Quantum Gravity Due to Geometry within a High Energy Density Field

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Abstract:

This theory of Quantum Gravity will describe the physical process which causes the force of Gravity. The energy of the vacuum causes photon pressure on every particle and energy wave in the universe. As interactions occur with the vacuum energy, it creates a locally uneven distribution of energy density. When another object is within a region of uneven density, it will be accelerated towards the object which created the variance in density. This theory uses the quite large energy of the vacuum 10^113J/m^3, C, and the small Planck length 10^-35m to calculate G, the gravitational constant.

Introduction:

We decided to tackle the current belief of the quantum vacuum and how it affects the world . We are attempting to find a proper solution to quantum gravity, and how it leads to the perceived normal gravity, as it seems that no reasonably complete solution has been found in the 100+ year search for the answer. We have a theory that may explain a lot of quantum gravity questions, which is what is shown below in the rest of this paper.

The core of this concept is that gravity is simply pressure from a high energy field;

$$F(Gravity) = E_{field} * Area\ of\ R_1 * \frac{r_2^2}{4D^2}(Blocked\ Ratio) * Density\ Correction\ factor$$

You would need a massive amount of field strength due to the field mostly canceling itself out due to the geometric structure proposed in this paper to create the gravitational pressure. The massless particles come from *The Field,* which is giant; 10^113. If 2 black holes are next to each other because of massless particle pressure they will move together because there are less massless particles in between the black holes

For the purpose of this paper, a few things will need to be assumed.

1. A) The observable universe is filled with a high energy field, which has an energy density of $4.63068 * 10^{113}$ joules/meters^3. This will be called *The Field*. (woah)
   B) A non-uniform density can be formed when the field interacts with waves or particles.
2. A maximal density sphere has an energy density of $4.63068 * 10^{113}$ joules/meters^3.

3. Any object with a density less than the maximal density can be corrected in any equations used to calculate maximal density objects with a number known as the 'density correction factor'. (Honestly, it's a lot easier to calculate with a known value than use many different numbers)
4. *Ap* is the cross-sectional area of a maximal density sized sphere to generate the density correction factor. With maximal density meaning equal to energy density of *The Field*.
5. The value of *The Field* (E_{vac}) appears to have a high level of uncertainly in the scientific community.
6. We will be using the term spheres for the objects that will be calculated. These spheres are assumed to be maximal density. One would be able to substitute the spheres with maximal density black holes, and the math would work out exactly the same. (Just saying)

Here are a few equations that will need to be known to go along with this:

- $r = \frac{2GM}{c^2}$ (This is for calculating the radius of the sphere, where *M* is the mass of the sphere and *R* is the radius)
- $V = \frac{4}{3}\pi r^3$ (This is simple geometry for calculating the volume of a sphere, where *V* is the volume, and *r* is the radius of the sphere)
- $A = \pi r^2$ (Again, simple geometry for calculating the area of a circle, where *A* is the area and *r* is the radius of the circle)
- $A = 4\pi r^2$ (Simple geometry for calculating the area of a sphere, where *A* is the area and *r* is the radius of the sphere)
- $F = \frac{M_1 M_2 G}{D^2}$ (This is a standard equation of gravitational force)

The properties of our field are stated as follows:

1. Standard Mass and Energy interacts/absorbs the energy field with a probability proportional to the Energy/mass
2. Objects that absorb the Energy Field will always emit it back in a random direction
3. The Energy Field produces no drag on moving particles due to thermal equilibrium
4. This field does not have a high probability with interacting with itself.
5. Again, it has a very high Energy Density, of 4.63068 * 10^{113} joules/meters^3
6. It has a relatively uniform Energy Density within our observable regions of space

7. Any energy emitted will be converted when considering that the field interaction and the particle that is interacting with it are a closed system
8. Local Regions of space will have a non-uniform Energy Density in the presence of standard matter and energy
9. The field is the quantum vacuum field predicted by application of Heisenberg's Uncertainty Principle

