IEEE Solid-State Circuits Society SSCS Distinguished Lecture
IEEE SSCS/CASS Atlanta Joint Chapter Seminar

Title: High-Efficiency Transmitters, the Road Ahead

Speaker: Dr. Osama Shana'a

Affiliation: Mediatek Inc.

Abstract: Modern communication systems are rapidly increasing in complexity fueled by high customer demand for data-rich media streaming over the airwaves. With limited, and sometimes fragmented, available spectrum, very complex modulation schemes with relatively high signal bandwidth are used to be able to "pack" such high data contents for wireless streaming. As a result, tremendous pressure is now put on RFIC designers to deliver circuits that can handle such complex modulation and maintain the required high signal integrity while still be power efficient. This talk walks the audience through design challenges and considerations for high-efficiency transmitters and what areas of research are needed to enable and enhance such circuits moving forward. A dual band digital transmitter supporting WiFi 802.11 a/b/g/n is used as a design example of a potential technique to address some of the highlighted issues. The design uses a digital-OR function to combine I and Q digital signals, which cuts the PA core size by half for the same output power. The resulting diamond-shape profile shows smaller die area and better PA efficiency due to reduced parasitics. The TX achieves an MCS7 HT40 output power of 18.6dBm/17.8dBm for 2.4GHz/5.5GHz bands with 3dB margin on the IEEE emission mask requirement. The entire digital PA core efficiency exceeds 14% for both bands. Circuits are implemented in 40nm CMOS.

Speaker Biography: Dr. Osama Shana'a (IEEE SM'94, M'01, S'03) has been with Mediatek as a Senior RFIC Design Director since 2008, where he is responsible for various CMOS RF SoC developments for both cellular and connectivity. He received his BSc. degree in electrical engineering with high honor from University of Jordan in 1992, the M.S.EE degree from Portland State University in 1996 and the Ph.D. degree in electrical engineering from Stanford University in 2001. Between 1995-2008 he held various IC design positions at Radio Comm. Corp., National Semiconductor, and Maxim Integrated Products, where he led many successful RF wireless designs for PCS, CDMA, WCDMA, WLAN and WiMax. In 2005 he was a visiting professor at the University of California Berkeley where he taught an advanced circuit design class for wireless communications. Dr. Shana'a is a Fulbright scholar, a member of the Etta Kappa Nu honor society and is a senior IEEE member. He currently serves on the Technical Program and Steering Committee for the IEEE RFIC Symposium. Dr. Shana'a is a former Associate Editor for the IEEE Transactions on Microwave Theory and Techniques and is currently a Distinguished Lecturer for the IEEE Solid State Circuits Society.

Seminar Time: 1:30PM-2:30PM on April 21st 2016 **Seminar Location:** TSRB 530, Georgia Tech.

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