Abstracts

The Effect of Cross-Section Curvature on Attenuation in Elliptic Waveguides and a Basic Correction to Previous Formulas

L. Lewin and A.M.B. Al-Hariri. "The Effect of Cross-Section Curvature on Attenuation in Elliptic Waveguides and a Basic Correction to Previous Formulas." 1974 Transactions on Microwave Theory and Techniques 22.5 (May 1974 [T-MTT]): 504-509.

It is shown that a certain asymptotic expansion of the Mathieu function of the fourth kind has almost certainly been inappropriately applied to previous elliptic waveguide calculations. An appropriate expansion is discussed at some length, and leads to a substantial modification of the published formulas. The need for a correction is demanded by a physical requirement to give the limit of the conventional surface impedance expression at the broad face of a very elongated elliptical shape. A curvature effect, the subject of some recent technical discussions, survives the change, and a discussion is given of an unsuccessful attempt to create a generalized form that replaces the ellipse parameters by differentials of the local curvature of the surface. An attempt is also made to justify the reality of such a substantial curvature effect. However, no effect occurs for flat surfaces or those of uniform curvature, confirming the validity of the usual perturbation technique of calculating waveguide attenuation in those cases. An anomalous property of the characteristic numbers of the Mathieu functions is discussed insofar as it relates to the present problem.

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