

# AUFGABE DER BACHELOR-/MASTERARBEIT

## im EIT-Bachelor-/Master- und ISE-Bachelor-/Master-Studiengang

für: **zu vergeben**

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

Thema: Study and Simulation of Beamforming with Linear Nonuniform Sparse Antenna Arrays

The increasing need for higher data rate wireless communications has intensified interest in terahertz frequencies, which are characterized by their significant propagation losses. Addressing these losses necessitates the use of highly directive antenna arrays. Within this context, nonuniform sparse arrays emerge as a significant approach. Unlike uniform linear arrays, which have equally spaced elements, nonuniform arrays exhibit various configurations with irregular element spacing. These configurations enable them to achieve the same aperture length as their uniform counterparts but with a reduced number of elements, offering significant cost savings and reducing the effects of mutual coupling.

The objective of this thesis is to study different nonuniform distributions and examine the impact of various array parameters on the radiation pattern through MATLAB simulations. Additionally, the research will incorporate full-wave simulations using CST Microwave Studio to account for mutual coupling.

The task entails the following:

- Creating a time and work plan,
- getting acquainted with the principles of beamforming and beam steering through nonuniform sparse arrays and their implementation in MATLAB,
- investigating the impact of various configurations and parameters of nonuniform arrays on the radiation pattern,
- implementing full-wave simulations in CST Microwave Studio to analyze mutual coupling effects and validate MATLAB simulation results,
- 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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Betreuer: \_\_\_\_\_

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