

Special Relativity Is Proved Wrong Theoretically

Xinhang Shen, NAC Geographic Products Inc.

ABSTRACTION

A critical error is found in the Special Theory of Relativity (STR): mixing up the concepts of the abstract STR time of a reference frame and the displayed time of a physical clock, which leads to use the properties of the abstract time to predict time dilation on physical clocks and all other physical processes. Actually, a clock can never directly measure the abstract time, but can only record the result of a physical process during a period of the abstract time such as the number of cycles of oscillation which is the multiplication of the abstract time and the frequency of oscillation. After Lorentz Transformation, the abstract time of a moving inertial reference frame expands by a factor gamma, but the frequency of a clock decreases by the same factor gamma, and the resulting multiplication i.e. the displayed time of a moving clock remains unchanged. That is, the displayed time of any physical clock is an invariant of Lorentz Transformation. The Lorentz invariance of the displayed times of clocks can further prove within the framework of STR that our earth based standard physical time is absolute, universal and independent of inertial reference frames as confirmed by both the physical fact of the universal synchronization of clocks on the GPS satellites and ground clocks on the earth, and the theoretical existence of the absolute and universal Galilean time in STR. It has been further theoretically proved that the time dilation and space contraction of STR are pure illusions, and within the framework of STR the real speed of light still follows Newton's speeds addition rule as confirmed by Fizeau experiment as recalculated in this article, which has disproved the postulate that the speed of light is constant. The existence of the absolute and universal clock time in STR has directly denied that the reference frame dependent abstract time of STR is the physical time. Therefore, STR as a theory of physics is totally wrong and all its predictions can never happen in the physical world. The paper has also proposed a modified Fizeau experimental setup to measure the speed of the earth relative to the medium of light (i.e. ether).

Keywords: Special Relativity, Clock Time, Physical Time, Time Dilation, Lorentz Transformation, Galilean Transformation, Inertial Reference Frame, Lorentz Invariant, speed of light, propagation speed of gravitation force

1 INTRODUCTION

In the real physical world, there is no abstract time, but only physical processes. We use one physical process as a standard process to compare with other physical processes to see how fast or slow the observed processes are relative to the standard process. In the human history, we have used the sun, the moon, the earth, water dropping, sand flow, a mechanical wheel, the oscillation of a pendulum, the oscillation of an electronic circuit, the mechanical resonance of a vibrating crystal, the electronic transition frequency of an atom, etc as time keepers. It means that there is no natural standard of time in the universe, but defined by time keepers i.e. specific physical processes. You can use any motion as a measure of time, even the growth of the height of a tree as a time keeper, which could lead to an interesting conclusion that time in the hot tropical area would flow faster than in the cold arctic area. You can also assume that all lives have the same life expectancy if we measure time using their own biological clocks. The length of a day is longer for a rabbit than for a turtle. If you defined time by the biological clock of a person, then each person had their own time which would end when he/she died, i.e., time to a life existed only in a limited period. Moreover, when these people were exchanging descriptions of events, they would need to do complicated conversion of their times which were really inconvenient. That means, although all these definitions of time could never be wrong in principle, there are indeed good definitions and bad definitions. The best definition of time can produce the simplest descriptions of events while bad definitions of time would lead to complicated or even unmanageable descriptions of events. The reason we choose atomic clocks as our standard time keepers now is that these atomic clocks have the best synchronization among all available time keepers to make the measurement of time in the descriptions of all events more consistent, repeatable, predictable, exchangeable and manageable. The times defined by the continuously improved time keepers seem to approach a stable ideal measurement. This stable ideal measurement is what we call "time" (more accurately, "physical time") in the theories of

physics and all other fields, which is now approximated by atomic clocks. These atomic clocks are physical processes with specific physical properties. Therefore, we must always be aware that all our descriptions of physical phenomena are measured by these physical clocks, not by any abstract time.

Though philosophers and scientists in the history had defined time very differently, they were all using the best available time keepers of their times in their daily lives, which had reflected their true intuitive understanding of what time really is: time is just a measurement of the best available time keepers of their times. This intuitive understanding of time had been adopted and used by everybody in the world for the entire human history. Most of the abstract definitions and explanations of time given by scholars are just word games, which have little influences on the actual use of time and the design of time keepers.

However, the concept of time has been really changed by Einstein's paper "The Special Theory of Relativity" (STR) in 1905^[1]. Because the Michelson–Morley experiment^[2] tells us that the speed of light is constant in all horizontal directions as observed on the earth surface, Einstein thought that earth is just a planet without anything special; if the speed of light was constant on earth, it should be constant in all inertial reference frames as all inertial reference frames should be equivalent. He further assumed that all physical laws should be valid in all inertial reference frames too, including Maxwell's equations. These postulates seem logically sound as nobody could tell why an inertial reference frame was superior over other inertial reference frames during that time.

Actually, electromagnetic waves are very similar to acoustic waves in the air. Both electromagnetic waves and acoustic waves satisfy the same wave equation except their propagation speeds different. Both speeds are constant as measured in any closed laboratory no matter whether it is stationary or moving at a constant speed. Because of this, can we conclude that acoustic waves have the same speed in all inertial reference frames? No, absolutely not. The speed of sound is not constant in all inertial reference frames, but only in an inertial reference frame moving with the local air. That is, the wave equation of sound is not invariant in all inertial reference frames.

