Advance Program (ver. 10/09/2020)

2020 International Symposium on Electromagnectic Compatibility - EMC EUROPE

Date: Wednesday, 23/Sept/2020

8:00am - 9:00am | **AUDITORIUM**

Plenary 1: Plenary Open Session

Session Chair: **MAURO FELIZIANI**
Session Chair: **MARIA SABRINA SARTO**

Welcome Address

Keynote Speaker: Akimasa Hirata, Nagoya Institute of Technology, Japan, "Human Exposure Standards and Compliance Assessment– 5G and Beyond"

9:00am - 10:00am | **ROOM 1**

TS01: EMC in Emerging Fields

Session Chair: **Richard Xian-Ke Gao**
Session Chair: **Ming Ye**

9:00am - 9:20am

Investigation on the Effectiveness of the Dynamic Offset Cancellation to Improve the Immunity of DDAs to EMI

Franco Fiori
Politecnico di Torino, Italy

9:20am - 9:40am

Analysis Challenge of Interference on the Coexistence Performance of a Wanted Radio Signal

Oussama Sassi[1], Naseef Mahmud[2], Pascal Hervé[3]
[1]Volkswagen AG, Germany; [2]Rohde & Schwarz GmbH & Co. KG; [3]CSA Group Bayern GmbH

9:40am - 10:00am

Measurement on Effect of Controlled Wave Phase in EM Fault Injection Attack

Yuto Shinoda[1], Mitsuki Takenouchi[1], Yu-ichi Hayashi[2], Takaaki Mizuki[1], Hideaki Sone[1]
[1]Tohoku University, Japan; [2]Nara Institute of Science and Technology, Japan

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10:00am - 10:20am
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Design of an Electromagnetic Scattering Wall Applying Array Antenna Theory

Yasutaka Murakami, Jerdvisanop Chakarothai, Katsumi Fujii
National Institute of Information and Communications Technology, Japan

9:00am - 10:00am | **ROOM 2**

TS02: Components, Packaging & Integration

Session Chair: **Alistair Duffy**
Session Chair: **Osami Wada**

9:00am - 9:20am

Tunable Band-Gap for Metallic Packages and Cavities

Muhammet Hilmi Nisanci[1], Francesco de Paulis[2], Mustafa Cakir[1]
[1]Sakarya University, Turkey; [2]University of L'Aquila, Italy

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9:20am - 9:40am

Impact on Signal Integrity and Radiated Emissions of Two-Layer vs Four-Layer BGA Package Technology for Automotive Applications

Damian Halicki[1], Aurora Sanna[1], Flavio Calvano[2], Marco Occhiali[2]
[1]STMicroelectronics, Italy; [2]Ansys Italia, Italy

9:40am - 10:00am

Cancellation of Common-Mode Excitation by SCD21 and SCC21 of CMF Due to Phase Relationship Between DM and CM Voltages

Tohlu Matsushima[1], Koichi Kikuchi[2], Kenta Ishibashi[1], Yuki Fukumoto[1], Nobuo Kuwabara[1]

[1]Kyushu Institute of Technology, Japan; [2]TDK Corporation, Japan

9:00am - 10:00am
ROOM 3

SS01: Exposure Assessment at Frequencies Above 6 GHz – Towards 5G Applications

Session Chair: **Valerio De Santis**
Session Chair: **Masao Taki**

9:00am - 9:20am

On the Concept of the Transmitted Field and Transmitted Power Density for Simplified Case of Hertz Dipole

Dragan Poljak, Vicko Doric
University of Split, Croatia

9:20am - 9:40am

Single User EMF Exposure Assessment in a Case of Incoming 5G Indoor Scenario

Marta Bonato[1,2], Laura Dossi[1], Emma Chiaramello[1], Serena Fiocchi[1], Silvia Gallucci[1], Gabriella Tognola[1], Paolo Ravazzani[1], Marta Parazzini[1]
[1]IEIIT, CNR, Italy; [2]DEIB, Politecnico di Milano

9:40am - 10:00am

Development of 5G-Frequency Bands Exposure Equipment System for Studies on Thermal Thresholds of Biological Effects of Quasi-millimeter to Millimeter Waves on Human Body

Takashi Hikage[1], Ryunosuke Ozaki[1], Hiroshi Masuda[2], Tatsuya Ishitake[2]
[1]Hokkaido University; [2]Kurume University School of Medicine Kurume

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10:00am - 10:20am

Skin Thermal Modeling for Exposure Assessment above 6 GHz: Models Comparison

Antonio Di Francesco, Valerio De Santis
University of L'Aquila, Italy

9:00am - 10:00am
ROOM 4

TU01: How to Write a Good Paper on IEEE T-EMC

Session Chair: **Heyno Garbe**
Session Chair: **Tzong-Lin Wu**

- General Concepts for Writing an Article for IEEE Journal Publication, Tzong-Lin Wu
- How to Avoid Mistakes and Conflicts with IEEE Publication Rules, Heyno Garbe

10:00am - 10:30am

B01: Break

10:30am - 12:30pm
ROOM 1

TS03: Shielding, Absorbing & Gasketing

Session Chair: **Mark Mifsud**
Session Chair: **Salvatore Celozzi**

10:30am - 10:50am

Electromagnetic Shielding Effectiveness Analysis of Enclosure Incorporating Frequency Selective Surface

Ning Shen[1], Liping Yan[1], Xiang Zhao[1], Richard Xian-Ke Gao[2]
[1]Sichuan University, China, People's Republic of; [2]Institute of High Performance Computing, A*Star, Singapore

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10:50am - 11:10am

A Novel 3D Ultra-wide Stopband Frequency Selective Surface for 5G Electromagnetic Shielding

Jinghan Zhang[1], Liping Yan[1], Richard Xian-Ke Gao[2], Chengrong Wang[1], Xiang Zhao[1]
[1]Sichuan University, China, People's Republic of; [2]Institute of High Performance Computing, A*STAR, Singapore

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11:10am - 11:30am

A Compact Absorbing FSS Structure for Antenna Decoupling in the 5G 3.5GHz Band

Faissal Merzaki[1], Maelle Sergolle[1], Xavier Castel[1], Mohamed Himdi[1], Philippe Besnier[1], Kevin Desmars[2], Thierry Levavasseur[2], Patrick Caldamone[2], Patrick Parneix[3]
[1]Univ rennes, INSA RENNES, CNRS, IETR-UMR 6164; [2]Seribase; [3]Naval Group

11:30am - 11:50am

A Second-Kind Fredholm Integral-Equation Approach for Simple Low- and High-Frequency Solutions of the Perfectly-Conducting Circular Disk

Giampiero Lovat[1], Paolo Burghignoli[2], Rodolfo Araneo[1], Luigi Verolino[3]
[1]DIAEE - EE Division University of Rome La Sapienza, Italy; [2]Department of Information Engineering, Electronics and Telecommunications University of Rome "Sapienza"; [3]Department of Electrical Engineering and Information Technology University of Naples "Federico II"

11:50am - 12:10pm

Thin-Film Screen Time-Domain Shielding Effectiveness: Multi-Objective Optimization of the Testing Pulse

Petr Kadlec, Martin Marek, Martin Štumpf
Brno University of Technology, Czech Republic

12:10pm - 12:30pm

An Experimental Study of the Variability of the Shielding Effectiveness of Circuit Board Shields

Andy Marvin[1], John Dawson[1], Linda Dawson[1], Haiyan Xie[2], Arunkumar Venkateshaiah[1]
[1]University of York, United Kingdom; [2]Northwest Institute of Nuclear Technology Xi'an, China

10:30am - 12:30pm
ROOM 2

TS04: ESD

Session Chair: **Stefan Dickmann**
Session Chair: **Zbigniew Joskiewicz**

10:30am - 10:50am

Analysis of the Increase in Radiated Emissions After Applying ESD on the CAN Communication Harness

Younghun Lee[1], Eunseok Kang[2], Youngduk Park[1], Junho Choi[2]
[1]Lab. team, Hanonsystems, Korea, Republic of (South Korea); [2]Control Development team, Hanonsystems, Korea, Republic of (South Korea)

10:50am - 11:10am

Observation of ESD Propagation Path Using Noise Visualization System

Ryota Kobayashi, Kenji Hirose, Takashi Kuwahara, Tsuyoshi Kobayashi, Chiharu Miyazaki
Mitsubishi Electric Corporation, Japan

11:10am - 11:30am

New approach for EMC Assurance of Noise Propagation Effects on Spacecraft Unit

Yuzo YAJIMA[1], Hiroshi KINODA[1], Toshihiko AOKI[1], Chiharu MIYAZAKI[2], Yuichi SASAK[2], Masayuki TATSUMI[2], Toru KASAI[3]
[1]Kamakura Works, Mitsubishi Electric Corporation; [2]Information Technology R&D Center, Mitsubishi Electric Corporation; [3]Japan Aerospace Exploration Agency, Japan

11:30am - 11:50am

Investigation of the Frequency Response Compensation Method for ESD Current Reconstruction for Different Test Levels and ESD Test Generators

Panagiotis Papastamatis[1], Evangelos Paliatsos[2], Ioannis Gonos[1], Ioannis Stathopulos[1]
[1]National Technical University of Athens, Greece; [2]Labor S.A., Greece

11:50am - 12:10pm

Simulation of the Transient Potential Distribution On-Chip During a Fast ESD Event Based on a Parametric Measurement Analysis

Lena Zeitlhoefler[1], Friedrich zur Nieden[2], Kai Esmark[2], Gernot Langguth[2]
[1]TU München, Germany; [2]Infineon Technologies AG

12:10pm - 12:30pm

Parameters of Current and Equipment Case Voltage Produced by Air Electrostatic Discharge

Alexander Worshevsky, Evgenii Grishakov, Dmitriy Dogorov
Saint-Petersburg marine technical university, Russian Federation

10:30am - 12:30pm
ROOM 3

SS02: Conducted and Low Frequency EMI in Smart Cities

Session Chair: **David Thomas**
Session Chair: **Robert Smolenski**

10:30am - 10:50am

Evaluating Rapid Voltage Changes and its Propagation Effect using Multipoint Measurement Technique

Muhammad Imam Sudrajat[1,2], Niek Moonen[1], Hans Bergsma[3], Rob Bijman[3], Frank Leferink[1,3]
[1]University Of Twente, Netherlands, The; [2]Indonesian Institute of Sciences, Indonesia; [3]Thales Netherland B.V, The Netherlands

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10:50am - 11:10am

Prospective Analysis of the effect of Silicon based and Silicon-Carbide based Converter on G3 Power Line Communication

Waseem Wafik El Sayed, Hermes Loschi, Choon LONG LOK, Piotr Lezynski, Robert Smolenski
University of Zielona Gora, Poland

11:10am - 11:30am

The Effect of the Current Pulse Width from LEDs on Narrowband Power Line Communication and its Analysis in Time and Frequency Domain

Muhammad Wibisono[1,2], Tom Hartman[1], Niek Moonen[1], Deny Hamdani[2], Frank Leferink[1,3]
[1]University of Twente, The Netherlands; [2]Institut Teknologi Bandung, Indonesia; [3]Thales Nederland B.V., Hengelo, The Netherlands

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11:30am - 11:50am

Reduction of Conducted Emissions in DC/DC Converters with FPGA-based Random Modulation

Hermes Loschi[1], Robert Smolenski[2], Piotr Lezynski[3], Waseem El Sayed[4], Douglas Nascimento[5]
[1]University of Zielona Góra, Poland; [2]University of Zielona Góra, Poland; [3]University of Zielona Góra, Poland; [4]University of Zielona Góra, Poland; [5]University of Zielona Góra, Poland

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11:50am - 12:10pm

Time-domain Assessment of Data Transmission Errors in Systems with Multiple DC/DC Converters

Karol Niewiadomski[1], Piotr Leżyński[2], Robert Smoleński[2], Jacek Bojarski[2], Mark Sumner[1], David W.P. Thomas[1]
[1]University of Nottingham, United Kingdom; [2]University of Zielona Góra, Poland

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12:10pm - 12:30pm

Imitation modeling of radiation of ultra short pulses by Horn antenna and evaluation of the energy efficiency of radiators on their basis

Alexey Usychenko[1], Leonid Sorokin[1], Aleksandr Sasunkevich[2], Yuriy Kutsan[3]
[1]St. Petersburg Institute for Informatics and Automation of the Russian Academy of Sciences, Russian Federation; [2]Department of Autonomous Control Systems Federal budgetary military educational institution of higher education “Military space Academy named after A.F. Mozhaysky“ of the Ministry of defense of the Russian Federation, Russian Federation; [3]Scientific and Technical Center Joint Stock Company “Scientific Research Institute “Vector”, St. Petersburg, Russian Federation

