Abstracts

The Characteristic Impedance of Trough and Slab Lines

R.M. Chisholm. "The Characteristic Impedance of Trough and Slab Lines." 1956 Transactions on Microwave Theory and Techniques 4.3 (Jul. 1956 [T-MTT]): 166-172.

A variational method is used to develop an expression for the characteristic impedance of a "trough line" consisting of a circular cylinder mounted inside and parallel to the walls of a semi-infinate rectangular trough. The "slab line" consisting of a circular cylinder between infinite, parallel plates is treated as a special case of the trough line in which the bottom of the trough is taken to be infinitely remote from the circular cylinder. The solution has not been restricted to cylinders that are mounted exactly half way between the parallel walls of the trough; a simple formula is presented for calculating the tolerances which must be placed on the "centering" of the center conductor for a given allowable error in the characteristic impedance. The expression for the characteristic impedance is presented as the sum of three terms. The first is a "zero order" logarithmic term, the second a "second order" correction term which vanishes as the center conductor becomes infinitely small, and the third is an "off-center" correction term which arises when the cylinder is not exactly half way between the parallel walls of the trough. The second order correction term amounts to about 0.3 ohms when the characteristic impedance is of the order of 50 ohms. A fourth order approximation using the same method changes this by about 0.001 ohm.

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