Why should electromagnetic wave equations be invariant in all inertial reference frames? Though air flow satisfies Newton's Laws of Motion which are invariant in all inertial reference frames, the acoustic wave equation is not a fundamental law of physics, but a derived local approximate equation without invariance of inertial reference frames. Similarly, it is probable that the laws governing the motion of electromagnetic medium be fundamental and invariant in all inertial reference frames, but Maxwell's equations may be only local approximate equations like acoustic wave equation which could stand only in a local inertial reference frame moving with the local electromagnetic medium.

That is, the two postulates of STR are not necessarily to be true.

Furthermore, we can see that STR has nothing novel, but just redefines time and space to create an artificial constant speed of light. That is, the change of definition of time and space won't change physical facts. The real speed of light is still measured with rulers and clocks. If we could redefine time and space, we could create our own version of STR based on the postulate that the speed of sound was constant in all inertial reference frames, too. The resulting theory would be as mathematically consistent as Einstein's STR. It could also claim that the acoustic speed was the speed limit in the universe. But the problem of the sound speed based STR is obvious as we have known that the speed of light is much faster than the speed of acoustic waves as we measure speeds still with rulers and clocks rather than the newly defined space and time. Moreover, because the redefined time and space were no longer the time recorded by clocks and no longer the length measured by rulers, all our existing descriptions of events would become invalid and everything would be messy and unmanageable.

Similarly, there is no reason to believe that light is special. The delay of the propagation of a gravitational force would make the gravitational force of the earth no longer perpendicular to the orbit of the moon, but with a component in the direction of the motion. This component would accelerate the moon. Based on the observed data, Laplace^[3] estimated that "*the gravitating fluid has a velocity which is at least a hundred millions of times greater than that of light*". Though there are arguments about the conclusion, the speed of the propagation of a gravitational force may very probably be much faster than the speed of light. Therefore, the speed of light may not be the speed limit of the universe either. All the problems of sound speed based STR would be shown in the light speed based STR, too.

But Einstein didn't think so. He insisted that the speed of light be constant but time and space could be redefined, which has totally denied our very intuitive understanding of time and space. He mistakenly thought that his new definition of time is still the clock time which makes people really confused: simultaneity would become relative; the causal nexus principle would not always be valid; all physical processes including clocks should follow the properties of his newly introduced abstract time to show time dilation. Because of time dilation, many people believe in time travel and dream for traveling back to the past and forward to the future, going through spacetime tunnels to other universes, etc. Even worse, many mainstream physicists are believing that time be relative and time travelling be possible. They have used STR as the theoretical foundation of physics to develop new theories of modern physics and to guide physical experiments, astronomical observations and industry applications such as the Global Positioning System. The influences of STR are so profound that you can find the shadow of STR almost in all branches of modern physics developed in the world during the last 110 years.

In principle, redefining time and space is just like redefining other mathematical variables that would not discover anything new in the physical world except changing the forms of the formulation. The critical error of STR is that it still uses traditional clocks and rulers as measurement devices for the newly defined time and space. The interesting thing is that it is exactly that error that leads to so called "new discoveries" of STR: time dilation, space contraction, mass increase, etc. If the error is corrected, then STR is just a mathematical theory, nothing to do with the physical world.

Now I would use STR itself to demonstrate that the abstract time of STR is no longer the displayed time of a clock which is the real physical time that we are using in both daily lives and scientific experiments/observations. The abstract time of STR is just a fake time that can never be measured by any physical clock. The speed of light defined by STR space and STR time is also a fake speed of light, while the real speed of light measured by physical rulers and clocks still follows Newton's speeds addition rule which denies the postulate that the speed of light is a universal constant. Time dilation is just the phenomenon of the fake time, which can never be observed on any physical clock or any physical process no matter how fast it moves. Time dilation and space contraction in STR are just illusions. Time travelling as predicted by STR is just an imagination and can never happen in the physical world.

2 DERIVATION

2.1 Clock time

In the real world, a clock can only record the result of a physical process (e.g. the angle of a rotating arm, the number of cycles of oscillation, etc) during a period of time, which is usually the multiplication of time and the progressing rate of the process (e.g., the arm rotating speed or the frequency of oscillation, etc). In Newtonian mechanics, the displayed time of a clock is equivalent to the abstract time because the frequency of the oscillator of a clock is an invariant of inertial reference frames and can be calibrated away from the displayed time. However, in STR, the time of an inertial reference frame and the displayed time of a clock calibrated with a fixed frequency are very different because in STR, the frequency of oscillation depends on an inertial reference frame. Now let's see the properties of a physical clock in STR.

Assume a clock moving at a constant speed v along the x -direction of an inertial reference frame called Frame A, while the frame attached to the clock is called Frame B. In the following, all variables of Frame B will carry apostrophe (') to distinguish them from those of Frame A. The clock uses the angle of its arm to represent its displayed time, which rotates at a constant speed ω' in a plane perpendicular to the clock's moving direction.

At the event that the clock passes the origin of Frame A, the location of the clock is at

$$x_1 = x'_1 = 0 \tag{1}$$

where x_1 and x'_1 are the coordinate of the clock in Frame A and Frame B respectively, and the arm of the clock points at 0 degree relative to both frames:

$$\alpha_1 = \alpha'_1 = 0 \tag{2}$$

which represents zero time in both Frame A and Frame B:

$$t_1 = t'_1 = 0 \quad (3)$$

Here is a new event in Frame A:

$$t_2 = \tau \quad (4)$$

$$x_2 = v\tau \quad (5)$$

$$\alpha_2 = \omega\tau \quad (6)$$

After Lorentz Transformation^[1], the corresponding variables of this event in Frame B are:

$$x'_2 = \gamma(x_2 - vt_2) = 0 \quad (7)$$

$$t'_2 = \gamma(t_2 - vx_2/c^2) = \tau/\gamma \quad \text{or} \quad t_2 = \gamma t'_2 \quad (8)$$

