Abstracts

Power loss for multimode waveguides and its application to beam-waveguide system

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The conventional way of expressing power loss in decibels/meter for a multimode waveguiding system with finite wall conductivity (such as a beam-waveguide (BWG) system with protective shroud) can be incorrect and misleading. The power loss (in decibels) for a multimode waveguiding system is, in general, not linearly proportional to the length of the waveguide. New power-loss formulas for multimode system are derived in this paper for arbitrarily shaped conducting waveguide tubes. In these formulas, there are factors such as [exp(jx)-1]/(jx), where x=(/spl beta//sub a/-/spl beta//sub b/)l, with /spl beta//sub a/ and /spl beta//sub b/ being the propagation constants of the different propagating modes and l being the distance from the source plane to the plane of interest along the guide. For a large BWG supporting many propagating modes, /spl beta//sub a/'s are quite close to /spl beta//sub b/'s, thus the mode coupling terms remain important for a very long distance from the source plane. The multimode power loss formula for a large circular conducting tube has been verified by experiments. This formula was also used to calculate the additional noise temperature contribution due to the presence of a protective shroud surrounding a millimeter-wave BWG system.

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