University of Stuttgart

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24.08.2022

Bachelor Thesis, Research Thesis, Master Thesis

ILH RF Group

Envelope Detector Design for 300 GHz Power Amplifier Pre-Distortion in THz Communication Transceivers

Our research group develops analog frontends for THz wireless communication systems operating in H-band (220-325 GHz).

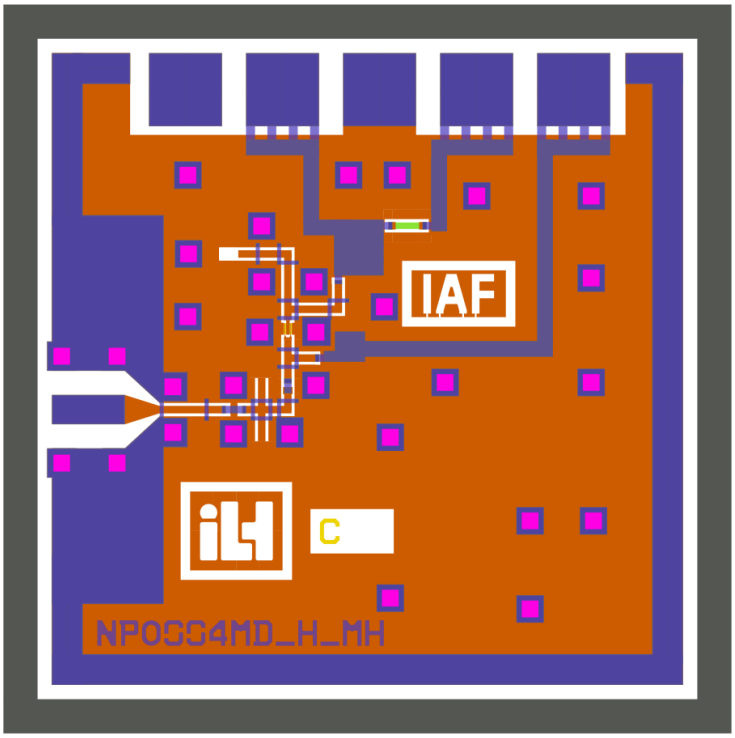
In scope of the SOLITONIC project, it is required to implement an integrated envelope detection functionality in the power amplifier monolithic integrated circuit in order to enable and investigate analog and digital pre-distortion techniques.

The goal of this thesis is to design a monolithic integrated envelope detector circuit operating at a center frequency of 300 GHz.

You will use the state-of-the-art 35 nm InGaAs HEMT technology from the Fraunhofer Institute of Applied Solid-State Physics, which has cutting-edge high frequency and low noise performance and achieves cutoff frequencies (f_max) of well beyond 1 THz.

The task includes the choice of the most appropriate circuit architecture, linear and non-linear circuit analysis, optimization and the creation of a production-ready MMIC layout. A focus is on high circuit compactness for on-chip co-integration of the envelope detector circuit with the PA stage.

The workload will be adjusted according to which kind of thesis you execute.



Previous work at the ILH. The picture shows the layout of an envelope detector in the 35 nm InGaAs HEMT technology from the Fraunhofer Institute of Applied Solid-State Physics. The detector operates at 300 GHz and the chip size is 750 µm x 750 µm.
[Mario Hüttel, "Design of a Power and Envelope Detector for Ultra Fast Communication Systems in the Low Terahertz Region" Master's Thesis, 2018, p. VIII.]