J Astrophys Aerospace Technol 2018, Volume 6
DOI: 10.4172/2329-6542-C3-024

Generation and coherent proprieties of entangled bi-modal field and its application

Nicolae A Enaki
Institute of Applied Physics, Moldova

It is investigated the application of coherent emission of two subgroups of quanta obtained in the cooperative decay of excited enable of radiator (nuclei, atoms or molecules) mixture, so that correlation appears between the blocks of quanta belonging to different modes of the electromagnetic field. It is proposed the new effect, in which the two-quantum cooperative emission is established between the two sub-ensemble of excited radiators (see Fig. 1 A and B). The equidistant two-level sub-ensemble, excited relative the dipole forbidden transition, can be ignited in two-quantum super radiance regime by single-photon decay process of dipole active species of radiators. We chose the situation in which the one-photon Dicke cooperative emission is inhibited by large emission band of the dipole active sub-ensemble. In this situation the new three particle exchange integrals between the dipole forbidden and dipole active sub-ensembles drastically increases. So the cooperative emission of the dipole-forbidden sub-ensemble of atoms stimulates the two-quantum emission of dipole-active species of radiators. This cooperative process between the dipole-forbidden radiators and dipole-active sub-ensemble is accompanied by the establishment of the coherence between the photon pairs. The multi-mode broadband light can be reduced to the coherent states of the bimodal ensemble of the electromagnetic field. The method of recording of information from such a coherent field opens the new perspectives in stimulation gamma emission, quantum cryptography and quantum information. At the first glance, one observes that such coherent effects may have nothing new in comparison with the traditional one- photon coherence. But the two-quantum coherent beam may be destroyed or restored if the photon-pair pulses pass through a disperse medium. So the "idler" photons from each pair change their directions relative to "signal" photons. Focusing the "signal" and "idler" photons into different optical fibers, we can destroy the coherence among the bi-photons. However, after a certain propagation distance, the "idler" and "signal" photons from the pairs may be mixed again and we may observe, that the restoration of coherence propriety of the bimodal field.

Fig: A. The mutual cooperative effects in two-photon transitions between the dipole-active atoms S and R and dipole forbidden transition of D atoms; B. The similar mutual transitions between dipole active atoms D subsystem in scattering process

Biography

From 1981 to 1985 Nicolae A. Enaki was the post-graduate student of the radio-physics department, Physics Faculty of Lomonosov State University from Moscow. Here he was focused on the subject of PhD dissertation "Quantum Statistics of superradiance in an extended system of radiators". After that N Enachi continues the studies of the quantum statistical properties of radiation in "Single- and two-photon cooperative processes in optics" (the theme of Dr. Habilitatus dissertation, 1993). Scientific advisor of Quantum Optics and Kinetic Process Lab in Institute of Applied Physics, Chishinau, R. Moldova. As a professor in physics, his lessons are reflected in the monograph "Nonlinear Cooperative effects in open quantum systems: entanglement and second-order coherence", published in Nova Science Publishers, NY, USA, 2015, 325 pp, which of course reflects his research Interests. At this moment he is scientific advisor of two international grants: NATO SPS and STCU.

Notes:

enakinicolae@yahoo.com