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Numerical Simulation of Soliton Pulse Propagation in Doped Optical Fibres by Finite-Difference Method

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Abstract: We report results of applications of explicit finite-difference schemes, viz. the combination of forward-difference and central-difference approximation schemes, to study a simulation of soliton pulse propagation in saturable optical fibres. The dynamic governing equation is the saturable nonlinear Schrödinger equation (SNLE). This equation thus far lacks analytical solution in the sense of the inverse scattering method, although an analytical solitary wave solution is available. We use the localized solution to generate data for simulations of fundamental and second order soliton pulse propagation. In addition, we check the numerical accuracy of the results by considering the physical significance of two conserved quantities which are properties of the governing equation.

Key Words: Soliton pulse, optical fibres, finite-difference, nonlinear Schršdinger equations

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