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Letter

Interpretation of the Results of the Real Wheeler's Experience

Parfentev Nikolay Andreevich

All Russian Institute of Optical Physic Measurements (VNIIOFI), Moscow, Russia

Email address:
nik_parfenium@mail.ru

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Abstract: The problem of the dualism of properties of quantum objectsis still one of the constantly debated problems of physics. To solve this problem, Wheeler proposed a thought experiment with a change in diffraction conditions for a separately flying particle. Interpretation of real experiments on the diffraction scattering of microparticles suggests that their behavior is determined by both their past and their future state. The purpose of this paper is to explain the obtained paradoxical result by the methods of classical physics. The concept of the temporal state of an object is introduced, which is equal to the square root of the pulse, analogous to the wave function in quantum mechanics. The novelty of the adopted approach is to describe the interaction of the current temporary state, both with the past and with the future temporary states. In this case, the interaction forces are proportional to the product of neighboring temporary states and inversely proportional to the time interval between these temporary states. The range of applicability of the proposed model is limited by speeds that are significantly lower than the speed of light, as well as by the condition of relatively small (compared to speed) temporal velocity increments. On the basis of the adopted method, formulas of classical dynamics for uniformly accelerated motion and motion along a circle are derived. In the framework of new ideas, the principle of equality of action and reaction is justified for the force of inertia.

Keywords: Wheeler's Problem, Dynamic Laws, Inertia Force

1. Introduction

The problem of the dualism of properties of quantum objects, which arose at the dawn of quantum physics, is still one of the constantly debated problems of physics [1]. On the way to its solution, Wheeler [2] conceived a thought experiment with a change in the conditions of diffraction of particles passing through gaps. Since the onset of Wheeler's problem, a significant number of theoretical studies have been done and many experimental schemes have been proposed [3-13]. A parodoxical result was obtained by a group of physicists from the Australian National University [14], during a real Wheeler experiment.

Unexpectedly, the result of this experiment showed a violation of the principle of causality. The behavior of particles determines not only the past state but also their future state. Explanations of this fact are usually attributed to the peculiarities of quantum physics, which are difficult to transfer to classical ideas about the movement of micro objects. The paper [15] proves the impossibility of interpreting the results of this experiment. However, in the field of classical physics, a description of the motion of macro particles is possible, which depends both on the past and on the future of its state [16]. In the present article, an attempt is made to explain the behavior of particles on the basis of another approach to the classical representation of inertial forces.

2. New form for Accelerated Movement

Since Newton's time, force is a measure of the interaction of bodies, and the reason due to which the body receives accelerations. In this case, according to Newton's third law, the forces of interaction are equal in absolute value and opposite in direction.

Nevertheless, the force of inertia, written as the product of the mass for acceleration (Newton's second law) does not

imply any interaction. The unification of various concepts is a sign of imperfection of the model.

According to modern concepts, time is recognized as the fourth coordinate in Minkowski space. However, practically nothing is known about the form of existence of any objects in time. It is legitimate to consider the interaction of bodies, both in space and in time. The formula for the force of inertia can be interpreted as an interaction, differing in time of body states

$$F = \frac{\mu_1 \mu_2}{t_{12}} \quad (1)$$

where μ_1, μ_2 - the time state indicators, t_{12} - the interval between two time States.

The above formula is based on the principle of symmetry for the temporal states of the body. At its base is the first law of Newton - the body, free from body interactions move freely and rectilinearly. From this it follows that the violation of temporal symmetry in the motion of the body is a sign of the action of force. Naturally, in the case of the interaction of temporal states of the body, the interaction force decreases with increasing time interval between these states. From the formula of the inertia force it can be assumed that the interaction characteristic is the quantity $\mu = \sqrt{mV}$, hence the square root of the impulse. It is obvious that the formula is valid only for velocities substantially lower than the speed of light. An analogous form is the wave function in quantum mechanics, the square of which determines the probability of a quantum object staying at a given point in space.

The case of motion along the circumference allows us to state that uncompensated repulsive forces of time states on a circular path cause the need for centripetal force.

