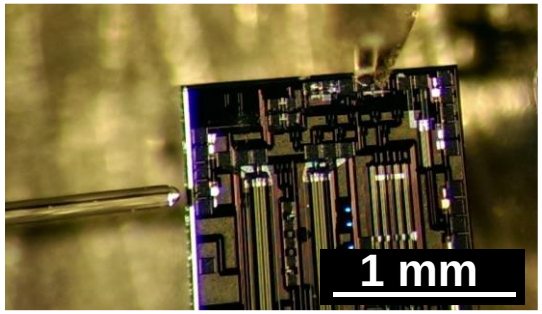
Master Thesis:
Integrated, perfectly balanced IQ-receivers for optical metrology

Karlsruhe Institute of Technology

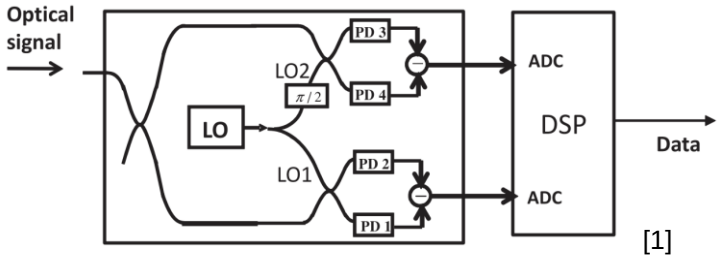
Coherent detection techniques are highly attractive for precision optical metrology, where accurate amplitude and phase information of optical signals is required. In this context, the chip-level integration of receiver circuits is of particular interest, as it minimizes the size, complexity, and power consumption of advanced metrology setups. A central building block is the IQ receiver, which consists of 90° or 120° optical hybrids followed by balanced photodetectors. These circuits rely on a near-perfect balance of splitting and coupling ratios in order to achieve high common-mode suppression ratios, which are crucial for low-noise, high-accuracy measurements. Such balancing can be realized by means of on-chip phase shifters and tunable couplers. The goal of this thesis is to assemble, calibrate, and evaluate the performance of tunable integrated receiver circuits for application in optical metrology.

Your tasks:

- Pre-characterization of integrated receiver circuits
- Design of a photodiode breakout board
- Build up chip-integrated receiver circuits with 3D-printed interconnects
- Characterization of receiver performance



The thesis is focused on the realization of integrated receiver circuits for optical metrology systems and the demonstration of their performance.



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[1] A. Shahpari, et al. "Coherent Access: A Review," J. Lightwave Technol. 35, 1050-1058 (2017).