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# ABOUT THE FAILURE OF THE A. EINSTEIN'S RELATIVITY PRINCIPLE

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## Abstract

Critical notes on the interval invariant and Lorentz transformations are presented. Their internal inconsistency is shown when considering the same processes from different frames of reference. The results of Sagnac's experiments with a ring interferometer are discussed. It is concluded that the Lorentz transformations incorrectly display the spatial and temporal coordinates of objects in a stationary space in the coordinates of a moving frame of reference.

It is also shown that the course of time and the propagation of light are physical processes that are not associated with the motion of the frame of reference. Transformations of coordinates are obtained under the assumption of the action of classical mechanics and a finite value of the speed of light. It is shown that in a moving system the illusion of time dilation and reduction of the size of spatial objects can arise, the appearance of which is associated with the finite speed of information transmission. It is shown that in classical mechanics there is a combination of spatial and temporal parameters, which turns out to be invariant in both coordinate systems.

**Keywords**: Lorentz transformations, theory of relativity, principle of relativity, interval invariance, classical mechanics.

## Introduction

More than a hundred years have passed since the creation of the theory of relativity. This theory revolutionized the traditional understanding of the properties of space and time. The scientific world as a whole perceived it as one of the greatest scientific achievements of the 20th century. The theory is perceived by most experts as an irrefutable truth.

The main elements of the special theory of relativity (SRT) are Lorentz transformations and Einstein's formula, which establishes the relationship between energy and mass. Lorentz transformations determine the relationship between the spatial and temporal coordinates of inertial systems. These transformations were a consequence of the principle of relativity, the effect of which Albert Einstein extended to all physical processes, including the propagation of light. The key result of the transformations was the slowing down of time and the reduction in the spatial dimensions of objects in moving frames. Such a result of transformations comes into conflict not only with common sense, but also with objective reality. Indeed, if two inertial systems are directed in opposite directions with the same speed from a stationary system, then there is no reason that would make the clock rate different in both systems. However, the Lorentz transformations assert that from the point of view of each of the systems, the time of the system moving in the opposite direction should go slower. It follows from this that transformations do not describe the real state of processes in moving systems. For some reason this contradiction has been ignored for more than a century.

This work is an attempt to show the reader not only the contradictory essence of the transformations, but also to substantiate doubts about the correctness of the basic principles underlying the special theory of relativity. In contrast to the theory of relativity, the inviolability of the fundamental concepts of classical mechanics about the independence of the flow of time and the propagation of light from reference frames is also demonstrated.

## 1. Basic properties of space and time from the point of view of classical mechanics

Before moving on to explaining the features of Lorentz transformations, let us designate the main properties of the space and time around us, in which we exist. We can define space as a physical entity that allows movement and placement of various physical objects within itself and provides the ability to transfer interaction and information between them. In addition, space retains all of its properties unchanged over time. The space surrounding us will be considered homogeneous and isotropic.

Time can be considered as a physical process covering the entire world space, in which movement occurs, and which allows you to determine the measure of movement by comparing the movement of some objects with the movement of other objects. The course of the time process can be normalized by the stationary periodic motion of one of the moving objects. In this case, the rate of movement of other material objects can be expressed in units of the measure of the object's movement, by means of which we normalize the course of the temporal process.

If space allows movement in its volume, then independent movement in time is impossible, since the course of time is a process that subjugates all space. Therefore, space with all material objects is in one time process, which is divided into the past and the future. In this case, all other processes and movements find themselves between the past and the future.

Further, for definiteness, we will consider our Earth as a fixed frame of reference. In view of the above, we will define the quantitative measure of the Earth's rotation around its axis as a unit of measure of time. That is, we will divide the daily rotation of the Earth into equal angular sections of its rotation - hours, minutes, seconds, etc. Thus, the rotation of the Earth will be our reference clock. If we observe the rotation of the Earth from a fixed point in our space, located at any distance from the Earth, then the time period of its revolution will be unchanged. Due to the finiteness of the speed of light, only information about the Earth's rotation will be delayed. This means that the course (flow) of time in a fixed coordinate system does not depend on the spatial coordinate. The movement of a moving clock can also be set in accordance with the rotation of the Earth.

