

AUFGABE DER MASTERARBEIT

im EIT- und ISE-Master-Studiengang

für: **zu vergeben**
gestellt von: **Prof. Dr.-Ing. Andreas Czylik**
Thema: Design and Optimization of MEMS-Based Reflectarrays

MEMS-based reflectarrays are promising candidates for terahertz beamforming and steering due to their compactness and power efficiency. However, they face challenges such as increased hardware complexity in large-scale reflectarrays and limited beam-steering speed compared to electronically steered antenna arrays, which could be improved through optimization. Evolutionary algorithms, particularly genetic algorithms (GAs) inspired by the principles of natural selection, provide a powerful approach for addressing such complex optimization problems. They are particularly effective in exploring large design spaces and converging toward improved solutions. By employing iterative processes such as selection, crossover, and mutation, GAs systematically refine designs to achieve the desired performance.

This thesis focuses on using genetic algorithms (GAs) in MATLAB to optimize beam-steering performance and reduce the hardware complexity of reflectarrays. The proposed designs will be validated through full-wave electromagnetic simulations to assess their effectiveness.

The task entails the following:

- Creating a time and work plan,
- getting acquainted with the principles of beamforming through reflectarrays and their optimization using genetic algorithms in MATLAB,
- optimizing the reflectarrays to reduce the number of actuators and facilitate faster scanning,
- verifying the optimized reflectarray designs using full-wave electromagnetic simulation tools like CST Studio or Empire XPU,
- documentation of the work,
- final presentation of the work, and
- submitting a digital copy of documentation and presentation in PDF format.

Zweitgutachter: Prof. Dr.-Ing. J.C. Balzer

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