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Article *in* Applied Physics Research · August 2023

DOI: 10.5539/apr.v15n2p36

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56 PUBLICATIONS **101** CITATIONS

Applied Physics Research; Vol. 15, No. 2; 2023
ISSN 1916-9639 E-ISSN 1916-9647
Published by Canadian Center of Science and Education

The Truths of Space-time Contractions of Special Relativity

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Received: May 6, 2023 Accepted: June 19, 2023 Online Published: August 14, 2023

doi:10.5539/apr.v15n2p36 URL: https://doi.org/10.5539/apr.v15n2p36

Abstract

This paper points out that there is no any experimental evidence for the length contraction of a moving object in special relativity. It is just a theoretical prediction based on the Lorentz transformation formula. Einstein put forward the concept of simultaneous relativity in order to explain the length contraction. In this paper, an example called Ji Hao's bridge-breaking paradox is provided to prove that this kind of paradoxes cannot be explained by simultaneous relativity. A completely symmetric method is introduced to prove that the famous twin paradox is unsolvable. The time delay experiments of special relativity, such as the life time of μ meson and the atomic clocks moving around the Earth are discussed. It is proved that time slows down of a moving clock does not exist too. It is a misunderstanding to use the lifetime of μ mesons to prove the time delay of special relativity because μ mesons decay prematurely due to strong collisions with other nuclei in the Earth's surface atmosphere. What calculated in theory is the time difference between two atomic clocks flying east and west observed in the stationary reference frame of the Earth's mass center. But the measurement of time difference is on the surface of the Earth. Because of the symmetry of motion speed, there is no time difference caused by the motion speed between the two atomic clocks observed on the Earth’s surface, so the experiment of atomic clocks moving around the Earth is invalid. The experiment is also suspected of fabricating experimental data. The conclusion of this paper is that the space-time contraction of special relativity and its relativity cannot happen in real nature, time and space are absolute concepts, and the Lorentz transformation cannot be correct.

Keywords: special relativity, Lorentz velocity transformation, length contraction, time delay, Ji Hao broken bridge paradox, slider paradox, twin son paradox, meson’s lifetime, atom clock around the earth experiment

1. Introduction

In March, 2023, Mei Xiaochun and Yuan Canlun published two papers in “Applied Physics Research”, proved that the Michelson-Morley experiment which is the most important and foundational experiment of Einstein's special relativity is invalid, and therefore the Lorentz coordinate transformation formula is unnecessary.

Meanwhile, it is proved that it is impossible to derive the mass-velocity formula and the mass-energy relation from the Lorentz transformation formula. If these two formulas are correct, the Lorentz transformation formula cannot be correct. Since the Lorentz transformation formula is the basic formula of Einstein's special relativity, if the Lorentz transformation formula is wrong, special relativity cannot be correct. The main contents are as follows:

1) As well known, in order to explain the zero result of the Michelson-Morley experiment (M-M experiment), Lorentz proposed the famous Lorentz coordinate transformation, which is the theoretical foundation of Einstein's special theory of relativity. In the Michelson's calculations of the M-M experiment, the light source was fixed to the ether reference frame or the absolutely stationary reference frame of the universe.

However, in the actual experiment, the light source was fixed on the Earth motion reference frame and moved with the interferometer, so the calculation of the M-M experiment is invalid. It is proved that the zero result of the M-M experiment can be explained well by fixing the light source on the moving reference frame of the Earth and adopting the Galilean velocity transformation formula, without the need of the Lorentz transformation formula (Mei, & Yuan, 2023). If Michelson had done his calculations correctly, there would have been no Einstein's special relativity.

2) All methods to derive the mass-velocity formula in special relativity are analyzed. It is proved that all of them are invalid. So, it is impossible to obtain the mass-velocity formula based on the Lorentz velocity transformation formula and the famous mass-energy relationship cannot be obtained (Mei, & Yuan, 2023). The mass-velocity formula can only be regarded as an empirical formula, which cannot be deduced theoretically. The most important two equations of Einstein's relativistic dynamics actually have nothing to do with special relativity. If these two formulas are correct, it just means the Lorentz transformation formula and Einstein’s special relativity are wrong.

This paper continues to discuss the space-time contraction and their relativity in the kinematics of special relativity. After Einstein put forward special relativity, researchers found that there were a lot of space-time paradoxes (Liu, 2011). These paradoxes are so varied, so endless, so contrary to basic human knowledge, it is unprecedented in the history of science.

For a scientific theory, there are so many abnormal logic problems, it can only show that the theory itself has fundamental defects, and will certainly cause people's high suspicion. This is the main reason why so many people have questioned Einstein’s special relativity since it was established more than a century ago. The skeptics included the people like Michelson, Lorentz, Maher and others who were considered the pioneers of relativity, which was ironic.

However, textbooks on special relativity did not regard them as paradoxes and thought that all of them can be eliminated by using following two methods.

1) Introduce the concept of simultaneous relativity to solve the problems of length paradox.

2) Use general relativity to solve the problems of time paradox.

Einstein proposed the concept of simultaneous relativity in his 1905 paper for the purpose of self-consistency of special relativity (Albert, 1977). However, the author has shown that the assumption of simultaneous relativity is problematic in itself and can also lead to contradictions. To explain the paradox of time and space with the concept of simultaneous relativity will lead to the superposition of contradictions and can not really solve the problems. Since the proof process is too complex, this paper will not discuss it. The interested readers can see Reference (Mei, 2014).

On the other hand, some length contraction problems cannot be explained by simultaneous relativity. The second chapter of this paper gives a typical example, namely the train crossing bridge problem proposed by Chinses scholar Ji Hao. This paradox was raised two decades ago, and special relativity has so far failed to provide any explanation on it.

This paper also discusses the calculation of W. Rindler on the problem of slider paradox (Rindler, 1961) and points out that W. Rindler's calculation violates the principle of relativity and is impossible to hold in practice. In fact, physics has never experimentally measured the length of a moving object so far, proving the existence of the length contraction of special relativity.

Special relativity only discusses the space-time problem of uniform inertial motion reference frame, which is considered to be inapplicable in the case of non-inertial motion. So general relativity is used to explain some space-time paradoxes involving non-inertial acceleration, such as the twin paradox and the Sagnac effect.

This paper cites a simple and perfectly symmetrical example of the twin travel proposed by Qi Ji (Qi, 1993), showing that the twin paradox is also impossible to be solved and the time delay of special relativity cannot occur in the real world.

The third chapter of this paper discusses the experimental test of time delay, namely the lifetime measurement of high-speed moving μ mesons, and the experiment of atomic clocks moving around the Earth (Zhang, 1994). It is actually a misunderstanding using the lifetime problem of μ meson with high speed to prove the the existence of time delay of special relativity. The experimental calculations and actual observation of atomic clocks moving around the Earth are not in the same frame of references, so it can not be used to prove the time delay of special relativity.

In fact, physics has never measured the lifetime of a μ meson at rest in a vacuum. What is actually measured is the lifetime after a high-speed moving μ meson is injected into a dense solid material and collides violently with the nucleus of something else, causing μ mesons to decay prematurely. It is like bombarding a uranium nucleus with neutrons, causing it to fission. It has not been proved for a meson moving with a high speed having a longer life than it is at rest in vacuum.

