Abstracts

Stepped Transformers for Partially-Filled Transmission Lines (Comments)

M.R. Leibowitz, D.J. Sullivan and D.A. Parkes. "Stepped Transformers for Partially-Filled Transmission Lines (Comments)." 1961 Transactions on Microwave Theory and Techniques 9.4 (Jul. 1961 [T-MTT]): 366-367.

The use of a lumped equivalent circuit for the transverse section of a waveguide has been used to determine the cutoff frequency of ridged guide. In essence, the transverse section of the guide is equated to an LC tank and the resonant frequency of the tank is determined by the usual formula. Sullivan and Parkes have extended this method to the analysis of a ridged guide partially loaded with dielectric. They account for the additional capacitance introduced by the dielectric and include this capacitance as part of the LC tank to be analyzed for the resonant frequency. While the simplified lumped-network equivalents are always desirable in analyzing microwave networks, we should be wary of overgeneralizing them. In the case of dielectric slab loading in a waveguide, the location of the added capacitance as well as its maguitude has an effect in determining the cutoff frequency. (This can also be said of the discontinuity capacitance at the edge of a ridge.) Note how a dielectric slab when centered in a rectangular waveguide will lower the cutoff frequency far more than when flush with the sidewall. This is not accounted for in the LC tank equivalent. The effect of each increment of capacitance due to each lamina of dielectric will be largely determined by the distance from the lamina to the short-circuit walls. Therefore, the author believes that the case of a partially dielectric-loaded guide can only be genuinely analyzed by the transverse resonance method or by some other method which accounts for the distributed parameters involved.

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