Abstracts

An Integral Transform Technique for Analysis of Planar Dielectric Structures

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This paper presents a novel efficient technique for the study of planar dielectric waveguides for submiliimeter-wave and optical applications. In an appropriate integral transform domain, which is determined by the Green's function of the substrate structure, higher-order boundary conditions are enforced in conjunction with Taylor expansions of the fields to derive an equivalent one-dimensional integral equation for the corresponding two-dimensional waveguide geometry. This reduction in the dimensionality of the boundary-value problem can easily be extended to three-dimensional planar structures, with equivalent two-dimensional integral equations being formulated. The reduced integral equations are solved numerically by invoking the method of moments, in width the transform-domain unknowns are expanded in a smooth localized entire-domain basis. It is demonstrated that using orthogonal Hermite-Gauss functions as an expansion basis provides very satisfactory results with only a few expansion terms. For the validation of the technique, single and coupled dielectric slab waveguides are treated.

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