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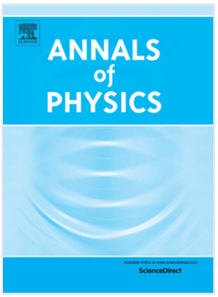

Spatial solitons in PT symmetric potential with competing gain and loss

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Spatial solitons in PT symmetric potential with competing gain and loss

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Abstract: The existence and stability of fundamental, dipole and tripole solitons are investigated in parity-time symmetric potential with competing gain and loss. The competing parameter decide both the width of potential and loss or gain region. All these solitons exist in the potential with a suitable width. It is easy to form a fundamental soliton when increased the parameter k. While to form a dipole and tripole soliton, the valure of k should locate in some region. These solitons are unstable for a larger power while may be stable for a relatively small one. The effects of competing gain or loss profile on the stability of these solitons are investigated with a linear stability analysis corroborated by a beam propagation method.

Keywords: Optical Solitons; PT symmetry; Propagation; Stability;

PACS numbers: 42.65.Tg; 42.65.Wi; 42.65.Bs;11.30.Er.

1. Introduction

Recently, Bender et al. investigated non-Hermitian Hamiltonians and found that many of them have entirely real spectrum provided that have the so-called Parity-Time (PT) symmetry property[1]. A necessary condition for the Hamiltonians to be PT symmetry is that the potential function $V_{PT}(X)=V(X)+iW(X)$ should satisfy the condition $V_{PT}^{*}(X)=V_{PT}^{*}(-X)$ [2-4]. In optics the complex refractive index plays the role of a PT symmetric potential such that $V(X)$ is an even function of position and $W(X)$ is an odd function. Since then, propagation of optical beam in complex nonlinear media featuring the PT symmetry has drawn considerable attention [5-18]. Spatial solitons would form when the optical beams diffraction is balanced by the nonlinearity or optical potentials. Solitons may exhibit two regions: one region soliton propagate stably where the other soliton propagate unstably. Lots of investigation on the existence of various types of solitons in PT

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