Consider two inertial systems: stationary $K$ and moving $K'$. As you know, the main result of the Lorentz transformations in the theory of relativity is the demonstration of the slowing down of time in a moving frame of reference. Therefore, we immediately notice that the illusion of time dilation and the constancy of the speed of light in a moving system can be obtained in classical mechanics. In a system moving at a speed $V$ away from the Earth, the daily rotation of the Earth, if it is accepted for normalizing time, turns out to be longer than in terrestrial conditions. Information about the total daily turnover of the Earth will come with a delay for the time the light travels the distance that the $K'$ system will cover from the beginning of the day until information about the completion of the Earth's daily turnover is received. As a result, a day in the $K'$ system will be longer than a day in Earth conditions and will be determined by the expression:

$$\tau'_{day} = (\frac{c}{c-V})\tau_{day} \qquad (1)$$

This transformation is a consequence of taking into account the final speed of information transmission, but not the slowing down of time determined by the Lorentz transformations. If we normalize the clock rate by the length of the day in the K′ system, then the relationship between the time course in the $K$ and $K'$ systems is determined by the expression:

$$t' = \frac{\tau_{day}}{\tau'_{day}} t = \frac{c-V}{c} t \qquad (2)$$

Note that the clock set synchronously with the Earth before the flight will run the same as on Earth, and the clock that was set in accordance with the Earth's daily rotation by observation from a moving system will run slower according to expression (2). The clock readings do not depend on how the system moves, but on what process their movement is normalized to. In classical mechanics, the transformation of the spatial coordinate is determined by the expression:

$$x' = x - Vt, \qquad (3)$$

With respect to an object moving with speed $u$, the time transformation takes the form:

$$t' = t\frac{c+u-V}{c} \qquad (4)$$

and its speed in the $K'$ system is determined by the expression:

$$u' = c(u-V)/(c+u-V). \qquad (5)$$

If the speed of the moving clock is equal to the speed of the frame $K'$, then the time of the moving frame coincides with the time of the clock, the course of which determines the time in the stationary frame. The same clock is a fixed clock in the $K'$ system. Thus, the transformation of the clock rate of a stationary system into the clock rate of a moving system is a transformation into themselves and the coincidence of their readings means the consistency of the transformation.

In time t, the moving system passes the distance $L = Vt$ in the stationary system. At the same speed, $t'$ time will pass in the moving system. Therefore, from the point of view of the $K'$ system, it will go through:

$$L' = Vt' = L\frac{c-V}{c} \tag{6}$$

Using simple transformations of formulas (2) and (3), it is easy to obtain the invariance of the combination of spatial and temporal coordinates of the two systems:

$$ct' - x' = ct - x \tag{7}$$

Expression (7) was obtained under the assumption of the validity of classical mechanics, but it satisfies the conditions for the maximum speed of light. We only note that the constant $c$ in all the above expressions is the speed of light in a stationary frame. The speed of light in a moving frame may differ from the speed of light in a stationary frame. Thus, taking into account the finiteness of the information transfer rate in classical mechanics can create the illusion of not only slowing down time, but also reducing the spatial dimensions in a moving system. In addition, in classical mechanics, there is a combination of spatial and temporal parameters, which turns out to be invariant in both coordinate systems.

Before the creation of the theory of relativity, it was believed that the properties of space and time are preserved even under the conditions of a uniformly and rectilinearly moving coordinate system. This point of view was formulated by the principle of relativity, according to which all mechanical processes in inertial reference systems proceed in the same way, regardless of whether the system is stationary or it is in a state of uniform and rectilinear motion. In addition, the speed of light was considered infinite, so its influence on all physical processes was not taken into account. The discovery of the finite speed of light created a problem that did not fit into the framework of traditional concepts of classical mechanics. A. Einstein, together with other physicists, solved this problem by extending the principle of relativity to all physical processes, including the speed of light.

## 2. Lorentz transformations and their features

In addition to the fact that A. Einstein extended the action of the principle of relativity to the speed of light and other physical processes, he defined the speed of light as the maximum speed of propagation of interaction, information and signal. Thus, the speed of light turned out to be the limit for the speed of any material objects.

