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Enhanced squeezing and entanglement in nondegenerate three-level laser coupled to squeezed vacuum reservoir. (English) [Zbl 1480.81070](#)

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Summary: Squeezing and entanglement of a two-mode cascade laser, produced by a three-level atom which is initially prepared by a coherent superposition of the top and bottom levels then injected into a cavity coupled to a two-mode squeezed vacuum reservoir is discussed. I obtain stochastic differential equations associated with the normal ordering using the pertinent master equation. Making use of the solutions of the resulting differential equations, we determined the mean photon number for the cavity mode and their correlation, EPR variables, smallest eigenvalue of the symplectic matrix, intensity difference fluctuation, and photon number correlation. It is found that the squeezed vacuum reservoir increases the degree of the statistical and nonclassical features of light produced by the system. Furthermore, using the criteria developed by logarithm negativity and Hillery-Zubairy criteria, the quantum entanglement of the cavity mode is quantified. It is found that the degree of the entanglement for the system under consideration increases with the squeezing parameter of the squeezed vacuum reservoir.

MSC:

- 81R30 Coherent states
- 81P40 Quantum coherence, entanglement, quantum correlations
- 78A60 Lasers, masers, optical bistability, nonlinear optics
- 81S22 Open systems, reduced dynamics, master equations, decoherence
- 35R60 PDEs with randomness, stochastic partial differential equations
- 81P42 Entanglement measures, concurrencies, separability criteria

Full Text: [DOI](#)

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