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12:30pm - 12:50pm

Practical Consideration on Power Line Filter Design and Implementation

Daria Nemashkalo[1], Niek Moonen[1], Frank Leferink[1,2]
[1]University of Twente,the Netherlands; [2]THALES Nederland B.V., Hengelo, the Netherlands

10:30am - 12:30pm **ROOM 4**	**WS01.I: Automotive - Part I** Session Chair: **Marco Klingler** • Analysis of Resonances of the Electrical Architecture of a Vehicle due to the Network of Shielded Links and 0V Wires, Marco Klingler • EMC Simulation of Power-Train System Within the Car, Antea Perrotta, Flavio Calvano and Frederic Bocquet • Characterization and Mitigation of the Magnetic Field Produced by an Automotive Wireless Power Transfer System, Tommaso Campi, Silvano Cruciani, Francesca Maradei, Mauro Feliziani • Simulation-Based Investigation of Possible Cavity Mode Excitation by a Stripline Antenna in a Vehicle EMC Chamber, Alastair Ruddle
12:30pm - 1:30pm	**B02: Break**
1:30pm - 3:30pm **ROOM 1**	**TS05: Transmission Lines & Cables I** Session Chair: **Rodolfo Araneo** Session Chair: **Farhad Rachidi**
	1:30pm - 1:50pm **FDTD Analysis of Metal Oxide Surge Arresters for Protection of Multiconductor Transmission Lines** **Erika Stracqualursi[1], Rodolfo Araneo[1], Giampiero Lovat[1], Paolo Burghignoli[2]** [1]Department of Astronautical, Electrical and Energy Engineering University of Rome "Sapienza"; [2]Department of Information Engineering, Electronics and Telecommunications University of Rome "Sapienza"
	1:50pm - 2:10pm **A Novel Implementation of the Perturbation Technique for Better Integration of NUTLs with Periodic Geometry** **Xiaokang Liu[1], Flavia Grassi[1], Giordano Spadacini[1], Sergio A. Pignari[1], Dries Vande Ginste[2]** [1]Politecnico di Milano, Italy; [2]Ghent University, Belgium
	2:10pm - 2:30pm **SPICE-Based Lumped Circuit Model of Shielded Cables for EMC Analyses** **Moustafa Raya, Mathias Magdowski, Ralf Vick** Otto von Guericke University Magdeburg, Germany
	2:30pm - 2:50pm **Non-intrusive Variability Analysis of Large Circuits with Parallelism in the Stochastic Space and Time-Domain** **Ye Tao[1], Behzad Nouri[1], Francesco Ferranti[2], Michel Nakhla[1], Kai Guo[1]** [1]Carleton Univerity, Canada; [2]IMT Atlantique, France
	2:50pm - 3:10pm **Accurate and Efficient Crosstalk Analysis by Full-wave Computations and System Identification** **Carl Holmberg[1,2], Thomas Rylander[1], Jan Carlsson[1,3], Tomas McKelvey[1]** [1]Chalmers University of Technology, Sweden; [2]Volvo Car Corporation; [3]Provinn AB
	3:10pm - 3:30pm **Cable Delay Cancellation with Low-Pass NGD Function** **Blaise Ravelo[1], Fayu Wan[1], Wenceslas Rahajandraibe[2], Nour Mohammad Murad[3]** [1]Nanjing University of Information Science & Technology (NUIST), China, People's Republic of; [2]Aix-Marseille University, CNRS, University of Toulon, IM2NP UMR7334, Marseille, France; [3]Energy Lab, Network and Telecom Department, IUT, Univ. La Réunion, Saint-Pierre cedex, France
1:30pm - 3:30pm **ROOM 2**	**TS06: Low Frequency EMC, Power Systems & Power Quality** Session Chair: **Flavia Grassi** Session Chair: **Anne Roc'h**
	1:30pm - 1:50pm **Unfairly Faulty Energy Meter Reading due to Inappropriate Use of the Blondel Theorem** **Bas Ten Have[1], Tom Hartman[1], Niek Moonen[1], Frank Leferink[1,2]**

[1]University of Twente, Netherlands, The; [2]THALES Nederland B.V., Netherlands, The

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1:50pm - 2:10pm

On-Site Waveform Survey in LV Distribution Network using a Photovoltaic Installation

Bas Ten Have[1], Marco Azpúrua[2], Marc Pous[2], Ferran Silva[2], Frank Leferink[1,3]

[1]University of Twente, Netherlands, The; [2]Universitat Politècnica de Catalunya, Barcelona, Spain; [3]THALES Nederland B.V., Netherlands, The

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2:10pm - 2:30pm

EMI Filter Performance of Transformerless Topology for Photovoltaic Applications

Duc-Thanh Do[1], Holger Hirsch[2]

[1]University of Duisburg-Essen, Germany; [2]University of Duisburg-Essen, Germany

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2:30pm - 2:50pm

Time-Domain EMI Measurements using a Low Cost Digitizer to Optimize the Total Measurement Time for a Test Receiver

Tom Hartman[1], Roelof Grootjans[1], Niek Moonen[1], Frank Leferink[1,2]

[1]University of Twente, Netherlands, The; [2]THALES Nederland B.V., Hengelo, Netherlands, The

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2:50pm - 3:10pm

New Verification Methods for Low-Frequency Susceptibility Testing

Soydan Cakir[1], Steve Ferguson[2], Osman Sen[1], Tayfun Acarer[3]

[1]TUBITAK UME, Turkey; [2]Compliance Direction LLC, USA; [3]Istanbul Bilgi University, Turkey

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3:10pm - 3:30pm

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On a Self-Adaptive Step-Down Converter Architecture for On-line EMI Reduction

Jens Werner, Alexandra Burger, Lars Nolle, Karsten Schubert

Jade University of Applied Sciences, Germany

1:30pm - 3:30pm

ROOM 3

SS03.I: Risk-Based EMC - Part I

Session Chair: **Frank Leferink**

Session Chair: **Davy Pissoort**

1:30pm - 1:50pm

Effectiveness of Time Diversity Against Multi-Frequency Disturbances Under Planewave Conditions

Syed Hassan Tirmizi, Jonas Lannoo, Dries Vanoost, Guy Vandenbosch, Davy Pissoort

KU Leuven, Belgium

1:50pm - 2:10pm

Effectiveness of PAM-4 Line Coding in Triplication-based Error Correction Codes under Harsh Electromagnetic Disturbances

Jonas Van Waes, Jens Vankeirsbilck, Jonas Lannoo, Dries Vanoost, Davy Pissoort, Jeroen Boydens

KU Leuven, Belgium

2:10pm - 2:30pm

Versatile and Transparent Model to Estimate the Disturbance Potential of Overhead Transmission Lines in the Context of HVDC Transmission using Voltage Source Converter

Markus Franke, Holger Hirsch

University of Duisburg-Essen, Germany

2:30pm - 2:50pm

Coupling of Energy into PCB Traces in a Reverberant Environment: Absorption Cross-Section and Risk of Susceptibility

Arunkumar Hunasanahalli Venkateshaiah[1], Haiyan Xie[2], John F. Dawson[1], Andrew C. Marvin[1], Linda Dawson[1], Martin P. Robinson[1]
[1]University of York, United Kingdom; [2]Northwest Institute of Nuclear Technology, China

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2:50pm - 3:10pm

Effects of an External Multi-Harmonic EMI Excitation on the Transmission Bit Error Rates of a Redundant Channel under Planewave Illumination

Syed Hassan Tirmizi, Jonas Lannoo, Dries Vanoost, Guy Vandenbosch, Davy Pissoort
KU Leuven, Belgium

3:10pm - 3:30pm

Introduction of Wireless Services and Devices in a Hospital Environment following a Risk-based EMC approach

Mumpy Das[1], Silvo Jeunink[1], Robert Vogt-Ardatjew[1], Bärbel van den Berg[3], Frank Leferink[1,2]
[1]University of Twente, The Netherlands; [2]Thales Nederland, Hengelo; [3]Medisch Spectrum Twente Hospital

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3:30pm - 3:50pm

Obsolescence in EMC Risk Assessment: A Case Study on EFT Immunity of Microcontrollers

Qazi Mashaal Khan[1], Mohsen Koohestani[1,2], Mohamed Ramdani[1,2], Richard Perdriau[1,2]
[1]Ecole Supérieure d'Électronique de l'Ouest (ESEO), France; [2]Institut d'Électronique et de Télécommunications de Rennes (IETR), France

1:30pm - 3:30pm	**WS01.II: Automotive - Part II**
ROOM 4	Session Chair: **Marco Klingler** • Emission Prediction of Automotive Ethernet Communication Cables Using Design Exploration and Machine Learning, Christoph Mäurer, Dr. Markus Schick • Isotropic field probes in reverberation chambers or what is my field strength, Martin Aidam • Novel 3D PEEC-Based Approach to EM/EMC Simulation of Large Scale Complex PCB Modules for Automotive Applications, Alexander Demurov, Giga Gabriadze, George Chiqovani, Anna Gheonjian, Roman Jobava
3:30pm - 4:00pm	**B03: Break**
4:00pm - 6:00pm	**TS07: Computational Electromagnetics, Modeling & Simulation I**
ROOM 1	Session Chair: **Lionel Pichon** Session Chair: **Giulio Antonini**

4:00pm - 4:20pm

Semi-Analytical Form of Full-Wave Self-Interaction Integrals Over Rectangles

Giulio Antonini[8], Francesca Di Murro[1], Jonas Ekman[2], Ivana Kovacevic-Badstubner[3], Ulrike Grossner[4], Mario Lucido[5], Fabrizio Frezza[6], Daniele Romano[7]
[1]University of L´Aquila, Italy; [2]Lulea University of Technology; [3]Lulea University of Technology; [4]ETHZ Zurich; [5]ETHZ Zurich; [6]University of Cassino and Southern Lazio; [7]Sapienza University of Rome; [8]University of L´Aquila, Italy

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4:20pm - 4:40pm

A Mesh-Free Adaptive Parametric Macromodeling Strategy with Guaranteed Stability

Alessandro Zanco, Stefano Grivet-Talocia
Politecnico di Torino, Italy

4:40pm - 5:00pm

Mode Coupling in TEM-Cells due to Variations in the Geometry Using Generalized Telegraphists Equations

Hoang Duc Pham, Heyno Garbe
Leibniz University Hannover, Germany

5:00pm - 5:20pm

Modal Network Representation for Broadband SI/PI-Analysis of Interconnection Structures in Multilayer PCBs

Sebastian Südekum, Hannes Schreiber, Marco Leone
Otto von Guericke University Magdeburg, Germany

5:20pm - 5:40pm

Taylor' Series Expansion-based PEEC Time Domain Solver for Transient Full-Wave Analysis

Giulio Antonini[1], Fabrizio Loreto[1], Daniele Romano[1], Albert Ruehli[2], Luigi Lombardi[3], Mauro Parise[4]
[1]University of L´Aquila, Italy; [2]Missouri University of Science and Technology; [3]Micron Semiconductor; [4]Campus Biomedico

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5:40pm - 6:00pm

Effective ElectricalCconductivity of CNT/Polymer Nanocomposites

Xiaoxin Lu[1,2], Yu Liu[2], Lionel Pichon[1], Delong He[2], Olivier Dubrunfaut[1], Jinbo Bai[2]
[1]Génie électrique et électronique de Paris, France; [2]Laboratoire Mécanique des Sols, Structures et Matériaux

4:00pm - 6:00pm
ROOM 2

TS08: Measurement & Instrumentations I

Session Chair: **Jan Luiken ter Haseborg**
Session Chair: **Valter Mariani Primiani**

4:00pm - 4:20pm

How Standards on Discontinuous Disturbances Jeopardise Measurement Repeatability

Mario Monti, Elena Puri, Massimo Monti
Elettronica Monti, Italy

4:20pm - 4:40pm

Evaluation of the Effects of Wanted Signal Mean Power and Blocking Signal Power Levels on Receiver Blocking Test

Cem Cengiz Keskin, Umut Dogan, Ugur Sukru Ceran
Vestel Electromagnetic Compatibility Laboratory

4:40pm - 5:00pm

Study on the Impact of the RF Output Power in EMC Tests of Radio Equipment

Cem Cengiz Keskin, Emre Alan, Faik Alan
Vestel Electromagnetic Compatibility Laboratory

5:00pm - 5:20pm

Statistical Evaluation of Measurement Accuracy in Full Time-Domain EMI Measurement Systems

