

APEMC 2017

2017 Asia-Pacific International Symposium on Electromagnetic
Compatibility (APEMC)

20-23 June, 2017 / The Commons, Yonsei University, Seoul, Korea

Final Program

Organized by

Yonsei University

Korea Advanced Institute of Science and Technology (KAIST)

Korean Institute of Electromagnetic Engineering and Science (KIEES)

Technical Program at a Glance

Data	Time	Industrial Bank of Korea Hall	Kwak Joung-Hwan Challenge Hall	Helinox Hall	Muak Rotary Club Hall	Exhibition
20 June (Tuesday)	09:00~17:00	Registration (Lobby)				
	10:00~11:50	TU-AM-1: Introduction to “EMC Made Simple” – Printed Circuit Board and System Design	TU-AM-2: SI/PI/EMI Modeling, Simulation and Design			
	11:50~13:00	Lunch Break				
	13:00~14:50	TU-PM-1A: Electromagnetic Compatibility of Switched-Mode Power Supplies (I)	TU-PM-2A: The Role of the IEC Advisory Committee on EMC (ACEC) in Coordinating IEC EMC Activities (I)	TU-PM-3: How to Publish a Paper in the EMC Transactions		
	14:50~15:10	Afternoon Break				
	15:10~17:00	TU-PM-1B: Electromagnetic Compatibility of Switched-Mode Power Supplies (II)	TU-PM-2B: The Role of the IEC Advisory Committee on EMC (ACEC) in Coordinating IEC EMC Activities (II)	TU-PM-4: Metamaterials, Periodic Structures and EBG in EMC/Wave Problems/BioEM		
	18:30~21:00	Welcome Reception				
21 June (Wednesday)	08:00~18:00	Registration (Lobby)				
	09:00~10:20	WE-AM-1: EMC Measurements (I)	WE-AM-2: Wireless Power Transfer	WE-AM-3: EMC of Integrated Circuits (I)	WE-AM-4: EMC Materials	
	10:20~10:40	Morning Break				Open
	10:40~12:20	Opening Ceremony (Venue : Kumho Art Hall) Keynote Speech I : Signal and Power Integrity – Research in EMC (Christian Schuster, Hamburg University of Technology, Germany) Keynote Speech II : Biological Effects of Radio Frequency Electromagnetic Fields on the Brain (Young-Hwan Ahn, Ajou University, Korea)				
	12:20~13:30	Lunch Break				
	13:30~14:50	WE-PM-1: EMC Measurements (II)	WE-PM-2: EMC Standards and Design	WE-PM-3: EMC of Integrated Circuits (II)	WE-PM-4: ESD and Transient EMC	
	14:50~15:10	Afternoon Break				
	15:10~16:50	WE-PM-5: Transport and Aerospace EMC	WE-PM-6: EMC Issues on Wireless Power Transfer	WE-PM-7: Hardware Security for Information/Communication Devices	WE-PM-8: Hot Issues Antenna & Wave Propagation	
	17:00~18:00	WE-PM-9: Poster Session (I) (Venue : Lobby)				

Data	Time	Industrial Bank of Korea Hall	Kwak Joung-Hwan Challenge Hall	Helinox Hall	Muak Rotary Club Hall	Exhibition	
22 June (Thursday)	08:00~18:00	Registration (Lobby)					Open
	09:00~10:20	TH-AM-1: System-level EMC	TH-AM-2: Modeling and Simulation Techniques for EMC, SI and PI (I)	TH-AM-3: EMC Issues Related to Common-mode Noise (I)	-		
	10:20~10:40	Morning Break					
	10:40~12:20	TH-AM-4: Signal Integrity and Power Integrity	TH-AM-5: Power Electronics Related EMC	TH-AM-6: Biological Effects of EMC	TH-AM-7: Radio-Frequency Interference		
	12:20~13:30	Lunch Break					
	13:30~14:30	TH-PM-1: Electronic Packaging EMC	TH-PM-2: Modeling and Simulation Techniques for EMC, SI and PI (II)	TH-PM-3: EMC Issues Related to Common-mode Noise (II)	TH-PM-4: Electromagnetic Environment and High Power EMC		
	14:30~14:50	Afternoon Break					
	14:50~16:50	TH-PM-5: Antenna and Wave propagation	TH-PM-6: Computational Electromagnetics and Multiphysics methods for Simulating Complex Electromagnetic Environment Effects	TH-PM-7: Near Field Scanning Technology for EMC	TH-PM-8: EMC & Antenna Design for Wireless Communication Systems		
	17:00~18:00	TH-PM-9: Poster Session (II) (Venue : Lobby)					
	18:30~21:00	Banquet (Venue : Grand Ballroom)					
23 June (Friday)	09:00~17:00	Registration (Lobby)					
	10:00~11:50	FR-AM-1: Testing of Wireless Devices in the Modern World	FR-AM-2: Development of Time-Domain Computational Electromagnetics Methods for Fast Characterizing Complex Electromagnetic Environment Effects	FR-AM-3: Current Activity in the CISPR 16 Series of EMC Standards			
	11:50~13:00	Lunch Break					
	13:00~14:50	FR-PM-1A: Advances in Automotive EMC Test and Measurement (I)	FR-PM-2A: Protection of the Electric Power System from High-altitude Electromagnetic Pulse (HEMP) and Intentional Electromagnetic Interference (IEMI) (I)	FR-PM-3: EMC Standard Measurement in Japanese Industry – Efforts to Improve the Accuracy of Measurement			
	14:50~15:10	Afternoon Break					
15:10~17:00	FR-PM-1B: Advances in Automotive EMC Test and Measurement (II)	FR-PM-2B: Protection of the Electric Power System from High-altitude Electromagnetic Pulse (HEMP) and Intentional Electromagnetic Interference (IEMI) (II)	FR-PM-4: Practical Aspects of a Comprehensive Space Charging Analysis				

Tutorials and Workshops

Tutorials (Tuesday, 20 June)

TU-AM-1: Introduction to “EMC Made Simple” – Printed Circuit Board and System Design

Time 10:00 – 11:50, Tuesday, 20 June
Room Industrial Bank of Korea Hall (B145)
Chair(s) Mark Montrose (Montrose Compliance Services, Inc., Santa Clara, CA, USA)

Abstract

This tutorial presents applied, hands-on content associated with both the design of printed circuit boards and integration into an enclosure to create a functional system that meets any EMC requirement, both emissions and immunity at an introductory level. The target audience is everyone regardless of expertise level who would like to [re]learn electromagnetic theory in a unique non-academic manner “without the math”. Electrical engineering involves understanding transmission line theory thinking in the time domain. An electromagnetic field propagates between a source and load using a transmission line; radiated field or conducted current. Any propagated electromagnetic energy loss that occurs within the transmission line creates undesired common-mode current. To make Maxwell Equations Made Simple, a subset of EMC Made Simple, a visualization approach is taken that allows attendees to understand what Maxwell tells us, converting his four equations conceptually into five simple algebraic equations to solve almost any EMC problem in minutes, using only a calculator. If we understand electromagnetic theory at the circuit or component level, designing anything electrical becomes simple.

- **Introduction to “EMC Made Simple” – Printed Circuit Board and System Design**
Mark Montrose (Montrose Compliance Services, Inc., Santa Clara, CA, USA)

TU-AM-2: SI/PI/EMI Modeling, Simulation and Design

Time 10:00 – 11:50, Tuesday, 20 June
Room Kwak Joung-Hwan Challenge Hall (B146)
Chair(s) Hideki Asai (Shizuoka University, Hamamatsu, Japan)

Abstract

Recently, with the progress of the electrical and electronic equipment, novel methodologies have been demanded for verification of the design. Therefore, a variety of electromagnetic (EM) simulation techniques have attracted attention very much for the efficient SI/PI/EMI (Signal Integrity/ Power integrity/ Electromagnetic Interference) design. In this session, we discuss several kinds of numerical techniques and their applications to efficient electronic design.

- **Signal Integrity (SI) Design and Analysis of Heterogeneous Integration Using Embedded Multi-die Interconnect Bridge (EMIB) Technology for High Bandwidth Memory (HBM)**
Kyungjun Cho (KAIST, Daejeon, Korea)
- **Advanced SI/PI/EMI Simulation Technology for Automotive ECU Design**
Hideki Asai (Shizuoka University, Hamamatsu, Japan)
- **Fast evaluation of transmission characteristics of wiring harnesses using the RLGC parameters**
Fengchao Xiao (The University of Electro-Communications, Tokyo, Japan)
- **Circuit interpretation of mode conversion in differential-line interconnects under the assumption of weak imbalance**
Flavia Grassi (Politecnico di Milano, Milan, Italy)

TU-PM-1A & 1B: Electromagnetic Compatibility of Switched-Mode Power Supplies

Time 13:00 – 17:00, Tuesday, 20 June (14:50 – 15:10 Coffee Break)
Room Industrial Bank of Korea Hall (B145)
Chair(s) Gunter Keller (Deggendorf Institute of Technology, Deggendorf, Germany)

Abstract

The tutorial is subdivided into six parts: Terminology and legal requirements, EMC tests (emissions and immunity), coupling mechanisms and countermeasures, types of interferences and their characteristics, origin of electromagnetic interferences in switched-mode power supplies and practical aspects of EMC design of switched-mode power supplies (SMPS).

After an overview of international standards and test procedures the coupling mechanisms are explained in theory and in SMPS applications with a number of worked examples. Signals are classified into differential and common mode and discussed in terms of Fourier analysis.

The origin of interferences are discussed in terms of normal operating mode of SMPS in low, medium and high frequency range, common-mode and differential-mode and due to parasitics of active and passive components.

