Abstracts

The Dominant Cutoff Wavelength of a Lunar Line

A.Y. Hu and A. Ishimaru. "The Dominant Cutoff Wavelength of a Lunar Line." 1961 Transactions on Microwave Theory and Techniques 9.6 (Nov. 1961 [T-MTT]): 552-556.

A method is presented for calculating the lowest cutoff wavelength of a new microwave transmission line, the "lunar line," which is formed by two eccentric circular metal tubes connected with a metal bar or tangential to each other. The lunar-shaped cross section is approximated by introducing a series of steps in the outer guide wall and by dividing the cross section into m fan-shape regions. Thus, the problem is reduced to one of a multiple-step waveguide and can be solved by introducing the angular parameter alpha/sub i/ for the individual regions. The radial boundary conditions require a combination of Bessel functions of noninteger order for each region. The common boundaries between regions give m integral equations that represent the total power in one region transferred into the next region. The integral equations are solved approximately by solving only the first terms of an infinite series expansion of the tangential electric field at the common boundary. The solution of the m-stepped waveguide results in a system of 2m equations containing 2m unknowns: the cutoff wave number beta/sub c/, the order of the Bessel function p/sub i/, and the angular parameter alpha/sub i/. A successive approximation method is applied to obtain the cutoff wavelength. The calculated value is in close agreement with experimental results.

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