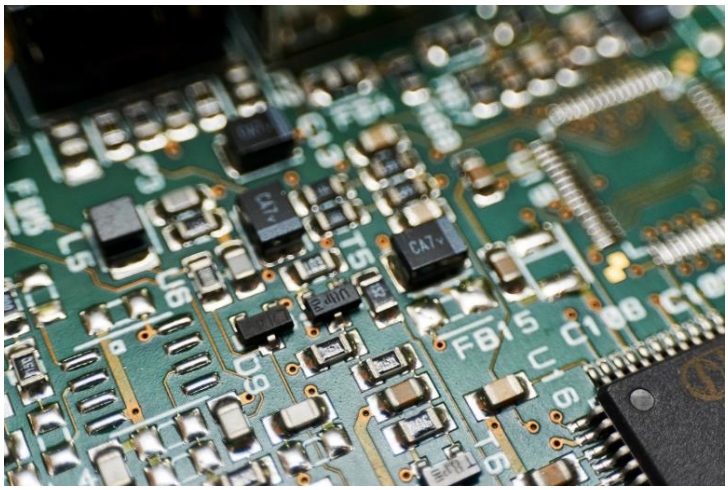
Institute for High-Frequency & Communication Technology

Master-Thesis

Towards the next generation of mobile communications (6G):

Design and verification of a digital FPGA based baseband transmitter and receiver.



In recent years, the demand for high data-rate wireless links has grown exponentially. At lower carrier frequencies with congested bandwidth, high-complexity high-order modulation is pushed to the limits to improve the speed of current communication systems. Driven by the demands of the future networks, the need for larger communication bandwidth in both indoor short-distance and outdoor large-distance point-to-point wireless links becomes evident, thus, motivating a gradual shift of carrier frequencies toward higher mmWave band. Carriers in the near-THz transmission window beyond 220 GHz with the still vast available spectrum are anticipated by the new IEEE 802.15.3d-2017 standards as promising for the realization of future 100+Gb/s data rates. The future 6G networks are envisioned to operate in this frequency range, with expected data-rates approaching to 1 Tb/s.

In this Master-Thesis, you will design a baseband transmitter and a receiver. They will be implemented in an FPGA board. In the transmitter, multiple modulation formats (QPSK to N-QAM) will be generated. In the receiver, a demodulator capable of displaying constellation and eye diagrams will be implemented. This demodulation will provide also analysis capabilities on the signal quality, such as EVM or BER.

Requirements:

- Previous knowledge in digital and analog modulations.
- Programming skills in MATLAB and VHDL.

After finishing this work, you will have good options to find a job in the following topics:

- Telecommunications
- Digital signal processing.

Supervisor: M.Sc. Pedro Rodriguez Vazquez, Dr. Janusz Grzyb
Raum: FE 00.09
Telefon: +49 202 439 – 1453
Email: rodriguezvazque@uni-wuppertal.de