Abstracts

Computer Optimization of Inhomogeneous Waveguide Transformers

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The problem of designing broadband multisection stepped rectangular waveguide impedance transformers, when the input and output guides have different cutoff frequencies but propagate the same mode, is formulated in general terms for direct optimization by digital computer. The formulation is sufficiently flexible to allow nonideal junction discontinuity effects and mismatched terminations to be taken into account during optimization. Constraints placed on the width, height, or length of any section need be dictated only by considerations for dominant mode propagation and the requirement of small (but not necessarily negligible) junction discontinuities. The objective of the present formulation is a minimax equal-ripple response over a predetermined frequency band satisfying the constraints selected for the particular problem. The ripple search strategy to locate the maximum reflection coefficient within the band and the razor search strategy to minimize it, as described by Bandler and Macdonald in another paper, were employed. Constrained optimum equal-ripple solutions to examples previously published by Young, Matthaei et al. and Riblet are presented. They demonstrate the considerable improvements made possible by the present formulation with regard to performance, reduction in number of sections, and physical size. The approach used in this paper should also find application in the design of broadband microwave matching or equalizing networks consisting of noncommensurate components and for which exact synthesis techniques may be unavailable.

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