With uniformly accelerated motion at time t_0, the body will be affected by the difference in forces from the neighboring temporal states of the body.

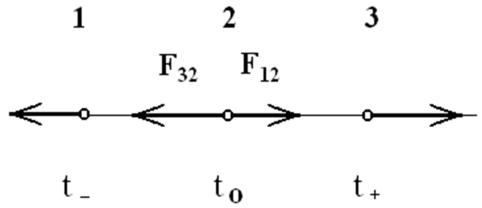

Figure 1. *The scheme of uniformly accelerated motion.*

With uniformly accelerated motion at time t_0, the body will be affected by the difference in forces from the neighboring temporal states of the body.

$$\Delta F = \frac{\mu_+ \mu_0}{\Delta t} - \frac{\mu_- \mu_0}{\Delta t} = \frac{\sqrt{m(V+\Delta V)}\sqrt{mV} - \sqrt{m(V-\Delta V)}\sqrt{mV}}{\Delta t} \quad (2)$$

In the equation μ_+, μ_0, μ_- - are the temporal states of the body at a future, present and past time, respectively.

For ΔV V after the transformation of the formula, we have

$$\Delta F = \frac{m\Delta V}{\Delta t}$$

The result is obvious, since the expression for the interaction force is formed on the basis of the formula for the inertia force. When moving along a circle (Figure 2), an uncompensated repulsive force arises due to opposing forces of equal repulsion and equal in magnitude.

3. New form for Driving Around the Circle

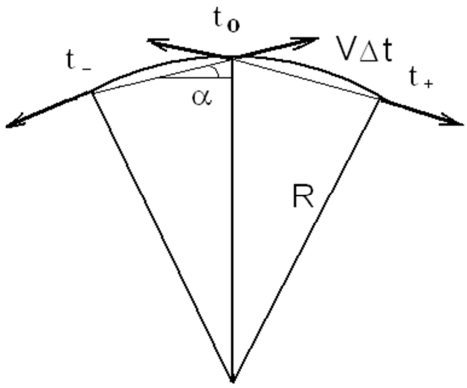

Figure 2. *Scheme of the appearance of a repulsive force when the body moves around the circumference.*

The force acting on the body moving along the circumference can be obtained by summing two repulsive forces equal to $\frac{mV}{\Delta t}$ and acting at an angle to the horizontal $\alpha = \frac{\Delta t V}{2R}$. As a result, we come to the form

$$F = \frac{mV^2}{R}$$

In this case, the interaction force for small values of the angle does not depend on the value of the time interval. Thus a classical expression for the inertia force that arises is obtained when moving along a circle.

It is likely that the resulting output of the force when moving in a circle organically follows from the underlying formula for the force of inertia, but the proposed calculation model allows you to use a single description for all acting forces.

It is necessary to indicate the main features of the proposed model:

- the dependence of the instantaneous value of force, both from the past and from the future temporal state,
- formula (1) is the coefficient of time asymmetry of the trajectory of the body, although in form coincides with the known interaction forces.

Primitiveness of the mathematical apparatus of the article is fully compensated by the exotic character of the representation of the inertia force. Before the results of Wheeler's actual experiment, such assumptions could be rejected as absurd. But at the present time, at least they can compete with the classic description of the inertia force.

4. Conclusions

As an explanation of the results of Wheeler's actual

experiment, a new formula for the inertial force is proposed, applicable to any moving object.

The movement of objects can be represented as the result of the interaction of their temporal states, while the future and the past state are equal. In fact, practically nothing is known about the form of existence of any objects in time. A form of inertia force is proposed, analogous to the classical forces of interaction.

The formula gives the classical expression of the inertia force for the uniformly accelerated motion of the body and the motion of the body along the circumference. The adopted ideology makes it possible to describe the force of inertia as a kind of interaction for which Newton's third law is valid.

It is currently not possible to determine the kind of particles involved in the interaction described above. It may be easy to suggest a physical experiment, on the basis of the results of which it will be possible to assert with certainty the truth or inconsistency of the presented model.

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