Abstracts

On the Theory of Randomly Misaligned Beam Waveguides

F.K. Schwering. "On the Theory of Randomly Misaligned Beam Waveguides." 1967 Transactions on Microwave Theory and Techniques 15.4 (Apr. 1967 [T-MTT]): 206-215.

A straightforward method for the determination of the expected attenuation in misaligned beam waveguides is presented. It applies to confocal guides and assumes that the misalignment consists of random displacements of the lenses in directions perpendicular to the beam axis. Reiterative fields, as they are present in perfectly aligned beam waveguides, do not exist in misaligned guides. However, it can be shown that there are beams whose expected field distribution is repeated from lens to lens. These "statistical modes" are determined by the eigenfunctions of a homogeneous integral equation of the second kind. The corresponding eigenvalues determine the expected attenuation per iteration. The absolute squares of the eigenvalues yield an upper bound for the expected power loss per iteration. The integral equation is solved for small mean square displacements of the lenses by a perturbation method. For infiitely extended lenses, the equation can be solved in closed form. In both cases the expected attenuation of the lower-order statistical modes has been calculated; the results are shown as function of the mean square displacement of the lenses.

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