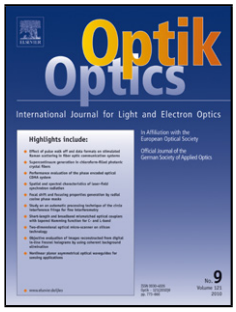

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Solitons, Lax pair and infinitely-many conservation laws for a high-order nonlinear Schrödinger equation in an optical fiber

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Abstract

Under investigation in this paper is a high-order nonlinear Schrödinger equation in an optical fiber. Lax pair and infinitely-many conservation laws are derived via the symbolic computation. By virtue of the Darboux transformation, one-, two- and three-soliton solutions are derived. Propagation and interaction of the solitons are illustrated graphically: Velocity of the soliton is linearly related to the higher-order dispersion coefficients, while amplitude of the soliton does not depend on them at all. Head-on interaction between the two bidirectional solitons as well as overtaking and oscillating interaction between the two unidirectional solitons are presented. For the interactions among the three solitons, we display two head-on and one overtaking interactions along with three overtaking interactions. Graphical analysis shows that each interaction between the two solitons is elastic, and each interaction among the three solitons is pairwise elastic.

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Keywords: Optical fiber; High-order nonlinear Schrödinger equation; Darboux transformation; Lax pair; Infinitely-many conservation laws; Solitons

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