

# Actual Time Dilation is Dependent on Absolute Velocity

## *It is Impossible for Human Being to Have Time Travel*

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### Abstract

A description of relative time dilation and absolute time dilation are given and it is pointed out that confusion of the two terms is likely to lead to paradox and it is considered that circular motion velocity to center of a circle is absolute velocity and the time dilation due to absolute velocity is actual dilation--absolute dilation. Absolute dilation is unrelated to any object in relative motion. The time dilation in correlated circular motion has been discussed to conclude that the absolute velocity human being can achieve is very limited; therefore, it is impossible to have time travel.

**Keywords:** special theory of relativity, relative velocity; relative dilation, absolute speed; absolute dilation, circular motion, correlated circular motion, time travel

### 1. Introduction

Special theory of relativity points out that clock time in motion is to dilate (run slowly), accordingly, for two clocks A and B in relative motion, A considers that clock B in motion dilates and B also considers that clock A dilates. We define the time dilation mutually considered by A and B to be the other time dilation as relative dilation. It is obvious that we cannot determine which one actually dilates between A and B based on relative dilation and that we cannot explain some question about time dilation in a scientific way if we take relative dilation as actual dilation, for example: question about twin paradox.

At present, all the explanations of twin paradox are illogical. One explanation is that although twins A and B are identical in terms of relative motion speed, A in space travel shall experience an accelerating process to get away from earth, this accelerating process shall make A younger than B, the other explanation is that A in space travel shall experience a rotating process to return to earth, this rotating process shall make A younger than B (Time Travel, 2014). It is known from analysis that these two explanations are illogical, the reason for which is that A in space travel for one day and for ten years shall be identical in terms of accelerating process and rotating process, it is known from above mentioned two explanations that A in space travel for one day and for ten years shall be identical in terms of young effect in substance. It is obvious that the inference is false, the cause for which is that there is no clear difference between relative time dilation and actual time dilation, the paper presents two concepts namely absolute velocity and absolute dilation to solve the problem.

### 2. Actual Time Dilation is Unrelated to Relative Velocity

First, we shall verify that relative time dilation is unrelated to actual time dilation in theory, as shown in the following Figure 1.

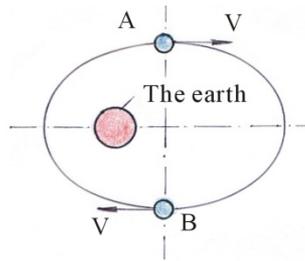


Figure 1. Spaceships A and B are in relative motion

We launch a spaceship A from the ground to fly around an elliptical orbit, the time for A to make a complete revolution around the earth is indicated by  $T$ , after  $T/2$ , we launch another spaceship B from the same location to fly around the same orbit, having the same orbital period. It is obvious that A (Or B) finds B (Or A) is in motion relative to it at any instant. According to special theory of relativity, both A and B speculate that the other clock runs slowly (Relative dilation). After a period of time, B and A return to earth at intervals of  $T/2$ . Since A and B have identical flight process, if there is time dilation in their clocks, it is certain that their time dilation shall be identical, therefore, after returning to earth, it is impossible for A and B to find that the other clock runs slowly, that is to say that the speculation by A and B indicating the other clock runs slowly (Relative dilation) is not consistent with the fact, which is to say it is impossible to know the actual time dilation only according to relative dilation.

It is also known in this way that for the objects different in motion velocity such as  $M_1, M_2, M_3, \dots$ , their motion velocity of  $M$  under observation relative to them is  $V_1, V_2, V_3, \dots$  respectively, according to special theory of relativity,  $M_1, M_2, M_3, \dots$ , it is speculated that the time dilation of  $M$  is  $t_1, t_2, t_3, \dots$ . Since it is impossible for clock dilation of  $M$  is equal to  $t_1, t_2, t_3, \dots$  at the same time, thereby, It is impossible for time dilation of  $M$  clock is associated with object in motion relative to it.

It should be pointed out that shortened length and time dilation of an object in motion concluded by special theory of relativity are the results of transformation of physical parameters in two different reference systems and the difference between different reference systems in measurement and observation, which do not mean that the length of the object in motion is shortened and that the clock runs slowly. For example, we find a person standing on a hill becomes smaller in stature, it does not mean that the person really becomes smaller in stature.

