

Self-Organisation in Optical Media with Competing Nonlinearities

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I will present recent work on nonlinear light propagation in the presence of competing local and nonlocal nonlinearities. Such system could be realized in a gas of thermal alkaline atoms. Apart from spatial soliton formation, the different length scales of the nonlocality can give rise to filamentation and subsequent self-organised lattice formation in the beam profile, akin to the super-solid phase transition in Bose-Einstein condensates. The particular role of optical vorticity in the process of the pattern formation will be emphasized. After that, I will discuss creation and nonlinear dynamics of imprinted topologically complex knotted vortex lines in Bose-Einstein condensates.