High-Dimensional Nonlinear Envelope Equations and Nonlinear Localized Excitations in Photonic Crystals

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Abstract: We investigate the nonlinear localized structures of optical pulses propagating in a one-dimensional photonic crystal with a quadratic nonlinearity. Using a method of multiple scales we show that the nonlinear evolution of a wave packet, formed by the superposition of short-wavelength excitations, and long-wavelength mean fields, generated by the self-interaction of the wave packet, are governed by a set of coupled high-dimensional nonlinear envelope equations, which can be reduced to Davey-Stewartson equations and thus support dromionlike high-dimensional nonlinear excitations in the system.

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