Particles in physical space

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ABSTRACT. The independence of the unidirectional speed of light upon the velocity of the light source indicates that the luminiferous aether is presented in the physical space. Any particle is some excitation of the rigid aether. The expansion of space and Universe is not possible. The stability of atoms is due to complete overlap of the de Broglie matter waves. The ordinary Euclidean geometry is sufficient for relativistic mechanics. The gravitational field is a pressure in aether created by excitations without any matter inside field. The aether plays the unifying role in physics.

1. Introduction

In theoretical physics, a number of "eternal" questions with no clear answers have been raised. It is unclear, for example, what the nature of the physical space, particles, gravitational field, inertial forces is, why the relativity principle operates and why atoms are stable. An attempt to give some answers has been done previously [1]. Here, we will consider the analytical approach for clarifying these questions.

2. Physical space

The first step of our approach relies on the data concerning the independence of the unidirectional light speed from the velocity of the light source. The initial results were obtained

while observing binary stars [2]. Note, however, that the speed-velocity independence arises from the Doppler effect. It can be added here that the simplest explanation for the so-called Sagnac effect, with other waves of different frequencies, is based on above independence. In general, the light source and/or adjacent space may be involved in the emission of light. As the light speed does not depend on the velocity of the light source, all the more processes of light propagation in space have no relation to the light source. Therefore, the speed of light depends only on the physical space. This conclusion complies with the definition of the luminiferous aether or light-bearing aether.

3. On the rigid aether and nature of elementary particles

Different authors suggested a variety of hypotheses regarding the aether structure. It is appropriate at this point to recall that the hypothesis of mechanical aether considered prior to special relativity, was based on the solid aether concept. However, it could not answer the question why the aether did not resist the celestial motion. Therefore, this was an argument against it seriously. Now we are willing to return to this question. Notice that there were no dissipation of energy and any elastic waves in the aether after the collision of particles. Therefore, the reactions between particles occur in rigid aether.

How can particles move in an inelastic medium? Since the photon can travel through the rigid aether, being a sort of excitationof the aether, therefore the structural particles and so-called elementary particles represent specific excitations (excitatons) in the aether. It follows from inelasticity that any object does not drag the aether. Moreover, we conclude that expansion of space and the Universe are not possible. We have the additional argument for this conclusion due to a single possibility of photon energy accumulation in a form of dark matter [1].

In addition, the inertial frame of reference cannot be related to any fixed part of the aether. Obviously, this aspect of the approach is a theoretical foundation for the principle of relativity

proposed by Poincaré [3] and Einstein [4]. Note that A.Einstein claimed afterwards that “the special theory of relativity does not compel us to deny ether.” and “According to the general theory of relativity space without ether is unthinkable.” (see A.Einstein, Ether and the Theory of Relativity, http://www.tu-harburg.de/rzt/rzt/it/Ether.html).

We may notice that an inertial frame of reference is not exposed to aether wind because it freely moves in aether. The light beams and any interactions, including electromagnetic interactions inside a solid body, are not objects of the aether wind as well. That is why it was impossible to reveal the aether wind using the Michelson interferometer.

4 . Wave function

Translational motion of a particle is possible under condition of creating a suitable excitation in the aether. We can compare this excitation with the de Broglie waves. In fact, in the widely known experiments on diffraction of electrons falling onto crystals and reflecting from atomic planes in certain directions, there simulta occurs a simultaneous interaction of each electron with the crystal. This means that the moving electron is manifested as a wave excitation in a volume comparable to the whole crystal. This conclusion contradicts the widely accepted interpretation of the probabilistic interpretation of the wave function; see additional arguments in [1]. Motion of the electron along its atomic orbit may be possible. However, when analyzing such a motion, it is necessa to take into account the wave properties of the moving electron and its wave volume. It is remarkable that, due to its length the electron wave can cover simultaneously the whole orbit to obtain the stable state, see de Broglie’s suggestion [5]. The de Broglie electron waves must be described by a periodic function with a period $2\pi/n$, where $n = \pm1, \pm2\ldots$ These values correspond to those of the projection of the angular moment in quatum theory.

5. Lorentz transformation in euclidian geometry

Free motion of a particle is characterized by plane de Broglie waves. According to the principle of relativity concerning the impossibility to determine “absolute” motion, the transverse dimensions of solid bodies bodies do not depend on their velocities. These dimensions of a body moving along the X axis with some velocity $\pm v$ will be proportional to expression

$$ds = (c^2dt^2 - v^2dt^2)^{1/2}.$$

The invariant s (and ds) determined thereby is applicable only to transverse dimensions of moving bodies. It differs from the widely known special relativity invariant which invariant that hasn’t physical meaning. Due to the invariance of the speed of light, we obtain the known equation

$$(c^2dt^2 - dx^2)^{1/2} = (c^2dt'^2 - dx'^2)^{1/2}.$$

This equation leads to the Lorentz transformation, according to which a moving body has a reduced length along the X axis.

Thus, the ordinary Euclidean geometry is sufficient for relativistic mechanics.

6. Inertia

If the body would stay in emptiness, then it remains unclear why it resists to displacement in this space. What does hold it? Due to rigid property of aether, some parts of aether cannot move through another part of aether. It was shown that the apearance of the force of inertia follows from the condition of the finite speed of propagation of any aether excitation [1]. Obviously, accelerations of bodies or particles may be possible by transfer of the additional excitation of aether.

7. On the gravitational field

One particle cannot induce a notable deformation of aether around itself due to its absence in the direction to the line along it. But the pressure and gravitational field may be possible in transfer direction without any matter matter.

We arrive at the conclusion that any particle creates the pressure in aether near itself. Because of the uniqueness of both the pressure and gravitational field, we may state that the gravitational field is generated by excitations without any matter inside it, cf. [1].

8. Fundamental role of aether

It was shown that speed of light decreases in the gravitation field, see [1]. The decrease of the rest energy of a particle in the gravitational field must be proportional to gravitational potential: $\Delta E = m\Delta\varphi$ (see explanation in [1]). On the other hand, the relative decrease of the rest energy $\Delta E/mc^2$ must be equal to the relative decrease of the atomic energy levels $\Delta\nu/\nu$. Therefore, using basic formulae, we obtain: $\Delta c/c = \Delta\varphi/c^2$. Note, that any particle and photon are excitations in aether space.

Thus, the aether concept plays the unifying role for different branches of physical science.

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