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Entanglement and pancharatnam phase of a four-level atom in coherent states within generalized Heisenberg algebra

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We consider a four-level atom (FLA) interacting with a field mode that is initially in a coherent state associated with a generalized Heisenberg algebra (CSGHA). The dynamical behavior of quantum entropy, the Pancharatnam phase, and the Mandel parameter are investigated. The statistical and nonclassical properties of the field in regard to its CSGHA are discussed through the evolution of the Mandel parameter, and the effects of the initial atomic state position and time-dependent coupling given in terms of atomic speed and acceleration are examined. The results show that the CSGHA strength and time-dependent coupling based on the atomic speed and acceleration have the potential to affect the time evolution of the entanglement, the Pancharatnam phase, and the Mandel parameter.

Biography

Haifa S Alqannas is a Professor in Physics at King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.

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