Abstracts

Accurate Determination of Modes in Dielectric-Loaded Cylindrical Cavities Using a One-Dimensional Finite Element Method

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A unified approach is presented here to calculate the resonant frequencies of all the modes in cylindrical cavities axisyrnmetrically loaded with dielectrics. In this method, the radial variations of the field components in the resonator are expressed in terms of first-degree finite element polynomials while the axial variations of the field components are approximated by trigonometric functions. To calculate the resonant frequencies, an H-vector variational formulation is employed and minimized with respect to the coefficients of the expanded field components. Spurious solutions which are inherent in the finite element technique are effectively eliminated by means of a penalty term included in the variational expression, imposing a divergence-free magnetic field constraint. To show the capability of the method, resonant frequencies of several cylindrical cavities including those loaded with dielectric rods and dielectric rings were calculated. A mode chart is also presented which can be used for designing certain multimode dielectric-loaded cavity filters. In contrast to other rigorous techniques reported in the literature, the present method is highly efficient when dielectrics are fully extended along the cavity length.

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