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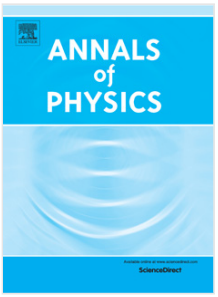

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Dromion-like structures and stability analysis in the variable coefficients complex Ginzburg-Landau equation

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Abstract

The study of the complex Ginzburg-Landau equation, which can describe the fiber laser system, is of significance for ultra-fast laser. In this paper, dromion-like structures for the complex Ginzburg-Landau equation are considered due to their abundant nonlinear dynamics. Via the modified Hirota method and simplified assumption, the analytic dromion-like solution is obtained. The partial asymmetry of structure is particularly discussed, which arises from asymmetry of nonlinear and dispersion terms. Furthermore, the stability of dromion-like structures is analyzed. Oscillation structure emerges to exhibit strong interference when the dispersion loss is perturbed. Through the appropriate modulation of modified exponent parameter, the oscillation structure is transformed into two dromion-like structures. It indicates that the dromion-like structure is unstable, and the coherence intensity is affected by the modified exponent parameter. Results in this paper may be useful in accounting for some nonlinear phenomena in fiber laser systems, and understanding the essential role of modified Hirota method.

Keywords: Ginzburg-Landau equation, Dromion, Instability, Asymmetry

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