Some Exact Analytical Solutions to the Inhomogeneous Higher-Order Nonlinear Schrödinger Equation Using Symbolic Computation

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In this paper, the generalized projective Riccati equation method is extended to investigate the inhomogeneous higher-order nonlinear Schrödinger (IHNLS) equation including not only the group velocity dispersion and self-phase-modulation, but also various higher-order effects, such as the third-order dispersion, self-steepening and self-frequency shift. With the help of symbolic computation, a broad class of analytical solutions of the IHNLS equation is presented, which include bright-like solitary wave solutions, dark-like solitary wave solutions, W-shaped solitary wave solutions, combined bright-like and dark-like solitary wave solutions, and dispersion-managed solitary wave solutions. From our results, many previously known results about the IHNLS equation can be recovered by means of some suitable selections of the arbitrary functions and arbitrary constants. Furthermore, from the soliton management concept, the main soliton-like character of the exact analytical solutions is discussed and simulated by computer under different parameters conditions.

Key words: Inhomogeneous Higher-Order Nonlinear Schrödinger Equation; Generalized Projective Riccati Equation Method; Solitary Wave Solutions; Symbolic Computation.