Stability of dissipative optical solitons in the three-dimensional cubic-quintic Ginzburg-Landau equation

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Résumé en anglais	We report results of a systematic analysis of the stability of dissipative optical solitons, with intrinsic vorticity S=0 and 1, in the three-dimensional complex Ginzburg-Landau equation with the cubic-quintic nonlinearity, which is a model of a dispersive optical medium with saturable self-focusing nonlinearity and bandwidth-limited nonlinear gain. The stability is investigated by means of computation of the instability growth rate for eigenmodes of small perturbations, and the results are verified against direct numerical simulations. We conclude that the presence of diffusivity in the transverse plane is necessary for the stability of vortex solitons (with S=1) against azimuthal perturbations, while zero-vorticity solitons may be stable in the absence of the diffusivity. On the other hand, the solitons with S=0 and S=1 have their stability regions at both anomalous and normal group-velocity dispersion, which is important to the experimental implementation. At values of the nonlinear gain above their existence region, the solitons either develop persistent intrinsic pulsations, or start expansion in the longitudinal direction, keeping their structure in the transverse plane.
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