

HPEM Threats, Modeling and Analysis for RF Devices/Circuits Breakdown under Intentional Electromagnetic Interference (IEMI)

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ABSTRACT:

In the past few years, special attention has been focused on intentional electromagnetic interference (IEMI) effects on communication systems. High power electromagnetics (HPEM), as it is sometimes known, “EM Terrorism,” is a new area of concern for public and commercial interests. Transceivers can be easily interfered with and their RF devices/circuits can be damaged under IEMI. In this talk, the electro-thermal-stress (E-T-S) multi-physics method is used to analyze the interactions of RF devices and electromagnetic pulses. It has been found the parameters of the electromagnetic pulse such as widths, numbers and repetition frequencies affect the thermal and stress of the RF devices. The device breakdown phenomena are observed under a scanning electron microscope (SEM) where the crack curve due to unrecoverable deformation in the device is displayed. TVS diodes and protection circuits are used in order to protect the RF devices. Simulation, measurement, and calculations show some correlations.



DISTINGUISHED LECTURER:

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Liang Zhou is a full professor with the School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University. His main research interests include system on packaging (SoP) design and modeling, EMC and High Power Microwave (HPM) protection of communication platforms, and multi-physics and its application.

He received the Ph.D. degree in electrical engineering from the University of York, UK, in 2005. From 2005 to 2006, he was a Senior RF Engineer with Motorola INC, Shanghai, China, where he was involved in power amplifier design for the next generation of base station transceivers. Since May 2006, he joined the Key Laboratory of the Ministry of Education of Design and Electromagnetic Compatibility of High-Speed Electronic Systems, Shanghai Jiao Tong University, Shanghai, China, as an assistant professor and then an associate professor. He has been a visiting scholar with the Massachusetts Institute of Technology, Cambridge, USA since 2007. From January 2017, he became a full professor in electromagnetic fields and microwave techniques with the School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, Shanghai, China. From February 2017, he is a Research Fellow with the Institute for Electronics Engineering (LTE) of the Friedrich-Alexander-University Erlangen-Nürnberg, Germany, granted by the Alexander von Humboldt-Stiftung, Germany. He is the IEEE EMC Society Shanghai Chapter Chair since 2015, and an IEEE senior member.

Dr. Zhou was the recipient of Alexander von Humboldt (AvH) research fellowship in 2016, APEMC Young Scientist Award in 2016, the Research Grant of the Okawa Foundation (Japan) in 2016, the International Union of Radio Science (URSI) Young Scientist Award in 2014, the best paper awards of Cross Strait Quad-Regional

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