Abstracts

Cutoff Frequencies of Eccentric Circular-Elliptic Metallic Waveguides

In this paper semianalytical expressions for the cutoff frequencies of eccentric circular-elliptic perfectly conducting waveguides, are derived for both TM and TE modes. Two types of waveguides are considered, one with circular inner and elliptic outer conductor and one with elliptic inner and circular outer conductor. The electromagnetic field is expressed in terms of both circular and elliptical cylindrical wave functions, which are connected with one another by well-known expansion formulas. Translational addition tlheorems for circular cylindrical wave functions are also used for the satisfaction of the boundary conditions in the outer conductor. When the solutions are specialized to small values of $h = kc/2$ (c is the interfocal distance of the elliptic conductor and k the cutoff wavenumber) semianalytical expressions of the form $f(h) = f(0)[1+gh^2+O(h/\text{sup } 4)/]$ are obtained for the cutoff frequencies of the corresponding waveguide. For several values of the parameters, both waveguides may appear larger operational bandwidth as compared to that of the corresponding eccentric circular one. Numerical results for both waveguides and both kinds of modes are given for various values of the parameters.

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