Special Relativity's Lorentz transformation factor has only been confirmed by atomic clocks in orbital motion. A centrifugal acceleration based derivation of that factor means it is not proof of absolute time dilation.

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ABSTRACT

If you start with the General Relativity factor = gR/c^2 and substitute g for half the centrifugal acceleration v^2/R you arrive at the Special Relativity Lorentz transformation factor - $gR/c^2 = v^2/2R \times R/c^2 = v^2/2c^2$

The Lorentz transformations original derivation is based on linear vector motions and the need for time dilation to reconcile the constancy of the speed of light c across different reference frames. As this $v^2/2c^2$ factor provides a valid and correct adjustment to GPS satellite clock atomic half life rates whilst in orbit, one of these competing derivations is likely to be a representation of reality, but the other one must be a coincidental hoax.

If back ground EM radiation or gravitational waves provide the medium relative to which light propagates its speed/wavelength energy mix then the observed constancy of c is explained. Lunar laser range tests are observational evidence of this. This paper therefore argues that the Lorentz derivation is likely to be the hoax and we no longer need special relativity's absolute time dilation.

INTRODUCTION

Original Lorentz transformation motivation and time dilation derivation -

The speed of light is known to somehow disconnect itself from the relative velocity of its emitting source and speed of light measurements always return an answer of c relative to the observing equipment. The Lorentz transformation equation for time dilation was an apparent resolution to that speed of light paradox. Its resultant derivation is as follows.-

A ray of light travelling vertically at speed c on a train travelling at speed v. To make the resultant vector light speed stay at c relative to an observer watching the train pass by, the rate of time on the train must be slightly slower due to its speed v as follows -

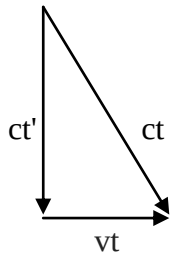
t = normal time according to the stationary observer watching the train.

t' = reduced time experienced by the train due to its speed v

$(ct')^2 + (vt)^2 = (ct)^2$

Which rearranges to

$t'/t = \sqrt{(1-v^2/c^2)}$



which when v<<c simplifies to

$t'/t = (1 - v^2/2c^2)$ OR ---

$v^2/2c^2$ = the rate at which time is reduced due to speed v **,** the output unit being fraction of a second of time dilation per second of normal time (s/s).

However, apparent proof of the Lorentz transformations time dilation always involves situations where there is centrifugal acceleration.

The US GPS systems on board satellite atomic clocks frequency have been altered [1][6] for a 45850 ns/day general relativity reduced gravity calculation and a 7214ns/day special relativity Lorentz transformation velocity calculation. The net daily adjustment being 38640ns/day reduces other GPS time synchronisations that are manually filtered out down to the order of +/- 25ns/day. [4][5]

The Hafele Keating [3] plus later more accurate experiments flying clocks around the world also appear to confirm the numerical accuracy of the Lorentz transformation factor, but only if the centre of the earth is set as the reference frame. Muons observed atomic half life correlation with speed is considered additional confirmation of the Lorentz transformation and does not involve orbital motion, but this is not confirmation at a numerically accurate level, only a general consistency level.

As the General Relativity factor refers to gravitational influence on atomic half life, unlike special relativity's absolute time dilation, it sits with in the intuitive comfort zone and is also confirmed by the GPS clock frequency calibrations. This papers work therefore seeks to link the clock frequency adjustment calculated by the Lorentz transformation factor to the centrifugal accelerations acting on the satellites in accordance with the gravity and acceleration equivalence principle.

CENTRIFUGAL ACCELERATION EQUIVALENCE TO GRAVITY DERIVATION

This paper presents the following alternative derivation of the Lorentz transformation factor based on the centrifugal acceleration acting on atomic clocks in an orbital motion. -

G = Gravitational constant, M = Mass of Earth, R = Radius of orbit, v = velocity of satellite, g = gravitational acceleration at that radius of orbit, c = speed of light in vacuum

Start with general relativity's gravitational time dilation factor

GM / Rc^2

Substitute into that $g = GM/R^2$, eg $GM = gR^2$

$gR^2/ Rc^2 = gR/c^2$

Substitute into that 1/2 the centrifugal acceleration v^2/R for gravity

$v^2R/2Rc^2$

And you end up with the Lorentz transformation factor **$v^2/2c^2$**

A theoretical explanation for this observation that only half the centrifugal acceleration applies to the GPS clocks in orbit is as follows- .

