

## General Relativity Light Speed Limit to Escape Velocity

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Relativistic light speed limits are accepted as one of the defining aspects of our reality. While exceptions have been both conceived and reasoned from observations of non-experimentally controlled data, they have never been demonstrated. The principal General Relativistic equation is shown to establish the same principal that the maximum velocity of a matter object is light speed[ $c$ ]. Partly because of the Boson slowdown Relativistic distortions impose, it is reasoned to set a  $c$  maximum escape velocity. Additionally, equations are reasoned using data that would be produced if observations were from Perspective of the distorted object. The logic overcomes the fundamental imaginary values contradiction inherent in the primary GENERAL RELATIVISTIC time distortion equation. The equations have been confirmed to 2000 decimal places.

After its introduction in “On the Electrodynamics of Moving Bodies” and fuller recognition by the Science Community, the theory of Special Relativity has always been accepted as establishing a speed limit for light in our Universe. That limit has characterizations that are inherent to the theory – a vessel that exceeds a velocity of  $|c/(2.5)|$  m/s would be perceived by observers inside it to be moving faster than the speed of light. Then, a parallel of what was established in the SPECIAL Relativistic Perspective pages can be reasoned. For the Relativistic equation illustrations that follow, all theoretical values are presumed to be exact to 100 decimal places. This presumption is not a declaration, only a valid theoretical assignment. Light speed  $|c$  is presumed to be  $2.9979245800 \sim 00E+08$  m/s<sub>1</sub>

In General Relativity, the principal equation is

$$\text{Time}' = \text{Time}/(1-2GM/rc^2)^{.5}$$

Where |Time| is the amount of Real time passing for any event when when the point is under no distortion. |Time'| is the Real time that passes for the same event when the expression “GM/rc<sup>2</sup>” is greater than zero – there is distortion. |G| has its usual identity: Gravitational Constant. |M| is the mass of object being considered. |r| is the radius of that object

The first postulate of this theory: |GM/rc<sup>2</sup>| is an expression that does not have any instances |GM| that would be greater than |rc<sup>2</sup>|. By the formula above, that would be an imaginary (the square root of a negative number) environment. If we accept the Universe to have a mass, then there is no verifiable evidence of what an imaginary quantity represents. They are used in circuit design, astronomy and other applications – but they are a logic technique, not an observable phenomenon. Electrons do not have “negative” charges; they have charges opposite to proton charges. Assignment of a negative value was simply a historic occurrence of human bias, not a description of a physical aspect/event.

The time distortion equation shows the value of Real||undistorted time units occurring for any event: |Time|. The paper will presume the Time units to be seconds, but all scientifically valid Time units can be used. The dependent variable |Time'| is Real value for the same event when it is under distortion. If time is slowed for the reality where that event occurs a greater number of Real seconds would pass for the same event when under distortion [Time']].

Two alternate variables would be General Relativistic seconds. The number of seconds passing for an event when there is no distortion from the Perspective of the Distorted body: Time<sub>noGRPD</sub>. The dependent variable would be the number of seconds passing for the same event when there is General Relativistic distortion: Time<sub>GRPD</sub>

The Classic General Relativity time equation is entirely from the non-relativistic perspective. Under the current interpretations, observations made from the Perspective of a Relativistic object

would not demonstrate a slower pace of time directly. What the observation would be is that there are more Real time units – things happening faster outside the distorted space/time location that is occupied. The inverse equation, the equation using the Relativistic values: those perceived when under Relativistic distortion. Fewer relativistic time units will pass under distortion than each of the same when not under distortion.

The General Relativity equation from the Relativistic Perspective would be

$$\text{Time}_{\text{GRPD}} = \text{Time}_{\text{noGRPD}} * (1 - 2GM/rc^2)^{.5} \quad \text{Equation 1}$$

We will not use the |Real| label; what is relativistic is not determinable in a Universe ruled by Planck’s constants – and the simple distribution of objects. Estimations can be made of all of the factors in the above equation, but they are only estimations. We cannot know the exact value of the variables above because (or so it is currently believed) the time distortion cannot truly be perceived. The above variables seek to avoid the inevitable bias following a Real label by assigning values that presume perfection. It solely a theoretical presumption.

