ancona, Italy
- 5293 EMC Analysis Including Receiver Characteristics - Pantograph Arcing and the Instrument Landing System**
Robert Geise, Oliver Kerfin, Björn Neubauer, Georg Zimmer and Achim Enders, Institute for Electromagnetic Compatibility, University of Braunschweig, Braunschweig, Germany
- 5316 An Interlaboratory Comparison for Mobile Phone SAR**
Andrei Marinescu, ICMET, Craiova, Romania, Yahya Emre Gülersoy, ICTA MSL Directorate, Ankara, Turkey and Gernot Schmid, Seibersdorf Labor GmbH, Seibersdorf, Austria
- 5327 Various Estimations of Composite Q-factor with Antennas in a Reverberation Chamber**
Philippe Besnier¹, Christophe Lemoine² and Jerome Sol², (1)IETR-CNRS-Institut National des Sciences Appliquées de Rennes, Rennes, France, (2)IETR-Institut National des Sciences Appliquées de Rennes, Rennes, France
- 5338 Feasibility Study of Multi-Frequency Test in a Single Rotation of Mode Stirred Reverberation Chamber**
Vignesh Rajamani, PhD, ECE, Oklahoma State University, Stillwater, OK and Gustav Freyer, Consultant, Monument, CO, USA
- 5361 Limitations of a Stripline for Immunity Tests on Road Vehicle Components**
Moawia Al-Hamid¹, Ralf Vick², Martin Krüger² and Philipp Wollmann³, (1)Chair for Electromagnetic Compatibility, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany, (2)Chair for Electromagnetic Compatibility, Otto-von-Guericke-University, Magdeburg, Germany, (3)Otto-von-Guericke University of Magdeburg, Magdeburg, Germany

**EMC 2015**

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Technical Program

5384 Optimization of Experiment Requirement in EMC Using Re-sampling Techniques

Chaouki Kasmi, Dr.¹, Emmanuel Prouff, Dr.², Sébastien Lalléchère, Dr.³, Sébastien Girard³, Françoise Paladian⁴ and Pierre Bonnet⁵, (1)Wireless and Hardware Security Lab, French Network and Information Security Agency, Paris, France, (2)Wireless and Hardware Security Lab, French Network and Information Security Agency, 75007, France, (3)CNRS UMR 6602, Institut Pascal Clermont université, Université Blaise Pascal, Aubière, France, (4) Physics Department -Pascal Institute - CNRS, UMR 6602 PHOTON axis - EMC group, Blaise Pascal University, Aubière, France, (5)Physics Department Pascal Institute - CNRS, UMR 6602 PHOTON axis - EMC group, Blaise Pascal University, Aubière, France

5593 Alternative Conducted Emission Measurements with LISN Simulation & CISPR 16 Voltage Probe

Osman Sen, Soydan Cakir, Savas Acak and Mustafa Cetintas, TUBITAK UME, Kocaeli, Turkey

5652 Direct Power Injection (DPI) Simulation Framework and Postprocessing

Andrea Lavarda and Bernd Deutschmann, Institute of Electronics, Graz University of Technology, Graz, Austria

5654 Adapter and Method for Improving the LISN Input Impedance Measurement Accuracy

François Ziadé¹, Mohamed Ouameur², Miha Kokalj³, André Poletaef¹, Borut Pinter³ and Djamel Allal¹, (1)Electrical Department, Laboratoire National de Métrologie et d'Essais (LNE), Trappes, France, (2)Polytech Clermont Ferrand, Clermont Ferrand, France, (3)Slovenian Institute of Quality and Metrology (SIQ), Ljubljana, Slovenia

5664 Alternative Conducted Immunity Testing with Multiple CDNs and Wire Winding

Soydan Cakir, Osman Sen, Savas Acak and Mustafa Cetintas, TUBITAK UME, Kocaeli, Turkey

5700 Wide Band Measurements in Time-Domain with Current and Voltage Probes for Power Losses Evaluation and EMC Measurements on Power Converters **BEST STUDENT PAPER FINALIST**

Kevin Loudiere¹, Arnaud Bréard¹, Christian Vollaie¹, François Costa², Houmam Moussa³ and Régis Meuret³, (1)Laboratoire Ampère, Ecullly, France, (2)Université Paris-Est SATIE-CNRS, Cachan, France, (3)Labinal Power Systems, Réau, France

5724 Time-Frequency Processing Adapted for the Different Electromagnetic Compatibility Issues in the Railways Domain

Mohamed Raouf Kousri^{1,2,3}, Virginie Deniau, Dr², Sylvie Baranowski³, Marc Heddebaut² and Jean Rioult², (1) Technological Research Institute, Railenium, Famars, France, (2)COSYS, IFSTTAR, villeneuve d'ascq, France, (3) IEMN, University Lille1 Sciences and Technologies, Villeneuve d'Ascq, France

5785 Broadband Phase Estimation Using Non-Coherent Measurement using a Spectrum Analyzer for EMI Applications

Zongyi Chen¹, Shubhankar Marathe², Hamed Kajbaf², Stephan Frei⁴ and David Pommerenke², (1)On-board Systems Lab - TU Dortmund, Dortmund, Germany, (2)EMC Laboratory, Missouri University of Science and Technology, Rolla, MO, (3)Amber Precision Instruments, San Jose, CA, (4)TU Dortmund University, Dortmund, Germany

5840 Spark-less Electrostatic Discharge (ESD) on Display Screens

Atieh Talebzadeh¹, Yingjie Gan², Ki-Hyuk Kim¹, Yiqiang Zhang³ and David Pommerenke¹, (1)EMC Laboratory, Missouri University of Science and Technology, Rolla, MO, (2)School of Science, Wuhan University of Technology, Wuhan, MO, China, (3)Nokia, Communication Company, Beijing, China

4855 Study on Triangular EBG Unit Cell Structures for Suppression of SSN in Power/Ground Planes

Jong Hwa Kwon, Radio Technology Research Department, ETRI, Daejeon, South Korea

5024 Nonlinear Loaded Microstrip Interconnect Analysis with Temperature Effect

Blaise Ravelo, Dr., Electronics, IRSEEM, Saint Etienne du Rouvray, France

- 5278 CSRR Common-Mode Filtering Structures in Multilayer Printed Circuit Boards**
Sang Goo Kang, Garrett Shaffer, Christopher Kodama, Christopher O'Daniel and Edward Wheeler, Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN
- 5395 Passive Device Degradation Models for a Electromagnetic Emission Robustness Study of a Buck DC-DC converter**
He Huang, Alexandre Boyer and Sonia Ben Dhia, LAAS CNRS, Toulouse, France
- 5584 Calculation of Power-Supply-Induced Jitter at a 3-D IC Channel including ESD Protection Circuits**
Eunkyeong Park¹, Jongjoo Lee², Youngwoo Park² and Jingook Kim¹, (1)Ulsan National Institute of Science and Technology, Ulsan, South Korea, (2)Samsung Electronics, Hwaseong, South Korea
- 5591 An Application of the Preference Set-based Design Method to Filter Designs**
Kawakami Masashi¹, Fengchao Xiao, Doctor², Kami Yoshio³ and Ishikawa Haruo³, (1)Dept. of Communication Engineering and Informatics, The University of Electro-Communications, Tokyo, Japan, (2)Communication Engineering and Informations, University of Electro-Communications, Tokyo, Japan, (3)The University of Electro-Communications, Tokyo, Japan
- 5619 Verification of Novel Extended Mixed-Mode S-parameters on Three-Conductor Lines**
Nan Zhang, School of Electric and Electronical Engineering, Sungkyunkwan University, Suwon, South Korea and Wansoo Nah, Department of Electrical and Electronics Engineering, Sungkyunkwan University, Suwon, South Korea
- 5734 Signal Integrity - EMI Affects the Reliability of Embedded Electronic Systems**
Kirsten Weide-Zaage, RESRI IMS-AS, Leibniz Universität Hannover, Hannover, Germany
- 5767 A Methodology to Characterize USB3 IO Link Signal Margin Variation in High Volume Manufacturing**
Steven Ji¹, Xiaoning Qi¹ and Sudeep Puligundla², (1)Intel Corporation, Santa Clara, CA, (2)Intel Corporation, Hillsboro, OR
- 5777 Stochastic Macromodeling for Hierarchical Uncertainty Quantification of Nonlinear Electronic Systems**
Giulio Antonini¹, Tom Dhaene², Luc Knockaert³, Domenico Spina⁴, Francesco Ferranti⁵, Georges Gielen⁶ and Dimitri De Jonghe⁶, (1)Dipartimento Ingegneria Industriale e dell'Informazione e di Economia, Università degli Studi dell'Aquila, L'Aquila, Italy, (2)Dept. of Information Technology, Ghent University, Ghent, Belgium, (3)Information Technology, Ghent University, Ghent, Belgium, (4)Information Technology, Ghent University - iMinds, Ghent, Belgium, (5)Department of Fundamental Electricity and Instrumentation, Vrije Universiteit Brussel, Brussels, Belgium, (6)Elektrotechniek ESAT-MICAS, KU Leuven, Leuven, Belgium

**EMC 2015**

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Technical Program

WEDNESDAY, AUGUST 19 | 1300 – 1400 | TERRASSENEBENE

Posters will be on display from 1020 - 1800.

