Abstracts

Monte Carlo-based harmonic-balance technique for the simulation of high-frequency TED oscillators

R. Kamoua. "Monte Carlo-based harmonic-balance technique for the simulation of high-frequency TED oscillators." 1998 Transactions on Microwave Theory and Techniques 46.10 (Oct. 1998, Part I [T-MTT]): 1376-1381.

A harmonic-balance technique for the analysis of high-frequency transferred electron device (TED) oscillators is developed. The behavior of the nonlinear TED is not obtained from a quasi-static equivalent circuit; rather, a physical transport model is used to determine its response in the time domain. This model is based on the ensemble Monte Carlo technique coupled to a heat-flow equation, which accounts for thermal effects on the device operation. It is found that the standard splitting method for updating the unknown voltage across the diode fails to converge to a steady-state solution at the fundamental frequency. A modified version is proposed, which updates the voltage at the fundamental and higher harmonics differently. This method exhibits much better convergence behavior. Simulation results obtained with the complete model are in very good agreement with experimental data from InP TED oscillators operating at 131.7 and 151 GHz in the fundamental mode and at 188 GHz in the second-harmonic mode.

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