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Non-Linear Modeling and Simulation of RF Power Amplifier with Hardware Verification.

ABSTRACT - Masterthesis

Power amplification is the prevalent building block of any RF transmitter front-end. For an RF engineer the prediction of the large signal behaviour of a power amplifier in the design phase is crucial. Modern simulation tools such as AWR-MWO are capable of deriving the characteristics of high frequency power amplifier.

The objective of this thesis is the characterization of the non-linear behaviour of RF transistor amplifiers and gives full design process of it using bi-polar transistor BFP780. The analysis shall include but is not limited to key factors such as generation of harmonics, gain compression, power match, 1dB compression point, Intermodulation products, IP3 point, load-pull analysis, power match contours.

In the initial chapter, a linear PA was designed using s parameters and certain effects were measured. Further, this linear PA was converted into non-linear PA by replacing the linear transistor with non-linear transistor model and several effects were measured both qualitatively and quantitatively.

Another aim of this thesis was to extract maximum power out of this PA and to achieve that a load pull method was used. The designing of all these PAs were done using simulation software AWR MWO. The final layout of the circuit was designed, itched and the characterization of the circuit shall be verified in the laboratory by a hardware measurement on a power amplifier design and the several non-linear effects were measured and the comparison between simulated and measured results was shown.