

## Aufgabe der Abschlussarbeit im ISE Bachelorstudiengang

**für:** Frau Bo Zhou

**gestellt von:** Prof. Dr.-Ing. Klaus Solbach  
Fakultät für Ingenieurwissenschaften – Hochfrequenztechnik

**Thema:** **Broadband Series-Fed Patch Array Antenna Design  
and Optimization for 24 GHz**

### Description:

This thesis shall focus on the design and the evaluation of patch antenna elements for series-fed patch array antennas for a center frequency of 24 GHz. Furthermore, a 24 GHz array antenna has to be designed based on optimized antenna elements. Two broadband concepts have already been investigated in [1] for a frequency band around of 5.8 GHz. These two antennas are to be redesigned / scaled to the center frequency of 24 GHz. In addition, a power distribution network for a given amplitude distribution has to be developed to excite the antenna columns. The fabrication accuracy is a critical issue which has to be taken into account through tolerance analysis for the proposed antenna elements and structures.

The thesis is divided in two parts:

- 1.) The evaluation and optimization of antenna elements for series-fed patch array antennas
  - program a toolbox for a scripted structure generation and simulation flow control in MATLAB and/or Python.
  - define parameters for the evaluation of patch antenna cells and compare antenna cells with different insets, height, patch width, regarding their bandwidth and radiation characteristics.
- 2.) Overall antenna array design including a power distribution network:
  - adopt the resistive broadband antenna element with series resistor [1] for 24 GHz.
  - develop a resistive broadband antenna cell with shunt resistors at the center patch and compare the two concepts.
  - use the transformer broadband antenna element [1] and rescale the antenna element.
  - design three antenna array columns, based on each antenna element type on a Rogers Ro4350 substrate material.
  - Design a power distribution network for the excitation of the antenna columns.
  - nearfield and farfield measurement.

A final presentation of the results has to be given.