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Quantum Localization of Vibrational Mirror in Cavity Optomechanics

Authors : Madiha Tariq, Hena Rabbani

Abstract : Recently, cavity-optomechanics becomes an extensive research field that has manipulated the mechanical effects of light for coupling of the optical field with other physical objects specifically with regards to dynamical localization. We investigate the dynamical localization (both in momentum and position space) for a vibrational mirror in a Fabry-Pérot cavity driven by a single mode optical field and a transverse probe field. The weak probe field phenomenon results in classical chaos in phase space and spatio temporal dynamics in position |ψ(x)²| and momentum space |ψ(p)²| versus time show quantum localization in both momentum and position space. Also, we discuss the parametric dependencies of dynamical localization for a designated set of parameters to be experimentally feasible. Our work opens an avenue to manipulate the other optical phenomena and applicability of proposed work can be prolonged to turn-able laser sources in the future.

Keywords : dynamical localization, cavity optomechanics, Hamiltonian chaos, probe field
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