CHAIR: Hans Georg Krauthäuser, General Chair EMC Dresden 2015

5282 Design Considerations of a Damped Sinewave Generator

Karl Thorup, MSEE, EMC, MOOG Inc., Salt Lake City, UT, USA

5642 Evaluation of The Electric-Field Transfer Functions Between IEMI Sources and Banking IT Equipment

Simon Runke¹, Mirjana Stojilovic², Sana Sliman², Marcos Rubinstein³, Markus Clemens¹, Nicolas Mora⁴ and Farhad Rachidi⁵, (1)Chair of Electromagnetic Theory, Bergische Universität Wuppertal, Wuppertal, Germany, (2)Institute of Information and Communication Technologies, University of Applied Sciences Western Switzerland, Yverdon-les-Bains, Switzerland, (3) Institute for Information and Communication Technologies, University of Applied Sciences Western Switzerland, Yverdon-les-Bains, Switzerland, (4)EMC Lab, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, (5)Electromagnetic Compatibility Laboratory, The Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland

5668 A Combined Time and Frequency Domain Characterization Method for Modeling of Overvoltage Protection Elements

Stanislav Scheier¹, Dominik Deelmann¹, Stephan Frei², Christian Widemann³ and Wolfgang Mathis³, (1)On-board Systems Lab - TU Dortmund University, Dortmund, Germany, (2)TU Dortmund University, Dortmund, Germany, (3)Leibniz Universität Hannover, Hannover, Germany

5818 Mathematical Expression of Electromagnetic Pulse in Immunity Standards

Corneliu Ursachi¹, Elena Helerea², Elena Larisa Mariut² and Marius Daniel Calin³, (1)Electric Engineering and Applied Physics, Transilvania University of Brasov, Brasov, Romania, (2)Transilvania University, Brasov, Romania, (3)Electrical Engineering and Applied Physics, Transilvania University of Brasov, Brasov, Romania

4484 Accurate Measurement of Transmission Line Parameters for Automotive Ethernet

Matthias Hampe, Department of Electrical Engineering, EMC, Ostfalia, Wolfenbuettel, Germany

5203 Design of Conductive Shield for Wireless Power Transfer System for Electric Vehicle Considering Automotive Body

Hongseok Kim, Chiuk Song, Dong-Hyun Kim, Yeonje Cho and Joungho Kim, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea

5651 BER Performance of GSM/EDGE Receiver under the Influence of adjacent Channel Interference

Zhaohai Jiang, Universität der Bundeswehr München, Neubiberg, Germany, Harald Gossner, Intel Deutschland GmbH, Neubiberg, Germany and Walter Hansch, Faculty of Electrical Engineering and Information Technology, Universität der Bundeswehr, Neubiberg, Germany

4935 Modeling of Rectifiers for Resonance Studies: A Pivotal Approach

Felix Kalunta, M.Sc, Electrical/Electronic Department, Electrical/Electronic Department, University of Lagos, Nigeria, Lagos, Nigeria and Frank Okafor, Ph.D, Professor, Electrical/Electronic engineering Department, University of Lagos, Lagos, Nigeria

5126 Some EMC Aspects of a 2 MV Marx Generator with Sensitive Diagnostic Equipment in the Immediate Vicinity

Alexander van Deursen and Pavlo Kochkin, Electrical Engineering, Eindhoven University of Technology, Eindhoven, Netherlands

5503 Specific Absorption Rate (SAR) Evaluation of Human Body Model in the Presence of Radar Wave Radiation on a Warship Deck

Yang Guo¹, Jian Wang², Hong-Ke Ma³, Lian-Dong Wang⁴ and Wen-Yan Yin Sr^{1,5}, (1)Centre for Optical and Electromagnetic Research (COER), Zhejiang University, Hangzhou, China, (2)School of Information Science and Engineering, Ningbo University, Ningbo, China, (3)Science and Technology on High Power Microwave Lab, Institute of Applied Electronics, Mianyang, China, (4)State Key Lab of Complex Electromagnetic Environment Effects on Electronics and Information System (CEMEE), Luoyang, China, (5)Key Lab of Ministry of Education of Design and EMC of High-Speed Electronic Systems, Zhejiang University/Shanghai Jiao Tong University, Shanghai, China

- 5168 Research on Twelve-phase Round-Shaped Transformers Applied in Rectifier Systems**
Tiejun Wang, Fang Fang, Xiaoyi Jiang and Lv Yang, Naval University of Engineering, Wuhan, China
- 5534 Wideband Characterization and Modeling of Coupled Inductors under Temperature Variations** **BEST STUDENT PAPER FINALIST** 
Fahim Hami^{1,2}, Habib Boulzazen² and Moncef Kadi³, (1)VeDeCoM, Versailles, France, (2)IRSEEM/ESIGELEC, Saint Etienne du Rouvray, France, (3)Electronics and Systems, IRSEEM/ESIGELEC, Rouen, France
- 5542 Electromagnetic Interfering Characteristics into the Air by a Buried Conductor as a Secondary ELF Line Source**
Sangmu Lee¹, Pyung-Dong Cho¹ and Dongho Kim², (1)Protocol Engineering Center, Electronics and Telecommunications Research Institute, Daejeon, South Korea, (2)Sejong University, Seoul, South Korea
- 5661 Predicting the Conducted Emissions of Switched-Mode Power Converters Including Component and Printed Circuit Board Parasitics**
Sören Weßling, Faculty of Electrical Engineering, Helmut Schmidt University / University of the Federal Armed Forces Hamburg, Hamburg, Germany and Stefan Dickmann, Institute of Fundamentals of Electrical Engineering, Helmut Schmidt University / University of the Federal Armed Forces Hamburg, Hamburg, Germany
- 5697 Modeling the Common Mode Impedance of Motor Drive Systems using the Antenna Wire Concept**
Rob Mestrom, Department of Electrical Engineering, Electromagnetics Group, Eindhoven University of Technology, Eindhoven, Netherlands, Anne Roc'h, Electrical Engineering Faculty - Electromagnetics, Eindhoven University of Technology, Eindhoven, Netherlands and Yingzhe Xi, Eindhoven University of Technology, Eindhoven, Netherlands
- 5774 Electric Current Exposure Evaluation of Hand in Current Perception Threshold Measurement**
Yoshitsugu Kamimura, Information Science, Utsunomiya University, Utsunomiya-shi, Japan
- 5836 Behavior of Fast Variable Loads at the Connection to the Power Supplying Source**
Petre-Marian Nicolae, Electrical Engineering, Energetic, and Aeronautics, University of Craiova, Craiova / Dolj County, Romania, Ileana-Diana Nicolae, Computer Science and Information Technology, University of Craiova, Craiova / Dolj County, Romania, Dinut - Lucian Popa, Electrical Engineering, Energetic, and Aeronautics, University of Craiova, Craiova, Romania and Marian - Stefan Nicolae, Electromechanics, Environment, and Industrial Informatics, Craiova, Romania
- 5039 Statistical Estimation of Maximum Electric Field in Electrically Large Cavity using Extreme Value Theory**
Tarek Bdour, OSA Department, XLIM Research Institute, Limoges, France and Alain Reineix, XLIM Laboratory, Limoges, France
- 5143 Processing of EMC Data with Factor Analysis**
Onofrio Losito, R&D, ITEL Telecomunicazioni srl, Ruvo Di Puglia (BA), Italy, Bruno Audone, Audone Consulting, Torino, Italy and Vincenzo Dimiccoli, ITEL Telecomunicazioni srl, Ruvo di Puglia, Italy
- 5409 Propagation Effects on Lightning Magnetic Fields Over Hilly and Mountainous Terrain**
Dongshuai Li^{1,2}, Javad Paknahad³, Farhad Rachidi², Marcos Rubinstein⁴, Keyhan Sheshyekani³, Zhenhui Wang¹ and Qilin Zhang¹, (1)Collaborative Innovation Center on Forecast and Evaluation of Meteorological Disasters, Nanjing University of Information Science and Technology (NUIST), Nanjing, China, (2)Electromagnetic Compatibility Laboratory, The Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, (3)Shahid Beneshti University, Tehran, Iran, (4)Institute for Information and Communications Technologies, HEIG-Vd, Switzerland, Yverdon-les-bains, Switzerland
- 5693 Calculation of Electromagnetic Emission Using Discontinuous Galerkin Time Domain Method**
Iskander Badzagua^{1,2}, Diana Eremian¹, Badri Khvitia^{1,2}, Zviad Kuchadze³, Giorgi Chiqovani¹, Zurab Sukhiashvili¹, Anna Gheonjian^{1,2} and Roman Jobava¹, (1)EMCoS Ltd., Tbilisi, Georgia, (2)Tbilisi State University, Tbilisi, Georgia, (3)EMCoS Research Laboratory, EMCoS Ltd., Tbilisi, Georgia



EMC 2015

DRESDEN, AUGUST 16-22

Technical Program

THURSDAY, AUGUST 20 | 1300 – 1400 | TERRASSENEBENE

Posters will be on display from 1020 - 1800.