Marco A. Azpurua, Marc Pous, Ferran Silva
Universitat Politécnica de Catalunya, Spain

5:20pm - 5:40pm

Evaluation of Different Techniques for Contactless RF Impedance Measurements in DC Power Grids

Martin Harm, Marvin Rust, Oliver Kerfin
Technische Universität Braunschweig, Germany

5:40pm - 6:00pm

Characterisation of Field-to-Line Coupling in a Reverberation Chamber using In-situ Calibrated Current Probes

Lukas Oppermann, Henriette Reineke
TU Braunschweig, Germany

4:00pm - 6:00pm
ROOM 3

SS03.II: Risk-Based EMC - Part II

Session Chair: **Frank Leferink**
Session Chair: **Davy Pissoort**

4:00pm - 4:20pm

System Level Risk Analysis for Immunity in Automotive Functional Safety Analyses

Lokesh Devaraj[1], Alastair Ruddle[1], Alistair Duffy[2]
[1]HORIBA MIRA Ltd., Nuneaton, UK; [2]De Montfort University, Leicester, UK

4:20pm - 4:40pm

Comparing the Performance of a Matched Filter and Majority Voting to Cope with Harsh Electromagnetic Disturbances

Jonas Lannoo, Jonas Van Waes, Dries Vanoost, Jeroen Boydens, Davy Pissoort
KU Leuven, Belgium

4:40pm - 5:00pm

The Need For and How To Evaluate Continuous Wave Immunity of Wireless Systems Used in V2X Applications

Tim Claeys[1], Aleksandr Ovechkin[1], Dries Vanoost[1], Guy A. E. Vandenbosch[2], Davy Pissoort[1]
[1]M-group, KU Leuven Bruges Campus, 8200 Brugge, Belgium; [2]ESAT-TELEMIC, KU Leuven, 3001 Leuven, Belgium

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5:00pm - 5:20pm

Development of an EMI Detector Based on an Inverted Data Pair with Reduced Number of False Negatives

Hasan Habib[1], Tim Claeys[1], Dries Vanoost[1], Guy A. E. Vandenbosch[2], Davy Pissoort[1]
[1]M-Group, KU Leuven Bruges Campus, 8200 Bruges, Belgium; [2]ESAT-Telemic, KU Leuven, 3001 Leuven, Belgium

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5:20pm - 5:40pm

Risk Analysis for Automotive EMC: Scope, Approaches and Challenges

Alastair Ruddle
HORIBA MIRA Limited, United Kingdom

5:40pm - 6:00pm

Design of an Automotive Sensor Readout Class AB CMOS Amplifier for Maximum Robustness Against Transient Electromagnetic Interference

Burak Baran[1], Hugo Pues[1], Wim Dehaene[2]
[1]Melexis Technologies NV, Belgium; [2]KU Leuven

6:00pm - 6:20pm

EMI Aspects of Low Voltage Power Distribution Systems for Ships

Nancy Omollo[1,2], Jan-Kees van der Ven[1], Robert Vogt-Ardatjew[2], Frank Leferink[2,3]
[1]RH Marine, Netherlands; [2]University of Twente, Netherlands; [3]Thales, Netherlands

4:00pm - 6:00pm
ROOM 4

F01: Industrial Forum - EMC Challenges on Aerospace in the Next Decade

Session Chair: **Emiliano Scione**

On-Demand Sessions
ON-DEMAND

OD01: Shielding, Absorbing & Gasketing

A FSS-Based Polarization Insensitive Switchable Rasorber/Absorber

SAIKAT CHANDRA BAKSHI, DEBASIS MITRA
INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY SHIBPUR, INDIA

Design Approach for High Efficiency NFC Systems with Magnetic Shielding Materials

Jorge Victoria[1], Pedro A. Martinez[2], Adrian Suarez[2], Antonio Alcarria[1], Sebastian Mirasol[1], Jose Torres[2]
[1]Product Management, Würth Elektronik eiSos; [2]Department of Electronic Engineering, University of Valencia

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Field Theory and EMC - A Short Summary on Educational Aspects

Robert Geise[1], Jens Werner[2], Achim Enders[3]
[1]University of Applied Science Leipzig, Germany; [2]Jade University of Applied Sciences; [3]TU Braunschweig, institute for EMC

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A Flexible and Ultrathin FSS for EM Shielding Applications

Syed Muhammad Qasim Ali Shah, Fahad Ahmed, Tania Tamoor, Tayyab Hassan, Sana Ilyas, Nosherwan Shoaib
Research Institute for Microwave and Millimeter-wave Studies National University of Sciences and Technology Islamabad, Pakistan

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An FSS Based Stop Band Filter for EM Shielding Application

Tania Tamoor, Fahad Ahmed, Syed Muhammad Qasim Ali Shah, Tayyab Hassan, Nosherwan Shoaib
Research Institute for Microwave and Millimeter-wave Studies National University of Sciences and Technology Islamabad, Pakistan

On-Demand Sessions **OD02: Transmission Lines & Cables**

ON-DEMAND

Investigation of Multi-Cable Effect to Radiated Emission from Cable Used for Power Line Communication

Tohlu Matsushima[1], Hiroyuki Okumura[1,2], Nobuo Kuwabara[1], Miuto Iwasaki[1], Dai-ichiro Koike[1], Yuki Fukumoto[1]
[1]Kyushu Institute of Technology; [2]Panasonic Corporation

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EMI Filter with Attenuation Pole for Differential Paired-Lines and Its Design by PSD

Kayano Yoshiki, Kami Yoshio, Xiao Fengchao
The University of Electro-Communications, Japan

Design-Oriented EMC Analysis of Wiring Systems

Alessandro Mori[1], Pier Luigi di Bartolomeo[1], Mauro Bandinelli[1], Aldo Bonsignore[1], Nathanaël Muot[2], Christophe Girard[2], Guillaume Prin[2], Jean-Philippe Parmantier[3], Isabelle Junqua[3], Solange Bertuol[3], Jérôme Morio[3], Giulio Antonini[4], Maria Denise Astorino[4], Charles Jullien[5]
[1]I.D.S. Ingegneria dei Sistemi S.p.A., Italy; [2]AXESSIM SAS, France; [3]Office National d'Etudes et de Recherches Aerospatiales – ONERA, France; [4]Università degli Studi dell'Aquila, Italy; [5]Safran Electrical & Power, France

Determination of Core Size Dependency on the EMI Suppression in Cable Ferrites

Adrian Suarez[1], Jorge Victoria[2], Jose Torres[1], Pedro A. Martinez[1], Victor Martinez[2], Ismael Molina[2], Steffen Muetsch[2], Raimundo Garcia-Olcina[1], Jesus Soret[1], Julio Martos[1]
[1]Department of Electronic Engineering, University of Valencia; [2]Product Management, Würth Elektronik eiSos

Elimination of Coating-Induced Mode Conversion By Parameter Selection for Multi-wire System

Xinwei Song[1], Bing Li[2]
[1]Beijing University of Civil Engineering and architecture, Beijing, China; [2]Beihang University, Beijing, China

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Analysis of Cable Length Dependency on Common Mode Current by Using Scale Model for Power Line Communication

Dai-ichiro Koike, Hiroyuki Okumura, Tohlu Matsushima, Yuki Fukukoto, Nobuo Kuwabara
Kyushu Institute of Technology / Japan, Japan

On-Demand Sessions **OD03: Computational Electromagnetics, Modeling & Simulation**

ON-DEMAND

Convergence Analysis in Indoor 3D Ray Launching Algorithm

Ping Zeng, Dan Shi
Beijing University of Posts and Telecommunications, China, People's Republic of

Analysis of Chaos Time Domain Reflectometry for the Soft Fault Detection in a Cable

Ihssane Bzikha, Paul Monferran, Vipin Velayudhan, Alain Reineix
XLIM Institute / University of Limoges, France

Benchmark for the Near-Field Problem: Simulation versus Measurement

Ralph Christian Josef Oskar Prestros[1], Karl Hollaus[1], Bernhard Auinger[1], Michael Leumüller[2]
[1]Silicon Austria Labs GmbH, Austria; [2]Technische Universität Wien

ARMS, an Automated Measurement System for Broadband Modeling of Tx/Rx Devices for High-Fidelity RF Interference Analysis

Giancarlo Guida[3], Mattew Miller[1], Christofer Behnke[2]
[1]EMA Inc; [2]National Instruments; [3]EMA Europe

Evaluation Method of Wireless Communication System Performance Based on PER-Function Coupled with Full Wave Simulation in Presence of EM-Interference

Oussama Sassi[1,2], Naseef Mahmud[3], Pascal Hervé[4], Moncef Kadi[2]
[1]Volkswagen AG, Germany; [2]UNIROUEN, ESIGELEC, IRSEEM; [3]Rohde & Schwarz GmbH & Co. KG; [4]CSA Group Bayern GmbH

Measurement and 3D Simulation Study of Shielding Properties of HV Connectors used in Electric and Hybrid Vehicles

Faik Bogdanov, David Imnadze, Anna Gheonjian, Irina Oganezova, Iskander Badzagua, David Karkashadze, Roman Jobava
EMCoS, Georgia

Investigation of the Surface Equivalence Principle on a Metal Surface for a Near-Field to Far-Field Transformation by the NFS3000

Sven Lange[1,2], Dominik Schröder[1,2], Christian Hedayat[2], Christian Hangmann[2], Ulrich Hilleringmann[1,2], Thomas Otto[2]
[1]University of Paderborn, Germany; [2]Fraunhofer ENAS, Germany

Crosstalk Prediction with Normalized Huygens's Equivalent Model in High Speed Transceiver

Chenjun Liu, Weichang Cheng, Jing Mei
Huawei Technologies Co., Ltd, China, People's Republic of

Accurate Prediction of Conducted Emissions in Switch-Mode Power Supplies for Space Applications

Gian Franco Volpi[1], Gianluca Viscillo[1], Sergio Pignari[2], Renato Trois[2]
[1]Thales Alenia Space, Italy; [2]Politecnico di Milano

An Analytical Approach for Evaluating the Effectiveness of Compensation Lines to Reduce the Inductive Coupling Interface between High Voltage Transmission Lines and Buried Pipelines

Mohammad Nazemi, Robert Dommerque, Tobias Hennig
Asset Management, Amprion GmbH, Germany

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Effect of Electric Field on the Magnetic Probe

li zhang, Yu-Ru Feng, Tian-Hao Song, Xing-chang Wei
Zhejiang University, China, People's Republic of

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EMI Source Reconstruction by Using Equivalent Dipoles at Different Height

Tian-Hao Song, Zhi-Yong Tang, Li Zhang, Yu-Ru Feng, Xing-Chang Wei
Zhejiang University, China, People's Republic of

Realization of a Gas Switched UWB Generator and its Analysis Using Finite Integration Technique

VIJAY HIRALAL BHOSALE[1], M JOY THOMAS[2]
[1]LRDE, India; [2]IISc, Bangalore, India

On-Demand Sessions **OD04: Lightning**

ON-DEMAND

Study and Analysis on Addressing Present Drawbacks of Traditional Surge Protection Devices (SPDs) using Machine Learning

Tuhan Chathnuka Binuja Dewmika Sapumanage[1,2], Nilantha Chameekara Sapumanage[3], Chamika Bandara[1,2]
[1]Coventry University, Coventry, United Kingdom; [2]National Institute of Business Management, Colombo, Sri Lanka; [3]University of Colombo, Colombo, Sri Lanka

Design of a Vehicular Movable Direct Lightning Protection System

Ping ZHOU, Zhihong CHEN, Fan LI, Jiong LIU, Tiehua JIANG, Jun WANG
Beijing Institute of Astronautic System Engineering, Beijing, China

Date: Thursday, 24/Sept/2020

8:00am - 10:00am
ROOM 1

APEMC Invited Session: APEMC Special Session: the Evolving Technologies and New Challengees in EMC

Session Chair: **Erping Li**
Session Chair: **Richard Xian-Ke Gao**

8:00am - 8:20am

An Efficient Neural Network Macro-model for Electromagnetic Radiation Spurious Emission from Voltage-Variable Capacitors

Sichen Yang, Duo Zhang, Chenhan Wu, Qiting Lu, Yudi Fan, Erping Li
Zhejiang Unviersity, China, People's Republic of

8:20am - 8:40am

Development of a New Broadband Antenna for EMI Measurement Usable in Microwave Band

Kyo Kobayashi[1], Toshiya Ishizaki[1], Shinobu Ishigami[1], Ken Kawamata[1], Katsushige Harima[2]
[1]Tohoku Gakuin University, Japan; [2]National Institute of Information and Communications Technology

