Bachelorthesis /Student Assistant / Masterthesis

» Design and Implementation of a N Bit Optical True Time Delay Line for Microwave Photonic Applications«

The research group
Circuit and System Technology
offers a
Bachelorthesis / Masterthesis/ Student Job
in the field of microwave photonics.

Several microwave applications like e.g. radar or communication links (7G), can benefit from inclusion of photonic components. E.g. the circuit and system design group implemented and tested the first monolithic integrated photonic radar transceiver chipset [1,2].

Within this work, a key component of a photonic phased array should be designed. By adjusting each phase of a microwave transmitter or receiver array, the far field antenna pattern can be directed into a specific region. Therefore, an optical true time delay line (OTTDL) needs to be implemented. A block diagram of an OTTDL is shown in fig. 1. The input signal is fed into an optical network, where the signal is switched between a non-delaying path and a delaying path. By adjusting the optical switches, an almost arbitrary delay can be realized.

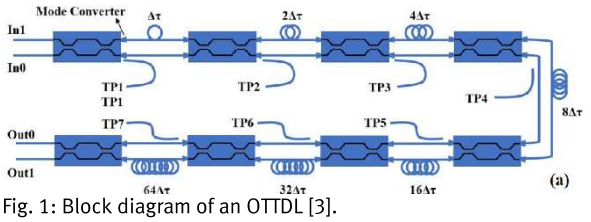

Fig. 1: Block diagram of an OTTDL [3].

Task Description:
Within this work a N bit OTTDL shall be designed. The workload includes:

- Literature research.
- Comparison of different topologies.
- Analytical model of the OTTDL.
- Simulation and optimization of the OTTDL.
- Implementation of an OTTDL.

Requirements:

- Knowledge on theoretical electrical engineering is advisable but not essential.
- Outstanding results in lectures from Prof. Thiede or Prof. Scheytt
- Knowledge on optical components is advisable but not essential.
- Experience in optical design environments like Lumerical is advisable but not essential.

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

[1] S. Kruse et al., " "Silicon Photonic Radar Transmitter IC for mm-Wave Large Aperture MIMO Radar Using Optical Clock Distribution," in *IEEE Microwave and Wireless Components Letters*, vol. 31, no. 6, pp. 783-786, June 2021

[2] S. Kruse *et al.*, "Silicon Photonic Radar Receiver IC for mm-Wave Large Aperture MIMO Radar Using Optical Clock Distribution," in *IEEE Microwave and Wireless Components Letters*, vol. 32, no. 12, pp. 1447-1450, Dec. 2022

[3] P. Zheng *et al.*, "A Seven Bit Silicon Optical True Time Delay Line for Ka-Band Phased Array Antenna," in *IEEE Photonics Journal*, vol. 11, no. 4, pp. 1-9, Aug. 2019

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