Two competing thoughts for whether the centrifugal acceleration is an additional influence on the atomic half lives of the clocks.

1. NIL influence - The orbital motion is due to the gravitational force, therefore the centrifugal acceleration calculation is simply related to part of that gravitational accelerating influence and does not constitute any additional influence.
2. 100% influence - The orbital motion of the clocks atomic material is assured due to its contact with/containment within the satellites structure. Therefore this centrifugal acceleration is an additional influence being exerted on the atomic material at the same time as that material experiences the full back ground gravitational influence.

The observed result being half the centrifugal acceleration is the simple average of these two competing scenarios. If there is a random oscillation between the two scenarios across time then the average of the two is the actual outcome.

The centrifugal acceleration derivation is a better fit in the case of orbital motion scenarios, and those scenarios are the only confirmation we have for the Lorentz factor.

It provides us with a centre of orbit reference frame -Everything makes perfect intuitive sense. We know exactly what is relative to what, why and when.

The Hafele Keating [3] type experiments involve clocks starting by the UTC clock at the US Naval Office in Washington then flying them around the world in an eastward and/or westward direction and comparing the timing back to that UTC clock. The Lorentz transformation calculations fail if you take the speeds to be the clocks flying speeds relative to the stationary UTC master clock. The calculations only work if you set the centre of the earth as the reference frame and the UTC clock is also considered to be moving due to the earth's rotation. In other words the observed time distortions are not a function of the clocks speed relative to each other, they are a function of the relative centrifugal acceleration they experienced. These test results are in perfect harmony with the

centrifugal acceleration derivation of the $v^2/2c^2$ factor and in total conflict with the time dilation based derivation.

The Twin Paradox - Motivated by the need to defend time dilation this paradox is crowded out by the claim that the object that experiences the dilated time is
- The one that moved out of the "stationary" objects reference frame.
- But the time dilation is a function of velocity and not related to the acceleration even though that was required to move the object out of the stationary ones reference frame.
This wrestle with reference frames and a "well it just is" way to divorce an objects speed from its originating acceleration does not apply to the centrifugal acceleration derivation. Quite simply we have no reason to believe in or have to deal with time dilation, instead there is just an interaction between atomic half life and acceleration.

Special relativity time dilation crosses a red line that general relativity does not. The type of time is different.

As this papers centrifugal acceleration derivation of the Lorentz factor starts with the equivalent time dilation factor within general relativity, it could be argued that this derivation simply proves it applies to both orbital and linear motion. This paper asserts that is not the case.
General relativity deals with gravitational forces and is totally with in Newtonian reality of energy, forces and their influence on matter including atomic half life. It is simply describing the corruption a force has on something that could be used to calibrate and measure absolute time.
In contrast the time dilation derivation of the Lorentz factor tries to explain the constancy of the speed of light by claiming absolute or "Newtonian" time itself can alter.
To explain absolute or Newtonian time, think of the starting default as being absolutely nothing. The nothing default in turn must extend across an infinite volume of space and persist for an infinite duration of absolute time. Big bangs are facilitated by the fact there is so much space for such long durations of time. This absolute time is a none negotiable default that moves forward at the same rate for both the nothing default and anything that gets to exist within it. There are many ways to calibrate and measure it, but it is a forward progressing none negotiable dimension of reality.
By claiming time alters to force different time-distance-speed calculations return an upper limit of the speed of light, the time dilation derivation of the Lorentz factor crosses a red line. It is not dealing with distortions to a systems measurement of time or rate of activity, it is claiming absolute time itself is variable.
The centrifugal derivation of the Lorentz factor brings all the observational confirmations of its numerical accuracy back within the scope of Newtonian reality and relegates the absolute time dilation described by special relativity to being an unproven theoretical fix for the observed constancy of the speed of light.

