Vectorial dark dissipative solitons in Kerr resonators

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We investigate the formation of vector solitons in weakly birefringent high-Q resonators. The presence of nonlinear polarization mode coupling in optical resonators subject to a coherent optical injection allows stabilizing up to two families of bright or dark vector dissipative solitons, depending on dispersion properties of the system. We use coupled Lugiato–Lefever equations to investigate the dynamical properties of interacting laser fields confined in Kerr optical resonators. The normal dispersion regime is considered, and it is shown that in both cases two branches of dissipative solitons coexist and exhibit different peak powers and polarization properties. In these regimes, the input-output characteristics possesses either a bistable or a tristable homogeneous response. The coexistence of two vectorial branches of localized states is not possible without taking into account the polarization degrees of freedom. The stabilization mechanism of these localized states is attributed to a front locking mechanism in the normal dispersion regime, contrary to the case of anomalous dispersion where the underlying cause was modulational instability. Their bifurcation diagrams exhibit a heteroclinic snaking type of instability.

Références

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