Bright sink-type localized states in exciton-polariton condensates

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Abstract

The family of one-dimensional localized solutions to dissipative nonlinear equations includes a variety of objects such as sources, sinks, shocks (kinks), and pulses. These states are in general accompanied by nontrivial density currents, which are not necessarily related to the movement of the object itself. We investigate the existence and physical properties of sink-type solutions in non-resonantly pumped exciton-polariton condensates modeled by an open-dissipative Gross-Pitaevskii equation. While sinks possess density profiles similar to bright solitons, they are qualitatively different objects as they exist in the case of repulsive interactions and represent a heteroclinic solution. We show that sinks can be created in realistic systems with appropriately designed pumping profiles. We also conclude that in two-dimensional configurations, due to the proliferation of vortices, sinks do not appear.