This result also applies to the lifetime of other microscopic particles, which is exactly the same as the length contraction problem. Physics has so far never measured the lifetime of a microscopic particle in a stationary reference frame of inertial motion without interaction, and measured the lifetime of a particle in a reference frame of motion, then compared them to prove the time delay caused by purely relative motion. The time delay experiments in special relativity are either misunderstanding or have other reason and can be explained otherwise.

What was calculated in the experiment of atomic clocks moving around the Earth was the time difference between two atomic clocks flying east and west in the stationary reference frame of the Earth's center of mass. But what was actually measured was the time difference between two atomic clocks from the viewed of observer on the Earth's surface. According to the relativity principle of motion, there was no time difference in the latter case, so the experiment of atomic clocks moving around the Earth was invalid. Observed on the Earth’s surface, it is impossible to find the time difference between two atomic clocks flying east and west.

However, how can the actual experiment observe the time difference? This paper cites the original data of the experiment obtained by British engineer A. G. Kelly from the United States Naval Observation Station under the Freedom of Information Act, and points out that the experiment date was suspected of artificial fabricating (Ma, 2004).

The fourth chapter of this paper lists a large number of papers published by the author in recent years, pointing out that Einstein's gravitational field equation is invalid, and many experimental tests of general relativity are questionable or otherwise explained. It is impossible to explain the space-time paradox of special relativity with general relativity because of its own problems.

Therefore, the conclusion of this paper is that the space-time paradox of special relativity can not be solved, the fundamental reason is that Lorentz transformation formula is invalid, Lorentz contraction factor does not exist. No matter in any reference frame, the measurement of time and space can only be absolute.

2. The Problem of Length Contraction

2.1 The Space-time Contraction in Special Relativity

Special relativity holds that the speed of motion is a relative concept, and so do for the simultaneity of clocks at two different spatial points. Let the reference frame K be at rest, and the reference frame K' moves to the right along the x axis at a uniform speed V. Let the origins of two reference frames K and K' coincide at the initial moment, and the two-dimensional space-time coordinate relation of these two reference frames at a certain moment is expressed by the Lorentz transformation as follows.

$$x' = \frac{x - Vt}{\sqrt{1 - V^2 / c^2}} \qquad t' = \frac{t - Vx / c^2}{\sqrt{1 - V^2 / c^2}} \tag{1}$$

Fixing a ruler on K' and measure both ends of the ruler on K at the same time to let $t_2 = t_1$ to get the length contraction formula. The time delay formula is obtained by comparing a clock fixed on K' with two stationary clocks fixed on K to let $x_2 - x_1 / (t_2 - t_1) = V$. The results are

$$\Delta x' = \frac{\Delta x}{\sqrt{1 - V^2 / c^2}} \quad \text{or} \quad \Delta x = \Delta x' \sqrt{1 - \frac{V^2}{c^2}}$$

$$\Delta t' = \Delta t \sqrt{1 - \frac{V^2}{c^2}} \quad \text{or} \quad \Delta t = \frac{\Delta t'}{\sqrt{1 - V^2 / c^2}} \tag{2}$$

Therefore, the observer on K thinks that the length of reference frame K' contracts and time becomes slow. On the other hand, by inverting Eq.(1), we can get

$$x = \frac{x' + Vt'}{\sqrt{1 - V^2 / c^2}} \qquad t = \frac{t' - Vx' / c^2}{\sqrt{1 - V^2 / c^2}} \tag{3}$$

Similarly, fixing a ruler on K and measure both ends of the ruler on K' at the same time to get the length contraction formula. The time delay formula is obtained by comparing a clock fixed on K with two clocks fixed on K'. The results are

$$\Delta x = \frac{\Delta x'}{\sqrt{1-V^2/c^2}} \qquad \text{or} \qquad \Delta x' = \Delta x\sqrt{1-\frac{V^2}{c^2}}$$

$$\Delta t = \Delta t'\sqrt{1-\frac{V^2}{c^2}} \qquad \text{or} \qquad \Delta t' = \frac{\Delta t}{\sqrt{1-V^2/c^2}} \tag{4}$$

Therefore, the observer on K' thinks that the length of K decreases and time slows down.

The space-time contractions are caused by the velocity of relativity motion and are considered as a completely relative effect. In the following, we first discuss the problems caused by using the space-time contraction formula to calculate the speed of light and the relative velocities of two reference frames, and then discuss the length contraction paradox in special relativity, which cannot be explained by simultaneous relativity.

2.2 The Contradiction Caused by Using the Formula of Space-time Contraction to Calculate the Speed of Light

Similar to classical physics, the common formula to calculate velocity in special relativity are also $\vec{u} = d\vec{x}/dt$. So Eqs.(2) and (4) can also be used to calculate the speed of light and relative speed between two reference frames. According to Eq.(4), assuming that light moves along the x axis, we have light's speed

$$c = u = \frac{dx}{dt} = \frac{1}{1-V^2/c^2}\frac{dx'}{dt'} = \frac{c'}{1-V^2/c^2} \neq c' \tag{5}$$

It indicates that light's speed is not a constant, unless $V = 0$. The result contradicts with the Lorentz formula of velocity transformation.

Besides, according to special relativity, the two reference frames have the same idea about the relative speed of motion between them. However, according to Eq.(4), we also have

$$V' = \frac{dx'}{dt'} = \left(1-\frac{V^2}{c^2}\right)\frac{dx}{dt} = V\left(1-\frac{V^2}{c^2}\right) \neq V \tag{6}$$

For this most simple problem, special relativity cannot be consistent unless $V = 0$. It means that the Lorentz transformation formula does not hold. Unfortunately, physicists did not find this problem for more than a hundred years after special relativity was established.

2.3 Ji hao's Broken Bridge Paradox

So far, there is no any experimental evidence for the length contraction of special relativity, which is just a theoretical conjecture. However, the length contraction causes many paradoxes in special relativity. According to preliminary statistics, there are no less than dozens of paradoxes, such as trains passing through tunnels, crossing bars into warehouses and submarine paradox and so on (Liu, 2011).

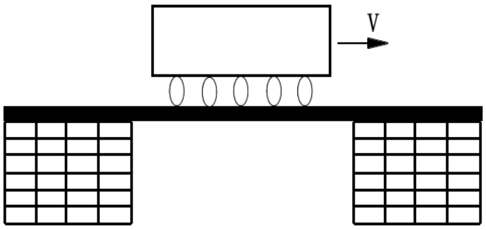

Figure 1. Train shorten and bridge must collapse when observed on the ground

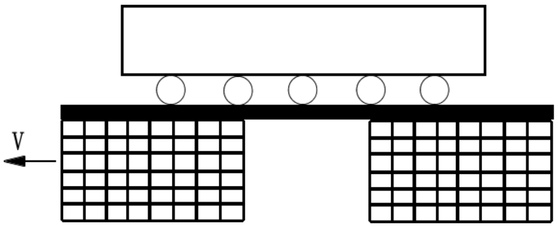

Figure 2. Bridge shorten and dose not collapse when observed on the train

These paradoxes can be divided into two types, the first is independent of simultaneous relativity, and the second seems to be explainable in terms of simultaneous relativity. For the second paradox, by denying the relativity of simultaneity, we can prove that they are really unsolvable paradoxes.

