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On the phase-space analysis of photon mediated quantum state transfer in nanophotonic waveguidance

Abstract

A cavity quantum electrodynamics (QED) based approach for transferring quantum state between quantum nodes has been proposed, wherein a rubidium (87Rb) atom trapped inside a two-mode optical cavity forms the quantum node and photons serve as the information carrier between two such nodes. Information is encoded into polarized photon states generated through the application of a system of lasers. The focus is made on the phase-space analysis of the approach, wherein two subspaces of the hyperfine energy levels with magnetic sub-levels of rubidium (87Rb) atom represent the logic states '0' and '1'. The system of lasers initiates a cavity assisted Raman process which, in turn, generates a right- or left-circularly polarized photon depending on the logic state of the transmit node. Once the photon is received (at the receive node), the logic state of the transmit node is restored into the receive node through a cavity QED process.

Keywords

Cavity quantum electrodynamics; Electromagnetic optics