THE APPLICATION OF GREEN FUNCTIONS METHOD TO THE THEORETICAL DESCRIPTION OF HYPERRAMAN SCATTERING LIGTH PHENOMENON.

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The non-linear effects can be classified to the number of quasi-particles which participate in an elementary act. Raman scattering process is characterized by participation of three quasi-particles. There are two photons and one phonon. Hyperraman Scattering covers the participation of four quasi-particles. There are two photons of primary radiation, one photon of resulted radiation and one phonon. The energies of the mentioned quasi-particles are connected with the law of energy conservation.

The consideration is presented within the theory of polyaritons which represent themselves the so-called "hybrids" of electromagnetic waves and electronic or vibration states. This effect was being considered earlier with the help of the method of perturbation. However, a lot of unsolved problems have been left.

As it was mentioned in literature (see for example [1]), the contribution into the effects of the fourth order causes a great deal of mechanisms. They are:

 a) the interaction of the cross-photons field with the crystal charges;
 b) the interaction of Coulon exitations;
 c) the kinematic interaction;
 d) the cascade processes.

The mentioned above mechanisms happen to be to some extent actual being observed in different spectrum intervals. The contributions they cause can be divided using the polarization measurements as well as by measuring the frequency dependency for the primary and scattering radiation.

The Green function method has been applied earlier to the Raman scattering [2] and a lit of interesting results have been obtained. The given paper presents the application of this method to hyperraman scattering, which can be considered as the effect of higher order and allows to study the following phenomena:

 the highest approximations of the theory of perturbation.
 to avoid a lot of difficulties, which happen in case when the frequency of the primary and scattering radiation is met at the absorption line.

These difficulties are caused by getting the separated expressions in the formula for the intensity of the scattering radiation.

At the definite conditions Hyperraman scattering causes the photons of scattering the light on flu light when two photons with the frequencies w and w_2 are transformed into two another w_3 and w_4. There is the connection between these frequencies: $w_1 + w_2 = w_3 + w_4$. It is caused by the law of energy conservation.

All mentioned above concerning the Hyperraman scattering can be applied to the phenomenon of scattering the light on the light. The given paper presents the practical recommendations concerning the experiments of observations the mentioned effects.

References:
1. P.A. Korotkov, L.N. Ovander, N.S. Tue. Raman-effect in the molecular crystals, Edition ZITI, Zhitomir, Ukraine, 2000, h.226. (in Russian) www.ziet.zhitomir.ua/ua/faculty/fim/Kaf_phis.html
2. L.N. Ovander and V.A. Shadura. J.Raman Spectrosc.**32**, 587 (2001).