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Analysis of the Third Harmonic of a Vacuum Response in a Subcritical Laser Field

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We investigate nonlinear response of the physical vacuum by the example of the third harmonic in radiation of the electron-positron-photon (EPP) plasma exciting by a strong time dependent electric field at the focus spot of counterpropagating laser pulses. The investigation was developed within the framework of the Bogoliubov-Born-Green-Kirkwood-Yvon kinetic theory [1,2] describing nonperturbatively vacuum creation of the electron-positron (EP) quasiparticle plasma (reviews [3-5]) and different channels its interaction with the photon subsystem in the single-photon approximation that are opened in the presence of a strong semi-classical field [6]. The corresponding closed self-consistent system of kinetic equations for the EP and photon subsystems is intended for description of the single-photon annihilation (pair production) and emission (absorption) processes.

Some preliminary results on this basis were obtained in the works [1,2] in the infrared region of the radiation in the annihilation channel (see also [7]). In the present report we show the results of detailed study of the third harmonic on the frequency of laser field in the spectrum of induced quantum radiation of the EPP plasma and compare it with the third harmonic in the radiation of the semi-classical field induced by inner plasma currents [8].

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