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Optical Soliton in Nonlinear Dynamics and Its Graphical Representation

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Abstract: The soliton arising from a robust balance between dispersion and nonlinearity is the solitary wave that maintains its shape while it travels at constant speed. The fiber Optical soliton in media and communication with quadratic nonlinearity and frequency dispersion are theoretically analyzed. The behavior of soliton solutions in the form of KdV partial differential equation have been investigated in the fiber optics solitons theory in communication engineering. In this study optical soliton is studied with illustrated graphical representation.

Keywords: *soliton solution, Korteweg-de Vries equation, Gaussian white noise, stochastic KdV equation, Fourier transform, nonlinear dynamics.*

Mathematics Subject Classification (2000): 35C08, 37K40, 35Q51.

1 Introduction

In recent years there have been important and tremendous developments in the study of nonlinear waves and a class of nonlinear wave equations which arise frequently in many engineering applications. The wide interest in this field comes from the understanding of special waves called *solitons* and the associated development of a method of solution to a class of nonlinear wave equations termed as the nonlinear Korteweg and de Vries (KdV) equation. A soliton phenomenon is an attractive field of present day research not only in nonlinear physics and mathematics but also in nonlinear dynamics and system engineering, specially in fiber optics and communication engineering. The soliton phenomenon was first pioneered by John Scott Russel in 1884, while he was conducting experiments on the Union Canal (near Edinburgh) to measure the relationship between the speed of a boat and its propelling force. Russel demonstrated the following findings as an independent dynamic entity moving with constant shape and speed:

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