Main part (half of the time) is the EMC design, including power factor correction, EMC filter, shielding, hard and soft-switching converters, suitable active and passive components, general and specific layout recommendations, examples: buck converter, flyback converter, immunity. Many recommendations are confirmed by measurements or simulations. Other characteristics as efficiency and life time are also taken into account.

- **Electromagnetic Compatibility of Switched-Mode Power Supplies**
Gunter Keller (Deggendorf Institute of Technology, Deggendorf, Germany)

TU-PM-2A & 2B: The Role of the IEC Advisory Committee on EMC (ACEC) in Coordinating IEC EMC Activities

Time 13:00 – 17:00, Tuesday, 20 June (14:50 – 15:10 Coffee Break)
Room Kwak Joung-Hwan Challenge Hall (B146)
Chair(s) Donald Heirman (Don HEIRMAN Consultants, Lincroft, NJ, USA)
William A. Radasky (Metatech Corporation, Goleta, CA, USA)

Abstract

This Tutorial continues to update researchers in the field of EMC of the coordination of EMC standards and activities in the International Electrotechnical Commission (IEC) by the IEC Advisory Committee on EMC known as ACEC. The members of this committee include representatives of IEC technical committees that produce EMC basic standards for measurement instrumentation/measurements and also product committees that apply the basic standards along with specific test levels, performance criteria, and emission limits.

- **What is ACEC?**
William A. Radasky (Metatech Corporation, Goleta, CA, USA)
- **Recent Trends in CISPR and its Subcommittees**
Donald Heirman (Don HEIRMAN Consultants, Lincroft, NJ, USA)
- **Recent Trends in TC77 and its Subcommittees**
William A. Radasky (Metatech Corporation, Goleta, CA, USA)
- **Emission Standardization in the 2 kHz to 150 kHz Frequency Band**
William A. Radasky (Metatech Corporation, Goleta, CA, USA)
- **EMC for E-mobility**
William A. Radasky (Metatech Corporation, Goleta, CA, USA)
- **Recent Topics in IEC TC62 (Electrical Equipment in Medical Practice) and its Subcommittees**
Donald Heirman (Don HEIRMAN Consultants, Lincroft, NJ, USA)

- **TC106 Overview: Assessment of Human Exposure to EMF**
Donald Heirman (Don HEIRMAN Consultants, Lincroft, NJ, USA)

TU-PM-3: How to Publish a Paper in the EMC Transactions

Time 13:00 – 14:50, Tuesday, 20 June
 Room Helinox Hall (B147)
 Chair(s) John Norgard (NASA/JSC EMI/EMC E3 Lab, Houston, USA)

Abstract

This tutorial is on the IEEE Transactions on Electromagnetic Compatibility (EMCT).
 Presentations on EMCT include:

- i) How to publish a paper in the EMCT.
- ii) How to prepare and write a good technical paper for the EMCT.

The presentation for part i), by Prof. Norgard, entitled “Publishing a Paper in the EMCT”, will cover the initial paper preparation process (topic & text), 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.

The presentation for part ii), by Dr. Wilson, entitled “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.

This EMCT tutorial is intended for anyone and everyone interested in publishing a paper in the EMCT, especially for the first time.

- **How to Publish a Paper in the EMC Transactions**
John Norgard (NASA/JSC EMI/EMC E3 Lab, Houston, USA)
- **How to Prepare and Write a Good Technical Paper for the EMC Transactions**
Perry Wilson (NIST, Boulder, USA)

TU-PM-4: Metamaterials, Periodic Structures and EBG in EMC/Wave Problems/BioEM

Time 15:10 – 17:00, Tuesday, 20 June
 Room Helinox Hall (B147)
 Chair(s) Sungtek Kahng (Incheon National University, Incheon, Korea)

Abstract

As the operating frequency goes higher and the demands on complex architectures of electronics and new materials increase, the classic guide lines and design rules on EMC and RF device designs are facing the challenges and limitations in meeting the requirements

In response to the need to find the alternatives, periodic structures such as FSS are adopted or hybridized with the conventional practices to stop the radiated/conducted noise and unwanted resonance more effectively. Especially, the photonic bandgap design as the periodic structures with perfect or imperfect periodicity is revisited and becomes the EBG by being adapted to RF frequency from optics.

With a different motivation, metamaterial is researched that when permittivity and permeability the constitutive parameters of a material are given unusual or usual values, they possibly result in phenomena interpreted meaningful to overcome the limitations above in EMC, microwave engineering and Bio EM problems. Particularly, the left-handedness and the infinite wavelength are introduced by negative permittivity and negative permeability and zero refractive index, respectively, and they are used to change the direction or phase of wave propagation. The dispersion engineering stemming from the metamaterials has drawn attention in that it is helpful to reduce the volume of a structure and form a bandgap free from the resonance condition of the conventional periodic structure approach. So, in this session, the analysis and design methods of FSS, DNG/SNG/AMC and EBG are dealt with as well as advanced applications to EMC/antenna/RF designs/Bio

EM & Human-EM Interaction. Also, we discuss the slow-wave effects of a periodic geometry and the resonant slots(non-metamaterial) of DGS and SRR/CSRR. Last but not least, a number of electromagnetic computational methods are shown to efficiently and accurately predict the scattering and radiation of the aforementioned structures.

- **Introduction to Metamaterials and the Advanced Technologies in EMC and RF Passive Components/Antennas**
Sungtek Kahng (Incheon National University, Incheon, Korea)
- **Advanced Technologies in RF Active Components**
Hongjoon Kim (Kyungpook National University, Daegu, Korea)
- **Advanced Technologies in BioEM problems**
Sungtek Kahng (Incheon National University, Incheon, Korea)

Workshops (Friday, 23 June)

FR-AM-1: Testing of Wireless Devices in the Modern World

Time 10:00 – 11:50, Friday, 23 June
Room Industrial Bank of Korea Hall (B145)
Chair(s) Alex Yeo (ETS-Lindgren, Singapore)

Abstract

With the continuous development of wireless technologies and their tight integration with various electronic/computer/communication devices, EMC issues, at both the system and the intra-system levels, become increasingly important. This tutorial will begin with a general overview on IoT and the new IEEE IoT Initiative, of which the IEEE EMC Society is a member. The workshop provides an overview and primer on testing wireless devices, the biggest challenges the test labs face with testing wireless devices and their techniques for addressing those challenges. We will look at the increasing concern of IEMI effects on wireless communication. The tutorial will conclude with a review of the growing wireless activity at the National Institute of Standards and Technology, the US Government metrology lab of the USA.

- **Internet of Things: IoT, M2M, 5G & EMC**
Mike Violette (Washington Labs, Gaithersburg, MD, USA)
- **Complex Challenges in Measuring 5G/Millimeter Wave Device Performance**
Andy Chung (ETS-Lindgren, Tokyo, Japan)
- **Assessing the Vulnerability of Wireless Systems to (Intentional) EMI**
Frank Leferink (University of Twente Enschede, The Netherlands; Thales Netherlands Hengelo, The Netherlands)
- **Millimeter-wave Channel Sounder Development at the National Institute of Standards and Technology**
Perry Wilson (National Institute of Standards and Technology, Boulder, CO, USA)

FR-AM-2: Development of Time-Domain Computational Electromagnetics Methods for Fast Characterizing Complex Electromagnetic Environment Effects

Time 10:00 – 11:50, Friday, 23 June
Room Kwak Joung-Hwan Challenge Hall (B146)
Chair(s) Wen-Yan Yin (Zhejiang University, Hangzhou, China)

Abstract

In this workshop, new research progresses in the development of computational time-domain electromagnetics methods will be addressed for fast solving and characterizing various complex electromagnetic environment effects in the presence of high-power electromagnetic pulse (HP-EMP) or intentional electromagnetic interferences (IEMI). These methods mainly include hybrid finite difference time domain (FDTD), time-domain integral equation (TDIE), adaptive integration method (AIM) together with time-domain physics optics approximation, etc. Some typical numerical examples will be shown to demonstrate their capability for accurately predicting 3-D current and field distributions over missile, aircraft and warship platforms for different incident EMP strengths, directions, and polarization states.

- **Development of Time-Domain Computational Electromagnetics Methods for Fast Characterizing Complex Electromagnetic Environment Effects**
Wen-Yan Yin (Zhejiang University, Hangzhou, China)

FR-AM-3: Current Activity in the CISPR 16 Series of EMC Standards

Time 10:00 – 11:50, Friday, 23 June
Room Helinox Hall (B147)
Chair(s) Zhong Chen (ETS-Lindgren, Cedar Park, TX, USA)

Abstract

The CISPR 16 series is an important basic standard in EMC and continues to be updated by CISPR Sub Committee A. Important changes to this standard continue below 30 MHz, above 1 GHz and in the areas of equipment calibration. Our speakers include experts active in the CISPR Subcommittee A and in the ANSI ASC C63® committee on EMC. Mark Terrien will describe changes associated with CISPR 16-1-1 on EMI receivers; Zhong Chen will discuss measurement uncertainty associated with CISPR 16-4-2; and Wolfgang Muellner will discuss the methods being developed for radiated measurements below 30 MHz.

- **Understanding the Importance of EMI Compliance Receiver Calibration Measurements**
Mark Terrien, (Keysight Technologies, Santa Rosa, CA, USA)
- **CISPR 16 Measurement Instrumentation Uncertainties from Site Contribution for Radiated Emissions Measurements above 1 GHz**
Zhong Chen (ETS-Lindgren, Cedar Park, TX, USA)
- **Recent Developments in CISPR 16 Series on Measurements below 30 MHz**
Wolfgang Muellner (Seibersdorf Laboratories, Siebersdorf, Austria)

FR-PM-1A & 1B: Advances in Automotive EMC Test and Measurement

Time 13:00 – 17:00, Friday, 23 June (14:50 – 15:10 Coffee Break)
Room Industrial Bank of Korea Hall (B145)
Chair(s) Alex Yeo (ETS-Lindgren, Singapore)

Abstract

Vehicle platforms continue to become increasingly more complex with propulsion, entertainment and safety related systems all having to function reliably without impacting safety or the legacy communications infrastructure. In this workshop, industry experts will share their latest research in automotive EMC test and measurement. They will address current and future requirements brought on by the increasing use of electronic components as well as the increased demand for electric and hybrid vehicles. This has driven the need for ever increasing permutations of system operation, operating frequency ranges and immunity levels. This will be discussed in light of current EMC test chamber design and test challenges.

