Efficient Time-Domain Beam-Propagation Method For Modelingintegrated Optical Devices

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Summary

A new efficient technique that models the behavior of pulsed optical beams in homogenous medium, metallic and dielectric waveguides, is introduced and verified using both linear nondispersive and dispersive examples that have analytical predictions. Excellent accuracy results have been observed. The method is called time-domain beam-propagation method (TD-BPM) because it is similar to the classical continuous-wave BPM with additional time dependence. The explicit finite difference and the Du Fort-Frankel approaches were used to discretize the TD-BPM equation. Comparisons between these techniques are also given with the application of the perfectly matched layers as spatial boundary conditions to the Du Fort-Frankel. Then the TD-BPM was successfully applied to model a two-dimensional dielectric Y-junction. It is concluded that the new technique is more efficient than the traditional finite-difference TD method, especially in modeling large optical devices