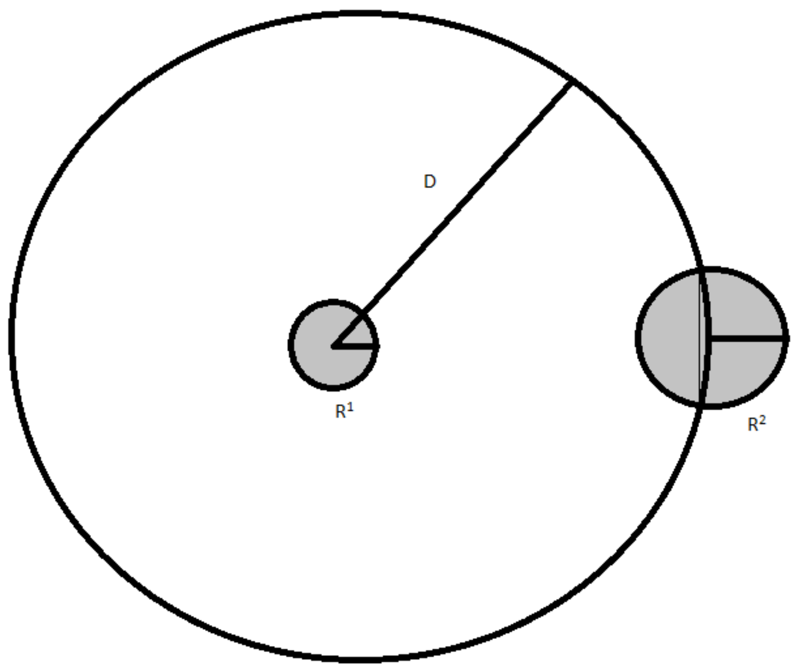

Figure #1

This diagram shows 2 spheres, and the relationship in distance between them. We are currently assuming they are fully dense, but if in any equation they will not be, a density correction factor can be inserted into the equation. *D* is the distance between the centers of each sphere. The thin line shown is a representation of a 2-D circle for simpler calculations.

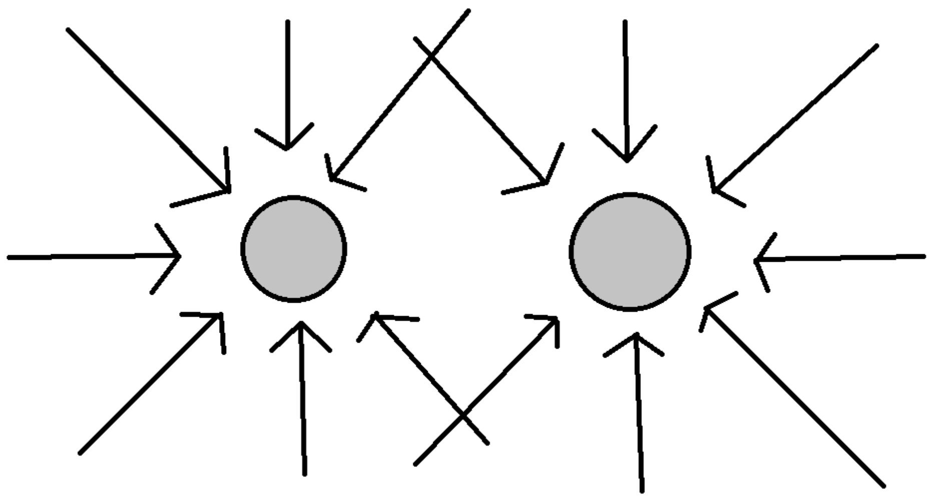

Figure #2

This diagram shows how massless particles interact with spheres. Massless particles have a property known as massless particle pressure, where any object hit by a massless particle will move in the direction the particle is traveling, because of the Law of Conservation of Momentum. Massless particles seem to logically come in and hit both spheres from all available angles. These massless particles are hitting these shown spheres in every direction and angle possible.

After the particles hit the spheres, the energy will be quickly absorbed, and then emitted back out again in a random direction.

In empty space, the spheres experiences a pressure similar to photon pressure. This can be substituted for any other massless particle, so we will call the force *MPS* (Massless Particle Pressure). These spheres do not have any net movement because an equal amount of pressure is being exerted from each side of the sphere. In a system like the one shown above, where the spheres are relatively close to each other, there is one spot where pressure is not exerted. In the space between the spheres. Since the spheres are close to each other, some of the particles that should be hitting one sphere are being blocked by the other sphere, so there is a 'gap' of pressure in between the two spheres.