### 3. Absolute Velocity and Absolute Dilation

One man holds a rope connected to a heavy  $M$  in his hand, he tries to make the rope connected to  $M$  turn round his hand, anyone in the car or on the plane can see that  $M$  is rotating round his hand and never think that his hand is rotating relative to  $M$  and it may be essential that  $M$  itself also thinks that it is rotating round hand, just like the earth rotates round the sun, believed by everyone on earth. Accordingly, the motion velocity of  $M$  relative to hand (Including all stationary objects) is absolute not relative. The circular motion velocity of  $M$  relative to hand is defined as absolute speed.

If the time for  $M$  to turn from beginning to end under the observation by people on the ground is indicated by  $T$  and the rotating velocity of  $M$  is indicated by  $V$ , according to special theory of relativity, the time interval  $T'$  between clock on  $M$  and  $T$

$$T' = T\sqrt{1 - V^2/C^2} \quad (C\text{---the speed of light}) \quad (1)$$

$T'$  is the result of observation of stationary hand and  $M$  in motion, being generally accepted, which is different from relative dilation at root, relative dilation means every one considers that the other clock runs slowly and that the clock of his or her own did not runs slowly, being not accepted, thereby, the generally accepted time dilation  $T'$  in circular motion is defined as absolute dilation.

Similar to the rotating rope, the earth rotates round earth axis (North and south poles), the rotating velocity of every point on earth to earth axis is its absolute speed. It is obvious that the absolute velocity on equator is the highest and the absolute dilation thereon is also the largest, the absolute velocity on north and south poles is zero (The earth axis rotates round the sun, in which there is absolute velocity of the earth axis to the sun, as shown in note 5), the clock on the north and south poles is the standard clock to indicate motion velocity in the time frame on earth.

#### 4. Experiment by J. C. Hafele and R. E. Keating

In 1971, J. C. Hafele and R. E. Keating made an experiment on relation between time dilation and motion velocity. They placed four caesium atomic clocks on the plane flying along equator. When the plane flew round the earth from the east to west along equator, they found that the average reading of the four caesium atomic clocks  $273 \times 10^{-9}$  seconds faster than those (Showing negative dilation) on the ground; and when the plane flew round the earth from the west to east along equator they found that the average reading of the four caesium atomic clocks was by  $59 \times 10^{-9}$  slower than those (Wu, 1987) on the ground. What is the reason for the results? Since the earth revolves from the west to east, when the plane is flying west, the absolute velocity of the plane is the difference between absolute velocity of the ground along equator and the speed of the plane. The absolute velocity of the plane and the absolute dilation of the clock thereof are smaller than the absolute velocity of the ground along equator and the absolute dilation of the clock thereof, therefore, the caesium atomic clocks on the plane run faster than those on the ground.

According to the theory of relativity, they calculated that the caesium atomic clocks on the plane are  $275 \times 10^{-9}$  seconds faster than those on the ground, which is basically in conformity with the actual reading; when the plane is flying east, the absolute velocity of the plane is the sum of the absolute velocity of the equator and the speed of light of the plane, and the absolute velocity and absolute dilation of the plane are greater than the absolute velocity and absolute dilation of the equator. Accordingly, the caesium atomic clocks on the plane run slowly than those on the ground. Their theoretically calculated value indicates that the caesium atomic clocks on the plane are  $40 \times 10^{-9}$  seconds slower than on the ground. It is obvious that there is marked deviation between the theoretical value and actual  $59 \times 10^{-9}$  seconds, but it should be noted that these two values are not absolute dilation.

In the experiment, the absolute dilation of the caesium atomic clocks on the plane is the sum of the absolute dilation of the caesium atomic clocks on the equator and  $59 \times 10^{-9}$  seconds, while the theoretically calculated value should be the sum of absolute dilation of the caesium atomic clock and  $40 \times 10^{-9}$  seconds. Since the experiment didn't set caesium atomic clocks in the North Pole or South Pole, it is not known the absolute dilation of the caesium atomic clock on the equator. According to conservative estimate, its value should be more than  $500 \times 10^{-9}$  seconds, based on which, it is estimated that the numerical error between the above mentioned absolute dilation ( $500 \times 10^{-9} + 40 \times 10^{-9}$ ) and ( $500 \times 10^{-9} + 59 \times 10^{-9}$ ) should be within 3.4%, accordingly, it is thought that the theory is consistent with reality. According to the above mentioned experiment results, the experiment done by J. C. Hafele and R. E. Keating are acceptable for it not only verified that the time dilation theory of clock in motion given in special theory of relativity conforms to objective reality but also proved that absolute dilation is dependent on absolute velocity to the full extent and unrelated to relative velocity of any object.

