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Optical solitons in nematic liquid crystals: nonlocal and saturation effects

Abstract:

We will discuss mathematical models for laser light propagation in nematic liquid crystals, and some of the simplified nonlinear Schrödinger equation (NLS) models used to describe self-focusing of a near-monochromatic beam propagating through a suitably prepared liquid crystal sample. This self-focusing effect leads to stable optical solitons.

We consider a model where the NLS equation is coupled to nonlinear elliptic equation for the director field response, and show a saturation of the director angles for arbitrary laser electric field. We use the analysis of the elliptic problem to show the existence of energy minimizing soliton solutions above a power threshold and to study well-posedness of the system.