Abstracts

Large Signal Analysis of Nonlinear Microwave Systems

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In some application, microwave systems are subjected to large input signals. For example, with front-end receivers in radar systems, the range of the target determines the size of the input signal. In communications and radar systems, nearby transmitters can result in a large, undesired input signal. The resulting intermodulation products (IP's) can lead to significant degradation performance. However, with some systems, e.g. mixers, intermodulation is an inherent part of system operation. Detailed numerical analysis of a nonlinear system with large signal excitation, is notoriously difficult and often does not yield the qualitative understanding required for design. In this paper we present a noniterative, algebraic treatment of large signal effects. The method provides valuable insight into the way in which circuit and device parameters affect large signal performance. As an example we investigate the gain compression performance of diode mixers and parametric amplifier. (These systems were chosen as they both incorporate the nonlinear resistance and reactance of a diode junction. The resistive nonlinearity is dominant with a mixer and the reactive nonlinearity with a parametric amplifier.) However, the approach can be applied to any system and to other types of nonlinear distortion (e.g. cross-modulation, intermodulation and detuning distortion).

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