Abstracts

A Comparison of Formulations for the Vector Finite Element Analysis of Waveguides

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The principal formulations that have been proposed for finding the modes of waveguides by the finite element method are reviewed and compared. In each case, it is shown how Maxwell's equations may be reduced to matrix form using the method of weighted residuals. The formulations are compared from several points of view: their ability to handle spurious modes, lossy materials, and reentrant corners; the number of field components; and the properties of the matrices. Three benchmark problems are described and used to compare the formulations: a rectangular waveguide partially loaded with lossless dielectric; an air-filled, double-ridged waveguide; and a shielded image guide with either lossless or lossy dielectric.

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