

Radio Frequency Interference for 5G/IoT

ORGANIZERS:

Jun Fan, Missouri University of Science and Technology

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ABSTRACT:

Radio-frequency interference is becoming a critical challenge in device and sensor designs used for wireless communications and IoT. Any RF antenna used as a radio receiver can easily pick up the unintended electromagnetic noise from ICs, cable, and interconnects, resulting in significant performance degradation. With the emerging 5G wireless and IoT, mitigation of RF interference in the physical layer is essential in ensuring normal operations of RF devices and sensors, especially in complex electromagnetic environment. This workshop will cover both the fundamentals and practical implications of RF Interference. Methodologies in terms of analysis, debugging, modeling and measurements will be discussed.

TALKS:

Overview of RF Interference and First-Hand Evaluation Using OTA Results

Prof. Jun Fan, Missouri S&T

RF Interference Modeling and Mitigation in Wireless Devices

Prof. Chulsoon Hwang, Missouri S&T

Nonlinearity-Related RF Interference and Nonlinearity Evaluations for Component-Level Compliance

Hanfeng Wang, Google

Intra-System EMC problems in mobile devices

Hwanwoo Shim, Samsung Electronics

Mechanism and Validation of USB 3.0 Connector Caused RFI

Bin-Chyi Tseng, ASUS

Identification and Quantification of TRX Issues in Terminal Products

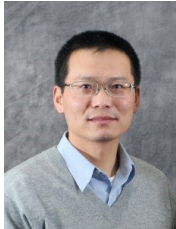
Guanghai Liu, Vivo

Study on Interference and Susceptibility Characteristics of MIPI in Terminal Products

Kaixiang Zhu, Honor

A Method to Mitigate LCD-Related EMI Issues in Cell Phone by Modeling Simulations

Weipeng Dai, Oppo

BIOS OF ORGANIZERS & SPEAKERS

Jun Fan (S'97-M'00-SM'06-F'16) received his B.S. and M.S. degrees in Electronic Engineering from Tsinghua University, Beijing, China, in 1994 and 1997, respectively. He received his Ph.D. degree in Electrical Engineering from the University of Missouri-Rolla in 2000. From 2000 to 2007, he worked for NCR Corporation, San Diego, CA, as a Consultant Engineer. In July 2007, he joined the Missouri University of Science and Technology (formerly University of Missouri-Rolla), and became tenured Professor in 2016. From October 2018, he was the Cynthia Tang Missouri Distinguished Professor in Computer Engineering. He served as the Director of the Missouri S&T EMC Laboratory, and the Director of the National Science Foundation (NSF) Industry/University Cooperative Research Center (IUCRC) for Electromagnetic Compatibility (EMC) from 2013. He was a Senior Investigator of Missouri S&T Material Research Center as well. His research focuses on hardware design and fundamental research for electromagnetic compatibility (including signal and power integrity) at the levels of integrated circuit, package, PCB and system, and development of specialized design tools and innovative measurement technologies. In the IEEE EMC Society, Dr. Fan served as a member of the Board of Directors, the Chair of the Technical Advisory Committee, the chair of the TC-9 Computational Electromagnetics Committee, and a Distinguished Lecturer. He currently is the inaugural Editor in Chief for the IEEE Transactions on Signal and Power Integrity, and an associate editor for the IEEE Transactions on Electromagnetic Compatibility. He was Technical Paper Chair and Technical Program Chair for a few IEEE International Symposia on EMC, General Chair for IEEE International Conference on Signal and Power Integrity, founding chair for the SC-4 EMC for Emerging Wireless Technologies Special Committee, and so on. Dr. Fan received an IEEE EMC Society Technical Achievement Award in August 2009.



Chulsoon Hwang received the B.S., M.S., and Ph.D. degrees in electrical engineering from the Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in 2007, 2009, and 2012, respectively.

