

On the investigation of quantum evolution of a single photon wavepacket: A simulation approach

Abstract

Investigation into photon wavepacket is fundamental to the deep understanding of electromagnetic fields as well as light-matter interaction. We studied quantum evolution of a photon wavepacket using numerical simulation. We devised a Hilbert space with sinusoidal basis functions and computed vector elements of the photon wavepacket in the Hilbert space through Fourier transform. We also formed the associated Hamiltonian in the matrix form and derived equations for time evolution of the wavepacket from standard Schrodinger equation. Finally, we performed simulation of the quantum evolution of the wavepacket through repeated application of the Hamiltonian on it. Simulation results showed efficacy of the approach.

Keywords

Hilbert space; Photon wavefunction; Photon wavepacket; Quantum evolution