Using this knowledge, one would be able to see that the spheres would start to be pushed towards each other. Since *MPS* is being exerted from all sides except the sides where they are facing each other, the net pressure is not 0, and like air moves into a vacuum to fill it up, the spheres will move towards each other. Gravity, anyone?

In order to calculate this, we will use an equation called the 'blocked ratio', which can tell us what percentage of massless particles being blocked by R_2. From Figure #1, the equation used would be $Blocked\ Ratio(\%) = \frac{Size\ of\ chord\ of\ r_2}{Area\ of\ Sphere\ D_1}$. This can be translated into:

$$Blocked\ Ratio(\%) = \frac{\pi r_2^2}{4\pi D^2}$$

This can be simplified to:

$$Blocked\ Ratio(\%) = \frac{r_2^2}{4D^2}$$

In order to find the gravitational force of R_1, this equation will be used:

$$F(Gravitational) = E_{field} * Area\ of\ R_1 * \frac{r_2^2}{4D^2}(Blocked\ Ratio) * Density\ Correction\ factor$$

We have assumed the cross-sectional area of fully saturated is $Ap = \pi r^2$. We are also assuming that $R = \sqrt{\frac{Ap}{\pi}} = \frac{lp}{\sqrt{\pi}}$

In real terms, that equation would look like this:

$$F = E_{field} * \pi r_1^2 * \frac{\pi r_2^2}{4\pi D^2} * \frac{\frac{lp}{\sqrt{\pi}}}{r_1} * \frac{\frac{lp}{\sqrt{\pi}}}{r_2}$$

In the above equation, *lp* stands for Planck length. Since lp^2 can be simplified to *Ap* (Planck area), the equation can be simplified to:

$$F = \frac{E_{field} * \pi * r_1 * r_2 * Ap}{4 * D^2 * \pi}$$

We can now replace every instance where either r_1 or r_2 comes up with the equation $= \frac{2GM}{c^2}$. To keep track of which sphere is being mention where, the subscripts will be moved to the *M* in the equation.

$$F = \frac{E_{field} * Ap * 4 * G * M_1 * M_2 * G}{4 * c^4 * D^2}$$

This can be simplified to:

$$F = \frac{E_{vac} * Ap * G * M_1 \ * M_2 * G}{c^4 * \ D^2}$$

Now, to simplify this to make it more comfortable and well known, we will cut it into two parts:

$$F = \left(\frac{E_{field} * Ap * G}{c^4}\right) * (\frac{M_1 * M_2 * G}{D^2})$$

An equation that was already defined is $F = \frac{M_1 M_2 G}{D^2}$, which is a standard equation for gravity that is accepted as a practical equation.

If one can assume that at normal values,$\left(\frac{E_{field}*Ap*G}{c^4}\right) = 1$, then our equation is basically equal to the current known value of gravity.

From the science world's knowledge, we have already calculated the numbers for a lot of the constants in this equation. The speed of light is 2.997 * 10^8. Planck area is 2.6121 * 10^{-70}.

The energy density of *The Field* can be calculated by $\frac{c^2 Mp}{Vp}$, where *Mp* is the Planck mass and *Vp* is the Planck volume. $Mp = 2.1765 * 10^{-8}$ and $Vp = 4.2217 * \ 10^{-105}$.

If $E_{vac} = \frac{c^2 Mp}{Vp}$ is correct, then we can solve it by substituting in the values. When we do that, we get $E = 4.63068 * 10^{113}$(This number, after these calculations, was realized to be basically the Plank energy density, which is $\frac{c^7}{\hbar G^2}$).Then, to calculate G from this, we would use the equation $G = \frac{c^4}{Ap * E_{vac}}$. By substituting in the variables, we get $G = 6.66979 * 10^{-11}$. The previously known value for *G* is $G = 6.67384 * 10^{-11}$. The difference between these two values of *G* are only within a 0.405% difference, which is within the tolerance for the values used in the calculations.

These calculations above assume a static physical system with the spheres of a stable size and mass. As the masses are absorbing a significant amount of energy from *The Field*, the spheres will either grow in size of need to emit an equal amount of energy. For the purposes of this paper, we have assumed these spheres would be in thermal equilibrium. If the energy density inside of the sphere equals the energy density outside the sphere with equal temperature and density, there may be energy exchanged, but no net change in density of the sphere.

