

Abstracts

Mode Conversion in Tapered Waveguides At and Near Cutoff

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The coupling coefficient between the TE₁₁ mode and the TM₁₁ mode in tapered circular waveguides is derived, and at cutoff frequency it tends to approach an infinity of the order of 0^{-1/4}. It is surprising to discover that the corresponding coupling coefficient between the TE₁₀ mode and the TM₁₂ mode in tapered rectangular waveguides approaches instead a zero of the order of 0^{1/4} at cutoff frequency. Accordingly, for the modes concerned, the choice of using circular or square waveguides as tapers for transition at and near cutoff frequency is significant in reducing mode conversion level. At and near cutoff frequency a "synthesized" square taper is better in that it is shorter than a "synthesized" circular taper for the same mode conversion levels. On the other hand, for frequencies far away from cutoff the choice is insignificant. Design procedures for "synthesized" waveguide tapers at and near cutoff are presented, and the results of measurements are in agreement with the theoretical calculations.

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