



# Theory of Relativity-Atomic Watches and Time Dilation

**Enrique Martinez Viladesau**

Escuela Técnica Superior de Ingenieros Industriales de Barcelona (ETSIUB), Spain

E-mail addresses: [emviladesau@gmail.com](mailto:emviladesau@gmail.com)

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## ABSTRACT

In this article, we asked about the validity of the results obtained using atomic clocks, when trying to contrast the idea of the Time Dilation. As we will try to demonstrate, the idea of time dilation is a utopia that appears by a misinterpretation of a Thought experiments. However, physical experiments performed with great precision, using atomic clocks, are interpreted as the occurrence of such fallacy. What if we are wrong? Do these physical experiments serve to corroborate the idea of time dilation?

**Keywords:** Relativity, Time dilatation

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## INTRODUCTION

According to the theory of relativity, time dilation is a difference in the elapsed time measured by two observers, either due to a velocity difference relative to each other, or by being differently situated relative to a gravitational field. Time dilation has also been the subject of science fiction works, as it technically provides the means for forward time travel (NASA, 2012). Here we will consider the validity and or invalidity of the concept of time dilation. The study here is consist of two parts. 1-First we show that a misinterpretation of the thought experiments used leads to the said fallacy and 2-We will demonstrate a misinterpretation of the result obtained in the verification of phenomenon, by means of atomic clocks, leads to admitting the said fallacy. Our highlighted word is interpretation and we use references by the same author (Viladesau, 2014, 2015) presented long time ago in (Monografias.Com) with expanded new contributions. The present work serves as an agglutinated of several ideas

that appeared in the aforementioned papers and gathered as a single unit, lead us to the subject we want to expose.

In this paper we will analyse one of the three thought experiments described in the Albert Einstein's books (Einstein, 2015; Infeld, 1971) and these mental experiment called the Train Car, or also the mirror have been intended to be used as an argument for the fallacy of time dilation.

Here we intended to point out the misinterpretations that lead to admitting the said fallacy and information extracted from (Viladesau, 2014). In physics, motion is a change in position of an object over time. Motion described in terms of displacement, distance, velocity, acceleration, time, and speed. Motion of a body observed by attaching a frame of reference to an observer and measuring the change in position of the body relative to that frame. Absolute space is a concept in physics and philosophy about the properties of the universe and absolute space and time may be a preferred frame. In absolute space, there are no predetermined addresses. Between two points of space, we will give their relative

position of one with respect to the other. Therefore, we will define the situation of an event when we give its position regarding to a point and the moment.

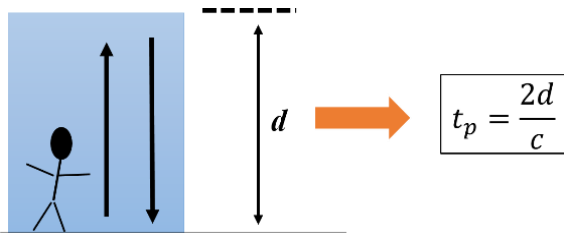
**THEORETICAL REVIEW (PHYSICAL PHENOMEN'S IMAGE TRAVEL TIME)**

At this point, we will not use the call to the link that we gave, but we give here directly the information on this topic. If we want to obtain the relation that can exist between the time of observation of the ray (round and round) between that which will register the operator  $O_1$ , located inside the car, and the one that will register the fixed observer  $O_2$ , located in the ground, we will rely on the following two figures. The relationship between two observers  $O_1$  (located inside the car) and  $O_2$  (a fixed observer located in the ground) can be consider in the following figures.

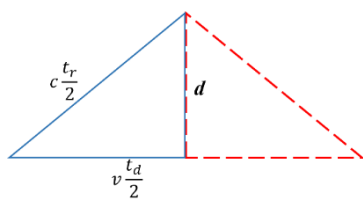
The Fig 1 shows the situation in which the observer  $O_1$  who is traveling above the car throws the ray of light. The wagon is moving with uniform and rectilinear motion and is an inertial reference system. This situation is equivalent, and intended to illustrate the drawing, if we consider that the wagon does not move then,

$$t_p = \frac{2d}{c} \tag{1}$$

Here  $d$  is the distance from the floor to the roof of the car and  $c$  is the speed of light.



