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Multi-hump bright solitons in a Schrödinger–mKdV system

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Abstract

We consider the problem of energy transport in a Davydov model along an anharmonic crystal medium obeying quartic longitudinal interactions corresponding to rigid interacting particles. The Zabusky and Kruskal unidirectional continuum limit of the original discrete equations reduces, in the long wave approximation, to a coupled system between the linear Schrödinger (LS) equation and the modified Korteweg–deVries (mKdV) equation. Single-and two-hump bright soliton solutions for this LS–mKdV system are predicted to exist by variational means and numerically confirmed. The one-hump bright solitons are found to be the anharmonic supersonic analogue of the Davydov's solitons while the two-hump (in both components) bright solitons are found to be a type of soliton consisting of a two-soliton solution of mKdV trapped by the wave function associated to the LS equation.

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