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A four-level atom enclosed in an optical cavity with multiphoton transition in the steady-state regime

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Abstract

The mechanism of a four-level atom confined in a single-mode optical cavity with multiphoton transition is theoretically investigated in the steady-state. The behavior of the atom-cavity system is delineated by the master equation which in order to solve this equation, a set of expected values of a series of operators has been used. To solve numerically this set of coupled expectation values, the matrix continued fractions method is used. How the changes of the physical quantities including the atomic population inversion, mean photon number and second-order correlation function have been studied for any transition. Finally, the process of converting the four-level atom to a three-level one under several specific conditions is discussed for each transition.

Keywords: four-level atom, optical cavity, master equation, matrix continued fractions, lasing

For full article, refer to the Persian section