- **An Update on Global Automotive EMC Standards and Testing**
Hyunwoo Park (Hyundai Calibration & Certification Technology, Icheon, Korea)
- **EMC Chamber Design and Test Challenges for E-Vehicles and Electronic Sub-Assemblies (ESA)**

K.D. Kim (ETS-Lindgren, Cedar Park, TX, USA)

- **Novel and Simplified Immunity Testing Methods for Automotive Applications**
Flavia Grassi (Politecnico di Milano, Milan, Italy)
- **Common RF Absorbers Evaluations in the W Band (75-110 GHz)**
Zhong Chen (ETS-Lindgren, Cedar Park, Texas, TX, USA)
- **Suppression of Power/Ground Noise on Power Window Control System in Automotive**
Karam Hwang (KAIST, Daejeon, Korea)

FR-PM-2A & 2B: Protection of the Electric Power System from High-altitude Electromagnetic Pulse (HEMP) and Intentional Electromagnetic Interference (IEMI)

Time 13:00 – 17:00, Friday, 23 June (14:50 – 15:10 Coffee Break)

Room Kwak Joung-Hwan Challenge Hall (B146)

Chair(s) William A. Radasky (Metatech Corporation, Goleta, CA, USA)

Abstract

Over the past 28 years the International Electrotechnical Commission (IEC) has written 22 standards and reports dealing with the environments and protection of civil electronic systems from HEMP and IEMI. Because it has become clear that the electric power system is the most important critical infrastructure in advanced economies throughout the world, it is important that these standards be applied to protect the basic building blocks of the high voltage power system: substations and control centers. This tutorial will present how the IEC standards can be used to provide the necessary levels of protection against these two security threats.

- **Description of the Radiated and Conducted Environments Associated with HEMP and IEMI**
William A. Radasky (Metatech Corporation, Goleta, CA, USA)
- **Description of the Vulnerability of Electronic Equipment to HEMP and IEMI**
William A. Radasky (Metatech Corporation, Goleta, CA, USA)
- **Approach to the Hardening of Power Substations and Control Centers to HEMP and IEMI**
William A. Radasky (Metatech Corporation, Goleta, CA, USA)

FR-PM-3: EMC Standard Measurement in Japanese Industry – Efforts to Improve the Accuracy of Measurement

Time 13:00 – 14:50, Friday, 23 June

Room Helinox Hall (B147)

Chair(s) Osami Wada (Kyoto University, Kyoto, Japan)

Abstract

In the Technical Working Groups in Expert Committee on EMC in KEC (KEC Electronic Industry Development Center) in Japan, practical research activities on EMC measurement technology related to EMC standard measurement have been conducted. The experts will explain important notes on ensuring measurement accuracy and measurement reliability in conducting measurement conforming to the EMC standard.

The topics in this workshop include; influence of measurement environment in radiated and conducted emission tests and influence of measurement system difference which have been clarified in a series of round robin tests; possibility of antenna calibration in an anechoic chamber and verification of its accuracy; important points on magnetic field measurement in radiated emission test below 30 MHz; and EMC measurement of automotive electronic devices. In addition, we will introduce the current status and future prospects of EMC test standards in Japan, particularly in comparison with US / European / Asian standards.

- **Workshop Overview**
Osami Wada (Kyoto University, Kyoto, Japan)
- **Radiated Emission Test - Influence of Measurement Environment**
Hirotugu Hashimoto, (Riken Environmental System Co. Ltd., Kumagaya, Japan)
- **Conducted Emission Test - Influence of Measurement System Difference**
Masahiro Inoue (KEC Electronic Industry Development Center, Kyoto, Japan)
- **Verification of Accuracy and Validity of Antenna Calibration in Anechoic Chamber**
Yujiro Seki (IPS Corporation, Nagano, Japan)
- **Important Points on Magnetic Field Measurement in Radiation Emission Test Below 30 MHz**
Fumiaki Yaguchi (TOYO Corporation, Tokyo, Japan)
- **Japanese EMC Test Standards - Comparison with US / European / Asian Standards and Future Perspective**
Aki Hattori (Tokin EMC Engineering Co., Ltd., Kawasaki, Japan)
- **Issues in EMC measurement of automotive electronic devices**
Takanori Uno (DENSO EMC Engineering Service Corporation, Kariya, Japan)

FR-PM-4: Practical Aspects of a Comprehensive Space Charging Analysis

Time 15:10 – 17:00, Friday, 23 June
Room Helinox Hall (B147)
Chair(s) Bryon Neufeld (Electro Magnetic Applications, Lakewood, CO, USA)

Abstract

Space charging presents a significant safety and reliability risk for many space platforms. Proper design strategy can mitigate or greatly reduce the risks associated with space charging. It is often not feasible or is even impossible to perform full vehicle testing for space charging, and testing does not offer the possibility to quickly and inexpensively check the effectiveness of design permutations. This makes numerical analysis an important part of developing an effective design strategy against space charging risks. In this presentation, we focus on some of the practical steps and issues involved with performing a comprehensive space charging analysis. We will discuss the model geometry development, materials characterization, simulation and processing that go into numerically assessing charging risks. We will also discuss how aspects of the space environment, including different plasma environments, sunlight illumination, and plume and wake effects, impact the charging analysis.

- **Surface Charging, Geometry Development and Meshing**
Bryon Neufeld (Electro Magnetic Applications, Lakewood, CO, USA)
- **Plume Modeling, Internal Charging**
Nicole Pothier McGillivray (Electro Magnetic Applications, Lakewood, CO, USA)
- **Programmatic Considerations**
Bob Scully (NASA, Houston, TX, USA)

Technical Sessions

Wednesday, 21 June

09:00 – 10:20

WE-AM-1: EMC Measurements (I)

Time 09:00 – 10:20, Wednesday, 21 June

Room Industrial Bank of Korea Hall (B145)

Chairs Ding-Bing Lin (National Taiwan University of Science and Technology, Taiwan)
Jonghoon Kim (KAIST, Korea)

09:00 **In-Circuit Common-Mode Impedance Measurement for Motor Drive System**

Fei Fan, Kye Yak See and Kangrong Li (Nanyang Technological University, Singapore); Xiong Liu, Michael Adam Zagrodnik and Amit Kumar Gupta (Rolls-Royce Singapore Pte. Ltd., Singapore)

09:20 **Study on Electrical Performance and Reliability Assessment of HEMP Protection Filters Applied in Communication Facilities**

Hyo-Sik Choi, Tae-Heon Jang and Won-Seo Cho (Korea Testing Laboratory, Korea)

09:40 **Design of an Bi-static C-band Radar for Characterisation of Wind Turbine Plants**

Karsten Schubert and Jens Werner (Jade University of Applied Science, Germany); Fabian Schwartau (Technische Universität Braunschweig, Germany)

10:00 **The Noise Source Modulation Technique for the Determination of Electromagnetic Noise Path**

Umberto Paoletti (Hitachi Ltd., Japan)

WE-AM-2: Wireless Power Transfer

Time 09:00 – 10:20, Wednesday, 21 June

Room Kwak Joung-Hwan Challenge Hall (B146)

Chairs Seungyoung Ahn (KAIST, Korea)
Young-Jin Park (Korea Electrotechnology Research Institute, Korea)

09:00 **A Study on Characteristics of Ferrite Sheets in Wireless Power Transfer at 6.78 MHz**

Tae-Hyung Kim, Se-Hwa Yoon and Jong-Gwan Yook (Yonsei University, Korea); Gi-Ho Yun (Sungkyul University, Korea); Woong-Yong Lee (Amotech, Korea)

09:20 **Leakage Magnetic Field Suppression Effects of Expanded Graphite in LF-WPT System**

In Gon Lee, Ic Pyo Hong and Kee-Sun Lee (Kongju National University, Korea)

09:40 **Novel Concepts in the Design of Near-Field Antenna for Short-Distance Wireless Power Transmission With High Transfer Efficiency**

Ding-Bing Lin (National Taiwan University of Science and Technology, Taiwan); Hsi-Tseng Chou and Jui-Hung Chou (National Taiwan University, Taiwan); Yu-Lin Cheng (National Taipei University of Technology, Taiwan)

10:00 **Improvement of Power Transmission Efficiency by Negative Impedance Converter for WPT**

Se-Hwa Yoon, Jong-Gwan Yook and Tae-Hyung Kim (Yonsei University, Korea); Gi-Ho Yun (Sungkyul University, Korea); Woong-Yong Lee (Amotech, Korea)

WE-AM-3: EMC of Integrated Circuits (I)

Time 09:00 – 10:20, Wednesday, 21 June

Room Helinox Hall (B147)

Chairs SoYoung Kim (Sungkyunkwan University, Korea)
Bo Pu (Samsung Electronics, Korea)

09:00 **Temperature Compensated, Low EMI Relaxation Oscillator**

Sung Jin Kim, Seung Il Huh, Sung Hun Cho and Kang-Yoon Lee (Sungkyunkwan University, Korea)

09:20 **Design and Analysis of Chip-level Wireless Power Transfer Using Magnetic-field Resonance Coupling and 0.18 um CMOS Technology**

