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Stationary Energy Partition between Waves in a Carbyne Chain

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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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