WORKSHOP

W1 : Workshop
Risk Based EMC initiatives in Europe

Chair :
Anne Roc'h
Frank Leferink
Davy Pissoort
Keith Armstrong

ABSTRACT - The recent European Blue Guide (which is about the implementation of EU product rules) made an EMI risk-based approach (rather than a conventional, rule-based approach) mandatory for any new piece of electronic equipment. Meanwhile, the specific regulations for medical equipment (MDR¯ Medical Devices Regulations and IEC 60601-1-2), which also refer to a risk-based approach became mandatory in 2021.

The problem is that many companies in the technology industry as well as the users of electronic systems are struggling with this EMI risk-based approach as there is a lack of understanding and no clearly prescribed risk-assessment methodology in place. Small and medium-sized enterprises (SMEs) are often not able to cope with such a major shift in approach.

In this workshop we will present the EMC Risk-based approach, in contrast with the tradition Rule-based one. We will discuss the recent IEEE 1848 which provides a set of practical methods for helping to manage the levels of risks due to electromagnetic (EM) disturbances throughout the lifecycles of electronic equipment.

This new risk-based methodology requires not only a formalization, but trained specialists to address the complexity of system, and all the individuals and institutions involved. We will introduce you to the two large European Networks (PETER and ETERNITY) which are currently training 29 Early Stage Researchers into the development and implementation of the risk-based methodology.

AGENDA :

· Risk based EMC
· Techniques and Measures for Managing the Functional Safety and Other Risks that can be caused by EMI (IEEE 1848)
· Presentation of the European Training Network PETER
· Presentation of the European Training Network ETERNITY

SPEAKERS :

Dr. Anne Roc'h (a.roch@tue.nl) Eindhoven University of Technology
Prof.dr. Frank Leferink (frank.leferink@utwente.nl) University of Twente - THALES
Prof.dr. Davy Pissoort (davy.pissoort@kuleuven.be) Katholieke Universiteit Leuven
Keith Armstrong (keith.armstrong@cherryclough.com) Cherry Clough Consultants

BALI

W2 : Workshop
Empower a billion lives

Chair :
Frank Leferink
Jelena Popovic
Deny Hamdani
Flavia Grassi

ABSTRACT - IEEE PELS launched IEEE Empower a Billion Lives (EBL-I) in 2018 as a recurring global competition for teams to develop and demonstrate scalable solutions to energy access. Over 450 teams from 70 countries responded. Five regional competitions (China, India, Africa, Europe and US) and field demonstrations in Rwanda, Uganda, Malaysia, Nepal, Madagascar, India, Tanzania, China, Nigeria, Cambodia, Singapore, Kenya & Ivory Coast with a global final in Baltimore in Oct 2019.

Solutions presented by the teams included microgrids, nanogrids, solar home systems, improved business models, and appliances. Over $500,000 was provided in awards and team support, including a $100,000 Grand Prize to team SoULS from IIT Bombay. Other global winners include Xpower, Reeddi, Entrepreneurs du Monde and Okra, SolarWorx and Havenhill Synergy. EMC, and especially power quality is strongly relating to renewable energy generation, as the majority of equipment is using fast-switching semiconductors to connect the generated energy to the micro-or nano-grid, or use fast-switching semiconductors to consume energy. By default, any micro-or nano-grid has low inertia like in conventional grids, and this low intertie is the cause of dips, surges and outages.

Building on the success of EBL-I, Empower a Billion Lives – II, global competition to be held from August 2021 to October 2022. Please visit www.empowerabillionlives.org for further information on joining the EBL community and/or to participate as a team.

AGENDA :
In this workshop we will present the concept of EBL, we will discuss with key stakeholders and to build global partnerships, to explore ways in which IEEE can help energy access, and to build a community to support EBL-II.

