Abstracts

Determination of the Steady State of an Oscillator by a Combined Time-Frequency Method

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This paper presents a new method for the computation of the steady state of nonlinear oscillators including distributed elements which exploits advantages of both time-domaiin and frequency-domain simulation. The oscillator network is divided into a linear subnetwork described by a hybrid matrix in the frequency domain and a nonlinear subnetwork represented by a set of first-order nonlinear differential equations solved in the time-domain. The periodic steady state of the oscillator is shown to be equivalent to the solution of a boundary value problem, where the boundary conditions are given at a set of points along the time axis. For the solution of the boundary value problem the multiple shooting algorithm is applied, which may be modified in a very effective way owing to the special structure of the boundary value problem. It will be shown that the bandwidth in the nonlinear subnetwork can be, chosen arbitrarily high regardless of the number of harmonics at the ports connecting the subnetworks. An error estimate for the neglected harmonics at the ports is derived, which does not require additional numerical effort. In order to demonstrate the feasibility of the method and to discuss the error mechanisms it is applied to two examples: a Clapp oscillator including a piecewise-linear characteristic and an integrated GaAs MESFET oscillator at 10.7 GHz.

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