The Non-local Perspective in General Relativity

Rayd Majeed Al-Shammari

The University of Jordan. Amman
Email: raydmajeed40b@gmail.com

Abstract

In special relativity speed of light is constant for all observers at any frame of reference but as Einstein proved later in some of his papers. This is not the same case in general relativity, when you have an accelerated frame of reference i.e. a deference in space-time curvature then the speed of light will be constant only for local observers and different for a non-local observers. For example, a distant galaxy away from us by billions of light-years due to the expansion of the universe moving at a velocity higher than the speed of light in relative to us, then if we try to measure the speed of light in that galaxy we should find it higher than the speed of light on our local perspective but it will be equal to the ordinary speed of light if it measured from a local observer in that distance galaxy. For another example a spacecraft using the hypothetical warped space-time drive, then the speed of light inside this spacecraft for the persons inside (i.e. local observers) will be unaffected, but for an outside observer in flat space-time (i.e. nonlocal observer) then the speed of light inside this spacecraft will be unobservable but it's higher than the local speed of light. So by following this line of work I manage to confirm and develop Einstein's work.

Keywords: Dark energy; dark matter; Black hole thermodynamics; singularities

I found that the minimum mass to affect space-time is half Planck mass then I use it to solve some important problems in general relativity such as

- Calculating the cosmological constant using the quantum field fluctuations with an accuracy of (93.5%) of the average accepted experimental results i.e. theoretical calculations($\Lambda \cong -1.4028 \times 10^{-9}$ $(J. m^{-3})$.
- A proper solution to the vacuum catastrophe.
- Calculating the dark matter density using third order quantum field fluctuations (in five dimensions) within high accuracy from the average accepted experimental results i.e. theoretical calculations.

  ; Dark matter density $= 5.3964586 \times 10^{-27}$; $\left(kg. m^{-1}. (s. c)^{-(4)} \right) \equiv (kg. m^{-3})$

Experimentally the dark matter density in the universe is around $(5.423 \times 10^{-27}$; $(kg. m^{-3})$)in the assumption of a flat universe then this will put our results to be within an accuracy of [96%] from the average current experimental values.

- Proving the effect of the gravitational blue shift of a gravity well, on the electric permittivity of free space $(\varepsilon_\circ)$ through both mathematical derivation and experimental evidence using a vertical variation of the Michelson-Morley experiment (by using both vertically fixed and vertically moving setup).
- Finding a definite mathematical solution for the black hole singularity.
- Finding a definite mathematical solution for the big bang singularity at $(t \leq 0)$ in cosmological constant form and driving the gravitational constant from it.
- Constructing new black hole thermodynamics and finding the entropy of the vacuum.
- Finding acceleration due to gravity from Schwarzschild metric solution
- A way for altering and manipulating space-time through cooperation between the relativistic mass and Schwarzschild metric to increase its curvature through what I like to name "the hoofing effect".

2. Introduction:

Special relativity deals with flat space-time i.e. constant velocities so it cannot describe acceleration and in particular the acceleration of frame of references since gravity is equvilant to the acceleration of frame of references (i.e. the equivalence principle),

So Einstein upgrade his theory of special relativity to contain the acceleration of frame of references, Einstein name it general relativity since it's a generalization for the special relativity.

In special relativity the speed of lght is allways the same for all observer but in general relativity then we have a difrent situation according to Einstein, in his scientific research paper entitled 'On the influence of gravity on the propagation of light' published in Annalen of Physiks (Volume 35) in June 1911, for a photon traveling from the surface of a gravitational force like the Sun to some point (O) in distance space then it has to overcome a gravitational potential to reach over there,

Then the total energy for this photon is the summation of its kinetic energy and its gravitational potential energy

$$E_T = E_k + E_P = hv - G\frac{mM}{r} = hv - \frac{hv}{c^2}\frac{GM}{r} = hv\left(1 - \frac{GM}{rc^2}\right)$$

$$\text{for a photon } E_T = hv \therefore\Rightarrow hv_g = hv_{bo}\left(1 - \frac{GM}{rc^2}\right)$$

$$\therefore\Rightarrow v_g = v_{ob}\left(1 - \frac{GM}{rc^2}\right) \therefore\Rightarrow t_g = t_{ob}\left(1 - \frac{GM}{rc^2}\right)$$

$; v_g$ & t_g *are the proper time and frequency at the surface of the gravity source*

$; v_{ob}$ & t_{ob} *are the proper time and frequency at the observer point*

$$\therefore\Rightarrow c' = c\left(1 - \frac{MG}{r\,c^2}\right); c_o \text{ is the speed of light in that distance point (O)}$$

The obve equation is equation number ③ in that research and it was in the next form

$$c' = c\left(1 - \frac{MG}{r\,c^2}\right)$$

Einstein suggested that the speed of light is faster in curved space-time if measured by an observer at infinity "i.e. observer in a flat space-time observing an event in a curve space time or an observer in a relatively flat space-time", in simple words the speed of light in a vacuum is influenced by difference due to gravity between flat space-time and curved space-time or any difference in space-time curvature such that this difference will increase with a deeper curve in compear to more flat curve if measured between these two regions and this phenomenon is the acceleration of the frame of references or perspective from a non-local observer.

Einstein consider it as a matter of directions and not a matter of distances since that the speed of light is a scalar quantity and not a vector quantity so his work was a very good estimation and not exact while Schwarzschild treated it as a pure scaler quantity

Where Schwarzschild came to the conclusion for time dilation to be

$$t_g = t_{ob}\sqrt{1 - 2\frac{GM}{rc^2}}$$

$; t_g$ *is the proper time at the surface of the gravity source*

$; t_{ob}$ *is the proper time at the observer point*

And for gravitional red shift as

$$\lambda_{ob} = \lambda_g\sqrt{1 - 2\frac{GM}{rc^2}}$$

$; \lambda_g$ & λ_{ob} *are respectivle wave length at emeter and observer perspective*

While Einstein came to the following conclusions for gravitional time dilation and the gravitional red shift to be as

$$\therefore \Rightarrow t_g = t_{ob}\left(1 - \frac{MG}{r\,c^2}\right) \ \& \ \lambda_{ob} = \frac{\lambda_g}{\left(1 - \frac{MG}{r\,c^2}\right)}$$

As I will show in this paper both mathematically and experimentally that Einstein approach is almost true but it needs some factor correction to be quite true, actually the speed of light for a local observer nearby gravity well is always constant but only for local observer and it will be diffrent for a non-local observer i.e. the speed of light at that gravity source should be differs by a factor of $\left[\left(1 - \frac{r_s}{r}\right)^{-1/2}\right]$ as long as the measuring is for photon approaching the gravity well but it will differs by a factor of $\left[\left(1 - \frac{r_s}{r}\right)\right]$ as long as the measuring is for aphoton distancing away from the gravity well as long as both measurements are taken by an observer at infinity

In short words speed of light is not constant between two regions of space as long as these regions have a difference in space-time curvature actually its gravitational blue shift and gravitational red shift phenomenon but since the time for the photon is zero then the gravitational time dilation will not compensate to keep the speed of light constant as for other mass particles and I will prove this mathematically also.

Since the original Michelson-Morley experiment does not change the distance between the interferometer and the nearby gravity well (i.e. The Earth) then there is no change in the space-time curvature so nothing will happen until we conduct a vertical variation of the Michelson-Morley experiment then we will get different results as I did get in the experimental part.
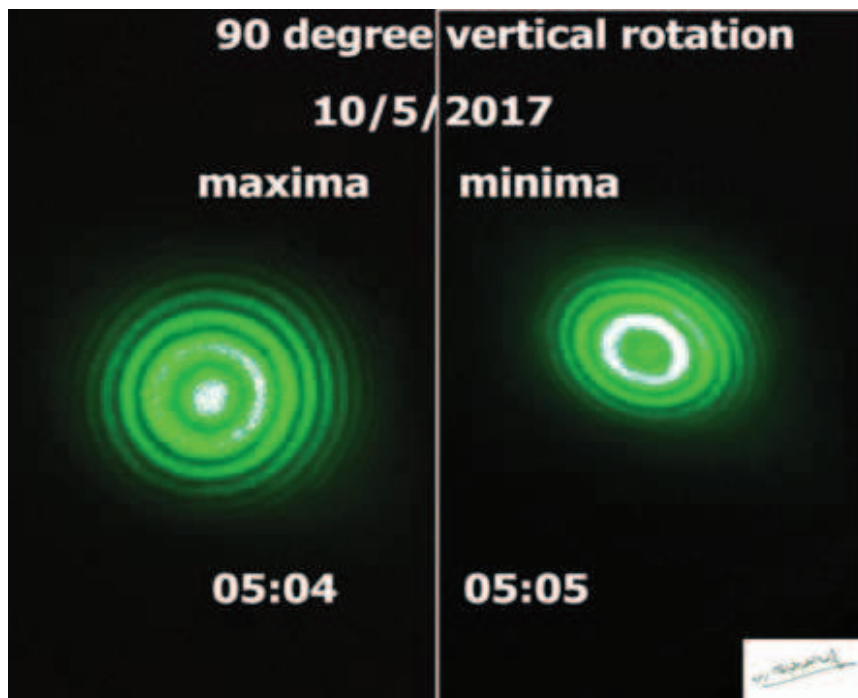
This is not a new thing it has ben observed expermentaly in 1953 by Pound and Rebka experiment on gravitational red-shift in nuclear resonance

This is has nothing to do with the special relativity and does not violet it since special relativity does not deal with an accelerated reference frame it only deals with a non-accelerated frame of references this is about general relativity phenomena and not special relativity

Then as we will see these results are the most usefull to calculate the cosmological constant using the quantum field fluctuations within an accuracy of [93.5%] from the average current experimental results i.e.($\Lambda \cong -1.4028 \times 10^{-9}$ (J. m^{-3}) and to solve so many other problems in general relativity.

3. Gravitational blueshift and the electric permittivity of the free-space $(\varepsilon_\circ)$

If we have a non-moving gravity well with a radiuse (R) and a photon with a wavelength equal to $(\lambda_\circ)$; $(\lambda_\circ = R_\circ)$ falling in this gravity well from a fixed point in space with a distnce of (R$_\circ$) from the surface of the same gravity well, then for an observer at infinity, the photon should have a gravitational blueshift as follow.

$$\therefore \lambda_{\text{blueshift}} = \lambda_\circ \left(1 - \frac{r_s}{r}\right)^{\frac{1}{2}}$$

$\because$ R, R$_\circ$ are real points in space separated by real distances and there is norelative movement between the source and the gravity well here but despite of this we have a gravitational blue shift

$\therefore \Rightarrow$ space itself gets shortened due to gravity by a factor of $\left(1 - \frac{r_s}{R}\right)^{\frac{1}{2}}$

$$\therefore \Rightarrow \left(r = r_\circ \left(1 - \frac{r_s}{R}\right)^{\frac{1}{2}}\right)$$
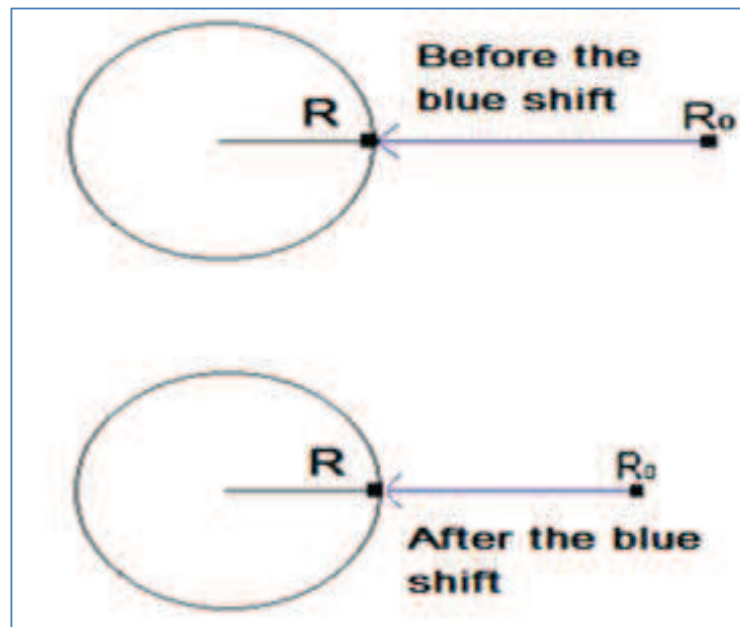
; $r_\circ \& r$ are respectively the radius of imaginary sphere in space as measured by a local observer and the radius of same imaginary sphere in space as measured by a non-local observer i.e. observer at infinity i.e. observer in a flat space-time i.e. observer in a relatively flat space-time i.e. are all the same thing

