ABSTRACT

Thesis: **Electrical Characterization and Modelling of High Frequency Transistors for PA Applications**

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Accurate measurement is essential for understanding device characteristics and so characterization of device plays a crucial role in achieving this understanding. This thesis research aims to characterize and model Silicon-Germanium Heterojunction Bipolar Transistors (SiGeHBTs) to evaluate their high-frequency performance. The approach involves implementing a calibration procedure using a 16-term error model. This model helps eliminate systematic errors in S-parameter measurements, leading to more precise characterization. The calibrated S-parameter data will be compared with the independent radio frequency (RF) measurements and electromagnetic (EM) simulations to validate the accuracy of the calibration procedure and assess the device's high-frequency performance. A calibration substrate is designed using K-Layout software, incorporating various two port standards based on dimensions from Cascade Calibration Substrates CS5 and CS15 and from theoretical understanding[1] [2] which has been shown in Figure a, b, c and d. A comprehensive Floor Plan including all designed structures is developed ensuring a systematic approach to calibration substrate design. The research contributes to improving the precision of RF measurements for increasingly miniaturized semiconductor devices, which is critical for the development of high-frequency electronic components.

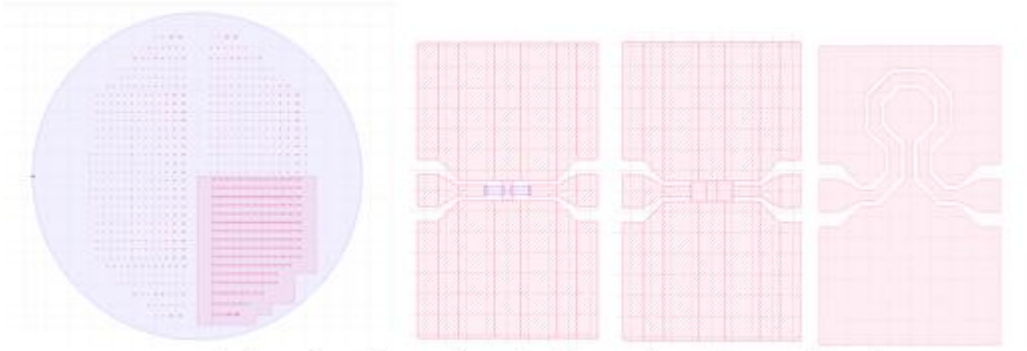

Figure. a) Floor Plan b) Load-Load c) Short-Short d) Meander Thru structure

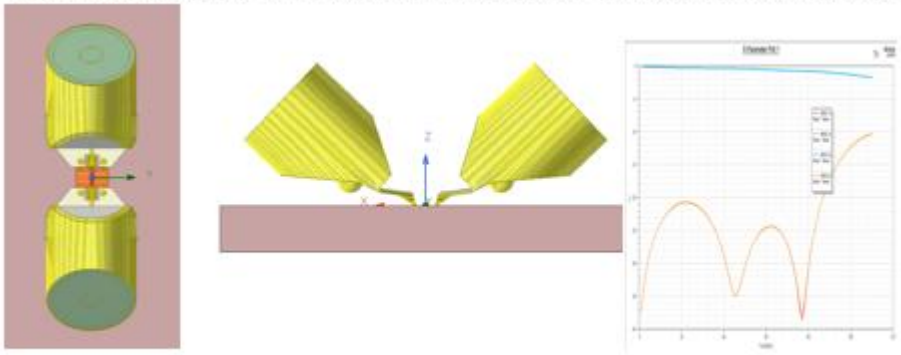

Figure e) Calibration Substrate with probe f) Probes g) S parameters

REFERENCES

[1] P.J.van Wijnen, "On the characterization and Optimization of High-Speed Silicon Bipolar Transistors", Paul. J. van Wijnen 25 June 1992

[2] J. V. Butler, D. K. Rytting, M. F. Iskander, R. D. Pollard, M. V. Bossche, "16 Term Error Model and Calibration Procedure for On-Wafer Network Analysis Measurements", in *IEEE Transactions on Microwave Theory and Techniques*, *Vol. 39, No. 12, December 1991*, IEEE, 1991, pp. 2211-2217