CHAIR: Bob Scully, President IEEE EMC Society

4850 Reformation of the Japanese Guidelines for Cellular Phone Use in Hospitals

Eisuke Hanada, Department of Information Science, Saga University Graduate School, Saga, Japan and Takashi Kano, Faculty of Health and Medical Care, Saitama Medical University, Hidaka, Japan

5460 Grounded Theory and EMC immunity test

Per Thaastrup Jensen, Mr., DELTA, Hoersholm, Denmark

5793 Can the New EMC Directive, 2014/30/EU, Stem the Tide of Non-Compliant Products

Nick Wainwright, York EMC Services Ltd, York, United Kingdom

5124 MRI Image Distortion Due to Magnetic Materials in Medical Implants

Dick Harberts, EMC Consultancy, Philips Innovation Services, Eindhoven, Netherlands and Mark van Helvoort, Philips Healthcare, Best, Netherlands

5578 Directivity and Effective Radius of an Electrically Large EUT with Attached Wires

Xiaowei Wang, OVGU University Magdeburg, Magdeburg, Germany

4561 Identification of Electromagnetic Radiation Source with Support Vector Machines

Dan Shi¹, Junjian Bi², Chao Li³, Zhiliang Tan², Hongbo Wang⁴ and Yougang Gao⁵, (1)Beijing university of posts and telecommunications, Beijing, China, (2)Shijiazhuang Mechanical Engineering, Shijiazhuang, China, (3) ministry of industry and information technology, Beijing, China, (4)ministry of industry and information technology, Beijing, China, (5)Beijing university of posts and telecommunications, Beijing, China

4897 Protection Against Common Mode Currents on Exposed Cables **BEST SYMPOSIUM PAPER FINALIST**

B.J.A.M. (Bart) van Leersum^{1,2}, C.C.J. (Jan-Kees) van der Ven³, F.J.K. (Frits) Buesink¹ and F.B.J. (Frank) Leferink^{1,4}, (1)University of Twente, Enschede, Netherlands, (2)Defence Materiel Organisation, Ministry of Defence, The Hague, Netherlands, (3)Imtech Marine Netherlands B.V., Rotterdam, Netherlands, (4)Thales Nederland B.V., Hengelo, Netherlands

4946 Prediction of PCB Radiated Emission in Shielding Cavity Using Equivalent Dipole Modeling

WenJie Kong, Zhejiang University, HangZhou, China and Er-Ping Li, Zhejiang University, Hangzhou, China

4966 Diagnosis and Suppression of the Electromagnetic Interference in Vehicle Co-site Radio System

Xie Ma, Southwest Communication Institute, Chengdu, China

4981 Analysis of a Healthcare Platform RF Emission in Indoor Environment

Blaise Ravelo, Dr.¹, Jorge Miranda², Jorge Cabral², Stefan Wagner³, Christian Pedersen³, Mukthiar Memon³, Morten Mathiesen⁴ and Adam Jastrzebski⁵, (1)Electronics, IRSEEM, Saint Etienne du Rouvray, France, (2)Centro Algoritmi, University of Minho, Guimarães, Portugal, (3)Dept. of Engineering, Aarhus University, Aarhus, Denmark, (4)Sekoia, Aarhus, Denmark, (5)University of Kent, Canterbury, United Kingdom

5152 Grounding Design for Low-Cost Ball Grid Array Package with High Shielding Effectiveness

Keiju Yamada, Research Scientist, Corporate Research & Development Center, Toshiba Corporation, Kawasaki, Japan, Masaaki Ishida, Chief Research Scientist, Toshiba Corporation, Kawasaki, Japan and Tomohiro Iguchi, Senior Research Scientist, Toshiba Corporation, Yokohama, Japan

5309 Statistical Approach to the Result of FM Broadcast Frequency Deviation Measurements

Georgij Leontjev, Dr., Radio monitoring, Communications Regulatory Authority of the Republic of Lithuania, Vilnius, Lithuania

5422 Optimization of Spectrum Monitoring Network in VHF-UHF Range Using Irregular Structure of Network

Vadym Blagodarnyi, Doctor of Philosophy, Associate professor, Scientific and Methodical Department, State Enterprise "Ukrainian State Centre of Radio Frequencies", Kiev, Ukraine and Mykola Kaliuzhnyi, Doctor of Philosophy, Senior Researcher, Scientific and Research Laboratory, Ministry of Education, Kharkiv, Ukraine

5243 EMC Analysis Between Fixed Service and Broadcasting Satellite Service in the Band 10.7 – 11.7 GHz Interference Evaluation

Ryszard Zielinski, Electronics, Wroclaw University of Technology, Wroclaw, Poland

5343 Compact Wideband Balanced Filter for Eliminating Radio-Frequency Interference on Differentially-fed Antennas

Ying-Cheng Tseng¹, Pei-Yang Weng¹ and Tzong-Lin Wu², (1)National Taiwan University, Taipei City, Taiwan, (2) Graduate Institute of Communication Engineering, National Taiwan University, Taipei City, Taiwan

5346 A General Measurement Method of Parameter Extraction for High-Frequency Mounted Cables with Arbitrary Connectors

Xinwei Song, Junjun Wang, Bing Li and Donglin Su, Institute of EMC Technology, Beihang University, Beijing, China

5383 Characterization of EMI Effects in Communication Data Link System in the Presence of High-power Radar Radiation on the Warship Platform

Jing Jin^{1,2}, Hao Xie², Gang Zhao³, Jian Wang⁴, Manxi Wang¹ and Wen-Yan Yin Sr.², (1)State Key Lab of Complex Electromagnetic Environment Effects on Electronics and Information System (CEMEE), Luoyang, China, (2) Centre for Optical and EM Research (COER), Zhejiang University, Hangzhou, China, (3)Science and Technology on High Power Microwave Lab, Institute of Applied Electronics, CAEP, Mianyang, China, (4)School of Information Science and Engineering, Ningbo University, Ningbo, China

5507 Active Absorption/Transmission FSS Using Diodes

Shinya Kitagawa¹, Ryosuke Suga¹, Kiyomichi Araki² and Osamu Hashimoto¹, (1)Aoyama Gakuin University, Sagami-hara, Japan, (2)Tokyo Institute of Technology, Tokyo, Japan

5559 An Extension of Schelkunoff's Shielding Theory to Anisotropic Conducting Multilayer Materials

Fabian Happ, Frank Gronwald and Heinz-D. Brüns, Institut für Theoretische Elektrotechnik, Technische Universität Hamburg-Harburg (TUHH), Hamburg, Germany

5758 Modeling absorbing materials for EMI mitigation

Qian Liu¹, Xiangyang Jiao¹, Jing Li¹, Victor Khilkevich¹, Paul Dixon², Yoei Arien³ and James Drewniak⁴, (1)EMC Laboratory, Missouri University of Science and Technology, Rolla, MO, (2)Laird, Randolph, MA, (3)Laird, Geel, Belgium, (4)Missouri S&T EMC Laboratory, Missouri University of Science and Technology, Rolla, MO

5759 Experimental Analysis and Modeling of Coaxial Transmission Lines with Soft Shield Defects

Hossein Manesh, ESYCOM Laboratory, Paris-Est University, Marne-la-Vallée, France, Abélin Kameni, Université Paris-Sud, GeePs (Group of electrical engineering of Paris), Gif-sur-Yvette, France, Florent Loete, GeePs (Group of electrical engineering of Paris), Gif-sur-Yvette, France, Jérôme Genoulaz, R&D, LABINAL POWER SYSTEMS, BLAGNAC, France, Lionel Pichon, GeePs (Group of electrical engineering of Paris), UMR 8507 CNRS, Université Paris-Sud, UPMC, Gif-sur-Yvette, France and Odile Picon, ESYCOM - EA 2552 Université Paris-Est, Marne-la-Vallée, France

5762 Using Simulation & Joint Time/Frequency Domain Analysis to Evaluate Absorber/Lossy Material Performance in Resonant Cavities

Bruce Archambeault, PhD, Systems & Technology Group, IBM Corporation, RTP, NC, Michael Varner, Rose-Hulman University, Terre Haute, IN, Jiawei Zhang, Rose-Hulman, Terre Haute, IN, Samuel Connor, Systems Group, IBM Corporation, RTP, NC and Edward Wheeler, Electrical and Computer Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN



EMC 2015

DRESDEN, AUGUST 16-22

Technical Program

CLAYTON R. PAUL GLOBAL UNIVERSITY



Once again, the Global University will offer basic instruction on EMC combined with high level topics for the attendees of the Joint IEEE EMC Symposium. The faculty includes outstanding and internationally renowned teachers from all over the world.



Professor Flavio Canavero, Torino, Italy
Chairman, Clayton R. Paul Global EMC University

ANTENNAS AND EM RADIATION

Monday, August 17 | 1400 - 1530
Seminarraum 4

Professor Jan Carlsson, *SP Technical Research Institute of Sweden*, Borås, Sweden

- What is an antenna, applications, antenna types
- Some theory, definitions and principles: electromagnetic fields, field regions, plane waves, polarization, reciprocity
- Antenna characteristics: Equivalent circuit models for transmit and receive, impedance, impedance matching, radiation properties (power density, radiation intensity, directive gain, directivity, relative power gain, antenna efficiency, radiation efficiency), point-to-point communication (LOS), multipath communication (diversity and combining methods)
- Example of antenna types and their characteristics: Dipole, monopole, log-periodic dipole, horn, reflector, microstrip, IFA, PIFA
- Small antennas: Definition, fundamental limitations
- Broadband antennas
- Antenna measurements: Gain, radiation pattern, classical measurement ranges, outdoor and indoor, reverberation chamber

CORRELATING BETWEEN EMC TEST FACILITIES AND THE ROLE OF EUT DIRECTIVITY

Monday, August 17 | 1600 - 1730
Seminarraum 4

Dr. Perry Wilson, *NIST*, Boulder, CO, USA

Emission and immunity tests can be made at a variety of EMC test facilities. These include open area test sites (OATS), semi-anechoic chambers (SAC), fully anechoic rooms (FAR), and reverberation chambers (RC). Ideally each of these facilities would yield the same test result for a given test object, that is, a product that passes a test in one facility would pass tests in the others and a product that fails in one facility would fail in the others. This ideal case could be met if emission and immunity data could be exactly correlated between EMC facilities. However, because most test objects are quite complex and because present EMC facility test methods sample different subsets of the full range of possible emission and immunity test variables, exact correlation of test data is typically not possible. This lecture will review simple models to describe emission and immunity tests and correlation at the above facilities, and the role of directivity as one transitions from simple (electrically small) to complex (electrically large) patterns.

