J Phys Chem Biophys 2018, Volume 8
DOI: 10.4172/2161-0398-C2-032

4th International Conference on Physics

Induced cooperative Raman lasing and entanglement between the mode components of cavities

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We focus our investigation on possibilities of elaboration of two or three modes lasing effect in the cavity in the process of cooperation between the pump, Stokes and anti-Stokes modes during the induced Raman scattering process. The phenomenon of quantum collectivization of photons scattered between three modes: pump, Stokes, and anti-Stokes modes occur due to energy transfer between these waves according to the corpuscular theory of light. It was established the quantum properties of the field in the resonator containing all three field modes pump, Stokes and anti-Stokes. According to the conception of minimization of the energy of interaction between these three waves, we indicate the possibility of quantum coherence between Stokes and anti-Stokes modes, which possesses the new properties and possibilities for quantum processing of information introduced in the amplitude (or phase) of a bimodal field. The new coherent model shows us the existence of fixed amplitude and phase of the electrical component product of these two waves. This effect opens the new possibilities in re-coherent optical phenomena and its application in the processing of information. The possibility of increasing of the collective decay rate of the entangled photon pairs generated by the system relative the dipole-forbidden transition is founded. One of them corresponds to the situation when the total energy of emitted photons by two dipole-active radiators which enter into the two-photon resonance with the dipole-forbidden transitions of the third atom. The second effect corresponds to the scattering situation when the differences of the excited energies of two dipole-active radiators are in the resonance with the dipole-forbidden transitions of the third atom. It is shown that the transfer of the excited energy between two quantum oscillators off from resonance takes place through dipole forbidden transitions of thread atom.

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