Since the Escape velocity is defined by  $|v_e = (2GM/r)^{.5}|$ , a valid expression for  $|1 - 2GM/rc^2|$  would be to more specifically define “2GM/r”. The variable name would be  $V_{\text{ESCnoGRPD}}$  for observed escape velocity from a General Relativistic perspective when the distortion factor is zero

$$V_{\text{ESCnoGRPD}} = (2GM/r)^{.5}$$

$$V_{\text{ESCnoGRPD}}^2 = (2GM/r)$$

So, the equation can then be re-written

$$\text{Time}_{\text{GRPD}} = \text{Time}_{\text{noGRPD}} * (1 - (2GM/r) * 1/c^2)^{.5}$$

$$\text{Time}_{\text{GRPD}} = \text{Time}_{\text{noGRPD}} * (1 - V_{\text{ESCnoGRPD}}^2 * 1/c^2)^{.5}$$

$$\text{Time}_{\text{GRPD}} = \text{Time}_{\text{noGRPD}} * (1 - V_{\text{ESCnoGRPD}}^2/c^2)^{.5} \quad \text{Equation 2}$$

The above gives a logical argument for there to never be an escape velocity greater than light speed. The logic is the reverse of the Special Relativity Equation. The non-Relativistic escape velocity would be whatever the escape velocity was calculated to be were there no distortion. The Relativistic escape velocity would be what it would be if the Relativistic shifts to the Gravitons were accounted for. In some ways, it would be the Real escape velocity.

We will formulate a new theorem using the above equation. Rather than conclude when objects reach Schwarzschild's Radius Limit<sup>1</sup> they become imaginary; Special Relativity logic would reason the escape velocity never exceeds light speed. The slowdown distortion of time in Special Relativity means a decrease of moving body's acceleration. Reactions would slow so the accelerative force of the propellant would decrease. That is one of the most fundamental declarations of Special Relativity. Denial of acceleration slowdown means you are denying Special Relativity principles. While the growing mass of the accelerant would increase its propulsive force, the increased mass of the body being propelled would exactly match it. As well velocity of all Bosons slows under Relativistic distortion.

General Relativistic distortion must do the same. Slowdown of time on a Gravitational body would mean the velocity of gravitational Bosons [Gravitons] would also slow. If the Gravitons did not slowdown, all of other Boson forces maintaining the structure of the Universe would be overpowered by the Gravitons. SO's would be forced into what they were first theorized to be SO's and collapse into a single non-radiating body.

There is also an argument against the notion that an extremely hot and dense singularity (hereafter, we will label the "Cosmic Egg" or CE) present at the beginning of the Universe could not be principally Energy/Bosons because all of them would be slowed down under Relativistic distortions. That would be with the possible exception of the Graviton - although it is limited like the others but not enough, which makes the escape velocity be greater than "c". General Relativity can be expressed in a way that shows that Relativistic forces must DIRECTLY affect gravitational forces in a way that limits the escape velocity to light speed. So either the

<sup>1</sup> Schwarzschild, K. (1916). "On the gravitational field of a mass point according to Einstein's theory" Meeting reports of the Royal Prussian Academy of Sciences

Gravitational Bosons do undergo a Relativistic slowdown and then reduces their force or the General Relativity theory is wrong. The latter is not a reasonable postulate.

There is another argument for the slowdown of Gravitons. On September 14, 2015 at 5:51 a.m. Eastern Daylight Time (9:51 UTC) by both of the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington, USA<sup>2</sup> it was confirmed that Gravitation did have a wave aspect to their transmission. That wave aspect means they would be subject to Relativistic slowdown. We already know that Special Relativity affects the velocity of gravitational Bosons. If it did not, the objects that we see receding at the edge of the Universe at Relativistic velocities would collapse on themselves. An un-slowng Graviton would develop greater and greater proportionate energy.

This author rejects that postulate. Consider Graviton slowdown as a result of General Relativistic effects. If the gravity/Graviton force did not slow down as well as the other Bosons, then the force of gravity itself would appear to increase. That would mean that objects affected by the relativistic gravitational force would increase their velocity and accelerate at a greater rate than predicted by current theory – and there would be no “halt” at the SR border; there would instead be an acceleration. As an aside, while some promote the kinetic halt, it is a completely unreasonable idea: by that presumption, no SO would ever grow. However, what effect an endlessly thickening cloak of matter/energy would bring is difficult to postulate.

So fewer GRPD time units will pass for any given number of non-GRPD time units. The particulate aspects of the Graviton can be under debate, but that it moves at a relativistic speed is not - it is a Boson. That is fundamental to General Relativity. Then, other equations can be deduced using the time distortion effect.

