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Non-Markovian entanglement dynamics of continuous measurement feedback open quantum system in structured bath

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In the past two decades, entanglement has attracted much attention continuously for its potential use as the key resource of quantum computation and quantum information. Due to decoherence of a system coupling to its environment or bath, entanglement degradation is unavoidable. In this work we investigate the entanglement dynamics of two two-state quantum systems coupling to a Bosonic mode and a common structured bath. Here the Bosonic mode, which is resonantly driven by a classical filed and heavily damped by a broadband reservoir, acts as a probe resonator for the use of continuous quantum measurement feedback, and the bath has one of three different structures characterized by the Ohmic types of spectral densities. We proceed by using hierarchical equations of motion (HEOM) approach. We present the master equation of the reduced density matrix for the system investigated and, accordingly, the HEOM for auxiliary operators. The HEOM calculation shows that the quantum measurement feedback plays a positive role in the entanglement generation, and the non-Markovian effect of the bath could greatly enhances this action, increasing the entanglement by 50% in the case of, for example, the Ohmic bath. We reveal in detail the dependence of the scheme performance on the spectral density parameters, the temperature of the bath, and the measurement feedback. The numerical results are obtained with the HEOM truncated at the 3rd order, which are equal to those obtained with the 6th order perturbation theory.

Recent Publications

1. Guo Zhu Song, Fang Zhou Wu, Mei Zhang and Guo Jian Yang (2016) Heralded quantum repeater based on the scattering of photons off single emitters using parametric down-conversion source. Scientific Reports DOI: 10.1038/srep28744.
2. Tianhui Qiu and Guojian Yang (2015) Electromagnetically induced angular Talbot effect. Journal of Physics B: Atomic, Molecular and Optical Physics 48(24):245502.
3. Min Xie, Fangzhou Wu, Peng Wu and Guojian Yang (2015) Generation and stabilization of entanglement in a cascaded atoms–cavity system. Quantum Information Processing 14(7):2477–2485.
4. Tao Li, Guo Jian Yang and Fu Guo Deng (2014) Entanglement distillation for quantum communication network with atomic-ensemble memories. Optics Express 22:23897.
5. Tianhui Qiu and Guojian (2014) Efficient generation and transfer of entanglement encoded in different photonic degrees of freedom by Raman interaction. Physical Review A 89:052312.

Biography

Wei Jaing is a Doctoral student of Physics Department, Beijing Normal University. He has graduated from Central South University and has got a Bachelor's degree of Electronic Information Engineering. His research field is non-Markovian effect in quantum optics.

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