Jinwook Song, Seungtaek Jeong, Shinyoung Park and JoungHo Kim (KAIST, Korea)

09:40 **Hierarchical Power Distribution Network Design in Fanout Wafer Level Package based Mobile AP-GPU**

Youngwoo Kim, Kyungjun Cho, Gapyeol Park, Subin Kim and JoungHo Kim (KAIST, Korea)

10:00 **Capacitor-less LDO Regulator Design Methods for High Noise Immunity**

Soyeon Joo and SoYoung Kim (Sungkyunkwan University, Korea)

WE-AM-4: EMC Materials

Time 09:00 – 10:20, Wednesday, 21 June

Room Muak Rotary Club Hall (B132)

Chairs Kyung Sub Lee (Sungkyunkwan University, Korea)
Sang-Woo Kim (Korea Institute of Science and Technology, Korea)

09:00 **Performance of Flexible Noise Suppressor for IoT Devices Made Only of Meltblown Non-Woven Fabric**

Masahiro Yamaguchi and Jiang Fu (Tohoku University, Japan); Sho Muroga (National Institute of Technology, Toyota College, Japan); Tomoya Tanaka, Chie Okamura, Lumina Obi and Kazufumi Kato (Asahi Kasei Fibers Corporation, Japan)

09:20 **A Transparent Electromagnetic Shielding Film by Applying Nano-imprinting Technology**

Hyunseok Choi, Kyungsub Lee and Sujeong Suh (Sungkyunkwan University, Korea)

09:40 **Guideline for Improvement of Signal Loss With Using Shielding Materials for FPCB**

Young-Min Im (Korea Electronics Technology Institute, Korea)

10:00 **Electromagnetic Wave Absorbing Properties of Magnetic Particles and Carbon Nanomaterials Reinforced composites**

Sang Bok Lee, Jae Ryung Choi, Byung Mun Jung, Seungchan Cho and Sang-Kwan Lee (Korea Institute of Materials Science, Korea); Ki Hyeon Kim (Yeungnam University, Korea)

13:30 – 14:50

WE-PM-1: EMC Measurements (II)

Time 13:30 – 14:50, Wednesday, 21 June

Room Industrial Bank of Korea Hall (B145)

- Chairs Perry Wilson (National Institute of Standards and Technology, USA)
Chulsoon Hwang (Missouri University of Science and Technology, USA)
- 13:30 **Investigation Into the Influence of Ground Plane Insulation Thickness on Radiated Emission From Mains Cable of EUT**
Shinichi Okuyama (VCCI Council; NEC Platforms, Japan); Nobuo Kuwabara (Kyushu Institute of Technology, Japan); Kuniyuki Miyata (Fujitsu, Ltd, Japan); Kunihiro Osabe (VCCI Council, Japan)
- 13:50 **Comparison of Configurations for Conducted Emission Measurement Specified in CISPR 32 and CISPR 13**
Nozomi Miyake (VCCI Council; NEC Corporation, Japan); Koichi Kakuda (NTT Advanced Technology Corporation, Japan); Yoshiaki Hiratsuka (FUJITSU Advanced Technologies Limited, Japan); Hidenori Muramatsu (VCCI Council, Japan)
- 14:10 **Use of FFT-based Measuring Receivers for EMI Compliance Measurements Against CISPR 32**
Jens Medler (Rohde & Schwarz GmbH & Co. KG, Germany)
- 14:30 **Comparison of Test Standards for Immunity Testing in Reverberation Chambers**
Soydan Çakir and Çağlar Aslan (TUBITAK UME, Turkey); Frank Leferink (University of Twente, The Netherlands)

WE-PM-2: EMC Standards and Design

- Time 13:30 – 14:30, Wednesday, 21 June
- Room Kwak Joung-Hwan Challenge Hall (B146)
- Chairs Peter S. W. Leung (City University of Hong Kong, Hong Kong)
Tea-Heon Jang (Korea Testing Laboratory, Korea)
- 13:30 **Smarter Concepts for Future EMI Standards**
Iwan Setiawan, Cees Keyer and Frank Leferink (University of Twente, The Netherlands)
- 13:50 **The Systematic Design of Integrated Busbar EMI Filter Considering the Coupling Characteristics of Multi-physical Fields**
Qianceng Lou, Xinxin Gao and Shishan Wang (Nanjing University of Aeronautics and Astronautics, China); Wei Yan (Nanjing Normal University, China)
- 14:10 **Robustness Analysis of Crosstalk-Based Hardware Trojans and Relevant Algorithms to Nonideal Positioning**
Keliang Yuan (Tsinghua University, China); Flavia Grassi, Giordano Spadacini and Sergio A. Pignari (Politecnico di Milano, Italy)

WE-PM-3: EMC of Integrated Circuits (II)

- Time 13:30 – 14:30, Wednesday, 21 June
- Room Helinox Hall (B147)
- Chairs SoYoung Kim (Sungkyunkwan University, Korea)
Bo Pu (Samsung Electronics, Korea)
- 13:30 **Embedded Bandstop Filter in Package to Enhance the Susceptibility of Integrated Circuits**
Bo Pu (Samsung Electronics, Korea); SoYoung Kim and Wansoo Nah (Sungkyunkwan University, Korea)
- 13:50 **Application of EMC Qualification Methodology to Semicustom Digital Design**
Hai Au Huynh and SoYoung Kim (Sungkyunkwan University, Korea)

- 14:10 **Exploring the Impact of Multi-Frequency Clocking and GALS Design on Power Supply Noises**
Nguyen Van Toan, Dam Minh Tung and Jeong-Gun Lee (Hallym University, Korea)

WE-PM-4: ESD and Transient EMC

Time 13:30 – 14:50, Wednesday, 21 June

Room Muak Rotary Club Hall (B132)

Chairs Shinobu Ishigami (Tohoku Gakuin University, Japan)
Ken Kawamata (Tohoku Gakuin University, Japan)

- 13:30 **Measurement of Electric Field Waveform Caused by Micro Gap ESD in a Pair of Spherical Electrodes**

Shinobu Ishigami, Ken Kawamata and Shigeki Minegishi (Tohoku Gakuin University, Japan); Osamu Fujiwara (Nagoya Institute of Technology, Japan)

- 13:50 **A Study on Response Characteristics Modeling Method for ESD Protection Device by Vector Network Analyzer**

Nobuhiro Kimura and Takahiro Yoshida (Tokyo University of Science, Japan)

- 14:10 **Time Domain Measurement of Discharge Phenomenon Using Optical E-Field Sensor**

Takayoshi Ohtsu, Norihiro Ogishima, Haruki Tashiro and Kohei Obara (National Institute of Technology, Numazu College, Japan); Ryuji Osawa (Seikoh, Giken Co., Ltd., Japan)

- 14:30 **System-level ESD Noise Induced by Secondary Discharges at Voltage Suppressor Devices in a Mobile Product**

Junsik Park (Ulsan National Institute of Science and Technology, Korea); Jongsung Lee, Cheolgu Jo and Byongsu Seol (Samsung Electronics, Korea); Jinguook Kim (Ulsan National Institute of Science and Technology, Korea)

15:10 – 16:50

WE-PM-5: Transport and Aerospace EMC

Time 15:10 – 16:30, Wednesday, 21 June

Room Industrial Bank of Korea Hall (B145)

Chairs Sergio A. Pignari (Politecnico di Milano, Italy)
Haengseon Lee (Sogang University, Korea)

- 15:10 **High Frequency Model of Power Autotransformer for Adjustable Speed Drive System**

Chuang Bi, Yingzhe Wu, Chuan Li and Hui Li (University of Electronic Science and Technology of China, China); Yongjian Zhi (CRRC Zhuzhou Institute Co Ltd, China)

- 15:30 **Mitigation of Current Oscillations in the DC link of Electric Vehicles**

Kelin Jia (Volvo CE, Sweden); Chuang Bi and Hui Li (University of Electronic Science and Technology of China, China)

- 15:50 **3-D Modeling of Common Mode Choke for Thermal Analysis**

Yong Liu and Kye Yak See (Nanyang Technological University, Singapore); Rejeki Simanjourang (Rolls-Royce Singapore Pte. Ltd, Singapore)

- 16:10 **Harmonics and Common Mode Voltage Analysis With Different Power Converter Configurations in Aerospace Applications**

Yong Liu and Kye Yak See (Nanyang Technological University, Singapore); Rejeki Simanjourang (Rolls-Royce Singapore Pte. Ltd, Singapore); Arie Nawawi and Lim Ziyoun (Nanyang Technological University, Singapore)

WE-PM-6: EMC Issues on Wireless Power Transfer

Time 15:10 – 16:50, Wednesday, 21 June

Room Kwak Joung-Hwan Challenge Hall (B146)

Chairs Hiroshi Hirayama (Nagoya Institute of Technology, Japan)
Seunyoung Ahn (KAIST, Korea)

- 15:10 **Design Formula of a Small Circular Coil With Circular Cross-section for Maximum Q-factor**
Do-Hyeon Kim and Young-Jin Park (Korea Electrotechnology Research Institute; University of Science and Technology, Korea)
- 15:30 **Suppression of Common-mode Radiation Using Folded-spiral Antenna for Wireless Power Transfer**
Hiroshi Hirayama, Masanori Ando and Toshihito Sonobe (Nagoya Institute of Technology, Japan)
- 15:50 **Active Implantable Medical Device EMI Estimation for EV-Charging WPT System Based on 3D Full-wave Analysis**
Takashi Hikage, Masakazu Yamagishi, Kazuki Shindo and Toshio Nojima (Hokkaido University, Japan)
- 16:10 **Reduction of Electromagnetic Interference for Wireless Power Transfer Coils in Mobile Devices**
Jaehyoung Park and Seunyoung Ahn (KAIST, Korea)
- 16:30 **A Study of Electromagnetic Emission From Evanescent Mode WPT System Through Metal Sheets**
Nak-Young Ko, Seong-Kyu Song, Jagannath Malik, Woo-Jin Park, Bon-Young Lee, Seok-Tae Seo and Franklin Bien (Ulsan National Institute of Science and Technology, Korea)