THE SPECIAL RELATIVITY TIME DILATION THEORY WAS A FIX WE NO LONGER NEED

Time dilation originated from the need to reconcile the observed constancy of the speed of light.

A more likely alternative solution

We know light reconfigures its speed/wavelength energy mix as it transmits through different gas, liquid or solid mediums. If back ground EM radiation and/or gravitational waves provide light with the locality against which its speed/wavelength mix propagates then its known independence to the velocity of its emitting source and locally measured constancy is fully explained.
Any physical system capable of emitting or receiving light waves will exist and move within in a wider vicinity of back ground EM radiation or gravitational fields. The relative speed of the emitter and observer can therefore only be detected in a change to the frequency, in other words red shift.

Proposed significant evidence for the alternative to the time dilation fix -

Pulse number - first and last shown, minimal variance observed throughout.			1	2636
Recorded Time pulse launch to pulse reception [2]	**T**	**nsec**	2637147909	2636466623
Distance at launch = Pulse emitter to reflector [2]	**DL**	**km**	395298.7883	395196.6513
Distance at reception = pulse receiver to reflector [2]	**DR**	**km**	395298.2404	395196.1313
Average Speed for the total round trip	**Va = (DL+DR)/T**	**m/s**	299792448.5	299792447.9
Difference between measured average and c in a vacuum	**Loss = Va - c**	**m/s**	-9.47	-10.10
Speed of projector and receiver due to earth's rotation (reduces as angular velocity changes with earth's rotation/time)	**Vo = (DL-DR)/T**	**m/s**	207.78	197.24

Figure 1. Speed/distance computations applied to a batch [2] of recoded time and distances to some NASA Lunar Laser Ranging tests, where by laser pulses were bounced off a reflector left on the moon by Apollo 15. The recorded times are of tests provided by the International Laser Ranging Service [7] and the corresponding independently calculated distances are from the Jet Propulsion Laboratory NAIF/SPICE model [8].

In the reference frame of the laser transmitter/receiver on earth and the reflector on the moon the average light speed observed was simply c, the speed of light. There is a minor difference which can be attributed to part of the journey going through earth's atmosphere rather than the vacuum of space.
The pulses would have first propagated to a speed/wavelength mix with speed c for the atmosphere and relative to that atmosphere. However it must have reconfigured to c for a vacuum and relative to the earth moon reference frame after exiting earth's atmosphere. The additional 200m/s of relative speed due to earth's rotation did not apply to the outbound trip beyond earth's atmosphere. The question is what did the pulses propagate onto in the vacuum of space between the earth and the moon, that 200m/s of extra velocity at point of emission was somehow zeroed off? In this scenario the prime suspect has to be the back ground EM radiation from the sun that the pulses are traversing but gravitational waves are another possibility.
This average speed of c for the round trip also means that on the return journey the pulses impacted with earths atmosphere at a relative speed of c + 200m/s before reconfiguring to a speed/wavelength mix relative to the atmosphere. There is no need to claim time is adjustable, or that light always travels a speed of c relative to the observer. We just need to establish the preferred hierarchy of back ground mediums that light chooses to propagate its speed/wavelength mix relative to.

NEW ISSUES THAT ARISE TO BE INVESTIGATED AND MODELLED

1 Accelerations directional influence on half life behaviour

The Hafele Keating plus later experiments show that the acceleration/deceleration of the plane take off and landings did not noticeably influence the atomic clock activity. However, if deceleration is simply additional acceleration but in a different direction, then the total acceleration of the take offs and landings was very significant. In Hafele Keating the total takeoffs plus landings acceleration was of the order of 6500m/s which was 130%(west flight) and 155%(east flight) of the

total gravitational acceleration difference that had altered the clocks timing due to the flights altitude.