The typical paradox that cannot be explained by the relativity of simultaneity is the bridge breaking paradox proposed by Chinese scholar Ji Hao. Assume that the bridge is 200 meters long, and the maximum weight it can bear is 200 tons. The train is 300 meters long, weighs 300 tons, the speed of train is $V = 0.866c$, the Lorentz contraction factor $\sqrt{1-V^2/c^2} = 0.5$. When observed on the ground reference frame, as shown in Figure 1, the train is shorten to 150 meters according to Eq.(2). The bridge will collapse when the train crosses it.

If viewed from the moving train reference frame, as shown in Figure 2, the train is still 300 meters and the bridge is shortened to 100 meters according to Eq.(4), so the bridge will not collapse when the train crosses it.

However, whether the bridge collapses or not is an absolute event, and it is impossible to have two results, which leads to the contradiction. Because of the relativity of motion, the ground reference frame and the train reference frame are completely equivalent. Within the framework of relativity, this contradiction cannot be solved by any means.

The only possible outcome is that neither the train nor the bridge is shorten, observed either from the ground or from the train. When a 300 meter train crosses a 200 meter bridge, the bridge will not collapse. This means that when observed in two reference frames, we only have $\Delta x = \Delta x'$. The Lorentz factors $\sqrt{1-V^2/c^2}$ in Eqs.(2) and (4) do not exist, and the Lorentz coordinate transformation formula cannot be correct.

2.4 Slider Paradox

The slider paradox problem appears frequently in the textbooks of special relativity and is thought to be solvable. It is proved below that the so-called solution of special relativity does not hold, and the slider problem is also a real paradox.

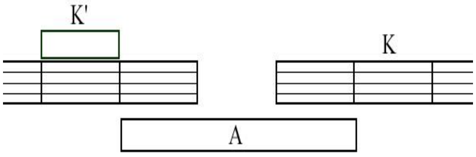

Figure 3.1

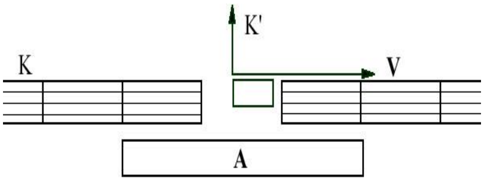

Figure 3.2

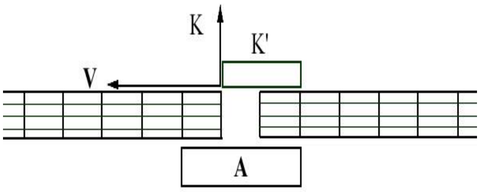

Figure 3.3

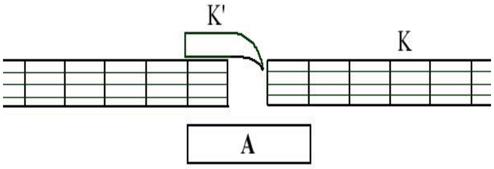

Figure 3.4

As shown in Figure 3.1, suppose that there is a stationary smooth plane represented by the reference frame K and a slit with the width L. The x axis of K is parallel to the plane, and the z axis is facing up. In addition, the reference frame K' moves along the x axis with a velocity V relative to K, and the x' axis of K' is also parallel to the plane, with the z' axis direction facing upward. A smooth iron block is placed on K', the length of which is $L' = L$ when the slider is at rest.

There is a large uniform magnetic tube A under the flat surface, which exerts a strong attraction to the iron block. The iron glides along the plane at speed V to the right side. As shown in Figure 3.2, let $\sqrt{1-V^2/c^2} = 1/2$, according to the length contraction formula of special relativity, the length of iron block is shortened into $L' = L/2$ relative to the observer on K. Suppose that when the origins of two reference frames meets, both clocks at the origin indicates time $t = t' = 0$, and the left side of iron block reaches exactly to the left of slit. So, for the observer on K, the iron will fall into the slit.

On the other hand, according to the relativity principle of motion, when viewed on K', the iron block is at rest and the reference frame K moves to the left with a velocity V. According to the relativity of Lorentz contraction, for the observer on K', the width of slit becomes $L = L'/2$ so that the iron does not fall into the slit, but slides through the slit and continues to move in the plane, as shown in Figure 3.3. Since the iron falling into the slit is an absolute event, it is impossible to have two results at the same time, so there is a contradiction.

W. Rindler proposed an explanation for the slider paradox (Rindler, 1961), which held that the pinion of observer on K is right. In order to let the observer on K' had the same viewpoint, W. Rindler argued that there was no longer the concept of rigid bodies in special relativity. In view of the popularity of W. Rindler's explanation, this paper provides a detailed analysis. The readers also can refer to Tan Zhansheng's book titled "From Special Relativity to Standard Space-time" (Tan, 2007).

According to the Lorentz transformation formula, the two reference frames do not move relative to each other in the direction of z or z' axis. For the reference frame K, let the falling acceleration of the iron block be a, the falling motion equation is

$$z = \begin{cases} 0 & t \le 0 \\ -at^2/2 & t > 0 \end{cases} \tag{7}$$

If the motion of iron block is observed on K', considering the Lorentz time transformation (1), when $t \le 0$ or $t' \le -Vx'/c^2$, we have $z' = 0$. Substituting t shown in Eq.(1) in Eq. (7), then the equation of motion track of iron block can be obtained

$$z = z' = -\frac{a(t'^2 + 2Vx't'/c^2 + V^2x'^2/c^4)}{2(1 - V^2/c^2)} \tag{8}$$

This is a parabolic equation of about the coordinate x'. Thus, according to Rindler, the concept of rigid bodies did not exist in the theory of relativity. To the observer on K', a straight line form of iron would become a parabolic object, with the front end of $x' > 0$ bent downward and inserted into the slit, as shown in Figure 3.4. So, the view of observer on K' was the same as the view of observer on K, and there is no paradox again.

This explanation is far-fetched and patently absurd. According to the principle of relativity, an object that is rectangular in one inertial motion reference frame should also be rectangular in another inertial motion reference frame, otherwise we would not be talking about relativity. If a body can deform in an inertial motion reference frame, it is equivalent to saying that the stationary reference frame and the moving reference frame are not equivalent.

From this we can distinguish between the stationary reference frame and the moving reference frame, and we can say that the reference frame in which the object is observed without deformation is superior.

In fact, even if the slider falls, Eq.(8) is only the motion equation of slider falling as a particle, rather than the deformation equation of slider. The slider remains rectangular as it falls.

In addition, W. Rindler hypothesized $z = z'$ in the process. Since the slider falls in K, it means that the slider also falls in K'. But this premise is wrong. When observed in K', the slider does not fall at all. W. Rindler made a logical error by taking the result to be proved as the premise of proof.

