

# **Abstract**

High performance RF and baseband building blocks for wireless receivers

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Because of the unique architecture of wireless receivers, a designer must understand both the high frequency aspects as well as the low-frequency analog considerations for different building blocks of the receiver. The primary goal of this research work is to explore techniques for implementing high performance RF and baseband building blocks for wireless applications. Several novel techniques to improve the performance of analog building blocks are presented. An enhanced technique to couple two LC resonators is presented which does not degrade the loaded quality factor of the resonators which results in an increased dynamic range. A novel technique to automatically tune the quality factor of LC resonators is presented. The proposed scheme is stable and fast and allows programming both the quality factor and amplitude response of the LC filter. To keep the oscillation amplitude of LC VCOs constant and thus achieving a minimum phase noise and a reliable startup, a stable amplitude control loop is presented. The proposed scheme has been also used in a master-slave quality factor tuning of LC filters. An efficient and low-cost architecture for a 3.1GHz-10.6GHz ultra-wide band frequency synthesizer is presented. The proposed scheme is capable of generating 14A novel pseudo-differential transconductance amplifier is presented. The proposed scheme takes advantage of the second-order harmonic available at the output current of pseudo-differential structure to cancel the third-order harmonic distortion. A novel nonlinear function is proposed which inherently removes the third and the fifth order harmonics at its output signal. The proposed nonlinear block is used in a bandpass-based oscillator to generate a highly linear sinusoidal output. Finally, a linearized BiCMOS transconductance amplifier is presented. This transconductance is used to build a third-order linear phase low pass filter with a cut-off frequency of 264MHz for an ultra-wide band receiver. carrier frequencies.