Abstracts

An Accurate and Efficient Entire-Domain Basis Galerkin's Method for the Integral Equation Analysis of Integrated Rectangular Dielectric Waveguides

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The propagation characteristics of multiple coupled rectangular dielectric waveguides are investigated through an integral equation analysis. In contrast with the widely used subdomain-basis Galerkin's method, in this work a novel set of entire-domain basis functions is introduced. This set consists of plane wave functions that satisfy Maxwell's equations in each guiding region, therefore representing a proper expansion system. The simple form of the basis functions employed enables the accurate numerical evaluation of the spectral integrals, by means of an efficient asymptotic extraction technique. It is found that the computed dispersion curves presented for various single and coupled waveguides compare very favorably to published results of other methods. Finally, leakage effects in lossy waveguides are numerically treated for the first time, in view of mode transitions from leaky to bound regime. The technique presented in this paper is accurate, though conceptually simple, and can deal with a wide variety of integrated circuits and multilayered substrate configurations. It is also demonstrated that its main advantage is superior computational efficiency, since very satisfactory results are obtained with only a few expansion terms.

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