$$y'_2 = y_2 \quad (9)$$

$$z'_2 = z_2 \quad (10)$$

where $\gamma = 1/(1 - v^2/c^2)^{1/2}$ and (y_2, z_2) and (y'_2, z'_2) are the coordinates of the tip of the arm in Frame A and B respectively. Here are the relationships between the angle and the coordinates:

$$\tan(\alpha_2) = y_2/z_2 \quad (11)$$

$$\tan(\alpha'_2) = y'_2/z'_2 \quad (12)$$

From equations (9-12), we have:

$$\alpha'_2 = \alpha_2 \quad (13)$$

Since the displayed time of the clock has been calibrated to the angle of the arm of the clock, Equation (13) tells that the displayed time of a rotating clock is an invariant of Lorentz Transformation. That is, any time elapse shown on the clock in Frame B will be the same as shown on Frame A. Therefore, we will never see time dilation shown on the displayed time of a rotating clock.

Since

$$\alpha'_2 = \omega' t'_2 \quad (14)$$

from equations (4), (6), (8), (13) and (14), we get:

$$\omega\tau = \omega' \tau/\gamma \quad (15)$$

That is

$$\omega' = \gamma\omega \quad \text{or} \quad \omega = \omega'/\gamma \quad (16)$$

Equation (8) shows there is a time expansion after Lorentz Transformation from Frame B to Frame A, but Equation (16) shows there is also a slowdown of the rotating speed of the arm of the clock transformed from Frame B to Frame A to make the angle of the arm (i.e. the multiplication of time and the rotating speed) unchanged after Lorentz Transformation. Since the angle of the arm of the clock represents the displayed time of a clock, therefore, the displayed time of the clock

(for example, 30 degrees: one o'clock, 60 degrees: two o'clock, 90 degrees: three o'clock, etc) remains unchanged after Lorentz Transformation.

As the face orientation of a clock does not influence its time counting functionality, and any clock can display its time as the angle of an arm through mechanical gears and/or digital converters to convert the number of cycles of oscillation of a physical clock into the angle of an arm attached to the clock, the above derivation can be logically extended to any physical clock including an atomic clock. That is, the displayed time of any physical clock remains unchanged after Lorentz Transformation because the expansion of time is canceled by the slowdown of the frequency (similar to Transverse Doppler effect) in the multiplication. Therefore, we have the following theorem:

Theorem 1 The displayed time of any physical clock is an invariant of Lorentz Transformation i.e. an invariant of all inertial reference frames, consistent with Galilean time.

With this theorem, we can easily see that the predictions of time dilation in twin paradox, GPS satellite clocks and decay rates of muons are already wrong theoretically within the framework of STR because the status of any physical process is an invariant of Lorentz Transformation similar to a physical clock and should not show any time dilation if the time is measured by a physical clock as we always do in real physical measurements.

Time dilation can only be observed in the abstract time of an inertial reference frame of STR. This abstract time is neither used in physical experiments nor measurable by any physical clocks. Actually, this abstract time is just an arbitrary variable Einstein introduced to make the speed of light a constant among inertial reference frames and does not have real physical meaning.

Now we can further establish a standard physical time in STR which is absolute, universal and independent of any inertial reference frame as shown in the following:

If we set all clocks including clocks moving at constant speeds with the same displayed time and same frequency of oscillation in an inertial reference frame with a constant speed of light in all directions, these clocks will have the same displayed time observed on this inertial reference frame all the time.

To set the same displayed time to all clocks, you can broadcast the displayed time from a standard clock. Each of other clocks can use its position to calculate the time for the message to travel from the standard clock to this clock and add this time on top of the time of the received message as its displayed time observed on the inertial reference frame of the standard clock, just like synchronizing orbiting GPS clocks with the clock on the earth.

To set the same frequency to all clocks, you can just repeat the above procedure and adjust the frequency of each receiving clock to let them show the same displayed time with the standard clock all the time observed on the inertial reference frame of the standard clock.

Once all these clocks have been well synchronized in the inertial reference frame of the standard clock, according to **Theorem 1**, these clocks will have the same displayed time observed in all other inertial reference frames too. Then, we get the following theorem:

Theorem 2 In STR, a standard physical time can be established which is absolute, universal, independent of any inertial reference frame and can be measured by any moving or stationary clock.

People might argue that the synchronized clocks in one inertial reference frame were no longer synchronized in other inertial reference frames. This would be true if the synchronization was defined by the abstract time of the inertial reference frame of STR, but in the real physical world, the synchronization is defined by the time of the physical clocks rather than the abstract time of the reference frame which is neither measurable nor usable as shown in the following discussion **Clocks in the GPS System**.

With the introduction of the universal physical time defined by synchronized clocks, any event recorded at a time of the universal physical time in one inertial reference frame will always be shown at the same universal time on all inertial

reference frames. Multiple events recorded simultaneously with the universal physical time in any inertial reference frame will be shown simultaneous on all inertial reference frames when the simultaneity is defined by the synchronized physical clocks.

The existence of the universal clock time has already disproved the claim of STR that clocks can never be synchronized in all inertial reference frames.

2.2 Relationship between Galilean time & space and STR time & space

The discovery of the invariance of clock time can be further illustrated in the following mathematical derivation too. Even in STR, we can still define Galilean time and space which will follow Galilean Transformation.

