

MASTER PROJEKTARBEIT

Für: **Verfügbar/available**

Gestellt von: **Prof. Dr.-Ing. A. Czylik**

Thema: **Design and manufacturing of a 3D-printed dielectric waveguide structure for space-to-time mapping with delayed terahertz pulses**

Terahertz (THz) radiation is defined as electromagnetic radiation approximately in the range from 0.1 to 10 THz. In the last decades some interesting applications for THz technology have been found. THz radiation penetrates many materials which visible light can not. Its absorption properties regarding water can be used in measurement systems. Also more precise distance measurements compared to microwave radiation become possible. The guidance of electromagnetic waves using dielectric waveguides is also possible in the terahertz regime. This could be helpful for the multiplexing of terahertz pulses (splitting into different branches). By varying the path length, it is possible to detect the pulses at different times at the output. This concept proves useful for the near-simultaneous measurement at different measuring points.

The design of such a waveguide is highly dependent on the used material and geometrical structure of the object of interest. This master project aims to develop a terahertz waveguide and coupler system which allows to guide a pulsed terahertz signal and branch it into paths with different delays.

This master thesis project entails the following steps:

- Creation of a work plan and a time schedule,
- Literature research on the used THz systems and on dielectric waveguide functionalities and designs,
- Development of at least one waveguide structure for the efficient guidance of terahertz pulses into multiple branches and delay thereof for space-to-time mapping,
- 3D-printing of the developed wave-guide system,
- Conducting measurements for the characterization of the waveguide system,
- Ranging measurements and evaluation,
- Documentation of the work,
- Presentation of the work in the form of an oral presentation.

Second reviewer: Prof. Dr.-Ing. Jan C. Balzer

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