

A 3.1 – 10.6GHz, 11 Band, OFDM based Ultra Wide Band (UWB) Receiver in 0.25 μ m SiGe BiCMOS

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Abstract: The objective of this research is the implementation of a fully integrated (from LNA to ADC) Multi-Band OFDM UWB receiver covering the entire frequency band licensed by FCC (3.1 to 10.6GHz).

Description

The allocation of 7.5GHz of bandwidth from 3.1-10.6GHz by the FCC along with the growing demand for wireless data capability in electronic devices at higher data rates (>100Mbps) and at lower cost and power has resulted in the increasing interest in UWB systems. In UWB systems, high data rates can be achieved with a low RF transmit power by using a larger bandwidth. The applications of such devices include portable consumer electronics, cell phones, computers and peripherals etc.

This research addresses the implementation of a multi-band UWB receiver for the entire range of frequency approved by the FCC. We propose a direct conversion receiver architecture integrated from LNA to ADC in a commercial IC package. The receiver includes a wideband RF front-end with a tunable in band notch filter for suppression of interferers in the U-NII band (5.15-5.8GHz), a frequency synthesizer capable of efficiently generating 11 carrier frequencies with switching time of <5nS between adjacent bands, a wide bandwidth filter with group delay variation of <0.2nS, a low power, wide band programmable gain amplifier with gain programmability of 0-42dB in steps of 2dB and a 6-bit, 1Gs/s time-interleaved ADC all implemented in 0.25 μ m SiGe BiCMOS.

Status:

- Theoretical paper on UWB synthesizer architectures submitted: “Frequency planning and synthesizer architectures for multiband UWB radios”.
- Receiver IC taped out on February 14th.
- RF blocks (LNA & Frequency Synthesizer) currently being tested.