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Photons and Antiphotons, Rationale for their Structure, Formation and Movement Processes

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Introduction: The work relates to the basics of quantum physics, photonics and optics, in particular to photons in their two states: as photons and antiphotons. The study of these problems is necessary for a better understanding of the basics of the structure of the material world and the general development of scientific knowledge about the Universe, which is an urgent and important task, to which the works of many scientists of the world are devoted. However, all problems have not been fully solved. The elimination of this deficiency is the main goal of the work being performed.

Analysis of the Problem State: It is known that within the framework of the symmetry of the material world, there are physical particles and their antiparticles. For the first time, this fundamental physical principle of the material world was substantiated by Paul Dirac, who theoretically predicted in 1928 the possibility of the existence of a positron as a paired particle to an electron.

The first experimental confirmation was obtained in 1932 by the American physicist Anderson during the observation of cosmic radiation. Then, electron-positron pairs were obtained in laboratory conditions from γ -quanta with an energy of more than 20.511 MeV, in a strong electromagnetic field. At present, the paired nature of elementary particles is a precisely established law of nature, substantiated by a large number of experimental facts.

However, the principle of pairing is difficult to detect for photons, since they do not have an electric charge - the main feature of physical particles and antiparticles, and its structure has not yet been fully studied. A photon is distinguished from an antiphoton only by the method of their production.

New Results of the Work: In the proposed work, the ballistic form of the photon and the process of its motion in the form of quantum jumps of a spherical wave in a sector of 1 steradian with a length of half an arc equal to the wavelength are substantiated. In this case, the spheres have a spin of rotation relative to the longitudinal axis of motion. On this basis, a scheme of photon reflection from a mirror surface is proposed, in which the rotation (spin) remains unchanged, and the vector of ballistic motion changes to the opposite. Thus, the photon is transformed into an antiphoton, as evidenced by the change in the right and left sides during mirror reflection. In this case, there is no need to use spin to characterize the photon and antiphoton, in them only the direction of their rotation relative to the vector of motion changes automatically.

Conclusions: Based on the proposed simplest scheme of formation and movement of a photon, the possibility and scheme of formation of an antiphoton are strictly substantiated. At the same time, there is no annihilation process, characteristic of the meeting of particles and antiparticles, which corresponds to the real conditions of reflection of wave photons and the light packets (rays) created by them.