As the Michelson and Morley experiment tells us that in our earth reference frame, the speed of light is almost constant in all horizontal directions, though the conclusion may be just valid in the neighborhood of the earth surface. Thus, it is safe to say there exists such an inertial reference frame in the universe, even just in a small neighborhood. In an inertial reference frame with a constant speed of light in all directions, Galilean time T and space X can be defined as STR time t and space x:

$$T = t \quad (17)$$

$$X = x \quad (18)$$

Now let's see time t and space x transformed to time t' and space x' of a new inertial reference frame moving at a constant speed v along x-axis (or X-axis as they are the same) of this frame through Lorentz Transformation:

$$t' = \gamma(t - vx/c^2) \quad (19)$$

$$x' = \gamma(x - vt) \quad (20)$$

In the moving frame, we can define Galilean time T' and space X' as:

$$T' = \gamma(t' + vx'/c^2) \quad (21)$$

$$X' = x'/\gamma \quad (22)$$

From equations (17-22), we have:

$$T' = \gamma(t' + vx'/c^2) = \gamma[\gamma(t - vx/c^2) + v\gamma(x - vt)/c^2] = \gamma(\gamma t - \gamma tv^2/c^2) = \gamma^2(1 - v^2/c^2)t = t = T \quad (23)$$

$$X' = x'/\gamma = \gamma(x - vt)/\gamma = x - vt = X - vT \quad (24)$$

That is:

$$T' = T \quad (25)$$

$$X' = X - vT \quad (26)$$

which proves that in the framework of STR we still have Galilean time and space satisfying Galilean Transformation, i.e., Galilean time is an invariant of Lorentz Transformation, absolute and universal, and Galilean space will never experience length contraction. The invariance of Galilean time is consistent with the invariance of clock time. Therefore, all physical clocks can be calibrated to measure Galilean time and they are equivalent. The one-dimensional Galilean time is our physical time. Galilean time is independent of Galilean space, i.e., time and space if defined properly can be completely separated even in the framework of STR.

The speed v of the moving frame is always the same no matter whether it is defined as x/t or X/T because of equations (17) and (18). Equations (19) and (20) can further prove that the speed of the stationary frame relative to the moving frame is always $-v$ no matter whether it is defined as $X'/T' = (X - vT)/T = -v$ or $x'/t' = \gamma(x - vt)/[\gamma(t - vx/c^2)] = -v$ where $X = x = 0$. That is, inertial reference frames are always the same no matter whether the relative speed is defined by STR time and space or Galilean time and space.

Moreover, we can see that Newtonian speeds addition rule still stands for the speed of light in STR if we use Galilean time and space to define it:

$$\text{Galilean speed of light in the moving frame} = X'/T' = (x'/\gamma)/[\gamma(t' + vx'/c^2)] = [(x'/t')/\gamma^2]/[1 + (v/c^2)(x'/t')] \quad (27)$$

Since the speed of light defined with STR space and time is a universal constant:

$$x'/t' = c \quad (28)$$

we have:

$$\text{Galilean speed of light in the moving frame} = (c/\gamma^2)/(1 + v/c) = c(1 - v^2/c^2)/(1 + v/c) = c(1 - v/c) = c - v \quad (29)$$

Equation (29) tells us that even in STR the speed of light defined with Galilean time and space is not a constant but depends on the speed of the reference frame. Since the real speed of light in the physical world is defined and measured with physical clocks i.e. Galilean time, not the abstract time of STR, the real speed of light is the Galilean speed of light and equation (29) directly denies the postulate of STR that the speed of light is constant, as confirmed by Daniel Y. Gezari's lunar laser test^[4].

From equations (21) and (22), we can get STR time and space defined with Galilean time and space:

$$t' = (1/\gamma)T' - (\gamma v/c^2)X' \quad (30)$$

$$x' = \gamma X' \quad (31)$$

which can be used with Galilean Transformation (i.e. equations (25) and (26)) to derive Lorentz Transformation. That is, all STR does is just to redefine time and space to produce an artificial constant speed of light in all inertial reference frames, which do not have real physical meaning.

Equation (30) tells us that in a moving frame, STR time not only scales down the unit of Galilean time (i.e. our physical time), but also adds an asymmetric term of Galilean space to compensate the asymmetric property of the real speed of light in a moving inertial reference frame which is different in the positive x' -axis direction and negative x' -axis direction. That is, STR not only needs to calibrate clocks with the speed of the frame but also needs to calibrate clocks according to locations, that is, STR needs a clock at every location in the space of every moving frame, which is impossible to achieve.

People may argue that the stationary clock of an inertial reference frame can measure STR time. If STR time was measured by a stationary clock, then that clock could be observed with the same displayed time in all inertial reference frames thanks to the Lorentz invariance of clock time and no time dilation of the clock could be observed at all in any inertial reference frame, contradictory to Lorentz Transformation. Therefore, STR time can never be measured by any physical clock. That is, STR time is not our physical time, but a fake time, and thus STR space is a fake space too.

Equations (21), (22), (30) and (31) tell us that in STR, Galilean time & space can be defined as functions of STR time & space and the speed of the moving frame, and in classical mechanics, STR time & space can be defined as functions of Galilean time & space and the speed of the moving frame. That is, all inertial reference frames in both STR and classical mechanics are the same. The fundamental differences between STR and classical mechanics are just different definitions of time & space. Based on the fake time and space, all conclusions of STR are wrong and will never happen in the physical world.

Using STR time and space, you can get a constant speed of light (of course a fake speed of light) in all inertial reference frames and keep the standard wave equations (fake wave equations) for electromagnetic waves, but will lose clocks as time keepers. Using Galilean time and space, you have clocks as time keepers, but lose the constant speed of light and the standard form for electromagnetic wave equations in different reference frames. The problems of Galilean time and space can be solved using Newtonian speeds addition rule and modified Maxwell equations or totally new theories of electromagnetic phenomena, but the problem of STR time (i.e. the lack of time measurement devices) can never be solved.

