# Abstracts

## Linearity characteristics of GaAs HBTs and the influence of collector design

*M. Iwamoto, P.M. Asbeck, T.S. Low, C.P. Hutchinson, J.B. Scott, A. Cognata, Xiaohui Qin, L.H. Camnitz and D.C. D'Avanzo. "Linearity characteristics of GaAs HBTs and the influence of collector design." 2000 Transactions on Microwave Theory and Techniques 48.12 (Dec. 2000 [T-MTT] (Special Issue on 2000 International Microwave Symposium)): 2377-2388.*

The linearity characteristics of GaAs heterojunction bipolar transistors (HBTs) are studied through measurement and analysis. Third-order intermodulation distortion behavior of HBTs is examined on devices with various epilayer designs and at various bias points, loads, and frequencies. Calculations from an analytical model reveal a strong bias and load dependence of third-order intercept point (IP3) on the nonlinearities from transconductance and the voltage dependence of base-collector capacitance. However, a simple model is not able to predict the fine details of IP3 with bias. A large-signal HBT model with an accurate description of the base-collector charge is shown to account for the measured trends. The base-collector charge function accounts for the modulation of base-collector capacitance with current, electron velocity modulation, and the Kirk effect (base pushout) for GaAs-based HBTs. A detailed study of the influence of collector design on linearity is also presented.

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