WE-PM-7: Hardware Security for Information/Communication Devices

Time 15:10 – 16:50, Wednesday, 21 June

Room Helinox Hall (B147)

Chairs Yuichi Hayashi (Tohoku Gakuin University, Japan)
Jong-Gwan Yook (Yonsei University, Korea)

- 15:10 **Hardware Security for Information/Communication Devices**
Yuichi Hayashi (Tohoku Gakuin University, Japan); Jong-Gwan Yook (Yonsei University, Korea); William A. Radasky (Metatech Corporation, USA)
- 15:30 **Signal-to-Noise Ratio Measurements of Side-Channel Traces for Establishing Low-Cost Countermeasure Design**
Yusuke Yano, Toshiaki Teshima, Kengo Iokibe and Yoshitaka Toyota (Okayama University, Japan)
- 15:50 **A Threat of Malicious Hardware Using On-chip Voltmeter**
Daisuke Fujimoto, Ryo Miyachi and Tsutomu Matsumoto (Yokohama National University, Japan)
- 16:10 **Hardware Trojan Threats After IT Device Manufacturing**
Masahiro Kinugawa (National Institute of Technology, Sendai College, Japan); Yu-ichi Hayashi (Nara Institute of Science and Technology, Japan)
- 16:30 **Estimate of the Effect of Concrete Wall for Information Leakage From LCD Monitor**
Ho Seong Lee and Jong-Gwan Yook (Yonsei University, Korea)

WE-PM-8: Hot Issues Antenna & Wave Propagation

Time 15:10 – 16:30, Wednesday, 21 June

Room Muak Rotary Club Hall (B132)

Chairs Wonbin Hong (Pohang University of Science and Technology, Korea)
Jungsuek Oh (Inha University, Korea)

15:10 **An Electrically Small, 3D Printed Folded Spherical Meander Antenna**

Myeongjun Kong, Geonyeong Shin, Suhyeon Lee and Ick-Jae Yoon (Chungnam National University, Korea)

15:30 **Analysis of Transparent Coplanar Waveguide With Few Microns - Grid Width**

Seung Yoon Lee, Dooseok Choi and Wonbin Hong (Pohang University of Science and Technology, Korea)

15:50 **Dual-Polarized Vivaldi Antenna With Quarter-Wave Balun Feeding**

Philip Ayiku Dzagbletey, Jae Yeon Shim, Jin Young Jeong and Jae-Young Chung (Seoul National University of Science and Technology, Korea)

16:10 **Photonic-assisted Imaging System for mm-wave Horn Antenna Near-Field Characterization**

Young-Pyo Hong, Hyunji Koo and Dong-Joon Lee (Korea Research Institute of Standards and Science, Korea)

17:00 – 18:00

WE-PM-9: Poster Session (I)

Time 17:00 – 18:00, Wednesday, 21 June

Room Lobby

Chairs Kyung Sub Lee (Sungkyunkwan University, Korea)
Taehoon Yoo (Dongyang Mirae University, Korea)

PS1-01 **Study on Measurement Method of Shield Continuity for Shielded Cable with Drain Wire**

Hong-je Jang and Tae-seung Song (Korea Testing Laboratory, Korea); Tae-hyeob Song (Korea Institute of Civil Engineering and Building Technology, Korea)

PS1-02 **Study of EMI Filter Performance Without LISN Based on Noise Impedances**

Kang-Rong Li, Kye-Yak See and Fei Fan (Nanyang Technological University, Singapore)

PS1-03 **"Customization" in EMC Measuring System**

Lei Zhou, Deng Linxiang, Chen Daosheng (Jiangsu Institute of Metrology, China); Yan Wei (Nanjing Normal University, China)

PS1-04 **Effect of ESD Generator Ground Strap Configuration on ESD Waveform**

Jawad Yousaf, Jaeyoung Shin, Rao Leqian and Wansoo Nah (Sungkyunkwan University, Korea); Jinsung Youn, Daehee Lee and Chanseok Hwang (Samsung Electronics, Korea)

PS1-05 **More Insight Into Conducted Immunity Tests and Investigation of Support Influences**

Osman Sen, Soydan Cakir and Savas Acak (TUBITAK UME, Turkey)

PS1-06 **Comparison of Log-Periodic, Dual-Stacked Log-Periodic, and Horn Antenna on the Field Uniformity and Power Efficiency from 80 MHz to 1 GHz**

Dwi Mandaris and Niek Moonan (University of Twente, The Netherlands); Jaap Schuurmans (Thales, The Netherlands); Frank Leferink (University of Twente, The Netherlands)

- PS1-07 **A Study of Measuring a Commercial Antenna Gain Using an R-SAM**
Jong-Hyuk Lim, Bo-Weon Lee, Yun-Jo Choi, and Hee-Baek Kim (National Radio Research Agency, Korea)
- PS1-08 **Comparison of Measurement Results on the Transfer Impedance of a Coaxial Cable**
Hyung-uk Kim and Tea-Heon Jang (Korea Testing Laboratory, Korea)
- PS1-09 **Unintentional Radiation of Electromagnetic Waves Caused by Deterioration of Metal Halide Lamps**
Yeong-Min Lee, Young-Choul Lim and Hongsik Keum (Korea Radio Promotion Association, Korea); Jungyu Yang (Radio Research Agency, Korea); Jong-Gwan Yook (Yonsei University, Korea)
- PS1-10 **Radiated Emission Tests due to the Direction of an Highly Directional EUT in a SAC And a RC**
Sang Il Kwak, Jong Hwa Kwon and Dong-Uk Sim (Electronics and Telecommunications Research Institute, Korea); Young Joong Yoon (Yonsei University, Korea)
- PS1-11 **Conceptual Design and Characteristics of Wireless Power Charging System for HTS Magnet using Copper Resonance Coupling Coils**
Yoon Do Chung and Jiseong Kim (Suwon Science College, Korea)
- PS1-12 **Electromagnetic Shielding Structure for Reduction of the Leakage Magnetic Field in Wireless Power Transfer System**
Jongchan Kim, Domin Choi and Nam Kim (Chungbuk National University, Korea); Seung-Yeop Rhee (Chonnam National University, Korea)
- PS1-13 **Analytic RF Multi Beam Synthesis Method considering Active Element Pattern of Array Antenna**
Sang Wook Chi and Jeong Hae Lee (Hongik University, Korea)
- PS1-14 **A Method to Improve Transfer Efficiency in Contactless Power Transfer Systems With Magnetically-Coupled Coils**
Taejun Lim and Yongshik Lee (Yonsei University, Korea)
- PS1-15 **Design and Optimization of Inductive Snubber for DC-DC Converter**
Hyo Sub Shin, Hai Au Huynh and SoYoung Kim (Sungkyunkwan University, Korea)
- PS1-16 **Investigation on Characteristic Impedance of Transmission Line in Meshed-ground Flexible Printed Circuit**
Yantao Zhu (University of Electronic Science and Technology of China, China); Fengchao Xiao (University of Electro-Communications, Japan); Xiangyang Sun (University of Electronic Science and Technology of China, China); Yoshiki Kayano and Yoshio Kami (University of Electro-Communications, Japan)
- PS1-17 **Introduction of Outdoor Radar Cross Section (RCS) Measurement System**
Hyunsung Tae, Minkyong Seo, Eungjoo Lee, Joon Hyuck Kwon and Eungjo Kim (Agency for Defense Development, Korea)
- PS1-18 **A Consideration of Mechanism of Audio Signal Deterioration Caused by Propagation Noise between Audio Equipment**
Takahiro Fujino and Takahiro Yoshida (Tokyo University of Science, Japan)
- PS1-19 **The Analysis and Design of Milk Pasteurization System by Using Radio Frequency Electric Fields**
Chanon Srisuma, Samran Santalunai, Thanaset Thosdeekoraphat and Chanchai Thongsopa (Suranaree University of Technology, Thailand)

- PS1-20 **Experiment and Design a Suitable Induction Heating for Air Heat Exchanger Application**
Keeratidech Thepsatitsilp, Worawut Boonpeang, Phanupong Saeung, Nuttakorn Pukseesang and Chanchai Thongsopa (Suranaree University of Technology, Thailand)
- PS1-21 **Analysis and Verification for Errors of Normalized Site Attenuation Method Below 30 MHz**
Hongsik Keum (Korea Radio Promotion Association, Korea); Jungyu Yang (Radio Research Agency, Korea); Nam Kim (Chungbuk National University, Korea); Seungwoo Lee (KEPCO, Korea)
- PS1-22 **Bounded-Wave(BW) Outdoor HEMP Simulator**
Kihwan Song, Joon Hyuck Kwon, Saedong Yeo and Eungjo Kim (Agency for Defense Development, Korea)
- PS1-23 **Measurement of Magnetic Field Levels Generated by EV/HEV Vehicles With Respect to Human Exposure**
Yunhyeong Jo and Jaehyun Park (I-SPEC, Korea); Seongkyu Lee (Hanyang University, Korea); Jaekon Shin (Korea Automobile Testing and Research Institute, Korea)
- PS1-24 **Non-invasive Detection of Object by UWB Radar**
Wei Ping Hung (National Chiao Tung University, Taiwan); Tsern-Huei Lee and Chia-Hung Chang (Chinese Culture University, Taiwan)

