

Short Wave-Length Dynamics of a String on Asymmetric Nonlinear Supports

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Contrary to conventional approach to nonlinear dynamics of the string on symmetric nonlinear elastic foundation dealing with long wave-length vibrations, we present a study of short wave-length dynamics taking into account discreteness of elastic supports and asymmetry of their nonlinear characteristics. The approach is based on the transition to complex representation of dynamical equations and use of multiple scale expansions. In our calculations the infinite weightless string with uniformly distributed concentrated masses is supposed to be supported by asymmetric nonlinear anchor springs, spatial distribution of masses being coincided with that for the springs. Potential energy of the springs is described by a fourth power polynomial. In main asymptotic approximation we obtain two continuous equations of motion with respect to complex combinations of the envelopes of displacements and velocities. In important particular cases these equations coincide with the system of coupled Nonlinear Schrodinger Equations and have localized soliton-like solutions. The comparison with numerical results is also made.

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