In the accepted restrictions, space and time in a moving coordinate system must have the same properties as in a stationary system, namely: space is isotropic and uniform, the speed of light and the course of time are constant throughout its entire length. A moving frame of reference has no restrictions on the size of space and the inclusion of any spatial objects in it. This means that we and the space around us as a whole can consider ourselves to be simultaneously in a stationary and in a moving system with the only difference that in a moving system we move with a speed equal to the speed of the system and opposite in direction.

Requirements for the properties of inertial systems, which were set by A. Einstein when constructing the theory of relativity, were expressed in the form of interval invariance.

$$s^2 = c^2t^2 - x^2 = c^2t'^2 - x'^2, \qquad (8)$$

in which the $x$ coordinate means the path traveled by any object in time $t$, and the terms containing the speed of light are the squares of the path made by light in time in each of the systems.

Note that the size of the interval is proportional to time, since the object's velocities remain constant over time and therefore the intervals become equal only due to the change in the course of time. In this case, expression (8) can be rewritten as:

$$s^2 = (c^2 - u^2)\,t^2 = (c^2 - u'^2)\,t'^2 \qquad (9)$$

in which, according to the Lorentz transformations, velocity $u'$ has the following dependence:

$$u' = (u - V)/(1 - uV/c^2) \qquad (10)$$

The invariance of the interval is not obvious and requires proof. The proof is carried out on the basis of a comparison of the values of intervals tending to zero using the properties of isotropy and homogeneity of space [1]. However, the transformations obtained with the help of such invariance demonstrate the anisotropy of the space common to both systems. Using the invariance of the interval, coordinate transformations were found between the stationary frame $K$ and the system $K'$ moving with velocity $V$, which were called Lorentz transformations. Transformations of spatial coordinates and time in a moving system, depending on the coordinates of a stationary system, have the form:

$$x' = (x - Vt) / \sqrt{(1 - V^2 / c^2)} \quad (11)$$

$$t' = (t - Vx / c^2) / \sqrt{(1 - V^2 / c^2)} \quad (12)$$

The dependences of the coordinates of the stationary system on the coordinates of the $K'$ system are shown by the next formulas.

$$x = (x' + Vt') / \sqrt{(1 - V^2 / c^2)} \quad (13)$$

$$t = (t' + Vx' / c^2) / \sqrt{(1 - V^2 / c^2)} \quad (14)$$

Note that the inverse transformations are obtained by changing the sign to the opposite of the system speed. This means the possibility of mutual replacement of roles for systems "moving" to "stationary" and vice versa.

Despite the fact that within each of the $K$ and $K'$ systems, we assume the course of time to be constant throughout the space and the space itself to be homogeneous and isotropic, the transformations have the form of complex dependences of spatial coordinates and time on coordinates, time and speed of another frame of reference. The constant course of time in a stationary system is transformed into a course of time, which depends on the speed of the object and the speed of the moving system. In this case, a moving system with predetermined special properties distorts the space and time of the stationary system, expressing its coordinates in the coordinates of the moving system.

We will further analyze some features of the Lorentz transformations. It is generally accepted that from the Lorentz transformations it follows that the time in the moving frame of reference goes more slowly than in the frame $K$. If in equation (14) we set $x$ equal to zero, then we obtain the dependence from which the conclusion really follows:

$$t = t' / \sqrt{(1 - V^2 / c^2)} \quad (15)$$

However, if we estimate the flow of time in frame $K$ from the position of a moving system and for this we put $x = 0$ in equation (12), then it turns out that time in a stationary frame flows more slowly than in a moving one:

$$t' = t / \sqrt{(1 - V^2 / c^2)} \tag{16}$$

Such dependencies add confusion to the understanding of the transformations being made. Transformations of spatial coordinates look no less absurd. At $t' = 0$ from expression (13) it follows:

$$x = x' / \sqrt{(1 - V^2 / c^2)}\ . \tag{17}$$

If the coordinate x is assigned some length L and in the $K'$ system we associate the length $L'$ with it, then we get:

$$L = L' \sqrt{(1 - V^2 / c^2)}\ . \tag{18}$$

If we use formula (11), then, setting $t = 0$, we get:

$$L' = L \sqrt{(1 - V^2 / c^2)}\ . \tag{19}$$

One gets the impression that for some values of the spatial coordinates, time in a moving frame supposedly goes slower than time in a stationary frame, in others - supposedly faster. The same metamorphosis occurs with the size of spatial objects. However, the seeming inconsistency of the above expressions is not yet proof of the falsehood of the transformations. In addition, they were obtained with gross errors. In the process of considering the Lorentz transformations, making various assumptions about the connections between the course of time and spatial coordinates, one should not forget that they are obtained from an expression that demonstrates the invariance of the interval in which x and t are not arbitrary coordinates, but denote the distance traveled and spent on it time as a moving object. In this case, for example, setting $x = 0$, we must set $t = 0$ and $x' = 0$ ; setting $t = 0$, we must set $t' = 0$. These requirements directly follow from equations (8), (9).

If we take into account such requirements when obtaining formulas (15) - (19), then dependencies (16) and (19) turn out to be erroneous, and we really get from the Lorentz transformations in a moving frame a time dilation and a reduction in the size of material objects in the direction of motion of the frame of reference.

Changing the functions of the systems $K$ and $K'$, assuming the system $K'$ as a stationary one, we get a similar slowing down of time and a change in the size of spatial objects in the "moving" frame $K$ with respect to the $K$ system. For every conceivable change in the speed of a moving system $K'$, the Lorentz transformations will give a corresponding change in the spatial scales of objects and the course of time in it. In this case, no changes will occur in the $K$ frame despite the inverse transformation corresponding to the new speed, which implies the illusory nature of the results of the Lorentz transformations in relation to any inertial system.

For a more detailed confirmation of the inconsistency of the Lorentz transformations with the real properties of space and time, let us return to the consideration of processes in fixed coordinate system $K$. The course of time in it is normalized by us in the form of a quantitative measure of the Earth's rotation around its axis. It is constant in all space and does not depend on the movement of the clock and other objects in it. We discussed other properties of the system space in the first section of the work.

According to the principle of relativity, space and time of a moving system have the same properties as a stationary system. Note also that the same objects and processes can be considered within any coordinate system. We consider inertial systems, which differ only in the speed of movement. The passage of time cannot slow down or accelerate at the whim of a "stationary" coordinate system, and just like in a stationary system, it must be the same at all points in space of a moving system.

Consider the transformation of the course of time in a clock moving with a speed u in a stationary frame. If we follow the Lorentz transformations (see formula (12)), then the readings of these clocks should be converted into readings of the $K'$ system clock in accordance with the formula:

$$t' = t(1 - uV / c^2) / \sqrt{(1 - V^2 / c^2)} \quad , \qquad (20)$$

according to which the course of time in the $K'$ system does not depend on the spatial position of the clock in the stationary frame $K$. From formula (20) it follows that the time shown by a clock moving with a speed $u$ in a stationary system is transformed in the $K'$ system into a time that depends only on the clock speed and the speed of the $K'$ system. In this case, the clock can be located at any point in space of the $K$.

We also remember that the transformation of time in classical mechanics also depends on the speed of the system and the speed of a moving object (formula (4)), according to which when the speed of the clock is equal to the speed of the system $K'$, the course of the clocks of both systems coincides ($t' = t$). Expression (21) says that the readings of the $K'$ system clock, which move at the same speed as the $K'$ system, are converted into the $K'$ system clock readings, which differ from the $K'$ system clock readings. However, in this case, we are talking about the clock that is stationary in the $K_i$ system is actually the clock of this system. They should show the time of the $K'$ system. Thus, the Lorentz transformations transform the time of the system's own clock into another time, the course of which does not correspond to the course of time in the system itself. The discrepancy between the transformation results and the proper time of the $K'$ system once again demonstrates that the Lorentz transformations do not reflect the real properties of space and time.

According to the properties of the $K'$ system, the clock rate in this system, wherever they are and at whatever speed they move, should show the same time. Moreover, if in both systems the same units are used to measure the course of time, then the course of clocks in both systems should be the same. Nothing prevents each of the reporting systems from adopting the stationary motion of the same object, for example, the Earth, as a standard for normalizing the course of time.

Lorentz transformations create similar distortions of the object's path, since its magnitude is proportional to time at a constant speed. Hence it also follows that the results of the Lorentz transformations come into conflict with the real properties of the general space of the systems $K$ and $K'$.