Thus, W. Rindler's explanation is meaningless. To the observer on K', iron block cannot bend and fall into a slit. It can only continue to slide across the slit, and the sliding block paradox of relativity cannot be eliminated. The only result of this problem is also that no matter in which reference frames, the slider and slit are not shortened with $\Delta x = \Delta x'$, the Lorentz factor $\sqrt{1 - V^2/c^2}$ cannot exist.

3. The Problems of Time Delay

The time delay of special relativity has both theoretical and experimental problems to be discussed. One of the most famous problems in theory is the twin paradox, which presents serious logical difficulties of special relativity. The main experiments are the lifetime of mesons and the atomic clocks moving around the Earth, which are credited to show the validity of special relativity. Let's discuss them separately.

3.1 The Twin Paradox

The problem of twin paradox is one of the most interesting problems in special relativity and has been discussed for more than a hundred years. Suppose there are two twins A and B. A travels to outer space in a high-speed spaceship, while B stays on the Earth. Years later, A returns to the Earth and asks which A or B is younger.

For this problem, B thinks that he is at rest, A is moving and his time is delayed, so A is younger than B. However, according to special relativity, motion is relative, A can also consider itself to be in a static state, B moves with the Earth, so B is younger. The viewpoints of A and B are obviously contradictory.

Skeptics of relativity argue that this is a paradox and always use this problem to deny relativity. Proponents of relativity argues that spacecraft needs to undergo acceleration to travel at high speeds from the Earth. Returning from outer space would also slow down, so the problem is not solved within the scope of special relativity. Mollerz first used general relativity to do calculation, the result was that A would younger when he came back from a trip to space (Zhang, 1980; Moller, 1972).

The author carefully examined the calculation of Mollerz using general relativity and found that there are many problems in it. For example, Mollerz needed to assume that the acceleration was infinite when the spaceship turned, and the initial condition chosen in the calculation of integration was wrong, so Mollerz's calculation was invalid (Mei, 2014).

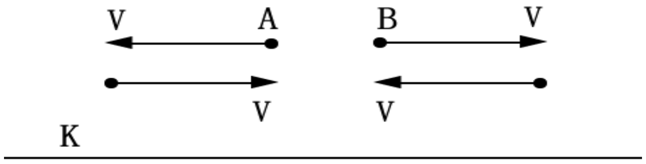

Figure 4. The travel process of the twins is perfectly symmetric

This article will not discuss the problem in detail, but cites a simple and symmetrical method proposed by Chinses scholar Qi Ji in his book “New Physics” (Qi, 1993) to show that the twin paradox cannot be solved and can only be considered as a real paradox.

As shown in Figure 4, suppose that twins A and B leave the Earth travelling to space in two identical spaceships and two opposite directions at the same speed, and return to the Earth at the same time several years later. In this case, neither A nor B can think that the other is younger than himself. The only result is that they are equally young. This is the only way to resolve the twin paradox, and it cannot go any other way. According to Eqs.(2) and (4), we have $\Delta t = \Delta t'$.

It follows that Lorentz factor $\sqrt{1-V^2/c^2}$ cannot exist and the Lorentz coordinate transformation formula cannot be correct. Although the acceleration process may have an effect on the state of the human body, the effect is absolute and not paradox are caused.

The twin paradox problem tells us once again that physics must obey the most basic logic and that paradoxes cannot exist in the real world. This principle must be followed when discussing the lifetime of meson and the experiments of atomic clocks moving around the Earth, otherwise that the problems of broken bridge paradox and the twin paradox will arise.

3.2 The Problem of μ Meson Lifetime

The lifetime of μ mesons has been regarded as the most important evidence for the validity of relativistic time-delay effects. However, this is actually a misunderstanding.

μ mesons were created when primary cosmic rays collided with the nuclei of air’s molecules high up in the Earth's atmosphere (10 to 20 kilometers above the ground) to produce π meson, then π meson decay into μ mesons and two positive and negative neutrinos. Assuming that the μ mesons travel approximately at the speed of light in vacuum, it can only move 660 meters during its lifetime $2.2\times10^{-6}s$ (Chamberlain, et al., 1955).

In practice, however, most μ mesons have been observed to reach the sea level, traveling about 20 kilometers. Therefore, the lifetime of high-speed moving μ meson becomes about 1.8×10^{-5} seconds, which is considered being consistent with the calculation of the time-delay formula of special relativity.

However, the truth is that physicists have never measured the lifetime of a meson at rest in a vacuum. What have been observed only the lifetime of μ mesons moving at a high speed. It is impossible for an observer to travel with a μ meson at high speed and measure its lifetime when he is at a relative rest state with μ meson. As a result of violent collisions between fast moving μ mesons and other atoms of matter, it is possible for μ mesons to decay prematurely as shown in Figure 5. It is like bombarding a uranium nucleus with neutrons, causing it to fission.

Therefore, we can think that the normal lifetime of μ mesons is inherently about $1.8\times10^{-5}s$. If it does not collide with the nuclei of atmosphere, it does not decay prematurely. The μ mesons moving along the dotted lines in Figure 5 can reach the sea level of the Earth. The lifetime problem of μ meson does not prove the existence of time delays of special relativity.

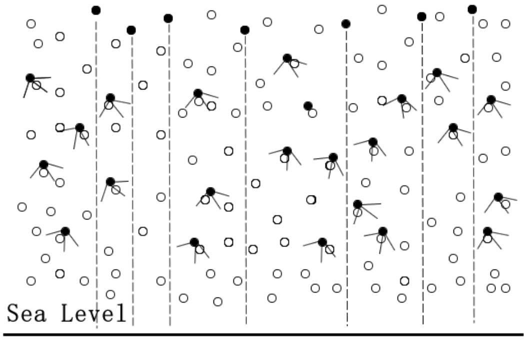

Figure 5. High speed μ meson (black dots) collides with atomic nuclei in Earth's atmosphere (white dots) leads to shorter decay lives. The μ mesons without collisions have normal lifetimes

Physicists have also measured the lifetimes of π mesons moving at high speeds, and believe that the results also meet the predictions of special relativity (Frisch, & Smith, 1963). However, all measurements have been made in the presence of interactions, and the lifetimes of these particles have never been measured in the absence of interactions. Therefore, the lifetimes of micro-particles predicted by the theory are invalid, and the time delay of special relativity has not been verified experimentally.

3.3 The Time Delay Problem of Atomic Clocks Moving Around the Earth

3.3.1 The Time Delay of an Atomic Clock in the Linear Motion

Let's start with an ideal simplified model. As shown in Figure 6, let K be the absolutely stationary reference frame, and the reference frame K' moves to the right with uniform speed u_0. The time indicated by the clock at rest on K be dt, and the time indicated by the clock at rest on K' be dt'. For the observer at rest on K, the time delay formula of special relativity is

$$dt = dt'\sqrt{1-\frac{u_0^2}{c^2}} \tag{9}$$

Due to $dt < dt'$, Eq.(9) indicates that the clock on K' becomes slow down when it is measured on K.