When energy is absorbed by the sphere, and an equal amount emitted, the direction of emission will be a random direction if the temperature is uniform on the perimeter of the sphere.

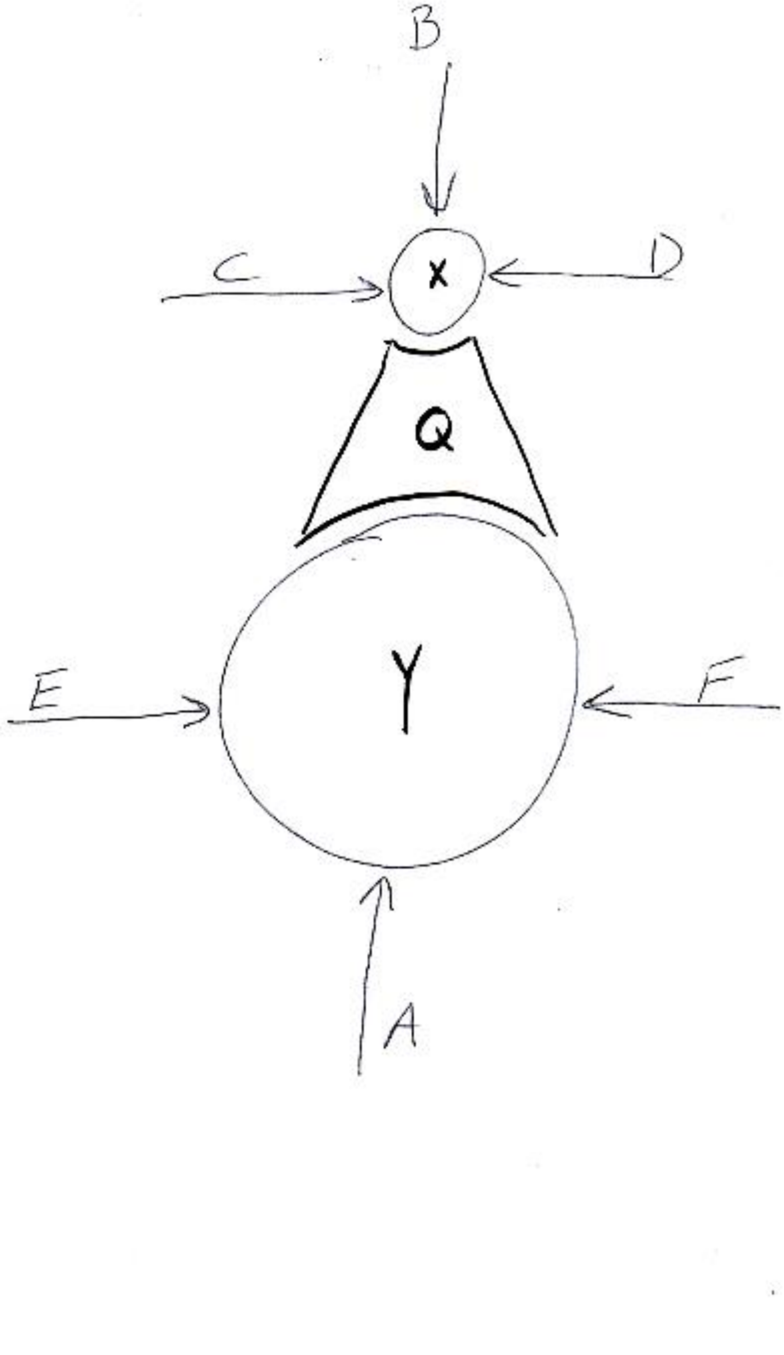

Figure #3

A,B,C,D,E, and F are all part of the Energy Field, interacting on ‘blobs’ of mass and energy X and Y. If C and D are exerting forces on mass X at an 180^{o}, then the net force would be 0. This same logic works for Energy Field Particles E and F and mass Y. Region Q will have a non-uniform energy density.

