Quantum Physics

# Collective versus Single--Particle Motion in Quantum Many--Body Systems from the Perspective of an Integrable Model

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We study the emergence of collective dynamics in the integrable Hamiltonian system of two finite ensembles of coupled harmonic oscillators. After identification of a collective degree of freedom, the Hamiltonian is mapped onto a model of Caldeira-Leggett type, where the collective coordinate is coupled to an internal bath of phonons. In contrast to the usual Caldeira-Leggett model, the bath in the present case is part of the system. We derive an equation of motion for the collective coordinate which takes the form of a damped harmonic oscillator. We show that the distribution of quantum transition strengths induced by the collective mode is determined by its classical dynamics.

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*Which authors of this paper are endorsers?*