Equation (30) shows that STR time at the origin of the moving frame is Galilean time artificially compressed by factor γ . STR claims that time of a moving frame would expand by a factor γ as observed on the stationary frame, but the reality is that it is just the recovery of Galilean time (i.e. clock time) because the γ factor cancels each other in the formulation:

$$t = \gamma t' = \gamma[(1/\gamma)T' - (\gamma v/c^2)X'] = \gamma(T'/\gamma) = T' = T \quad \text{where } X' = 0 \quad (32)$$

That is, STR time of a moving frame observed in the stationary frame is always the same as STR time of the stationary frame, both of which are Galilean time. Therefore, time dilation in STR is just an illusion.

Equation (31) shows that STR space of a moving frame is Galilean space artificially enlarged by factor γ . STR claims that the length of a moving frame would contract by factor γ as observed in the stationary frame. The reality is that the length of a moving frame is always the same as Galilean length without any contraction at all because γ factor cancels each other in the formulation:

$$\Delta x = \Delta x'/\gamma = (\gamma \Delta X')/\gamma = \Delta X' = \Delta X \quad (33)$$

That is, the length of a moving frame as observed in the stationary frame always equals to that of the stationary frame. Therefore, space contraction in STR is also an illusion.

Now we have seen that all STR does is just to redefine time and space to generate a constant speed of light, but the newly defined time and space are no longer our physical time and space; the real speed of light still follows Newton's speeds addition rule; time dilation and space contraction in STR are just illusions; the absolute and universal Galilean time is the physical time we were using, are using and will continue using in our daily lives and scientific experiments. Therefore, Einstein's Special Theory of Relativity as a theory of physics is wrong.

3 DISCUSSIONS

In STR, it is a mistake to use a physical clock to directly measure the abstract STR time of a reference frame because STR time and clock time are very different: STR time of a reference frame is not an invariant of Lorentz Transformation, but the displayed time of a clock is. As discussed above, there is no way to use physical clocks to measure STR time.

Some people argue that STR has been mathematically proved without any contradiction and also verified by numerous experiments and observations (it is not true either: *A search of the literature reveals that none of the five new optical effects predicted by the special theory of relativity have ever been observed to occur in nature*^[5]). It may be true that there is no internal mathematical error in STR, but it's already shown that the interpretations of many experiments and observations are wrong because STR itself has proved that the displayed time of a physical clock is an invariant of Lorentz Transformation and won't show any time dilation theoretically. It is a mistake to mix up the concepts of the abstract time of STR and the physical time of a clock.

Now let us further look at the problems of STR through well known cases:

Sec. 3.1 Twin clocks

The thought experiment of twin clocks is the most typical thought experiment Einstein used to demonstrate time dilation caused by relativity though we have already theoretically proved time dilation is just an illusion of STR. Let's see two clocks: clock A (stationary) and clock B (moving at a constant speed v). If they were synchronized when they met. Then

at any other time observed on the moving reference frame, clock B would display a time for example 3 o'clock. After Lorentz Transformation to the stationary frame, clock B would still be 3 o'clock according to **Theorem 1**, but Einstein thought, clock A would show a faster time for example 4 o'clock. Therefore, he confirmed that this time difference was a time dilation caused by moving speed of clock B.

Now let us observe these two clocks on the moving frame again. Due to the invariance of the displayed time of a clock (i.e. **Theorem 1**), clock A would still show 4 o'clock and clock B would still show 3 o'clock. Actually, you can observe these two clocks on any inertial reference frame, it would still be 4 o'clock on clock A and 3 o'clock on clock B. There was no frame dependent time dilation shown on these two clocks at all. That means, clock B was set to be slower than clock A. They were never identical, contradictory to what Einstein believed: "they were identical". Therefore, it proves that Einstein made a mistake and that time dilation can never be observed on the twin clocks. Time dilation is just a phenomenon of the abstract time of STR, not the time of a physical clock. The conclusion of STR that a moving clock would become slower is the result of mixing up the concepts of the abstract time of STR and the displayed time of a physical clock.

On the other hand, if the displayed times of the twin clocks were the same all the time observed on the stationary reference frame, they would remain the same observed on the moving reference frame too according to **Theorem 1**. Because of their exact symmetric positions, these two clocks were truly identical, and no time dilation or time difference could be observed on these identical clocks no matter observed on which inertial reference frame.

People may argue that these two clocks synchronized in one inertial reference frame are no longer synchronized in the time of another reference frame. This is true if the simultaneity is defined by the abstract STR time. For example, at time $t = T$ in the reference frame of clock A, event of Clock A is represented as event $(T, 0)$ and event of clock B as (T, vT) and both clocks have the same displayed time T . When observed in the reference frame of clock B, the events will be represented by event $(\gamma T, -\gamma vT)$ and event $(T/\gamma, 0)$ respectively while their displayed times are still the same T , i.e. the two events happened at two different times of the reference frame attached to clock B. Now the question is: how is the time measured in the physical world? The reality is that time can only be measured with physical clocks while the abstract STR time of an inertial reference frame remains invisible in the physical world. If two events have the same clock time on an inertial reference frame, they are considered simultaneous.

As the invariance of clock time makes the relationship between the times of the clocks frozen in Lorentz Transformation, clock A can't be faster than clock B in Frame A and slower than clock B in Frame B. Lorentz Transformation can only makes the abstract STR time behave in such a weird way.