THE CLAYTON R. PAUL GLOBAL UNIVERSITY WAS ESTABLISHED IN 2007 TO PROVIDE ENGINEERS, TECHNICIANS, AND PROFESSIONALS WITH ADVANCED EDUCATION OPPORTUNITIES. THIS IS A CERTIFICATE PROGRAM AVAILABLE TO THOSE WITH AN ENGINEERING OR TECHNOLOGY DEGREE AND IS AVAILABLE FOR AN ADDITIONAL REGISTRATION FEE.

SIGNAL INTEGRITY ENGINEERING FOR HIGH-SPEED LINKS

Tuesday, August 18 | 1400 - 1530
Seminarraum 4

Professor Christian Schuster, *Technical University
Hamburg-Harburg (TUHH)*, Hamburg, Germany

Introduction to the fundamentals of signal integrity engineering for high-speed digital systems with a focus on packaging aspects. Topics that will be addressed include lumped discontinuities, transmission line effects, crosstalk, via and power plane effects, return current issues, and measurement techniques for Gbps links.

SHIELDING, CABLING AND FILTERING FOR EMC

Tuesday, August 18 | 1600 - 1730
Seminarraum 4

Dr. Franz Schlagenhauser, *The University of
Western Australia*, Perth, Australia

Electromagnetic fundamentals as the common base for understanding principle shielding, cabling and filtering techniques.

- Shielding: Low frequency electric and magnetic fields, Schelkunoff approach, shielding degradation due to openings, practical shielding enclosure design
- Cabling: Coaxial and twisted pair cables, coupling between cables, cable transfer impedance, grounding of cable screens, examples
- Filtering: Filter parameters, installation, importance of low-impedance grounding, ferrites

PRINTED CIRCUIT BOARD DESIGN AND LAYOUT FOR EMC

Wednesday, August 19 | 1400 - 1530
Seminarraum 4

Professor Todd H. Hubing, *Clemson University
International Center for Automotive Research*, Greenville, SC, USA

- Importance of proper board layout for EMC
- Identifying the unintentional antennas on a board
- Identifying noise sources and coupling mechanisms
- Circuit board grounding vs. current return
- Proper use of design rules and modeling tools
- Design examples

POWER INTEGRITY

Wednesday, August 19 | 1600 - 1730
Seminarraum 4

Professor Tzong-Lin Wu, *National Taiwan
University*, Taipei, Taiwan

- Advanced Packaging and Power Integrity
- Power Distribution Network (PDN)
- Mechanism of Power Noise
- Quantification of Power Noise
- Strategies to Suppress Power Noise

In 2014, the Board of Directors voted to name the Global University in honor of Clayton R. Paul, who dedicated his career to EMC education and was instrumental in setting up the initial Global University. We are pleased to be able to offer Global University once again at the 2015 IEEE International Symposium on Electromagnetic Compatibility and EMC Europe.

**EMC 2015**

DRESDEN, AUGUST 16-22

Technical Program

EMC/EMI ASPECTS OF POWER ELECTRONICS

Thursday, August 20 | 1400 - 1530
Seminarraum 4

Professor Tsuyoshi Funaki, *Osaka University, Japan*

Power electronics flexibly convert voltage, current, and frequency of electricity based on the switching operation of a power device. Inductors and capacitors are used to store electrical energy for switching short period and smooth the input and output voltage and current. The higher switching frequency with fast switching of a power device not only makes high controllability of the converter, but also miniaturizes the system with smaller inductance and capacitance.

The basics of power conversion mechanism in power electronics is explained at first with assuming an ideal switching operation and circuit configuration; e.g. DC-DC step up/down converter, DC-AC inverter, and AC-DC converter.

The key component in a power conversion circuit is a power switching device, which also causes EMI noise in its operation. The non-ideal behavior of a power device in switching operation is explained precisely based on the semiconductor physics.

The parasitic inductance and capacitance originates from the geometric structure of component and wirings in actual circuits. The mechanisms to generate EMI noise by the interaction of switching operation in power device and parasitic components in the circuit is addressed.

The switching operation in power conversion circuit intrinsically generates differential mode noise, which is almost suppressed with the properly designed filter circuit. The asymmetry of circuit topology induces the common mode noise, which should be suppressed to avoid noise emission. The mechanisms for common mode noise generation are also explained.

EVALUATION OF MEASUREMENT UNCERTAINTY (MU) IN EMC: BASICS, APPLICATIONS, TRENDS

Thursday, August 20 | 1600 - 1730
Seminarraum 4

Dr. Carlo Carobbi, *Università degli Studi di Firenze, Firenze, Italy*

Topics covered include terminology and definitions, probability density functions, measurement model, law of propagation of uncertainty, central limit theorem, coverage interval and coverage probability, non-linear models and propagation of distributions.

Examples of MU calculation in EMC testing and calibrations will be addressed as well as how evaluation of MU will change in the near future (the new GUM).

**WANT TO LEARN MORE ABOUT THE
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BEST SYMPOSIUM PAPER AWARD FINALISTS

PAPER TITLE	AUTHORS
Protection Against Common Mode Currents on Exposed Cables	B.J.A.M. (Bart) van Leersum ^{1,2} , C.C.J. (Jan-Kees) van der Ven ³ , F.J.K. (Frits) Buesink ¹ and F.B.J. (Frank) Leferink ^{1,4} , (1)University of Twente, Enschede, Netherlands, (2)Defence Materiel Organisation, Ministry of Defence, The Hague, Netherlands, (3)Imtech Marine Netherlands B.V., Rotterdam, Netherlands, (4)Thales Nederland B.V., Hengelo, Netherlands
Transfer Characteristic of a MV/LV Transformer in the Frequency Range between 2 kHz and 150 kHz	Stefan Schöttke, Stephan Rademacher, Jan Meyer and Peter Schegner, Institute of Electrical Power Systems and High Voltage Engineering, Technische Universität Dresden, Dresden, Germany
Impact of Rogowski Sensors on the EMC Performance of MV Power Substations	Christian Suttner ¹ , Stefan Tenbohlen ¹ and Werner Ebbinghaus ² , (1)Institute of Power Transmission and High Voltage Technology, University of Stuttgart, Stuttgart, Germany, (2)ABB AG, Ratingen, Germany
Detection Method for Overclocking by Intentional Electromagnetic Interference	A. Nagao ¹ , Y. Okugawa ¹ , K. Takaya ¹ , Y. Hayashi ² , N. Homma ² , and T. Aoki ² , (1) NTT Energy and Environment Systems Laboratories, Musashino-shi, Japan, (2) Tohoku University, Sendai, Japan
Shielding Effectiveness of Screened Rooms with Line Feed-Throughs - a Semi-Analytical Approach	H. Karcoon ⁽¹⁾ , S. Parr ⁽¹⁾ , S. Dickmann ⁽¹⁾ , and R. Rambousky ⁽²⁾ , (1), Helmut Schmidt Univ. / Univ. of the Federal Armed Forces, Hamburg, Germany, (2) Bundeswehr Research Institute for Protective Technologies, Munster, Germany
Subminiature Common Mode Filter with Integrated ESD Protection	Jens Werner ¹ , Jennifer Schütt ² , Guido Notermans ² , (1)Jade University of Applied Science, Wilhelmshaven, Germany, (2)NXP Semiconductors Germany GmbH, Hamburg, Germany
Experience on Proficiency Testing in Italy	Carlo Carobbi ¹ , Alessio Bonci ¹ , Marco Cati ² , Carlo Panconi ³ , Michele Borsero ⁴ , Giuseppe Vizio ⁴ , (1)Department of Information Engineering, Università degli Studi di Firenze, Firenze, Italy, (2)Powersoft S.p.A., Firenze, Italy, (3)Elettrotecnologia, Pistoia, Italy, (4)INRIM, Torino, Italy
Conformal Equivalent Circuit Model and Leapfrog Alternating Direction Implicit Formulation for Fast Simulation of Power Delivery Network	Tadatoshi Sekine ¹ , and Hideki Asai ² , (1) Mechanical Engineering, Shizuoka University, Hamamatsu-shi, Japan, (2) Nanovision Research Division, Research Institute of Electronics, Shizuoka University, Hamamatsu-shi, Japan
Broadband Equivalent-Circuit Model for Non-Uniform Transmission Lines	Andreas Mantzke, Sebastian Südekum, Marco Leone, Otto-von-Guericke University, Magdeburg, Germany
An Experimental Study of Electrostatic Discharge Immunity Testing for Wearable Devices	Takeshi Ishida ¹ , Shuichi Nitta ¹ , Fengchao Xiao ² , Yoshio Kami ³ , Osamu Fujiwara ⁴ , (1) Engineering dept., Noise Laboratory Co.,LTD, Sagamihara, Japan, (2)Communication Engineering and Informations, University of Electro-Communications, Tokyo, Japan, (3) Center of Industrial and Governmental Relation, University of Electro-Communications, Tokyo, Japan, (4)Nagoya Institute of Technology, Nagoya, Japan
High Frequency Models of Toroidal Inductors for EMC Filtering	Felix Traub, Stanislav Skibin and Bernhard Wunsch, ABB Switzerland AG, Baden-Dättwil, Switzerland
Challenges of Time Domain Measurement of Field-field Correlation for Complex PCBs	Chris Smartt ¹ , Dave Thomas ¹ , Hayan Nasser ¹ , Mohd Baharuddin ¹ , Gabriele Gradoni ² , Gregor Tanner ² and Stephen Creagh ² , (1)Electrical Systems and Optics, University of Nottingham, Nottingham, United Kingdom, (2)School of Mathematical Sciences, The University of Nottingham, Nottingham, United Kingdom
Experimental Investigations on the Pulsed Power Switch of a HIRA based UWB System	Vijay Bhosale ¹ , Joy Thomas M. ² , D.C. Pande ³ and Joseph Vas ² , (1) DRDO, LRDE, Bangalore, India, (2) Electrical Engineering, Indian Institute of Science, Bangalore, India, (3) ÉMI-EMC, LRDE, Bangalore, India