SPEAKERS :
Prof.dr. Frank Leferink (frank.leferink@utwente.nl) University of Twente - THALES
Dr. Jelena Popovic (j.popovic@utwente.nl) University of Twente – Klimop Energy, Vice-Chair TC12 IEEE PELS
Dr. Deny Hamdani (deny@power.ee.itb.ac.id) ITB Bandung
Dr. Flavia Grassi (flavia.grassi@polimi.it) Polito di Milano – Chair TC7 IEEE EMCS

BALI

W3 : Workshop
Conducted EMI problems with modern static electrical energy meters

Cees Keyer
Chair : Tom Hartman
Bas ten Have

ABSTRACT - More often consumers are complaining about the energy bill after the conventional electromechanical meter has been replaced by an electronic, or static, energy meter. Active infeed converters for photo-voltaic systems are a known source for interference to static meters. To investigate the root cause, experiments on static meters have been performed in a controlled lab environment. Interference cases are found due to dimmed lighting equipment of light emitting diode and compact fluorescent lighting technology, and a speed controlled water pump. Maximum experimental errors of 2675% are found. The drawn currents have a high rising slope, small pulse duration and high crest factor. Static energy meters that use a Rogowski coil to measure the current contribute to the highest misreadings, followed by the current transformer principle, and when using a shunt resistor or Hall effect sensor lower energy readings are reported.

AGENDA :

- Conducted EMI on static energy meters from modern household appliances
- Static energy meters running backwards
- Measurement survey of current waveforms occurring in on-site situations
- Discussion panel

SPEAKERS :

Cees Keyer (c.h.keyer@utwente.nl) University of Twente
Tom Hartman (tom.hartman@utwente.nl) University of Twente
Bas ten Have (bas.tenhave@utwente.nl) University of Twente

BALI

W4 : Workshop
The Impact of Electro Mobility on Automotive EMC Standards and Measurements

Chair : **Jens Medler**
Sam Chew

ABSTRACT - This workshop will provide key updates to the global Automotive EMC Standards and will review proposed changes to address the rapidly developing electro mobility. Participants will learn what is new in these standards, what to expect in the new revisions, what to anticipate in future standards based on automotive technology trends, and how this may influence their current EMC test and measurement activity.

AGENDA :

- Current and Future Changes to the CISPR Automotive EMI Standards and the applicability of FFT-based measuring receivers for compliance measurements
- EMC Safety in ADAS and Autonomous Driving - Challenges and possible solutions
- The challenges of electromagnetic environment scenarios testing for connected cars
- Monitoring and assessing performance of automotive systems during EMS testing

SPEAKERS :

Jens Medler (Jens.Medler@rohde-schwarz.com) Rohde & Schwarz GmbH
Zhang Xu - China Automotive Technology and Research Center Co. Ltd
Sam Chew - Rohde & Schwarz ASIA
Jacky Li - Rohde & Schwarz ASIA

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W5 : Workshop
EMC Engineering in automotive applications

Chair : **Alessandro Amaducci**
Enrico Mazzola

ABSTRACT - The increasing market for EVs and autonomous driving systems calls for a systematic approach to EMC in the automotive industry. Despite the complexity of the subject, the speakers address it from an industrial perspective aiming to practical outcomes.

AGENDA :

Module A: Accurate modeling for a CISPR 25 virtual CE test
A complete automotive powertrain simulation model of a CISPR 25 CE test setup is presented and compared with real CE measurements. The model is then exploited to assess the impact of key parameters on the goodness of the simulation outcomes.

Module B: Non-standard measurements for an effective EMC CE pre-compliance session
Non-standard measurements during a pre-compliance CE test lead to the accurate characterization of a power train emissions. Furthermore, novel measurement techniques allow the extraction of components modal impedances under loading condition.

Module C: Advanced EMI filter design techniques
Using the information gathered in Module A and Module B, some tips and tricks for an effective passive/active EMI filter design are presented keeping the focus on the typical automotive challenges and constrains.

SPEAKERS :

Alessandro Amaducci (alessandro.amaducci@schaffner.com) Schaffner Automotive
Dr. Enrico Mazzola (enrico.mazzola@schaffner.com) Schaffner Automotive

B A L I

W6 : Workshop
Comparing Emission Measurements performed by a Spectrum Analyzer with EMC Functions vs. Pre and Full Compliant Receivers

Chair : Michele Zingarelli

ABSTRACT - A comparison between measurements performed with 1 Spectrum Analyzer, 1 Pre-Compliant Receiver and 1 Full-Compliant Receiver will be showed, using a Reference CISPR 16-1-1 Pulse Repetition Frequency Generator and a sample EUT, in order to bring the evidence on how much an Emission Test could be affected by a simple Spectrum Analyzer or a Pre-Compliant EMI Receiver, versus a CISPR 16-1-1 Certified Full-Compliant EMI Receiver.

