Institute for High-Frequency & Communication Technology
IHCT

Master-Thesis

Towards the next generation of mobile communications (6G): Evaluation of the maximum achievable data-rates with RF front-ends operating above 200 GHz.

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 evaluate the maximum achievable data rates of a radio-frequency (RF) front-end operating at a carrier frequency of 240 GHz. The performance will be quantified using standard metrics, such as the error vector magnitude (EVM) and the bit error rate (BER). The bandwidth of the signals that you will need to handle go up to 20 GHz in the baseband, carrying data-rates above 100 Gbps. You will need to optimize the measurement setup to maximize the data throughput, increasing the modulation order from QPSK to the maximum possible N-QAM scheme.

Requirements:

- Previous knowledge in digital and analog modulations and in MATLAB.
- Basic understanding of free-space propagation and polarizations

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

- Digital signal processing
- Telecomm and RF systems

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