EMC Europe 2016

International Symposium and Exhibition on
Electromagnetic Compatibility

September 5 - 9, 2016, Wrocław, Poland

Organized by:

Wrocław University of Technology



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Important dates:

Submission of preliminary papers:

February 15, 2016

Submission of proposals for workshops, tutorials,
special sessions and short courses:

March 15, 2016

Acceptance notification:

April 18, 2016

Submission of final papers and materials
for workshops and tutorials:

May 16, 2016

Reduced registration fee:

May 16, 2016

Further information: www.emceurope.org/2016
www.emceurope.eu/2016



BEST STUDENT PAPER AWARD FINALISTS

PAPER TITLE	ID	AUTHORS
An Evaluation of the Independent Stirrer Positions in the Dresden Reverberation Chambers based on Field Homogeneity within a Defined Test Volume	4464	Stephan Pfnig, Chair of Electromagnetic Theory and Compatibility, Technical University Dresden, Dresden, Germany
Influence of Parasitic Elements on Radiated Emissions of a Boost Converter	4955	Lars Middelstaedt ¹ , Andreas Lindemann ¹ , Moawia Al-Hamid ² , Ralf Vick ² , (1)Chair for Power Electronics, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany, (2)Chair for Electromagnetic Compatibility, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany
Conducted Emission Characteristics of CCM Boost Converter with SiC Schottky Barrier Diode	5156	Takaaki Ibuchi and Tsuyoshi Funaki, Osaka University, Suita, Osaka, Japan
Antenna Factor Determination of a Shielded Standard Loop Antenna	5374	Nino Richter ¹ , Alexander Küllmer ² , Achim Enders ² , Axel Junge ¹ , (1)EMC Section, European Space Agency -ESTEC, Noordwijk, Netherlands, (2)Institute for Electromagnetic Compatibility, TU Braunschweig, Braunschweig, Germany
Effect of Pulsed Interference on an ASK Receiver	5406	Stefan van De Beek ¹ , Silvo Jeunink ¹ and Frank Leferink ^{1,2} , (1) University of Twente, Enschede, The Netherlands, (2) Thales Nederland B.V., Hengelo, The Netherlands
Extension of the Emission Measurements for Alternative Test Methods above 1 GHz for Unintentional Electromagnetic Radiators	5519	Benjamin Menßen, David Hamann and Heyno Garbe, Institute of Electrical Engineering and Measurement Technology, Leibniz Universität Hannover, Hannover, Germany
Wideband Characterization and Modeling of Coupled Inductors under Temperature Variations	5534	Fahim Hami ^{1,2} , Habib Boulzazen ² and Moncef Kadi ³ , (1) VeDeCoM, Versailles, France, (2)IRSEEM/ESIGELEC, Saint Etienne du Rouvray, France, (3)Electronics and Systems, IRSEEM/ESIGELEC, Rouen, France
Electromagnetic Shielding Properties of Nano Carbon Filled Silicone Rubber Composites	5597	Joseph Vas and Joy Thomas, Indian Institute of Science, Bangalore, India
Wide Band Measurements in Time-Domain with Current and Voltage Probes for Power Losses Evaluation and EMC Measurement on Power Converters	5700	Kevin Loudiere ¹ , Arnaud Bréard ¹ , Christian Vollaie ¹ , François Costa ² , Houmam Moussa ³ and Régis Meuret ³ , (1)Laboratoire Ampère, Ecully, France, (2)Université Paris-Est SATIE-CNRS, Cachan, France, (3)Labinal Power Systems, Réau, France
Immunity of Modulation Schemes in Automotive Low Bitrate Power Line Communication Systems	5834	A. Zeichner, S. Frei, S. A. Hassanpour Razavi, TU Dortmund, Dortmund, Germany

**EMC 2015**

DRESDEN, AUGUST 16-22

Technical Program

TECHNICAL COMMITTEES



Technical Committee (TC) Meetings play an important role in the overall success of the EMC Society by promoting activities in their fields and providing expert knowledge and assistance to generate and review technical papers, organize and operate sessions at symposia, generate and develop standards, and evaluate the state of the art in EMC science. All meetings are open to everyone; join them for breakfast, a break, lunch, or dinner. Listen to the discussions and learn what they are working on. Join your peers who volunteer to make EMC better.

TECHNICAL COMMITTEE 1 | **EMC MANAGEMENT**

Tuesday, August 18 | 0730 - 0930 | Seminarraum 5

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.

TECHNICAL COMMITTEE 2 | **EMC MEASUREMENTS**

Tuesday, August 18 | 0700 - 0830 | Seminarraum 1

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

TECHNICAL COMMITTEE 3 | **ELECTROMAGNETIC ENVIRONMENT**

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

TECHNICAL COMMITTEE 4 | **EMI CONTROL**

Wednesday, August 19 | 1200 - 1400 | Seminarraum 4

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.

TECHNICAL COMMITTEE 5 | **HIGH POWER ELECTROMAGNETICS**

Wednesday, August 19 | 1200 - 1330 | Seminarraum 2

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

TECHNICAL COMMITTEE 6 | **SPECTRUM MANAGEMENT**

Tuesday, August 18 | 1200 - 1330 | Seminarraum 5

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.

TECHNICAL COMMITTEE 7 | **LOW FREQUENCY EMC**

Tuesday, August 18 | 1200 - 1330 | Seminarraum 6

This 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.

TECHNICAL COMMITTEE 9 | **COMPUTATIONAL ELECTROMAGNETICS**

Tuesday, August 18 | 1200 - 1330 | Seminarraum 1

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.

TECHNICAL COMMITTEE 10 | **SIGNAL AND POWER INTEGRITY**

Wednesday, August 19 | 1200 - 1300 | Seminarraum 1

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

TECHNICAL COMMITTEE 11 | **NANOTECHNOLOGY**

Thursday, August 20 | 1200 - 1300 | Seminarraum 6

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

SPECIAL COMMITTEE 1 | **SMART GRID**

Monday, August 17 | 1745 - 1830 | Seminarraum 2

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

SPECIAL COMMITTEE 4 | **EMC FOR EMERGING WIRELESS TECHNOLOGIES**

Tuesday, August 18 | 0800 - 0900 | Seminarraum 6

This committee is concerned with the design, analysis, modeling and measurement for interference control and mitigation in emerging wireless products. The committee encourages research including but not limited to the following areas: EMC-based system architecture design and system planning, strategic EMC performance budgeting and distribution, new system interface requirements and new system integration methods, intra-system coupling path analysis, modeling and validation, new EMC evaluation/measurement methods and standards for components/devices, innovative component designs with integrated EMC functionalities, new EMC material requirements, applications and evaluation methods, and interdisciplinary issues involving EMC, audio, mechanical, and thermal designs.

SPECIAL COMMITTEE 6 | **UNMANNED AIRCRAFT SYSTEMS EMC**

Monday, August 17 | 1200 - 1330 | Seminarraum 3

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



EMC 2015

DRESDEN, AUGUST 16-22

Technical Program

MEETING NAME	START TIME	END TIME	ROOM
Saturday, August 15			
Strategic Planning Committee Meeting	1600	1800	Seminarraum 4
Board of Directors Executive Committee (ExCom) Meeting	1800	2200	Seminarraum 4
Sunday, August 16			
Board of Directors (BoD) Meeting	0830	1700	Seminarraum 3
IEC Joint Task Force TEM	0900	1700	Seminarraum 4
dB Society Picnic "BEAUTIFUL BAROQUE"	1830	2130	Pulverturm
Monday, August 17			
Technical Advisory Committee (TAC) Meeting #1	0700	0930	Seminarraum 3
Standards Development & Education Committee (SDECom) Meeting	0800	1100	Seminarraum 2
Standards Advisory & Coordination Committee (SACCom) Meeting	1100	1200	Seminarraum 2
SC 6: Unmanned Aircraft Systems EMC	1200	1330	Seminarraum 3
IEEE Std P1302 - On Board Shielding, Planar Materials, Forensic Pouches	1400	1730	Seminarraum 1
SC 1: Special Committee on Smart Grid	1745	1830	Seminarraum 2
EMCS Chapter Chair Dinner	1730	2030	Seminarraum 6
International Steering Committee (ISC) EMC Europe Meeting #1	1800	2000	Seminarraum 3
International Steering Committee (ISC) EMC Europe Dinner	2000	2300	Restaurant
Tuesday, August 18			
TC 2: EMC Measurements	0700	0830	Seminarraum 1
TC 1: EMC Management	0730	0930	Seminarraum 5
SC 4: EMC for Emerging Wireless Technologies	0800	0900	Seminarraum 6
TC 6: Spectrum Engineering	1200	1330	Seminarraum 5
TC 7: Low Frequency EMC	1200	1330	Seminarraum 6
TC 9: Computational Electromagnetics	1200	1330	Seminarraum 1
TEMC Editorial Board Meeting	1200	1400	Seminarraum 3
IEEE Validation and Risk Management Std	1400	1730	Seminarraum 1
Wednesday, August 19			
Education and Student Activities Committee (ESAC) Meeting	0700	0900	Seminarraum 4
Working Group DKE AK767.0.5 Meeting	0900	1700	Seminarraum 3
Senior Member Elevation	1000	1600	Seminarraum 7
TC 4: Electromagnetic Interference Control	1200	1400	Seminarraum 4

