Karlsruher Institut für Technologie

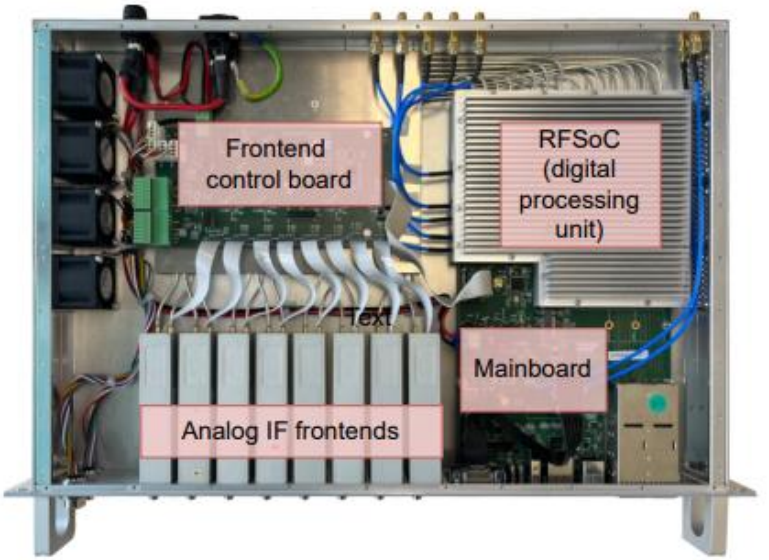
# Master Thesis

ITIV Institut für Technik der Informationsverarbeitung

IHE

## Real-time Implementation of MIMO OFDM radar

In recent years, with the rise of Joint Communication and Sensing (JCAS), OFDM (Orthogonal Frequency-Division Multiplexing) waveforms have gained increasing attention for radar systems due to their high spectral efficiency and resilience to multipath effects. The IHE and ITIV have successfully implemented a SISO OFDM radar system on the Xilinx RFSoC platform, achieving real-time performance with up to 600 range-Doppler processing cycles per second, showcasing high efficiency and reliability.
The aim of this project is to expand the existing SISO system into a MIMO OFDM radar, further improving spatial resolution. However, processing multiple data channels introduces significant challenges: data from 8 channels must be stored in external DDR memory and processed sequentially to perform range-Doppler estimation, which increases the demand for FPGA resources and efficient data management.
The student will design an optimized task allocation strategy, determining the most efficient division of computational tasks between the FPGA and the host PC. This includes deciding where to implement key functions such as OFDM modulation and DoA (Direction of Arrival) estimation, while ensuring that time-critical tasks like range-Doppler processing and beam steering are handled efficiently to achieve optimal system performance and resource utilization.




Requirements**:**

- Communications engineering, signals and systems
- Knowledge of Matlab
- Knowledge of FPGA programming
- Knowledge of Xilinx Vivado is an advantage

### Ansprechpartner

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