Soliton solution of generalized kinetic equation for many particle Jaynes-Cummings model

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Jaynes-Cummings model [1] is considered as a system of including N two-level bosons interacting with multi electromagnetic field modes as known as Tavis-Cummings model. Study dynamics of system of including N two-level bosons interacting with multi electromagnetic field modes is an actual. For this purpose in the present work we consider a dynamics of the macroscopic system as consisting of N two-level atoms interacting with multi cavity field modes. For definition dynamics of such a system we use method of formulation of the generalized kinetic equation with the following its solution, offered for the first time N.N. Bogolubov and N.N. Bogolubov Jr. in work [2], which was devoted to study electron-phonon interaction.

There is an interest also, determination of the condition under implementation which generalized kinetic equation has a solution in the manner of solitons. For this purpose system is considered, consisting of N two-level particles interacting with multi photons [3]. Having limited consideration one-photon transition, for this system generalized kinetic equation is derived and under the condition of the weak interaction between particles and field for one dimensional case, condition is defined which solution of generalized kinetic equation is reduced to solution of the nonlinear Schrödinger equation.

[1] E. T. Jaynes, F. W. Cummings, *Proc. IEEE* **51**, 89 (1963).

[2] N. N. Bogolubov, N. N. Bogolubov Jr., *Physics of Elementary Particles and Atomic Nuclei* **11**, 245 (1980).

[3] N. N. Bogolubov Jr., M. Yu. Rasulova, I.A. Tishabaev, *Theoretical and Mathematical Physics* **171**, 116 (2012).