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8:40am - 9:00am

DGS and FSS Incorporated EMC Design and Robust Optimization for 5G Electronic Systems

Richard Xian-Ke Gao[1], Hui Min Lee[1], Liping Yan[2], Xiang Zhao[2]
[1]Institute of High Performance Computing, Singapore; [2]Sichuan University, China

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9:00am - 9:20am

Modeling and Analysis of High Speed Switching Buck Converter IC for Conducted Emission Estimation

Jaehyoung Park[1], Chiuk Song[2], Jonghyun Park[2], Hycksu Kweon[2], Seungyoung Ahn[1], Jun Fan[3], Hongseok Kim[3]
[1]KAIST, Korea, Republic of (South Korea); [2]Hyundai mobis Co., Ltd, Korea, Republic of (South Korea); [3]Missouri University of Science and Technology, US

8:00am - 10:00am
ROOM 2

TS09: Measurement & Instrumentations II

Session Chair: **Ferran Silva**
Session Chair: **Fabrizio Marra**

8:00am - 8:20am

EMI Effects on Electrical Parameters in Fiber Optic Converters for LIN (Local Interconnect Network) Communication

Younghun Lee[1], Eunseok Kang[2], Christopher Hiler[3], Youngduk Park[1], Junho Choi[1]
[1]Lab. team, Hanon Systems, Korea, Republic of (South Korea); [2]Control Engineering Development team, Hanon Systems, Korea, Republic of (South Korea); [3]E&FP team, Hanon Systems, Novi, USA

8:20am - 8:40am

The Effect of Nonlinear Characteristics of an Electric Field Probe on Detection Response to OFDMA Signal

Ifong Wu, Yasushi Matsumoto, Kaoru Gotoh, Kanako Wake, Soichi Watanabe
National Institute of Information and Communications Technology, Japan

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8:40am - 9:00am

Broadband Electromagnetic Noise Source Identification Using Modulation Frequency Analysis

Umberto Paoletti
HITACHI, Japan

9:00am - 9:20am
APEMC 2020

One-Antenna Method with Time Domain Gating using Equi-Ripple FIR filter

Karsten Schubert, Jens Werner

Jade University of Applied Sciences, Germany

9:20am - 9:40am
APEMC 2020

A Confirmation into How a CMAD Affects MIU in Regard to AE Termination Impedance in Non-Invasive Measurement

Nozomi Miyake, Motoki Yoshida, Hidenori Muramatsu
VCCI/NEC Platforms, Ltd., Japan

9:40am - 10:00am
APEMC 2020

Impact of Process Variations on Low-side MOSFET circuit Conducted Emission

nicolas Baptistat[1,2], Geneviève Duchamp[1], Tristan Dubois[1], Kamel Abouda[2]
[1]IMS, France; [2]NXP Semiconductors

8:00am - 10:00am
ROOM 3

SS04: Recent Progress in Human Exposure Assessment

Session Chair: **Akimasa Hirata**
Session Chair: **Ilkka Laakso**

8:00am - 8:20am

Dosimetry and Compliance for Wireless Power Transfer Systems in Vehicle

KEISHI MIWA, TOMOHIRO TAKENAKA, AKIMASA HIRATA
Nagoya Institute of Technology, Japan

8:20am - 8:40am

Exposure Assessment Methods with Respect to the 5G Mobile Communication Systems

Teruo Onishi[1], Kai Niskala[2], Andreas Christ[3], John Roman[4]
[1]National Institute of Information and Communications Technology, Japan; [2]EMFEX.Ltd.; [3]Reseach Consultant; [4]Intel Corporation

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8:40am - 9:00am

Computational Dosimetry at Low Frequencies: Recent Progress and Open Issues

Ilkka Laakso
Aalto University, Finland

9:00am - 9:20am

Compliance of Non-Sinusoidal or Pulsed Magnetic Fields Generated by Industrial Sources with Reference to Human Exposure Guidelines

Luca Giaccone
Dipartimento Energia "G. Ferraris", Politecnico di Torino, Italy

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9:20am - 9:40am

Emission Levels of ELF Magnetic Fields Under Medium Voltage Power-lines in Ngodini, Mpumalanga Province

Phoka Rathebe
University of Johannesburg, South Africa

9:40am - 10:00am

Difference of ICNIRP Guidelines and IEEE C95.1 Standard for Human Protection from Radio-Frequency Exposures

Akimasa Hirata, Sachiko Kodera
Nagoya Institute of Technology, Japan

8:00am - 10:00am
ROOM 4

F02: Discussion Forum: Reverberation Chambers at the Edge of Chaos

Session Chair: **Ramiro Serra**
Session Chair: **Gabriele Gradoni**

10:00am - 10:30am **B04: Break**

10:30am - 12:30pm
ROOM 1

TS10: Automotive I

Session Chair: **Carlo Carobbi**
Session Chair: **Stephan Frei**

10:30am - 10:50am

Concepts for Bitrate Enhancement and Latency Reduction in Recurring Disturbed CAN FD Networks

Carina Austermann, Stephan Frei
TU Dortmund University, Germany

10:50am - 11:10am

Floating Circuit S-parameter Measurement Using Indirect Measurement Method

Kengo Fukunaga[1], Noboru Maeda[1], Keishi Miwa[2], Soichiro Ota[2]
[1]SOKEN, INC., Japan; [2]Toyota Motor Corporation, Japan

11:10am - 11:30am

Dimension Dependence of Transmission Coefficients of Tubular Wave Coupler and Improvement of Directivity

Kota Endo, Yusuke Yano, Osami Wada
Kyoto Univ., Japan

11:30am - 11:50am

Black Box Approach to Active Impedance Characterization of Automotive Components

Teresa Tumbrägel[1,2], Benjamin Willmann[1,3], Hanno Raabe[1]
[1]Volkswagen, Germany; [2]Technical University of Brunswick; [3]Otto-von-Guericke University

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11:50am - 12:10pm

A Parameterization of 6-Port High-Frequency Delta- and Star-Connected Induction Motor Model

Vefa Karakasli[1], Qiwei Ye[1], Gerd Griepentrog[1], Junsheng Wei[2]
[1]Technical University of Darmstadt, Germany; [2]ZF Friedrichshafen AG/Germany

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12:10pm - 12:30pm

Analysis and Assessment of the Common Mode Termination for Automotive Ethernet 1000BASE-T1

Matthias Hampe[1], Sanaz Mortazavi[2], Alexander Stieler[1], Karl-Dieter Tieste[1], Lothar Klaus[2]
[1]Ostfalia University of Applied Sciences, Germany; [2]Volkswagen AG

10:30am - 12:30pm
ROOM 2

TS11: System Level EMC

Session Chair: **Frank Leferink**
Session Chair: **Alessio Tamburrano**

10:30am - 10:50am

Reduction of Radiated Noise Using Two Inverters for Motor Drive Operating in Opposite Phases

Yasuhiro Shiraki, Takayoshi Miki, Shinsuke Kadoi, Shinobu Nagasawa
Mitsubishi Electric Corporation, Japan

10:50am - 11:10am

Statistical Characterization of Segregation Distance Among Cable Bundles Aboard Aircraft

Maria Denise Astorino[1], Giulio Antonini[1], Jean-Philippe Parmantier[2], Isabelle Junqua[2], Solange Bertuol[2], Jerome Morio[2], Nathanael Muot[3], Christophe Girard[3], Guillaume Prin[3], Alessandro Mori[4], Pierluigi Di Bartolomeo[4], Mauro Bandinelli[4], Aldo Bonsignore[4], Charles Julien[5]
[1]University of L´Aquila, Italy; [2]ONERA/DEMR Université de Toulouse, France; [3]AxesSim, France; [4]I.D.S. Ingegneria dei Sistemi S.p.A, Italy; [5]Safran Electrical & Power, France

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11:10am - 11:30am

Influence of Parasitic Coupling to Ground Plane on EMC Noise of Power Converters

Ville Forsstrom[1], Stanislav Skibin[2], Bernhard Wunsch[2]
[1]ABB Oy, Finland; [2]ABB Corporate Research Ltd, Switzerland

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11:30am - 11:50am

Eigenmode Based Optimization of Sensors

Jan Benz[1], Jan Hansen[1], Stephan Frei[2]
[1]Robert Bosch GmbH, Germany; [2]TU Dortmund University, Germany

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11:50am - 12:10pm

Influence of Cable Shielding Strategies on Current Distributions in Automotive Electrical Drives

Madhavi Dhara[1,2], Guido A. Rasek[1], Harald Schwarz[2], Georg Möhlenkamp[2]
[1]Valeo Siemens eAutomotive germany GmbH, Germany; [2]Brandenburg University of Technology Cottbus-Senftenberg

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12:10pm - 12:30pm

Fast and Efficient Approach to Predict EMC Immunity of Complex Equipement After a Component Change

Saliha CHETOUANI[1,2], Alexandre BOYER[2,3], Sonia BEN DHIA[2,3], Sébastien SERPAUD[1,2]
[1]IRT Saint Exupéry Toulouse France; [2]LAAS-CNRS Toulouse France; [3]INSA Univ de Toulouse France

10:30am - 12:30pm
ROOM 3

TS12: Intentional EMI, EMP & High Power Electromagnetics

Session Chair: **Heyno Garbe**
Session Chair: **Tadeusz Wieckowski**

10:30am - 10:50am

Response of the UAV Sensor System to HPEM Attacks

Grzegorz Lubkowski, Marian Lanzrath, Louis Cesbron Lavau, Michael Suhrke
Fraunhofer INT, Germany

10:50am - 11:10am

A Reference Test Setup and Comparison Between Different HPEM Testing Schemes

Tomas Hurtig[1], Mattias Elfsberg[1], Niklas Wellander[1], Thorsten Pusch[2], Martin Schaarschmidt[3], Michael Suhrke[2]
[1]Swedish Defence Research Agency, Sweden; [2]Fraunhofer INT; [3]Bundeswehr Research Intitute for Protective Technologies and NBC-Protection

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11:10am - 11:30am

Susceptibility Modelling of Flyback SMPS Transformer Input Stage Under High Current Pulse Injection

Laurine CUROS[1,2], Tristan DUBOIS[2], Guillaume MEJECAZE[1], Frédéric PUYBARET[1], Jean-Michel VINASSA[3]
[1]CEA DAM CEA-Gramat F-46500 France; [2]Univ. Bordeaux CNRS IMS UMR 5218 F-33400 Talence France; [3]Univ. Bordeaux CNRS Bordeaux INP IMS UMR 5218 F-33400 Talence France

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11:30am - 11:50am

Effects of Conducted Interference on a Microcontroller Based on IEC 62132-4 and IEC 62215-3

Felix Burghardt, Heyno Garbe
Leibniz University Hannover, Germany

11:50am - 12:10pm

Preliminary Investigation of Impedance Discontinuity Detection on Wire Network Using Sequence Time Domain Reflectometry

Daiki Kameyama, Kengo Iokibe, Yoshitaka Toyota

Okayama University, Japan

12:10pm - 12:30pm

Opportunity of the Software Defined Radio for Automatic Intentional EM Aggression Tests

Jean-Christophe JOLY, Clément LAPARRO, Laurine CUROS
CEA, France

10:30am - 12:30pm | **TU02: EMC for Emergent Wireless Systems**

Session Chair: **Davy Pissoort**

ROOM 4

- Short Introduction on the CORNET EEWISE Project, David Pissoort
- EMC Assessment Using Near-Field Scanning and Simulation Techniques, David Schroeder
- Implementation of Shielding Approaches in System-in-Package Configurations, Marco Rossi
- Software Defined Radios, an EMI Debugging Tool?, Tim Claeys
- Robust Communication in Autonomous Electric Cars – An Example considering Automotive Ethernet and Bluetooth Low Energy, Christian Hangmann

12:30pm - 1:30pm | **B05: Break**

1:30pm - 3:30pm | **TS13: Automotive II**

Session Chair: **Jan Carlsson**
Session Chair: **Bernd Deutschmann**

ROOM 1

1:30pm - 1:50pm

Enhanced Circuit Model for Insertion Loss Prediction of Active EMI Filters Considering Non-ideal Parameters

Enrico Mazzola[1,2], Flavia Grassi[2], Alessandro Amaducci[1]
[1]Schaffner EMV AG, 4542 Luterbach, Switzerland; [2]Politecnico di Milano, 20133 Milan, Italy

1:50pm - 2:10pm

Active Cancellation of Periodic DM EMI at the Input of a GaN Motor Inverter by Injecting Synthesized and Synchronized Signals

Andreas Bendicks, Michael Gerten, Stephan Frei
TU Dortmund University, Germany

2:10pm - 2:30pm

Susceptibility of 100Base-T1 Communication Lines to Coupled Fast Switching High-Voltage Pulses

Sebastian Jeschke[1], Jan Loos[1], Michael Kleinen[1], Jörg Bärenfänger[1], Oguz Kurt[1], Christian Hangmann[2], Ingo Wüllner[2]
[1]EMC Test NRW GmbH, Germany; [2]SIL System Integration Laboratory GmbH

2:30pm - 2:50pm

Research on EMI from Modern Electric Vehicles and their Recharging Systems

Konstantinos Pliakostathis
Joint Research Centre, European Commission, Italy

2:50pm - 3:10pm

Novel Multi Charge Pump Architecture Allowing Drastic Conducted Emission Reduction on Battery Lines

Kamel ABOUDA, Adrien DORIDANT, Juliette VEDELAGO
NXP, France

3:10pm - 3:30pm

A Test Bench for Measuring the Sensitivity Threshold of FM Receivers in the Presence of Interference Through Direct Injection of the Radio Signal

Abdivall Maouloud[1,2], Marco Klingler[1], Philippe Besnier[2]
[1]Groupe PSA, France; [2]INSA Rennes, CNRS, IETR UMR 6164

1:30pm - 3:30pm
ROOM 2

SS05: Electromagnetic Eavesdropping (TEMPEST)

Session Chair: **Gilles Peres**
Session Chair: **Frank Sabath**

1:30pm - 1:50pm

Reconstructing Video Images in Color Exploiting Compromising Video Emanations

Pieterjan M.L. De Meulemeester[1,2], Bart Scheers[1], Guy A.E. Vandenbosch[2]
[1]Royal Military Academy, Brussels, Belgium.; [2]Katholieke Universiteit Leuven, Leuven, Belgium.

