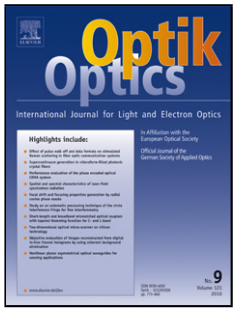

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PII: S0030-4026(18)31291-9
DOI: https://doi.org/10.1016/j.ijleo.2018.08.141
Reference: IJLEO 61438

To appear in:

Received date: 30-8-2018
Accepted date: 30-8-2018

Please cite this article as: Mani Rajan MS, Bhuvaneshwari BV, Controllable soliton interaction in three mode nonlinear optical fiber, *Optik* (2018), https://doi.org/10.1016/j.ijleo.2018.08.141

Controllable soliton interaction in three mode nonlinear optical fiber

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Abstract

In this paper, the analytical bright soliton solutions are obtained for the 3-coupled nonlinear Schrödinger equations with variable coefficients in a three-mode fiber. Lax pair is constructed for 3-coupled NLS system by employing AKNS procedure. With the help of symbolic computation, the multi-soliton solutions are obtained by means of Darboux transformation technique. Based on two-soliton solutions, we demonstrate the various interaction scenarios of solitons in three mode fiber through the choice of control parameters. Furthermore, we investigate the dynamical behaviors of solitons for both constant and variable coefficients. Our result reveals that interactions of optical solitons have some specific applications such as the construction of logic gates, optical computing, soliton switching, and soliton amplification in wavelength division multiplexing (WDM) system.

Keywords: Soliton interaction, Soliton control, *3*-coupled nonlinear Schrödinger equation, soliton switching, symbolic computation, three-mode fiber

1. Introduction

In the context of nonlinear fiber optics, nonlinear Schrödinger equations have been employed to describe the optical pulse propagation in nonlinear optical fiber medium. Since the theoretical prediction [1] and experimental observation [2], optical solitons has potential applications in various fields which includes the optical communication systems and all-optical switching devices [3, 4]. Optical solitons ascend when the linear effect dispersion and nonlinear effect like self-phase modulation are exactly balanced. In a mono mode fiber, pulse propagation can be represented by the nonlinear Schrödinger (NLS) equation, which involves the group