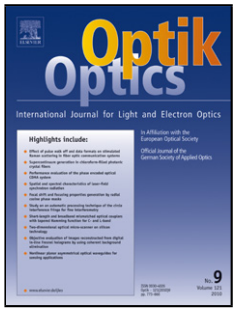

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PII: S0030-4026(17)30528-4
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2017.05.008
Reference: IJLEO 59153

To appear in:

Received date: 20-2-2017
Revised date: 1-5-2017
Accepted date: 2-5-2017

Please cite this article as: Xiao-Hang Jiang, Yi-Tian Gao, Qian-Min Huang, Nonlinear wave solutions for an integrable sixth-order nonlinear Schr*ddoto*dinger equation in an optical fiber, <*![CDATA[Optik - International Journal for Light and Electron Optics]]*> (2017), http://dx.doi.org/10.1016/j.ijleo.2017.05.008

Nonlinear wave solutions for an integrable sixth-order nonlinear Schrödinger equation in an optical fiber

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Abstract

Under investigation in this paper is an integrable sixth-order nonlinear Schrödinger equation. Muti-soliton and higher-order breather solutions are obtained via the Darboux transformation. Higher-order rogue-wave solutions are derived via the generalized Darboux transformation. Effects of higher-order terms on the interaction and propagation of the solitons, breathers and rogue waves have been discussed graphically. Interactions among the solitons are elastic because the soliton amplitudes keep unchanged except for phase shifts. In addition, higher-order terms could enhance the steepness of the solitons. Periods of Kuznetsov-Ma breathers are only related to the spectral parameter, while the periods of the Akhmediev breathers are not only related to the spectral parameter, but also related to the coefficients of higher-order terms. Akhmediev breathers have phase shifts after the interaction, while the Kuznetsov-Ma breathers have no phase shifts. Higher-order terms could enhance the steepness and symmetry of the rogue waves.

PACS numbers: 05. 45. Yv; 47. 35. Fg; 02. 30. Jr

Keywords: Optical fiber; Sixth-order nonlinear Schrödinger equation; Darboux transformation; Solitons; Breathers; Rogue waves;

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