

## Short Course on

# CMOS Power Amplifier Design

by

Dr. Fan-Hsiu Huang  
Chang Gung University, Taiwan

### Abstract

Millimeter-wave Signal Generation using Injection Locking Technique

Since the characteristics of good thermal dissipation, low cost, and highly integration with various functional sub-circuits are easily accomplished in CMOS process, a demand for high-power microwave circuit design is becoming important. CMOS power amplifiers (PA) have been developed for mobile and wireless communications. A watt-level PA with high efficiency and high output power has posed a formidable challenge because it still suffers the avoidable problems from a low quality factor passive components on a lossy silicon substrate and low breakdown voltage of active devices. In order to improve the breakdown characteristic of MOSFETs, the cascode type device is a better solution applied to PA design. Based on a differential circuit topology, the output power therefore can be increased by using a balun or a power-combining transformer. The improvement in efficiency performance can be fulfilled through the methods of dynamical biasing, stage conversion, and the variable load using controllable capacitor. For further achieving an accurate large-signal behavior in simulation, the characteristics as the substrate effect, breakdown characteristic, and the parasitic RC has to be concerned and modified to a cascode MOSFET model depending on the small-signal and loadpull measurement results. The nonlinearity and high-order harmonics performances also can be exhibited and understood based on X-parameter measurement and loadline demonstration.

### Biography

**Fan-Hsiu Huang** was born in Taipei, Taiwan, R.O.C. He received the M.S. degree and the Ph.D degree in electrical engineering from National Central University, Chungli, Taiwan, in June, 2003 and October, 2007, respectively. His research is interesting in microwave/millimeter-wave integrated circuits, fiber-optic communication front-end circuit design, and high-speed signal transmission. After he received the Ph.D degree, he was a postdoctoral researcher in Optical Sciences Center, National Central University, Taiwan, where he was engaged in researching and developing of microwave CMOS high-power switch and power amplifier circuits, injection locking technology, and 60 GHz phased array system. Since 2012, he joined the faculty at Chang Gung University as an assistant professor in the Department of Electronics Engineering. His currently research areas focus on microwave high-power devices and circuits, millimeter-wave monolithic integrated circuit, and high data rate wireless systems.

**Date** : 14 Mar., 2012 (Wednesday)  
**Time** : 9:00am – 1:00pm  
**Venue** : P7822, Academic 1 Building,  
City University of Hong Kong

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

Enquiries: Prof Quan Xue, Department of Electronic Engineering  
Tel. : 3442 4680 Fax : 34420353 e-mail: [eeqxue@cityu.edu.hk](mailto:eeqxue@cityu.edu.hk)