Quantum Decoherence of Macroscopic Object Induced by Inner Environments: an Exactly Solvable Model

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Abstract: We revisit the quantum decoherence problem of the center of mass motion of a macroscopic object, which is modelled as a one-dimensional atom chain. Induced by the coupling of the center of mass (C.M) motion with the inner degrees of freedom, this inner-environment-induced decoherence is reflected by the localization of the C.M wave packet. We show that, the C.M motion is coupled to the inner states only when the chain has interaction with the external potential. This result provides a realistic mechanism for the analysis of the inner-environment-induced localization of a macroscopic object.

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