Abstracts

A systematic optimum design of waveguide-to-microstrip transition

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In this paper, a systematic optimum design method is introduced, which consists of the finite-element method (FEM), design sensitivity analysis (DSA), and the steepest descent algorithm. A waveguide-to-microstrip (W/G-to-M/S) probe-type transition is designed by using the proposed method. In the FEM as a full-wave analyzer, eigenvalue and eigenvector calculations in the two-dimensional (2-D) FEM precede the three-dimensional (3-D) FEM, in order to terminate the W/G-to-MIS transition model into an electrically small model. The analysis results of this approach are compared with ones of a commercial FEM software high-frequency structure simulator (HFSS). The total derivative required in the steepest descent algorithm is calculated numerically by the DSA based on the FEM. The additional time needed for this proposed method is only one more calculation of a sparse matrix equation. The return loss is chosen as the objective function to be minimized, and the backshort length and probe length are selected as the design variables in the transition design. The proposed method gives a good convergence characteristic and the optimized results show its usefulness.

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