Abstracts

A Mode-Matching Technique for Mode Coupling in a Gyrotron Cavity

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The mode-matching technique (MMT) is used to compute the electromagnetic fields, stored energy, and input admittances of a gyrotron cavity coupled to one or more waveguides. The method is based on matching the cavity and waveguide eigenmodes across the cavity apertures and accommodates cavity walls of finite conductivity. The MMT is used in the gyrotron problem because fields in and near the aperture must be computed accurately, and because the eigenmode decomposition is advantageous for inclusion of an electron beam. Irrotational modes are part of the complete set of orthogonal vectors required to expand an H-field in an open cavity, but were excluded in most gyrotron literature; here, this is corrected. The MMT is numerically implemented for cavities of rectangular and circular cross section. Coupling between different modes in a gyrotron cavity through external and ohmic losses is demonstrated. A coupled (complex) cavity gyrotron design is analyzed using MMT. The energy and modal spectra of the cavity are computed, demonstrating the mode selective properties of the design.

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