He was with Samsung Electronics, Suwon, South Korea, as a Senior Engineer from 2012 to 2015. In July 2015, he joined the Missouri University of Science and Technology (formerly University of Missouri-Rolla), Rolla, MO, USA, where he is currently an Assistant Professor. His research interests include RF desense, signal/power integrity in

high-speed digital systems, EMI/EMC, hardware security and machine learning.

Dr. Hwang was a recipient of the AP-EMC Young Scientist Award, the Google Faculty Research Award, and Missouri S&T's Faculty Research Award. He was a co-recipient of the IEEE EMC Best Paper Award, the AP-EMC Best Paper Award, and a two-time co-recipient of the DesignCon Best Paper Award.



Hanfeng Wang received the B.S. and M.S. degrees in electronic engineering from Tsinghua University, Beijing, China, in 2005 and 2008, respectively, and the Ph.D. degree in electrical engineering from Missouri University of Science and Technology (formerly University of Missouri-Rolla), Rolla, USA, in 2012. From 2012 to 2015, he was a Signal Integrity Engineer with Apple. From June 2015 to July 2017, he joined Microsoft as a Senior Electrical Engineer and since July 2017, he has been the Signal Integrity Engineer

and recently became the team lead in Google's consumer hardware division. His current research interests include signal integrity, power integrity, and electromagnetic interference in high-speed digital systems. He is an active Senior member of IEEE and is serving as the vice chair for TC10 (focusing on signal and power integrity) of the IEEE EMC Society.



Hwanwoo Shim joined Samsung Electronics in MX division(former Mobile Business division) in 2004 and worked as a project leader for commercial smartphone development. In 2013, he moved to hardware engineering group, where he has been responsible for CAE modeling of RF and EMC issues. Also included are the In-House tool development for automations and On-premise HPC sever farm. Recently, he focuses on modeling troublesome issues, which have been solved on trial-and-error bases.

He received Ph.D. degree from University of Missouri-Rolla(Currently, Missouri University of Science and Technology) and M.S. degree from Korea Advanced Institute of Science and Technology in 2004 and 1994, respectively. His research interests are SI/PI simulation, noise modeling, system-level RF simulations.



Bin-Chyi Tseng (M'95–SM'20) double majored in communication engineering and management science. He received B.S. and B.S.M. degrees at the same year 1994, and the M.S. and Ph.D. degrees in communication engineering all from the National Chiao Tung University, Hsinchu, Taiwan, in 1996 and 2004, respectively.

From 1996 to 2001, he was an RF circuit engineer with the Computer and Communication Laboratories, Industrial Technology Research Institute, Hsinchu, Taiwan, where he developed multilayer RF components and modules. In 2001, he joined Walsin Technology Corp., where he developed low-temperature co-fired ceramic RF components and miniaturized WiFi/BT modules. In 2005, he joined the Department of Electrical Engineering, Feng Chia University, Taiwan, as an Assistant Professor. In March 2013, he joined ASUSTek Computer Inc., Taipei, Taiwan, and is currently a Division Director with the Advanced EM Technical Division. His research interests include signal/power integrity, radio frequency interference designs in high-speed digital systems, design of various electromagnetic compatibility components, numerical simulations, and multilayer RF circuits.



Guanghui Liu has 16 years of working experience in EMC, and is currently an EMC leader in Vivo Mobile Company. His field is on EMC design, simulation, hands-on methodology study and troubleshooting. He skilled in intra and inter system interference along with EMC-relevant reliability design.



Kaixiang Zhu received the B.S. degree and the Ph.D. degree from Beihang University, Beijing China, in 2013 and 2019. He is currently a Senior Engineer with Honor Device, working towards RF interference, susceptibility of multimedia module and other EMC problem in terminal products.



Weipeng Dai received the B.S. degree from Xidian University, Xi'an China, in 2009. He is currently an EMC director with OPPO, working towards new EMC protection scheme, RF interference and other EMC problems in terminal products.