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COLLATERAL MEETINGS

MEETING NAME	START TIME	END TIME	ROOM
Wednesday, August 19 <i>continued</i>			
TC 5: High Power Electromagnetics	1200	1330	Seminarraum 2
TC 10: Signal and Power Integrity	1200	1300	Seminarraum 1
EMC Young Professionals Luncheon	1200	1330	Seminarraum 6
Thursday, August 20			
Exhibitors Breakfast	0830	0945	Restaurant ICD
Subcommittee DKE UK 767.4 Meeting	0900	1700	Seminarraum 3
Past President Luncheon	1130	1330	Lounge/Blue Bar
TC 11: Nanotechnology and Advanced Materials	1200	1300	Seminarraum 6
EMCS Chapter Chair Training	1200	1400	Seminarraum 1
Women in Compliance Lunch	1200	1330	Seminarraum 2
International Steering Committee (ISC) EMC Europe Meeting #2	1200	1330	Restaurant
IEEE Std 1128 – Absorber Evaluation - Revision	1400	1500	Seminarraum 1
Standards Development & Education Committee (SDECom) Meeting	1500	1730	Seminarraum 2
Board of Directors (BoD) Meeting	1800	2200	Seminarraum 1
Friday, August 21			
Technical Advisory Committee (TAC) Meeting #2	0700	0930	Seminarraum 1
Subcommittee DKE UK 767.4 Meeting	0900	1600	Seminarraum 3
2015 EMC Symposium Wrap Up Session	1430	1630	Seminarraum 1
Saturday, August 22			
JTF Reverberation Chamber	0900	1700	Seminarraum 1

OTHER SYMPOSIUM EVENTS	Start Time	End Time	Room
Sunday, August 16			
Tote Bag Stuffing	1200	1400	Registration Counter
Monday, August 17 through Friday, August 21			
Speakers Breakfast Coffee	0730	0815	Restaurant
Speaker Ready Room (Media Check)	0700	1700	Konferenz 7
Companion Hospitality			Bürraum Saal Ebene
Monday, August 17 through Thursday, August 20			
Clayton R. Paul Global University	1400	1730	Seminarraum 4



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- Social networking, connecting and unique Ottawa culture

www.emc2016.emcss.org



The General Chair for EMC 2016, **Kris Hatashita**, and the General Vice Chairs, **Wahab Almuhtadi** and **Qiubo Ye** invite EMC and SI professionals, engineers, researchers, and leaders from industry and academia to convene in The Shaw Centre in Ottawa, Canada with hundreds of international experts in the field to learn, exchange ideas and engage in professional development.

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LEADING EDGE INFO:

- EMC Measurements
- EMI Control
- EMC Management
- Low Frequency EMC
- Computational Electromagnetics
- High Power Electromagnetics
- Electromagnetic Environments
- Military EMC - Special Sessions
- Theme Topic I – Signal & Power Integrity
 - High-speed channel characterization and modeling
 - Signal/power integrity co-design and co-simulation
 - 3D IC and 3D packaging
 - Measurement techniques
 - Jitter, equalization, BER
- Theme Topic II – EMC for Emerging Technologies
 - Wireless EMC
 - Radio-Frequency Interference
 - Smart Grid EMC
 - Nano-Materials and Silicon Photonics
 - Unmanned Aircraft Systems EMC
- Theme Topic III – Space EMC
 - Launch vehicles
 - On-orbit platforms
 - Systems and Networks
 - Design and Mitigation for the Space Environment



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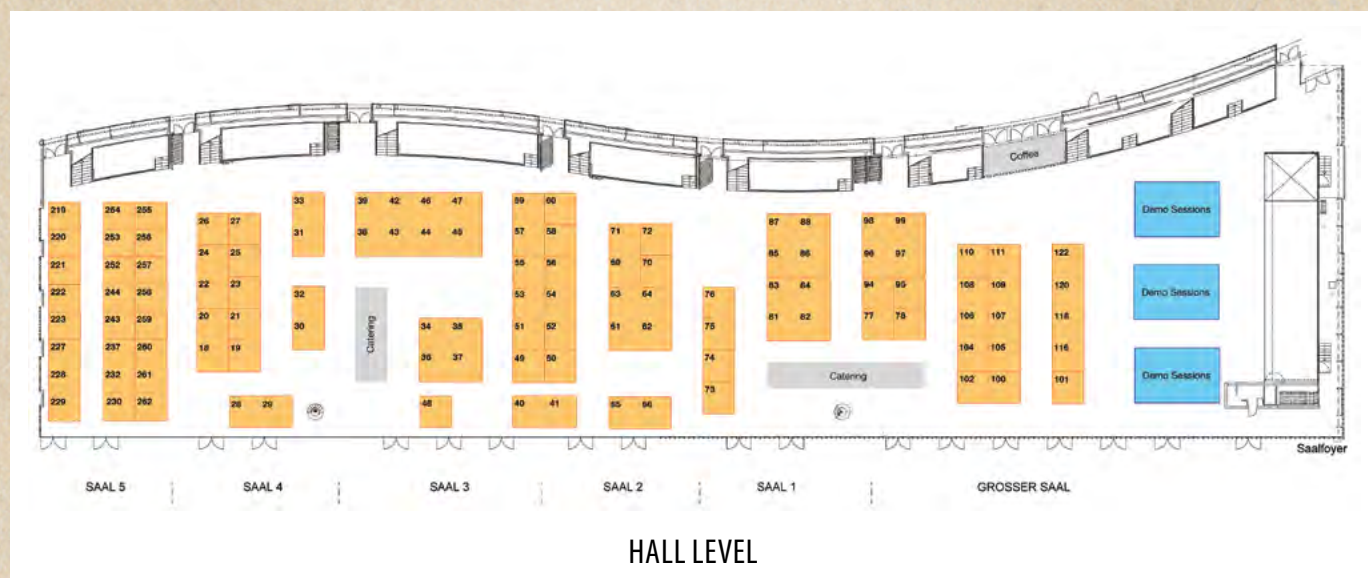


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ANSI Workshop

EMC 2015

DRESDEN, AUGUST 16-22

Emission Measurements (New 2014 Edition of ANSI C63.4) and Time Domain (TD) Applications (draft ANSI C63.25)

(Visit www.c63.org for more information) This combined workshop is presented in two parts during one full day. Topics covered include: (1) review of the new 2014 edition of ANSI C63.4 and (2) preview of the draft ANSI C63.25 site validation document and application of Time Domain (TD) measurements for test site validation and antenna calibration. These workshops are designed to increase your understanding of the new C63.4 standard and the TD approach. For the C63.4 workshop, there will be an analysis of the test site validation including using

the CISPR SVSWR method above 1 GHz, requirements for hybrid antenna use, test setup requirements and many other changes from that of the previous edition in 2009. Application of time domain methods to validating test sites will also be presented along with a demonstration using a Keysight PNA microwave network analyzer. As time permits, attendees will get a chance to apply what they learned via problem solving and/or participating in the real-time time domain demonstration.

In the C63.4 workshop, you will learn changes between the 2009 and 2014 editions in these areas:

- RF emission measurement procedures above 1 GHz
- Regulatory implications
- Test facility changes and hybrid antenna validation
- Handling tablet PCs, rack-mounted equipment and visual displays
- The basic information contained in the CISPR 32 (multimedia, IT and receivers) testing approach

In the Time Domain (C63.25 draft) workshop, you will learn:

- Application for site validation
- Application for antenna calibration
- Updates on the draft standard

Support material provided

- A complete lecture flash drive

Who Should Attend

Those responsible for determining compliance with FCC Rules and Regulations (and CISPR 22/32), including:

- Product managers and developers
- EMC engineers and test technicians
- Regulatory compliance managers
- Test instrumentation developers
- Those using and calibrating antennas in making radiated emission compliance measurements
- Calibration technicians
- Calibration and measurement accreditation bodies
- Lab quality assessors
- Test instrumentation and chamber manufacturers

Expert Instructors

Workshops feature leading industry experts and ANSI C63" members, including Don Heirman, Workshop Director, (Don HEIRMAN Consultants), and Zhong Chen (ETS-Lindgren).

Date and Location

August 14, 2015

Technical University (TU) -Dresden

Address and room number to be provided upon registration.

Fee Includes

Transportation to/from the Maritim Hotel (host hotel for IEEE EMC Symposium) and TU-Dresden, complete lecture flash drive, continental breakfast, lunch, breaks, and completion certificate. Fee does NOT include copies of the draft or published standards. Fee does NOT include hotel accommodations. See www.emc2015.org for hotel and symposium information.

