비선형 클래드를 갖는 평면 광도파로에서 생성되는 공간 솔리톤의 FDTD 분석

FDTD Analysis of Spatial Soliton Generated in Planar Waveguides with a Nonlinear Cladding

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The finite-difference time-domain (FDTD) method based on the Maxwell's time-dependent curl equations describes the very accurate and realistic behaviors of nonlinear waves, such as optical soliton propagation, scattering, and switching, because of using no approximation and considering all the effects, such as vector properties, reflections, and transients.[1]

In this work, we utilize the FDTD method to analyze spatial soliton generation in slab waveguides having a Kerr-type nonlinear cladding.[2] We adopt Berenger's perfectly matched layer boundary condition, which provides reflectionless absorption independent of frequency or angle of incidence.[3] A comparison between the numerical results from the FDTD and the finite difference beam propagation method (FDBPM) with the paraxial approximation was performed. We have found that the numerical results obtained using the FDTD method disagree with those of the paraxial FDBPM.

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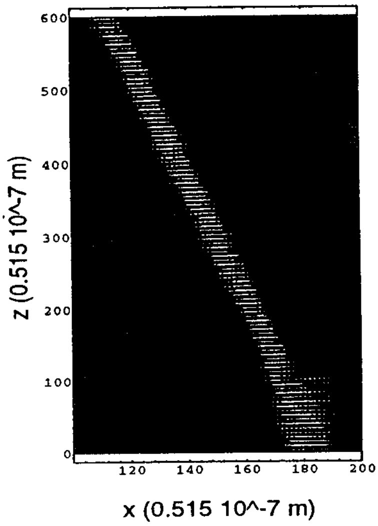
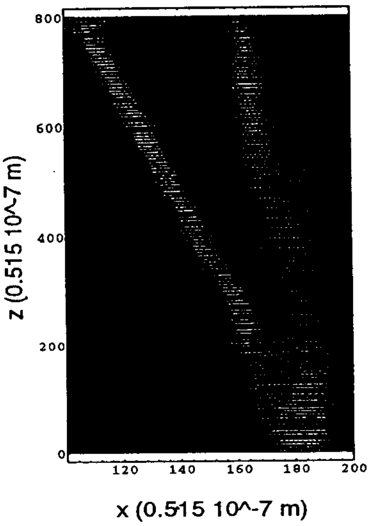


(a)



(b)

Fig. 1. Simulation of spatial soliton propagation using the FDTD method: (a) P_{in}=60.0 mW/mm, β=1.64, ω_0=0.6μm, and d_f = 0.6μm and (b) P_{in}=100.0 mW/mm, β=1.70, ω_0=0.5μm, and d_f = 1.2μm, respectively.