Abstracts

Signal space and its implementation for microwave nonlinear-network analysis

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Today, harmonic balance is the most useful approach for microwave nonlinear-network analysis. Fast Fourier transform (FFT) is usually used to convert the nonlinear element time waveforms into the frequency domain as part of the harmonic-balance process. This approach is straightforward for a single-frequency excitation, but is quite complicated and time consuming for the multifrequency-excitation case. In this paper, we propose a mathematical model termed "signal space", which enables (for a given nonlinearity) a direct calculation of the current spectrum (given the voltage spectrum) and is suited for implementation for harmonic balance. Under describing-function criteria, we use the signal-space approach to get expressions for oscillator parameters such as oscillation frequency, stability condition, and injection-locking bandwidth. There is a good, agreement between our results and Kurakawa's expressions.

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