Optical soliton propagation and interaction in inhomogeneous nonstationary media

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Nonlinear dynamics of the solitons are very interesting due to their interactions. Analytically obtained solitons interact with each other in elastic manner. In this connection, an investigation of possibility of non-elastic relations is interesting. These problems correspond to soliton management problem, which is actual question in communication. Herewith, investigation of influence of inhomogeneities of dispersion and nonlinearities, non-stationary parameters on the solitons' propagation. The problem reduces to the Schrödinger nonlinear equation of light field amplitude with spatial and temporal coordinates.

Fourier splitting method of the physical terms of the equation was used at numerical modeling, in which inhomogeneity of coefficients is taken into account. Equation is divided into two linear and nonlinear parts, dispersive and nonlinear effects are considered separately, corresponding operators are assumed commutative. Implicit scheme of finite-difference method is used for investigation of soliton spreading in nonstationary environment.

Numerical experiments show that inhomogeneity of medium changes the amplitudes of solitons and other light impulses, their spreading velocities, their number, which is caused by their nonelastic interaction in inhomogeneous fibber. Nonstationary medium changes a form of impulse and affects its spectral features.

Changes of modulation of the medium parameters makes possible variation of nonelastic interaction character of solitons attraction-repulsion.

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