A possible solution is that the takeoff and landing accelerations were at a tangent to the influencing gravitation and centrifugal acceleration and therefore could not exert any influence. If influence is direction dependent, earth's gravity is by far the most dominant influence and probably therefore dictated the direction of influence throughout these tests. If so the atomic time dilations observed were in turn only due to differences in gravitational and centrifugal differences which were on the total gravity line of influence. All other off line accelerations did not have any influence. A possible confirmation of this line of influence explanation can be found by looking at the changes to the exchange rate between acceleration and atomic time dilation at different altitudes. At higher altitudes you get much more time dilation for your acceleration input. Trying to make intuitive sense of this mathematical outcome does support the line of influence theory.

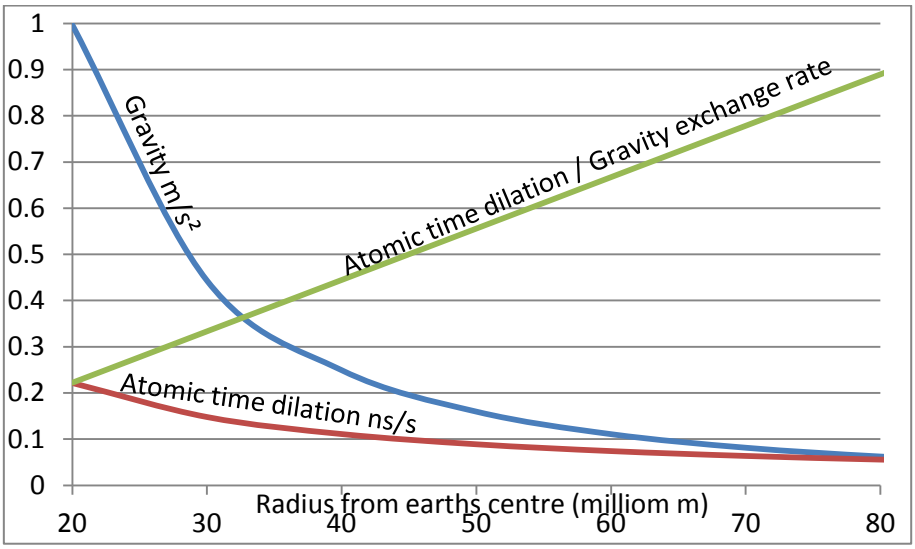


Figure 2. Gravity and general relativity's atomic time dilation compared to the radius distance from earths centre

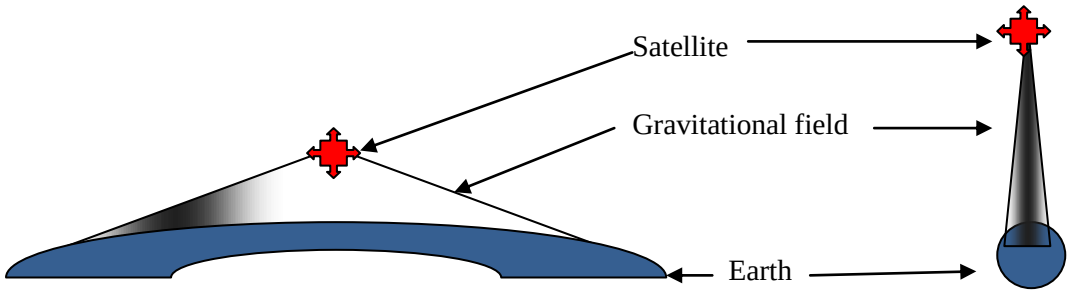


Figure 3. Suggested intuitive understanding for why the atomic time dilation / gravity exchange rate increases with altitude is as follows.

Figure 3 shows that the gravitational force acting in the direction of the centre of the earth is the net resultant vector of a spread of gravitational influences due to matter attracting to matter and the large diameter of the earth relative to a satellite. In a low orbit the spread of gravitational influences is a relatively flat vector triangle. Although the gravitational forces from the base of the triangle all contribute to the total resultant central vector gravitational force, they do not contribute to the atomic time dilation because they are not sufficiently aligned with the satellite vs centre of earth line of influence. As the altitude of the orbit increases, although the gravitational force diminishes an increasing proportion of it falls along the line of atomic time dilation influence.