Then, if we have an electric charge in the center of this imaginary sphere in an empty space under the gravity influence and since the imaginary photon of electric field of this electric charge is affected by gravity as we know from general relativity then the electric field will occupy a smaller space due to a shortening in its radius only in respect to non-local observer such that it will change the electric flux only in respect to a non-local observer as follows

$$\because (\Phi_E) = E4\pi r^2 \therefore \Rightarrow \Phi_E' = \frac{E4\pi r_o^2}{\left(1 - \frac{r_s}{R}\right)}$$

Since the electric charge is allways conserved, then for a non-local observer this will affect the electric permittivity of the free space (ε_o) as follows:

$$\because \varepsilon_o = \frac{q}{\Phi_E} = \frac{q}{E4\pi r^2} \therefore \text{ under gravity} \Rightarrow \varepsilon_o' = \frac{q}{\frac{E4\pi r_o^2}{\left(1 - \frac{r_s}{R}\right)}} \Rightarrow \varepsilon_o' = \varepsilon_o \left(1 - \frac{r_s}{R}\right) \because r_s < R \therefore \Rightarrow \varepsilon_o' < \varepsilon_o$$

$$; (\varepsilon_o') \equiv Vacuum\ permittivity\ under\ gravity\ as\ only\ observed\ from\ infinty$$

This does not apply to the magnetic permeability of the free space since it is a fully geometrically characterized entity as follows.

$$\because \mu_o = \frac{B}{H} \therefore H = \frac{B}{\mu_o} \therefore \Rightarrow H = \frac{\left(\frac{B}{\left(1 - \frac{r_s}{R}\right)}\right)}{\mu_o}$$

$$\therefore \Rightarrow \mu_o' = \frac{\left(\frac{B}{\left(1 - \frac{r_s}{R}\right)}\right)}{\frac{\left(\frac{B}{\left(1 - \frac{r_s}{R}\right)}\right)}{\mu_o}} \therefore \Rightarrow \mu_o' = \mu_o \frac{\left(\frac{B}{\left(1 - \frac{r_s}{R}\right)}\right)}{\left(\frac{B}{\left(1 - \frac{r_s}{R}\right)}\right)} \therefore \Rightarrow \mu_o' = \mu_o$$

Since the speed of light is not a vector quantity and it is a scalar quantity that is independent on the direction of the moving source nor the observer and it is only dependent on the nature of the empty space itself:

$$\because c = \frac{1}{\sqrt{\varepsilon_o \mu_o}}$$

$$\therefore \Rightarrow c' = \frac{1}{\sqrt{\varepsilon_o \mu_o \left(1 - \frac{r_s}{R}\right)}}$$

$$\therefore \Rightarrow c' = c \left(1 - \frac{r_s}{R}\right)^{-1/2} \quad \dots \boxed{1.3}$$

for continuity considerations we will take equation $\boxed{1.3}$ tobe in the next form

$$\therefore \Rightarrow c' = c \left(1 - \frac{r_s}{r}\right)^{-1/2} \quad \dots \boxed{1.3}$$

$\therefore$ for observer at infinity i.e. in flat space time observing the speed of light in a curved space time $c' > c$

Since electric flux affected by gravity and since the electric charge is conserved, then this will change the electric permittivity of the empty space itself (ε_o) such that a photon will keep falling towards the black hole and the event horizon will always keep running away from it until it reaches the singularity:

$$\therefore \text{at event horizon and at singularity} \left(r_s < r \Rightarrow \frac{r_s}{r} < 1 \right)$$

Thus, the Schwarzschild metric will always be valid all the way to the singularity, so that the event horizon itself is the singularity at the center of the black hole

If we consider the angle of incidence to be zero ($\theta = 0$) i.e. Schwarzschild line element in two-dimensions then the Schwarzschild metric is as follows:

$$\Rightarrow ds^2 = \left(1 - \frac{r_s}{r}\right) c^2 dt^2 + \frac{dr_s^2}{\left(1 - \frac{r_s}{r}\right)}$$

Since the space-time anomaly at the event horizon is restricted to the event horizon area with zero time (because of the gravitational time dilation goes to infinity at the event horizon):

$$\therefore \text{at the event horizon } r_s = r \therefore \Rightarrow \left(1 - \frac{r_s}{r}\right) \to 0 \therefore \Rightarrow ds^2 = \frac{dr_s^2}{\left(1 - \frac{r_s'}{r_s}\right)}$$

$; r_s \equiv$ Schwarzschild radius & $r_s' \equiv$ the upgraded Schwarzschild radius due to $c' = c_\circ \left(1 - \frac{r_s}{r}\right)^{-\frac{1}{2}}$

$$\therefore \Rightarrow ds^2 = \frac{dr_s^2}{\left(1 - \frac{r_s'}{r_s}\right)} = 4\pi r_s'^2$$

$$\because (dr_s^2) = dr_s . dr_s \therefore \Rightarrow \frac{dr_s . dr_s}{\left(1 - \frac{r_s'}{r_s}\right)} = 4\pi r_s'^2 \therefore \Rightarrow \frac{dr_s . dr_s}{\left(1 - \frac{r_s'}{r_s}\right) 4\pi r_s'^2} = 1$$

$$\therefore \Rightarrow \frac{dr_s}{2\sqrt{\pi} r_s' \sqrt{\left(1 - \frac{r_s'}{r_s}\right)}} = 1$$

By integration $\Rightarrow$
$$\frac{\ln\left(\sqrt{\left(1 - \frac{r_s'}{r_s}\right)} + 1\right) + 2r_s\left(\sqrt{\left(1 - \frac{r_s'}{r_s}\right)}\right) - \ln\left(\left|\sqrt{\left(1 - \frac{r_s'}{r_s}\right)} - 1\right|\right)}{4\sqrt{\pi}} + C = r_s + D$$

When C=D

$$\therefore \ln\left(\sqrt{\left(1 - \frac{r_s'}{r_s}\right)} + 1\right) - \ln\left(\left|\sqrt{\left(1 - \frac{r_s'}{r_s}\right)} - 1\right|\right) = 4\sqrt{\pi} r_s - 2r_s\left(\sqrt{\left(1 - \frac{r_s'}{r_s}\right)}\right)$$

$$\frac{\left(\sqrt{1 - \frac{r_s'}{r_s}} + 1\right)}{\left(\left|\sqrt{\left(1 - \frac{r_s'}{r_s}\right)} - 1\right|\right)} = e^{\left(4\sqrt{\pi} r_s - 2r_s\left(\sqrt{\left(1 - \frac{r_s'}{r_s}\right)}\right)\right)}$$

$$\frac{\left(\sqrt{1-\frac{r_s'}{r_s}}+1\right)}{\pm\left(\sqrt{\left(1-\frac{r_s'}{r_s}\right)}-1\right)} = e^{\left(4\sqrt{\pi}\,r_s-2r_s\left(\sqrt{\left(1-\frac{r_s'}{r_s}\right)}\right)\right)}$$

At the singularity:

Each time a photon reaching the event horizon the speed of light itself get increased as I proved before in this formula$\left(c' = c\left(1-\frac{r_s}{r}\right)^{-\frac{1}{2}}\right)$ so we have here a step counter $(r_s \& r_s')$ so when the photons reach (r_s') it's become the new (r_s) until the collapsing steps reach the center of the black hole.

At the center for local observer $(r_s' = 0)$ $\therefore \left(c' = c\left(1-\frac{0}{r}\right)^{-\frac{1}{2}}\right) \therefore c' = c \dots \boxed{2.3}$

At the singularity for local observer $\because c' = c \Rightarrow r_s' = 0 \therefore\Rightarrow \left(1-\frac{0}{r_s}\right) = 1 \dots \boxed{3.3}$

The singularity for nonlocal observer $(r_s = r_s')$ $\therefore\Rightarrow \left(1-\frac{r_s'}{r_s}\right) = 0 \dots \boxed{4.3}$

(for non–local observers only) $\therefore\Rightarrow \pm 1 = e^{\left(4\sqrt{\pi}\,r_s\right)}$

$$\therefore\Rightarrow \begin{cases} \text{from Euler's identity } (1 = e^{2i\pi}) \therefore\Rightarrow e^{2i\pi} = e^{4(\sqrt{\pi})r_s} \therefore\Rightarrow r_s = i\frac{\sqrt{\pi}}{2} \\ \qquad\qquad \text{or} \\ \text{from Euler's identity}(-1 = e^{i\pi}) \therefore\Rightarrow e^{i\pi} = e^{4(\sqrt{\pi})r_s} \therefore\Rightarrow r_s = i\frac{\sqrt{\pi}}{4} \end{cases}$$

$\because r_s > r_s' \therefore\Rightarrow r_s = i\frac{\sqrt{\pi}}{2} ,,, r_s' = i\frac{\sqrt{\pi}}{4} ; i\frac{\sqrt{\pi}}{2} \& i\frac{\sqrt{\pi}}{4} \equiv$ ratio radii i. e. line element,

I will refer to the short ratio radius as$\left(r_T = i\frac{\sqrt{\pi}}{4}\right)$

$; r_T \equiv$ length element at the singularity i. e. singularity ratio radius

$\because r_s > r_s' \therefore\Rightarrow r_s = i\frac{\sqrt{\pi}}{2} ,,, r_s' = i\frac{\sqrt{\pi}}{4} \therefore\Rightarrow \frac{r_s'}{r_s} = \frac{i\frac{\sqrt{\pi}}{4}}{i\frac{\sqrt{\pi}}{2}} = \frac{1}{2}$

for local observer i. e. $(r_s' \to 0)$ $\because c' = \dfrac{c}{\sqrt{\left(1-\frac{r_s'}{r_s}\right)}} = \dfrac{c}{\sqrt{\left(1-\frac{0}{r}\right)}} = c \therefore c_s' = c; r_s$ is minimum

$\therefore$ line element is the radius here $\therefore dr_s^2 = r_s'.r_s'$

Since the photon geodesic is a null curve and at $\Theta=0$:

$$\therefore\Rightarrow ds^2 = -\left(1 - \frac{r_s{}'}{r_s}\right)c^2 dt^2 + \frac{\left(i\frac{\sqrt{\pi}}{4}\right)^2}{\left(1 - \frac{r_s{}'}{r_s}\right)} = 0$$

$$\therefore\Rightarrow \left(1 - \frac{1}{2}\right)dt_s{}^2 = \frac{\left(i\frac{\sqrt{\pi}}{4}\right)^2}{c^2\left(1 - \frac{1}{2}\right)} \quad \therefore\Rightarrow \left(\frac{1}{2}\right)dt_s{}^2 = \frac{\left(i\frac{\sqrt{\pi}}{4}\right)^2}{c^2\left(\frac{1}{2}\right)}$$

$$\therefore\Rightarrow dt_s{}^2 = \frac{\left(i\frac{\sqrt{\pi}}{4}\right)^2}{c^2\left(\frac{1}{2}\right)^2} = \frac{4\left(i\frac{\sqrt{\pi}}{4}\right)^2}{c^2} = -\frac{\pi}{c^2 4}$$

$$\therefore\Rightarrow ds^2 = -\left(\frac{1}{2}\right)c^2\left(-\frac{\pi}{c^2 4}\right) + \frac{\left(i\frac{\sqrt{\pi}}{4}\right)^2}{\left(\frac{1}{2}\right)} \quad \therefore\Rightarrow ds^2 = \left(\frac{\pi}{8}\right) - \left(\frac{\pi}{8}\right) = 0$$