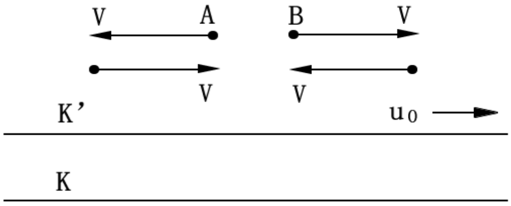

Figure 6. No time delay for an atomic clock moving in a straight line

On the other hand, suppose that there are two airplanes A and B in the reference frame K', carrying two identical atomic clocks moving in opposite directions at the same and uniform speed V. According to the Lorentz velocity addition formula, the velocity of airplane A relative to K is u_1, and the velocity of aircraft B relative to the reference frame is u_2, we have

$$u_1 = \frac{u_0 + V}{1 + u_0 V / c^2} \qquad\qquad u_2 = \frac{u_0 - V}{1 - u_0 V / c^2} \tag{10}$$

Suppose that for each observer in the airplanes, the times of stationary clock are dt''_1 and dt''_2 respectively. For an observer at rest in the absolute stationary reference frame K, the times of atomic clocks on these two aircraft are

$$dt_1 = dt''_1 \sqrt{1 - \frac{u_1^2}{c^2}} \qquad\qquad dt_2 = dt''_2 \sqrt{1 - \frac{u_2^2}{c^2}} \tag{11}$$

Due to $u_0 << c$ and $V << c$, so $u_1 \approx u_0 + V$, $u_2 \approx u_0 - V$, Eq.(11) can be approximately written as

$$dt_1 = dt''_1 \sqrt{1 - \frac{(u_0 + V)^2}{c^2}} \approx dt''_1 \left(1 - \frac{u_0^2 + V^2 + 2u_0 V}{2c^2}\right) \tag{12}$$

$$dt_2 = dt''_2 \sqrt{1 - \frac{(u_0 - V)^2}{c^2}} \approx dt''_2 \left(1 - \frac{u_0^2 + V^2 - 2u_0 V}{2c^2}\right) \tag{13}$$

For this experiment, let $dt''_2 = dt''_1 = dt''$, we have

$$\Delta t = dt_2 - dt_1 \approx \frac{u_0 V}{c^2}(dt''_2 + dt''_1) = \frac{2u_0 V}{c^2} dt'' \tag{14}$$

That is to say, for the observer on K, the atomic clocks of two airplanes experience different times, and there is a time difference between them described by Eq.(14).

However, for the observer on K', the speeds of two airplanes are the same and the time delays are the same with

$$dt'_1 = dt''_1 \sqrt{1 - \frac{V^2}{c^2}} \qquad\qquad dt'_2 = dt''_2 \sqrt{1 - \frac{V^2}{c^2}} \tag{15}$$

So we have $dt'_2 - dt''_1 = 0$ when $dt''_2 = dt''_1 = dt''$. Therefore, for the stationary observer in the reference frame K', although both flight clocks have time delay, there is no time difference between them. Finally, for the observer in the two aircraft, according to the Lorentz velocity addition formula, the relative velocity of the two aircraft is

$$u' = \frac{V + V}{1 + V^2 / c^2} = \frac{2V}{1 + V^2 / c^2} \tag{16}$$

So for the observer on airplane A, the clock on airplane B slows down. But for the observer on plane B, the clock on plane A slows down, i.e

$$dt''_2 = dt''_1 \sqrt{1 - \frac{u'^2}{c^2}} \qquad \text{or} \qquad dt''_1 = dt''_2 \sqrt{1 - \frac{u'^2}{c^2}} \tag{17}$$

3.3.2 Contradiction Caused by Time Delay of Atomic Clock in Linear Motion

So when the two airplanes return to the reference frame K', exactly the same problem as the twin paradox arises. It is simply not possible that an observer on plane A thinks the clock on plane B is slowing down, and an observer on plane B thinks the clock on plane A is slowing down. The only possibility is that the clocks on both aircraft A and B indicate the same time, i.e., the Lorentz factor in Eq.(17) cannot exist.

3.3.3 The Experiment of Time Delay of Atomic Clocks Moving Around the Earth

The experiment of atomic clocks moving around the Earth only changed the linear motion in Figure 6 into a circular motion (Zhang, 1994). As shown in Figure 7, the stationary reference frame of the Earth's mass center is K, the Earth rotates around the reference frame of the Earth's mass center of mass (or the geocentric reference frame) at an angular speed Ω, and the radius of the Earth is R. The rotating reference frame of the Earth's surface is K'. The tangential velocity of an atomic clock at rest on the equator with respect to the geocentric reference frame is $u_0 = \Omega R << c$. Let dt' be the time of an atomic clock at rest on K', and the time of an atomic clock at rest on K is dt. According to Eq.(9), we have

$$dt = dt'\sqrt{1-\frac{u_0^2}{c^2}} = dt'\sqrt{1-\frac{\Omega^2 R^2}{c^2}} \approx dt'\left(1-\frac{\Omega^2 R^2}{2c^2}\right) \tag{18}$$

The above formula represents the view of an observer on K, that is, the time of atomic clock on K' slows down. Although K' is not an inertial reference frame, Eq.(18) in fact defaults that the time delay formula of special relativity is valid for non-inertial motion.

Then assume that at an altitude $h << R$ above the Earth's surface, there is an aircraft moving east with speed $V << c$ relative to the ground. If the influence of the Earth's gravitational field is not taken into account, the time delay formula of flying clock relative to the observer on the Earth surface is (Zhang, 1994)

$$dt_1' = dt_1''\sqrt{1-\frac{V^2}{c^2}} \approx \left(1-\frac{V^2}{2c^2}\right)dt_1'' \tag{19}$$

Where dt_1' is the time of the atomic clock at rest on K', dt_1'' is the time of the atomic clock at rest in the airplane.

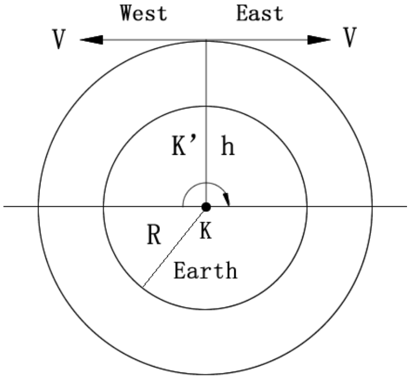

Figure 7. The experiment of time delay of atomic clocks moving around the Earth

Since the distance of the clock from the geocentric is $R+h$, the rotating speed of atomic clock relative to the geocentric reference frame is $u = \Omega(R+h)$. According to the velocity addition rule of special relativity, the moving speed of atomic clock with respect to the geocentric reference frame is

$$u_1 = \frac{u+V}{1+uV/c^2} = \frac{V+\Omega R(1+h/R)}{1+V\Omega R(1+h/R)/c^2} \approx V + \Omega R \tag{20}$$

Thus, the experienced time of an atomic clock on the eastbound airplane relative to the geocentric reference frame is

$$dt_1 = dt_1''\sqrt{1-\frac{u_1^2}{c^2}} \approx dt_1''\sqrt{1-\frac{(V+\Omega R)^2}{c^2}} \approx \left(1-\frac{V^2}{2c^2}-\frac{\Omega^2R^2}{2c^2}-\frac{V\Omega R}{c^2}\right)dt_1'' \tag{21}$$

If expressed in terms of the time of a clock at rest on the Earth's surface, substituting Eq.(19) in Eq.(21) and eliminating dt_1'', we get

$$dt_1 \approx \frac{(1-V^2/2c^2-\Omega^2R^2/2c^2-V\Omega R/c^2)}{(1-V^2/2c^2)}dt_1' \approx \left[1-\frac{\Omega R}{2c^2}\left(\Omega R+2V\right)\right]dt_1' \tag{22}$$

Considering the fact that the atomic clock is in the Earth's gravitational field, there is still a time difference generated by the gravitational potential difference between the atomic clock on the ground and the atomic clock in flight, Eq.(22) should be rewritten as:

$$dt_1 \approx \left[1-\frac{\Omega R}{2c^2}(\Omega R+2V)+\frac{gh}{c^2}\right]dt_1' \tag{23}$$

Where gh/c^2 is the time difference caused by the Earth's gravity, but this effect is not important to the result of this experiment.

