

Bachelor-/ Masterthesis

» An Optoelectronic 77 GHz Beat Frequency to Voltage Converter in 45nm CMOS«

The research group

Circuit and System Technology

offers a

Bachelor- / Masterthesis

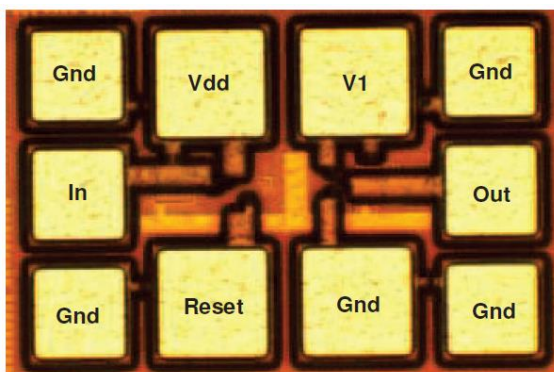
In photonic assisted radar systems, for e.g. automotive or space applications, an optical local oscillator (LO) signal is distributed to the different transmitter and receiver frontends, where it is used to generate the transmit signal or downconvert the received signal.

For the generation of the optical LO signal, several approaches can be used. Two common approaches are:

1. Detuning of two optical lasers
2. Modulation of a laser signal

In the first approach, the absolute value of the beat frequency needs to be stabilized by means of a control loop.

A key component of the control loop is a frequency to voltage converter, like the one presented in [1]. In combination with an optical receiver [2], the beat frequency of the optical LO signal can be transformed into a voltage signal, which is fed into the control loop.



Chip photograph of a frequency to voltage converter [1]

Task Description:

Within this work an optoelectronic 77 GHz beat frequency to voltage converter shall be designed and implemented in a modern 45nm CMOS technology. The workload includes:

- Literature research
- Analysis of different architectures
- Simulation and optimization of the circuit
- Implementations of the circuit (only for masterthesis)

Requirements:

- Outstanding results in the exam circuit and system design.
- Outstanding results in a master course from Prof. Thiede and/or Prof. Scheytt (only for masterthesis).
- Knowledge on optical components and circuits is advisable but not essential.
- Experience in with Keysight ADS and Cadence Virtuoso is advisable but not essential.

In case of interest, please send an E-Mail containing your latest transcript of records to (stkruse@hni.upb.de).

[1] B. Jamali and A. Babakhani, "A 0.2-2.6GHz instantaneous frequency-to-voltage converter in 90nm CMOS," *2016 IEEE Radio and Wireless Symposium (RWS)*, Austin, TX, USA, 2016, pp. 45-47

[2] S. Gudyriev, J. C. Scheytt, L. Yan, C. Meuer and L. Zimmermann, "Fully-differential, DC-coupled, self-biased, monolithically-integrated optical receiver in 0.25µm photonic BiCMOS Technology for multi-channel fiber links," *2017 IEEE Bipolar/BiCMOS Circuits and Technology Meeting (BCTM)*, Miami, FL, USA, 2017, pp. 110-113