TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Elektrotechnik und Informationstechnik

Task Formulation for a Master Thesis

Student´s Name:	Mohammad Omer Sadek Bhuiyan
Matriculation Number:	4821947
Studies:	Nanoelectronic Systems
Subject:	**Design and Layout of a Sub-Harmonic Quadrature Injection Locked Oscillator (SH-QILO) for the 60GHz WiGig frequency band in Global Foundries 22nm FDX technology**

Objectives of work

The approach of an analog mm-wave front-end with lowest complexity for a joint communication and RADAR system in the 60GHz IEEE 802.11ad frequency range advances the integration and miniaturization of future communication devices. An essential component of this approach, a voltage-controlled oscillator with minimized complexity should be employed to deliver the local oscillator signal (LO) within a frequency range between 58.32GHz and 64.80GHz for Channel 1 and Channel 4 center frequencies, respectively.

A promising candidate for such a low complexity oscillator is the sub-harmonic quadrature injection-locked oscillator (SH-QILO), which will generate the 5th harmonic of an off-chip reference signal with approx. 12GHz and provide the desired tuning range of the IEEE 802.11ad. Such a SH-QILO has to be designed in schematic and layout, applicable for on-chip measurements. Thus a differential input with 100 Ohm input impedance and a quadrature output with 50 Ohm output impedance (referred to single-ended design) is required.

The following requirements shall be accomplished:

Parameter	Requirement	Condition
Tuning range	58.32 – 64.8 GHz	
Input impedance	100 Ohm	Differential
Output impedance	50 Ohm	Single-ended
Output power	0 dBm	Referred to 50 Ohm for each quadrature output
Phase noise	Maximum -100 dBc/Hz	@ 1 MHz offset
IQ Phase Imbalance	< 5°	Within tuning frequency range
IQ Amplitude Imbalance	< 0.5 dB	Within tuning frequency range
Fundamental harmonic rejection ratio (HRR1)	> 20 dB	Within tuning frequency range

The SH-QILO will be designed in the latest Global Foundries 22nm FDX technology, i.e. 22FDX-EXT V1.0_3.1.

Master thesis will be written in English.

Advisor:	Dipl.-Ing. Robert Trieb
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