The abstract time of an inertial reference frame in STR is just an artificial variable that does not have real physical meaning. Therefore, the simultaneity defined by that fake time does not have physical meaning either. Time dilation is just an illusion of the fake time. When it is applied onto a physical clock, the expansion of the abstract time is always accompanied by the slowdown of the frequency to make the displayed time unchanged.

Sec. 3.2 Clocks in the GPS system

Many people think that the corrections of the clocks on GPS satellites are the proof of time dilations. This is wrong because the displayed time of any physical clock is an invariant of inertial reference frames and can never generate any time dilation even in STR. Some people argue that they have really observed time dilations on the clocks of GPS satellites, but these are just wrong interpretations of errors caused by other factors such as gravitation, radiation, geomagnetic fields, acceleration, etc.

Let us have a look at this case. If all the clocks on the GPS satellites are synchronized with the clock on the earth observed in an inertial reference frame attached to the earth at the observing moment, then everything will work well. But according to STR, the clocks on GPS satellites in different orbits should never be synchronized relative to each other if they are synchronized relative to clocks on the earth. Have you ever seen any reports on this kind of problems? The speed of a GPS satellite relative to the earth is about 14,000km/h (i.e. 3,888m/s)^[6], and the gamma factor is about 1.0000000008402. During a 24 hour period, it may generate 7259 nanosecond time difference between the clock on a satellite and the clock on the earth caused by the speed of satellite relative to the earth. The relative speeds between

satellites in different orbits have the similar magnitude. As all the satellites are working in very similar gravitational environments, the relative speeds caused time dilation between the clocks on satellites in different orbits should be obvious as measured by caesium clocks which has an accuracy of 1 second in 30 million years (i.e. 9.13242×10^{-2} nanoseconds per day)^[7]. Have you ever heard such continuously accumulated time dilation caused time differences observed between the clocks of satellites after the clocks have been synchronized with the clocks on the earth? The answer is clearly no. If there were such time differences, there would be no way to correct them, and everything would become chaotic and unmanageable. No positioning work could be done. This has further illustrated that time dilation can never be observed on physical clocks.

Moreover, if the displayed time of an orbiting clock and the displayed time of a clock on the earth are synchronized observed on an inertial reference frame attached to the earth at the observing moment, according to STR, the satellite clock is now adjusted faster than the time of the reference frame by the factor gamma. Now let's observe the ground clock on the inertial reference frame attached to the satellite, the time of the ground clock should be slower than the time of the reference frame of the satellite by a factor gamma. That is, the ground clock should be slower than the satellite clock by a factor of the square of gamma. Have you ever heard there is such a time dilation? The answer is no either. That has clearly confirmed that the physical simultaneity is not defined by the abstract STR time of the reference frame, but by the time of the physical clocks. Because of **Theorem 1**, these two clocks will have exactly the same displayed time observed on the inertial reference frame attached to the satellite at the observing moment too. That is, because of their exact symmetric positions, these two clocks have become truly identical after the correction. Therefore, the corrections are correcting the errors caused by the transportation processes and/or working environmental factors (acceleration, gravitation, radiation, geomagnetic fields, etc) which made the clocks no longer identical to the clocks on the earth, but not correcting frame dependent time dilations caused by relative motion.

On the other hand, according to **Theorem 2**, if these clocks are once synchronized to the standard clocks on the earth observed on an inertial reference frame at the observing moment attached to the earth, they will have the same displayed time observed on any inertial reference frame attached to any satellite at any time. With this universal synchronization, GPS satellites can do their positioning work correctly. This proves that the absolute universal standard physical time is not only existing but also a prerequisite for the GPS system^[8].

The existence of the universal synchronization of clocks on the GPS system has been confirmed by one of the designers of the GPS system^[9]: *“Now suppose we tried to Einstein-synchronize the system of clocks. Satellite and ground clocks would tick at different rates. And if we tried to work in any local, instantaneously co-moving inertial frame, the corrections needed to synchronize with each orbiting clock would be unique to that observer's frame and different from moment to moment because both clocks are accelerating. The practical difficulties of operating the system would be virtually insurmountable.” This is what Einstein's approach requires. However, what we have in actual practice is a situation where “all atomic clocks aboard satellites with a variety of orbital planes, and all atomic clocks all over the rotating Earth, are all synchronized with one another, and remain synchronized, despite being in many different inertial frames. This appears to be a practical realization of Lorentz's universal time.”*

Sec. 3.3 Twin brothers and general physical processes

Many people believe that according to STR, space traveling will make the traveling twin brother younger than his twin brother remaining on earth. This is also a wrong interpretation of the physical time with the abstract time of an inertial reference frame of STR. This will never happen even in STR because the biological age of a human being is the multiplication of time and the aging speed, similar to the displayed time of a clock, which is also an invariant of inertial reference frames. The biological ages of the twin brothers are not measured with the abstract times of the reference frames, but the displayed times of physical clocks. Because of the invariance of both the biological ages and the displayed times, their measurements are also invariants of inertial reference frames. That is, the biological ages of the twin brothers measured by the displayed time of any one of the synchronized clocks will always be the same without any time dilation that can be observed on any inertial reference frame, just like the identical clocks discussed above in the twin clocks case. This proves that the prediction of an age difference between twin brothers is also wrong.

Similarly, the result of any physical process including the lifetime of a muon is the multiplication of time and the progressing rate of the physical process which is also an invariant of Lorentz Transformation. Therefore, no time dilation can ever be observed on any physical process if the time is measured by physical clocks. However, that doesn't mean the lifetimes of muons do not increase when they go through atmosphere at high speeds. It simply mean that these phenomena are not caused by time dilation of STR. It is a mistake to use the concept of time dilation of the abstract time of STR to explain physical phenomena measured with physical clocks.

