Abstracts

A General Power Loss Method for Attenuation of Cavities and Waveguides (1962 [MWSYM])

The usual power loss method of evaluating the damping constant of cavities and the attenuation constant of waveguides, as caused by finite wall conductivity, breaks down in the case of degenerate modes and fails to predict the coupling between degenerate modes. Papadopoulos has treated the problem by means of a perturbation method involving an expansion of the fields in terms of the modes for the ideal cavity or waveguide. In this paper a variational formulation is presented that permits the eigenvalues for the lossy case to be readily computed. This formulation turns out to be a simple extension of the usual power loss method and in addition to giving the damping constant it also shows that there is an equal shift, in the resonant frequency in the case of a cavity, and in the phase constant for a waveguide. In addition the coupling between the degenerate modes is obtained. Furthermore it is shown that the new non-degenerate sets of coupled modes form an orthogonal set. The above properties all arise from the characteristics of the matrix eigenvalue problem which arises when the Rayleigh-Ritz technique is used in conjunction with the variational formulation of the boundary value problem.

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