AGENDA :

A short theoretical introduction will be given for highlighting the requirements from the Standard and resuming the various CISPR Defined Detectors and their responses to the pulses defined as references for the validation of an EMI Measuring Equipment. Then practical measurements will be performed using these three different equipment on a selected EUT.

SPEAKERS :

Dr.Eng. Michele Zingarelli (michele.zingarelli@L3Harris.com) Narda Safety Test Solutions

B A L I

TUTORIAL

T1 : Tutorial
Global EMC Standards Update for Commercial, Automotive, and Aerospace/Government Applications

Chair : Janet O'Neil

ABSTRACT - This tutorial will provide updates on the industry EMC standards most commonly used for commercial, automotive, and aerospace/military applications. Speakers will share information about the state of the art in test site validation, automotive performance verification, and use of EMC measurement equipment required by many current international standards. Specific requirements and nuances that can challenge even the most experienced EMC practitioner will be discussed. This tutorial strives to provide the latest developments in CISPR 16, ANSI C63®, Automotive, and Military standards, as well as "behind the scenes" discussions associated with proposed changes to future editions.

Speakers include global experts who are actively involved in using, writing, and maintaining the standards in which the commercial, automotive, and aerospace/ MIL-STD EMC measurement requirements are specified. For example, for the automotive standards, reviews will include the current revisions of the main international automotive component and full vehicle standards, including CISPR 12, CISPR 25, ISO 11451-2, ISO 11452-2, and ECE Reg. 10.6. For the ANSI standards, discussions will include C63.25.1 and C63.25.2 for site validation techniques and requirements for above and below 1 GHz testing. An update on the latest developments proposed for the next edition of C63.4 will be provided. Attendees can expect to increase their understanding of both the background of the latest equirements for usage of EMC measurement equipment and test environments as well as learn novel approaches to test site validation of anechoic chambers.

AGENDA :
· Update of Site Validation Measurements in the ANSI C63 Standards (C63.25.1 and C63.25.2) and Proposed Changes to C63.4
· Automotive International EMC Standards Update

SPEAKERS :

Zhong Chen, ETS-Lindgren
Garth D'Abreu, ETS-Lindgren

B A L I

T2 : Tutorial
Connected Vehicles: The Future of the Modern Automotive Industry

Chair : Janet O'Neil

ABSTRACT - The phrase "connected vehicles" is a hot topic these days, but what does this mean and why is it important? "Connected vehicles" refers to communication between vehicles (vehicle-to-vehicle V2V), between vehicles and the surrounding communication infrastructure (vehicle-to-infrastructure V2I), vehicle-to-cloud (V2C) and cellular vehicle-to-everything (C-V2X). The developing Advanced Driver Assistance Systems (ADAS) rely on this communication network for increasing levels of vehicle autonomy. Current ADAS features including adaptive cruise control, autonomous emergency breaking, lane departure warning systems, and blind spot warning, to name a few, rely solely on the on board sensors. On board systems are currently included in the scope of module-based EMC tests. Over the Air (OTA) communication for connected vehicles, however, necessitates additional measurements now required to verify wireless performance of the systems. To satisfy the requirements of high network reliability, high data throughput and low latency, there are potential solutions with Dedicated Short Range Communications (DSRC), 4G and 5G based cellular networks. Today's drivers expect safety features to operate flawlessly. In the future, with autonomous vehicles and no driver, it is critical that connected vehicles operate seamlessly, with no margin for error

Speakers in this tutorial will address the challenges connected vehicle technology presents on performance and verification test methods. Novel solutions to these challenges will be provided. Topics related to automotive test and measurement include a primer on basic computer simulation. This will demonstrate how simulation tools can be applied early to achieve compliance, using automotive EMC standards as a guide. Full vehicle measurement techniques and guidelines will be reviewed to evaluate the performance of connected vehicles.

The tutorial will conclude with a discussion on the EMC test environment for conducting these automotive measurements, with a focus on the important contribution of dynamometers and e-motors to simulating real-world applications.

