

MXN RADIO PLATFORM INTEGRATION CHALLENGES

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Future communication devices should support key usage models such as simultaneous voice and data transmissions, multi-media applications that scale across networks, seamless handoff, location-based services etc. [V. Nair et al., Universal Communicator: Next Generation Wireless Handset, in Annual Review of Communications, Volume 57, International Electronic Consortium; Nov. 2004]. Such a mixed network (MxN) communication device necessitates high-level integration of high speed digital, analog and RF circuitries in small form factor platforms. System-level modeling and accurate RF characterization of multiple radios are needed to fully understand the complex RF interactions and to develop a consistent platform design methodology. RF interferences due to the placement of multiple radiating elements in a small form factor device will have to be thoroughly investigated.

RF component technologies for wireless systems have been steadily advancing over the years. Low power consumption RFICs, highly linear power amplifiers, embedded passives and advanced filter technologies are being developed to meet the system requirements. During the last few years, film bulk acoustic resonator (FBAR) filters have also been incorporated in cell phones. RF micro electro mechanical systems (MEMS) technology advanced significantly over the last few years to realize practical circuit functions for wireless applications. Another key challenge is to combine front-end antenna with filters, switches and rest of the RF module in a unique packaging platform. Antenna concepts like reconfigurable antenna and multi-band antenna have to be developed for small form factor devices. Some of the innovative antenna concepts and receiver technologies required for MxN radios are discussed in the paper by Fathy et al. [A. Fathy, S. El-Ghazaly, H. Chunna, S. Yang and V. Nair., Reconfigurable Antennas and RF Front ends for Wireless Receivers, 2005 URSI General Assembly , New Delhi, Oct. 2005]

In a multi-radio platform, noise mitigation and interference minimizations are very critical. Noise interference in MxN radios can be categorized into three areas: a) platform-to-radio noise, b) radio-to-radio noise, and c) radio-to-platform noise. Each of these noise interferences requires separate mitigation techniques. In order to study the platform integration challenges of MxN radios, we designed several proof-of-concept (POC) devices. The POC device included WirelessLAN, Bluetooth, WCDMA and GPS radios integrated into a very small form factor handheld platform. Individual radio performance and the radio co-existence were characterized to determine multi-radio operation efficiency. For example, GPS radio characterization showed that the receiver sensitivity decreased about 3 dB when the application processor was turned on. An additional 2 dB of desensitization occurred when the base band processor was powered up. Impact of other radios in the platform was also determined in order to develop a mixed network radio platform design methodology.

This paper will discuss the advances and challenges in the MxN radio platform integration.

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