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Opinion

Light beams, photons, axions

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The question of the interaction of light with small particles, with molecules, atoms in gases, in liquids has been considered by many authors in the scientific literature. As a rule, this is elastic, Raman, or Rayleigh scattering. The frequency of the scattered light in the first case is the same as that of the incident, and in cases 2 and 3, the spectrum of scattered radiation is enriched with the corresponding components. The subject of this work is the interaction between each other in the medium of two coherent light beams.

Let's focus on the example of light propagation in the medium given in [1]. "Let's assume that we illuminate a transparent medium in complete darkness, for example, clean water with an intense laser beam. Even if the medium does not contain any impurity particles, the beam trajectory in the medium may become slightly noticeable even when observed in directions that do not lie in the plane of incidenc. We must. Reveal. The origin of this weakly scattered light in all directions, which is superimposed on a more intense unidirectional beam." The authors [1] believe that fluctuations in the density of the medium are responsible for the scattering of light in all directions in optically dense media.

Nevertheless, there is a direction in which we will not see scattered light. What is this direction, and what is the reason for the lack of scattering? Let us turn to the phenomenon of interference. A simple form of the interference pattern is obtained if two plane waves of the same frequency – v (two light beams) intersect at an angle. The interference pattern can be observed in the air at the intersection of the rays using a microscope, the axis of which is directed strictly along the bisector of this angle towards the radiation.

And here is the question: do the dark bands of the interference pattern indicate that there is no scattering of light radiation in the direction chosen in this way? The energy of light radiation is transferred by beams, but there is no scattering.

In the interference region, the photons of the beams collide with each other. If the collision occurs in a strong field of the nuclei of atoms of liquid molecules, (and in the case of air - oxygen or nitrogen) in the area occupied by the electron shells, then it becomes possible to merge photons with each other. As a result of the fusion of two photons, axioms may appear in the medium [2,3]. It is appropriate to introduce an idea of virtual energy levels here. The virtual level, whose energy is determined by the sum of the energies of two quanta of pumping radiation, as a rule, does not coincide with the levels of the atom. The values $h\ v$, $2\ h\ v$ are the energy of the virtual levels.

According to Primakoff [4] the fusion of two quanta (photons) in the field of the atomic nucleus can lead to the birth of axion – Ax [4]:

$$h\ v + h\ v = Ax = hv + h\ v \quad (1)$$

Where hv is the energy of the pump quanta (photons), v is the frequency of the pump radiation. The birth and decay of the axiom corresponds to the direct and inverse Primakoff effect [4].

For photons of coherent beams forming an interference field, this field represents a series of nodes and antinodes. The intensity of the light field is high in the region of the antinodes and is zero at the nodes. It is natural to assume that the passage of the plane of nodes for photons is painless, but in the antinode zone, where the intensity of the light field is high, photons merge in pairs, forming, according to the ratio (1), axions.

The light bands of the interference pattern observed in the microscope lens correspond to the process of scattering of radiation photons by air molecules; possibly on density fluctuations. This scattering can be observed when a single beam of laser radiation propagates in a cuvette with a liquid. The dark bands observed in the microscope lens indicate that the propagation of axions in the air is not accompanied by scattering.

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