If another atomic clock B is traveling west at the same speed V and at the same altitude in the opposite direction, relative to the observer on the Earth's surface reference frame, the time delay is

$$dt_2' = dt_2''\sqrt{1-\frac{V^2}{c^2}} \approx \left(1-\frac{V^2}{2c^2}\right)dt_2'' \tag{24}$$

The speed of atomic clock B relative to the geocentric reference frame is

$$u_2 = \frac{u-V}{1-uV/c^2} = \frac{V-\Omega R(1+h/R)}{1-V\Omega R(1+h/R)/c^2} \approx V-\Omega R \tag{25}$$

Corresponding Eqs.(21) and (23), the time of atomic clock B is

$$dt_2 \approx dt_2''\sqrt{1-\frac{(V-\Omega R)^2}{c^2}} \approx \left(1-\frac{V^2}{c^2}-\frac{\Omega^2R^2}{2c^2}+\frac{V\Omega R}{c^2}\right)dt_2'' \tag{26}$$

$$dt_2 \approx \left[1-\frac{\Omega R}{2c^2}(\Omega R-2V)+\frac{gh}{c^2}\right]dt_2' \tag{27}$$

For an observer in the geocentric reference frame, according to Eqs.(23) and (27), by taking into account $dt_2' = dt_1'$ for the atomic clocks which are at rest on the airplanes, let $dt_2' = dt_1' = dt'$, the time difference between the two flying atomic clocks is

$$\Delta t = dt_2 - dt_1 = \frac{\Omega RV}{c^2}(dt_2' + dt_1') = \frac{2\Omega RV}{c^2}dt' \tag{28}$$

Eq.(28) shows that when observed at the geocentric reference frame, the clock traveling west experiences more time than the clock traveling east.

3.3.4 The Contradiction of Time Delay Experiment of Atomic Clock Moving Around the Earth

It should be noted that Eq.(28) was calculated from the perspective of an observer at rest on the geocentric reference frame. For the observer on the Earth's surface reference frame, the result is different. As the case that an airplane moves in a straight line, according to the principle of motion relativity, atomic clocks traveling in both directions have the same speed and the same altitude when observed on the reference frame of the Earth's surface. There is no time difference between them after moving round the Earth. Considering the time change caused by the gravitational potential of flight altitude, Eqs.(19) and (24) can be written as

$$dt_1' = \left(1 - \frac{V^2}{2c^2} + \frac{gh}{c^2}\right) dt_1'' \qquad dt_2' = \left(1 - \frac{V^2}{2c^2} + \frac{gh}{c^2}\right) dt_2'' \tag{29}$$

For this experiment with $dt_2'' = dt_1'' = dt''$, and according to Eq.(29), the time different should be

$$dt_2' - dt_1' \approx \left(1 - \frac{V^2}{2c^2} + \frac{gh}{c^2}\right)(dt_2'' - dt_1'') = 0 \tag{30}$$

Eq.(30) shows that observed on the Earth surface reference frame, when two atomic clocks return to the Earth surface, though both clocks move slowly, the amplitude of time delay is the same, and there is no time difference between them.

On the other hand, according to the principle of relativity, an eastbound observer thinks that himself is at rest and a westbound clock is delayed, while a westbound observer thinks the opposite. Therefore, the observers on the Earth and two airplanes have contradictory views, and that are something which can not happen in reality.

The only possibility is that the clocks on both airplanes experience the same time. Compared with a clock resting on the Earth's surface, there is only a time difference in flight due to gravitational potential. So, for the observers on the airplanes or on the Earth surface, the Lorentz factor does not exist. The situation is completely the same with that of symmetry twins traveling.

It should be noted that the change of atomic clock’s time caused by gravitational potential difference is essentially a change in the frequency of atomic vibration, rather than a change of so-called time. Time is not equal to atomic frequency. Both concepts have principle and basic difference. Time cannot be changed, but the frequency of atoms can be changed. The change in the vibration frequency of atoms in the gravitational field can also be explained by the Newton's theory of gravity, Einstein's general theory of relativity is also unnecessary.

3.3.5 The Mistakes and the Analysis of Experiments of Atomic Clock Moving Around the Earth

Curiously, however, in 1971, Hafele and Keating carried out an experiment of atomic clocks moving around the Earth, and then compared atomic clocks in flight with those at rest on the Earth surface, and found that the flying clocks slowed down. Instead of comparing flying atomic clock with the clock at rest on the geocentric reference frame, and found that the flying clock slows down.

In fact, as discussed above, it is impossible to observe a time difference of two clocks traveling east and west for the observers on the Earth's surface. The experimenter could neither have made an observation in the geocentric reference frame, nor could there be an atomic clock at rest in the geocentric reference frame.

In practical experiment, Hafele and Keating put four caesium atomic clocks on the ground and another four on the airplane. Flying from east to west at a certain altitude, the airplane circled the Earth's equator, taking about four days. The airplane then travels from west to east for another four days (Hafele, 1970).

The four clocks traveling east were compared with the clocks on the Earth’s surface and found that they slowed down $59\times10^{-9}s$ on average, and the four clocks traveling west were faster $273\times10^{-9}s$ on average than the ground clocks, as predicted by special relativity. The data published by Hafele and Keating are shown in the column of Published data in Table 1.

Table 1. Published data is the experimental data published by Hafele and Keating, while Original data was G. Kelly Raw obtained from the United States Naval Observatory

	Flying east time (ns)		Flying west time (ns)	
Clock No.	Original data	Published data	Original data	Published data
120	-196	-57	+413	+277
361	-54	-74	- 44	+284
408	+166	-55	+101	+266
447	-97	-51	+26	+266
Average value		-59		+273
Predicted value	-40		+275	

The problem is that the calculating result Eq.(28) represents the time difference between the flying clock and the clock at rest on the geocentric reference frame, while the experiment measures the time difference between the flying clock and the clock at rest on the Earth’s surface reference frame, so the data in Table 1 is invalid.

