USC Viterbi School of Engineering
Ming Hsieh Department of Electrical Engineering

Ming Hsieh Institute Seminar Series
Ming Hsieh Department of Electrical Engineering

Integrated Systems

Time-Varying Electromagnetic Devices: Breaking the Fundamental Limits of Passives

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Professor at UCLA

Date: Friday, February 24th, 2017
Time: 2:30pm Location: EEB 132

Abstract: Passive electromagnetic devices such as transmission lines, filters and antennas are essential parts of a wireless system. They often dominate the system's efficiency, bandwidth and noise performance. Traditional passives often operate in a time-invariant manner as they are built with materials and structures that have time independent properties. They are subject to many well-known fundamental limits such as the reciprocity of transmission line, limit of quality factors of passive filters and limit of efficiency bandwidth product in electrically small antennas. Utilization of transistor based active electronics may help to overcome some of these challenges but they oftentimes incur noise and power handling issues.

In this talk, I will introduce the multiple initiatives supported by NSF and DARPA on the development of a new class of electromagnetic devices that are operating in a time-varying fashion. These time-varying devices including transmission lines, filters and antennas may be constructed on semiconductor or electromechanical platforms to leverage on their time-dependent property enforced through parametric modulation or switching modes. It will be demonstrated through the addition of the new time dimension the aforementioned fundamental limits of passives can be lifted. Potential new applications such a full-duplex radios, tunable RF front-ends and broadband VLF transmitters may be developed with this novel device concept.

Biography: Dr. Yuanxun Ethan Wang received the B.S. degree in Electrical Engineering from University of Science and Technology of China (USTC), Hefei, China in 1993, and the M.S. and the Ph.D. degrees in electrical engineering from University of Texas at Austin, in 1996 and 1999. He became an Assistant Professor with the EE department of UCLA since Nov. 2002 and is now an Associate Professor with the same department. Dr. Wang is a senior member of IEEE and an associate Editor of IEEE Transactions on Antennas and Propagation. He has published more than 100 journal and conference papers. His research is in the general area of microwave systems with emphasis on the front-ends including antennas, phased arrays, high performance RF transmitters and receivers. His researches blend digital technologies and concepts into RF design, which often leads to novel antenna and circuit configurations with performances beyond the conventional bound. Dr. Wang is the director of the Digital Microwave Lab and the Center for High Frequency Electronics in the Electrical Engineering Department of UCLA and the leader of the antenna thrust in National Science Foundation funded Engineering Research Center – Translational Applications of Nanoscale Multiferroic Systems (TANMS).

Hosted by Prof. Hossein Hashemi, Prof. Mike Chen, Prof. Dina El-Damak, and Prof. Mahta Moghaddam.
Organized and hosted by Jae-Won Nam.