Abstracts

Characterization of Nonlinearities in Microwave Devices and Systems

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A simple model to describe a nonlinear device or system is proposed which extends the power series expansion, conventionally restricted to amplitude nonlinearities, to include phase nonlinearities as well. Four different test methods are selected for which the experimentally observed nonlinearity parameters are related to the "gain" and "phase" coefficients of the extended series. A set of simplified relationships is derived where the "1-dB gain compression point" represents gain contributions only while phase nonlinearities are included in the "intercept point," the "third-order intermodulation (IM) coefficients," and the "noise-power-ratio (npr)." For a TWT amplifier in which phase nonlinearities dominate, the third-order IM coefficient was measured. The results are compared with those calculated from single-tone and noise-loading tests using the relationships derived from the model. Agreement to ±1 dB is found over a 15-dB power range.

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