$\therefore$ at singularity $\Rightarrow ds^2 = 0 \equiv$ the real space–time interval at singularity

since $r > r_s{}' > 0$ $\therefore\Rightarrow r_s - r_s{}' \neq 0$ $\therefore\Rightarrow \Delta r_s \neq 0$

$$\because c' = \frac{c}{\sqrt{\left(1 - \frac{r_s{}'}{r_s}\right)}} \quad \therefore r > r_s{}'$$

i.e.(r_s) always will be bigger than ($r_s{}'$) it's indeed a hammering effect from the event horizon all the way dawn to the singularity

$$\because 0 < \frac{r_s}{r} < 1 \;\therefore\Rightarrow \text{chaing in position} \neq 0 \;\therefore\Rightarrow r - r_s{}' \neq 0 \equiv \text{uncertainty in position}$$

Since we have mass with an uncertain position between zero and one $\left(0 < \frac{r_s}{r} < 1\right)$, then this is resulted from a normalized wave function this is only happening under the Heisenberg uncertainty principle:

$$\therefore\Rightarrow \triangle r_s \triangle P_s \geq \frac{\hbar}{2}$$

This is reasonable since we are reaching such a tiny scale:

$$\text{when reaching singularity} \Rightarrow \left(r_s = r_T = i\frac{\sqrt{\pi}}{4}\right) \therefore i\frac{\sqrt{\pi}}{4} = \frac{2MG}{c^2}$$

$$\therefore\Rightarrow M = ic^2\frac{\sqrt{\pi}}{8G} \text{ ; for a local observer at singularity} \Rightarrow c' = c$$

$$\text{when } r_s{}' \to 0 \;\therefore\Rightarrow i\frac{\sqrt{\pi}}{4} \cdot ic^2\frac{\sqrt{\pi}}{8G}c \geq \frac{\hbar}{2} \;; \left(r_s Mc = n\frac{\hbar}{2}\right)$$

$$\therefore\Rightarrow i\frac{\sqrt{\pi}}{4} \cdot ic^2\frac{\sqrt{\pi}}{8G}c = n\frac{\hbar}{2}$$

$$\therefore \Rightarrow \frac{c^3}{\hbar G} i \frac{\sqrt{\pi}}{4} \cdot i \frac{\sqrt{\pi}}{4} = n$$

; n is the number of Schwarzschild radii steps of the event horizon

due to the effect of gravity on empty space

$$\text{at } n = 1 \therefore \Rightarrow \frac{c^3}{\hbar G} \left(i \frac{\sqrt{\pi}}{4} \right)^2 = 1$$

$$\therefore \Rightarrow \frac{\left(i \frac{\sqrt{\pi}}{4} \right)^2}{l_p{}^2} = 1 \therefore \Rightarrow i \frac{\sqrt{\pi}}{4} = l_p \; ; l_p \equiv \text{Planck length}$$

$$\therefore \Rightarrow n = \frac{r_s}{l_p} \text{at } n = 1 \therefore \Rightarrow \frac{r_s}{l_p} = 1 \therefore \Rightarrow \frac{2GM}{c^2 l_p} = 1$$

$$\frac{2GM}{c^2 l_p} = 1 \therefore M = \frac{c^2}{2G} \sqrt{\frac{G\hbar}{c^3}} = \frac{1}{2} \sqrt{\frac{c\hbar}{G}}$$

$$\therefore \Rightarrow M = \frac{m_p}{2} \; ; m_p \equiv \text{Planck mass}$$

$$\therefore \Rightarrow \frac{m_p}{2} \text{ is the least required mass to form a black hole}$$

$$\therefore \Rightarrow \frac{m_p}{2} \text{ is the least mass considered as a gravity well}$$

since energy is quantized

$$\therefore \Rightarrow M = n \frac{m_p}{2} \; ; n = 1,2,3 \dots, \dots \boxed{5.3}$$

This is the least mass condition required to form a black hole (T) .

Now the speed of light at singularity for an observer at infinity is:

$$\therefore \; c.(T) = \frac{c}{\left(\sqrt{1 - \frac{1}{2}} \right)^{\frac{2M}{m_p}}} = \frac{c}{\left(\frac{1}{\sqrt{2}} \right)^{\frac{2M}{m_p}}} \; ; (T) = \left(\sqrt{2} \right)^{\frac{2M}{m_p}} \therefore \Rightarrow c_T = c \left(\sqrt{2} \right)^{\frac{2M}{m_p}} \dots \boxed{6.3}$$

$\Rightarrow$ A black hole is any mass that will increase the speed of light on its surface by at least a factor of $(\sqrt{2})$ only in respect to a non-local observer

A gravity well is any mass is equal or bigger than half Planck mass.

$$\because \textit{gravitational time dilation} \equiv t_g = t_{ob} \sqrt{1 - 2 \frac{GM}{rc^2}}$$

$$\therefore \textit{for a black hole gravitational time dilation} \Rightarrow t_g = t_{ob} \left(\sqrt{2} \right)^{\frac{2M}{m_p}} \dots \boxed{7.3}$$

4. Space-time curvature and Schwarzschild radii due to local and non-local perspective for both rotating and non-rotating black-holes:

A non-rotating black-holes of mass (M) will have multiple different Schwarzschild radii depending on the observers such that we have here two observers each one will report a different Schwarzschild radius.

The first observer is the particles that falling in the event horizon and I will denote the Schwarzschild radius in this perspective as (r_{Sf}).

The second observer is an observer at infinity i.e. observer in flat space-time and in this perspective, the black hole will have the ordinary Schwarzschild radius in which we all know and love$\left(r_s = \frac{2GM}{c^2}\right)$.

The first observer is the falling particle in the event horizon the speed of light at this region will be increased by a factor of $(\sqrt{2})$ in compare with the speed of light in flat space-time then the Schwarzschild radius will shrink in the same ratio i.e. a factor of (2) due to squaring the speed of light $\left(r_s = \frac{2GM}{c^2}\right)$.

But since the particle is a local observer then it will not have a difrence in the space-time curvetuer then the speed of light here is the same but the mass of the black hole will be difrent in the same ratio since the particle has allrady crosed our event horizon so the mass of the black hole in the particle perspective will be decreased in the same ratio as follows

$$\therefore \Longrightarrow r_{Sf} = \frac{2Gm_T}{c^2}; \ m_T = \frac{M}{(2)^{\left(\frac{2M}{m_p}\right)}}; \frac{2M}{m_p} \geq 1 \dots \boxed{1.4}$$

; M is the mass of the black hole as observed from flat space–time

This is very reasonable since when the particle reaches event horizon will have a space-time curvature behind it start from infinity caused by the black hole itself then the speed of the fall will be increased by a factor of (2) but the curvature will be less by the same factor and as the particle will fall towards the black hole at each step it will leave behind it more curved space-time and this curvature behind the particle will decrease the total curvature of the space-time of the black hole itself in the falling particle perspective.

This is nothing but changing of energy from potential to kinetic energy in simple words when you fall from a one-story building is really different from when you fall from a ten-story building.

For a rotating black-hole we should add the relative mass due to the rottational velocity as follow

$$\therefore \Longrightarrow r_{Sf} = \frac{2Gm_{\circ T}}{c^2}; \ m_{\circ T} = \frac{M(\gamma \cos(t))}{(2)^{\left(\frac{2M}{m_p}\right)}}; \frac{2M}{m_p} \geq 1; \gamma = \frac{1}{\sqrt{1 - v^2/c^2}}; 0 \leq t \leq \frac{\pi}{2}; \dots \boxed{2.4}$$

$$at \ (t) = \frac{\pi}{2} \ \therefore \Longrightarrow r_{Sf} = 0 \dots \boxed{3.4}$$

i.e. black holes are drilled from the pools to the center with cylinder of a radius of Planck length

Since the Schwarzschild radius will always run away from anything falling in the black hole, such that the virtual particles at mostly will not be separated and it fall together in the black hole and when it reaches the center it should leave through this drill which penetrates the black hole from the center to its poles since at the poles all the way to the center Schwarzschild radius is zero

This is appropriate solution for losing matter to the black hole singularity, the information paradox and the relativistic jets.

5. Black hole thermodynamics and the entropy of the vacuum:

Lets consider a hypothetical isolated thermodynamic system of a single test particle with a single microstate reaching event horizon of a black hole, then according to Boltzmann entropy law, the entropy for such particle or system is zero as follows:

$$S = k_B \ln \Omega = k_B \ln 1 = 0$$

Since this test particle falling towards a black hole, then it will have a time dilation on the event horizon as in equation $\boxed{7.3}$

$$\left[t_g = t_{ob}\sqrt{2} \, ... \, \boxed{7.3} \right]$$

Since the entropy is a time arrow then the time dilation will affect the entropy in this system and increase it by the time dilation factor and the Boltzmann entropy law should be upegraded for what behind the event horizion as follows

$$\therefore S = k_B \ln\sqrt{2} \, \Omega \, ... \, \boxed{1.6}$$

$$\therefore \Rightarrow U = k_B \, K \, ln(\sqrt{2}\,)\Omega \, ... \, \boxed{2.6}$$

But since the speed of light will be increased by a factor of square root of two then when a particle reach event horizon the Schwarzschild radius will shrink by a factor of two and that's mean nothing could ever cross the event horizon

$$\because r_{sf} = \frac{2Gm_T}{c^2}; \; m_T = \frac{M}{(\sqrt{2})^{\left(\frac{2M}{m_p}\right)}}; \frac{2M}{m_p} \geq 1 \, ... \, \boxed{1.4}$$

And as long as nothing could ever cross the event horizon as we saw with equation $\boxed{1.4}$, then it is safe to claim that what is located behind event horizon is nothing but empty space, even when it is not.

Then such a mathematical formula should represent the vacuum entropy as follows.

$$\therefore S = k_B \ln\sqrt{2} \, \Omega \; \therefore \text{at } \Omega = 1 \Rightarrow S_H = k_B \ln\sqrt{2} \, ... \, \boxed{3.6}$$

$$; S_H \equiv vacuum \; entropy$$

We could generalize it for black holes as follow:

$$\therefore S_T = k_B \ln\left(\Omega(\sqrt{2})^{\frac{2M}{m_p}} \right) = k_B \left(\ln \Omega + \ln(\sqrt{2})^{\frac{2M}{m_p}} \right)$$

$$\therefore S_T = k_B \frac{2M}{m_p} \ln\sqrt{2} + k_B \ln \Omega \, ... \, \boxed{4.6}$$

$$For \; local \; observer \; \left(\frac{2M}{m_p} = 0 \right) \therefore S_T = k_B \, ln \, \Omega \, ... \, \boxed{5.6}$$

$$\text{since nothing could cross the event horizon} \because \Rightarrow \Omega = 1 \therefore S_T = k_B \frac{2M}{m_p} \ln\sqrt{2} \, ... \, \boxed{6.6}$$

$$\text{at } \frac{2M}{m_p} = 1 \therefore \text{ vacuum entropy } S_H = S_T = k_B \ln \sqrt{2}$$

$$\therefore \Rightarrow U = k_B K \ln \sqrt{2} \therefore \text{ at } K = 1 \therefore U_H = k_B \ln \sqrt{2} \dots \boxed{7.6}$$

∴ Landauer's principle should be corrected.

Then, even when we have nothing then we will have this entropy for nothing just due to space-time nature

This happened since nothing could cross the event horizon:

Because of the locality principle issues, we should consider only the first event horizon i.e. N=1 and we take it for all the black hole entropy since we are interacting with only the first event horizon as a surface but with the whole black hole entropy

$$\therefore N = 1 \Rightarrow M = \frac{m_p}{2}$$

$$\Rightarrow K_T = \frac{\frac{m_p}{2}(c\sqrt{2})^2}{k_B \ln\left(\sqrt{2}^N\right)}$$

$$\Rightarrow K_T = \frac{m_P c^2}{\left(\frac{2M}{m_p}\right) k_B \ln(\sqrt{2})} \Rightarrow K_T = \frac{K_P}{N \ln(\sqrt{2})} \Rightarrow K_T = \frac{m_P K_P}{M \ln(2)}$$

$$= \frac{(2.176434 \times 10^{-8})(1.416785 \times 10^{32})}{M \ln(2)}$$

$$K_T = \frac{K_{TP}}{M_T}; K_{TP} \cong 4.448 \times 10^{24} \text{kg. K}$$

Black hole has a mass between 3 and 10 solar masses [3].

$$\lambda = \frac{b}{K_T} \Rightarrow \lambda = \frac{b}{\frac{K_{TP}}{M_T}} \Rightarrow = M_T \frac{b}{K_{TP}} \sqrt{2} \Rightarrow M_T = \frac{\lambda}{b\sqrt{2}} K_{TP}$$

$$\therefore b = 2.897771955 \times\times 10^{-3} \therefore \Rightarrow M_T = \gamma \times 1.0853893997044233898436482461721 \times 10^{27}$$

6. Calculating the cosmological constant using the quantum field fluctuations within an accuracy of [93.5%] from the average current experimental results.