Thursday, 22 June

09:00 – 10:20

TH-AM-1: System-level EMC

Time 09:00 – 10:20, Thursday, 22 June

Room Industrial Bank of Korea Hall (B145)

Chairs Jingook Kim (Ulsan National Institute of Science and Technology, Korea)
Bumhee Bae (Samsung Electronics, Korea)

09:00 **Study of Currents Induced in Wire Lines Placed inside the Metal Shield of Electronics in the Beginning of the Resonance Mode**

Valentin Butin and Pavel Kundyshev (Dukhov Research Institute of Automatics, Russia)

09:20 **Shielding Effectiveness Performance of Conductive Concrete Structures**

Aaron Krause, Lim Nguyen, Christopher Tuan (University of Nebraska-Lincoln, USA); Joel Blasey, James Zemotel (Department of the Air Force, USA)

09:40 **Recovery Method of S/W Failure Induced by ESD using Far-end Crosstalk between PCB Traces**

JongJin Baek (Samsung Electronics, Korea); Hyosub Shin and SoYoung Kim (Sungkyunkwan University, Korea)

10:00 **Conducted EMI from Motor Drive System of Electric Vehicle Under Load Operation**

Li Zhai and Chao Song (Beijing Institute of Technology, China)

TH-AM-2: Modeling and Simulation Techniques for EMC, SI and PI (I)

Time 09:00 – 10:20, Thursday, 22 June

Room Kwak Joung-Hwan Challenge Hall (B146)

Chairs Hui Min Lee (A*STAR Institute of High Performance Computing, Singapore)
Ikpyo Hong (Kongju National University, Korea)

09:00 **Evaluating Airborne Slotted Waveguide Antenna Arrays Using an Equivalent Model Based on Near-Field Samplings Over Slots**

Si-Ping Gao, Hui Min Lee, Wei-Jiang Zhao, En-Xiao Liu and Ching Eng Png (Institute of High Performance Computing; A*STAR, Singapore)

09:20 **Evaluation of Electromagnetic Field According to Current Change of Wireless Power Transmission**

SangWook Park, BeomJin Choi and EunHa Kim (Korea Automotive Technology Institute, Korea); SeungDo Kim (Green Power Co. Ltd., Korea)

09:40 **EM Coupling Analysis Between Windscreen Antennas and Power Cables in Electric Vehicles**

Jaehoon Kim (Altair Engineering, Korea)

10:00 **Study of Monopole Antenna's Received Power in Reverberation and Anechoic Chambers**

Huapeng Zhao, Jun Hu and Zhizhang Chen (University of Electronic Science and Technology of China, China)

TH-AM-3: EMC Issues Related to Common-mode Noise (I)

Time 09:00 – 10:20, Thursday, 22 June

Room Helinox Hall (B147)

- Chairs Yoshitaka Toyota (Okayama University, Japan)
Wansoo Nah (Sungkyunkwan University, Korea)
- 09:00 **Dependency of Transmission Loss of Shielded-FPC on Thickness of Conductive Shield**
Yoshiki Kayano (The University of Electro-Communications, Japan); Hiroshi Inoue (The Open University of Japan, Japan)
- 09:20 **An Efficient Partition Analysis for Electromagnetic Interference Estimation of High-Speed Input/Output Differential Interfaces**
Chi-Kai Shen and Tzong-Lin Wu (National Taiwan University, Taiwan); Tze-Min Shen, Chih-Ying Hsiao, Ting-Kuang Wang and Kuan-Yu Chen (MStar Semiconductor, Taiwan)
- 09:40 **Technique of Immunity Estimation for In-Vehicle 1Gbps Ethernet**
Miyuki Mizoguchi, Youhei Sekiya, Hiroyuki Mori and Noboru Maeda (Nippon Soken, Inc., Japan); Kaoru Yoshida, Hiroki Keino, Takashi Yasuda and Hideki Goto (Toyota Motor Corporation, Japan)
- 10:00 **Study of Magnetic Field Exposure Emitted From a Motor Drive System of an Electric and Hybrid Vehicle**
Kyoseung Keum and Seongkyu Lee (Hanyang University, Korea); Jongkyoung Lee (E&R Tech, Korea); Jaekon Shin (Korea Automobile Testing and Research Institute, Korea); Jaehoon Choi (Hanyang University, Korea)

10:40 – 12:20

TH-AM-4: Signal Integrity and Power Integrity

- Time 10:40 – 12:20, Thursday, 22 June
Room Industrial Bank of Korea Hall (B145)
Chairs Jun Fan (Missouri University of Science and Technology, USA)
Ick-Jae Yoon (Chungnam National University, Korea)
- 10:40 **Transmission Line Model for Designing Common-Mode Suppression Filter on Multi Differential Signal Pairs**
Ding-Bing Lin (National Taiwan University of Science and Technology, Taiwan); Yong-Xun Chen, Yi-Hsien Lee and Lin-Zong Zheng (National Taipei University of Technology, Taiwan)
- 11:00 **Improvement of Eye Diagram of USB 3.0 Signal in Laptop PC Using Passive Equalizer Embedded on Flexible PCB**
Jun-Young Jang, Ho-Seong Lee and Jong-Gwan Yook (Yonsei University, Korea)
- 11:20 **Fabrication and Evaluation of the Quasi-distributed Constant Line Filter with Multiple Magnetic Cores**
Yusuke Ohdaira, Koki Harada and Shigeyoshi Yoshida (NEC TOKIN Corporation, Japan); Toshiro Sato (Shinshu University, Japan)
- 11:40 **SI/PI Co-Optimization for LPDDR3 Mobile Interface**
Nitin Srivastava, Antonio Ciccomancini Scogna, Hwan-Woo Shim, Albert Baek, YongHyock Lee, and Dong Sub Kim (Samsung Electronics, Korea)
- 12:00 **Signal Integrity Analysis of High Speed Connector for Multi-Media System**
Huijin Song, Jonghoon J. Kim and Junyong Park (KAIST, Korea); Junho Lee and Seongmin Choi (Korea Electric Terminal Co., Ltd, Korea); Joungho Kim (KAIST, Korea)

TH-AM-5: Power Electronics Related EMC

- Time 10:40 – 12:20, Thursday, 22 June

- Room Kwak Joung-Hwan Challenge Hall (B146)
- Chairs Tsuyoshi Funaki (Osaka University, Japan)
Jingook Kim (Ulsan National Institute of Science and Technology, Korea)
- 10:40 **Design of Effective Surge Protection Circuits for an Active EMI filter**
Sangyeong Jeong and Dongil Shin (Ulsan National Institute of Science and Technology, Korea); Jongpil Kim and Seokjoon Kim (Hyundai Motor Group, Korea); Jingook Kim (Ulsan National Institute of Science and Technology, Korea)
- 11:00 **A Study on Wiring Pattern Design for Intelligent SiC Power Module With PEEC Method**
Eisuke Masuda, Takaaki Ibuchi and Tsuyoshi Funaki (Osaka University, Japan); Hirotaka Otake, Yasuo Kanetake, Tatsuya Miyazaki and Takashi Nakamura (ROHM Co., Ltd., Japan)
- 11:20 **Extraction of Network Parameters for the Winding-to-Shaft Coupling Effect of an AC Motor**
Younggon Ryu and Ki Jin Han (Ulsan National Institute of Science and Technology, Korea)
- 11:40 **Parameter Identification of Noise-source Linear Equivalent Circuit of DC-DC Converter and Its Evaluation**
Yuhei Osaki, Yusuke Yano, Kengo Iokibe and Yoshitaka Toyota (Okayama University, Japan)
- 12:00 **System-level Modeling of Conducted Emission in Motor Driving Circuit for Brake System**
Junesang Lee, Jungrae Ha, Minho Kim, Chanho Lee, Sangwon Yun and Yeongsik Kim (MANDO Company, Korea); Wansoo Nah (Sungkyunkwan University, Korea)

TH-AM-6: Biological Effects of EMC

- Time 10:40 – 12:20, Thursday, 22 June
- Room Helinox Hall (B147)
- Chairs Nam Kim (Chungbuk National University, Korea)
Yoon Myoung Gimm (Dankook University, Korea)
- 10:40 **The Effects of RF-EMF in Alzheimer Disease Models**
Yun-Sil Lee (Ewha Womans University, Korea)
- 11:00 **Time Reversal based Microwave Focusing for Medical Applications**
Jang-Yeol Kim, Soon-Ik Jeon and Seong-Ho Son (Electronics and Telecommunications Research Institute, Korea)
- 11:20 **Transmission Array of a Focused Microwave Thermotherapy System for Leg Diseases**
Soon-Ik Jeon, Jang-Yeol Kim and Seong-Ho Son (Electronics and Telecommunications Research Institute, Korea)
- 11:40 **Influence of RF-EMF Exposure on Neurotransmitters in Rat: Glutamate**
Hye Sun Kim (Ajou University, Korea); Hyung-Do Choi (Electronics and Telecommunications Research Institute, Korea); Jeong-Ki Pack (Chungnam National University, Korea); Nam Kim (Chungbuk National University, Korea); Young Hwan Ahn (Ajou University, Korea)
- 12:00 **Effects of Wrist Model During the Specific Absorption Rate Evaluations on Smart-watch**
Seon-Eui Hong, Jong-Hwa Kwon and Hyung-Do Choi (Electronics and Telecommunication Research Institute, Korea); Jeong-Ki Pack (Chungnam National University, Korea)

TH-AM-7: Radio-Frequency Interference

- Time 10:40 – 12:00, Thursday, 22 June
- Room Muak Rotary Club Hall (B132)

