

**Aufgabe der Abschlussarbeit im
ISE Masterstudiengang**

für: Herrn Ashraf **Abuelhaija**

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Thema: **Development of a novel Switched Beam Antenna for communications**

Description:

Many communication systems require antennas with omni-directional coverage and high gain. A single antenna element (e.g., a dipole) cannot provide both at the same time. Therefore, either a high gain antenna array is scanned electronically (phased array) or rotated mechanically or antenna elements are combined in away as to produce different overlapping patterns at the same time at different ports (multi-beam array). A novel switched-beam concept was developed where four quarter-wave conductors are arranged in a crossed configuration and are interconnected by switches to create two V-shaped dipoles which act as a two-element array antenna. Using different settings of the switches, four different array antennas can be realized with four overlapping main beams covering the full 360° in azimuth.

The task of the thesis is to simulate the antenna configuration using a field theoretical simulation tool in order to optimize the dimensions and the required reactive loads. A verification of the theoretical results is to be provided by building a small antenna model for 1 GHz and testing the pattern using the anechoic chamber far field range of the department. In particular the steps should be

- Scanning the literature to find similar antenna concepts and realizations
- Modelling of the antenna concept in a wire-antenna simulator (EZNEC) or 3D-EM Simulator (EMPIRE)
- Optimizing the length of the conductors and the reactive load required for best gain and front/back pattern ratio
- Building an experimental model (without switch) for 1 GHz operation and test of impedance and radiation pattern
- If time allows (Master Thesis or Diplom-Arbeit): Building a full function model (including switches) for short-wave operation and comparative testing against our 3-element rotary beam on our roof platform

At the end of the work, a public presentation of the results is to be given.