the general science journal

Does an intrinsic time dilatation really exist?

Thierry De Mees

thierrydemees @ telenet.be

Abstract. In this paper, we analyze the validity of the common belief in modern science that an intrinsic time dilatation would exist, i.e. that time effectively dilates with speed and not just the ticking rate of the clocks that measure it. I start from the Special Relativity theory and I analyze if it is theoretically possible to obtain an intrinsic time dilatation. Furthermore, I analyze the context of the Hafele–Keating experiment, which used atomic clocks and the Special Relativity theory to calculate the time rates. Finally, I analyze what is at the origin of the time dilatations that are measured in atomic clocks.

Keywords: cesium clocks, relativity, accuracy, drift-rate, Special Relativity Theory, time dilatation.

Introduction

The Special Relativity Theory [1] interprets the Lorentz Transformations by considering that time is intrinsically dilated by velocity, as well as lengths contracted and masses increased. The proof of such a time dilatation is allegedly given by the atomic clock retardations, as calculated by the Hafele–Keating experiment [2].

In this paper, I will analyze this more closely.

1. The observer and the inertial frame in the Special Relativity Theory

In the Special Relativity theory, two postulates are essential:

1. The laws of physics are invariant in all inertial systems;
2. The speed of light in a vacuum is the same for all observers.

The first postulate is also interpreted as follows: the laws of physics are independent from the observer.

Let A and B be two observers connected to inertial frames of which one is uniformly moving. Since the relativity theory only considers relative motion and not absolute motion, one can say that the observers see the other in motion. The observer A sees the frame B moving at a velocity v and the observer B sees the frame A moving at a velocity $-v$.

Since the laws of physics are allegedly identical for both inertial frames, the special relativity theory learns us that the observer A will find that his time rate is given by t_A and that the time rate of the frame B is given by :

$$t_B = t_A \Big/ \sqrt{1-v^2/c^2} \tag{1}$$

Strictly speaking however, to get the complete time and not just the time rate, the eq.(1) should be corrected by the distance between both inertial frames, as required by the Lorentz transformations:

$$t_B = \left(t_A - v\, x_{AB}/c^2\right) \Big/ \sqrt{1-v^2/c^2} \tag{2}$$

The eq.(2) is useful to synchronize the clocks when $x_{AB} = 0$, which means that both clocks are passing by at the same point. Since this requirement has been dismissed by many authors that used the special relativity, because they only want to calculate the time rate, including by Hafele and Keating in their experiment calculus [2], we will also simplify this eq.(2) here and use eq.(1). This will change nothing to the clock rate, only to the starting time for both observers.

An important issue that I want to point out is that also the observer B will find that his time rate is given by t_B and that the time rate of the frame A is given by :

$$t_A = t_B \Big/ \sqrt{1-v^2/c^2} \tag{1}$$

Hence, in the special relativity theory it is impossible to know which reference frame is moving and which is not, and each observer can say that the other observer is moving, hence, that his time rate is dilated!

I conclude that it is impossible in the special relativity theory to get intrinsic time rate changes, let alone, time itself!

2. The Hafele–Keating experiment

In 1972, Hafele and Keating made an experiment with four atomic clocks, and they compared the calculated (predicted) and the measured values.

In their paper, they didn't use the first postulate because they defined the non-rotating Earth as the preferred reference frame, without motion. Also in electromagnetism and gravitomagnetism it is required that each field of the non-moving charge or mass is the reference frame for velocities of the other charges or masses [4]. This means that in reality, reference frames are not observer-dependent but mass-dependent. As in Newtonian physics, the larger the mass, the more important the role is that the field will play.

Moreover, as A.G. Kelly pointed out [3], in Hafele's and Keating's experiment, two of the clocks has shown very deviating results from the theory, which in two cases are opposite to the predicted results. Only by adding all the information together of the four atomic clocks, including the one with the strongly deviating measurements, the results of Hafele's and Keating's paper were obtained that complied well with the theory.

	Eastward			Westward		
Clock No	**Test Results**	**First Change**	**Second Change**	**Test Results**	**First Change**	**Second Change**
120	**-196**	-52	-57	**+413**	+240	+277
361	**-54**	-110	-74	**-44**	+74	+284
408	**+166**	+3	-55	**+101**	+209	+266
447	**-97**	-56	-51	**+26**	+116	+266
Average	**---**	**-54**	**-59**	**---**	**+160**	**+273**

Tab. 1. Original Test Results and H & K alterations [3]

It is then also clear that the origin of the deviation is not an intrinsic behavior, otherwise, the results should be strictly the same. Instead, external influences act upon the measurements.

3. Electromagnetism induction upon clocks

Even when triple shielded against the influence of magnetic fields from the Earth, it is not sure at all that the cesium clocks are unaffected by the fields of the Earth. The explanation of the abnormal gravitational results for solar eclipses by Wang [5] rather suggests that even the electromagnetic fields from the extra-coronal Solar winds are almost not shielded by the iron contained in the Moon.

It is certain that gravity fields will not be shielded anyway. Hence, there is a high probability that the atomic clocks got an electromagnetic induction, which indeed will modify the clock rate of cesium clocks without of course changing the intrinsic time of the airplane.

Oleg Jefimenko has made an interesting theoretical study of elementary electromagnetic clocks that are in motion [9]. He found that, depending from the precise clock construct, there will be found different values for the clock rate delays due to its velocity in an electromagnetic field. He found this by observing that the Lorentz Transformations express in fact the retardation in time of the fields, by the speed of light, between two inertial reference frames. Hence, the retardation of clocks is caused by physical phenomena.

4. Conclusion: can an intrinsic time delay exist?

It follows from the study of the Special Relativity Theory that it is impossible to define velocity within the frame of the theory. Hence, the theory doesn't represent the physical reality. Indeed, Oleg Jefimenko found that the Lorentz Transformations are deducible from the simple fact that the fields between inertial reference frames are retarded by the speed of light. He moreover found that electromagnetic clocks are affected by speed due to an electromagnetic induction. The value of the delay depends from the clock construct.

It is found that Hafele's and Keating's experiment includes strongly diverging results (in opposite direction) from two atomic clocks before the average has been calculated, which then amazingly complies well with the theory. The large variations of the results show that the alterations have a physical cause, not an intrinsic one.

Finally, it is found, with the support of the results of a solar eclipse that the shielding of the cesium clocks is likely insufficient to avoid an electromagnetic or gravitational induction of the clocks.

It must be added that the supposed longer life of high-velocity mesons, which is seen as a 'proof' of the intrinsic time delay Special Relativity Theory can very simply be explained by the radial compression of the mesons by the gravitomagnetic field, which is caused by its speed in the Earth's field [4]. This compression retards the disintegration of the mesons.

Hence, no intrinsic time dilatation is possible.

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