The expansion of the universe is an anti-gravitational act and as I have shown in equations ($\boxed{5.3}$ & $\boxed{6.3}$ & $\boxed{7.3}$) space-time can only be affected by masses equal to or larger than half Planck mass and since gravity and anti-gravity both described in general relativity by Einstein field equation as the same, then they are obeying the same condition too.

So we should only consider quantum fluctuation with frequencies that are coherent with half Planck mass, then such a quantum field frequencies should be responsible for the universe expansion.

If we take virtual particles in the time-energy uncertainty principle corresponding to energies of half Planck mass, and we try to figure out its effect on space-time, then we should consider three important factors to reach the right mathematical pattern.

- We take one dimension for the space between two points representing the creating point and the annihilation point of the virtual particles since virtual particles oscillate between existence and nonexistence that's mean we could exclude any inner path because we could safely presume that it just didn't happen in the first place, so that will leave us with only one space dimension and that's between the creating point and annihilation point of the virtual particles.

- That will leave us with two remaining dimensions, in fact, these two dimensions are time-disguised dimensions as space dimensions since space-time interval has a term for time-disguised as space dimensions by multiplying the time term by the speed of light so if we consider the angle of incidence to be zero i.e. ($\theta = 0$)to consider the only the line element of the metric to facilitate calculations.

$$\therefore \Rightarrow ds^2 = -\left(1 - \frac{r_s}{r}\right) dt^2 c^2 + \left(1 - \frac{r_s}{r}\right)^{-1} dr^2$$

Its dual-time dimensions disguised as space dimensions because the first time-disguised dimension is due to the accelerated frame of reference of the virtual particles where the speed of light in this frame will be unchanged ;($c'=c$) in respect to the virtual particles and another time dimension related to the non-accelerated frame of reference of the observer such that the speed of light of the virtual particles in respect to the observer frame of reference will be changed in a factor of the square root of two($; \acute{c} = c\sqrt{2}$).

That's mean the virtual particles will have dual light speed measurements one in its own frame of reference and the other one is in the observer frame of reference and that will give the virtual particles in these conditions dual time-disguised dimensions as space dimensions.

Now: since photon geodesic is a null geodesic $\therefore \Rightarrow ds^2 = 0$

$$at\ \theta = 0 \Rightarrow 0 = -\left(1 - \frac{r_s'}{r_s}\right) dt^2 c^2 + \left(1 - \frac{r_s'}{r_s}\right)^{-1} dr^2$$

at $\dfrac{2M}{m_p} \leq 1 \Rightarrow r_s' = 0$, I already proved this mathematically in equations(2.3 & 3.3)

$$\therefore \Rightarrow \left(1 - \frac{r_s'}{r_s}\right) = \left(1 - \frac{0}{r_s}\right) = 1;\ dr = i\frac{\sqrt{\pi}}{4}$$

this is the line element of the virtual particles in the observer frame of reference

$$ds^2 = 0 \therefore \Rightarrow dt^2 c^2 = dr^2 \Rightarrow dt^2 c^2 = dr^2 \therefore \Rightarrow dt^2 = \frac{dr^2}{c^2}$$

$$dt^2 = \frac{dr^2}{c^2} \Rightarrow dt = \frac{dr}{c} \Rightarrow dt = \frac{i\sqrt{\pi}}{4c} \therefore \Rightarrow\ \text{the first disguised time dimension} = \frac{i\sqrt{\pi}}{4}$$

at $\left(1 - \dfrac{r_s}{r}\right) = \dfrac{1}{2} \Rightarrow r_s' = i\dfrac{\sqrt{\pi}}{4}$; $dr = i\dfrac{\sqrt{\pi}}{2}$ line elementin in the observer frame of reference

since photon geodesic is a null geodesic and at $\theta = 0$ $\therefore \Rightarrow ds^2 = 0$

$$\therefore \Rightarrow \left(\frac{1}{2}\right) dt^2 c^2 = \left(\frac{1}{2}\right)^{-1} dr^2 \therefore \Rightarrow \left(\frac{dt^2 c^2}{2}\right) = 2dr^2 \therefore \Rightarrow dt^2 = 4\frac{dr^2}{c^2}$$

$$dt^2 = \frac{4dr^2}{c^2} \Rightarrow dt = \frac{2}{c}dr \Rightarrow dt = \frac{2}{c}i\frac{\sqrt{\pi}}{2} = i\frac{\sqrt{\pi}}{c}$$

14

$$\therefore \Rightarrow dt = i\frac{\sqrt{\pi}}{c} \therefore \Rightarrow \text{ the second disguised time dimension} = i\sqrt{\pi}$$

For $\left(\frac{2M}{m_p} > 1\right)$ for each step we will have a different speed of light i.e. an extra time dimension

$\therefore \Rightarrow$ the second disguised time dimension in the observer frame of refrence $\equiv \left(\frac{2M}{m_p}\right) i\sqrt{\pi}$

For the space dimension we have the following

$$\frac{2M}{m_p} = 1 \therefore \Rightarrow M = \frac{m_p}{2} \therefore \Rightarrow r_s = \frac{2G\frac{m_p}{2}}{c^2} = \frac{Gm_p}{c^2} = \frac{6.6743 \times 10^{-11} \times 2.176435 \times 10^{-8}}{(299792458)^2}$$

$$= \frac{14.5261801205 \times 10^{-19}}{(89875517873681764)} = 1.616 \times 10^{-35} \equiv l_p$$

We should use an upgrade to Lorentz factor and I will denote it as (γ_T) for the virtual particles in the reference frame of the observer, it will affect the length and time dimension in this frame of reference

$$; \gamma_T = \left(1 - \left(\frac{v}{c(\sqrt{2})^{\left(\frac{2M}{m_p}\right)}}\right)^2\right)^{-\frac{1}{2}} ; \frac{2M}{m_p} \geq 1$$

Expansion of the universe is an increase in entropy so we could represent it mathematically we should use the entropy law for empty space that I derived before in equation

$$\because equation \boxed{2.6} i.e. \left[E = k_B K \ ln(\sqrt{2})\Omega\right]$$

Then to obtain the energy density in which represent the cosmological constant we should divide it on the space-time volume in which I derived it mathematically above

$$\therefore \Rightarrow \Lambda = \frac{k_B K \ ln(\sqrt{2} \ \Omega)}{\frac{4}{3}\pi \left(\left(\frac{2M}{m_p}\right)(i\sqrt{\pi} \ \gamma_T)\left(i\frac{\sqrt{\pi}}{4}\gamma\right)\left(\frac{l_p}{\gamma_T}\right)\right)} \therefore \Rightarrow \Lambda = \frac{k_B K \ ln(\sqrt{2} \ \Omega)}{\frac{4}{3}\pi \left(\left(\frac{2M}{m_p}\right)i\sqrt{\pi}\left(i\frac{\sqrt{\pi}}{4}\gamma\right)l_p\right)}$$

$$at \ \frac{2M}{m_p} = 1 \therefore \Rightarrow \Lambda = \frac{-3 \ k_B \ K ln(\sqrt{2} \ \Omega)}{\pi^2 \ \gamma \ l_p} \ .... \boxed{1.7}$$

$$\therefore \Rightarrow \Lambda = \frac{-3(1.38 \times 10^{-23})(2.7)[(0.346) + ln(\Omega)]}{(9.869)(1.616 \times 10^{-35})}\left(\frac{1}{\gamma}\right)$$

By taking the appropriate relative velocity for Lorentz factor and the appropriate multiplicity(Ω) we will get energy density exactly equal to the experimental value of the cosmological constant

For example, if we take the multiplicity$\{\Omega = 4\}$ and the relative velocity very close to the speed of light with 34 digits after the comma to be compatible with Planck length in the equation as follows

$$v = 299,792,457.999,999,999,999,999,999,999,999,999,999,999,8 \ ^m/_s$$

$$\therefore \Rightarrow \left(\frac{v}{c} = 99.99999999999999999999999999999999999999933287181\%\right)$$

$$\therefore \Rightarrow \frac{1}{\gamma} = 1.1551001605 \times 10^{-21}$$

$$\therefore \Rightarrow \Lambda = -1.4028 \times 10^{-9} \quad (\text{J}.\,\text{m}^{-1}.\,\text{s}^{-2}.\,\text{c}^{-2} \equiv \text{J}.\,\text{m}^{-3})$$

This value is in (93.5%) from the average experimental accepted value.

Black hole is an increase in the speed of light by a factor of $\left(\left(\sqrt{2}\right)^{\left(\frac{2M}{m_p}\right)} \right)$ and as I show that the virtual

particles increasing the speed of light in only one spatial dimension by a factor of $\left(\sqrt{2}\right)$ that's mean one thing

Each pair of virtual particles is nothing but a virtual line black hole i.e. a black hole in one space dimension disappears with the inhalation of the virtual particles appears and disappears again due to its virtual nature and its linear since it's acting only in one spatial dimension.

If we took my previous calculations for the cosmological constant as a reference estimation point then in the Planck level due to the effects of the quantum field there are roughly (449,792) virtual linear black holes in every cubic centimeter of vacuum these are the source of universe expansion and dark energy.

The most suitable, convenient name in Arabic for such quantum field is the word (Eyde) which means in Arabic the mighty firmness, where the (Eyde) quantum field is responsible for the universe expansion and very suitable for cosmic inflation as I will show.

7- Solving the vacuum catastrophe:

If we generalize equation $\boxed{1.7}$ for quantum field fluctuations frequencies corresponding to energies of than half Planck mass i.e. $\left(\frac{2M}{m_p}\right) > 1; \left(\frac{2M}{m_p}\right) \to \infty.$

Then for each higher frequency we will get an extra disguised time dimension in the denominator and this will drain out the infinite energy frequencies fluctuations of the quantum field and this will prevent the vacuum catastrophe.

$$\Lambda_n = \frac{-3\,k_B K\;ln\left(\sqrt{2}\,\Omega\right)}{(\pi)^2 \left(i\frac{\sqrt{\pi}}{4} \right)^{n-1} \left((\gamma_{T2})(\gamma_{T3})(\gamma_{T4}) \cdots\cdots (\gamma_{Tn}) \right)(l_p)(\gamma)} ; \left(J.\,m^{-1}.(s.\,c)^{-(n+1)} \right); \left(\frac{2M}{m_p} n \right.$$
$$\left. \to \infty \right) \dots \boxed{1.8}$$

In simple words, it seems that there are infinite energies from the quantum field fluctuations fighting against infinite time dimensions and this will bring the quantum field into balance and prevent the vacuum catastrophe.

Without this balance, everything will explode into oblivion and we will have nothing but black holes or impossibly rapid fast expansion due to the infinite energies of the quantum field's fluctuations.

Energies resulting from higher frequencies of (Λ_G) formula are distorting space-time with a factor of $\left(\sqrt{2}^{\left(\frac{2M}{m_p}\right)} \right)$ in Planck level and even lower than that such that it will let other virtual particles to move faster than the speed of light in respect to us but in their frame of reference they move less than

there speed of light and they follow the updated factor (γ_T) and updated transformations it's exactly as Lorentz transformations but with an, increased speed of light because of the updated factor (γ_T).

$$; \gamma_T = \cfrac{1}{\sqrt{1 - \left(\cfrac{v}{c(\sqrt{2})^{\left(\frac{2M}{m_p}\right)}}\right)^2}} \; ; \frac{2M}{m_p} \geq 1 \dots \boxed{2.8}$$

We should note that for mass bigger than half Planck mass there are extra relative time-disguised dimensions for each step and it all depends on the observer's point of view.

We saw that high energy do not reveal higher space dimensions, but reveal extra relative time-disguised dimensions and all that about measuring the speed of light differently between two frames of reference one of them accelerated in relative to the other one that's mean there is no extra higher space dimension.

