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Many new exact solutions to the higher-order nonlinear Schrödinger equation with derivative non-Kerr nonlinear terms using three different techniques

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Abstract

Many new types of Jacobi elliptic function solutions, solitons and other solutions to the higher-order nonlinear Schrödinger equation with derivative non-Kerr nonlinear terms have been found using three mathematical techniques, namely, the special kind of (G'/G) -expansion method, the ϕ^6 -model expansion method and the new mapping method. This equation could be a model equation of pulse propagation beyond ultrashort range in optical communication systems. This model is photonic crystal fiber (PCF). Comparing our new results with the well-known results are given. Also, we compare the results yielding from the three methods with each other.

Keywords: The special kind of (G'/G) -expansion method; ϕ^6 -model expansion method; New mapping method; Jacobi elliptic function solutions; Solitons and other solutions; Exact solutions; Higher-order nonlinear Schrödinger equations with derivative non-Kerr nonlinear terms.

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1 Introduction

When nonlinear partial differential equations (PDEs) are analyzed, one of the most important equation is the construction of the exact solutions of those equations. Searching for the exact solutions of those equations plays an important role in the study of nonlinear physical phenomena. Nonlinear wave phenomena appears in various scientific and engineering fields, such as fluid mechanics, plasma physics, optical fibers, biology, solid state physics, chemical kinematics, chemical

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