In classical mechanics, the effect of "slowing down" time is the result of the apparent slowing down of processes in a stationary system due to the delay in the arrival of information caused by the movement of the observer and the final speed of information transmission. The same effect will take place in the case of observation from a stationary system for the movement of objects in a moving system. Note also that for all transformations, nothing makes the clock go differently in each of the systems.

The Lorentz transformations do not take into account the effect of lagging information about processes in a stationary system, therefore, the dependences on the parameters of motion in formulas (4) and (20) differ significantly, although in the limiting case, when the speed of light tends to infinity, their transformed times turn out to be equal to the time in a stationary system.

The Lorentz transformations arose from the invariance of the interval (formulas (8) and (9)). Interval invariance is a mathematical expression of Einstein's principle of relativity. Since the Lorentz transformations do not reflect the real relationships between the coordinates of inertial systems, it can be concluded that Einstein's principle of relativity does not describe the real properties of space and time.

The above reasoning about the erroneousness of the Lorentz transformations could not have been done. It suffices to refer to the example given in the Introduction. Between any two moving inertial reference frames, you can always find a coordinate system, relative to which these frames move with the same opposite speed. In relation to such "stationary" system, time in moving systems must go the same way. Having placed between one of the moving systems and the former “stationary” a new “stationary” system, one can come to the same conclusion about the same course of time in the original moving and former “stationary” systems. Consequently, the course of time must be the same in all inertial systems. Likewise, they must maintain their sizes and spatial objects in different IS.

The spread of light is also a physical process. The constancy of the passage of time and the constancy of the speed of light are mutually exclusive properties of moving frames of reference. The way out of this contradiction is that the course of time and the propagation of light are processes independent of the frames of reference. Light propagates in space, the transport properties of which are not related to the frame of reference.

One of the experimental refutations of the fact that the speed of light is constant in moving systems was the experiments of Sagnac [2,3], in which he received interference on counter propagating beams of light in an interferometer with a rotating system of mirrors, indicating that light propagates independently of the frame of reference. Discussion of these experiments by the scientific community was conducted mainly in attempts to prove the consistency of the theory of relativity of the results obtained by Sagnac, despite the fact that these contradictions are obvious [4].

From the Lorentz transformations, there is no connection between energy and relativistic mass. A. Einstein established the connection between energy and mass independently. The validity of Einstein's formula has been repeatedly confirmed in practice. For such a representation of energy, the constancy of the speed of light in all moving frames of reference is not required. In this case, Galileo's principle of relativity is no longer fulfilled in relation to the speed of light, which in a moving frame of reference will be expressed by a simple formula:

$$c = C - V cos\vartheta , \qquad (21)$$

where $\vartheta$ is the angle between the direction of propagation of light and the direction of motion of the reference frame, $C$ is the speed of light in the absolute coordinate system.

## 3. On experiments to test the theory of relativity

The assumption about the constancy of the speed of light in inertial reference frames is based on the experiments of Michelson Morley, in which the interferometer failed to detect the motion of the Earth relative to the stationary ether. There are many possible reasons for the failure of such experiments. In my opinion, the most probable cause could be the air in the atmosphere of which the experiments were carried out. Air has a refractive index of light other than unity ($n_r$=1.00027). This means that it sets the magnitude of the speed of light in accordance with its refractive index and makes it independent not only of the direction of propagation, but also of the speed of the Earth in outer space.

The experiments that refute the assumption of the constancy of the speed of light include the above-mentioned experiments of Sagnac [2,3]. The essence of such experiments was as follows. Sagnac used an annular interferometer rotating in the plane of the ring, along the perimeter of which several mirrors were located, which could consistently reflect a beam of light, directing it along the ring. The interferometer also contained a light source that could emit two beams of light simultaneously in opposite directions. The light beams met after passing through the ring. In the absence of rotation of the ring, the path lengths traversed by the colliding beams were equal, therefore, there was no difference in the phases of these beams and no interference was observed at the point of their meeting.

