Exact Soliton Solutions to an Averaged Dispersion-managed Fiber System Equation

Biao Li

Department of Applied Mathematics, Dalian University of Technology, Dalian 116024, China (corresponding adress) and Key Laboratory of Mathematics Mechanization, Chinese Academy of Sciences, Beijing 100080, China

Reprint requests to Dr. B. L.; E-mail: libiao@dlut.edu.cn.

By introducing a set of ordinary differential equations which possess q-deformed hyperbolic function solutions, and a new ansatz, a method is developed for constructing a series of exact analytical solutions of some nonlinear evolution equations. The proposed method is more powerful than various tanh methods, the $\sec_q$-$\tanh_q$-method, generalized hyperbolic-function method, generalized Riccati equation expansion method, generalized projective Riccati equations method and other sophisticated methods. As an application of the method, an averaged dispersion-managed (DM) fiber system equation, which governs the dynamics of the core of the DM soliton, is chosen to illustrate the method. With the help of symbolic computation, rich new soliton solutions are obtained. From these solutions, some previously known solutions obtained by some authors can be recovered by means of some suitable choices of the arbitrary functions and arbitrary constants. Further, the soliton propagation and solitons interaction scenario are discussed and simulated by computer.

Key words: Nonlinear Schrödinger Equation; Dispersion-managed Solitons; Soliton Propagation; Solitons Interaction; Symbolic Computation.