Abstracts

A Finite Element Cavity Resonance Method for Waveguide and Microstrip Line Discontinuity Problems

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This paper presents a novel finite element cavity resonance method for analyzing waveguide and microstrip discontinuities. The method originates from the classical nodal shift measurement technique for waveguide discontinuities, and is closely related to the transverse resonance technique (TRT). The method differs from the TRT in two important ways. First and foremost, the tedious search required in the TRT approach for the three sets of cavity lengths that satisfy the resonance condition at each of the specified frequencies of interest, is avoided in the present method. It is replaced, instead, with the problem of computing the resonant frequencies of the cavity for a number of different, systematically-chosen, longitudinal dimensions. The frequency behaviors of the S-parameters are reconstructed later for a wide band of frequencies from the sampled resonant frequency data by using an interpolation procedure described in the paper. Second, the finite element method (FEM) employing vector finite elements is used in conjunction with the numerically efficient Lanczos algorithm to compute the cavity resonant frequencies in an iterative manner. Several waveguide and microstrip line discontinuity problems have been analyzed by using this method. Numerical results are compared with available data.

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