University of Stuttgart

Institute of Robust Power
Semiconductor Systems

Contact:
Janis Wörmann
Pfaffenwaldring 47, 70569 Stuttgart
janis.woermann@ilh.uni-stuttgart.de
+49 (0)711 / 685 - 68982

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Bachelor´s Thesis*
Research Work*
Master´s Thesis*

to be assigned

ILH RF-group

Circuit design for millimeter- wave radar frontend

[various topics]

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 **mi**llimeter-wave **rad**ar based on multiple surface **r**eflections) circuit parts for a SiGe based Radar Transceiver MMIC should be developed.

- Large bandwidth (>10%) radar transceiver at 140GHz as the overall system goal
- Fully integrated and independent transmitter and receiver

Your Tasks (*):

- Investigate State-Of-The-Art Radar Frontends resp. circuit components and understand the theoretical background
- Design and simulation of a selected analog circuits e.g. mixer, amplifier, multiplier,… as part of the transceiver, in a high performance technology
- MMIC layout and verification with professional EDA and simulation tools, e.g. Keysight ADS and Cadence Virtuoso

Language: German/English
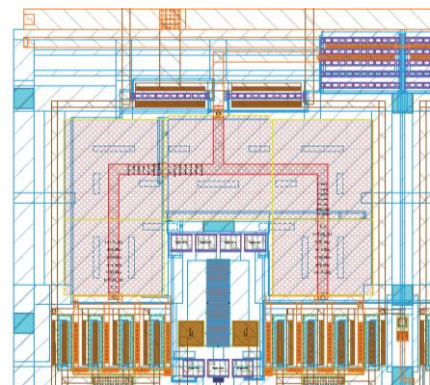
Layout example of an analog circuit in SiGe BiCMOS technology.
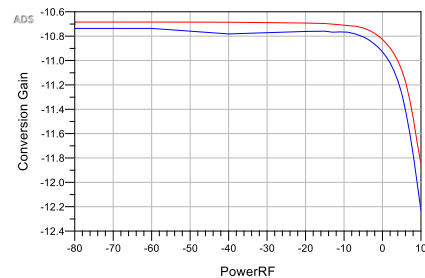
Simulation result of a resistive down conversion mixer.

Your Qualifications:

- Familiar with circuit simulation techniques
- Passion for RF-circuit design at challenging 140 GHz
- Knowledge of RF-circuit design is advantageous
- Knowledge of radar fundamentals is advantageous
- Hands-in experience with Keysight ADS and/or Cadence Virtuoso is advantageous

*the workload will be adjusted accordingly