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Bipartite Quantum Entanglement in Correlated Spontaneous-Emission Laser

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ABSTRACT

Bipartite quantum entanglement has numerous practical applications in quantum computation and communication. Here, we study the temporal evolution of bipartite entanglement of a two-mode Gaussian state at the output of a correlated spontaneous-emission laser. The lasing medium is coupled with a strong classical field and two quantized modes of the cavity field, which are initially considered in two arbitrary single-mode Gaussian states. The influence of various parameters of the system on the bipartite entanglement of the two-mode Gaussian state is analyzed in detail. In presence of the cavity damping rates, we show that the amount and the time evolution of entanglement increase with the non-classicality of the initial states. However, the purity of the initial states shows the absence of obvious effects on the entanglement dynamics. Further, the time interval of entanglement enhances with the Rabi frequency of the classical pump field. In addition, the photon number statistics of the two evolved modes of the cavity field is studied.

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