- Chairs Chulsoon Hwang (Missouri University of Science and Technology, USA)
Hyun Ho Park (The University of Suwon, Korea)
- 10:40 **LCD Baseband Noise Modulation Estimation for Radio Frequency Interference in Mobile Phones**
Chulsoon Hwang (Missouri University of Science and Technology, USA); Sunkyu Kong (Korea Advanced Institute of Science and Technology, Korea); Takashi Enomoto, Kenji Araki and Junji Maeshima (Sony Global Manufacturing and Operations Corporation, Japan); David Pommerenke and Jun Fan (Missouri University of Science and Technology, USA)
- 11:00 **Analysis of Throughput Performance of Smart TV by Noise Effect Using Simulation Methodology**
Soonyong Lee and Yeonsik Yu, Hoyong Kim, Yonghee Cho and Sungsoo Choi (Samsung Electronics, Korea)
- 11:20 **SMPS Noise Modeling and Analysis in Mobiles at 3-level Buck Converter-based Fast Charging Mode**
Kiyeong Kim, Hwan-Woo Shim, Antonio Ciccomancini Scogna, and Dong-Sub Kim (Samsung Electronics, Korea)
- 11:40 **Extraction of Equivalent Array Dipole-Moments Model From Only Magnitude Data of Near-Field Scan**
Kyungjin Kwak (Ulsan National Institute of Science and Technology, Korea); Taeil Bae, Kichul Hong and Hyungsoo Kim (SK Hynix, Korea); Jinguok Kim (Ulsan National Institute of Science and Technology, Korea)

13:30 – 14:30

TH-PM-1: Electronic Packaging EMC

- Time 13:30 – 14:30, Thursday, 22 June
Room Industrial Bank of Korea Hall (B145)
Chairs Ki Jin Han (Ulsan National Institute of Science and Technology, Korea)
Myunghoi Kim (Hankyong National University, Korea)
- 13:30 **Mitigation of Unintentional Radiation from the Package Lid Using PMC Packaging**
Xiao-Li Yang, Er-Ping Li, Yong-Sheng Li, Dong-Ke Zhu and Ping Cheng (Zhejiang University, China); Hui-Chun Yu and Bin Li (Huawei Technologies Co. Ltd, China)
- 13:50 **Miniaturization of Planar EBG Structure using Dual Power Planes**
Xingxiaoyu Lin, Yoshitaka Toyota and Kengo Iokibe (Okayama University, Japan); Toshiyuki Kaneko (KYOCERA Corporation, Japan)
- 14:10 **Modified Pinwheel Meander-line Perforated Plane Structure for System-in-Package**
YoungBong Han, Hai Au Huynh and SoYoung Kim (Sungkyunkwan University, Korea)

TH-PM-2: Modeling and Simulation Techniques for EMC, SI and PI (II)

- Time 13:30 – 14:30, Thursday, 22 June
Room Kwak Joung-Hwan Challenge Hall (B146)
Chairs Ikpyo Hong (Kongju National University, Korea)
Hui Min Lee (A*STAR Institute of High Performance Computing, Singapore)
- 13:30 **Estimating Frequency Spectrum of IC Power Supply Current Through Time-Domain Voltage Measurement on Power Distribution Network**

Jun Wu Zhang, Eng Kee Chua and Kye Yak See (Nanyang Technological University, Singapore);
Wee Jin Koh and Weng Yew Chang (DSO National Laboratories, Singapore)

13:50 **Modeling of Current Sources Near a Wall of Reverberation Chambers in Discrete Singular Convolution Method**

Huapeng Zhao, Jun Hu and Zhizhang Chen (University of Electronic Science and Technology of China, China)

14:10 **Application of Space Object Conjunction Method in the System Level EMC Evaluation**

Asad Husnain Baqar, Ping Xu and Tao Jiang (Harbin Engineering University, China); Yachen Zhang (Heilongjiang University, China)

TH-PM-3: EMC Issues Related to Common-mode Noise (II)

Time 13:30 – 14:30, Thursday, 22 June

Room Helinox Hall (B147)

Chairs Wansoo Nah (Sungkyunkwan University, Korea)
Yoshiki Kayano (The University of Electro-Communications, Japan)

13:30 **Generation of Common Mode in Non-Uniform Differential Interconnections**

Xinglong Wu, Flavia Grassi, Xiaokang Liu, Jingkai Sun and Sergio A Pignari (Politecnico di Milano, Italy); Paolo Manfredi and Dries Vande Ginste (Ghent University, Belgium)

13:50 **A Novel Differential Serpentine Delay Line to Reduce Differential to Common Mode Conversion and Impedance Discontinuity**

Jianquan Lou and Xiaoxia Zhou (CISCO, China); Shun Li (Ericsson, China); Yingchun Shu (CISCO, China); Alpesh Bhoje (CISCO, USA); Jinghan Yu (CISCO, China)

14:10 **Common Mode Reduction in Bi-directional DC-DC Converter by Changing Position of Parasitic Capacitor**

Tohlu Matsushima, Takao Kuroyanagi, Takashi Hisakado and Osami Wada (Kyoto University, Japan)

TH-PM-4: Electromagnetic Environment and High Power EMC

Time 13:30 – 14:30, Thursday, 22 June

Room Muak Rotary Club Hall (B132)

Chairs Frank Leferink (University of Twente, The Netherlands)
William A. Radasky (Metatech Corporation, USA)

13:30 **Exposure to Electromagnetic Near-Fields Radiated by an RFID Reader Antenna**

Kassem Jomaa and Fabien Ndagijimana (Grenoble Institute of Technology, France); Houssam Ayad, Majida Fadlallah and Jalal Jomaah (Lebanese University, Lebanon)

13:50 **Spacecraft Design Considerations for Spacecraft Charging Environments**

Nicole Pothier (Electro Magnetic Applications, USA)

14:10 **Analysis and Reduction on Electromagnetic Interference for Photovoltaic Converter**

Zhou Lei (Jiangsu Institute of Metrology, China); Yan Wei (Nanjing Normal University, China)

14:50 – 16:50

TH-PM-5: Antenna and Wave propagation

- Time 14:50 – 16:50, Thursday, 22 June
Room Industrial Bank of Korea Hall (B145)
Chairs Ick-Jae Yoon (Chungnam National University, Korea)
Sungtek Kahng (Incheon National University, Korea)
- 14:50 **On Signal-Strength-of-Arrival Based Localization with Unknown Transmit Power**
Di Wang, Er-Ping Li and Jiao He (Zhejiang University, China)
- 15:10 **A Multi-Horn Antenna Produced by a 3D Printer**
Yaron Levy and Moshe Raminfar (Azrieli College of Engineering, Israel); Haim Matzner (Holon Institute of Technology, Israel); Ely Levine (Afeka College of Engineering, Israel)
- 15:30 **Phased Array Antenna Modules with Dual Ports for Independent Transmitting and Receiving Beam-Forming Networks**
Hsi-Tseng Chou and Yen Ting Chen (National Taiwan University, Taiwan)
- 15:50 **Spectrum Analysis of Slit for Real Metal at Terahertz Frequencies**
Jun Hur, Jong-Eon Park and Hosung Choo (Hongik University, Korea)
- 16:10 **Sidelobe Suppression of Reflector Antennas by Embedding Non-Resonant Periodic Metal Cells along the Reflector Edge Boundary**
Shih-Chung Tuan (Oriental Institute of Technology, Taiwan); Hsi-Tseng Chou (National Taiwan University, Taiwan); Hsien-Kwei Ho (Yuan Ze University, Taiwan)
- 16:30 **An Analysis on the Compact Quasi-Isotropic Antenna Using Folded Split Ring Resonator**
Joon-Hong Kim and Sangwook Nam (Seoul National University, Korea)

TH-PM-6: Computational Electromagnetics and Multiphysics methods for Simulating Complex Electromagnetic Environment Effects

- Time 14:50 – 16:50, Thursday, 22 June
Room Kwak Joung-Hwan Challenge Hall (B146)
Chairs Wen-Yan Yin (Zhejiang University, China)
Jae Wook Lee (Korea Aerospace University, Korea)
- 14:50 **A Discontinuous Galerkin Time-Domain Method for Modeling of Power-Ground Planes With Narrow Slots and Signal Vias**
Hui Min Lee, Si-Ping Gao and En-Xiao Liu (Institute of High Performance Computing; A*STAR, Singapore)
- 15:10 **JEMS-FD: Engineering Application Oriented High-Performance Program for Electromagnetic Compatibility Analysis**
Wei-Jie Wang (China Academy of Engineering Physics, China); Hai-Jing Zhou (Institute of Applied Physics and Computational Mathematics, China)
- 15:30 **Shielding Effectiveness Prediction of Metallic Structures with Thin Slots Using FDTD**
Mingjiang Fang, Liping Yan, Zhangshuai Cao and Xiang Zhao (Sichuan University, China); Qiang Liu and Haijing Zhou (Institute of Applied Physics and Computation Mathematics, China)
- 15:50 **Multi-GPU based Fast Electromagnetic Simulation Method for Analyzing PCB**
Yuta Inoue and Hideki Asai (Shizuoka University, Japan)
- 16:10 **Application of Group Theory in 2D Electromagnetic Scattering in Resonant Frequency**
Changwei Xu, Hao Guo, Li-Fei Geng, and Hong-Tao He (Luoyang Electronic Equipment Test Center, China)
- 16:30 **Hybrid Scheme Combining Iterative Physical Optics and Edge Current Method to Compute Scattering by Conducting Tail-Wing Structure**

TH-PM-7: Near Field Scanning Technology for EMC

Time 14:50 – 16:50, Thursday, 22 June

Room Helinox Hall (B147)

Chairs Xing-Chang Wei (Zhejiang University, China)
Er-Ping Li (Zhejiang University, China)

14:50 **Estimation of Initial Guess of Steepest Descent Method for Near Field Phase Retrieval**

