

Semester Project

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Extractions of Millimeter-Wave Bipolar Transistor Equivalent Circuit Models from Measured S-Parameters

Vision

Type-II InP/GaAsSb double heterojunction bipolar transistors (DHBTs) show an excellent combination of bandwidth and breakdown voltages, making it a great candidate for 5G communication. The continuous increase in device cutoff frequency ($f_t/f_{MAX}= 463/829$ GHz, last reported by MWE group) requires RF characterization and cut-off frequency extrapolation in the sub-millimeter wave bands.

Thesis Description

In the course of gain cut-off frequencies extraction from measured S-parameters, de-embedding is necessary to subtract the effect of probe pads. The MWE group recently proposed an iterative de-embedding method which enables a more reliable cut-off frequency determination than conventional de-embedding methods.

The goal of this semester thesis is to find out the subtracted physical elements in DHBT small signal equivalent model within each iteration.

You will

- Learn how to characterize S-parameters of DHBT from 0.2 to 67 GHz with a PNA-X vector network analyzer.
- Learn how to extract cut-off frequencies and equivalent circuit elements (e.g. emitter, base, collector resistances and capacitances) from measured S-parameters.
- Practice programming in Matlab or Python.

