MOST RF CIRCUIT DESIGN

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Introduction

Radio-frequency design is going through a renaissance because of the explosion of the telecommunication field. They used to be realized with discrete bipolar devices and later on in integrated bipolar technologies. Recently they have become a reality in submicron CMOS technologies as well. This first day of the AACD '96 was therefore entirely devoted to circuit design of telecommunication subsystems in CMOS technologies.

The first presentation is given by Dick Klaassen on aspects of high-frequency modelling of MOST devices. Details are given on Philips' model 9 both at DC as well as at RF frequencies up to 20 GHz. Considerable attention is paid to parasitic effects and to the behavior of elementary circuit combinations such as cascades and cascodes.

The first paper addressing the integration of full transceivers in CMOS technology is given by Paul Gray. It provides an overview of technical challenges in portable battery-powered transceivers for personal communications.

It is followed by a presentation by Patrice Senn on 2 GHz RF circuits in BICMOS technology. Extensive discussion is given on a LNA (low-noise amplifier), a mixer, a low-phase noise VCO, etc.
Michiel Steyaert then gives a presentation on the pitfalls of RF CMOS design. He started with a review of the high-frequency limitations of MOST devices. This is applied to the realization of a monochip receiver, a synthesizer and a transmitter.

The fifth paper is given by Jan Sevenhans. He discusses the various implementations currently in use in commercial GSM products. He also sketches the possible merits of GaAs and future battery technologies.

Finally Asad Abidi shows several integrated circuit examples such as a digital frequency synthesizer, an upconversion mixer, an RF power amplifier, etc., all in CMOS to prove that a 900 MHz spread-spectrum wireless transceiver has become reality. Other critical problems such as an integrated inductor are discussed as well.

It can be concluded that these texts amply show that CMOS has become a viable technology for high-frequency communications applications. With the advent of more advanced submicron CMOS, even higher frequency realizations can be expected.