Abstracts

Experimentally Verifiable Modeling of Coplanar Waveguide Discontinuities

V. Radisic, D.R. Hjelme, A. Horrigan, Z.B. Popovic and A.R. Mickelson. "Experimentally Verifiable Modeling of Coplanar Waveguide Discontinuities." 1993 Transactions on Microwave Theory and Techniques 41.8 (Sep. 1993 [T-MTT] (Special Issue on Modeling and Design of Coplanar Monolithic Microwave and Millimeter-Wave Integrated Circuits)): 1524-1533.

A general technique for obtaining the frequency-dependent scattering parameters of open waveguiding structures is discussed. The first step of the analysis is an iterative solution for the charge distribution on the electrodes which, in our case, uses the "straight line" solution, the one first derived by Maxwell, as the starting value. A calibrated optical sampling technique allows for direct verification of the validity of the quasi-static charge distribution for structures in which the dielectric layers are also electrooptic. (Common waveguiding dielectrics such as GaAs and InP are sufficiently electrooptic to yield more than sufficient signal-to-noise ratios for accurate verification.) In cases where the quasi-static solution is valid, it is shown that the full dynamics of the propagation problem can be recovered from an equivalent nonuniform transmission line, the parameters of which can be determined from the phase velocity and impedance distribution defined by the static charge distribution. Here, we present analysis of planar discontinuities in coplanar waveguides (CPW), but the method can be modified and applied to include active devices, as well as three-dimensional discontinuities, such as airbridges. The method is based on an iterative solution of the quasi-static charge distribution using successive over relaxation and the dynamics are introduced via the Riccati equation. Additional measurements performed on the "in-house" fabricated passive circuits using an HP8510 Network Analyzer verify the accuracy of the dynamical part of the method.

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