Abstracts

Dielectric-Lined Circular Waveguide with Increased Usable Bandwidth

P.J. Meier and H.A. Wheeler. "Dielectric-Lined Circular Waveguide with Increased Usable Bandwidth." 1964 Transactions on Microwave Theory and Techniques 12.2 (Mar. 1964 [T-MTT]): 171-175.

This report describes how the useful (single-mode) bandwidth of circular waveguide can be significantly increased by using a smaller diameter with dielectric lining. The increased bandwidth results from an increase in the ratio of the cutoff frequency of the second, or TM-01, mode over that of the dominant, or TE-11 mode. A cavity test is described which permits the measurement of mode separation for any thickness of dielectric lining. A lining with a dielectric constant in the vicinity of 4 appears to be near optimum for maximum single-mode bandwidth. For a dielectric constant of 3.8 (fused silica), the greatest mode separation is obtained if the dielectric cross section has about 0.44 of the area of the entire cross section, in which case the useful bandwidth is about doubled (perhaps increased from 8 to 16 per cent, if the entire band is to clear the TE-11 cutoff frequency by 20 per cent). Over the useful bandwidth of such a waveguide, the guide wavelength may be calculated approximately by the simple waveguide formula in terms of the equivalent dielectric constant, as determined by the cavity measurement. Applications which would benefit from increased dominant-mode bandwidth in circular waveguide include rotary joints carrying circular polarization, rotary attenuators and phase shifters, and array radiators.

❑ Return to main document.