Abstracts

Propagation in a Dielectric-Loaded Parallel Plane Waveguide

M. Cohn. "Propagation in a Dielectric-Loaded Parallel Plane Waveguide." 1959 Transactions on Microwave Theory and Techniques 7.2 (Apr. 1959 [T-MTT]): 202-208.

A theoretical analysis of wave propagation in a parallel plane waveguide partially filled with a dielectric is performed. This transmission line is a symmetrical three-region structure consisting of two infinite parallel conducting planes with a dielectric slab of rectangular cross section between and contacting each of the planes. It has been found that TEM and TM modes cannot propagate on this structure. This investigation is concerned with TE modes, although hybrid modes can also propagate on this line. The lowest order TE mode, which is the dominant mode, has no cutoff and hence is inherently suited to extremely wide bandwidth operation. Equations have been presented for the field components, guide wavelength, cutoff criteria, power handling capabilities, wall losses, and dielectric losses as a function of the operating wavelength, waveguide dimensions, and material constants. In the case of the dominant mode, design curves covering a large range of wavelengths, dimensions, and dielectric constants are presented. For a loosely bound wave, the losses are comparable or less than those of conventional rectangular waveguide and the power handling capacity is an order of magnitude greater.

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