Existence Conditions for Stable Stationary Solitons of the Cubic-Quintic Complex Ginzburg-Landau Equation with a Viscosity Term

Woo-Pyo Hong

Department of Electronics Engineering, Catholic University of Daegu, Hayang, Gyongsan, Gyungbuk 712-702, South Korea

Reprint requests to W.-P. H.; E-mail: wphong@cu.ac.kr

Z. Naturforsch. **63a,** 757 – 762 (2008); received August 13, 2008

We report the existence of a new family of stable stationary solitons in the one-dimensional cubic-quintic complex Ginzburg-Landau equation with the viscosity term. By applying the paraxial ray approximation, we obtain the relation between the width and the peak amplitude of the stationary soliton in terms of the model parameters. We find the bistable solitons in the presence of the small viscosity term. We verify the analytical results by direct numerical simulations and show the stability of the stationary solitons. We conclude that the existence condition obtained by the paraxial method may serve as physically more reliable initial condition for stable stationary soliton propagation in the optical system modeled by the one-dimensional cubic-quintic complex Ginzburg-Landau equation with the viscosity term, of which analytical solution is not obtainable with all nonzero parameters.

Key words: One-Dimensional Cubic-Quintic Complex Ginzburg-Landau Equation; Viscosity Term; Existence Conditions for Stationary Solitons; Numerical Simulation.