Abstracts

Circular Waveguide Loaded with Dielectric Discs for Increased Usable Bandwidth

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For each mode of propagation in waveguide, there is a critical (cutoff) frequency below which waves do not propagate. In practice, it is preferable to restrict the propagation to a single mode. If the dominant (TE-11) mode in circular waveguide is to be utilized, other modes may be excluded by operating at frequencies below the cutoff of the next mode (usually the TM-01). Thus the ratio of the TM-01 cutoff frequency over the TE-11 limits the waveguide's useful bandwidth. This ratio is 1.31 for uniform filling, and may be increased to 1.41 by a dielectric lining in the waveguide. A much greater ratio can be achieved by periodically loading the waveguide with discs of high dielectric constant, as shown in Fig. 1. The waveguide diameter is decreased to raise the cutoff frequency of the TM-01 mode, and the dielectric discs are inserted to lower the TE-11 cutoff frequency. As will be shown, the discs have relatively little effect on the TM-01 mode.

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