Agenda

ANSI C63.4: Half-day August 14

8:00 am Registration

Class: 8:30 am to 12:00 pm

Time Domain: Half-day August 14

Registration: 12:00 pm

Class: 1:00 pm to 5:00 pm

Registration Form

Telephone: 425-868-2558

Contact: Janet O'Neil

j.n.oneil@ieee.org

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Time Domain workshop only – August 14 (afternoon)

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Both workshops – All day August 14

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Please do not mail after July 15.

Please visit www.c63.org/workshops.htm for more information on ANSI ASC C63", these workshops, and speaker biographies.

NOTE: You are not registered until you receive confirmation.

****With prior telephone confirmation only.**

The organizing committee reserves the right to substitute speakers, modify the program (or lecture notes), restrict attendance or to cancel the workshop(s). In the event the workshop(s) is/are canceled, registration fees will be refunded. No refunds will be made to individuals who cancel after July 10. Substitutions are allowed. Workshops without a minimum of six attendees signed up by 27 July 2015 will be cancelled and registration fees returned. It is suggested that you book refundable travel arrangements as appropriate if workshop(s) is/(are) cancelled.

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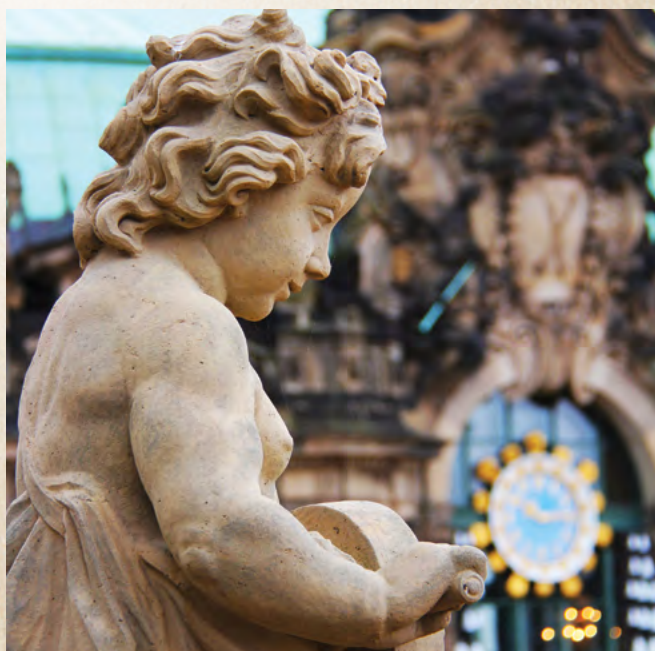
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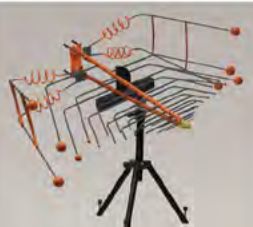
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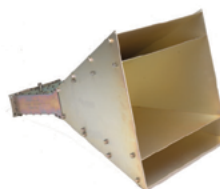
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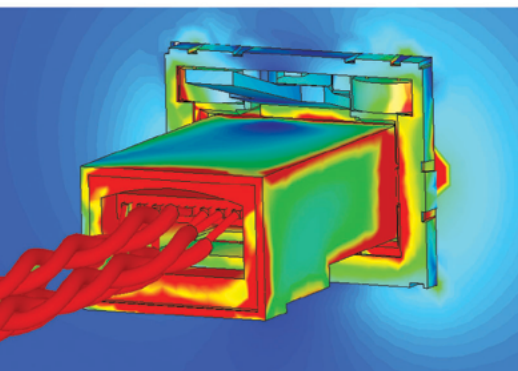
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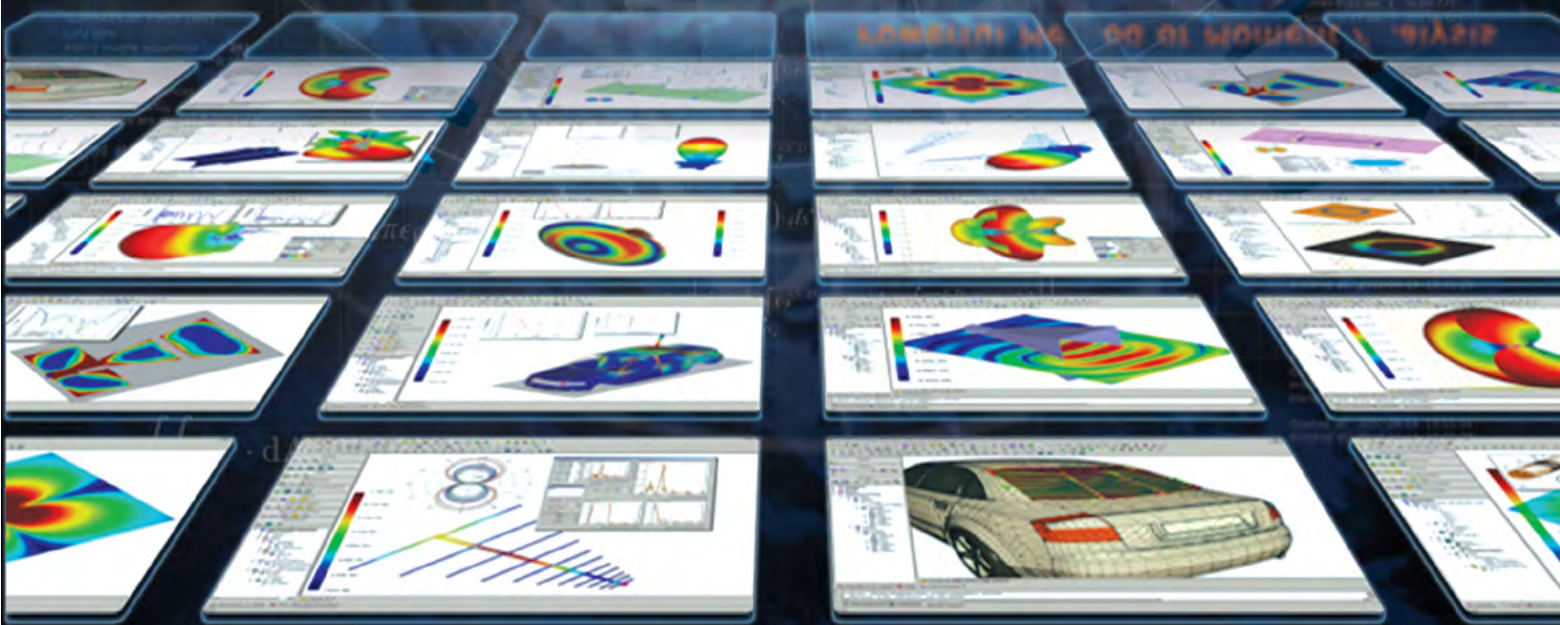
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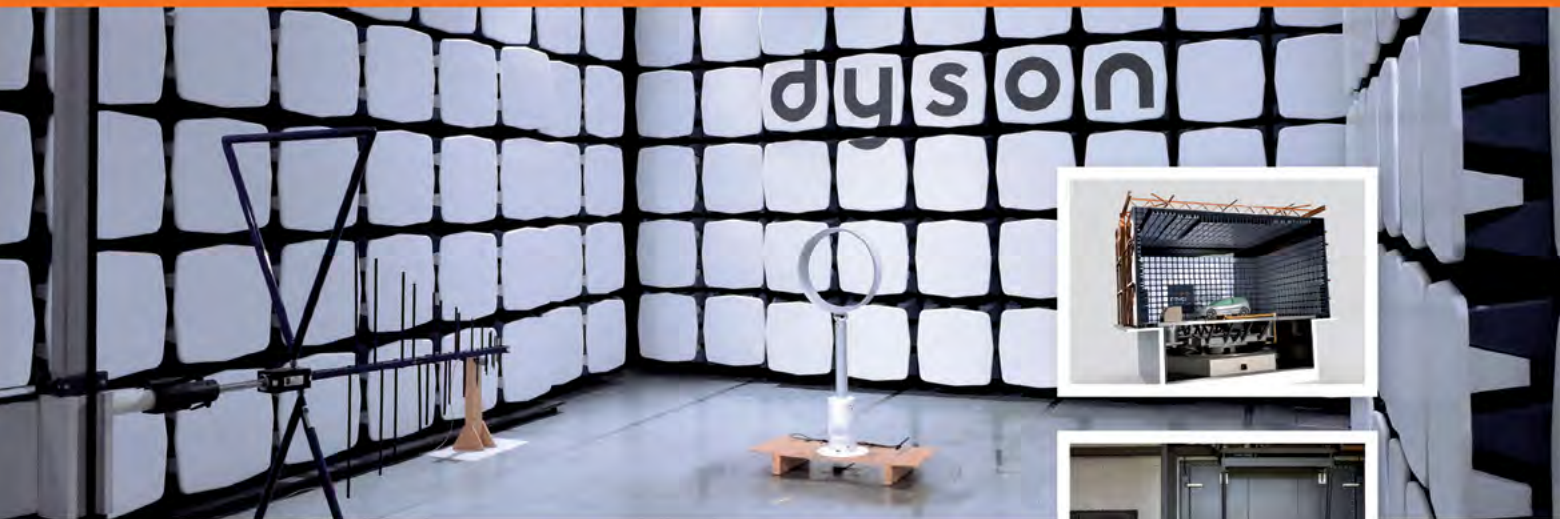
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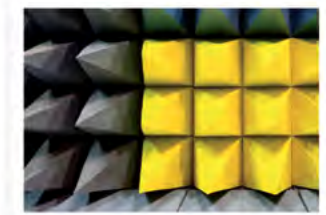
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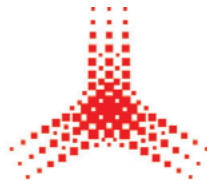