**Fig 1.** The situation of observer  $O_1$  who is traveling above the car throws the ray of light.



**Fig 2.** The ascending portion of the ray

We can execute the calculation with applying the Pythagorean theorem and a simple mathematics (see Fig 2). The hypotenuse of the triangle represents the ascending portion of the ray, only the ascending segment. Therefore it is only represents half of the total path. The total route would be the round trip of the thunderbolt. Here  $t_r$  and  $t_d$  are the travel time and train wagon offset time which are moving with velocity of  $c$  and  $v$  respectively. Obviously, the time between the beginning and the end of the ray observation should be equal.

$$t_d = t_r \tag{2}$$

Now with using the Eq(2) we have,

$$\left(c \frac{t_d}{2}\right)^2 = \left(v \frac{t_d}{2}\right)^2 + d^2 \tag{3}$$

or,

$$t_d = \frac{2d}{\sqrt{c^2 - v^2}} = \frac{2d}{c} \sqrt{1 - \frac{v^2}{c^2}} \tag{4}$$

and by using  $t_p = \frac{2d}{c}$  then, the above equation will be as,

$$t_d = t_p \sqrt{1 - \frac{v^2}{c^2}} = L t_p \tag{5}$$

Where here  $L$  is Lorentz factor and is defined as,

$$L = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{6}$$

The equation (6) show that the value of  $L$  is always greater than unity ( $L > 1$ ) and therefore,

$$t_d > t_p \tag{7}$$

The Fig1 and Fig2 shows that the time travel of the light beam  $t_p$  observed by the observer in the wagon ( $O_1$ ), is less than  $t_d$  which computes a fixed observer at the beginning of the wagon path and observed the beginning and end of the beam path. This is the idea that we must stay because it is intend to justify the mistakes of the dilation of time. Using this experiments that the treatises expose on the subject, can one affirm that it is the time that the dilates?

**GENESIS OF A UTOPIA**

According to Eq (6) and Eq (7) we found that  $t_d = L t_p$ , so that  $L$  is less than unit. In the interpretation of this mathematical inequality is where the error leads to admit the utopia of time dilation. The first doubt that we have is; If we had said that we had to operate with synchronized movements, in such a way that the time of the path of the ray at any moment must be the same, look from where it is looked at, that is that they must be considered simultaneous movements, we ask, how is it that equality  $t_d = t_p$  does not occur? Why does the Lorentz factor  $L$  intervene and here is where the confusion appears. The idea to be interpreted is the expression of an equivalence of observations ( $O_1$  and  $O_2$ ) between two different types of time. It is not a question of calculating the value of the transformation of one type of time in another. So instead of using the mathematical sign of equality we must use the mathematical sign of equivalence.

$$t_d \approx L t_p \tag{8}$$

To this expression we must give the approach that it is an equivalence in the result of two different types of time, observed by a person who contemplates, as if it were a real experiment, the mental experiment of the train car. This person values each of the two times using the above expression. From here comes the criterion of comparison. We can interpret it as if it were ourselves that we are recreating to contemplate as if it was a real experiment what was created in the minds of other observer, that is, the designers of the toy called mental experiment. The next figure pretends to represent what we are saying.

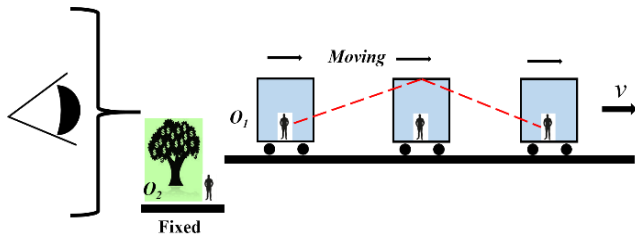


Fig 3.

The third eye appears, ours, which is the one that allows us to observe the two actions of observer \$O\_1\$ and \$O\_2\$. With this observation, out of the game, we can appreciate that time does not dilate. We value time in two concurrent but different circumstances. Now the observer of the real phenomenon is us and for this reason the two other observers we call them Operarios.

The mistaken idea of transformation of times and not precisely that of equivalence of observation of times is the one that prevails in the treaties on the subject that occupies to us and is the one that leads to dream with utopias. In order to focus ideas, we must inform that until now the subject of the mental experiment of the railway car or, perhaps rather, how a misinterpretation of this mental experiment, is finished, leads to the referred fallacy. It is now a matter of studying how the information of an event occurring in a particular situation of outer space is transferred to another situation of this space. The Fig 4 is intended to be a representation of the above statement. In a certain situation of the outer space appeared a certain event \$E\$. The environment in which it was produced is identified as a fixed reference system (FRS).

