

# ABSTRACT

Superharmonic Injection Locked Quadrature LC VCO Using Current Recycling Architecture

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Quadrature LO signal is a key element in many of the RF transceivers which tend to dominate today's wireless communication technology. The design of a quadrature LC VCO with better phase noise and lower power consumption forms the core of this work. This thesis investigates a coupling mechanism to implement a quadrature voltage controlled oscillator using indirect injection method. The coupling network in this QVCO couples the two LC cores with their super-harmonic and it recycles its bias current back into the LC tank such that the power consumed by the coupling network is insignificant. This recycled current enables the oscillator to achieve higher amplitude of oscillation for the same power consumption compared to conventional design, hence assuring better phase noise. Mathematical analysis has been done to study the mechanism of quadrature operation and mismatch effects of devices on the quadrature phase error of the proposed QVCO. The proposed quadrature LC VCO is designed in TSMC 0.18  $\mu\text{m}$  technology. It is tunable from 2.61 GHz - 2.85 GHz with sensitivity of 240 MHz/V. Its worst case phase noise is -120 dBc/Hz at 1 MHz offset. The total layout area is 1.41  $\text{mm}^2$  and the QVCO core totally draws 3 mA current from 1.8 V supply.