1:50pm - 2:10pm

Improved Characteristics of Countermeasure Method for Image Information Leakage by Electromagnetic Radiation from ITE

Kimihiro Tajima, Hitoshi Nobata, Yasunao Suzuki
NTT Advanced Technology Corporation, Japan

2:10pm - 2:30pm

Survey of Hardware Trojan Threats and Detection

Yu-ichi Hayashi[1], Shinichi Kawamura[2]
[1]Nara Institute of Science and Technology, Japan; [2]National Institute of Advanced Industrial Science and Technology, Japan

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2:30pm - 2:50pm

Measurements Toward a Theory of Light Emitting Diode Reversal Attacks, Part 1: Error Avoidance

Joe Loughry
Netoir.com, United States of America

1:30pm - 3:30pm
ROOM 3

SS06.I: Stochastic Methods in Electromagnetic Compatibility - Part I

Session Chair: **Valter Mariani Primiani**
Session Chair: **Gabriele Gradoni**

1:30pm - 1:50pm

A Probabilistic Interpretation of the IEC~61000-4-21 Threshold Levels for Field Uniformity in Ideal Reverberation Chambers

Ramiro Serra[1], Carlo Carobbi[2]
[1]Eindhoven University of Technology, the Netherlands; [2]Università degli Studi di Firenze, Italy

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1:50pm - 2:10pm

Probability of Failure Using the Kriging Controlled Stratification Method and Statistical Inference

Thomas Houret[1,2], Philippe Besnier[1], Stéphane Vauchamp[2], Philippe Pouliguen[3]
[1]INSA Rennes, CNRS, IERTR, UMR 6164, F-35000; [2]DEA DAM, Gramat, France; [3]AID/DGA, PAris, France

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2:10pm - 2:30pm

A Closed-Loop Calibration Method for the Vibrating Intrinsic Reverberation Chamber

Danilo Izzo[1,2], Alexander Rommel[2], Martin Aidam[3], Frank Leferink[1], Robert Vogt-Ardatjew[1]
[1]University of Twente; [2]Daimler Truck AG, Germany; [3]Mercedes-Benz AG

2:30pm - 2:50pm

"Well-Stirred" Condition Method applied to a Multiple Monopole Source Stirred Reverberation Chamber

Alfredo De Leo[1], Guillaume Andrieu[2], Valter Mariani Primiani[1]
[1]Università Politecnica delle Marche, Italy; [2]XLIM Laboratory University of Limoges Limoges, France

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2:50pm - 3:10pm

Statistical Analysis of Smartphone MDT Signaling Power Measurements for Radio Maritime LTE Propagation Study

Davide Micheli, Giuliano Muratore, Aldo Vannelli
Telecom Italia, Italy

3:10pm - 3:30pm

Deterministic-Stochastic Modeling of a Glide Path Antenna System above a Multilayer

Dragan Poljak[1], Vicko Doric[1], Anna Susnjara[1], Mario Birkic[2], Sebastien Lallechere[3], Khalil El Khamlichi Drissi[3]
[1]FESB, University of Split, Croatia; [2]Croatian Air traffic Control, HKZP, Zagreb, Croatia; [3]Institut Pascal, Université Clermont Auvergne, Clermont-Ferrand, France

1:30pm - 3:30pm — **WS02.I: Conducted EMI and Power Quality Issues in Power Distribution Networks - Part I**

Session Chair: **Daria Nemashkalo**
Session Chair: **Lu Wan**

ROOM 4

- European Research Projects SCENT and ETOPIA on Conducted and Low Frequency EMC, Frank Leferink
- Aggregated Conducted Electromagnetic Interference Generated by Photovoltaic Power Station, Robert Smolenski
- Multi-Channel Time-Domain EMI Measurements in Modern Systems, Niek Moonen

3:30pm - 4:00pm — **B06: Break**

4:00pm - 6:00pm — **TS14: Computational Electromagnetics, Modeling & Simulation II**

Session Chair: **John Dawson**
Session Chair: **Silvano Cruciani**

ROOM 1

4:00pm - 4:20pm

Spacecraft Hull Effect on Radiated Emissions and Optimal Onboard Payload Allocation

Anargyros T. Baklezos[1], Christos D. Nikolopoulos[1], Theodoros N. Kapetanakis[2], Ioannis O. Vardiambasis[2], Christos N. Capsalis[1]
[1]School of Electrical and Computer Engineering National Technical University of Athens; [2]dept. of Electronic Engineering Hellenic Mediterranean University

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4:20pm - 4:40pm

An ELF Radiation Model for Estimating the Transient Electric Behavior of Space Units

Christos D. Nikolopoulos[1], Anargyros T. Baklezos[1], Marco Nicoetto[2], Illario Marziali[2], Demis Boschetti[2], Christos N. Capsalis[1]
[1]National Technical University of Athens, Greece; [2]Thales Alenia Space Italia, Turin, Italy

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4:40pm - 5:00pm

Computer Aided Engineering for Optimal EMC design of On-Board Battery Chargers

Antonio Camarda, Flavio Calvano, Asad Mazhar Khan, Mirco Balbarani, Paolo Montanari, Daniel Grossi
Metasystem, Italy

5:00pm - 5:20pm

Modeling and Measurement of RF-Emissions at Transceiver Pins in Automotive System ICs Caused by Integrated DC/DC-Converters

Alexander Schade[1], Frank Klotz[1], Stefan Jahn[1], Robert Weigel[2]
[1]Infineon Technologies AG, Germany; [2]Lehrstuhl für Technische Elektronik, Friedrich-Alexander-Universität Erlangen-Nürnberg

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5:20pm - 5:40pm

Non-Destructive Modeling of a 9V Alkaline Battery for EMC Simulation Based on S-Parameter Measurement

Herbert Hackl[1], Martin Ibel[1], Bernhard Auinger[1], Dominik List[2], Christian Stockreiter[2]
[1]Silicon Austria Labs GmbH, Austria; [2]ams AG, Premstätten, Austria

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5:40pm - 6:00pm

Transient Impedance of the Synchronous Generator Grounding Electrode due to Short Circuit Current

Silvestar Sesnic, Ante Soldo, Dragan Poljak
FESB, University of Split, Croatia

4:00pm - 6:00pm
ROOM 2

TU03: Using Reverberation Chambers for EMI Testing
Session Chair: **Frank Leferink**

- Introduction – Rationale for RC Testing; Overview of Reverberation Chamber Theory', Vignesh Rajamani
- Aircraft Quality Factor Measurement Approach for the Evaluation and Prototyping of Wireless Systems Onboard Aircraft, Dennis Lewis
- Flexible testing: shaken, not stirred, Frank Leferink

4:00pm - 6:00pm
ROOM 3

SS06.II: Stochastic Methods in Electromagnetic Compatibility - Part II
Session Chair: **Valter Mariani Primiani**
Session Chair: **Gabriele Gradoni**

4:00pm - 4:20pm

Applications of the Random Coupling Model for Stacked Printed Circuit Boards

Valentin Houchouas[1,2], Muriel Darces[2], Marc Hélier[2], Emmanuel Cottais[1], José Lopes Esteves[1]
[1]National CyberSecurity Agency of France, France; [2]Sorbonne University, CNRS, Group of Electrical Engineering - Paris;University of Paris-Saclay, CentraleSupélec, CNRS, Group of Electrical Engineering - Paris

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4:20pm - 4:40pm

Distribution of Energy through Cable Networks using Random Coupling Model

Mubarack Ahmed, Gabriele Gradoni, Stephen C. Creagh, Chris Smartt, Steve Greedy, Gregor Tanner
University of Nottingham, United Kingdom

4:40pm - 5:00pm

Field Homogeneity and Isotropy Analysis of a Reverberation Chamber Equipped with a Pair of Hemispherical Diffractors

Mathias Magdowski[1], Eike Suthau[2], Konstantin Pasche[3], Stephan Pfennig[3], Ralf T. Jacobs[2], Ralf Vick[1]
[1]Otto von Guericke University, Germany; [2]Technische Universität Dresden; [3]LUMILOOP GmbH

5:00pm - 5:20pm

Uncertainty Quantification of Cable Inductances and Capacitances via Mixed-Fidelity Models

Paolo Manfredi
Politecnico di Torino, Italy

5:20pm - 5:40pm

Variability Analysis of a Non-Uniform Transmission Line Using Stochastic Galerkin Method

Tadatoshi Sekine, Shin Ususki, Kenjiro T. Miura
Shizuoka University, Japan

4:00pm - 6:00pm
ROOM 4

WS02.II: Conducted EMI and Power Quality Issues in Power Distribution Networks - Part II
Session Chair: **Daria Nemashkalo**
Session Chair: **Lu Wan**

- Unresolved Issues Regarding EMC Between Communication Circuits and Power Systems in the Frequency Range 2-150 kHz, Dave Thomas
- Challenges in the Modelling of Power Electronics Modules Onboard Electric Vehicles, Flavia Grassi
- Power Quality Due to SMPS's and PV Installations, Cees Keyer

On-Demand Sessions
ON-DEMAND

OD05: Measurements & Instrumentation

Bit Error Rate Estimation Based on the Probabilistic Model of the Crosstalk Voltage

Yury Kuznetsov[1], Andrey Baev[1], Maxim Konovalyuk[1], Anastasia Gorbunova[1], Johannes A. Russer[2]
[1]Moscow Aviation Institute (National Research University), Russian Federation; [2]Technical University of Munich

An Improved Reference Device for Radiated Immunity Interlaboratory Comparison

Emrah Tas, Frederic Pythoud, Beat Muehlemann
Federal Institute of Metrology METAS, Switzerland

Direct Methods to Analyse Shielding Properties of HV Cables Used in EVs and HEVs

Abid Mushtaq
AKKA EMC GmbH, Germany

Capacitive Clamp Usage in Damped Oscillatory Wave Immunty Tests for IEC and ANSI Standards

Marco VInicio Bazzotti[1], Marco Mozzi[2], Renato Henz[3]
[1]ABB ELDS, Dalmine, Italy; [2]AFJ Instruments, Milan, Italy; [3]EMC Partner AG Laufen, Switzerland

Analysis of the Electromagnetic Emission of a Railway Vehicle According to the EN 50121-3-1 Standard: a Case Study

Siriana Paonessa[1], Walter Picariello[2], Luca Bocciolini[2], Carmine Zappacosta[2], Stefano Di Pascoli[1], Bernardo Tellini[3], Massimo Macucci[1]
[1]University of Pisa, Italy - Diparimento Ingegneria dell'Informazione; [2]Italcertifer s.p.a; [3]University of Pisa, Italy - Dipartimento di Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni

Investigating Power Line Termination Device Effectiveness in Regards to Radiated Emission Measurement Reproducibility in Consideration of Two Disturbance Sources and AC Mains Cable