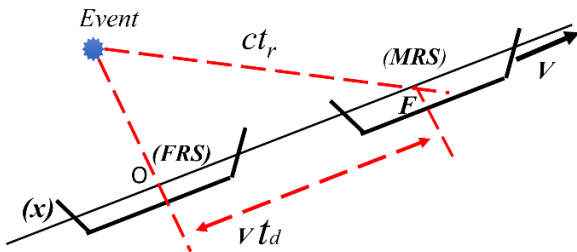


Fig 4.

This event have a certain time \$t\_p\$. The observation of event is made from the point \$F\$ contained in the environment of a mobile reference system (MRS) with respect to the said (FRS). The observer located at \$F\$ and travel time \$t\_r\$ to visualize the occurrence of the event \$E\$. Just as we did in the thought experiments of the train car in which we look for the relationship between the time of the phenomenon and the time of displacement \$t\_d\$ of the car, we are interested in finding the relationship between the \$t\_p\$ and the travel time \$t\_r\$ of the information. In this case we will impose the simultaneity and in consequence, the equality of values

$$(t_d) = (t_r) \tag{9}$$

so we will perform the following calculations

$$(ct_r)^2 = (ct_p)^2 + (vt_d)^2 \tag{10}$$

And since \$t\_d\$ and \$t\_r\$ must be equal, then we choose \$t\_r\$,

$$(ct_p)^2 = t_r^2 (c^2 - v^2) \tag{11}$$

$$t_r^2 = \frac{(ct_p)^2}{(c^2 - v^2)} \tag{12}$$

and

$$t_r = \frac{ct_p}{c \sqrt{1 - \frac{v^2}{c^2}}} \tag{13}$$

or

$$t_r = Lt_p \tag{14}$$

same as train wagon experiment, here also we should consider the expression of equivalence

$$t_r \approx L t_p \tag{15}$$

in which the time of travel \$t\_r\$ of the image of the event that has taken place intervenes. It makes us see the delay that exists between the appearance of an event and the perception of it from another situation of space. In this case also the correct interpretation of the result obtained in the thought experiments of the train car, we now have to talk about the correct interruption of the response obtained when performing checks using atomic clocks. It is understood that we do not doubt the validity of the data obtained. What we doubt is the validity of its interpretation, which leads us to admit the fallacy of the dilation of time. The reason may be as follows. In the experiments proposed an error is made in interpretation and we pass on this error of interpretation when moving it in an experiment physical, made using atomic clocks. If we start from an error of interpretation of the thought experiments on which we rely, the interpretation of the answers obtained by applying a verification test will be contaminated. It is not that atomic clocks are a defective tool to measure what we propose. Perhaps they tell us what we do not want to interpret. The use of atomic clocks only detects the time difference \$t\_r - t\_p\$ that must exist between the two observation platforms (MRS) and (FRS). Nothing of time dilation. By justifying the reason for the difference (infinitesimal) denoted by the atomic clocks located in an Inertial Reference System and, furthermore, to justify that the answer obtained is not due to the concept of dilation of time, we believe we have achieved it. We could finish our Essay here. Nevertheless, we think it useful to add the topic of the formulas of the transformations of Lorentz to try to dispel any doubt that the reader may have. Although we will see that the concept of Lorentz factor \$L\$ will appear, it is necessary that we have clear distinction following. So far we have studied the observation of an event from a (MRS) that has occurred in a (FRS). In this study we have justified the despicability of times that occurs and not precisely because the time of the Event is lengthened. Simply, the time \$t\_r\$ of the vision of the Event is longer than the own time \$t\_p\$ of the Event. Now we will analyze the quantification, from a (MRS), that must be given to the variables time \$t\$ and space (\$e\$) of a certain physical law that governs in a certain phenomenon that is given in a (FRS). For more detail and information regarding to this subject we suggest to see (Viladesau, 2014, 2015) of the formulas of the Lorentz Transformations by the same author.

## RESULT

The result of investigation shows that the concept of time dilation is a fallacy. It shows that the typical example of the twin brothers is nothing more than a science fiction story.

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