For the following analysis of the atomic time dilation vs centrifugal acceleration exchange rate, the parameters have been restricted such that the gravitational force is greater than or equal to the centrifugal acceleration to be compatible with GPS and Hafele Keating type known results.

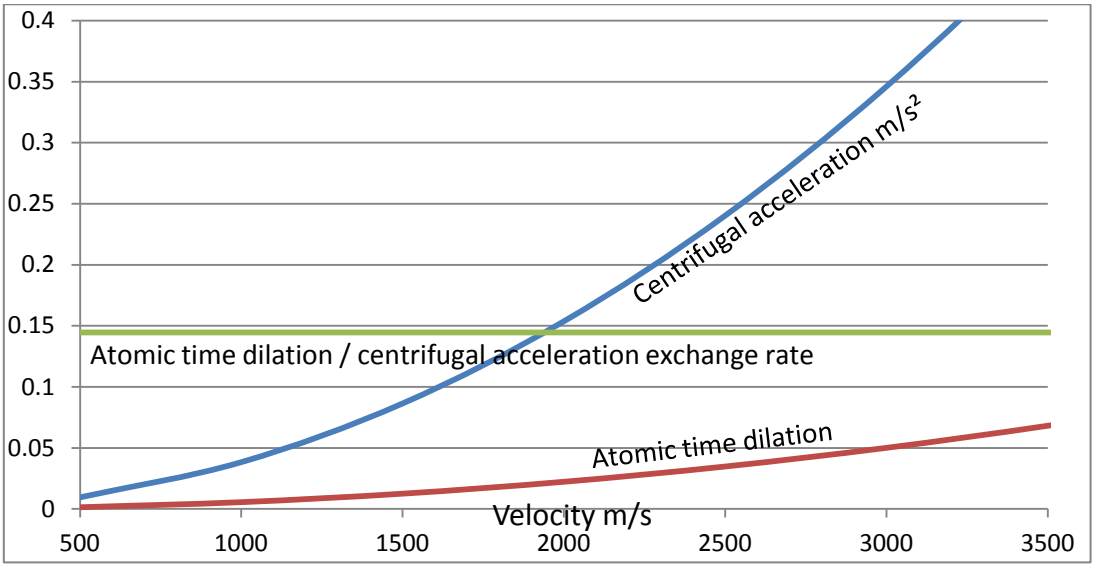


Figure 4. Centrifugal acceleration and atomic time dilation compared to velocity when the orbit radius is fixed at 26,000km

