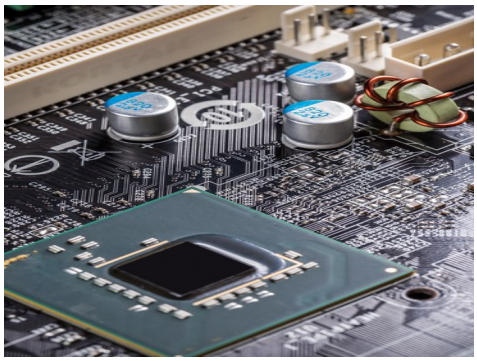
Institute for High-Frequency & Communication Technology

# Master-Thesis

## Development of Super-regenerative Receiver Circuits for Terahertz Signal Detection

Whether for artificial intelligence, augmented reality or the Internet of Things - 5 billion people worldwide will be able to record their surroundings with smart devices in the coming year. Our mission is to develop innovative, mobile sensors and sensor systems. To do this, we use cutting-edge technologies at our department, such as those from the local semiconductor manufacturer Infineon. Our current research areas include next-generation communication (6G), radar systems (gesture control), imaging (body scanners), near-field sensors (cancer research) and spectroscopy (material recognition), all of which require a suitable receiver circuit for signal detection.



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In receivers based on the principle of super-regeneration, the start-up time of an oscillator is disturbed by an incoming terahertz signal and the resulting time difference is detected indirectly by monitoring the envelope of the oscillator within a fixed quench period. In this work, a super-regenerative receiver circuit for the detection of input signals above 200 GHz is to be developed simulatively in an integrated 130 nm SiGe HBT process. The circuit development includes in particular the analysis of integrated low-noise amplifier circuits, oscillators and THz detectors, which are to be combined to form a super-regenerative receiver.

**Requirements:**

- Knowledge in Python or MATLAB
- Good English skills
- Knowledge in 3D EM simulation (Ansys HFSS)
- Knowldge in IC simulations (Cadence SpectreRF)

**Occupational Outlook:**

- Automotive-Radar
- Quality Control
- Signal processing

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