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An optimally transformer coupled, 5GHz Quadrature VCO in a 0.18 μ m digital CMOS process

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Abstract

We present a 5GHz, voltage controlled quadrature oscillator, based on transformer coupling between the quadrature components. The oscillator is fabricated in a 0.18 μ m low voltage digital CMOS process with a lossy substrate ($\rho \sim 10\text{mohm-cm}$) and thin, high resistivity metallization. Fully integrated low Q (~ 4) spirals form the transformer windings in the resonator. The oscillator achieves a tuning range of $\sim 1\text{GHz}$, and a phase noise of up to -123dBc/Hz at a 1MHz offset, while drawing 7.5mA at 1.6V. An image reject receiver built using the on-wafer quadrature signals, provides 43dB of image rejection, confirming better than 1^0 of quadrature matching.