Shinichi Okuyama[1], Kunihiro Osabe[2], Nobuo Kuwabara[3], Fujio Amemiya[4], Toshiki Shimasaki[5], Hidenori Muramatsu[6]
[1]VCCI Council / NEC Platforms, Japan; [2]VCCI Council; [3]kuwabara.nobuo756@mail.kyutech.jp; [4]VCCI Council; [5]VCCI Council; [6]VCCI Council

Examining the Necessity of 10 dB-Attenuation at the Measurement Port of AANs

Yoshiharu Akiyama[1], Motoki Yoshida[2], Hidenori Muramatsu[3]
[1]NTT Advanced Technology Corporation; [2]Panasonic Corporation; [3]VCCI Council

Analysis of Field Deviation in Radiated Emission Measurement at Frequencies up to 60 GHz

Xuping Yang[1], Liping Yan[1], Xiang Zhao[1], Ming Ye[2]
[1]Sichuan University, China, People's Republic of; [2]Huawei Technologies, Sweden AB

Fundamental Study on Measurement Resolution of Side Channel Waveform in Correlation Power Analysis

Kohei Utsumi[1], Yu-ichi Hayashi[2], Takaaki Mizuki[3], Hideaki Sone[4]
[1]Tohoku University, Japan; [2]Nara Institute of Science and Technology, Japan; [3]Tohoku University, Japan; [4]Tohoku University, Japan

Research on Frequency Estimation of LFM Signal with Spectrum Superposition

Yakai Dong[1], Shuguo Xie[2], Yan Yang[2]
[1]Beijing Institute of Spacecraft System Engineering; [2]Beihang University

Optimization of the GTEM Cell Resistive Network

Binwen Wang, Tingyong Jiang, Zhen Liu, Hui Ning, Lei Shi
Northwest Institute of Nuclear Technology, China, People's Republic of

Electromagnetic Characterization of 3D Printed Antennas Employing Conductive Filament

Marc Pous, Marco Azpúrua, Marcos Quílez, Marc Mateu, Mireya Fernández, Ferran Silva
Universitat Politècnica de Catalunya, Spain

Implementation of an All-Textile Bow-Tie Antenna for the 868 MHz ISM Band

Martin Pavec[1], Theodoros N. Kapetanakis[2], Melina P. Ioannidou[3], Chistos D. Nikolopoulos[2], Anargyros T. Baklezos[2], Radek Soukup[1], Tomas Blecha[1], Ales Hamacek[1], Ioannis O. Vardiambasis[2]
[1]Department of Technologies & Measurement University of West Bohemia; [2]Division of Telecommunications, Department of Electronic Engineering Hellenic Mediterranean University; [3]Department of Information & Electronic Engineering International Hellenic University

Mutual Antenna Coupling Test Approach for Spacecraft Applications

Emiliano Scione, Marco Nati, Marco Ruzzo, Lorenzo Pesci, Emanuele Ruà
Thales Alenia Space Italia spa, Italy

Numerical Analysis of Vibrating Intrinsic Reverberation Chamber between Various Shielding Effectiveness Measurement Techniques

Makoto Hara[1], Tatsuya Yoshikai[1], Yasuo Takahashi[1], Robert Vogt-Ardatjew[2], Frank Leferink[2]
[1]Kawasaki Heavy Industries, Ltd., Japan; [2]University of Twente, Netherlands

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A Study of Frequency Extension of AC Magnetic Field Sensor Using Radio-Microwave-Optical Multiple Resonance in 133Cs

MASANORI ISHII
National Institute of Advanced Industrial Science and Technology, Japan

APEMC 2020

Decomposition of Radiated Disturbances Based on Single-channel Blind Source Separation

Bin Cao[1], Jiajun Lu[1], Yixing Gu[2], Jinjing Ren[2], Shenhui Jing[2]
[1]Marine Design & Research Institute of China, China, People's Republic of; [2]School of Mechanical Engineering, Southeast University, Nanjing, China,People's Republic of

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Investigation of a High Frequency Coupling Path Between HV and Shaft of an Electric Machine

Sergii Tsiapenko, Holger Hirsch
Universität Duisburg-Essen, Germany

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Measurements on Absorbers – Results on Configurations and Properties

Robert Geise[1], Carsten Rabe[2], Bjoern Gruetter[2], Markus Brandl[2]
[1]University of Applied Science Leipzig, Germany; [2]Research and Transfercentre EMC e.V. Leipzig

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Biaxial Material Characterization Utilizing A Focus Beam System

Nicholas O'Gorman, Michael Havrilla
Air Force Institute of Technology

Development of an Experimental System for Current Perception from 1 to 10 MHz

Yoshitsugu Kamimura[1], Kenshu Daimon[1], Naoya Matsumoto[1], Shunai Kimura[1], Ken Sato[2]
[1]Utsunomiya University, Japan; [2]National Institute of Technology, Hachinohe College

On-Demand Sessions **ON-DEMAND**	**OD06: Automotive**
	Numerical and Experimental Analysis of Non-Coaxial DCI-Excitations as HIRF-Replacement in Automotive Immunity Testing **Jan Ückerseifer, Frank Gronwald** University of Siegen, Germany
	Efficient Use of Circuit & 3D-EM Simulation to Optimize the Automotive Bulk Current Injection (BCI) Performance of Ultrasonic Sensors **Chakrapani Nandyala, Harry Litz, Bastian Hafner, Raffi Kalayciyan** Valeo Schalter und Sensoren GmbH, Germany
On-Demand Sessions **ON-DEMAND**	**OD07: System Level EMC**
	System-Level Response of Ethernet Linkage to Bulk Current Injection into Cables **Akira Tsukada[1], Ken Okamoto[2], Yuichiro Okugawa[2], Jun Kato[2], Makoto Nagata[1]** [1]Kobe University, Japan; [2]NTT Corporation, Japan
	System Level EMC Analysis And Semi-physical Verification Technology of Satellite **Yuting Zhang[1,2], Liang Zhang[1], Yakai Dong[1]** [1]Beijing Institute of Spacecraft System Engineering, China, People's Republic of; [2]eijing Engineering Research Center of EMC and Antenna Test Technology, China, People's Republic of
	Interference Path Loss Measurements of Beechcraft B300 Aircraft at 4 GHz Wireless Avionics Intra-Communication Band **Shunichi Futatsumori[1], Norihiko Miyazaki[1], Takashi Hikage[2], Tetsuya Sekiguchi[2], Manabu Yamamoto[2], Toshio Nojima[2]** [1]Electronic Navigation Research Institute, National Institute of Maritime, Port and Aviation Technology, Japan; [2]Graduate School of Information Science and Technology, Hokkaido University
On-Demand Sessions **ON-DEMAND**	**OD08: SS-APEMC: New Aspects on Digital Communication and EMC**
	APEMC 2020 **Impacts of Near-Field Undesired Radio Waves from Semiconductor Switching Circuits on Wireless Communications** **Makoto Nagata[1], Koh Watanabe[1], Noriyuki Miura[1], Satoshi Tanaka[1], Yasunori Miyazawa[2], Masahiro Yamaguchi[2]** [1]Kobe University, Japan; [2]Tohoku University, Japan
	APEMC 2020 **Ferromagnetic Noise Suppressor to be Implemented in an IC Chip Package** **Masahiro Yamaguchi[1], Yasunori Miyazawa[1], Koh Watanabe[2], Kosuke Jike[2], Satoshi Tanaka[2], Noriyuki Miura[2], Makoto Nagata[2]** [1]Tohoku University, Japan; [2]Kobe University, Japan
	APEMC 2020 **Measurement of Throughput Degradation due to Pulse Disturbance in Power Line Communication** **Kyoko Kadoyoshi, Kazumasa Oshikawa, Toshiyuki Wakisaka, Tohlu Matsushima, Yuki Fukumoto** Kyushu Institute of Technology, Japan
	APEMC 2020 **Investigation of Communication Quality Degradation of 1000BASE-T1 by Pulse Disturbance** **Yusuke Yano, Takashi Hisakado, Osami Wada**

Kyoto University, Japan

Date: Friday, 25/Sept/2020

8:00am - 10:00am
ROOM 1

TS15: Transmission Lines & Cables II

Session Chair: **Pierre Degauque**
Session Chair: **Alessandro Giuseppe D'Aloia**

8:00am - 8:20am

A new Voltage Measurement Probe for investigating Radiated Immunity Test

Alexandre BOYER[1], Sonia BEN DHIA[1], André DURIER[2]
[1]LAAS-CNRS, France; [2]IRT Saint-Exupéry, France

8:20am - 8:40am

Wearable Measurement Method for Voltage to Ground of Conducted Noise on Unshielded Cables

Naruto Arai, Ken Okamoto, Jun Kato
NTT Corporation, Japan

8:40am - 9:00am

"Virtual" Signal Integrity Test on High-Speed Ethernet Cables in a Reverberation Chamber

Sahand Rasm[1,2], Guillaume Andrieu[1], Rémi Tumayan[2], Alain Reineix[1]
[1]XLIM laboratory, SRF axis, EMC team, Limoges, France; [2]Renault, RF & EMC department, Guyancourt, France

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9:00am - 9:20am

Experimental Extraction Method for Primary and Secondary Parameters of Shielded-Flexible Printed Circuits

Yamagiwa Taiki, Kayano Yoshiki, Kami Yoshio, Xiao Fengchao
The University of Electro-Communications, Japan

9:20am - 9:40am
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Estimation of Radiated Emissions from Multiple Cables and Connectors

Qi Zhou, Xiang Zhou, Ruoqi Wang, Zhongyuan Zhou, Jinjing Ren, Peng Li
Southeast University, China, People's Republic of

9:40am - 10:00am
APEMC 2020

Research on the Coupling Response and Shielding Design of Cable in Compound Electromagnetic Environment

Maoxing Zhang, Cui Meng
Department of Engineering Physics,Tsinghua University, China, People's Republic of

8:00am - 10:00am
ROOM 2

TS16: Power Electronics

Session Chair: **Franco Fiori**
Session Chair: **Umberto Paoletti**

8:00am - 8:20am

Visualization of Dynamic Noise Current Distribution from Si and SiC Power Devices Based on Time-Synchronized Near Magnetic Field Scanning

Takaaki Ibuchi, Tsuyoshi Funaki
Osaka University, Japan

8:20am - 8:40am

Measuring Small Differential-Mode Voltages with High Common-Mode Voltages and Fast Transients -- Application to Gate Drivers for Wide Band-Gap Switches

Hadiseh GERAMIRAD[1,2], Florent MOREL[1], Bruno LEFEBVRE[1], Chrisitian VOLLAIRE[1,2], Arnaud BREARD[1]
[1]SuperGrid Institute, France; [2]Ecole centrale de Lyon

8:40am - 9:00am

Time Domain Analysis of RF Impedances in Fast Switching Power Electronic Systems

Oliver Kerfin, Martin Harm
Technische Universität Braunschweig, Germany

9:00am - 9:20am

Improvement of Predictive Pulsed Compensation using Adapted Synchronization

Denis Müller[1], Konstantin Spanos[2], Michael Beltle[1], Stefan Tenbohlen[1]
[1]University of Stuttgart, Germany; [2]Robert Bosch GmbH, Germany

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9:20am - 9:40am
APEMC 2020

Analysis of Common Mode Current of Isolated Converters Caused by Imbalance Factor Mismatch

Taiki Nishimoto, Naoki Sawada, Noriaki Takeda, Masahiro Yamaoka, Toru Yamada
Panasonic Corporation, Japan

9:40am - 10:00am
APEMC 2020

Conducted Noise Investigation for IMS Based GaN HEMT Power Module by Black Box Model

Amina GAHFIF[1], Francois COSTA[2], Mounira BERKANI[2], Pierre-Etienne LÉVY[3], Marwan ALI[4], Bertrand REVOL[4]
[1]SAFRAN SA, France; [2]Université Paris Est Créteil, France; [3]ENS Paris-Saclay, France; [4]SAFRAN SA, France

8:00am - 10:00am
ROOM 3

SS07: EMC and EMF Issues in Wireless Power Transfer System

Session Chair: **Seungyoung Ahn**
Session Chair: **Tommaso Campi**

8:00am - 8:20am

Active Shielding Design for a Dynamic Wireless Power Transfer System

Silvano Cruciani[1], Tommaso Campi[1], Francesca Maradei[2], Mauro Feliziani[1]
[1]Dept. of Industrial and Information Eng. and Economics, University of L'Aquila, L'Aquila, Italy; [2]Department of Astronautics, Electrical and Energetic Eng., Sapienza University of Rome, Rome, Italy

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8:20am - 8:40am

A LCL-LCL Topology for Odd Harmonic Magnetic Fields Reduction in Over-Coupled WPT System