The amount of time is determined by the speed of light and the difference between two differently accelerated frames of reference.

The direction of time is determent by the entropy.

That means space-time didn't come from the big bang since there is no enough high energy that will generate more space-time without original space-time and we observed that both in black hole singularity and in the cosmological constant equations.

8. Calculating the dark matter density using third-order quantum field fluctuations within an accuracy of [96%] from the average current experimental accepted values:

We have a convenient solution here for the quantum vacuum at $\left(\frac{2M}{m_p} = 3\right)$ such that instead of negative energy and pressure we will get an old fashion attracting graviton effect that agree with dark matter phenomenon

$$\text{at} \left(\frac{2M}{m_p} = 3\right) \Rightarrow \Lambda_3 = \frac{3(4)^2 \, k_B K \, ln(\sqrt{2}\,\Omega)}{(\,i\,)^4 \, (\pi)^3 (\gamma_{T2})(\gamma_{T3})(l_p)(\gamma)} \; ; \left(J.m^{-1}.(s.c)^{-(4)}\right) \dots \boxed{1.9}$$

$$\because m = \frac{E}{c^2} \; \therefore \Rightarrow \text{Dark matter density} = \frac{\Lambda_3}{c^2}$$

$$\Lambda_3 = \frac{3(4)^2 \, k_B K \, ln(\sqrt{2}\,\Omega)}{(\,i\,)^4 \, (\pi)^3 (\gamma_{T2})(\gamma_{T3})(l_p)c^2(\gamma)} \; ; \left(kg.m^{-1}.(s.c)^{-(4)}\right)$$

Extra time dimensions are not about extra space at all it's just about the difference in curvature of the empty space itself i.e. the units here in principle doesn't matter; $\left(kg.m^{-1}.(s.c)^{-(4)}\right) \equiv \left(kg.m^{-1}.(s.c)^{-(2)}\right)$

$$\text{Dark matter density} = \frac{\Lambda_3}{c^2} = \frac{3(4)^2 \, k_B K \, ln(\sqrt{2}\,\Omega)}{(c^2)\,(\,i\,)^4 \, (\pi)^3 (\gamma_{T2})(\gamma_{T3})(l_p)(\gamma)}$$

$$\text{at} \left(\frac{2M}{m_P} = 2\right) \Rightarrow c_{T2} = c\left((\sqrt{2})^2\right) = 599,584,916 \frac{m}{s}$$

By taking the virtual particle speed in the second extra time disguised dimension as follow

$$v_{T2} = 593{,}320{,}000 \ \frac{m}{s}, \text{at} \left(\frac{2M}{m_p} = 2\right)$$

$$at \left(\frac{2M}{m_P} = 3\right) \Rightarrow c_{T3} = c\left((\sqrt{2})^3\right) = 847{,}941{,}120.0015329554957764343634 \ \frac{m}{s}$$

By taking the virtual particle speed in the third extra time disguised dimension as follow

$$v_{T3} = 839{,}081{,}190.827204754355017953848 \ \frac{m}{s}$$

$$\therefore \Rightarrow \gamma_{T2} = \gamma_{T3} = 0.1441816003705216436389$$

$$\therefore \Rightarrow Dark \ matter \ density = 5.3964586 \times 10^{-27} \times 10^{-27}; \left(kg.m^{-1}.(s.c)^{-(4)}\right) \equiv (kg.m^{-3})$$

Experimentally the dark matter density in the universe is around $(5.423 \times 10^{-27}; (kg.m^{-3}))$[4] in the assumption of a flat universe then this will put our results to be within an accuracy of [96%] from the average current experimental values.

9. Solving Einstein field equations to find the microstate of the system:

$$G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

$$\because G_{\mu\nu} \ units \ in \ m^{-2} \ \therefore \Rightarrow \left(G_{\mu\nu}\right)(r)c^2 \equiv surface \ gravity$$

$$T_{\mu\nu} \equiv energy \ dencity \ \Rightarrow T_{\mu\nu} = \frac{k_B K \ \ln(\sqrt{2}\,\Omega)}{\frac{4}{3}\pi r^3}$$

$$\left(G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}\right)(r)c^2$$

$$\Rightarrow g = \frac{8\pi G(r)}{c^2} T_{\mu\nu}; T_{\mu\nu} = \frac{k_B K \ \ln(\sqrt{2}\,\Omega)}{\frac{4}{3}\pi r^2}$$

$$\Rightarrow g = r \cdot \frac{8\pi G}{c^2} \cdot \frac{k_B K \ \ln(\sqrt{2}\,\Omega)}{\frac{4}{3}\pi r^3} \Rightarrow g = \frac{G}{c^2} \cdot \frac{6 k_B K \ \ln(\sqrt{2}\,\Omega)}{r^2}$$

$$\Rightarrow g = \frac{G}{r^2} \cdot \frac{6 k_B K \ \ln(\sqrt{2}\,\Omega)}{c^2} \ \therefore \Rightarrow M = \frac{6 k_B K \ \ln(\sqrt{2}\,\Omega)}{c^2} \ \therefore \Rightarrow \ln(\sqrt{2}\,\Omega) = \frac{Mc^2}{6 k_B K}$$

$$\therefore \Rightarrow \Omega = \frac{1}{\sqrt{2}} e^{\left(\frac{M}{K} \cdot \frac{c^2}{6 k_B}\right)}$$

10-Acceleration due to gravity:

To drive acceleration due to gravity, we have to take two measurements for the speed of light at the surface of the gravity well due to the difference in space-time curvature.

First from local perspective on the surface of the gravity well i.e. $(c = c)$, second from non-local perspective i.e. the speed of light in an infinitely distance point at space i.e. speed of light in a curved space-time i.e. $c' = c\left(\sqrt{1 - \frac{r_s}{r}}\right)$.

The first is the speed of light from local perspective and the second is the speed of light from non-local perspective

$$\therefore \Rightarrow g = \frac{(c - c')}{\frac{2r}{(c + c')}} \Rightarrow g = \frac{(c + c')(c - c')}{2r} \because c' = c\left(\sqrt{1 - \frac{r_s}{r}}\right)$$

$$\therefore \Rightarrow g = \frac{\left(c + c\left(\sqrt{1 - \frac{r_s}{r}}\right)\right)\left(c - c\left(\sqrt{1 - \frac{r_s}{r}}\right)\right)}{2r} = \frac{c^2}{2r}\left(1 + \left(\sqrt{1 - \frac{r_s}{r}}\right)\right)\left(1 - \left(\sqrt{1 - \frac{r_s}{r}}\right)\right)$$

$$\therefore \Rightarrow g = \frac{c^2}{2r}\left(1 - \left(1 - \frac{r_s}{r}\right)\right) \therefore \Rightarrow g = \frac{c^2}{2r}\left(\frac{r_s}{r}\right)$$

$$\therefore \Rightarrow g = \frac{c^2 r_s}{2(r)^2}$$

For a black hole we don't have a fixe point as a surface to event horizon as we had in the ordinary gravity well.

Then to describe the local and non-local perspective we have only the Schwarzschild radius but since it is a non-reachable region because when you reach it your speed of light will be bigger, then the Schwarzschild radius will be smaller

So to solve this problem we take measurements between two Schwarzschild radii the first is Schwarzschild radius measured from a flat space time and the second is from a curved space-time.

$$g = \frac{c}{\frac{\Delta(r_s)}{c}} \Rightarrow g = \frac{c^2}{\Delta(r_s)}; \Delta(r_s) = \frac{2GM}{c^2} - \frac{2GM}{\left(\frac{c}{\sqrt{2}}\right)^2} = r_s(1 - 2) = -r_s \therefore \Rightarrow g = -\frac{c^2}{r_s}$$

Now by integration we should get the speed of light

$$\int_{\frac{r_s}{c}}^{0} g \, dt = \int_{\frac{r_s}{c}}^{0} -\frac{c^2}{r_s} \, dt = c$$

11. Finding the equation for the big bang singularity at (t≤0), the Planck era, and the gravitational constant:

If we inflict ($\Lambda_\circ$) formula upon the Planck era we could easily rolls out the temperature from the equation as follows:

$$\because \Lambda = \frac{-3 \, k_B \, K \ln\left(\sqrt{2} \, \Omega\right)}{\pi^2 \, \gamma \, l_p} \therefore \Rightarrow \Lambda_P = \frac{-3 \, k_B \, K_P \ln\left(\sqrt{2} \, \Omega\right)}{\pi^2 \, \gamma \, l_p}; K_P = \text{Planck temperature}$$

$$\therefore \Rightarrow \Lambda_p = -\frac{3 \, k_B \, \frac{m_p c^2}{k_B} \ln\left(\sqrt{2} \, \Omega\right)}{\pi^2 \, (l_p)} \frac{1}{\gamma} = -\frac{3 m_p c^2 \, \ln\left(\sqrt{2} \, \Omega\right)}{\pi^2 \, (l_p)} \frac{1}{\gamma} = -\frac{3 \, c^4 \, \ln\left(\sqrt{2} \, \Omega\right)}{\pi^2 \, G} \frac{1}{\gamma}$$

$$\therefore \Rightarrow \Lambda_p = -\frac{3 \sqrt{\frac{\hbar c}{G}} c^2 \, \ln\left(\sqrt{2} \, \Omega\right)}{\pi^2 \, \sqrt{\frac{\hbar G}{c^3}}} \frac{1}{\gamma}$$

$$\therefore \Rightarrow \Lambda_p = -\frac{3c^4 \ln(\sqrt{2}\,\Omega)}{\pi^2\,G\,\gamma}, \; or, \; \Lambda_p = -\frac{3\,F_p\;ln(\sqrt{2}\,\Omega)}{\pi^2\,G\,\gamma} \quad \cdots \boxed{1.10}$$

$$\therefore \Rightarrow G = \frac{3c^4\;\ln(\sqrt{2}\,\Omega\,)}{\pi^2\,\Lambda_p}\frac{1}{\gamma} \quad \cdots \boxed{2.10}$$

$$\therefore \Rightarrow G = \frac{3c^4\;\ln(\sqrt{2}\,\Omega\,)}{\pi^2\;0.7361\times10^{23}}\frac{1}{\gamma}$$

at $\Omega = 4$ & at v $= 299792457.999,999,999,999,999,999,999,999,999,999,999,8$ m/s

$$\therefore \Rightarrow \frac{v}{c} = 99.99999999999999999999999999999999999999933287181\%$$

$$\frac{1}{\gamma} = 1.1551\times10^{-21}$$

$$\therefore \Rightarrow \Lambda_P = -0.7361\times10^{23} \;\; (\text{J.}\,m^{-1}.\,s^{-2}.\,c^{-2} \equiv \text{J.}\,m^{-3})$$

From the same formula and the same conditions we have

$$G = \frac{3c^4\;\ln(\sqrt{2}\,\Omega\,)}{\pi^2\;0.7361\times10^{23}}\frac{1}{\gamma} \therefore \Rightarrow G = 6.6947\times10^{-11}\left(\frac{m^3}{\text{kg.}\,s^2}\right)$$

Since we canceled out both the temperature and the Planck length from our consideration by the Planck era trick and by using vacuum entropy then we could easily calculate it for the big bang singularity at $(t \le 0)$

At $(t \le 0)$ there is nothing there is no prior causality i.e. there is no Lorentz factor or (γ_T) factor and there is nothing to have any multiplicity so we could only use vacuum entropy and of curse that's mean the temperature is exactly the absolute zero then we will have only two things flat & smooth space-time

Flat space-time i.e. there is no energy equal or bigger than half Planck mass and smooth space-time means there is no energy at all and the temperature is exactly the absolute zero.

