

Analog Circuits and Signal Processing

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Quadrature Frequency Generation for Wideband Wireless Applications

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To my dear parents. . .

Preface

This book provides an overview on quadrature generation techniques for wireless transceivers. The main focus is on LC quadrature VCO (QVCO) design. The book tries to provide a simple and intuitive understanding of the operation of quadrature LC VCOs, as well as a discussion of their drawbacks and limitations. The discussion is provided from a designer's perspective, allowing a simple understanding. Based on this understanding, a general classification of the quadrature LC VCO techniques in literature is provided, together with the advantages and limitations of each. Building on this understanding, two new quadrature coupling techniques are introduced. The first technique allows robust quadrature coupling with reduced phase-noise, by using a simple modification of the conventional QVCO. The coupling scheme doesn't require any frequency-sensitive coupling networks, or complex transformer-based designs. The second technique is targeted at millimeter-wave applications, allowing a wide-tuning range QVCO design at 60 GHz and beyond. This is all culminated by the introduction of a frequency-synthesis scheme for a 4 GHz instantaneous bandwidth channelized receiver. Injection locking techniques are used, together with QVCOs, to generate two simultaneous quadrature LOs at 20 GHz and 22 GHz using a single-ended, single-phase, 1.33 GHz reference clock.

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