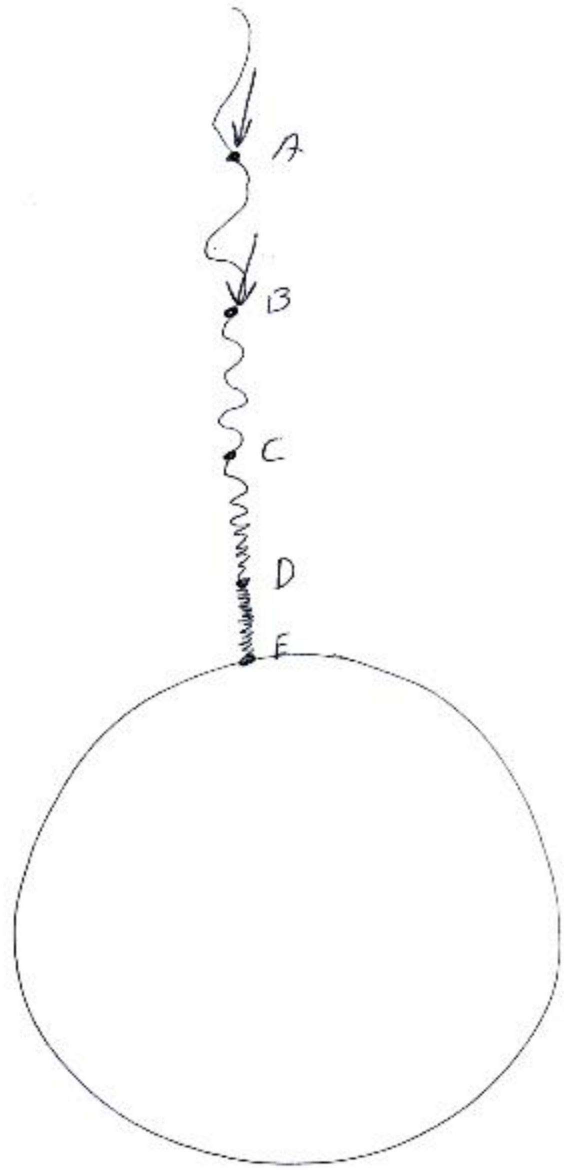

Figure #4

Quantized gravity:

A,B,C,D, and E represent quantized points where the target photon interacts with the Energy Field. The energy of the photon is increased with each interaction A,B,C,D,E leading to quantized, gravitational acceleration of the photon. Other interactions would occur at different angles, but they statistically cancel out (see Figure #4) with the interactions from the opposite direction.

The above paragraph helps explain how our theory is complaint with the classical tests of general relativity, such as 'Gravitational Redshift.' The above diagram shows the wavelength of light being shorter and having a higher energy as it moves towards the larger source of gravity. This will lead to a time going slower closer to the massive body than the time away from the massive body (perceived source of gravity).

It also can be seen in figure #4 that Gravitational Lensing of light would occur near a massive dense object due to the interaction with the field. This lensing would be the same curvature as predicted by general relativity as the gravitational force has been shown to be the same.

This quantized gravitational change in energy may be able to be verified with experiments.

One surprising result of this theory is the energy density of $4.63068 * 10^{113}$ does not lead to a near instantaneous gravitational collapse of all objects in the universe.

This theory is compliant with general relativity and special relativity. We will list all of the necessary points to each theory, and we will show that our theory is compliant with each of these points.

1. *The speed of light must be constant for all observers.* As no changes were made from accepted physics, I see no reason why our theory isn't complaint with this, so why not?
2. *All rules of the universe must be consistent with all inertial reference frames.* Again, there is no part of our paper that says otherwise…
3. *This theory is compliant with the equivalence principle.* An object in free fall will feel the same force acting upon it as if it was floating in space, which is nothing. This theory is compliant as an object in this quantized gravitational field would feel no effects relative to any non-supported object within the local region.
4. *The curvature of spacetime due to gravity; this can be viewed 2 ways:*
    a. *The curvature of spacetime may appear to be absent but it is in reality consistent with this theory.* This theory can be considered compatible with

curved space if curved space is defined as the path light takes near a massive body.

b. *Alternatively,* curved spacetime should be considered a non-physical approximation useful for analysis and predictions of objects as they interact with each other. In the end it seems that the very concept of space may need to be abandoned or redefined as something like simply a reference for the physical reality of information and interactions of waves, energy and matter, in the universe.