There is nothing except the initial conditions of thxe universe before the rupture in the space-time that's represented by the big bang

From Planck era cosmological constant we will get

$$\because \Lambda_p = -\frac{3c^4\;\ln(\sqrt{2}\,\Omega)}{\pi^2\,G\,\gamma} \therefore \Rightarrow \Lambda_\circ = -\frac{3\,c^4\;\ln(\sqrt{2}\,)}{\pi^2\,G} \therefore \Rightarrow \Lambda_\circ = -\frac{3\;\ln(\sqrt{2}\,)}{\varepsilon_\circ^2\mu_\circ^2\pi^2\,G} \quad \cdots \boxed{3.10}$$

$$\therefore \Rightarrow \Lambda_\circ = -1.2749\times10^{43}(\text{J.}\,m^{-3})$$

We could calculate the gravitational constant as follows:

$$\therefore \Rightarrow G = \frac{3\;\ln(\sqrt{2}\,)}{\varepsilon_\circ^2\mu_\circ^2\pi^2\,(-\Lambda_\circ)} \quad \cdots \boxed{4.10}$$

$$\therefore \Rightarrow G = \frac{3\;\ln(\sqrt{2}\,)}{\varepsilon_\circ^2\mu_\circ^2\pi^2\,(-\Lambda_\circ)} = \frac{3c^4\;ln(\sqrt{2}\,\Omega\,)}{\pi^2\,(-\Lambda_p)}\frac{1}{\gamma}$$

$$\therefore \Rightarrow \frac{\ln(\sqrt{2}\,)}{(-\Lambda_\circ)} = \frac{ln(\sqrt{2}\,\Omega\,)}{(-\Lambda_p)}\frac{1}{\gamma} \therefore \Rightarrow \frac{1}{(-\Lambda_\circ)} = \frac{1+ln(\Omega\,)}{(-\Lambda_p)}\frac{1}{\gamma} \therefore \Rightarrow \Lambda_\circ = \frac{\Lambda_p}{1+ln(\Omega\,)}\gamma \cdots \boxed{5.10}$$

12. Nature of time and the higher dimensions:

Black hole is an increase in the speed of light by a factor of $\left(\sqrt{2}\right)^{\left(\frac{2M}{m_p}\right)}$ and as I show that the Eyde virtual particles increasing the speed of light in only one spatial dimension by a factor of $\left(\sqrt{2}\right)$ that's mean one thing

Each pair of Eyde virtual particles is nothing but a virtual line black hole i.e. a black hole in one space dimension disappears with the inhalation of the Eyde virtual particles appears and disappears again due to its virtual nature and its linear since it's in one spatial dimension act.

If we took my previous calculations for the cosmological constant as a reference estimation point then in the Planck level due to the effects of the Eyde quantum field there are roughly (449,792) virtual linear black holes in every cubic centimeter of vacuum that distorting space-time with a factor of $\left(\sqrt{2}\right)$ exclusively in Planck level and that will let other virtual particles to move faster than the speed of light in respect to us but in their frame of reference they move less than there speed of light and they follow updated factor (γ_T) and updated transformations it's exactly as Lorentz transformations but with the updated factor (γ_T)

$$; \gamma_T = \frac{1}{\sqrt{1 - \left(\frac{v}{c\left(\sqrt{2}\right)^{\left(\frac{2M}{m_p}\right)}}\right)^2}} ; \frac{2M}{m_p} \geq 1$$

We should note that for $\left(\frac{2M}{m_p}\right)$ condition higher than one there are extra time-disguised dimensions for each step.

We saw that high energy do not reveal higher space dimensions, but reveal extra time dimensions and all that about measuring the speed of light differently between two frames of reference one of them accelerated in relative to the other one that's mean there is no extra higher space dimension and any theory relying on extra higher space dimension should be excluded and should be considered as nothing but unnecessary mathematical fantasy.

The amount of time is determined by the speed of light and the difference between two differently accelerated frames of reference.

The direction of time is determent by the entropy.

That means time didn't come from the big bang since there is no enough high energy that will generate more space-time without original space-time and we observed that both in black hole singularity and in the Eyde quantum field.

13. Space-time hoofing:

For local observer in an ordinary gravity well any mass that exceeds $\left(\frac{2M}{m_p}\right)$ condition moving at a relativistic speed then the relativistic mass will be added to the total mass as follows:

$$\therefore t_g = t_{ob}\sqrt{\left(1 - \frac{r_{Br}}{r}\right)} \; ; r_{Br} = \frac{2GM}{c^2} \; ; M = m_\circ(\gamma \cos(t)) ; \gamma = \frac{1}{\sqrt{1 - v^2/c^2}} \; ; 0 \le t \le \pi ; v$$

$$= \textit{the velocity of the gravity well} \dots \boxed{4.4}$$

We will have a different rate of gravitational time dilation that's vary with angle and this will create a gravity around the accelerated mass i.e. artificial gravity or artificial antigravity

This effect just looks to me like a mule's hoof or a donkey's hoof pushing in a run.

14. Experimental results:

Since the speed of light is independent of the direction of the moving source and the observer i.e. it is only dependent on the nature of the empty space itself:

$$c = \frac{1}{\sqrt{\varepsilon_\circ \, \mu_\circ}} \; ; \varepsilon_\circ = \frac{q}{\Phi_E} = \frac{q}{E4\pi r^2}\hat{r} \; ; \; \mu_\circ = \frac{B}{H}$$

Then, changing the distance from a large gravity well and not the direction this will change the nature of the empty space itself due to gravitational blueshift, thus, we should detect a notable interference pattern.

We could detect this by setting up a vertical Michelson-Morley experiment relative to the Earth (and not parallel to the Earth or horizontally). In this way, when we rotate the Michelson's interferometer 90 degrees; we should get a significant change due to gravitational redshift and blueshift, which responds to the change in the speed of light as follows:

$$c' = \frac{1}{\sqrt{\varepsilon_\circ \, \mu_\circ \left(1 - \frac{r_s}{r}\right)}} \; \therefore \Rightarrow c' = c\left(1 - \frac{r_s}{r}\right)^{-1/2}$$

This is not a new thing it's made before in Pound-Rebka experiment.

For the $90°$ rotation, I have a confirmed positive change in the central interference pattern from maxima to minima as follows.
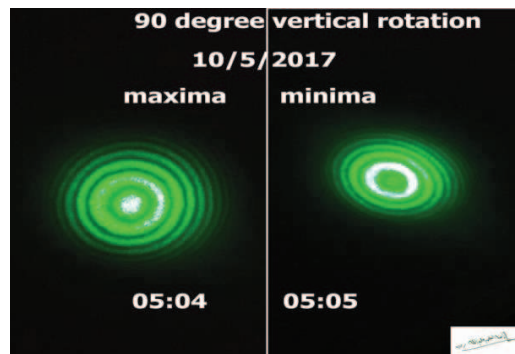
For more than $90°$ rotation I have a positive chnge in the central interference pattern from maxima to minima to maxima in the central interference pattern

10/5/2017
Little more than 90 degree vertical rotation

(04:27) maxima   (04:29) minima   (04:30) maxima
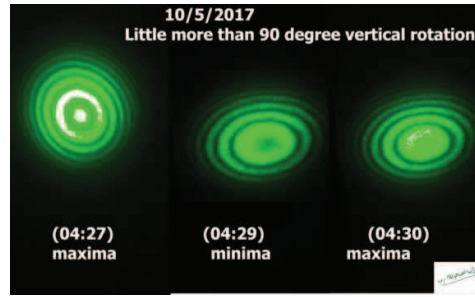
We could make an ordinary horizontal Michelson-Morley experiment, but next to a large mountain-chain so that the mass of the mountain-chain will act like a runaway gravity well and we will still get a positive change in the interference pattern.

However, detecting the space-time hoofing is much harder since it's depending on the movement of the earth so a vertical non-rotating interferometer in which it's horizontal arm oriented to the north or south to eliminate the Sagnac effect should be enough to do it

The justification for this is as follow

The earth is a gravity well and since its revolving around the sun then it should gain a relative mass and according to my work the gravitational potational should be different for a fixed observer but since the earth revolving around itself then the velocity rate of this movement is relative to an observer on the surface of the earth is changing with this rotation as in equation 4.4.

$$\therefore \Rightarrow t_g = t_{ob}\sqrt{\left(1 - \frac{r_B}{r}\right)} \, ; r_B = \frac{2GM}{c^2} ; \mathrm{M} = m_\circ(\gamma \cos(t)) ; \gamma = \frac{1}{\sqrt{1 - v^2/c^2}} ; 0 \le t \le \pi ; \dots \boxed{4.4}$$

I got a lot of results considering the same temperature and the minimum time elapsed to remove as possible the earth tilting effect and any thermal effect on the interferometer

The folowing are some of these results

21-4-2017 (05-00)H;21.5c   21-4-2017 (05-55)H;21.5c

(01:49)s 23/4;23.5c   (02:32)s 23/4;23.5c   (03:16)s 23/4;23.5c
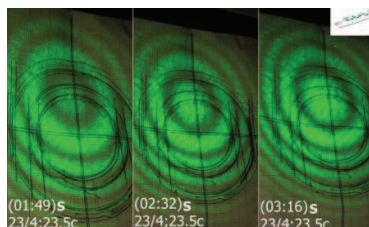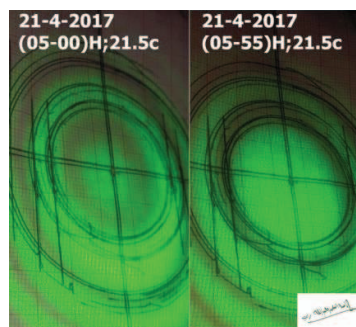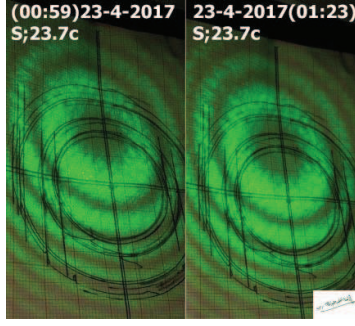
15. Conclusions

1. An observer at infinity or an observer in a flat space-time observing an event in a curve space-time or an observer in a relatively flat space-time observing an event in a curve space time,mathmaticly all are the same thing and we call this in general reativity a non-local observer , in such a circumstances the differences in space-time curvature due to gravity will affect the electric flux and since the electric charge is conserved and since light and virtual photons have zero time and zero rest mass then time dilation will not adjust to correct this change as it happens to other elementary particles then this will affect the electric permittivity of free space in which will affect the speed of light only for a non-local observer as follows.

$$\because (\Phi_E) = E4\pi R^2 \quad \therefore \Rightarrow \Phi_E{}' = \frac{E4\pi R_\circ{}^2}{\left(1 - \frac{r_s}{r}\right)}$$

$$\because \varepsilon_\circ = \frac{q}{\Phi_E} = \frac{q}{E4\pi R^2} \quad \therefore \text{ under gravity} \Rightarrow \varepsilon' = \frac{q}{E\frac{4\pi R_\circ{}^2}{\left(1 - \frac{r_s}{r}\right)}} \Rightarrow \varepsilon' = \varepsilon_\circ\left(1 - \frac{r_s}{r}\right) \because r_s < r \therefore \Rightarrow \varepsilon' < \varepsilon_\circ$$

for a black hole in respect to an observer from flat space-time i.e nonlocal observer, we have

$$\left[c_T = c(\sqrt{2})^{\frac{2M}{m_p}} \right]$$

2. Since space-time interval at the black hole singularity is well defined to be equal to zero as I show before then space-time is a continuous physical entity and not discrete.

$$\because \text{space–time interval at singularity} \equiv ds^2 = -\left(\frac{1}{2}\right)c^2\left(-\frac{\pi}{c^2 4}\right) + \frac{\left(i\frac{\sqrt{\pi}}{4}\right)^2}{\left(\frac{1}{2}\right)} \quad \therefore \Rightarrow ds^2 = \left(\frac{\pi}{8}\right) - \left(\frac{\pi}{8}\right) = 0$$

We observed that at the center of the black holes with the previous equations such that we have a smooth transition from Planck length to half Planck length to less than that until we reach zero without generating singularities

$$near\ black\ hole\ center\ ;\ r_s = l_p \Rightarrow length\ element\ at\ the\ singularity = i\frac{\sqrt{\pi}}{4} = \frac{l_p}{2}$$

