

**Aufgabe der Abschlussarbeit im  
ISE Bachelorstudiengang**

**für:** Herr Aleksandr **Andrasiuk**

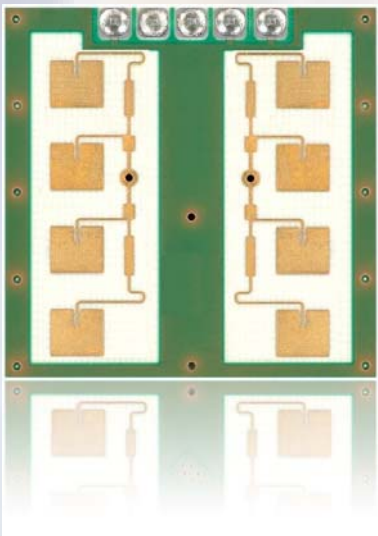
**gestellt von:** Prof. Dr.-Ing. Klaus Solbach  
Fakultät für Ingenieurwissenschaft - Hochfrequenztechnik

**Thema:** **24 GHz Doppler Radar Demonstrator**

**Beschreibung:**

## Description:

Low cost, low power Radar modules are used in a wide range of commercial applications, e.g. in door openers or in process automation. A commercial module, IVS-465 from InnoSenT GmbH, is available which produces a transmit signal at about 24 GHz which is radiated by a small planar antenna. In the same module, an I/Q- mixer circuit converts signals received by a second small planar antenna which is realized as a patch array on the same circuit board as the transmit antenna. The output signal of the receive converter combines a low frequency audio signal of a few mV, the Doppler signal, on top of a dc offset voltage of several 100 mV. The Doppler signal frequency is proportional to the velocity of the Radar target; while the two I/Q receive output signals each contain the Doppler frequency, the phases of the two audio signals differ by plus or minus 90 degrees, depending on whether the target closes in or retracts.



The task of the thesis is to build a Doppler Radar demonstrator using the IVS-465 module as the Radar sensor, realizing a mother board for the module and two audio filter / amplifier circuits and using a notebook computer to process the Doppler signals and display the measured target velocity.

The task entails the following steps:

- Familiarize with the Radar principles involved and with the function of the Radar module.
- Familiarize with EAGLE, the CAD tool for the design of printed circuits boards, using the EAGLE tutorial.
- Design the amplifier / filter circuit using standard operational amplifier ICs and include the interface to the Radar module as well as to the sound card input of the notebook computer.
- Deliver the PCB data set to the in-house PCB workshop which will provide the PCB with the ICs assembled. Assemble the SMD components to the fabricated PCB and test the functionality of the circuit.
- Develop a Graphical User Interface in Matlab and a code which controls the sound card and derives the target velocity and displays it on the screen.
- If time allows, develop an extended function which presents an "Oscilloscope" display of the I/Q- signal (x-axis for I-signal, y-axis for Q-signal).

**At the end of the work, a public presentation of results is to be given at the HFT department.**