Meanwhile, according to the calculation result of Eq.(30), observing on the Earth’s surface reference frame, the time difference between two atomic clocks flying east and west is equal to zero. However, according to Table 1, there is a time difference between the clocks flying east and west, so the data in Table 1 must be wrong.

As early as 1982, British engineer A. G. Kelly thought that Hafele and Keating's experimental data might be problematic. Therefore, according to the Freedom of Information Act, A. G. Kelly obtained the original data of the experiment from US Naval Observation Station shown in Original data in Table 1 (Ma, 2004; Cao, 2019).

It can be seen that Original data in Table 1 was chaotic and irregular. The delay time of clock No.408, which was flying east, was completely opposite to that of the other three clocks, and the difference was very large. The time delay of clock N0.361, which was flying east, was also against the other three clocks. Such measurement data were actually meaningless and did not tell us anything.

Kelly also managed to get a memo that Hafele wrote a year after the experiment which recorded Hafele’s internal reports. Hafele frankly admitted: “Most people (himself included) do not think that the time becoming fast of these atomic clocks means anything, “The difference between the theory and the measurements was confusing" (Ma, 2004).

Obviously, the data in the publication column has been artificially modified to make the theoretical predictions consistent. A. G. Kelly asked, "Are these experiments trying to fabricate a confirmation of the theory, or are they trying to produce objective and reliable results?" (Ma, 2004).

Therefore, Hafele and Keating's atomic clock experiments did not prove Einstein's theory of time delay. On the contrary, it proved that the time delay caused by the motion speed in special relativity does not exist.

3.3.6 GPS Does Not Need to Take Into Account the Time-delaying Effects of Special Relativity

It is often said that the global positioning system (GPS) needs to take into account the time delay effect of special relativity. The application of special relativity to GPS proves the correctness of special relativity. From the discussions above, the so-called time delay effect of special relativity does not exist. GPS cannot take advantage of things that do not exist. Time correction in GPS is only the most common error processing techniques, which has nothing to don with special relativity.

As discussed in this paper, atomic clocks on different satellites moving around the Earth at the same orbital altitude tell the same time. Their time may be different from that of ground-based atomic clocks due to the differences of gravitational potential. But they can not have the difference caused by the relative speed of motion. In addition, there is no time difference between satellites due to the speed of motion.

Otherwise, according to the theory of relativity, the delay of time is a relativistic effect. Observers moving with clock A thinks the clock B is slowing down, while those moving with clock B think the clock A is slowing down. Therefore, the global positioning system (GPS) will become very confusing. It is impossible to establish the same time standard, and to get the right spatial positions. In fact, Jean-Marie Zogg's book "Fundamentals of GPS Satellite Navigation" does not mention that relativity contributes anything to GPS at all (Zogg, 2011). This shows that the GPS system works without considering relativity at all.

Chinese aerospace expert Guo Yanying published an article on Science Popularization Times on September 11, 2020, titled "Does the clock of satellite navigation system need to be corrected?" The article points out that GPS and other satellite navigation positioning systems do not need “special relativistic correction” for positioning or calibration. Therefore, it is unrealistic to hope that the satellite navigation and positioning system can confirm the correctness of relativity, or deny it.

For more detailed argument about the irrelevance of GPS to special relativity, Ma Qingping published a paper in China Science Net. Ma Qingping pointed out that GPS space-time system is a classical space-time system, not a relativistic space-time system. The so-called “relativistic effect correction” in GPS system is not truly a relativistic correction. The foundation of GPS's success is the absoluteness of simultaneity of classical physics, without which there would be no GPS. In principle, if the relativity of simultaneity were true, dozens of satellite atomic clocks at different speeds could not all be synchronized, and there would be no GPS (Ma, 2016).

4. Using General Relativity Can Not Explain Space-time Paradox

Many space-time paradoxes of special relativity, such as the twin paradox, and same experiment problems in special relativity, such as the Sagnac effect, were considered unsolvable within the scope of special relativity and required the use of general relativity. These problems involve non-inertial acceleration processes, and special relativity only deal with the space-time problem of uniform inertial motion. Special relativity was considered inapplicable in the presence of non-inertial motion.

In recent years, the author has published a large number of papers proving that Einstein's gravitational field equation is invalid, so it is impossible using general relativity to explain the space-time paradox and some experiment problems of special relativity. The main contents are as follows.

1. Einstein's original paper on general relativity in 1915 contained five calculation mistakes. The most critical mistake was that when Einstein derived the motion equations of planets and light based on the equation of gravitational field, he miscalculated the constant term, leading to the failure of the motion equations of planets and light (Mei, 2021; 2022, April; 2022, February).

2. According correct derivations, general relativity can only describe the parabolic orbital motions of celestial bodies (with minor corrections), can not describe the elliptic and hyperbolic orbital motions. Therefore, the calculation of the perihelion precession of Mercury in general relativity is meaningless, because it cannot even describe the elliptical orbit.

3. By the proper calculation, general relativity can not be able to deduce that the deflection angle $1.75''$ of light in the solar gravitational field. The deflection angle of light in the solar gravitational field should be a slight correction of the calculation result $0.85''$ of the Newton's gravitational theory with 10^{-5} order magnitude.

4. This raised another question. How could Eddington et al in 1919 observed what general relativity did not actually predict, the deflection angle $1.75''$ in the solar gravitational field?

Mei Xiaochun and Huang Zhicun published a paper in 2021 (Mei & Huang, 2021) to reveal that besides having not to consider the influence of the gas on the solar surface on the deflection of light, Eddington and other subsequent observations adopted very complex statistical methods such as the least square method and introduced many fitting parameters to make the observation values consistent with Einstein's prediction. In fact, using this statistical method, we can also make the observed deflection angle consistent with the prediction of Newtonian gravity, negating general relativity.

5. Another example was the discovery of gravitational waves. In recent years, LIGO has repeatedly announced the detection of gravitational waves produced by the collision of black holes. However, Mei Xiaochun, Huang Zhixun, Hu Suhui and Yuan Canlun published two papers in 2022 to prove that the gravitational field equation of general relativity has no linear planer wave solution and spherical wave solution even under the weak field condition, or that general relativity cannot predict the existence of gravitational waves (Mei, Huang, Hu & Yuan, 2022).

6. Before this, Mei Xiaochun, Huang Zhixun and Yuan Canlun published a paper pointing out what appeared in two laser gravitational wave detectors of LIGO were not actually gravitational wave signals, but some noises satisfying the time dependence conditions (Mei, Huang & Yuan, 2022). The theory and experiments of general relativity itself has serious problems.

In fact, Einstein's theory of gravity in curved space-time is based on the principle of general relativity, which in turn is an extension of the principle of special relativity. Using general relativity to solve the problem of special relativity is actually a logical loop, and in principle it is completely impossible.

5. Conclusions

This paper discusses the space-time contraction problems of special relativity and its experimental test. On the basis of the Lorentz coordinate transformation and the concept of relativity of motion, the kinematics theory of special relativity exists many pace-time paradox. These strange and varied problems have puzzled the physicists for more than one hundred years, and the controversy has not stopped until now. In the history of science, no any a normal scientific theory had been so full of inherent contradictions like special relativity.

