

University of Stuttgart

Institute of Robust Power
Semiconductor Systems

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Motivation:

A novel FMCW radar principle operates without an explicit local oscillator signal in the receiver, but relies on self-mixing of the receiver. Thus, the receiver is electrically, as well as locally completely independent from the transmitter. In contrast to common radars, the information gained is not the absolute distance to the target object, but the relative distance between multiple surfaces. This allows numerous potential applications, particularly in the fields of production engineering, medicine, materials analysis and safety.

Goals:

Covered by the project MIRADOR (Self-mixing millimeter-wave radar based on multiple surface reflections) and in possible collaboration with *Balluff GmbH*, a compact, self-contained radar demonstrator should be developed. It should cover a large FMCW Bandwidth ($> 15\text{GHz}$) to achieve a radar- resolution in *cm* range and will be situated in the E-Band ($70 - 90\text{GHz}$). The demonstrator will be used to show the broad capabilities of the self-mixing radar principle.

- Development of a self-mixing radar frontend with transmitter and novel receiver, using E-Band MMIC from ILH
- Integration on a demonstrator Platform on a high performance RF-PCB-Substrate

Your Tasks:

- System Level simulation
- EM-Simulation of PCB, chip interconnects etc.
- Design, simulation, layout and assembly of a prototype RF-PCB with professional assembly facilities
- Setup, measurement and characterization of the demonstrator with state-of-the-art RF-measurement equipment
- Implementation of offline signal processing (e.g. Simulink) of acquired radar data for verification purposes

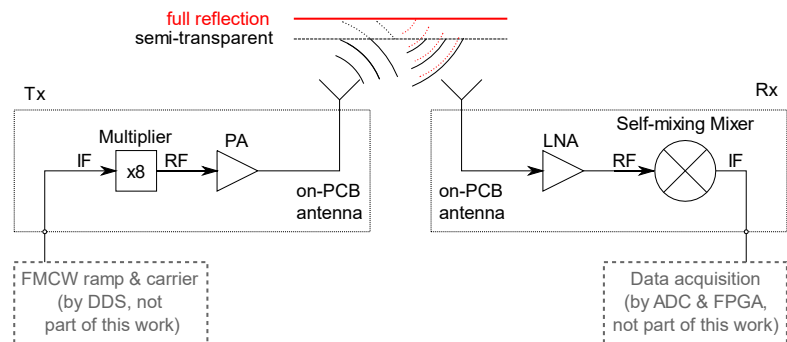
www.ilh.uni-stuttgart.de

Master's thesis

to be assigned

ILH
RF-group

E-Band (70-90 GHz) Radar Demonstrator for a novel, self-mixing Radar Principle



Self-mixing radar scheme with independent transmitter and receiver



Hybrid measurement setup of a stepped frequency continuous wave radar of a preceding work

Your Qualifications:

- Hands-on experience in PCB-design
- Familiar with Matlab/Simulink
- Familiar with scripting (e.g. for measurement routines)
- Passion for RF-circuit design at challenging 90 GHz
- Knowledge of RF-circuit design is advantageous
- Knowledge of Radar fundamentals is advantageous

Language: German/English

**the workload will be adjusted accordingly*

