



Figure Tu14P-26

LOQC Grover's algorithm implementation with two-qubit KLM gate

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Linear Optical Quantum Computing (LOQC) plays important role in quantum information science as one of the physical platforms for universal quantum computing. Compared to superconducting implementations it has much longer coherence times and simplicity of qubit encoding. However, there are limitations that stand before LOQC on its way to become a platform for solving problems with quantum superiority. We present modeling Grover's algorithm realized on a linear optical chip. We proposed Grover's algorithm optical scheme which can be integrated into a chip. Our analysis shows that it is necessary to use KLM CZ gates instead of two-photon CZ gates with higher success probability, due to because mode matching errors of the latter. We modeled the algorithm performance taking into consideration directional coupler distortions in Hadamard gates and single-photon generation and detection efficiencies. Finally we determined algorithm tolerances against distortions in technological parameters of directional couplers. These results can be

kept still for lengthy times it could be rather preferable to make them embedded into a transparent host material. We investigate how presence of the host media can influence the fluorescence intensity and its spectral composition and how it can interfere into the dipole-dipole interaction. We built our theory with the use of the Bogolubov-Born-Green-Kirkwood-Yvon (BBGKY) hierarchy of equations for reduced density matrices and many-particle correlation operators written for a multicomponent system which includes material light emitters, constituents of the host and photons. This formalism gives a fully microscopic approach to solving the problem and considers the individual and collective behavior of the emitters. Using this approach, we derive the terms describing the dipole-dipole interaction, the decay rates, and the local field characteristics. Within the hierarchy we show a direct path to calculating photoluminescence excitation and emission spectra. The parameters of the material equations take effective values which are functions of dispersive and absorptions properties of the host medium. The method based on the BBGKY hierarchy allows us to describe some collective effects in optics without using phenomenology and avoid some of the traditional assumptions. We have derived the equations for atomic (emitters and host particles) and field density matrix operators and also the correlation matrix to describe the interaction between the emitting pair and the media. This study was supported by the Russian Science Foundation (Project no. 17-72-20266).

come a basis for a physical implementation of the Grover's algorithm in integrated waveguide circuits.

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Fluorescence Excitation and Emission Spectra Shown by Two Coupled Light Emitters Confined in a Dielectric Host

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In this work we investigate the effect of the host media on the spectral properties of a pair of light emitters separated by a distance smaller than the excitation/emission wavelength for which the dipole-dipole interaction is important. In experiments where positions of the particles under study are to be adjustable or

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Cavity-Assisted Atomic Raman Memories Beyond the Bad Cavity Limit: Effect of Four-Wave Mixing

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Quantum memories can be used not only for storage of quantum information but also for a substantial manipulation of ensembles of quantum states. Therefore, the speed of such manipulation and the ability to write and retrieve signals of relatively short duration becomes important. One approach towards enhancing the performance of a quantum memory is to combine active medium with an optical cavity. Previous works investigating cavity-enhanced memories concentrated on noise processes in the bad cavity limit, that is, for signals that are much longer than the cavity field lifetime.

In this work we investigate [1] four-wave mixing noise that arises from the retrieval of relatively short signals from cavity-assisted memories, thus complementing recent works by other authors [2,3]. We assume that the memory channel is supported by the cavity, and the luminescence channel which generates deleterious four-wave mixing noise is partially off-resonant. We propose an approach that allows one to account for noise sources of different frequencies and different physical origin, including atomic relaxation, by using two-