As time dilation and space contraction in STR are illusions and can never be observed in the physical world, phenomena "showing time dilation, space contraction and mass increase" are actually unknown phenomena. This paper doesn't attempt to deny physical phenomena that seem to show "relativistic effects", but asserts that these are not relativistic effects. Though in the physical world, it is possible that rulers may contract, clocks may slow down and mass may increase, for example, a ruler will become shorter in a freezer, a pendulum clock will go more slowly on the moon and an object has more inertia in water, (it would be even more challenging if all clocks, rulers and masses would change when they were going through some medium at a constant speed as there would be no unchanged reference clocks, rulers and masses in the moving reference frame), all these are real physical changes which are invariants of inertial reference frames, not relativistic effects.

Sec. 3.4 Fizeau Experiment

Fizeau experiment^[10], which lets two beams of light go through two paths of flowing water with opposite flow directions, is always used as a strong evidence of STR's speeds addition rule.

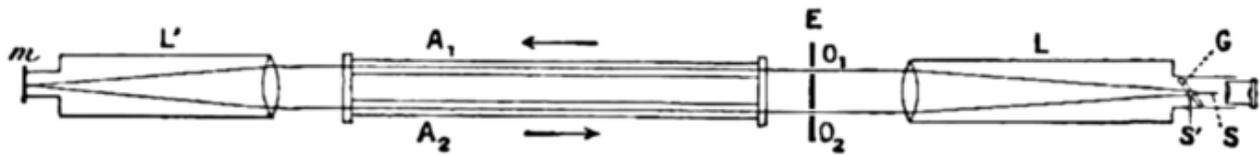


Fig.1 Fizeau's Experiment Setup^[11]

Actually, Fizeau made two mistakes in all his calculations: 1) using the mean velocities instead of the central velocities of water flow in the pipes for his calculations, and 2) using a constant speed of light instead of a relative speed of light in the reference frames of flowing water for calculating Newton's speeds addition rule based result. These two mistakes make the calculation based on STR's speeds addition rule closer to the result of experimental measurement than the calculation based on Newton's speeds addition rule. If the mistakes are corrected, it is just another evidence to disprove STR.

We know that the light beams in the experiment are propagating along the central line of the pipes. The central velocity of the water flow in a pipe is twice as large as the mean velocity because laminar flow in a pipe has a parabolic velocity distribution. It is wrong to use the mean velocities of water to make the calculations. Secondly, the speeds of light in the reference frames of flowing water based on Newton's speeds addition rule are not constant, but follow Newton's speeds addition rule. The correct calculation of the displacement of the bands based on STR's speeds addition rule for Fizeau experiment should be multiplied by 2, i.e., $0.2022 \times 2 = 0.4044$ which is almost twice as large as Fizeau's measurement: 0.23.

Now let's see the calculation based on Newton's speeds addition rule. In the reference frame of moving water, the speed of light before entering water is not c , but $c+v$ for the flow in the direction against the light and $c-v$ for the flow in the direction along the light. Thus, the speed of light in the moving water relative to the reference frame of water is not c/m , but $(c+v)/m$ or $(c-v)/m$, where m is the index of refraction of water. Therefore, the speed of light in the moving water relative to the reference frame of the pipes should be

$$(c - v)/m + v = c/m + v(1 - 1/m) \text{ in the water flowing along the direction of light} \quad (34)$$

or

$$(c + v)/m - v = c/m - v(1 - 1/m) \text{ in the water flowing against the direction of light} \quad (35)$$

The retardation between two beams is

$$\Delta = \{2L/[c/m - v(1 - 1/m)] - 2L/[c/m + v(1 - 1/m)]\}c = 4Lvc(1 - 1/m)/[c^2/m^2 - v^2(1 - 1/m)^2] \quad (36)$$

The displacement of the bands should be approximately

$$\Delta/\lambda = [4Lm^2(1-1/m)v/c]/\lambda \quad (37)$$

where Δ is the total retardation of between the two light beams. When $L = 1.4875$ meters, $m = 1.333$, $v = 2 \times v_A = 2 \times 7.059 = 14.118$ m/s, $\lambda = 0.000000526$ meters and $c = 299\,792\,485$ m/s, we have $\Delta/\lambda = 0.236460214$ which perfectly matches the result of Fizeau's measurement: 0.23. Therefore, Fizeau experiment is a confirmation of Newton's speeds addition rule and a denial of STR's speeds addition rule.

This experiment is just an example of many so called "experimental proofs of STR" which actually are wrong either in calculation or in interpretation of measurement results.

Sec. 3.5 A Modified Fizeau Experiment To Ether

If we modify Fizeau experimental setup to let the light beams go through the water pipes only once instead of twice in Fizeau experiment (i.e. replacing the reflection mirror with the interferometer of observation), we can use the modified experimental setup to detect the speed of the experimental setup relative to the medium of light.

Assume the speed of the experimental setup moving relative to the medium of light is u , we have

$$(c - u - v)/m + v = (c - u)/m + v(1 - 1/m) \text{ in the water flowing along the direction of light} \quad (37)$$

or

$$(c - u + v)/m - v = (c - u)/m - v(1 - 1/m) \text{ in the water flowing against the direction of light} \quad (38)$$

The displacement of bands will be

$$\Delta/\lambda = [2Lm^2(1-1/m)v/(c - u)]/\lambda \quad (39)$$

or

$$u = c - 2Lm^2(1-1/m)v/[(\Delta/\lambda)\lambda] \quad (40)$$

Therefore, we can use this new experimental setup to detect the speed of the earth relative to the medium of light in the neighborhood of the earth surface if the experimental setup is fixed on the earth or the speed of a space station relative to the medium of light in the neighborhood of the space station if the experimental setup is installed on the space station. That is, we can know exactly how the medium of light or called ether is distributed in the space and end the debate about the existence of ether.

