

WAVE DYNAMICS OF IMPULSE PERTURBATIONS IN 1D FORCE-CHAINS

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The problem of pulse transport in 1D force chain with nonlinear interparticle contacts analyzed in details [1-3]. It is shown that altogether with a set quasi-normal modes with power-law decaying amplitudes exist also a resonance solution which displayed in long-wave limit of governing equations [3,4]. This specific solution purposed to be interpreted as a parametric resonance which occur when wave velocity succeed a definitive value. Also, considered class of governed equations are satisfied by autowave solutions. The role of confinement and inhomogeneity (which can be produced by external field, and/or decoration) has been analyzed. We present the obtained results in analytical form which make possible necessary parameterization for practical applications (for instance in the problem of pulse/energy transport in micro-mechanical materials like granular systems).

We conclude that wave dynamics which developed in 1D force chain with inhomogeneities and nonlinear contacts display a multiscale character with transitions between linear (normal-mode) and nonlinear (soliton-like) modes depends on relations between the parameters of confinement, perturbation, nonlinearity, disorder and some others.

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