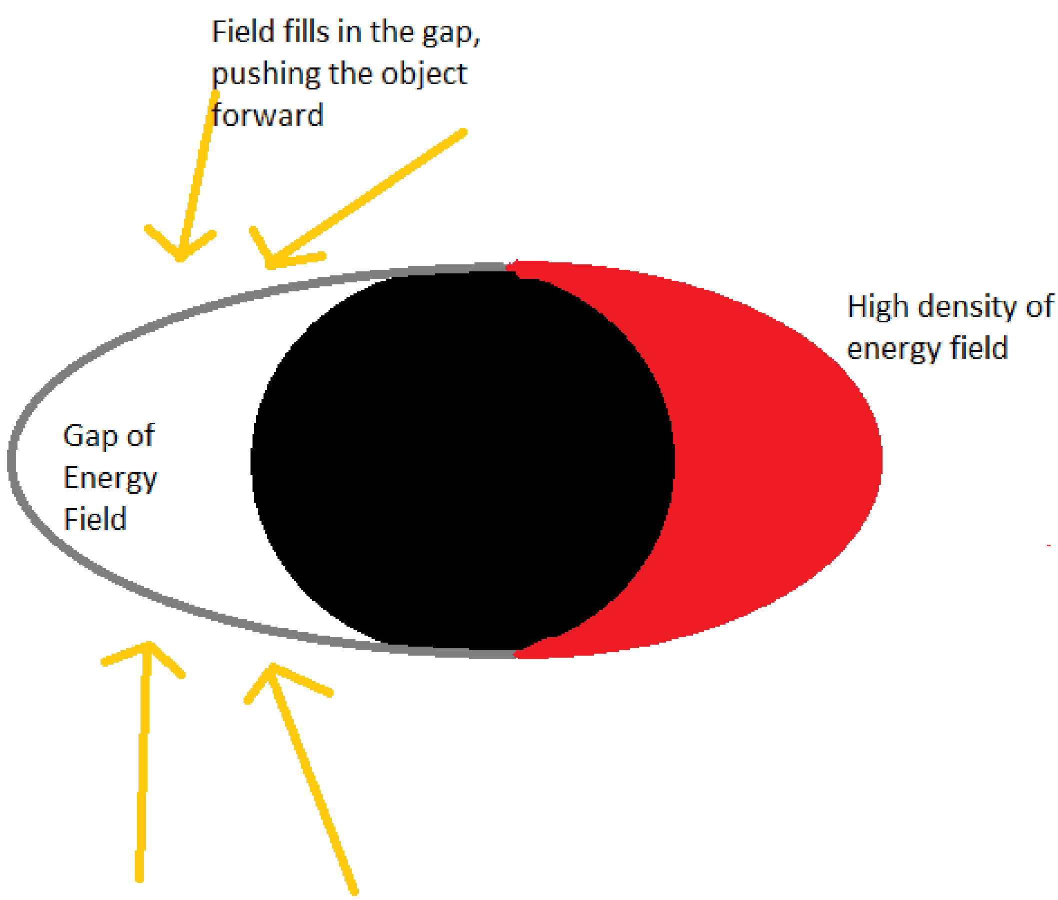

Figure #5

This diagram shows how there would be no drag in a closed system with only an accelerating sphere and the Energy Field. An argument that could be made against the energy field theory could be "There would be so much energy in front of an object for it to be able to even move". This is wrong, because the energy behind the sphere would be less than the energy density in all other places, so the energy field would fill in the 'empty' space, propelling the ball forward with the same speed that the ball in being push back at, causing a net force from the energy field of 0, meaning it would move normally. The best way to view this is from a thermodynamics point of view. The leading edge of the sphere would be hot, the trailing edge is cold. This would force more field emission on the redshifted trailing edge than the blueshifted leading edge.

In the unlikely event the core gravitational theory above is found to be correct or partially correct, here are some concepts to be explored in greater detail:

1: Masses will be gravitationally attracted towards each other, but unlike current theory, no singularity will occur even in a black hole. In the center of the black hole the masses form a big clump of matter like kitty litter which losses the gravitationally attraction because it reaches thermal equilibrium in the field. This is different from standard theory and is testable if anyone goes into the center of a black hole. The problem with the test is that there might be some casualties in the process.

