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# On solitary waves in diatomic lattices

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## Abstract

We consider a mass-spring chain of alternating particles of different masses. At generic mass ratios, pulses propagating through the chain radiate lattice waves traveling behind them, thus precluding formation of genuine solitary waves. However, numerical simulations and some recent work on strongly nonlinear granular chains suggest that under certain conditions there is a sequence of special 'anti-resonance' values of mass ratio at which there is no radiation and solitary waves do exist. Using multiscale asymptotic analysis, we find a Fredholm-type condition for mass ratios approximating such values. The condition is explicit for the diatomic Toda lattice, where the obtained small-ratio approximate values are in good agreement with the numerical results.

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