Runge-Kutta – Split-Step Fourier Method For Solving Generalized Nonlinear Schrödinger Equation in Nonlinear Fiber Optics

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Abstract

Generalized Nonlinear Schrödinger Equation (GNLSE) is a partial differential equation that govern the wave propagation in a nonlinear medium. Runge-Kutta – Split-Step Fourier method can solve GNLSE in nonlinear fiber optics by solving the linear and nonlinear effects of fiber optics independently in frequency domain using Fourier transform and in time domain using Runge-Kutta. The method provides results quite accurately with error-rate from order 10^{-11} % until 10^{-1} % for pulse propagation along ten dispersion length. The error-rate depends on various schemes of Runge-Kutta – Split-Step Fourier method and step size those are chosen, also depends on various parameters of fiber optics and input-pulse.

Keywords

Generalized Nonlinear Schrödinger Equation (GNLSE), Runge-Kutta – Split-Step Fourier method, nonlinear fiber optics.