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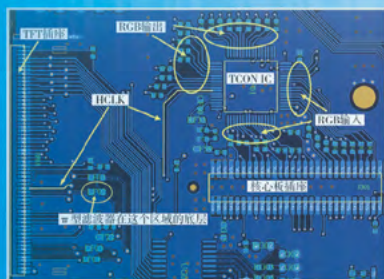


图 5 Tcon IC 顶层布线图

EMC Guidance

3 耦合衰减测试研究

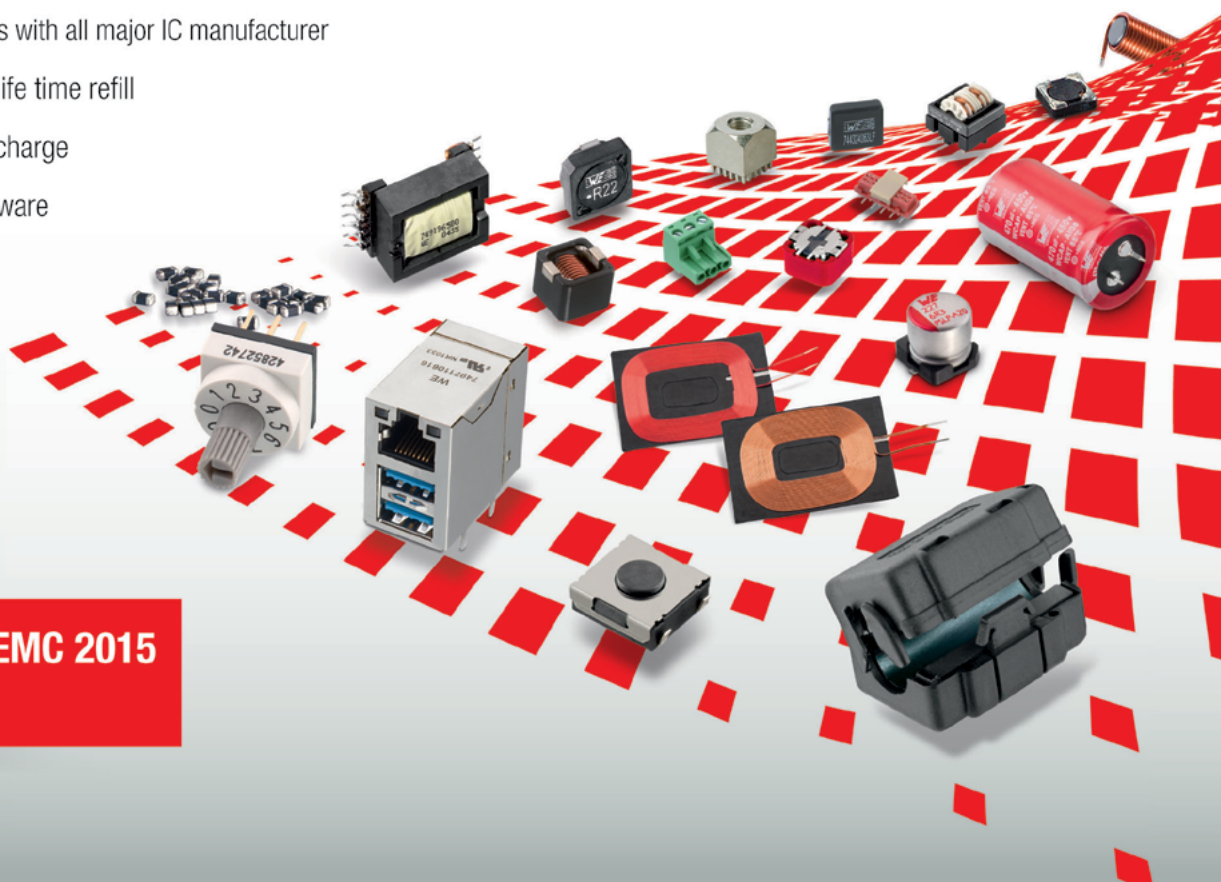




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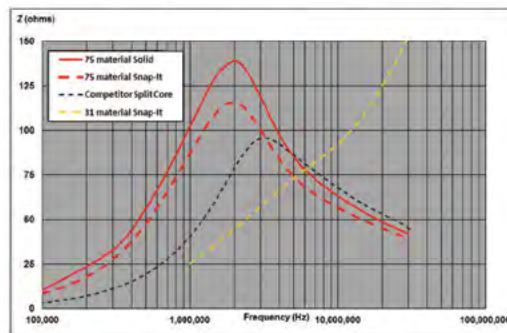
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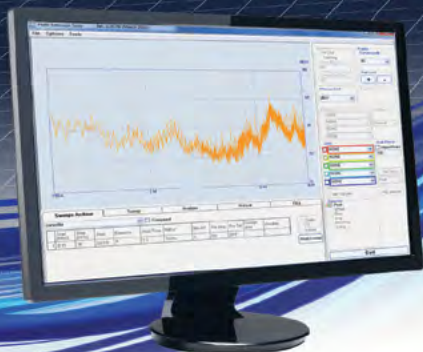
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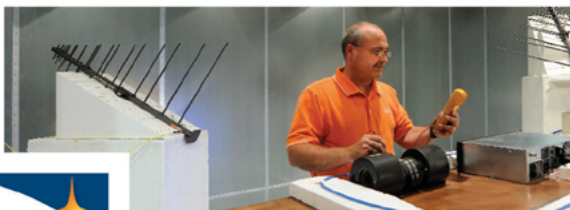
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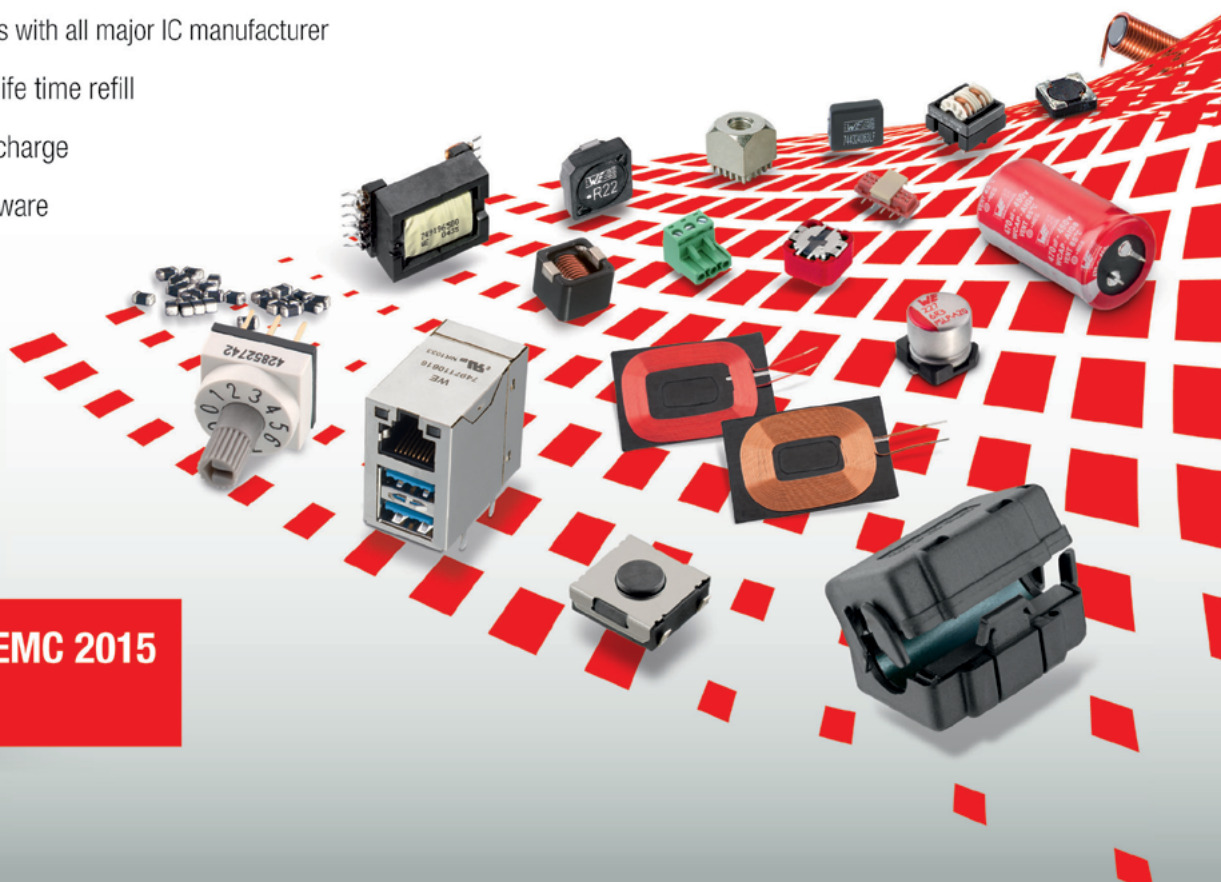




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