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Properties of Entropy and Entanglement of Two-Mode Nonlinear Coherent States

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Abstract: In this communication, two-mode nonlinear coherent states are reviewed and special cases are given. Starting from a three-level atom coupled to two modes of radiation with any form of nonlinearities of the two-mode fields, we derive a Raman-coupled effective Hamiltonian by a unitary transformation, evaluated perturbatively in coupling constants. We use the quantum entropy to measure the degree of entanglement in the time development of an effective two-level atom interacting with two-mode nonlinear-coherent states. The results show that the nonlinearity effect yields the superstructure of atomic Rabi oscillations and the effect of the Stark shift changes the quasiperiod of the field entropy evolution and entanglement between the particle and the field. A possible experimental test of a new effect is proposed.

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