Abstracts

Low-Loss Twists in Oversized Rectangular Waveguide

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Twists may be required in oversized rectangular waveguide used for low-loss transmission at the higher microwave and millimeter-wave frequencies. The unwanted mode conversion in such twists is calculated here from numerical integration of the coupled mode equations, considering simultaneous coupling of the five lowest order modes coupled in a twist. Twists with tapered or linearly varying rates of twist are shown to be superior in medium- or broad-band applications to those with uniform twist rate, such as those normally made commercially for single-mode waveguide. Some recent applications and designs for oversized rectangular waveguides are presented in [1]. Measurements consistent with these theoretical calculations are discussed for uniform twists in WR90 (0.9x0.4 in.) at 60 GHz and for an electroformed twist having a linearly tapered rate of twist in WR187 (1.872x0.872 in.) from 15.7 to 17.7 GHz. The coupling coefficients needed in the calculations are derived in an appendix and are compared with the results of other work, including a modal expansion of the dominant mode in twisted waveguide. A second appendix considers the transmission through an oversized waveguide with a mode converter generating a trapped unwanted mode, and derives the result for the dependence of the resonance depth on the mode conversion and the attenuation of the trapped mode.

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