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Effect of dielectric medium on the nonclassical properties of nonlinear sphere coherent states

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Abstract

In order to investigate the effect of a medium with dissipation and dispersion and also the curvature of the physical space on the properties of the incident quantum states, we use the quantization of electromagnetic field based on phenomenological approach to obtain input-output relations between radiations on both sides of dielectric slab. By using these relations the fidelity, the Wigner function, and also the quantum correlation of the outgoing state through dielectric slab are obtained for a situation in which the rightward incident state is a nonlinear coherent state on a sphere and the leftward incident state is a vacuum state. Here, the incident states are considered monochromatic and the modeling of the medium is given by the Lorentz' model. Accordingly, we study nonclassical properties of the output states such as the quantum entanglement. It will be observed that the nonclassical properties of the outgoing states depend strongly on the optical property of the medium and also on the curvature of the physical state.

Keywords: quantization of electromagnetic field, dissipation, Wigner function, quantum entanglement, mutual entropy

For full article, refer to the Persian section