

UCLA Electrical Engineering ARR 2011

Session 11. Innovative Analog and RF Design North Ridge Room

3:15-3:40

"V-band Self-Healing Power Amplifier with Adaptive Feedback Bias Control in 65nm CMOS"

Jenny Yi-Chun Liu, Adrian Tang, Ning-Yi Wang, Qun Jane Gu, Roc Berenguer, and Mau-Chung Frank Chang

Abstract:

A self-healing two-stage 60 GHz power amplifier (PA) with amplitude/phase compensation is realized in 65 nm CMOS. An adaptive feedback bias scheme with three control knobs is proposed to extend the linear operating region and enhance chip-to-chip performance yield; allowing a 5.5 dB improvement of the output 1-dB compression point (P1dB) and a less than 2% chip-to-chip gain variation. At a 1 V supply, the fully differential PA achieves a saturation output power (Psat) of 14.85 dBm with a peak power-added-efficiency (PAE) of 16.2%. With the on-chip amplitude compensation, the P1dB is extended to 13.7dBm. With the on-chip phase compensation, the output phase variation is minimized to less than 0.5 degree. The PA delivers a linear gain of 9.7 dB and has a 7 GHz bandwidth from 55.5 to 62.5 GHz with a very compact area of 0.042 mm².

3:40-4:05

"Wide-bandwidth open loop phase modulator"

Nitin Nidhi and Sudhakar Pamarti

Abstract:

Emerging wireless communication standards require the transmitter to be wide-bandwidth and power efficient. Polar and out-phasing are two promising candidates for such applications. Both of these architectures require a wide-bandwidth phase modulator. Open loop phase modulation presents a viable solution for achieving wide-bandwidth operation. An on-chip calibration technique, which can attain high precision in the measurement of digital-to-phase characteristics of a phase interpolator, is proposed. The technique makes use of the time-to-digital converter (TDC) in a digital PLL, while avoiding the impact of its non-idealities.

4:05-4:30

"Gain-Enhanced Distributed Amplifier-Based CRLH-Leaky Wave Antenna for Quasi-Resonant Power Recycling Scheme"
Chung-Tse Michael Wu and Tatsuo Itoh

Abstract:

A distributed amplifier combined with CRLH-leaky wave antennas (LWAs) for a new resonant type power recycling scheme is proposed. By connecting a closed loop to the LWA on the drain side of the distributed amplifier, we can obtain gain enhancement compared to the one directly terminated without the loop. Such enhancement fluctuates with respect to the frequency. At some specific frequencies, the enhancement reaches a maximum. The phenomenon will be explained theoretically and validated through the measurement and simulation.

4:30-4:55

"Signal-processing techniques for wideband data converters"
Abhishek Ghosh and Sudhakar Pamarti

Abstract:

This talk will focus on signal conditioning techniques for voltage-controlled oscillator (VCO) ring A/D converters. VCOs promise an inexpensive, power-efficient way to implement A/D converters of moderate to high bandwidths. The frequency of the ring oscillator output is changed proportional to the input signal that needs to be quantized; quantization is achieved by simply counting the number of rising/falling edges of the ring oscillator output(s) in a given period of time. However, the non-linear VCO tuning curve poses severe limitations on the ADC dynamic range. To allay this problem, novel dithered signal-conditioning techniques to scramble the VCO-tuning errors are proposed. The oversampled nature of the system enables pushing out the error power out of the signal band, thereby attaining a robust SNDR at a minimal power expense. The scheme is able to achieve a resolution >12 bits at a nominal power-consumption of 5mW for signals having bandwidths in the 20MHz range.