The interference appeared when the ring was rotated. If you observe such an experiment in a laboratory (stationary) coordinate system, then a light beam moving in the direction of rotation of the ring, in order to reach the light source, must make a full circular turn and plus some section of the arc, which the light source will have time to turn. In this case, the colliding beam will meet the light source without completing a full turn. As a result, a phase shift will occur at the point where the beams meet, resulting in interference. The time shift for the arrival of light beams to the meeting point is determined by the expression [5]:

$$\Delta t = \frac{4\pi \Omega R^2}{c^2\left(1 - \frac{\Omega^2 R^2}{c^2}\right)}, \tag{22}$$

where Ω is the rotation frequency, $R$ is the radius of the ring. This time shift will determine the phase shift of the encountered waves. In fact, the interference is created by waves emitted at more than one moment in time. The wave that catches up with the light source is emitted before the oncoming wave, but this circumstance does not affect the phase displacement at the point where the waves meet. Thus, from the standpoint of the laboratory coordinate system, the phase shift in such an experiment is beyond doubt. The results of Sagnac's experiment when viewed from the laboratory coordinate system will be the same both from the point of view of the theory of relativity and from the point of view of classical mechanics. In the laboratory coordinate system, the speed of light in SRT and in classical mechanics is the same, therefore, in one and the other case, a rotating interferometer will give interference.

Now let's see how the same experiment will look like in a frame of reference moving with the light source from the point of view of the theory of relativity. With respect to the light source, both directions of wave propagation are equal and the speed of light in them is the same. Both rays of light travel the same path before meeting. Consequently, from the point of view of the theory of relativity in a moving frame of reference, there should be no phase shift when the light beams meet. There is no phase shift, so there is no interference. Interference can only be created by waves that simultaneously arrive at the place of registration and have a different phase.

The reader may argue that the special theory of relativity (SRT) describes the properties of inertial systems, and this experiment is carried out in a system that does not seem to be called inertial, since the movement of light is carried out along a circular path. However, light rays in the space between the mirrors propagate along the shortest path - along straight paths, therefore, in such cases, light propagation occurs under the conditions of an inertial system. Consequently, such an experiment has every reason to consider it from the point of view of the special theory of relativity.

Consideration of the Sagnac experiment from the frame of reference associated with the rotation of the interferometer, under the assumption of the action of classical mechanics, gives the same result in terms of the phase shift of counter propagating waves and their interference, as when considering from the point of view of the laboratory frame of reference. We obtain a completely different result when analyzing the results of Sagnac's experiment from the standpoint of the theory of relativity in the laboratory frame of reference and in the frame associated with the rotation of the interferometer. Thus, the fact of the presence of interference, obtained in the research of Sagnac, indicates that the propagation of light is not associated with the movement of the reference frame. Here is what he writes in the publication [3]: "The outcome of these measurements shows that in ambient space, light propagates with speed $V_0$ independent of the motion of the apparatus, the light source O and the optical system. This property of space describes the luminiferous ether experimentally. "

The results of Sagnac's experiments quite convincingly refute the validity of the theory of relativity. However, supporters of the SRT have made a lot of efforts to prove the opposite. This is the subject of an extensive survey of such proofs carried out by G.B. Malykin [4]. The author of the review uses nearly three hundred scientific publications. In all the materials cited, the Sagnac effect is explained within the framework of STR only when viewed from the laboratory coordinate system.

Mention should also be made of the direct experiment to determine the relativistic time dilation, carried out by American specialists J. C. Hafele and R. E. Keating [5]. In October 1971 Jon Hafele and Richard Keating flew around the world twice, first to the east, then to the west, with four sets of cesium atomic clocks, after which they compared the readings of these clocks with the same clock left in the US military observatory. The flights were operated by regular airliners on regular commercial flights.

The calculations of the change in the clock rate were carried out taking into account three mechanisms - deceleration according to the special theory of relativity, the influence of the general theory of relativity and the influence of the Sagnac effect. As a result of the experiment, a satisfactory agreement was allegedly obtained between the calculated data and the clock readings. In this case, the course of the clock moving towards the west for some reason accelerated, and the clock moving towards the east slowed down. The acceleration of the clock moving to the west proceeded according to the results of calculations of both special and general theories of relativity.

