Time dispersion in the Bogolyubov reduced description method

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The Bogolyubov reduced description method is widely used to construct time equations for parameters of description of macroscopic systems. In this paper the method of reduced description of the nonequilibrium states is applied for consideration of the electromagnetic field (EMF) in a nonrelativistic thermostat from the charged particles of few sorts. Strength of the electric field and vectorial potential in the Hamilton gauge are selected as parameters of the EMF description, which satisfy the Peletminsky-Yatsenko condition that is had oscillated dependence on time. The main idea of the paper consists in the selection of harmonious oscillations with frequency ω_k characterized a selected process as the main characteristic of the EMF time evolution. For this purpose at construction of perturbation theory the following main EMF hamiltonian is selected: $H_0 = \frac{1}{8\pi}\int d\vec{x}\left(\vec{E}^2(\vec{x}) + \frac{1}{c^2}\int d\vec{x}'\omega^2(\vec{x}-\vec{x}')\vec{A}(\vec{x})\vec{A}(\vec{x}')\right)$. Proper to the interaction of EMF with a thermostat hamiltonian is considered small. The use in the current following after the second approximations is considered in an electrodynamics as the account of nonlinearity, that will give the high degrees of strength and potential of EMF. But absence of nonequilibrium correlations among the parameters of the EMF description is assumed. Only in this case it is possible to get rid of dependence of current on the magnetic field (or vectorial potential) through equation of bond, that will result in expression of potential in interaction picture only through strength. In agreement with the Peletminsky-Yatsenko condition we search the solution as a plane monochromatic wave. Within the second order an electric current is linear on EMF. First by the Bogolyubov method dispersion equations are found not only for short transversal waves but also for long-wave and low-frequency, both longitudinal and transversal EMF. Permeability, that is expressed through the Green functions, is coincided with obtained from other methods. For nonrelativistic limit it is possible to rewrite the interaction hamiltonian through operators of strength of the field, that gives the type of equations of nonlinear electrodynamics absolutely identical to phenomenological.