Special relativity uses two basic methods to explain these problems. The concept of the relativity of simultaneity was used to explain the length paradox that occurs between purely inertial reference frames. If the problem involves non-inertial motion, such as the famous twin paradox, which is considered beyond the scope of special relativity, it needs to be explained by general relativity. Meanwhile, there are lots of specious, highly arbitrary, often paradoxical, non-standard explanations for the paradoxes in special relativity.

In this paper, Ji Hao bridge breaking problem, sliding block falling problem and symmetrical twin travel problem are taken as examples to prove that these problems of special relativity are in fact logical paradoxes, which can not be explained by any method. It is also impossible to explain these space-time paradoxes by general relativity. The key problem is that the Lorentz transformation does not hold, and the basic mathematical framework of special relativity cannot properly describe nature.

In fact, the length contraction of a moving body has never been experimentally tested in physics. The same is true of the time delay, physics has so far never measured the lifetime of a microscopic particle in an inertial motion reference frame without interaction, and then measured the lifetime of a particle in a motion reference frame, and compared them to prove the time delay caused by purely relative motion of special relativity. The time delay experiment in special relativity is either a misunderstanding or caused by other reason and to be explained by else mechanism.

The experimental tests of time delay mainly include the lifetime of μ meson and the experiment of atomic clocks moving around the Earth. This paper points out that these two experiments are invalid and do not prove the existence of relativistic time delay. There were also suspicions that the experiment of atomic clocks orbiting the Earth were falsifying data.

The current understanding on the lifetime of μ meson in special relativity is wrong. The experiment calculation of atomic clocks moving around the Earth is not based on the same reference frame as actual observation, so the experiments are also invalid.

The short life of stationary μ meson is actually caused by the violent collisions between the fast moving μ meson and the nuclei of other matter in the Earth's atmosphere, causing them to decay prematurely. The μ mesons that do not collide with other atoms can reach the sea level, and their lifetime is the normal lifetime. It does not mean that a μ meson moving at high speeds does not have longer lifetime. Physics has never measured the lifetime of stationary and unstable microscopic particles in the absence of interaction. The claims of the longer lifetime of moving particles in special relativity have no experimental basis in fact.

What calculated was the time difference in the experiments of two atomic clocks moving around the Earth flying in different directions observed in the geocentric reference frame. But what actually measured was the time difference between two atomic clocks on the motion reference of Earth's surface, which were not in the same reference frame. Due to the symmetry of motion velocities, there was no time difference between the two clocks for the observer to measure on the Earth’s surface, so the experiment of atomic clocks moving around the Earth was also invalid.

The paper also points out that A. G. Kelly obtained the original experiments data from the United States Naval Observatory that were completely different from those published by Hafele. The original data was messy, irregular and virtually invalid. Hafele's paper was suspected of artificially modifying the data could not be used to prove the existence of the time-delay effect of special relativity.

The conclusion of this paper is that the space-time paradox of special relativity can not be solved. The space-time contraction and its relativity do not exist in the real nature. Time and space can only be an absolute concept, the Lorentz coordinate transformation can not be correct.

References

Albert, E. (1977). *On the Electrodynamics of Moving Bodies. Einstein Papers,* Vol. 2. The Commercial Press, p. 9, p. 83, p. 113.

Cao, G.-J. (2019). Why relativity is always correct?. Retrieved from https://zhuanlan.zhihu.com/p/70223763

Chamberlain, *et al.*. (1955). *Phys. Rev., 100,* 947.

Frisch, H., & Smith, J. H. (1963). *Am. J. Phys., 5,* 342.

Hafele, C. (1970). *Nature, 277,* 270.

Hafele, C. (1971). *Nature, Phys. Sci., 229,* 238.

Hafele, C. (1972). *Am. J., Phys., 40,* 81.

Liu, Y.-C. (2011). *Special Relativity and Its Paradoxes.* Tsinghua University Press, p. 47.

Ma, Q.-P. (2004). *Inquiry into the self-consistency of logic of special relativity*. Shanghai Scientific and Technical Literature Press, p.188.

Ma, Q.-P. (2016). On the relationship between relativity and GPS. Retrieved from https://blog.sciencenet.cn/blog-279604-976951.html

Mei, X.-C. (2014). *The Third Space-time Theory and Gravity and Cosmology in Flat Space-time.* Intellectual Property Press, p. 93, p. 428.

Mei, X.-C. (2021). The Precise Calculations of the Constant Terms in the Equations of Motions of Planets and light of General Relativity. *Physics Essays, 34*(2), 183-192. Retrieved from https://Physicsessays.org/browse-journal-2/product/1861-9-mei-xiaochun-the-precise-calculations-of-the-constant-terms.html

Mei, X.-C. (2022, April). Four Mistakes in the Original Paper of Einstein in 1915 to Calculate the Precession of Mercury’s Perihelion. *SCIREA Journal of Physics, 7*(2). https://doi.org/10.54647/physics14418

Mei, X.-C. (2022, February). Using the Newton Theory of Gravity to Calculate the Deflection of Light in the Solar System and the Orbital Poles of Lights Motion of General Relativity. *SCIREA Journal of Physics, 7*(1). https://doi.org/10.54647/14417

Mei, X.-C., & Huang, Z.-X. (2021). The Experiments of Light’s Gravity Deflection of General Relativity were invalid. *International Astronomy and Astrophysics Research Journal*, *3*(3), 7-26. Retrieved from https://www.doc88.com/p-58047140434257.html

Mei, X.-C., & Yuan, C.-L. (2023). A Re-understanding the zero Result of Michelson-Morley Experiment. *Applied Physics Research*, *15*(1). https://doi.org/10.5539/apr.v15n1p76

Mei, X.-C., & Yuan, C.-L. (2023). Mass-velocity formula and mass-energy relationship cannot be derived from from Lorentz velocity transformation. *Applied Physics Research, 15*(1). https://doi.org/10.5539/apr.v15n1p30

Mei, X.-C., Huang, Z.-X., & Yuan, C.-L. (2022). The Proofs that the Einstein's Equations of Gravity Fields Have No Liner Plane and Spherical Wave Solutions. *SCIREA Journal of Physics*, *7*(4). https://doi.org/10.54647/physics14481

Mei, X.-C., Huang, Z.-X., Hu, S.-H., & Yuan, C.-L. (2022). What Did LIGO Detect Being Gravitational Waves or Noises?. *International Astronomy and Astrophysics Research Journal*, *4*(2), 46-59.

Moller, C. (1972). *The Theory of Relativity.* Oxford Clarendon Press, pp. 292-262.

Qi, J. (1993). *New Physics.* American Science Press, p. 260.

Rindler, W. (1961). Length constraction paradox. *Am. J. Phys., 29*, 365.

Tan, Z.-S. (2007). *From special relativity to standard space-time theory*, p. 225.

Zhang, Y.-L. (1980). *Introduction to Relativity.* Yunnan People's Publishing House, p. 164.

Zhang, Y.-Z. (1994). *Experimental Basis of Special Relativity.* Science Press, p. 59.

Zogg, J.-M. (2011). *Fundamentals of GPS Satellite Navigation.* Aviation Industry Press.

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