Abstracts

Calculation of the Fundamental Mode Sizes in Optical Channel Waveguides Using Gaussian Quadrature

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A fast numerical method using Gaussian quadrature, which takes only seconds on a microcomputer, is presented for calculating the fundamental mode sizes in optical channel waveguides. Variational expressions for the square of the propagation constant, beta/sub 2/, of the TE- and TM-like modes are derived using the vector wave equations. For channel waveguides with gradual refractive index distributions, these expressions approach the variational expression obtained using the scalar wave equation. To show the usefulness of our numerical technique we present the results for titanium indiffused lithium niobate channel waveguides, which are commonly used in integrated optical circuits. Since these waveguides have gradual refractive index distributions, both types of expressions give the same results; however, it takes less time to compute the mode sizes when using the variational expression obtained from the scalar wave equation. We find the calculated mode sizes are in good agreement with published measurements. From the comparison process, best fit parameters are obtained, which give mode sizes close to the values published in the literature. For one special case we are able to obtain an analytical variational expression and we use it to test the accuracy of our numerical method. We find that the values of beta/sub 2/ given by both methods agree to six significant figures.

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