

AUFGABE DER MASTERARBEIT

im Studiengang „Elektrotechnik und Informationstechnik“

für: **zu vergeben**

gestellt von: **Prof. Dr.-Ing. Andreas Czylik**

Thema: Design, Simulation, and Characterization of 3D-Printed Terahertz Waveguides

The expanding range of terahertz (THz) applications has driven the need for more efficient and cost-effective devices. Among these, THz waveguides serve as essential building blocks for couplers, filters, and interconnections in THz systems. Traditional fabrication methods for dielectric waveguides are often complex and expensive. However, 3D printing provides a cost-effective and flexible alternative.

This project aims to design, simulate, fabricate, and characterize 3D-printed polymer waveguides for THz frequencies. The focus is on investigating coupling efficiency, propagation losses, and bandwidth for different waveguide designs. The fabricated waveguides will be characterized using a THz frequency-domain spectroscopy system (THz-FDS).

The task entails the following:

- Creating a time and work plan,
- getting acquainted with the principles of THz waveguide design and simulation,
- perform full-wave simulations using CST Studio or Empire to simulate and design waveguide geometries.
- fabricate waveguides using a 3D printer,
- characterize the waveguides using THz frequency-domain spectroscopy (THz-FDS) and compare experimental results of different designs,
- documentation of the work,
- final presentation of the work and
- submitting a digital copy of documentation and presentation in PDF format.