Abstracts

Analysis of oscillators with external feedback loop for improved locking range and noise reduction

Heng-Chia Chang, A. Borgioli, P. Yeh and R.A. York. "Analysis of oscillators with external feedback loop for improved locking range and noise reduction." 1999 Transactions on Microwave Theory and Techniques 47.8 (Aug. 1999 [T-MTT] (Mini-Special Issue on Low-Power/Low-Noise Technologies for Mobile Wireless Communications)): 1535-1543.

A simple scheme for enhancing the locking/capture range and phase-noise performance of FET-based voltage-controlled oscillators (VCO's) is presented using a low-pass feedback loop from the oscillator output to the varactor tuning port. The nonlinearity of the FET provides for mixer or phase detector behavior (a self-oscillating mixer). The resulting feedback oscillator advantageously combines the principles of a conventional injection-locked oscillator (ILO) and phase-locked loop (PLL), which we refer to as an injection-locked phase-locked loop (ILPLL). The analysis suggests that the ILPLL can be designed for superior near-carrier phase-noise performance compared with conventional ILO or PLL circuits. A 10-GHz prototype was fabricated, which demonstrated a locking range more than double that of the isolated VCO injection-locking range over the same range of injected signal power.

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