Set the variable Time<sub>noGRPD</sub> as follows:

<sup>2</sup> LIGO: GRAVITATIONAL WAVES DETECTED 100 YEARS AFTER EINSTEIN'S PREDICTION | [https://www.ligo.caltech.edu/system/media\\_files/binaries/310/original/LHO-NewsRelease-11Feb16-Final.pdf?1455201669](https://www.ligo.caltech.edu/system/media_files/binaries/310/original/LHO-NewsRelease-11Feb16-Final.pdf?1455201669)

$$\text{Time}_{\text{noGRPD}} = 1\text{m} / V_{\text{ESCnoGRPD}}$$

$$V_{\text{ESCnoGRPD}} = 1\text{m} / \text{Time}_{\text{noGRPD}}$$

Because the time was slowed, it would appear that the escape velocity was increased by the distortion, by exactly the margin of that time distortion.

$$V_{\text{ESCGRPD}} = 1\text{m} / \text{Time}_{\text{GRPD}}$$

In a Relativistic Perspective version of the equation, we divide both sides with 1 Real (undistorted/non-Relativistic) metre:

$$\text{Time}_{\text{GRPD}} / 1\text{m}_{\text{noGRPD}} = (\text{Time}_{\text{noGRPD}} / 1\text{m}_{\text{noGRPD}}) * (1 - V_{\text{ESCnoGRPD}}^2 / c^2)^{.5}$$

Invert the expression

$$1\text{m}_{\text{noGRPD}} / \text{Time}_{\text{GRPD}} = (1\text{m}_{\text{noGRPD}} / \text{Time}_{\text{noGRPD}}) / (1 - V_{\text{ESCnoGRPD}}^2 / c^2)^{.5}$$

Dividing both sides by one metre would not change the distortion. But it would allow the distortion to be expressed in Velocity, not Time. General Relativistic time distortion would then make the escape velocity appear to be greater than it was, as follows:

$$V_{\text{ESCGRPD}} = V_{\text{ESCnoGRPD}} / (1 - V_{\text{ESCnoGRPD}}^2 / c^2)^{.5} \quad \text{Equation 3}$$

Let us then suppose (as we do in Special Relativity) that the “1-” format of the relativistic equation means that  $|V_{\text{ESCnoGRPD}}|$  has an absolute limit of light speed – from a viewpoint from outside the area of distortion. In the area of distortion, the escape velocity would appear greater than light speed, but only because of the time distortion. Special Relativistic distortion effects would make a sub-light velocity appear to be greater than light from a viewpoint within the distorted area. GENERAL RELATIVISTIC distortion would be different from that in Special Relativity: the mass of the “matter” in a body is increased by the matching decrease in the speed of light that would have to take place if there were a time as well as a gravity distortion. The

mass of all zero-rest-mass particles/Bosons [Photons||Gluons||w/x/y/z mesons] and their energy would decrease as the time distortion reduced their speed. The time distortion MUST reduce the value of the Gravitational Constant. It is unreasonable that the gravitational Time distortion would alter the other three forces and not Gravity. Deducing the inverse relationship of  $V_{ESCnoGRPD}||V_{ESCGRPD}$  would start with squaring both sides:

$$V_{ESCGRPD}^2 = V_{ESCnoGRPD}^2 / (1 - V_{ESCnoGRPD}^2 / c^2)$$

Move the  $(1 - V_{ESCnoGRPD}^2 / c^2)$  expression to the left side

$$V_{ESCGRPD}^2 * (1 - V_{ESCnoGRPD}^2 / c^2) = (1 - V_{ESCnoGRPD}^2 / c^2) * (V_{ESCnoGRPD}^2 / (1 - V_{ESCnoGRPD}^2 / c^2))$$

$$V_{ESCGRPD}^2 * (1 - V_{ESCnoGRPD}^2 / c^2) = V_{ESCnoGRPD}^2$$

Expand  $||V_{ESCGRPD}^2 * (1 - V_{ESCnoGRPD}^2 / c^2)||$

$$V_{ESCGRPD}^2 - V_{ESCGRPD}^2 * V_{ESCnoGRPD}^2 / c^2 = V_{ESCnoGRPD}^2 / c^2$$

Add  $||V_{ESCGRPD}^2 * V_{ESCnoGRPD}^2 / c^2||$  to both sides

$$(V_{ESCGRPD}^2 - V_{ESCGRPD}^2 * V_{ESCnoGRPD}^2 / c^2) + (V_{ESCGRPD}^2 * V_{ESCnoGRPD}^2 / c^2) = \sim V_{ESCnoGRPD}^2 + (V_{ESCGRPD}^2 * V_{ESCnoGRPD}^2 / c^2)$$

Simplify  $||V_{ESCnoGRPD}^2 + (V_{ESCGRPD}^2 * V_{ESCnoGRPD}^2 / c^2)||$

$$V_{ESCGRPD}^2 = V_{ESCnoGRPD}^2 * (1 + V_{ESCGRPD}^2 / c^2)$$

Divide both sides with  $||1 + V_{ESCGRPD}^2 / c^2||$

$$V_{ESCGRPD}^2 / (1 + V_{ESCGRPD}^2 / c^2) = V_{ESCnoGRPD}^2 * (1 + V_{ESCGRPD}^2 / c^2) / (1 + V_{ESCGRPD}^2 / c^2)$$

So

$$V_{eSCGRPD2} / (1 + V_{eSCGRPD2}/c2) = V_{eSCnoGRPD2}$$

$$V_{eSCnoGRPD2} = V_{eSCGRPD2} / (1 + V_{eSCGRPD2}/c2)$$

Take the square root of the expression

$$(V_{eSCnoGRPD2})^{.5} = (V_{eSCGRPD2})^{.5} / (1 + V_{eSCGRPD2}/c2)^{.5}$$

So

$$V_{eSCnoGRPD2} = V_{eSCGRPD2} / (1 + V_{eSCGRPD2}/c2)^{.5} \quad \text{Equation 4}$$