Sec. 3.6 Hafele-Keating Experiment

The Hafele-Keating experiment^[12] was made in October 1971 by Joseph C. Hafele, a physicist, and Richard E. Keating, an astronomer. They took four cesium-beam atomic clocks aboard commercial airliners and flew twice around the world, first eastward, then westward. They found that clocks flying eastward 59 ns faster than the stationary clocks, and clocks flying westward 273 ns slower than the stationary clocks. They concluded that the relativistic kinematic time dilation caused time differences are about -203 ns for eastward and 98 ns for westward after deducting the effects caused by gravitation.

What does the experiment mean? Is it really an evidence of relativistic kinematic time dilation?

No, it is not an evidence to support the existence of relativistic kinematic time dilation at all. Everybody knows "relativity" means everything is relative. Clocks in motion is just a relative concept. Relative to the clocks on board of airliners, the ground clocks are moving and should show relativistic kinematic time dilation too. Where was that time

dilation of ground clocks in this test? Theoretically, relativistic kinematic time dilation should never be observed as each observer sees the other observer's clock slower. Of course, using clocks to represent the abstract time of STR is already wrong logically because clock time is invariant of Lorentz Transformation and shall never show time dilation which is the property of the abstract time of STR. Therefore, it is completely wrong to interpret the slowdown of clocks in this experiment as an evidence of relativistic kinematic time dilation.

Actually, the experiment is a great proof of the existence of ether. The experiment says that the three sets of clocks have different velocities. Relative to what do these sets of clocks have different velocities? It is relative to ether these three sets of clocks have different velocities!

Moreover, the experiment indicates that atomic clocks will slow down when they move through ether, just like the behavior of a mechanical clock with its balance wheel exposed to the wind, in which the faster the wind blows, the slower the clock will be. Can we claim that the clock in wind experiences a relativistic time dilation? No, absolute not. It is just a specific physical process influenced by a specific environment. It is nothing to do with relativistic time dilation. Therefore, Hafele-Keating experiment is irrelevant to relativistic kinematic time dilation too, but is a great evidence of the existence of ether.

4 CONCLUSION

As discussed above, we have the following conclusions:

1. The physical time we were using, is using and will continue using in daily activities and scientific observations is clock time.
2. Clock time is invariant of inertial reference frames, absolute and universal. If all clocks are synchronized in one inertial reference frame, they are synchronized in all inertial reference frames.
3. The frame dependent abstract time of STR is not our physical time, but a fake time.
4. The real speed of light measured with rulers and clocks still follows Newton's speeds addition rule.
5. Time dilation and space contraction in STR are just illusions.
6. STR as a theory of physics is wrong. No matter how beautiful in mathematical formulation, STR remains a mathematical theory without any way to land on the physical world. All its predictions are pure imaginations.
7. All problems related to the speed of light, Maxwell's Equations, invariance of laws of physics, gravitation, space expansion, dark energy, ether, vacuum and many others are becoming open arguments again, which are waiting for new theories of physics to solve.
8. A new experimental setup has been proposed to detect the speed of the earth relative to ether.

5 References

- [1] Einstein, Albert "Zur Elektrodynamik bewegter Körper," *Annalen der Physik*, 17: 891, (1905).
- [2] Michelson, Albert A.; Morley, Edward W., "On the Relative Motion of the Earth and the Luminiferous Ether," *American Journal of Science* 34: 333–345, (1887).
- [3] Laplace, P., "Mechanique Celeste", Chelsea Publ., New York, 642-645, (1966).
- [4] Daniel Y. Gezari, " LUNAR LASER RANGING TEST OF THE INVARIANCE OF c ", <http://arxiv.org/ftp/arxiv/papers/0912/0912.3934.pdf>
- [5] Daniel Y. Gezari, "Experimental Basis for Special Relativity in the Photon Sector", <http://arxiv.org/ftp/arxiv/papers/0912/0912.3818.pdf>
- [6] Physics.org, "A Question of Timing," <http://www.physics.org/article-questions.asp?id=77>
- [7] Wikipedia, "Atomic Clock," https://en.wikipedia.org/wiki/Atomic_clock
- [8] Ashby, Neil, "Relativity in the Global Positioning System," *Living Reviews in Relativity*, Max Planck Institute for Gravitational Physics, Am Muhlenberg, 6, (2003)
- [9] Van Flandern, Tom, "What the Global Positioning System Tells Us about Relativity," from book [Open Questions in Relativistic Physics], Apeiron, Montreal, 81-90, (1998)

- [10] Fizeau, M. H., "On the Effect of the Motion of a Body upon the Velocity with which it is traversed by Light", https://en.wikisource.org/wiki/On_the_Effect_of_the_Motion_of_a_Body_upon_the_Velocity_with_which_it_is_traversed_by_Light
- [11] Wikipedia, Fizeau experiment, https://en.wikipedia.org/wiki/Fizeau_experiment
- [12] Hafele, J. C.; Keating, R. E. (July 14, 1972). "Around-the-World Atomic Clocks: Predicted Relativistic Time Gains". *Science* 177 (4044): 166–168. Bibcode:1972Sci...177..166H. doi:10.1126/science.177.4044.166. PMID 17779917.