Abstracts

Integral Formulation for Analysis of Integrated Dielectric Waveguides

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A polarization integral equation is advanced for use in the conceptual and numerical analysis of a broad class of integrated dielectric waveguiding systems. The equation is applied to axially uniform waveguides, in which case the axial integral becomes convolutional in nature, prompting a Fourier transform on that variable. Inversion of the transformed guiding region field, aided by complex analysis, allows identification of two components of that field the surface-wave modes and the radiation field. These are found in terms of the sources exciting the system, leading to a new formulation for the excitation of such waveguides. Analysis of the behavior of the kernel of the transformed integral equation in the complex plane leads to a general criterion for surface-wave leakage from the guiding region. Numerical results for the propagation characteristics of step- and the graded-index rectangular strip and rib waveguides are obtained from the integral equation by application of the method of moments and by a quasi-closed-form solution technique. These results are compared to those of other formulations. Further application of the integral equation is discussed, and several promising areas for further study are identified.

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