

## Aufgabe der Abschlussarbeit im ISE Masterstudiengang

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**Thema:** Doppler Simulator for 10 GHz Doppler Radar

### Description:

The Doppler Radar project aims to realize a demonstrator radar system that allows hearing and the visualization of Doppler frequencies from moving targets and the measurement velocity. The testing and verification of system components requires the presence of continuous signals that can be processed, rather than a real-world scenario that only provides time-variable signals. Such stationary Doppler shifted radar signals can be created by a so-called Doppler simulator which uses electronic circuits to shift the frequency of a received signal and retransmit the signal after amplification. On the other hand, a Doppler simulator can be used to demonstrate electronic counter measures used in military systems to deny the measurement of the velocity by a hostile radar system.

The task in this project is to study the possible concepts for the creation of a Doppler simulator and to design and evaluate such a Doppler simulator for the 10 GHz band. The preferred concept for the simulator is based on the principle of an electronic phase shifter which can sweep the phase shift linearly in a saw-tooth pattern, approximating a continuous phase increase or decrease of a Doppler shifted signal; the phase shifter circuit can use a large number of biased PIN-diodes (UHF/VHF-tuner types) as shunt loads to a microstrip transmission line of several wavelengths while the diodes are switched in and out in growing number, controlled by a linear ramp sweep voltage. One other alternative is loading the transmission line by varactor diodes and varying the bias voltage of all diodes at the same time.

In particular the task incorporates:

- Search for applicable publications and patents.
- Determination of the required phase shift range, time variation and adjustment range.
- Investigation of the phase shift performance of a single diode.
- Design of the RF-circuit and the bias circuit for sweeping the phase shift.
- Realization and test of the circuit.
- Test and adjustment of the simulator together with the 10 GHz radar.

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