Joint meeting with Lehigh Valley Chapter Circuits and Systems
October 29 beginning at 6:00 PM, Lehigh University

6:00 PM – Meet and Greet with Free Refreshments. Room PL 324 (RSVP Required)
7:00 PM – Technical Meeting. Room PL 416 (Open to all)
"Future Directions for Silicon Radio Frequency Electronics", by Professor John R. Long
Electronics Research Laboratory/DIMES, Delft University of Technology, the Netherlands

ABSTRACT: Analog/RF circuit innovations relevant to developing more efficient infrastructure, conserving energy, and delivering better health care are described in this talk. Three examples from recent research into the design of adaptive, wideband, and scalable high-frequency electronics aimed at emerging applications are described .

1. Wireless silicon sensors capable of measuring position and velocity accurately are needed for intelligent traffic management schemes. A recently developed mm-wave FMCW radar transmitter IC incorporates the phase-locked loop, digitally controlled oscillator, PA, and calibration circuits in 65nm CMOS. The ADPLL performs autonomous calibration and closed-loop DCO gain linearization in order to output a GHz-speed triangular chirp with high sweep linearity. The transmitter achieves excellent in-band/ out-of-band phase noise performance, ultra-low reference spur levels (-74 dBc), and is scalable to future technology nodes.
2. Scenarios for improving health care often require low-power radios to monitor patients remotely. In the second example, a low-power, autonomous FM ultra-wideband transceiver and power management unit that transfers data reliably at 100kbit/s and includes full on-chip digital calibration of the transceiver is described.
3. Fiber-optic technologies in the internet backbone are migrating towards coherent modulation schemes to increase data throughput. A silicon electronic driver capable of producing the 6Vp-p output required to drive a Mach-Zehnder optical modulator is presented. Based on a distributed amplifier architecture, the novel input interface enables performance competitive with III-V semiconductor technologies (i.e., 15ps rise-fall times at 10Gb/s) but on a silicon IC platform capable of full transceiver integration.

Speaker Biography:

John R. Long received the B.Sc. in Electrical Engineering from the University of Calgary in 1984, and the M.Eng. and Ph.D. degrees in Electronics from Carleton University in Ottawa, Canada, in 1992 and 1996, respectively. He was employed for 10 years by Bell-Northern Research, Ottawa involved in the design of ASICs for Gbit/s fibre-optic transmission systems, and from 1996 to 2001 as an Assistant and then Associate Professor at the University of Toronto. Since January 2002 he has been chair of the Electronics Research Laboratory at the Delft University of Technology in the Netherlands. His current research interests include low-power and broadband/mm-wave transceiver circuitry for highly-integrated wireless applications, and electronics design for high-speed data communication systems.

Professor Long is a recipient of the NSERC Doctoral Prize, Douglas R. Colton and Governor General's Medals for research excellence, and Best Paper Awards, including: ISSCC in 2000 and 2007, IEEE-BCTM 2003, and the IEEE-RFIC Symposium in 2006 and 2011. He is a member of the ESSCIRC technical program committee and has served on the technical program committees for the ISSCC (RF subcommittee chair), BCTM, EuMW, and ICUWB conferences. He was co-chair of the European microwave IC conference in 2008 and 2012. Associate Editor of the IEEE Journal of Solid-State Circuits, and General Chair of the IEEE Bipolar/BiCMOS Circuits and Technology Meeting. He is currently a Distinguished Lecturer for the IEEE Solid-State Circuits Society and Editor-in-Chief of the new IEEE virtual journal on RFICs. See: ieeexplore.ieee.org/xpls/virtual-journal/virtualJournalHome?pub=rfic

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