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Dynamics of quantum coherence and Hilbert-Schmidt speed of V-type three-level atom in anisotropic photonic crystal

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Abstract

In this paper, the time evolution of quantum coherence and Hilbert-Schmidt speed, as a criterion to measure the memory of the quantum system, of a V-type three-level atom embedded in an anisotropic photonic crystal are investigated. The effect of the different relative positions of the upper levels from the forbidden gap and the initial relative phase values on the mentioned quantum features are studied. We show that the photonic band gap crystal, as a structured environment, significantly influences the preservation and enhancement of these quantum features. The photonic gap band materials have non-Markovian properties and offer a new approach as a basic solution in overcoming the decoherence problem and subsequently in problems related to quantum information.

Keywords: anisotropic photonic crystal, quantum coherence, Hilbert-Schmidt speed

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