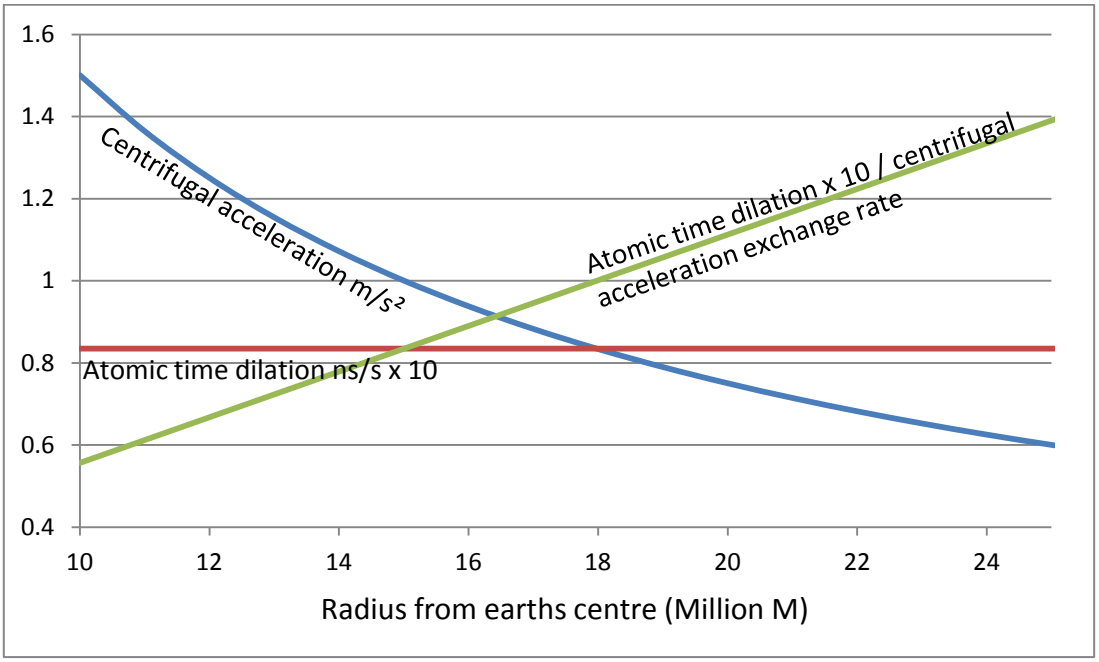


Figure 5. Comparison of centrifugal acceleration and atomic time dilation to radius of the orbit above earth. Velocity fixed to GPS system speed 3874 m/s

When considering figure 5 it is important to remember the Hafele Keating type experiments only work if you set the reference frame to be the centre of the earth. This is all about relative centrifugal acceleration and not relative speed. This graph does not save SR's conventional interpretation. The improved exchange rate offsetting the reduction in centrifugal acceleration to deliver a constant time dilation value is the mathematical quirk of the radius cancelling out to leave a Lorentz transformation factor that leaves no trace of the fact the v^2 actually refers to that from the centrifugal acceleration formula.

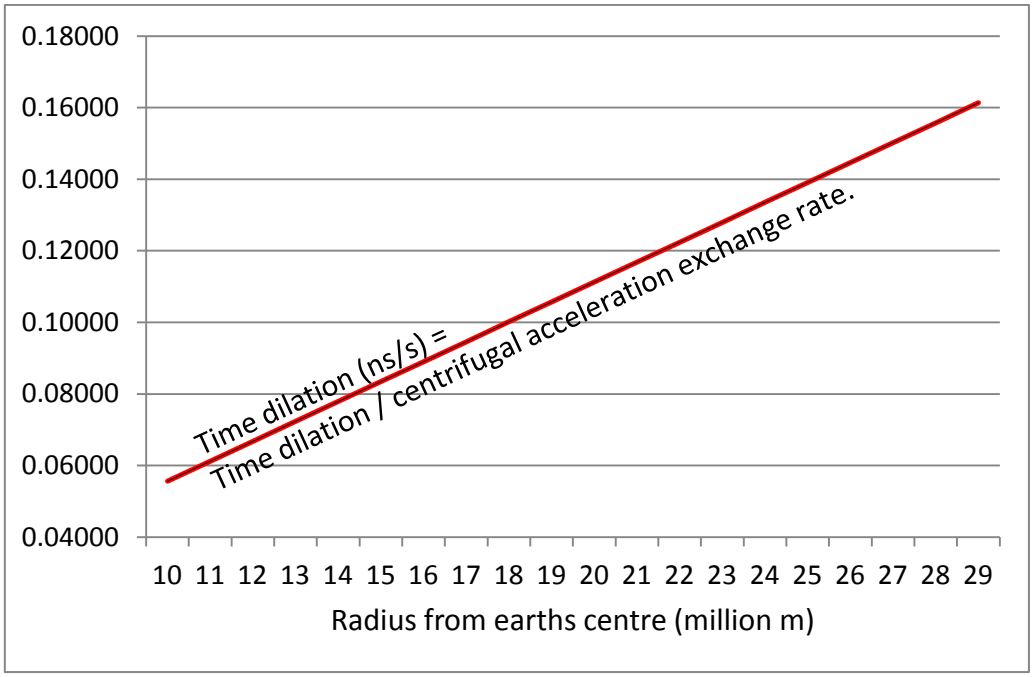


Figure 6. A plot of time dilation against different radiuses of orbit fixing the centrifugal acceleration at **1m/s²** by altering the velocity for the different radiuses