An absolutely critical piece of logic must be used in evaluating this above. Not all observation items can be taken as absolutely valid. The change in the state of the observing object will not mean that reality has changed. The escape velocity will appear to be greater than the speed of light for any observer either on the Relativistic scale body or on the escaping body. From the Perspective of observation point not distorted, the body will escape without ever moving faster than the speed of light. All mathematical reasoning for Physics hypotheses presumes ideals. There is nowhere in our observed reality where there are no more than 2 objects exerting an above-Planck-level gravitational force. That does not invalidate Sir Newton's equations.

Equation 3 and 4 do mean that there can be two more equations added to Einstein's collection.

Equation can also be written:

$$(1 - V_{eSCnoGRPD2}/c2)^{.5} = V_{eSCnoGRPD2} / V_{eSCGRPD2} \quad \text{Equation 5}$$

Equation 4 can be rephrased

$$(1 + V_{eSCGRPD2}/c2)^{.5} = V_{eSCGRPD2} / V_{eSCnoGRPD2} \quad \text{Equation 6}$$

The above ratios would mean that the Classic Time equation

$$\text{Time}' = \text{Time}/(1-2GM/rc^2)^{.5}$$

Could also be phrased

$$\begin{aligned} \text{Time}' &= \text{Time} / (V_{eSCnoGRPD} / V_{eSCGRPD}) \\ \text{Time} &= \text{Time}' / (V_{eSCGRPD} / V_{eSCnoGRPD}) \\ \text{Time} &= \text{Time}' / (1 + V_{eSCGRPD}^2 / c^2)^{.5} \end{aligned} \quad \text{Equation 7}$$

It would be appropriate to use the above where the Real  $V_{eSCnoGRPD}$  escape velocity exceeded light speed. By the above logic the Cosmic Egg that is so fundamental a part of current Cosmological theory would never be imaginary. It would resolve a very unreasonable declaration made by the current interpretation of the General Relativity Time distortion equation.

An illustration will add argument to the postulate. By the current interpretation of Einstein's equations, the SR of a 1.1000~00053kg (presuming a theoretical ideal of 100 decimal places in the scientific notation expression, all but the first digit being zero ('0')) CE would be:

$$1.650539296012660670517650085381057449377755628847194946626603912380085051~4436078713707752959740519920E26m$$

Or

$$1.744621412475783993438193522867086250472388744973178439279568674543176123~1831234882433711126834403678E10ly$$

By the classic Newtonian equations, the gravity at the SR of such a Body would be

$$2.722610667034744820396468508584261911681835580675643811992193177822376796~6410079920549576854528442629E-10m/s^2$$

The distortion at the SR of the CE would be infinite. One Planck Length from the SR, the distortion would be

3.195641066345552844769422013031338701969872315504978997824025723908390152~  
1065432865331865487592915188E30

One full metre from the SR the distortion would be

1.2847331614046010412562037436174861705623286428808608110491037870419065009~  
118285286762851038700929290E13

The gravity at that point would be

2.722610667034744820396468475593703327442461121395225511735504409090651030~  
0035615234144445156150801773E-10m/s<sup>2</sup>

The difference between those two Newtonian gravities would be

3.299055858423937445928041830025668876873172576663744646864051316983776408~  
5602192317828786164131716685E-36

So, a proportional infinite difference in distortion between those two points is accompanied by an arithmetic gravity difference of  $3.99 \sim 685E-36$ . Surely that indicates incompleteness in current theory. Using Relativistic Perspective equations, from the Real||non-Relativistic perspective the distortion at the SO border would be

1.213559752433835755243683217585571228160347979488682079792611079619899484~  
7059027669959469621593168089E0

The distortion 1 metre out would be

1.213559752433835755243683216405539649229956281002178787840134903881468599~  
7174840268876886797873194978E0

Again, the difference between those two points would be

1.180031578930391698486503291952476175738430884988418740108258282371997311~  
1092980189806812298981505446E-27

The above has also been examined in much greater detail in the (currently) incomplete paper **The General Relativistic Perspective**. Although this researcher does have a number of other (published and unpublished) papers there is no request made to read any of them. Not before accepting the simple principle of Relativistic Perspective and that there is a light speed limit to escape velocity.