Yujun Shin, Haerim Kim, Jaehyoung Park, Bumjin Park, Seongho Woo, Sungryul Huh, Chanjun Park, Seungyoung Ahn
Korea Advanced Institute of Science and Technology, Korea, Republic of (South Korea)

8:40am - 9:00am

Magnetic Near Field Investigation and Shielding Effectiveness Evaluation of an Inductive Power Transfer System with a Resonator Array

Mattia Simonazzi, Leonardo Sandrolini, Ugo Reggiani
University of Bologna, Italy

9:00am - 9:20am

Electric Near Field Reduction in Wireless Power Transfer Systems

Sami Barmada, Danilo Brizi, Nunzia Fontana, Agostino Monorchio, Mauro Tucci
University of Pisa, Italy

9:20am - 9:40am

	Multi Resonant Reactive Shield for Reducing the Electromagnetic Fields from Wireless Charging Electric Vehicle **Jaehyoung Park, Yujun Shin, Chanjun Park, Bumjin Park, Seongho Woo, Sungryul Huh, Haerim Kim, Seungyoung Ahn** KAIST, Korea, Republic of (South Korea)
	9:40am - 10:00am **Effect of Wireless Charging of Mobility Scooters on Human Health and Temperature Increase of their Chassis** **Ibrahim Dergham[1], Juan-Carlos Martinez Rocha[1], Rodrigue Imad[2], Yasser Alayli[1]** [1]Versailles Engineering Systems Laboratory (LISV), France; [2]Mechatronics department - University of Balamand, Lebanon
8:00am - 10:00am **ROOM 4**	**WS03: High Intensity Radiated Field Environments …** Session Chair: **Jeffrey Viel** • Aircraft Protection Against High Intensity Radiated Field (HIRF), Jeffrey Viel • Aircraft Protection Against Lightning, Andy Plumber
10:00am - 10:30am	**B07: Break**
10:30am - 12:30pm **ROOM 1**	**TS17: Computational Electromagnetics, Modeling & Simulation III** Session Chair: **Frank Gronwald** Session Chair: **Wen Yan Yin**
	10:30am - 10:50am **Identification of Common Mode Sources for Simulation of DC Motor Radiation** **Alexander Engeln, Stefan Dickmann** Helmut Schmidt University Hamburg, Germany
	10:50am - 11:10am **Validity of Geometrical Simplifications in the Application of a Modal Equivalent Circuit for Interconnection Networks in Metallic Enclosures** **Christoph Lange, Marco Leone** Otto-von-Guericke University Magdeburg, Germany
	11:10am - 11:30am **Efficient Calculation of the Radiation by an Electrically Large Slot in a Rectangular Cavity** **Jörg Petzold, Ralf Vick** Otto-von-Guericke University, Germany
	11:30am - 11:50am **Flexible FDTD Simulation for the Wireless Earphone Exposure Evaluation** **Alessandro Gravina, Franco Moglie, Luca Bastianelli, Valter Mariani Primiani** Universita' Politecnica delle Marche, Italy
	11:50am - 12:10pm **Simulation Method for Inverter Common-mode Noise at the Whole Train Level** **Kiyoto Matsushima, Umberto Paoletti, Keisuke Fukumasu** CTI-Production Engineering, Yokohama Research Laboratory, Hitachi Ltd., R&D Group
	12:10pm - 12:30pm **Numerical Evaluation of the Lightning Currents Flowing Through Aircrafts Fasteners – Comparison and Cross-Validation of methods** **Christophe GIRARD** AXESSIM SAS, France
10:30am - 12:30pm	

ROOM 2	**TS18: Electromagnetic Environment** Session Chair: **Kia Wiklundh** Session Chair: **Marc Pous**
	10:30am - 10:50am **Simple Measurement Method of Electromagnetic Field Distribution Using Machine-Learning** **Ken Sato[1], Yoshitsugu Kamimura[2]** [1]National Institute of Technokogy, Hachinohe College, Japan; [2]Utsunomiya University
	10:50am - 11:10am **Generalized Extreme Value Distribution Based Framework for Shielding Effectiveness Evaluation of Undermoded Enclosures** **Peng Hu, Zhongyuan Zhou, Xiang Zhou, Jinpeng Li, Jingkang Ji, Mingjie Sheng, Peng Li** Electromagnetic Compatibility Laboratory, School of Mechanical Engineering, Southeast University, China, People's Republic of
	11:10am - 11:30am **First Principle Computational EMI Model of V and W Wideband Signal Temporal Delay Induced By A HANE in the Ionosphere** **ANDREW KNISELY[1], ANDREW TERZUOLI[2]** [1]IEEE, USA; [2]IEEE, USA
	11:30am - 11:50am **EMC Test Campaign on VEGA C Launcher Upper Stage** **María Jiménez[1], Jesús Ortiz[2], Rocco Albano[3], Daniel López[1], Carolina Morales[4,1], Manuel Añón[1], Alessandro Potini[3]** [1]INTA, Spain; [2]CRISA, Spain; [3]AVIO, Italy; [4]Procesia, Spain
	11:50am - 12:10pm **Characterization of Electromagnetic Fields of Radiating Systems by Thermo-Fluorescence** **Hugo Ragazzo[1], Daniel Prost[1], Jean-François Bobo[2], Stephane Faure[3]** [1]ONERA, France; [2]CNRS-CEMES, France; [3]LPCNO, France
	12:10pm - 12:30pm **Electromagnetic Characterization for UHF-RFID Fixed Reader in Smart Healthcare Environments** **Victoria Ramos[1], Angeles Trillo[2], Oscar J. Suarez[3], Victor M Febles[4], Jose C. Fernandez-Aldecoa[4], Luis E Rabassa[4], Samuel D Suarez[4], Jolanta Karpowicz[5], Jose A. Hernandez[4]** [1]Instituto de Salud Carlos III, ISCIII, Spain; [2]Hospital Universitario Ramón y Cajal; [3]Secretaría de Estado de Telecomunicaciones e Infraestructuras Digitales; [4]Hospital Universitario de Canarias; [5]Central Institute for Labour Protection – National Research Institute CIOP-PIB
10:30am - 12:30pm **ROOM 3**	**TS19: PCBs, Signal Integrity & Power Integrity** Session Chair: **Mohamed Ramdani** Session Chair: **Tzong-Lin Wu**
	10:30am - 10:50am **Reduction of Radiated Far-Field Emission and Susceptibility Using a Suspended Metal Loop** **Mohsen Koohestani[1,2], Mohamed Ramdani[1,2], Richard Perdriau[1,2]** [1]Ecole Supérieure d'Électronique de l'Ouest (ESEO), France; [2]Institut d'Électronique et de Télécommunications de Rennes (IETR), France
	10:50am - 11:10am **Via Design Optimization for Server Applications** **Nick K. H. Huang** ASUSTek Computer Inc., Taiwan

11:10am - 11:30am

Characterization of EMI Sources from Reconstructed Current Distributions Based on Phase-Less Electric and Magnetic Near-Field Data

Robert Jan Nowak, Anika Henke, Stephan Frei
TU Dortmund University, Germany

11:30am - 11:50am

Bayesian Optimization for Signal Transmission Including Crosstalk in a Via Array

Katharina Scharff[1], Hakki M. Torun[2], Cheng Yang[1], Madhavan Swaminathan[2], Christian Schuster[1]
[1]Institute of Electromagnetic Theory, Hamburg University of Technology, Hamburg, Germany; [2]3D Systems Packaging Research Center (PRC), School of Electrical & Computer Engineering, Georgia Institute of Technology, Atlanta, GA, 30332

11:50am - 12:10pm

EMI Effects in CMOS Time-Mode Circuits

anna richelli, luigi colalongo, zsolt miklos kovacs-vajna
university of brescia, Italy

12:10pm - 12:30pm

Suppression of Mode Conversion Due to Asymmetric Geometry of Dense Parallel Traces in Differential-Transmission Lines

Tomoya Takeuchi, Kengo Iokibe, Yoshitaka Toyota
Okayama university, Japan

10:30am - 12:30pm **ROOM 4**	**F03: Discussion Forum EMC and Education** Session Chair: **Ramiro Serra** Session Chair: **Davy Pissoort**
12:30pm - 1:30pm	**B08: Break**
1:30pm - 3:30pm **ROOM 1**	**TS20: Measurement & Instrumentations III** Session Chair: **Andy Marvin** Session Chair: **Giovanni De Bellis**

1:30pm - 1:50pm

Coupling Mean Study To Test Automotive Equipment Against Wideband Pulse Interferences

Thomas Picon[1,2], Tristan Dubois[2], Marco Klingler[1], Genevieve Duchamp[2]
[1]Groupe PSA, Centre technique de Vélizy, route de Gisy, 78943 Vélizy-Villacoublay, France; [2]Univ. Bordeaux, IMS laboratory – CNRS UMR 5218, 33405 Talence, France

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1:50pm - 2:10pm

Investigation of Emission Requirements above 1GHz towards 5G

Ralf Vick, Johanna Kasper, Jörg Petzold, Max Rosenthal
Otto-von-Guericke Universität, Germany

2:10pm - 2:30pm

Alternative Method for Transfer Impedance Measurements

Christian Tuerk, David Pommerenke, Susanne Bauer
Graz University of Technology, Austria

2:30pm - 2:50pm
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Experimental Study of the Shielding Effectiveness Performance Degradation for a Shielding Material Used in Protective Storage Pouch

Zbigniew Joskiewicz, Jaroslaw Janukiewwicz
Wroclaw University of Science and Technology, Poland

2:50pm - 3:10pm

Comparing Various Measurement and Simulation Techniques for Estimating Crosstalk

Jesper Lansink Rotgerink[1,2], George Erotas[2], Niek Moonen[2], Frank Leferink[2,3]
[1]Royal Netherlands Aerospace Centre, Netherlands, The; [2]Universiteit Twente, Netherlands, The; [3]Thales Nederlands B.V., Netherlands, The

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3:10pm - 3:30pm

On the Measurement of Fields produced by Sea Return Electrodes for HVDC Transmission

Massimo Marzinotto[1], Paolo Molfino[2], Mario Nervi[2]
[1]Terna S.p.A., Italy; [2]University of Genova, Italy

1:30pm - 3:30pm
ROOM 2

SS08: EMC Diagnostics of Complex Systems

Session Chair: **Vladimir Mordachev**
Session Chair: **Riccardo Trinchero**

1:30pm - 1:50pm

Results of EMC Experimental Studies of 5G Network Transmitters and Receivers of Fixed-Satellite Service in 3.5 GHz Band

VALERY TIKHVINSKIY[1,3], VIKTOR KOVAL[2], PAVEL KORCHAGIN[2], ALTAY AITMAGAMBETOV[4]
[1]NIIR (Radio Researcg & Development Institute), Russian Federation; [2]GEYSER-TELECOM Ltd.; [3]MOSCOW TECHNICAL UNIVERSITY OF COMMUNICATIONS AND INFORMATICS; [4]International Information Technology University, Kazakhstan

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1:50pm - 2:10pm

Worst Case Model for Fast Analysis of Intermodulation Interference in Radio Receiver

Eugene Sinkevich
Belarusian State University of Informatics and Radioelectronics, Belarus

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2:10pm - 2:30pm

Modeling of the Maximum Induced Currents in Automotive Radiated Immunity Tests via Thevenin-based Metamodels

Riccardo Trinchero, Igor Stievano, Flavio Canavero
Politecnico di Torino, Italy

2:30pm - 2:50pm

Verification of Worst-Case Analytical Model for Estimation the Electromagnetic Background Created by Mobile (Cellular) Communications

Vladimir Mordachev
Belarusian State University of Informatics and Radioelectronics, Belarus

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2:50pm - 3:10pm

Optimized Aircraft EMC Demonstration Based on Exploitation of Digitalized Data: EMC Matrix Tool

David Garcia Gomez[1], Daniel Garcia-Donoro[2], Patricia Lopez Rodriguez[1], Hirahi Galindo Perez[1], Laura Diaz Acosta[3]
[1]EME & Antenna Systems. AIRBUS Defence and Space. Spain; [2]Alten SAU Spain; [3]EMC Area. National Institute for Aerospace Technology. Spain

1:30pm - 3:30pm
ROOM 3

SS09.I: EMI analysis in Power Applications - Part I

Session Chair: **David Thomas**

Sub-Millisecond Transient Analysis with Multi-Point Measurement in Weak Grids

Alexander Matthee, Niek Moonen, Frank Leferink
University of Twente, The Netherlands

Continuous Electromagnetic Emission Measurement Setup with Antenna Position Tracking

