

## Seminar on

### Low-Power CMOS Integrated Circuits and Systems for Wireless Communications

by

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#### Abstract

To facilitate the ever-increasing demand for higher data rates, recent wireless communication systems have explored shifting their operating frequencies away from the overcrowded RF spectrum towards much higher millimeter-wave (mmW) or even visible-light regions which offer significantly wider available bandwidths. The numerous potential applications of these systems in consumer electronics has further motivated research on wireless transceivers in CMOS technology due to its high integration level, small form factor, high reliability and low cost. Unfortunately, this introduces a new set of unique design challenges at both the circuit and system level. In this talk, these challenges and solutions will be presented in the design and implementation of several CMOS integrated circuits and systems for mmW radios and visible light communications (VLC).

For mmW circuits, several novel design techniques for the key building blocks in 60-GHz frequency generation will be discussed, including the bimodal enhanced-magnetic-tuning to widen the tuning range of a quadrature VCO, and the harmonic-boosting to extend the locking range of a divide-by-4 frequency divider. Furthermore, a 4-path 45-GHz LO generation scheme featuring linear phase shift and automatic successive-approximation phase tuning will be described. Finally, at the system level, a 4-element 60-GHz phased-array receiver front-end system with transformer-based hybrid-mode mixing and closed-loop beamforming calibration will be presented.

For VLC, two interesting systems in low-cost CMOS will be presented, including the IEEE 802.15.7 PHY-I standard compliant transmitter and LED driver mixed-signal SoC for location-based applications using standard white LED lights as beacons or broadcasters, and the active matrix LED (AMLED) microdisplay driver SoC with built-in VLC transmitter.

#### Biography

**Dr Liang Wu** received the B.S. and M.S. degrees in Materials Science from Fudan University, China, in 2004 and 2007 respectively, and the Ph.D. degree in Electronic and Computer Engineering from the Hong Kong University of Science and Technology in 2012. From March 2013, he joined the Department of Electronic and Computer Engineering at the Hong Kong University of Science and Technology where he is now a research assistant professor and the deputy director of HKUST-Qualcomm Joint Innovation and Research Lab.

His research interests include CMOS RF / millimeter-wave integrated circuits for wireless transceivers, mixed-signal visible light communication system-on-a-chip (SoC), and visible light indoor positioning systems.

**Date** : 10 March, 2015 (Tuesday)

**Time** : 02:00 pm – 03:00 pm

**Venue** : Room 15-202, meeting room of State Key Laboratory of Millimeter Waves, 15/F, Academic 3, City University of Hong Kong

\*\*\* ALL ARE WELCOME \*\*\*

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