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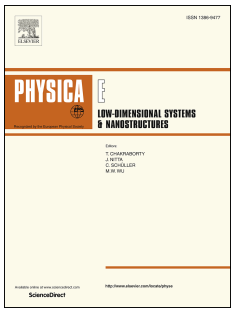

Quantum entanglement analysis of an optically excited coupling of two nuclear spins via a mediator: Combining the quantum concurrence and negativity

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Quantum entanglement analysis of an optically excited coupling of two nuclear spins via a mediator: combining the quantum concurrence and negativity

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Abstract

In this paper, we investigate the characteristics of the nuclear spin entanglement generated by an intermedium with an optically excited triplet. Significantly, the interaction between the two nuclear spins presents to be a direct XY coupling in each of the effective subspace Hamiltonians which are obtained by applying a transformation on the natural Hamiltonian. The quantum concurrence and negativity are discussed to quantitatively describe the quantum entanglement, and a comparison between them can reveal the nature of their relationship. An innovative general equation describing the relationship between the concurrence and negativity is explicitly obtained.

Keywords: optically excited entanglement, two nuclear spins, concurrence, negativity

1. Introduction

All along, the generation of controllable entanglement is a crucial task in quantum computing, quantum information and other quantum technologies. Studies show that controllable entanglement operations can be achieved in a wide range of systems, such as pairs of ions, pairs of atoms, pairs of photons, between a photon and an atom, and between a photon and an ion.[1, 2, 3, 4] However, different approaches usually should be adopted for these different systems, and it is not easy to transfer a given method to different physical systems. Employing molecular systems realizes the high reproducibility. Generally speaking, nucleon spin is widely regarded as the most promising type of qubit to be used as the basis for quantum memory because nucleon spins have a long coherence

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