Here we consider the features of SRT, therefore, we will evaluate the results of the research by J. Hafele and R. Keating in terms of taking into account the influence of this theory on the experimental results. In the calculations, the stationary (laboratory) system was taken, the coordinates of which were tied to the location of the stars. The control clock was on the surface of the Earth and moved with the speed of the Earth's rotation. At the same time, their course, according to the Lorentz transformations, slowed down relative to the supposed course of the clock located in the laboratory frame of reference. The deceleration of the clock moving towards the west due to the lower speed was less than the deceleration of the control clock, so they went faster than the control clock. The clock moving eastward was running slower than the control clock. The experimental results turned out to be close to the calculated ones.

If we take the system associated with the control clock as a stationary frame of reference, then both directions of aircraft movement from the point of view of Lorentz transformations turn out to be equal. In this case, we will have a deceleration of the clock, regardless of the direction of its movement. Moreover, it should be determined by one expression:

$$\Delta T = -V^2 T / 2c^2, \tag{23}$$

where $V$ is the speed of the clock, $T$ is the flight time of the aircraft around the globe.

Thus, in the case of the experiment of J. Hafele and R. Keating, we arrive at a contradiction similar to the contradiction in the Sagnac experiment. The calculation results for the time dilation are different when using different reference systems. The dependence of the results on the choice of the frame of reference is evidence that the Lorentz transformations give a distorted idea of the real course of physical processes in moving systems. The coincidence of the experimental results with one of the calculation options raises doubts about the quality of the experiment.

Flights of Earth satellites provide a convenient opportunity to check the Lorentz transformations. At a speed of about 8 km / s for one year of the satellite's flight, the time dilation should be about 10 milliseconds. For some reason, there is no information about such an experiment.

## Conclusion

Despite the fact that the absurdity of the theory of relativity in terms of Lorentz transformations lies on the surface, for more than a century it continues to be considered the height of scientific thought. The results of the discussion of such a problem in the previous sections are as follows.

1. The assumption about the constancy of the speed of light in all inertial systems comes into conflict with the real properties of space and time. The independence of the propagation of light from the motion of the frame of reference was proved experimentally by Sagnac's experiments.

2. Lorentz transformations between the coordinates of two inertial systems are based on the postulate of the interval invariance. The results of the transformations conflict with the properties of space and time, which suggests that the invariance of the interval is a consequence of assumptions about their properties that do not correspond to reality.

3. The illusion of time dilation in relation to time in a stationary system arises under the conditions of a moving system due to the finite speed of information transmission. For such a

case, transformations of time and spatial coordinates between stationary and moving systems are obtained under the conditions of the action of classical mechanics. Transformations create the effects of "slowing down" the passage of time and "reducing" the size of spatial objects in a moving frame of reference. It is shown that in classical mechanics there is a combination of spatial and temporal parameters, which turns out to be invariant for both coordinate systems.

4. Time is an all-embracing physical process, the course of which does not depend on the movement of the frame of reference.

A characteristic feature of classical mechanics is the independence of time from the velocities of inertial reference systems. Taking as a basis as a unit of time the period of the Earth's revolution around its axis, we can recalculate any stationary processes relative to it, starting from frequencies or periods of oscillation of particles in the microcosm and ending with periodic processes of the macrocosm - the movement and rotation of planets, stars, galaxies, etc. ... At the same time, all periods of radiation, revolutions and other movements, as well as the relationship between them, remain unchanged throughout the foreseeable period of observation.

What do the Lorentz transformations offer for an observer in the cockpit of a spacecraft that flies with a speed $V$ relative to the "stationary" frame $K$? The periods of all the mentioned processes (including the periods of rotation of the planets around their axis and the periods of their revolution around the Sun) in such a system, according to the transformations, will be determined by expression (12) for the time $t'$. And there we have not only the proportionality of the time t, but also the dependence on the changing speed of the $K'$ system relative to the object, the time period of which we estimate. As a result, the relationship between the periods of movement of all space objects is violated. The periods of rotation and motions in the orbits of planets and satellites become not constant, but change depending on the spatial position of the space object. In fact, a moving frame of reference loses the ability to synchronize its time with any independent stationary periodic process. And this happens in conditions when the planets and satellites rotate and move in their orbits, maintaining their stable relationship with the times and periods of movements of other space objects and not suspecting the existence of Lorentz transformations.

The above arguments allow us to conclude that the assumptions about the properties of space and time, which are the basis of Einstein's principle of relativity, do not correspond to the real properties of space and time.

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