Huapeng Zhao, Ying Zhang, Jun Hu and Zhizhang Chen (University of Electronic Science and Technology of China, China)

15:10 **Near-Field-Based Array Failure Diagnosis Using Sparse Source Reconstruction**

Huapeng Zhao, Ying Zhang, Qun Wan, Jun Hu, and Zhizhang Chen (University of Electronic Science and Technology of China, China)

15:30 **Study on the Phase Error of Plane Wave Spectrum Expansion**

Sihong Tao, Huapeng Zhao, Ying Zhang, Jun Hu and Zhizhang Chen (University of Electronic Science and Technology of China, China)

15:50 **An Effective Equivalent Radiation Source Based on Near-field Scanning for Electromagnetic Interference Estimation**

Jun Li, Xing-Chang Wei, Liang Gao and Yufei Shu (Zhejiang University, China)

16:10 **Investigation of the Probe-Factor Deconvolution Methods for Dynamic ESD Fields Measurements**

Myungjoon Park and Jinguok Kim (Ulsan National Institute of Science and Technology, Korea);
Joungcheul Choi, Jinwoo Kim, Seonghoon Jeong, Manho Seung and Seokkiu Lee (SK Hynix Inc., Korea)

16:30 **Constant Velocity Motion of a Micro-Robot Using Uniform Magnetic Field**

Dongwook Kim and Seungyoung Ahn (KAIST, Korea)

TH-PM-8: EMC & Antenna Design for Wireless Communication Systems

Time 14:50 – 16:50, Thursday, 22 June

Room Muak Rotary Club Hall (B132)

Chairs Eakhwan Song (Kwangwoon University, Korea)
Soonyong Lee (Samsung Electronics, Korea)

14:50 **A Novel Robust Design Method for a Mobile Antenna With a Metal Frame**

Sungwoo Lee, Jong Min Lee and Keum Cheol Hwang (Sungkyunkwan University, Korea); Sanguk Park and Soonyong Lee (Samsung Electronics, Korea)

15:10 **Design of the PCB Embedded Active IC Structure for Ultra-thin Wearable Application With Low-RFI**

Bumhee Bae, JongWan Shim, Younho Kim, HyungGeun Kim and HarkByeong Park (Samsung Electronics, Korea); Jonghoon Kim (KAIST, Korea);

15:30 **Advanced Impedance Matching Technology to Optimize RF Circuit Design of Practical Wireless Systems**

Sinhyung Jeon, Kyungho Yoo, Youjin Kim, and Jeongnam Cheon (Samsung Electronics, Korea)

15:50 **IC Placement Optimization for RF Interference Based on Dipole Moment Sources and Reciprocity**

Chulsoon Hwang and Qiaolei Huang (Missouri University of Science and Technology, USA)

- 16:10 **Design Optimization of Board-level Signal Integrity Depending on PCB Stack-up Configuration in a Mobile Device**
Inmu Kim, Kipyong Kim and Youngmin Cho (LG Electronics, Korea); Eakhwan Song (Kwangwoon University, Korea)
- 16:30 **Design and Analysis of On-chip Active Power Distribution Network for Efficient Simultaneous Switching Noise Suppression in Mobile AP**
Subin Kim, Youngwoo Kim and Jounggho Kim (KAIST, Korea)

17:00 – 18:00

TH-PM-9: Poster Session (II)

Time 17:00 – 18:00, Thursday, 22 June

Room Lobby

Chairs Kyung Sub Lee (Sungkyunkwan University, Korea)
Hyun Ho Park (The University of Suwon, Korea)

- PS2-01 **Element-Based Electromagnetic Interference Suppression for Modular Systems**
Aixin Chen, Yue Zhao, Xiaojun Ying and Wenbin Wu (Beihang University, China)
- PS2-02 **Noise Reduction Between High Speed Differential Pairs and Ground Shape**
Chung-Han Tsai, Hank Lin, Shih-Keng Chuang and Bin-Chyi Tseng (ASUSTek Computer Inc., Taiwan)
- PS2-03 **A Study On EMI Generation From A Capacitive Touch Screen Panel**
Hoonbae Kim and Byung-Wook Min (Yonsei University, Korea)
- PS2-04 **Experimental Study on Probability Threshold of Electromagnetic Effect of Electronic Equipment**
Xin Li, Ping Wu, Cui Meng, Yinong Liu and Hanbing Jin (Tsinghua University, China)
- PS2-05 **Evaluation of Fibre Weaving of Substrate on Differential Microstrip Using an Analytical Approach**
Eng Kee Chua, Jun Wu Zhang and Kye Yak See (Nanyang Technological University, Singapore);
Wee Jin Koh and Weng Yew Chang (DSO National Laboratories, Singapore)
- PS2-06 **Crosstalk Reduction by Introducing Periodic Structure into Dense Differential Pairs**
Hiroaki Takeda, Kengo Iokibe and Yoshitaka Toyota (Okayama University, Japan)
- PS2-07 **Crosstalk Suppression by Applying Multilevel Signal Transmission**
Yafei Wang and Xuehua Li (Beijing Information Science and Technology University, China)
- PS2-08 **Discontinuous Galerkin Time-Domain Analysis of Power/Ground Plate Pairs With Wave Port Excitation**
Ping Li and Lijun Jiang (The University of Hong Kong, Hong Kong); Hakan Bagci (King Abdullah University of Science and Technology, Saudi Arabia)
- PS2-09 **Surface Charging Dynamics in a Space Plasma**
Bryon Neufeld (Electro Magnetic Applications, USA)
- PS2-10 **Effective Equation of EMP Shielding Effectiveness with Multi-layered Waveguide-Below-Cutoff Array**

Sangin Kim, Yuna Kim and Jong-Gwan Yook (Yonsei University, Korea)

- PS2-11 **Modeling of Printed Spiral Coils Based on Conformal Mapping Method With Fringing Capacitance Effects**
Kyungmin Kim, Hyukjun Oh and Eakhwan Song (Kwangwoon University, Korea)
- PS2-12 **Synthesized Network Compensator for Crosstalk Cancellation**
Sang Seop Song; Jeonghwan Kim; Ki Jin Han (Ulsan National Institute of Science and Technology, Korea)
- PS2-13 **Small Handheld UHF RFID Reader Antenna for Industrial Laundry Applications**
Guan-Lin Chen, Rong Cao and Chow-Yen-Desmond Sim (Feng Chia University, Taiwan)
- PS2-14 **A Ka-band Parallel-plate Parabolic Reflecting Structure to Implement the Beam Forming Networks for Phased Array of Antennas**
Hsi-Tseng Chou (National Taiwan University, Taiwan); Ying-Shan Chen (Yuan-Ze University, Taiwan); Chia-Hung Chang (Feng Chia University, Taiwan)
- PS2-15 **High-Performance DOA Estimation for Coprime Arrays With Unknown Number of Sources**
Anh-Tuan Nguyen, Takashi Matsubara and Takakazu Kurokawa (National Defense Academy, Japan)
- PS2-16 **Research on 8mm-band Elliptic Cylindrical Reflector Antenna and a New Feed Antenna**
Liqing Wang and Nannan Wang (Harbin Institute of Technology, China)
- PS2-17 **Size Reduction of a Sinuous Antenna Using Planar Meandering**
Hosang Lee (Sungkyunkwan University, Korea); Taehoon Yoo (Dongyang Mirae University, Korea); Wansoo Nah (Sungkyunkwan University, Korea)
- PS2-18 **Study on the Surface Wave Plasma Column for Plasma Antenna Applications Using Surfaguide Launcher**
Mohammad Mahdi Abbasi and Shahrooz Asadi (Shahid Beheshti University, Iran)
- PS2-19 **Modal Analysis of Radio Frequency Interference From Shield Can Holes in Mobile Devices**
Hyun Ho Park (The University of Suwon, Korea); Eakhwan Song (Kwangwoon University, Korea)
- PS2-20 **Modeling of Wave propagation in Thin Graphene Sheets With 3-D ADE-WLP-FDTD Method**
Ru-Jun Liu and Wei-Jun Chen (Lingnan Normal University, China)
- PS2-21 **Analysis of Impedance Matrix Fill-in Time in CBFM Optimization for Large Scale EMC Problem**
Chan-Sun Park (Yonsei University, Korea); Ic Pyo Hong (Kongju National University, Korea); Heoung-Jae Chun (Yonsei University, Korea); Yong Bae Park (Ajou University, Korea); Youn-Jae Kim (Agency for Defense and Development, Korea); Jong-Gwan Yook (Yonsei University, Korea)
- PS2-22 **EM Scattering From Dimples in a Circular Cylinder**
Sangsu Lee and Yong Bae Park (Ajou University, Korea)
- PS2-23 **Impact of Magnetic Field Generated by Wireless Power Transfer System of Electric Vehicle on Retinal Pigment Epithelium Cell in Vitro**
Weinong Sun, Yaqing He, Yinliang Diao, Sai-Wing Leung, Yun-Ming Siu and Richard Kong (City University of Hong Kong, Hong Kong)
- PS2-24 **Evaluating Human Exposure to Electromagnetic Field Radiated by the Commercial Wireless Power Charging Device**

Jun Seok Kang, Byung Nam Kang, Kang Hui Jeon and Nam Kim (Chungbuk National University, Korea)

PS2-25 **Implementation of Chip-Level EMC Strategies in 0.18 μm CMOS Technology**

Yin-Cheng Chang, Ping-Yi Wang and Shawn S. H. Hsu (National Tsing Hua University, Taiwan);
Mao-Hsu Yen (National Taiwan Ocean University, Taiwan); Yen-Tang Chang and Jian-Li Dong
(Bureau of Standards, Metrology and Inspection, Taiwan); Ta-Yeh Lin and Da-Chiang Chang
(National Applied Research Laboratories, Taiwan)