

On the global dynamics for some dispersive systems in nonlinear optics

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We consider two family of coupled equations in the context of nonlinear optics, whose coupling terms are given by quadratic nonlinearities. The first system is a perturbation of the classic cubic nonlinear Schrödinger equation by a dissipation delay term induced by the medium (Schrödinger - Debye system). In H^1 - critical dimension, we present recent results about an alternative between the possible existence of blow-up solution or the grow of the Sobolev norm with high regularity with respect to the delay parameter of the system. The problem of existence of formation of singularities in finite or infinite time remains open for this system.

The second model is given by the nonlinear coupling of two Schrödinger equations and we will show the formation of singularities in the L^2 - critical and super-critical cases using the dynamic coming from the Hamiltonian structure. Furthermore, we derive some stability and instability results concerning the ground state solutions of this model.

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