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Decoherence-assisted transport in a dimer system

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<p>The transfer of energy and information in quantum networks plays an important role in both quantum communication and quantum computation. The quantum system inevitably interacts with the surrounding environment, and such interaction leads to dissipation and decoherence, which are processes typically associated with a destruction of quantum coherence in the system. However, recently evidence of surprisingly long-lived quantum coherence has been identified in conjugate polymers and in photosynthetic light harvesting complexes.

Here, the dynamics of a dimer under the influence of decoherence are studied. An exact analytical expression for the transition probability in the dimer system is obtained for different situations, i.e., for the dimer coupled to two independent environments, and coupled to two correlated environments, both in a spin star configuration. In all cases considered, it is shown that there exist well-defined ranges of parameters for which decoherent interaction with the environment assists energy transfer in the dimer system. In particular, it is found that correlated environments can assist energy transfer more efficiently than separate baths.

This simple and analytically solvable model for energy transfer in a dimer system is easily extendible to more complex quantum networks, and more complex environmental models.

Level (Hons, MSc,
   PhD, other)?

PhD

Consider for a student
   award (Yes / No)?

Yes

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

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