Abstracts

A Wideband Waveguide Transition Design with Modified Dielectric Transformer Using Edge-Based Tetrahedral Finite-Element Analysis

A waveguide transition analysis approach has been established to deal with arbitrary shaped three-dimensional (3-D) waveguide discontinuity problems, by hybridizing the edge-based tetrahedral finite-element method for the junction region and the analytic modal expansion technique for the waveguide region. Several unique features have been imbedded in the analysis, including a variational formula for the scattering coefficients, a modified Delaunay triangulation for the mesh generation, and a frontal solution technique for the sparse matrix solution. As a result, the analysis is verified to be accurate, versatile, and efficient through extensive comparisons with the theoretical and measurement data in the available literature. The approach is then applied to design a rectangular to dielectric-filled circular waveguide transition with less than -20 dB return loss over a 40% bandwidth by using a suitable modified dielectric rod transformer.

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