Abstracts

Uniform Asymptotic Technique for Analyzing Wave Propagation in Inhomogeneous Slab Waveguides

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The guided modes of inhomogeneous dielectric slab waveguides are analyzed by a uniform asymptotic technique based on the related equation method. This technique gives highly accurate solutions in the sense of asymptotic expansion. The algorithm for calculating the guided modes of slab waveguides with an even polynomial refractive-index medium is presented. As an example, we calculate the third-order approximate solutions for the guided modes in an analytic form. The results show that the WKB solutions for higher order modes are more accurate than for the lower order modes and the correction to the WKB solutions is significant for the lower order modes. The numerical result for eigenvalues and modal fields confirms that the third-order asymptotic solution is accurate for all the guided modes of the near-parabolic profile waveguides and for higher order modes in the case of the quasi-Gaussian profile.

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