2: A possible way to view matter is as a reduction in the field. Thus the maximum density of any mass is the density of the field the mass has displaced.

3: It is possible that the field interacting with itself caused the inflationary period of the universe. After the inflationary period, the field stopped interacting with itself but still kept its high energy density with the only observable effects are gravity and possibly the cosmological constant.

5: As galactic structures are observed to be moving away from each other and absorbing energy from the field while emitting energy at a lower wavelength, the even distribution of the field will be changed from curve A the curve B. see fig #6 below:

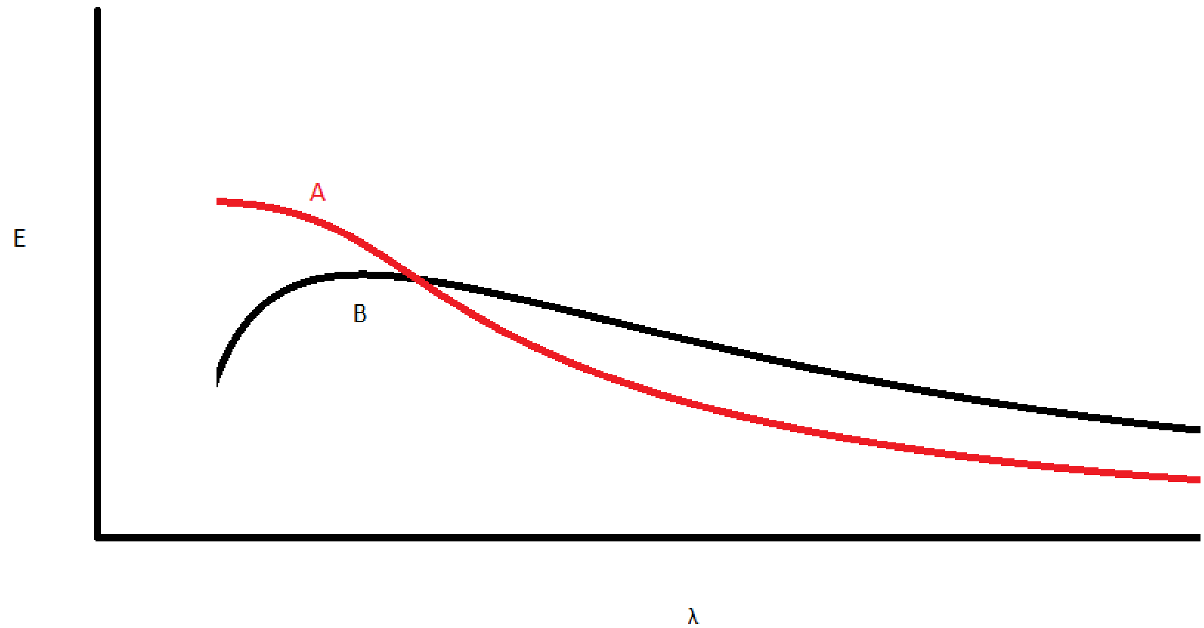

Figure #6

6: Possibly the inflationary period of the universe stared inflation at near zero energy density and has emitted a continuously higher density and will continue indefinitely higher. This would avoid the singularity at the beginning of the Big Bang as it would be a “soft start” with the first zero, then a non-zero energy density small enough that it statistically be unlikely to create any energy waves due to quantum mechanics. This small, but non-zero energy density would be indistinguishable from zero as it statistically would have the same null effect on the universe. It would then proceed to energy densities large enough to produce a measurable universe. The observable region of the universe seems to have a constant energy density and therefore non-changing fundamental constants. But, if our observable region of space is infinitesimally small relative to the total universe, the ratio of (change in energy density across the observable universe)/(median energy density of the observable universe) could be too small to measure, and therefore not measurable, which explains our observation that the energy density and therefore fundamental constants are the same throughout the entire universe.

Conclusion:

In conclusion, this theory has been shown to be identical to the observed gravitational force on large scales. On small scales, quantum effects can be predicted and hopefully tested.

Now I conclude this paper by stating that this is just a theory and we are probably wrong. But I strongly believe something in here is somewhat useful in more of our theories that we will work on in the future. And that is where I would like to end this paper on quantum gravity.