

Contents

1	Introduction	1
1.1	Overview	1
1.2	Wireless Personal Area Networks	2
1.3	Multiband OFDM Ultra-Wideband	3
1.3.1	UWB Physical Layer (PHY) Description	5
1.3.2	Signal Generation	7
1.3.3	Coexistence, Emission Limits, and Worldwide Regulations of MB-OFDM UWB	9
1.3.4	Detection and Avoid	11
1.4	Frequency Synthesizer for MB-OFDM UWB	12
1.5	Book Organization	14
	References	15
2	Architectures for Frequency Synthesizers	17
2.1	Overview	17
2.2	Frequency Synthesis Techniques	17
2.2.1	Direct Digital Frequency Synthesizer	18
2.2.2	Phase-Locked Loop-Based Approaches	20
2.2.3	Digital Phase-Locked Loop-Based Approaches	26
2.2.4	Sub-Harmonic Injection-Locking Techniques	27
2.2.5	Delay-Locked Loop-Based Techniques	31
2.2.6	Comb Generator Technique	34
2.2.7	Techniques Based on Polyphase Filtering	36
2.2.8	Frequency Synthesis by Frequency Division and Mixing	38
2.2.9	Comparison of Different Frequency Synthesizer Solutions	39

2.3	Proposed Fourteen-Band Frequency Synthesizer for UWB	39
2.3.1	Frequency Dividers with Quadrature Outputs	41
2.3.2	Fractional Frequency Dividers	41
2.3.3	Broadband High-Gain Interface Amplifiers	41
	References	42
3	Frequency Division and Quadrature Signal Generation at Microwave Frequencies	45
3.1	Overview	45
3.2	Injection-Locked Frequency Divider Design	46
3.3	Circuit Implementation.	49
3.4	Measurement Results of the Prototype Frequency Divider	51
3.5	Conclusion	55
	References	56
4	Analysis of Injection-Locked Regenerative Frequency Dividers	57
4.1	Overview	57
4.2	Fractional Frequency Dividers.	57
4.3	Injection-Locked Regenerative Frequency Dividers	59
4.4	Stability Analysis of Injection-Locked Regenerative Frequency Dividers	61
4.5	Injection-Locked Two-Stage Ring-Oscillator.	63
4.5.1	Free-Running Oscillation	66
4.5.2	Two-Stage Ring-Oscillator Under Single Node Injection	67
4.5.3	Two-Stage Ring-Oscillator Multi-Node Injection	71
4.6	Phase Noise Analysis of Injection-Locked Regenerative Divider	77
4.7	Design Example of a Divide-by-2.25/4.5	81
4.8	Conclusion	85
	References	85
5	Design of Broadband Amplifiers in Digital CMOS Technology	87
5.1	Overview	87
5.2	Architectures for Cascading Two Mixers	87
5.2.1	Voltage-Mode Approaches for Cascading of Mixers	88
5.2.2	Current-Mode Approaches for Cascading of Mixers	88
5.2.3	Comparison of Mixer Cascading Topologies	92
5.3	Overview of Design Techniques for CMOS Broadband Amplifiers	93
5.3.1	Cascade of Low-Gain Wideband Amplifiers.	93
5.3.2	Neutralization for Bandwidth Enhancement	95
5.3.3	Unity Gain Buffers	97
5.3.4	Shunt Peaking and Active Inductors	98

5.3.5	Cherry–Hooper Amplifier	99
5.3.6	Driver and Output Stages	101
5.4	Proposed Inductor-Less Broadband Amplifier	103
	References	105
6	An Inductor-Less CMOS 14-Band Frequency Synthesizer for UWB	107
6.1	Overview	107
6.2	Circuit Design	108
6.2.1	Frequency Dividers	108
6.2.2	Linearity Considerations	111
6.2.3	Polyphase Filter	112
6.2.4	Single-Sideband Mixer	119
6.2.5	Mixer Interface	122
6.2.6	Multiplexer Design	123
6.3	Measured Results	126
6.4	Conclusion	130
	References	132
7	Conclusion	135
	Appendix A: Stability Analysis of the Oscillation Phases of a Two-Stage Ring-Oscillator	137
	Appendix B: Step Response of Injection-Locked Two-Stage Ring-Oscillator	139
	Appendix C: Analysis of the Negative Impedance Generator	143
	Appendix D: Zero Frequencies of a Multi-Stage Polyphase Filter	147
	Index	151

<http://www.springer.com/978-1-4614-0489-7>

Fast Hopping Frequency Generation in Digital CMOS

Farazian, M.; Larson, L.E.; Gudem, P.S.

2013, XIV, 154 p., Hardcover

ISBN: 978-1-4614-0489-7