Abstracts

Waveguides of Arbitrary Cross Section by Solution of a Nonlinear Integral Eigenvalue Equation (Sep. 1972 [T-MTT])

B.E. Spielman and R.F. Harrington. "Waveguides of Arbitrary Cross Section by Solution of a Nonlinear Integral Eigenvalue Equation (Sep. 1972 [T-MTT])." 1972 Transactions on Microwave Theory and Techniques 20.9 (Sep. 1972 [T-MTT]): 578-585.

The problem of electromagnetic wave propagation in hollow conducting waveguides of arbitrary cross section is formulated as an integro-differential equation in terms of fields at the waveguide boundary. Cutoff wave numbers and wall currents appear as eigenvalues and eigenfunctions of a nonlinear eigenvalue problem involving an integro-differential operator. A variational solution is effected by reducing the problem to matrix form using the method of moments. A specific solution of the problem is developed using triangle expansion functions in the method of moments. The solution is simplified by symmetry considerations and is implemented by two digital computer programs. Listings and full documentation of these programs are available. This solution yields accurate determinations of cutoff wave numbers, wall currents, and distributions of both longitudinal and transverse modal field components for the first several modes. Illustrative computations are presented for the single-ridge waveguide, which has a complicated boundary shape that does not lend itself to exact solution.

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