IEEE KITCHENER-WATERLOO

IEEE CAS-Chapter Presentation

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" Low Power RFICs for Transceiver Applications "

Abstract:

The recent explosion in wireless communication services has opened the path for implementation of fully integrated mixed signal circuits, operating in the GHz range. This explosion has been accompanied by a significant increase in research activities in low-power radio-frequency integrated circuits (RFICs) for portable or wireless telecommunications applications. These wireless systems demand low-power operation from the RF front-end, since it is expected that the portable devices be able to operate for extended periods of time before battery recharge. Furthermore, the low-cost benefits of using a CMOS process, along with ease of integrability, lend themselves well to such applications.

In this presentation, we discuss some of our recent work on several low-power RFIC building blocks that are suitable for wireless and portable transceiver applications. All RFICs were designed in 0.18µm standard CMOS technology. First, we discuss the design and performance of a 1.8V, 10GHz fully integrated monolithic CMOS voltage-controlled oscillator (VCO) with automatic amplitude amplitude control and temperature compensation. Then, the design and performance of an ultra-low power (40µW), low voltage (0.4V) VCO operating at 2.4GHz is discussed. Next, the design and operating characteristics of a 12GHz wideband frequency doubler for future wireless applications is discussed. Mixers are important circuit blocks for transceivers, so a low-power 1.9GHz body-input mixer using a 0.8V supply is presented and discussed. The design and performance characteristics of novel low noise amplifiers for the 2-3GHz band and higher frequencies is presented and discussed. Finally, new results on the on the effects of hot carrier degradation of integrated CMOS oscillators on its performance parameters - oscillation power, phase noise and frequency – and their evolution with stressing times will be presented and discussed.

Biography:

M. Jamal Deen was born in Georgetown, Guyana. He completed a B.Sc. degree in Physics and Mathematics at the University of Guyana (1978), a M.S. degree (1982) and a Ph.D. degree (1985) in Electrical Engineering and Applied Physics at Case Western Reserve University (CWRU), Cleveland, Ohio, U.S.A. He is currently Professor of Electrical and Computer Engineering and holder of the Senior Canada Research Chair in Information Technology at McMaster University.

In the past 26 years, Dr. Deen has worked in academia, research organizations and industry in Guyana, USA, Canada, Nederland and France. He has edited 2 research monographs and 7 conference proceedings. His research work has been disseminated in 14 invited book chapters, the award of 6 patents and more that 280 peer-reviewed articles of which 52 were invited/keynote/plenary conference presentations and invited journal articles. His current research interests include physics, modeling, reliability and parameter extraction of semiconductor devices; optical detectors and receivers; and low power, low noise, high frequency circuits.

Dr. Deen is a member of Eta Kappa Nu, the American Physical Society and the Electrochemical Society. He won the Chancellor's medal as the second best graduating student in 1978, was a Fulbright-Laspau Scholar from 1980 to 1982, an American Vacuum Society Scholar from 1983 to 1984, and an NSERC Senior Industrial Fellow in 1993. He is a Distinguished Lecturer of the IEEE Electron Device Society; was awarded the 2002 Thomas D. Callinan Award from the Electrochemical Society - Dielectric Science and Technology Division; the Distinguished Researcher Award, Province of Ontario in July 2001; the IEEE Custom Integrated Circuits Conference Best Invited Paper award in 2002; and a SPIE's best student paper award in 2002. Dr. Deen is currently an Editor of *IEEE Transactions on Electron Devices*; Executive Editor of *Fluctuations and Noise Letters*; and Member of the Editorial Board of *Interface*, an Electrochemical Society journal. He is also a Fellow of IEEE and of EIC (Engineering Institute of Canada).

ALL ARE WELCOME,

REFRESHMENT WILL BE SERVED

DATE: **Tuesday May 18, 2004**

TIME: **10:30 am**

LOCATION: **EIT 3142 University of Waterloo**

Invited by Fayçal Saffih, IEEE CAS Chapter