3. Spae-time is not aether because its non-draggable entity it only changes under gravity through time dilation i.e. differences in space-time curvature due to gravity and this is what separate space-time from the aether i.e. $\left(\frac{2M}{m_p}\right)$ condition and $\left(\frac{2M}{m_p}\right)$ ratio

$$\therefore \Rightarrow c' = \frac{1}{\sqrt{\mu_\circ \varepsilon_\circ \left(1 - \frac{r_s}{r}\right)}} \quad \therefore \Rightarrow c' = c\left(1 - \frac{r_s}{r}\right)^{-1/2} \dots \boxed{1.3}$$

$$\therefore \ c.(T) = \frac{c}{\left(\sqrt{1 - \frac{1}{2}}\right)^{\frac{2M}{m_p}}} = \frac{c}{\left(\frac{1}{\sqrt{2}}\right)^{\frac{2M}{m_p}}} \ ; (T) = \left(\sqrt{2}\right)^{\frac{2M}{m_p}} \ \therefore \Rightarrow c_T = c\left(\sqrt{2}\right)^{\frac{2M}{m_p}} \dots \boxed{6.3}$$

4. Gravity is nothing but curvature of space-time created by the probability distribution of the wave function of masses equal or bigger than half Planck mass, i.e. it's not a force its a reaction to the three other forces of nature as long these three forces act at minimum as half Planck mass $\left(M = \frac{m_p}{2}\right)$ and this is the minimum requirements to create curvature in space-time fabric in which we identify it as gravity,

I already proved this in driving equation $\boxed{5.3}$

In principle, gravity is not a weak interaction "gravity the difference between a curved and flat space-time i.e gravity depends on the difference of curvature and the relative depth of this curvature and this difference will increase as long as you have two things first a little difference between Schwarzschild radius and the dimensions of the mass in question and second the measurement point location to be at infinity or more specifically in a flat space-time

i.e. how much the difference in the space-time curvature between the measurement point and observer point and thats why its appear to us in most cases as a weak interaction due to the difference between Schwarzschild radius and the dimensions of the mass in question so when the diffrence between Schwarzschild radius and the dimensions of the mass in question become small the gravity efect become bigger and in dramatic way.

$$\text{for black hole} : \text{space time contraction factor} \equiv \frac{1}{\sqrt{2}} \ ; \frac{r_s{}'}{r_s} = \frac{i\frac{\sqrt{\pi}}{4}}{i\frac{\sqrt{\pi}}{2}} = \frac{1}{2}$$

$$\text{for other gravity wells} : \text{space time contraction factor} \equiv \left(1 - \frac{r_s}{r}\right)^{-1/2} ; r \gg r_s$$

i.e. elementary particles do not meet half Planck mass so it cannot affect space-time until space-time affected by a mass scale bigger than or equal to half Planck mass i.e. $\left(M = \frac{m_p}{2}\right)$ or its equivalent of energy and that's mean a gathering of molecule reaching half Planck mass will curve space-time but the atoms and the elementary particles that make this molecule will not.

In simple words, an electron traveling through a double-slit experiment will not affect space-time but a cluster of molecules with a mass equal to or bigger than half Planck mass will bend space-time as its traveling through space and when it passes through the double-slit its wave function will change and its gravity effect will change too

5. Dark energy is nothing but first -order $\left(\frac{2M}{m_p}\right)$ condition quantum field fluctuations $\left(\frac{2M}{m_P} = 1\right)$ and it's calculated as follows

$$\Lambda = \frac{-3\,k_B K\,\ln\left(\Omega\sqrt{2}\,\right)}{\pi^2 l_p}\left(\frac{1}{\gamma}\right)$$

By taking the appropriate relative velocity for Lorentz factor and the appropriate multiplicity (Ω) we will get energy density exactly equal to the experimental value of the cosmological constant For example if we take the multiplicity $\{\Omega = 4\}$ and the relative velocity very close to the speed of light with 34 digits after the comma to be compatible with Planck length in the equation as follow

$$(V = 299{,}792.457{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}8\;{}^m/_s)$$

$$\therefore\Rightarrow \left(\frac{V}{c} = 99.9999999999999999999999999999999999933287181\%\right)$$

$$\therefore\Rightarrow \Lambda = -1.4028 \times 10^{-9}\;\;(J.\,m^{-1}.\,s^{-2}.\,c^{-2} \equiv J.\,m^{-3})$$

This value is in (93.5%) from the average current experimental accepted values

6. Generalizing the cosmolgical constant formula $(\Lambda_\circ)$ to include higher energies this will prevent the vacuum catastrophe since the infinite fluctuations of the quantum field will fight against high numbers of $\left(\frac{2M}{m_p}\right)$ in which will bring it all to zero.

$$\Lambda_n = \frac{-3\,k_B K\,ln\left(\sqrt{2}\,\Omega\right)}{(\pi)^2\left(i\frac{\sqrt{\pi}}{4}\right)^{n-1}\left((\gamma_{T2})(\gamma_{T3})(\gamma_{T4})\cdots(\gamma_{Tn})\right)(l_p)(\gamma)}\;;(J.\,m^{-1}.\,(s.\,c)^{-(n+1)});\left(\frac{2M}{m_p}n\right.$$
$$\left.\to\infty\right)\dots\boxed{1.8}$$

7. Since the cosmological constant formula is temperature-dependent then the expansion of the universe was bigger in the past due to the early universe high temperatures so it could help us to solve cosmic inflation problem for example if we input Planck temperature to see how the cosmological constant act in the Planck era then we will have really a different expansion by a factor of (10^{32}) if we took my previous result as an estimation reference point then:

$$\therefore\Rightarrow \Lambda_p = -\frac{3c^4\,\ln\left(\sqrt{2}\,\Omega\right)}{\pi^2\,G\,\gamma}$$

$$\therefore\Rightarrow G = \frac{3c^4\,\ln\left(\sqrt{2}\,\Omega\right)}{\pi^2\,0.7361 \times 10^{23}}\frac{1}{\gamma}$$

at $\Omega = 4$ & at $v = 299792457.999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}8$ m/s

$$\therefore\Rightarrow \frac{v}{c} = 99.9999999999999999999999999999999999933287181\%$$

$$\frac{1}{\gamma} = 1.1551 \times 10^{-21}$$

$$\therefore\Rightarrow \Lambda_p = -0.7361 \times 10^{23}\;\;(J.\,m^{-1}.\,s^{-2}.\,c^{-2} \equiv J.\,m^{-3})$$

Since the temperature effect the expansion then the universe will never stop expanding since the absolute zero is impossible basically the big bang is not a repeatable event at anyway.

8. Dark atter is nothing but third-order $\left(\frac{2M}{m_p}\right)$ condition quantum field fluctuations $at \left(\frac{2M}{m_P} = 3\right)$

$$Dark\ matter\ density = \frac{\Lambda_3}{c^2} = \frac{3(4)^2\ k_B K\ ln(\sqrt{2}\,\Omega)}{(c^2)\ (i)^4\ (\pi)^3(\gamma_{T2})(\gamma_{T3})(l_p)(\gamma)}; (kg.m^{-1}.(s.c)^{-(4)}) \equiv (kg.m^{-3})$$

$$at \left(\frac{2M}{m_P} = 2\right) \Rightarrow c_{T2} = c\left((\sqrt{2})^2\right) = 599{,}584{,}916\,\frac{m}{s}$$

By taking the virtual particle speed in the second extra time disguised dimension as follow

$$v_{T2} = 593{,}320{,}000\,\frac{m}{s}, at \left(\frac{2M}{m_p} = 2\right)$$

$$at \left(\frac{2M}{m_P} = 3\right) \Rightarrow c_{T3} = c\left((\sqrt{2})^3\right) = 847{,}941{,}120.0015329554957764343 6342\,\frac{m}{s}$$

By taking the virtual particle speed in the third extra time disguised dimension as follow

$$v_{T3} = 839{,}081{,}190.82720475435501 79538481\,\frac{m}{s}$$

$$\therefore \Rightarrow \gamma_{T2} = \gamma_{T3} = 0.1441816003705216436389$$

$$\therefore \Rightarrow Dark\ matter\ density = 5.3964586 \times 10^{-27} \times 10^{-27}; (kg.m^{-1}.(s.c)^{-(4)}) \equiv (kg.m^{-3})$$

Experimentally the dark matter density in the universe is around $(5.423 \times 10^{-27}; (kg.m^{-3}))$ in the assumption of flat universe then this will put our results to be within an accuracy of [96%] from the average current experimental values.

9. As we saw in generalized cosmological constant formula (Λ_G) when we add enormous energy then this will not reveal higher space dimensions instead of this it will only change the measure of the speed of light between a different accelerated frame of reference and this will be translated mathematically into disguised time dimensions and not a higher space dimensions.

$$\Lambda_n = \frac{-3\ k_B K\ ln(\sqrt{2}\,\Omega)}{(\pi)^2 \left(i\frac{\sqrt{\pi}}{4}\right)^{n-1} ((\gamma_{T2})(\gamma_{T3})(\gamma_{T4})\cdots(\gamma_{Tn}))(l_p)(\gamma)}; (J.m^{-1}.(s.c)^{-(n)}); \left(\frac{2M}{m_p}n \to \infty\right)\dots\boxed{1.8}$$

10. The big bang singularity in expansion terms is as follows

$$\Lambda_\circ = -\frac{3\ c^4\ ln(\sqrt{2})}{\pi^2\ G}; for\ the\ assumption\ of\ no\ prior\ causality\ ; (\Omega = 1\ i.e. \equiv 0)$$

$$\therefore \Rightarrow \Lambda_\circ = -1274.9 \times 10^{40}(J.m^{-3})$$

$$; \Lambda_\circ \equiv the\ cosmological\ constant\ at\ (t \leq 0).$$

i.e. space-time expansion is a property for both space-time and it caused by space-time and by virtual particles with energies equal to half Planck mass.

space-time is prior to the big bang itself.

In a short word since I proved that the vacuum has entropy higher than zero with the vacuum entropy then space-time is prior to the big bang itself.

$$\text{vacuum entropy: } S_H = k_B \ln(\sqrt{2})$$

i.e. the universe has a beginning but the time has not.

11. We could drive gravitational constant from the original cosmological constant constant $(\Lambda_\circ)$ since it's the most basic elementary equation in physics, infact it's the only equation in which act on a plane and smooth space-time and without prior physical causality there is no other equation act like this and there is no wonder about this we are talking about the first act of physics and the beginning of creation itself

$$\therefore \Rightarrow \Lambda_\circ = -\frac{3 \ln(\sqrt{2})}{\varepsilon_\circ^2 \mu_\circ^2 \pi^2 G} \quad \therefore \Rightarrow G = \frac{3 \ln(\sqrt{2})}{\varepsilon_\circ^2 \mu_\circ^2 \pi^2 \Lambda_\circ}$$

If we use a less precise approach as Planck era expansion and we use my previous estimation as a reference point then

$$\therefore \Rightarrow \Lambda_p = -\frac{3\sqrt{\frac{\hbar c}{G}} c^2 \ln(\sqrt{2}\,\Omega)}{\pi^2 \sqrt{\frac{\hbar G}{c^3}}} \frac{1}{\gamma} = -\frac{3c^4 \ln(\sqrt{2}\,\Omega)}{\pi^2 G \gamma}$$

$$\therefore \Rightarrow G = \frac{3c^4 \ln(\sqrt{2}\,\Omega)}{\pi^2 \, 0.7361 \times 10^{23}} \frac{1}{\gamma}$$

at $\Omega = 4$ & at $v = 299792457.999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}999{,}8$ m/s

$$\therefore \Rightarrow \frac{v}{c} = 99.99999999999999999999999999999999999999933287181\%$$

$$\frac{1}{\gamma} = 1.1551 \times 10^{-21}$$

$$\therefore \Rightarrow G \cong 6.6947 \times 10^{-11} \left(\frac{m^3}{kg.\,s^2}\right)$$

12. Time is the scale of causality transmion rate and the dissipation of its sequential order ;where its amount or its "causality transmion rate" decided by the speed of light and the relative speed of light in which decided by updeated factor (γ_T) $\left(\frac{2M}{m_p}\right)$ condition inwhich decided by the following law

$$\because c' = c \left(1 - \frac{r_s}{r}\right)^{-\frac{1}{2}} ; \text{as measured by observer at infinity}$$

$$c_T = c(\sqrt{2})^{\frac{2M}{m_p}} ; M = n\frac{m_p}{2} ; n = 1,2,3 \dots,$$

and its direction decided by the law of vacuum entropy

$$[S = k_B \ln(\sqrt{2}\Omega)] \ \& \ [S_H = k_B \ln(\sqrt{2})]$$

Then for an accelerated frame of reference that creating a variance in the speed of light from a non-local prespective ,this will create a time-disguised dimension in relative to an observer at infinity in another frame of reference and since the speed of light in vacuum is decided by Maxwell law

$$\left[c' = \frac{1}{\sqrt{\mu_\circ \epsilon_\circ \left(1 - \frac{r_s}{r}\right)}} \right], \left[c_T = \frac{(\sqrt{2})^{\frac{2M}{m_p}}}{\sqrt{\mu_\circ \epsilon_\circ}} \right]$$ Since the vacuum has an entropy.

