

SEMINAR

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Antennas on Chip, Challenges, and Benefits

by

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Abstract: Recently rapid development in the field of integrated circuits (ICs), as a result of better simulation tools, high level transistor scaling, advanced fabrication processes, and lower cost has been witnessed. This fast development is resulted in highly integrated multiband/ultra-wideband transceivers for wireless communications.

Each wireless system can be broken down to four different major sections: the signal processing part, the signal conditioning section, the RF front-end section, and the final part, the antenna for transmission of signals. These four parts can get connected in any fashion. Traditionally done, either in a horizontal or a vertical fashion in which different parts have been connected to each other in a stacked or a planar manner, respectively. However, by the advances in the CMOS technology, combining these different parts on chip was made possible. This leads to the System-on-Chip integration fashion which by far seems to be the best (size wise) remedy. At the same time the applications using higher frequency bands (particularly mm-wave) have caught a lot attention. The result of this high frequency of operation is antennas with very small area needed, meaning that antennas as the last barrier can potentially be integrated as well.

In this presentation, a brief summary of various examples of Antennas-on-chip (working at different frequencies) is provided. The difficulties in the design process and also the measurement as the most intense problems in finding a solution for having the last barrier on chip in order to achieve a full flawless integration are studied. Also, a sample slot antenna designed in a standard CMOS technology along with the results is presented.

Alireza Pourghorban Saghati (S'08) was born in Tehran, Iran, in 1985. He received the M.Sc. degree (hons) in electrical engineering from Urmia University, Urmia, Iran, in 2010. He is currently working toward the Ph.D. degree in electrical and computer engineering at Texas A&M University, College Station, TX, USA. Since January 2012, he has been working as a Research Assistant at the Analog and Mixed Signal Center, Texas A&M University, College Station, TX. His research interests include reconfigurable, multiband and broadband antennas, tunable and reconfigurable filters, miniaturized antennas, SIW antennas and their tunability methods, AiP (Antenna-in-package), and AoC (Antenna-on-Chip). Mr. Pourghorban Saghati was the recipient of the Texas A&M University ECE Departmental graduate student scholarship in Fall 2011. He also received the Student Paper Award (honorable mention) at the Student Paper Competition presented at the 2013 IEEE AP-S International Symposium, Orlando, FL, USA.