Denys Pokotilov[1], Robert Vogt-Ardatjew[1], Tom Hartman[1], Frank Leferink[1,2]

[1]University of Twente, Netherlands, The; [2]Thales Nederland B.V., Hengelo, The Netherlands

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Power Quality Analysis (0-2kHz) in DC/DC Converters under Steady State & Transient Conditions

Arun Dilip Khilnani[1], Erjon Ballukja[2]

[1]The University of Nottingham, United Kingdom; [2]The University of Bologna, Italy

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SPICE Simulation of Modal Impedances in Automotive Powertrains Under Different Operating Conditions

Lu Wan, Abduselam Hamid, Flavia Grassi, Giordano Spadacini, Sergio Pignari

Politecnico di Milano, Italy

Power Quality and Electromagnetic Interference in a Trolleybus Traction Sistem

Iurie Nuca[1], Ilie Nuca[2], Petre-Marian Nicolae[1], Alexandr Motroi[2,3], Vitalie Esanu[2,3]

[1]Craiova University, Romania; [2]Technical University of Moldova; [3]Informbusiness SRL

An Open Source, FPGA-Based Bit Error Rate Tester for Serial Communications

Michael James Basford, Angel Eduardo Pena-Quintal, Steve Greedy, Mark Sumner, David Thomas

University of Nottingham, United Kingdom

Data Links Modelling under Radiated EMI and its Impact on Sampling Errors in the Physical Layer

Angel Eduardo Pena-Quintal, Michael James Basford, Karol Niewiadomski, Steve Greedy, Mark Sumner, David Thomas

University of Nottingham, United Kingdom

1:30pm - 3:30pm

WS04: Electric Powertrain Conducted and Radiated Emissions Simulation

Session Chair: **Flavio Calvano**

ROOM 4

- PCB parasitics extraction with Ansys HFSS and SIwave, Flavio Calvano
- IGBT Power modules, busbar, magnetic components simulation with Ansys Maxwell and Q3D, Antea Perrotta
- Cable Harness simulation with Ansys EMA 3D Cable, Frederic Bocquet
- Electric Powertrain system conducted and radiated emissions simulation, Flavio Calvano

3:30pm - 4:00pm

B09: Break

4:00pm - 5:00pm

TS21: Chambers & Cells

ROOM 1

Session Chair: **Philippe Besnier**

Session Chair: **Christopher Holloway**

4:00pm - 4:20pm

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NSA Chamber Validation Measurements Below 30 MHz Using Loop Antennas

Martin A.K. Wiles[1], Alexander Kriz[2], F-W Trautnitz[1]

[1]Albatross Projects GmbH, Germany; [2]Seibersdorf-laboratories, Austria

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4:20pm - 4:40pm

Theoretical Radiated Emission Prediction of an Aperture Array by Reverberation Chamber Field Sampling

Alfredo De Leo, Graziano Cerri, Paola Russo, Valter Mariani Primiani

Università Politecnica delle Marche, Italy

4:40pm - 5:00pm

A Geometric Optics Congruent Monte Carlo Model for Reverberation Chambers

Zhong Chen, Michael Foegelle
ETS-Lindgren, United States of America

4:00pm - 5:00pm
ROOM 2

TS22: EMC in Railway Transport Systems

Session Chair: **Alexander van Deursen**
Session Chair: **Tetiana Serdiuk**

4:00pm - 4:20pm

Modelling of the Distribution of Return Traction Current Harmonics in Electrically Asymmetric Rails

Volodymyr Havryliuk
Dnipro National University of Railway Transport named after Academician V. Lazaryan, Ukraine

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4:20pm - 4:40pm

A Joint Time-Frequency Analytical Method for Electromagnetic Interference in Railway GNSS System

Lu Xing[1,2,3], Yinghong Wen[1,2], D. W. P. Thomas[3], Jinbao Zhang[1,2], Dan Zhang[1,2], Jianjun Xiao[1,2]
[1]Electromagnetic Compatibility Laboratory, Beijing Jiaotong University, China; [2]Beijing Engineering Research Center of EMC and GNSS Technology for Rail Transportation, Beijing, China; [3]George Green Institute for Electromagnetics Research, Uniersity of Nottingham, UK

4:40pm - 5:00pm

Research on Return Traction Current Harmonics

Tetiana Serdiuk[1], Mauro Feliziani[2], Kseniia Serdiuk[1]
[1]Dnipro National University of Railway Transport named after Academician V. Lazaryan, Ukraine; [2]University of L'Aquila, Italy

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5:00pm - 5:20pm

Electromagnetic Compatibility and Power Quality of Traction and Non-Traction Consumers

Tetiana Serdiuk
Dnipro National University of Railway Transport named after Academician V. Lazaryan, Ukraine

4:00pm - 5:00pm
ROOM 3

SS09.II: EMI analysis in Power Applications - Part II

Session Chair: **David Thomas**
Session Chair: **Petre-Marian Nicolae**

Analyzing Electromagnetic Interferences in Power Applications by Using Time-Efficient Joint Analysis Based on DWT and WPT Trees

Ileana Diana Nicolae, Petre Marian Nicolae, Kostic Dusan
University of Craiova, Romania

Analysis of Shielding Effectiveness of an Automotive Display through Simulation and Testing

Andrei-Marius Silaghi[1], Felix Mueller[2], Aldo De Sabata[1], Adrian-Petru Buta[1], Petre-Marian Nicolae[3]
[1]University Politehnica Timisoara, Romania; [2]Continental Automotive Regensburg, Germany; [3]University of Craiova, Romania

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{Experimental Investigation on Electromagnetic Interference (EMI) in Motor Drive Using Silicon Carbide (SiC) MOSFET

Yingzhe Wu[1], Shan Yin[2], Zhaoyi Liu[3], Hui Li[1], Kye Yak See[4]
[1]University of Electronic Science and Technology of China, China, People's Republic of; [2]Microsystem and Terahertz Research Center, China Academy of Engineering Physics, Chengdu, China; [3]China Electronics Technology Group Corporation, Beijing, China; [4]School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, Singapore

4:00pm - 5:00pm
ROOM 4

WS05: Comparing Emission Measurements

Session Chair: **Michele Zingarelli**

Comparing Emission Measurements Performed by a Spectrum Analyzer with EMC Functions vs. Pre and Full Compliant Receivers, According to CISPR 16-1-1 Assessments for EMI Measuring Equipment, Michele Zingarelli

5:00pm - 6:00pm

AUDITORIUM	**Plenary 2: Closing Plenary Session** Session Chair: **MAURO FELIZIANI** Session Chair: **MARIA SABRINA SARTO** Round Table on "EMC Virtual Conferences: Present and Future": Moderator (D'Amore) Award Ceremony Presentation of 2021 EMC conferences Concluding Remarks
On-Demand Sessions **ON-DEMAND**	**OD09: Power Electronics**
	Two-port Noise Source Equivalent Circuit Model for DC/DC Buck Converter with Consideration of Load Effect **Shuqi Zhang, Taishi Uematsu, Kengo Iokibe, Yoshitaka Toyota** Okayama University Japan, Japan
	APEMC 2020 **An Open Educational Platform: Controller Design of EMC Compliant DC Converters** **Alexandra Burger, Lars Nolle, Jens Werner, Özlem Akcay, Anna Bodamer** Jade University of Applied Sciences, Germany
	APEMC 2020 **Modeling of Common-Mode Voltage Source for Multilevel Inverter Topologies** **Hans Hoffmann Sathler[1,2], Francois Costa[2,3], Bernardo Cougo[1], Denis Labrousse[2,4], Jean-Pierre Carayon[1]** [1]IRT SAINT EXUPERY, France; [2]Laboratory SATIE, France; [3]Paris Est Créteil University; [4]Le CNAM
On-Demand Sessions **ON-DEMAND**	**OD10: Electromagnetic Environment**
	Measurement and Analysis of the Radio-Frequency Electromagnetic Environment in Downtown Areas of Beijing **Xinwei Song, Yuntao Yue, Xinyue Zhu, Hao Chang** Beijing University of Civil Engineering and architecture, Beijing, China
	Identification of EM Disturbances Interfering the Time-Phase Controller by Short Circuit Tests **Jolanta Sadura[1], Jan Sroka[2], Maciej Owsiński[1], Adam Jóśko[2]** [1]Institute of Power Engineering, Poland; [2]Warsaw University of Technology, Poland
	Impact of Lightning on Street Lights -An Experimental Study Investigating Different Poles and Cables **Åke Wisten** Luleå University of Technology, Sweden
	Importance of Cables During HERO Tests **Sena Çınar, Gökçenur Gürbüz, Merve Deniz Kozan** Otokar Otomotiv ve Savunma Sanayi A.Ş., Turkey
	Aggregation Effect of Radiated Disturbances from Multiple Emitters on the Limit-Setting Model **Yasushi Matsumoto, Kaoru Gotoh, Yukio Yamanaka** National Institute of Information and Communications Technology, Japan
On-Demand Sessions **ON-DEMAND**	**OD11: PCBs, Signal Integrity & Power Integrity, Filters**
	A Basic Study of Multi-drop Transmission scheme with Reflection Compensation Lines for High-speed Impulse Transmission System

Hiroshi Itakura, Yoshihiro Akeboshi, Tetsu Owada
Mitsubishi Electric co., Japan

Reducing the Radiation from PCB Cavities with a High-DK Dielectric Layer

Yoshi Fukawa[1], Robert Carter[2]
[1]TechDream, Inc.; [2]Oak-Mitsui Technologies LLC

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EFT Transient Noise Model and Protection Analysis from Chip to System Level on Power Distribution

Han-Nien Lin Lin, Tzu-Hao Ho, YuChun Huang, Jia-Yu Huang, Po-Ning Ko, HueiChun Hsiao, YuLin Tsai, JieKuan Li, YenTing Lin, YenTang Chang, ChiaHung Su
FENG CHIA UNIVERSITY, Taiwan

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NGD Analysis of 10-Line Microstrip Structure Crosstalk

Lili Wu, Blaise Ravelo, Fayu Wan
Nanjing University of Information Science & Technology (NUIST), China, People's Republic of

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Problem of the Slot Connector Model Extraction by De-embedding Methodology

Scott Lee, Eriksson Chuang, William Chang, Jerry Syue, Cooper Li
Quanta Computer Inc., Taiwan

Evaluation of Surface Mount Shunt Capacitor Filters Using Bilateral Magnetic Coupling Implemented to IC Power Supply Line on PCB

Akihito Kobayashi, Tetsu Owada, Chiharu Miyazaki
Mitsubishi Electric Corporation, Japan

Characterizing EMI-filters' Deviations caused by the Capacitors Ageing based on Complex Impedance Analysis

HAO LIU[1], Tim Claeys[2], Davy Pissoort[2], Guy A. E. Vandenbosch[1]
[1]ESAT-TELEMIC Research Division, KU Leuven, Leuven, Belgium; [2]M-Group, KU Leuven Bruges Campus, Brugge, Belgium

On-Demand Sessions **OD12: SS - EMC Diagnostics of Complex Systems**

ON-DEMAND

Estimation of Electromagnetic Background Intensity Created by GSM Cellular Networks Base Stations with High Spatial Density on Urban Area

Aliaksandr Svistunou
Belarusian State University of Informatics and Radioelectronics, Belarus

Monitoring of Electromagnetic Environment and Estimation of Electromagnetic Compatibility Using Sensor Radio Monitoring Network

Vadym Blagodarnyi[1], Volodymyr Korsun[1], Valentyn Vigovskyi[2], Maksym Kolomytsev[2]
[1]State Enterprise Ukrainian State Centre of Radio Frequencies, Ukraine; [2]ATDI Ukraine

Computationally Effective Wideband Worst-Case Model of Electromagnetic Wave Penetration between Compartments inside Enclosure

Dzmitry Tsyanenka[1], Yaraslau Tamashevich[1], Yauheni Arlou[1], Eugene Sinkevich[1], Vladimir Mordachev[1], Xie Ma[2]
[1]Belarusian State University of Informatics and Radioelectronics, Belarus; [2]China Electronics Technology Cyber Security Co., Ltd., China

Computationaly Efficient Wideband Worst Case Model of Plane Electromagnetic Wave Diffraction by Conductive System Hull

Dzmitry Tsyanenka[1], Ivan Shakinka[1], Yauheni Arlou[1], Vladimir Mordachev[1], Eugene Sinkevich[1], Wen-Qing Guo[2]

[1]Belarusian State University of Informatics and Radioelectronics, Belarus; [2]China Electronics Technology Cyber Security Co., Ltd.,China