Dynamics of quantum coherence of two-mode Gaussian systems in a thermal environment

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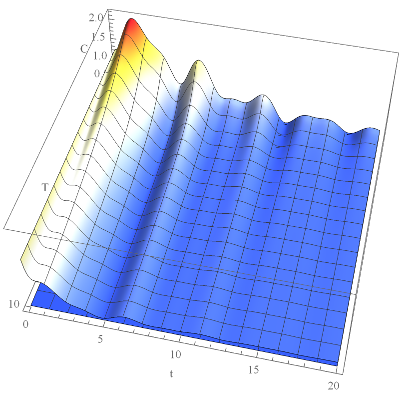
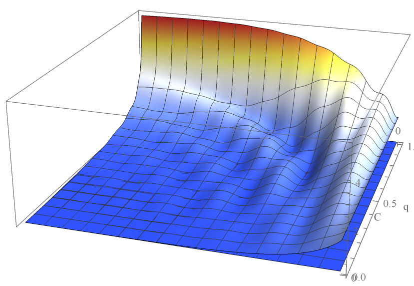
Abstract

We give a description of the time evolution of the quantum coherence by using the relative entropy of coherence for a system consisting of two coupled non-resonant bosonic modes immersed in a thermal environment.

An impressive progress in the development of quantum information theory is reached presently from the quantum resource theory approach to quantum correlations, like entanglement, discord and steering [1, 2, 3], and to quantum coherence. Recently, a framework for the quantification of coherence has been established [4], in which quantum coherence is treated as a resource in a manner similar to quantum entanglement. In this work we address the quantification of coherence in Gaussian open systems [5], in the framework of the theory of open systems based on completely positive quantum dynamical semigroups.

We give a description of quantum coherence by using the relative entropy of coherence for a system consisting of two coupled non-resonant bosonic modes immersed in a thermal environment. We discuss the influence of the reservoir on the time evolution of the quantum coherence in terms of the covariance matrix for initial squeezed thermal states. We show that the dynamics of the quantum coherence strongly depends on the initial states of the subsystem (squeezing parameter and thermal photon numbers), the frequencies of the modes, the parameters characterizing the thermal reservoir (temperature and dissipation coefficient) and the intensity of the coupling between the two modes [6]. In the figures below it is illustrated the dependence of the quantum coherence C on time t and the temperature T of the thermal environment (left), respectively on time t and intensity q of the coupling between the modes (right).





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