AGENDA :
· Implementing Vehicle Level Measurements for Advanced Driver Assistance Systems
· Chamber Design Considerations for EMC and Antenna Pattern Measurements of Full Vehicles

SPEAKERS :

Garth D'Abreu, ETS-Lindgren
Zhong Chen, ETS-Lindgren

B A L I

T3 : Tutorial
Improving integrated circuit reliability by combining tests to ionizing radiation and electromagnetic compatibility

Fabian Vargas
Chair : **Bernd Deutschmann**
Sonia Ben Dhia

ABSTRACT - Technology scaling, which made electronics accessible and affordable for almost everyone on the globe, has advanced IC and electronics since sixties. Nevertheless, it is well recognized that such scaling has introduced new (and major) reliability challenges to the semiconductor industry. This tutorial addresses the background mechanisms impacting reliability of very deep submicron (VDSM) integrated circuits (Ics). In more detail, topics such as the basics about electromagnetic compatibility (EMC) and ionizing radiation, the mechanisms by which they affect Ics, the current standards and laboratory test infrastructure for EMC, total-ionizing dose (TID) and single-event effects (SEEs) on Ics are presented and their combined effects on the reliability of modern ICs are discussed. Moreover, the way reliability failure mechanisms for (ionizing and non-ionizing) radiation are modeled and how they are impacting IC aging and lifetime will be covered. Recent results from laboratory experimental measurements are described. Classic design solutions to counteract with TID, SEEs, aging and EMC in VDSM ICs as well as the recent achievements on the development of on-chip sensors to monitor EM conducted noise on IC power supply lines are introduced. A YouTube video is presented to illustrate the effectiveness of such on-chip sensors to detect aging. Finally, Spice simulations are used to demonstrate the combined effect of ionizing radiation with power supply noise on SRAM cells followed by the presentation of some measures to counteract with it.

SPEAKERS :

Fabian Vargas (vargas@computer.org) Catholic University - PUCRS
Bernd Deutschmann (bernd.deutschmann@tugraz.at) Graz University of Technology
Sonia Ben Dhia (sonia.bendhia@insa-toulouse.fr) Université de Toulouse, LAAS-CNRS

B A L I

T4 : Tutorial
IEEE Electromagnetic Compatibility Transactions

Chair : **John Norgard**
Perry Wilson

ABSTRACT - This EMCT Tutorial is intended for everyone interested in publishing a paper in the EMCT, especially for the first time. This Tutorial is on the IEEE Electromagnetic Compatibility Transactions (EMCT).

AGENDA :

Publishing a Paper in the EMCT
will cover the submission process, the review cycle (Reviewers, Associate Editors, and the Editor-in-Chief), and final paper publication procedures for the IEEE Transactions on EMC. In addition, acceptance criteria are covered, along with style guides, on-line web support and help-aids, and proper paper organization, with examples of accepted papers.

Writing a Good EMCT Paper: My Perspective
will cover aspects of writing a good paper for submission to the IEEE Transactions on EMC. Covered will be goals, hints, and dos and don'ts for the abstract, index terms, main text, and conclusions of a paper. The material is very much from the personal perspective of the presenter based on his experience as both a reviewer and a former Editor-in-Chief of the Transactions.

SPEAKERS :

Prof. John Norgard NASA/JSC
Dr. Perry Wilson NIST

B A L I

T5 : Tutorial
Power Quality and EMC in Transportation and Renewable Energy Systems

Chair : **Muhammad Alamsyah**
Venkatkumar Muneeswaran

ABSTRACT - The rapid increasing of renewable energy sources around the world and its EMC problems are something that can not be separated. Both Low-Frequency conducted and radiated emission research have been conducted due to the problem caused by it. Therefore, there is a strong need to analyze the Renewable Energy Systems in Low-Frequency area in order to comply with the EMC standards. In this Tutorial, the related problems will be presented focusing on conducted interference topic, aiming to get better perspective of understanding the EMC issue in power converters in Renewable Energy systems also covering Aerospace applications, and Automotive vehicle sector.

AGENDA :
· Renewable Energy and Automotive EMC – Testing, Standards and Regulations
· Methodologies or The Simulation of Conducted Emissions of DC-DC Converters For Future Aerospace Applications
· Some problems concerning Power Quality and EMC in Energy Systems Including Renewables
· Aggregated Conducted Interference Generated by Power Electronic Interfaces in Photovoltaic Power Plant

SPEAKERS :

Dr.-Ing. Sebastian Koj (sebastian.koj@iav.de) IAV GmbH
Prof. Dave Thomas (dave.thomas@nottingham.ac.uk) University of Nottingham
Prof. Petre-Marian Nicolae (nicolae_ileana@software.ucv.ro) University of Craiova
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