$[S_H = k_B \ln(\sqrt{2})]$ then time exists before the big bang itself and time cannot be zero nor reversed even when entropy get lucky and arrange the system to be less random even in this case then due to vacuum entropy then the system will get more random, and thus time cannot be zero nor reversed.

13. For the experimental part, this is not a new thing it was done in Pound and Rebka gravitational red-shift in nuclear resonance experiment[5] and and this does not violet the special relativity simply because special relativity is exclusively for the non-accelerated frame of reference but here due to gravity we have an accelerated frame of reference.

14. The surface temperature of the black hole is as follows,
$$K_T = \frac{K_{TP}}{M_T}; K_{TP} \cong 4.448 \times 10^{24} \text{kg. K}$$

15. Black hole entropy is vacuum entropy multiplied by $\left(\frac{2M}{m_p}\right)$ condition of that black hole

$$\left[S_T = \frac{2M}{m_p} k_B \ln \sqrt{2} \right]$$

16. The virtual particles with energy equal to half Planck mass are bending space-time at Planck level and elevating the speed of light by a factor of $\left(\sqrt{2}^{\left(\frac{2M}{m_p}\right)} \right)$ for an outside observer and that

will let other virtual particles to move faster than the speed of light in respect to us but in there frame of reference they move less than there speed of light and they follow the updated factor (γ_T) and updated transformations it's exactly as Lorentz transformations but using the updated factor (γ_T)

$$; \gamma_T = \frac{1}{\sqrt{1 - \left(\frac{v}{c(\sqrt{2})^{\left(\frac{2M}{m_p}\right)}} \right)^2}}$$

17. Space-time is not aether because aether is a medium filling the vacuum and dragged by any mass moving through it while space-time is a physical fabric with special properties it could expand to infinity and constrict to zero in response to an exclusive wave function of masses that follows $\left(\frac{2M}{m_p}\right)$ condition and unlike aether, it can not be affected with any mass less than half Planck mass condition, in fact, it affected exclusively by the wave function of masses equal or more than half Planck mass and I have proven this previously when I calculated the changing in the speed of light due to $\left(\frac{2M}{m_p}\right)$ condition in equation ($\boxed{5.3}$ & $\boxed{6.3}$ & $\boxed{7.3}$)

29

$$\left[M = n\frac{m_p}{2} \;\; ; n = 1,2,3 \dots \right], \left[c_T = c(\sqrt{2})^{\frac{2M}{m_p}} \right], \left[t_g = t_{ob}\sqrt{2} \right]$$

And it's unlike aether it's un-draggable and it will only change its nature due to gravity.

18. Any gravity well moving in a relative speed should gain a relative mass and according to my work the gravitational potational should be different for a fixed observer as example observer on the serface of the earth since the earth revolving around itself then the velocity rate of this movement is relative to this observer is changing with this rotation as follows

$$t_g = t_{ob}\sqrt{\left(1 - \frac{r_{Br}}{r}\right)} \;\; ; r_{Br} = \frac{2GM}{c^2} ; M = m_\circ(\gamma \cos(t)); \gamma = \frac{1}{\sqrt{1 - v^2/c^2}} ; 0 \le t \le \pi; v$$

$$= the\ velocity\ of\ the\ gravity\ well \dots \boxed{4.4}$$

And this change in gravitational time dilation which direction dependent is nothing but an artificial gravity & artificial anti-gravity

We will have a different rate of gravitational time dilation that's vary with angle and this will create a gravity around the accelerated mass i.e. artificial gravity or artificial antigravity

This effect just looks to me like a mule's hoof or a donkey's hoof pushing in a run.

19. For a rotating black-hole the relative mass due to the rotational velocity will effect as follow

$$\therefore \Rightarrow r_{Sf} = \frac{2Gm_{\circ T}}{c^2}; \; m_{\circ T} = \frac{M(\gamma \cos(t))}{(2)^{\left(\frac{2M}{m_p}\right)}}; \frac{2M}{m_p} \ge 1; \gamma = \frac{1}{\sqrt{1 - v^2/c^2}} ; 0 \le t \le \frac{\pi}{2}; \dots. \boxed{2.4}$$

$$at\ (t) = \frac{\pi}{2} \therefore \Rightarrow r_{Sf} = 0 \dots. \boxed{3.4}$$

i.e. black holes are drilled from the pools to the center with cylinder of a radius of Planck length

Since the Schwarzschild radius will always run away from anything falling in the black hole, such that the virtual particles at mostly will not be separated and it fall together in the black hole and when it reaches the center it should leave through this drill which penetrates the black hole from the center to its poles since at the poles all the way to the center Schwarzschild radius is zero

This is appropriate solution for losing matter to the black hole singularity, the information paradox and the relativistic jets.

20. Since the vacuum entropy $\left[S_H = k_B \ln\left(\sqrt{2}(\Omega)\right) ; in\ vacuum\ \Omega = 1 \right]$, then both Boltzman entropy law and Landauer's principle should be revision.

21. The fine-structure constant does not affect by gravitational blue-shift or by the quantum field of energies equal to or bigger than half Planck mass since the fine-structure constant is considered a local observer,

$$\because c' = c\left(1 - \frac{r_s}{r}\right)^{-1/2}\,; (c')\ \text{as measured by an observer at infinity}$$

since elementary particles are local observer $\therefore \Rightarrow c' = c\ \therefore \Rightarrow \alpha\ \text{constant}$

16. Key features

- *equation numbering is as follows* $\boxed{a.b}$; $\boxed{a}$ *is equation number and* $\boxed{b}$ *is chapter number*

- $\varepsilon_\circ \equiv \text{the electric permittivity of the free} - \text{space}$

- $\mu_\circ \equiv \text{magnetic permeability of the free} - \text{space}$

- $\Phi_E \equiv \text{electric flux}$

- $q \equiv \text{electric charge}$

- $E \equiv \text{electric field}$

- $M \equiv \text{mass of the gravity well}$

- $\Phi \equiv \text{gravity potential}$

- $G \equiv \text{Gravitational constant}$

- $r \equiv \text{gravity well radius}$

- $c' \equiv \text{updated speed of light due to gravity as measured by an observer at infinity}$

- $v \equiv \text{photon frequency in free} - \text{space}$

- $v_g \equiv \text{photon frequency near a gravity well, i.e., blue} - \text{shifted}$

- $t_g \equiv \textit{the proper time at the surface of the gravity source}$
- $t_{ob} \equiv \textit{the proper time at the observer point}$

- $\lambda \equiv \text{wavelength}$

- $\lambda_g \equiv \text{wavelength near gravity well blue} - \text{shifted as measured by an observer at infinity}$

- $R = \text{shrinking length of space–time due to gravitational effects}$

- $R_\circ = \text{ordinary length of space} - \text{time free of any effect of gravity}$

- $\varepsilon' \equiv \text{updated electric permittivity of the free} - \text{space due to gravity}$

- $ds^2 \equiv \text{space–time interval}$

- $r_s \equiv \text{Schwarzschild radius}$

- $r_s' \equiv \text{updated Schwarzschild radius due to gravity as measured by an observer at infinity}$

- $dr_s^{\,2} \equiv \text{line element squared in Schwarzschild metric}$

- $dt_s^{\,2} \equiv \text{time element squared in Schwarzschild metric}$

- $l_p \equiv \text{Planck length}$

- $m_p \equiv$ Planck mass

- $M \equiv$ gravity well mass

- $\left(T = (\sqrt{2})^{\frac{2M}{m_p}}\right) \equiv$ (T) ration

- $c_T \equiv$ speed of light at event horizon as calculated by an observer at infinity

- $\left(r_T = i\frac{\sqrt{\pi}}{4}\right) \equiv$ black hole ratio radius

- $r_B \equiv Schwarzschild\ radius\ due\ to\ relativistic\ mass\ effect$

- $\hbar \equiv$ Planck reduced constant $= (h/2\pi)$

- $k_B \equiv$ Boltzmann constant

- $S \equiv$ entropy

- $S_H \equiv$ vacuum entropy i. e. empty space $-$ time entropy

- $\Omega \equiv$ microstates multiplicity

- $K_T \equiv$ blackhole Surface temperature for a local observer

- $S_T \equiv$ black hole entropy

- $U \equiv$ energy in thermodynamic part

- $\gamma \equiv$ Lorentz factor

- $\gamma_T \equiv$ updeated factor

- $F_p \equiv$ Planck force

- $g \equiv$ surface gravity

- $\alpha \equiv$ fine-structure constant and the graviton effects

- $\Lambda_\circ \equiv$ cosmologecal constant at $(t = o)$

- $\Lambda_P \equiv$ cosmologecal constant at Planck era

- $\Lambda_G \equiv$ Generalized cosmological constant for energies higher than half Planck mass

17. Acknowledgements

18. References

1.   A. Einstein, On the influence of gravitation on the propagation of light. Annalen of Physiks 35, 898-908 (1911). (http://www.relativitycalculator.com/pdfs/On_the_influence_of_Gravitation_on_the_Propagation_of_Light_English.pdf)

2.   Roger Penrose. On Gravity's role in Quantum State Reduction (1996), General Relativity and Gravitation journal. (https://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=8ACCBFD5BC4128BC957FF0B3BEC5EFE5?doi=10.1.1.468.2731&rep=rep1&type=pdf)

3.   Richard Feynman. Lorentz Transformations of the Fields (Lecture 26). In The Feynman Lectures on Physics Volume II. Table 26–4 .(http://www.feynmanlectures.caltech.edu/II_26.html)

4.   Steven Weinberg. The cosmological constant problem. (1989) REVIEWS OF MODERN PHYSICS (https://repositories.lib.utexas.edu/bitstream/handle/2152/61094/Weinberg_1989.pdf;jsessionid=B98D0C0094C5C596A3E1A7B08DDFD97D?sequence=1)

5.   Ryder, L. (2009). Introduction to General Relativity. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511809033

6.   M. Blau, Lecture Notes on General Relativity. Available from: http://www.blau.itp.unibe.ch/newlecturesGR.pdf

7.   W.Q. Sumner, On the variation of vacuum permittivity in Friedmann universes. The Astrophysical Journal, 429, 491-498 (1994). (http://adsabs.harvard.edu/full/1994ApJ...429..491S)

8.   Mohamed AHMED Abouzeid, Was Einstein in need to impose the stability of the speed of light in the Theory of Special Relativity.(file:///C:/Users/MJ/Downloads/Was-Einstein-in-need-to-impose-the-stability-of-the-speed-of-light-in-the-Theory-of-Special-Relativity.pdf)

9.   R. V. Pound and G. A. Rebka, Jr., Gravitational Red-Shift in Nuclear Resonance Phys. Rev. Lett. 3, 439 – Published 1 November 1959. (https://journals.aps.org/prl/pdf/10.1103/PhysRevLett.3.439)

---

[1] A. Einstein, On the influence of gravitation on the propagation of light. Annalen of Physiks 35, 898-908 (1911). (http://www.relativitycalculator.com/pdfs/On_the_influence_of_Gravitation_on_the_Propagation_of_Light_English.pdf)

[2] https://physicsworld.com/a/spacecraft-in-a-warp-bubble-could-travel-faster-than-light-claims-physicist/

[3] https://www.nasa.gov/vision/universe/starsgalaxies/Black_Hole.html
[4] https://wmap.gsfc.nasa.gov/universe/uni_matter.html
[5] In fact, there is a german physics enthusiastic his name is Mr. Martin Grusenick he made the first working vertical moving Michelson–Morley experiment and his work should be noticed
But he couldn't figure it out he even put a full demonstration and documentation on YouTube for his experiment with full results but his work was used by pseudoscience on the internet a lot (https://youtu.be/7T0d7o8X2-E)