Figures 5 and 6 show that the exchange rate of time dilation for centrifugal acceleration increases as the radius of the orbit increases. However this is not simply a case of diminishing returns in the form of the higher the acceleration the lower the time dilation return. Figure 4 clearly shows that for a fixed radius and variable speed / centrifugal acceleration the time dilatation vs centrifugal acceleration exchange rate is constant. The direction of influence theory could reconcile this. In the case of the lower orbits the rate at which the direction of the centrifugal force has to change is higher than for higher altitude orbits. The rate of change of centrifugal direction could translate into an efficiency rate where, like with gravity, as the altitude increases a higher percentage of the acceleration gets to act along the line of influence.

2. Modelling straight line acceleration influences.

The observational data dealt with by this paper gives us formula that model the interactions of gravitation and centrifugal acceleration on half life activity where gravity is more than or equal to the centrifugal acceleration. No suggestion is offered by this paper for the obscure scenario of centrifugal acceleration being greater than gravitational acceleration.

However for straight line acceleration a speculative prediction based on the conclusions of this paper is as follows-

- Only half the centrifugal acceleration applies to GPS observations etc due to an overlap with the back ground gravitational acceleration influences.

-Therefore if linear acceleration was the only influencing acceleration, 100% of it applies making the atomic time dilation factor simply A/c^2 where A is the acceleration rate in m/s^2.

-For the linear acceleration to be the influencing directional acceleration it simply has to be the highest acceleration acting on the object.

-If there is a back ground gravitational force also acting on the object in the line of influence, eg a rocket vertically launching, then A would be the addition of motional acceleration and gravity adjusted for the line of influence losses.

3 Half life behaviour after the period of acceleration

The various tests demonstrate that gravitational or accelerating influences on atomic half lives is not compounding. It must be concluded then that the

atomic half life after a period of acceleration goes into a wind down process. In other words it does not instantly revert back to a level had it not experienced the acceleration influence, but it does not maintain that level either. The apparent correlation between muon half lives and velocity is therefore an observation of this wind down period, the actual source of the half life extension being the greater level of acceleration experienced.

4. To what extent does back ground EM radiation and or gravity influence EM waves.

The hierarchy of mediums from gas to liquid to solid and the extent of their influence on light transmitting through them is know. The same needs to be established for the possible mediums that occupy the vacuum of space.

As the back ground EM radiation from the sun is by far the dominant factor compared to gravitational fields, intuition tells us that it would have been the EM radiation that provided the vicinity reference frame against which the NASA lunar laser pulses propagated their speed wavelength mix relative to rather than gravity, but is it?

As the Lunar laser tests did not detect any evidence of drift that may be expected given that the earth and moon are orbiting around the sun at a speed of 30km/s, it suggests the influence of either gravity or back ground EM radiation was limited to influencing the speed/wavelength mix in the line of travel but did not corrupt that line of travel. That in turn is consistent with it being well observed that photons do not interact with each other, incidents where they do is an exceptional high energy contrived event. For example EM wave interference is competing photons delivering opposing signals, it is not photons actually interacting with each other. The general theme of quantum mechanics is one of electromagnetic fields interacting rather than particle interaction. Unfortunately if we reconfigured the time distance speed calculations to all be relative to the sun, the earth and moons motion of 30km/s relative to the sun alters the distance out Vs the distance back, but that does not change the total distance. So although this test is strong evidence that light will propagate its speed relative to background radiation or gravity it does not reveal the extent of influence, the line of travel could also have been altered making the reference frame as being relative to the sun rather than just the earth to moon.

CONCLUSION

The Lorentz transformation is a valid measure of the alteration to half life activity by centrifugal acceleration and a centrifugal acceleration based derivation of that formula is identified. The traditional time dilation based derivation of the formula is therefore a coincidental hoax and its apparent success at measuring atomic half life activity changes does not constitute proof special relativity's absolute time dilation.

We no longer need absolute time dilation to explain the observed constancy of the speed of light. Far more likely explanations firmly grounded within Newtonian reality are available to us and should be investigated.

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