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Stationary Energy Partition between Waves in a Carbyne Chain

Authors: Svetlana Nikitenkova, Dmitry Kovriguine

Abstract: Stationary energy partition between waves in a one dimensional carbyne chain at ambient temperatures is investigated. The study is carried out by standard asymptotic methods of nonlinear dynamics in the framework of classical mechanics, based on a simple mathematical model, taking into account central and noncentral interactions between carbon atoms. Within the first-order nonlinear approximation analysis, triple-mode resonant ensembles of quasi-harmonic waves are revealed. Any resonant triad consists of a single primary high-frequency longitudinal mode and a pair of secondary low-frequency transverse modes of oscillations. In general, the motion of the carbyne chain is described by a superposition of resonant triads of various spectral scales. It is found that the stationary energy distribution is obeyed to the classical Rayleigh-Jeans law, at the expense of the proportional amplitude dispersion, except a shift in the frequency band, upwards the spectrum

Keywords: resonant triplet, Rayleigh-Jeans law, amplitude dispersion, carbyne

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