And now, we can explain twin paradox in a simple way. The answer is whether twin A in space travel is younger than B is fully dependent on whether the absolute dilation of A is larger than the absolute dilation of B., Take the above experiment as an example, if A flies from the east to west by plane, then A is not younger than B; if A flies from the west to east by plane, then A is younger than B.

#### 5. Absolute Dilation of Correlated Circular Motion

The earth revolves round the sun, and the moon revolves round the earth. If the moon has artificial satellite, the satellite revolves round the moon, the correlated rotation motion is defined as correlated circular motion.

The absolute velocity for the earth to revolve round the sun is indicated by  $V$ , its time interval is indicated by  $T$ ; the absolute velocity for the moon to revolve round the earth is  $V_m$ , the time interval relative to  $V_m$  and  $T$  is indicated by  $T_m$ ; the absolute velocity for the moon satellite to revolve round the moon is  $V_s$ , the time interval relative to  $V_s$  and  $T$  is indicated by  $T_s$ . Since we carry out observation and analysis based on the human oriented point of view, thereby we define  $T$  (time interval of earth axis) as reference time interval. According to special theory of relativity, the formulae are as follows:

$$T_m = T \sqrt{1 - V_m^2 / C^2} \quad (2)$$

$$T_s = T_m \sqrt{1 - V_s^2 / C^2} = T \sqrt{1 - V_m^2 / C^2} \cdot \sqrt{1 - V_s^2 / C^2} \quad (3)$$

If the time interval of  $T$  relative to the sun is indicated by  $T_0$ , then there is

$$T_0 = T / \sqrt{1 - V^2 / C^2} \quad (4)$$

If the velocity for a planet of the sun to revolve round the sun is  $V_x$ , the time interval relative to  $V_x$  and  $T$  is indicated by  $T_x$ , then there is

$$T_x = T_o \sqrt{1 - V_x^2 / C^2} = T \sqrt{1 - V_x^2 / C^2} / \sqrt{1 - V^2 / C^2} \quad (5)$$

It should be pointed out that the orbits for earth, moon and other planets of the sun are not pure circular orbits, since there is a radius of curvature at every point on the ellipse, namely each has a corresponding center of a circle, consequently, the motion velocity of the planet at every point on the elliptical orbit is absolute velocity.

### 6. It is Impossible for Human Being to Have Time Travel

Synchrocyclotron is able to accelerate the motion velocity of particle near to the speed of light; can the motion velocity of the manned spaceship be accelerated to the speed of light by the corresponding synchrocyclotron? The answer is no, the reason for which is that it is difficult for human being to fabricate practical and grand synchrotron for spaceship and the more important is that human being is not charged body and that it is impossible for human in synchrotron to endure huge centrifugal force due to circular motion because human being have no Lorentz force to offset centrifugal force. In particular, human body cannot withstand the centrifugal force as a result of  $V = 30 \text{ km} / \text{s}$ , being ten thousandth of the speed of light, let along the speed of light. It is known from calculation that if the mass of a man  $M = 50 \text{ kg}$  and the radius of cyclotron  $R = 50 \text{ km}$ , the centrifugal force ( $mv^2 / R$ ) to be withstood by the man is up to 900,000 N, 1,800 times the weight of the man (about 500 N). In this way, the time dilation achieved by the man within a year is only 0.16 second, which is to say that there is no time dilation. Therefore, it is impossible for human to have time travel by cyclotron.

Since the universal gravitation among celestial bodies (Mass is indicated by M) can offset the centrifugal force due to circular motion, thus, it is practical for human to achieve absolute dilation by flying round the celestial body in spaceship. Assume the mass of a man is  $m$  and the revolving radius of  $M$  is  $R$ , the velocity is  $V$ , when revolving of  $m$  round  $M$  is instable equilibrium state, the centrifugal force  $mv^2 / R$  should be equal to universal gravitation  $GMm / R^2$  ( $G$ —universal gravitation constant), based on which the formula is as follows:

$$V = \sqrt{GM / R} \quad (6)$$

It is known from formula (6) that the greater  $M/R$  is, the higher  $V$  will be. On the premise that M remains unchanged, the smaller  $R$  is, the higher  $V$  will be.

