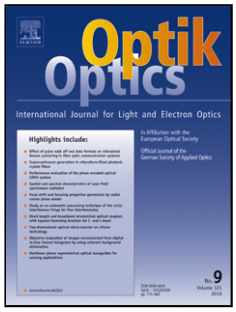

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Optical solitons in multiple-core couplers with the nearest neighbors linear coupling

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Abstract: This paper addresses a type of nonlinear directional optical couplers with four different forms, namely the Kerr law, power law, parabolic law and dual-power law. The multiple-core couplers with the nearest neighbors linear coupling is studied with four forms of nonlinearity. Bright and dark optical solitons are obtained as well as Jacobi elliptic function solutions. The constraint conditions are acquired for the existence of solitons.

Keywords: Optical solitons, optical couplers, Jacobi elliptic functions.

1 Introduction

The dynamics of solitons in nonlinear directional couplers has been studied recently in the context of nonlinear optics. Nonlinear optical couplers are very useful devices that distribute light from a main fiber into one or more branch fibers. Couplers also have applications as intensity-dependent switches and as limiters.

The nonlinear Schrödinger's equation (NLSE) is the main governing model for the propagation solitons through optical fibers. There are several results and many new ideas about this equation for optical solitons [1]-[31]. We consider the NLSE with spatio-temporal dispersion (STD) and group velocity dispersion (GVD) in the case of optical couplers in this work. We study multiple-core couplers which is a type of nonlinear directional optical couplers with four forms of nonlinearity. The nonlinearities that are considered in this paper are the Kerr law, power law, parabolic law and dual-power law. The Jacobi elliptic functions are used to get exact solutions of this equation. We have studied earlier twin-core couplers which is another type of nonlinear directional optical couplers in [6].