The known speed for spaceship to fly round the earth is up to 7.9km/s, from formula (1), its absolute dilation is 0.01 second per year. If a spaceship flies round the moon, it is known from putting the mass and radius of the moon into the formula (6) that the maximum velocity of the spaceship is no more than 1.7km/s and the velocity for the moon to revolve the earth is 1.02 km/s. From formula (3), the absolute dilation  $T_s$  of the spaceship is 0.0052 second within one year; the velocity for Mercury to revolve the sun is the highest among planets of the sun, but its temperature is too high; Venus is in the second place, assume that man is to fly round the sun along Venus orbit by spaceship, its speed can reach 34km/s. The average speed for the earth to revolve round the sun is 29.78km/s, put the two velocities into formula (5) to calculate the spaceship revolving round the sun along Venus orbit to know that its absolute dilation  $T_x$  compared with T of the earth is 0.0157 second within a year. It is known from the above data for absolute dilation that the absolute dilation achieved by human in spaceship to revolve round the earth, moon and the sun is too little to realize time travel.

It seems that we have to look for other planet in outer space. It is known from celestial observation that the largest star in mass discovered is R136a1, its mass is 320 times that of the sun, but its diameter is 3,600 times that of the sun, and with higher temperature. It is known from formula (6) that the maximum velocity achieved by flight revolving round it is far below that achieved by revolving round the sun ( $M/R$ ); the star A<sub>1</sub> is in the second place, its mass is 150 times that of the sun, its diameter is 114 times that of the sun (Cosmic Planet, 2014). Assume that there is human being existing in adjacent planet similar to the human being on earth and the spaceship is to make a flight round the surface of the star, it is known from calculation that the velocity of the spaceship is up to 501km/s and that the absolute dilation achieved is 44 seconds within a year, namely the human life is prolonged by 1.4 millionth. It is obvious that the flight cannot have time travel at all.

It is certain that flight around the black hole shall greatly enhance the absolute velocity and absolute dilation of the spaceship, however, according to black hole theory, the mass of the black hole similar to football court in size is equal to the mass of four suns (Black Hole, 2014). It is known from calculation that the mass of the black hole similar to a grain in size is more than the mass of six trillion people on earth. (Per capita mass is 50kg). If black hole

is actual and composed of the known 118 types of elements and then even if all atoms in black hole are collapsed and all electrons around atoms fall on atomic nucleus and turn into neutrons and that the neutrons are compacted together, its volume is one million times more than the volume defined according to black hole theory, indicating that black hole composed of atoms is impossible. We only discuss actual substance and actual celestial body instead of the unproven black hole not composed of atoms, for the vantage, human life is limited and it is impossible for human to reach to black hole.

In summary, the absolute dilation achieved by human in spaceship to make a flight around celestial body in outer space shall be no more than 44 seconds every year, accordingly, it is impossible to satisfy the basic requirement for human to prolong their life by several times by time travel, consequently, it is known that it is impossible for human to have time travel.

It should be pointed out that J. C. Hafele and R. E. Keating have spent much time in experiment to learn about the relation between motion velocity and time dilation, their experimental analysis has substantially indicated that the absolute dilation is only related to absolute velocity and unrelated to relative velocity, as a consequence, the discovery of absolute velocity and absolute dilation thanks to J. C. Hafele and R. E. Keating, the paper presents supplementary and induction to their experimental analysis.

### References

- Black Hole. (2014). In *Wikipedia, the free encyclopedia*. Retrieved from [http://en.wikipedia.org/wiki/Black\\_hole](http://en.wikipedia.org/wiki/Black_hole)
- Cosmic Planet. (2014). In *Wikipedia, the free encyclopedia*. Retrieved from <http://en.wikipedia.org/wiki/Planet>
- Fudan University. (1985). *Physics*. China Higher Education Press.
- Time Travel. (2014). In *Wikipedia, the free encyclopedia*. Retrieved from [http://en.wikipedia.org/wiki/Time\\_travel](http://en.wikipedia.org/wiki/Time_travel)
- Wu, S. H. (1987). *Basics of Theory of Relativity*. Shaanxi Science & Technology Press.

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