GRAVITATIONAL ACCELERATION EQUATION WITH WAVELENGTH AND SPEED OF LIGHT WITHOUT USING THE UNIVERSAL GRAVITATIONAL CONSTANT OF NEWTON

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Abstract

In this paper I derive an equation relating the gravitational acceleration with speed of light and the gravitational wavelength corresponding to the energy density at a point in space without using the gravitational constant of Newton (G).

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1. INTRODUCTION

The mathematical physicist Sir Isaac Newton in 1687 published his book "Philosophiae Naturalis Principia Mathematica" where he presented the law of universal gravitation empirically derived to describe and calculate quantitatively the mutual attraction of each particle and massive objects in the universe. In that document, Newton concluded that the attraction together two bodies is proportional to product of their masses and inversely proportional to the square of the distance that separates them.

However, these must be adjusted proportionalities by introducing a constant called Universal Gravitation (G) with an approximate value of 6.67428 × 10-11 N m2 kg-2 units in the International System. Without the introduction of this constant, the equation, lose their rationality and is impractical to calculate the force of gravity without it.

For Newton, gravity is considered a force exerted on a remote Instant. Moreover, when the gravity force is exerted by two or more bodies extremely mass, Newton's law has serious limitations and then must resort to the Theory of Relativity General stated by Albert Einstein in 1915, who says that gravity is not a force exerted to distance but a contraction of Space-Time produced by the presence of Energy-Matter (1).

However in the final formulation of the equations of the universe, to make it compatible with the law of conservation of energy and principles of general covariance, Einstein included geometric concepts such as the Ricci Tensor and scalar, but mainly the Energy-momentum tensor, but fails to integrate into said Energy-Momentum Tensor the constant Universal Gravitation Newton (G), as this is finally out of tensor ($T_{\mu\nu}$) in the second member of the equation.

While Einstein equation establishes the relationship between gravity, energy and geometry distortions space-time, it does not define the origin of the relationship.

In this regard, in 1995 Jacobson achieved considerable progress in linking the laws of thermodynamics to the Einstein equation and the equation of state correlates entropy with the area of energy flow (2).

Erik Verlinde published on January 6, 2010, his work "On the Origin of Gravity and the Laws of Newton" (3), which proposed that gravity is a reality entropic force emerging space. In its formulation, includes reduced Planck's constant, N as a Screen of information bits of space, adds a new constant called G, which ultimately found to be equivalent to the Universal Gravitational Constant. On that basis, Verlinde forecast to gravity as a fundamental force.

In March 2010, Jae-Weon Lee, Hyeong-Chan Kim and Lee Jungjai published a paper in which suggest that the Einstein equation can be derived from the principle of Landauers on the Elimination of information causal horizons, and conclude that gravity has its origin in quantum information (4). From then such work is also supported by Jacobson linking between thermodynamics and the equation Einstein, as well as on the work of Verlinde entropic force.

Thus, today we already have a strong linkage between energy, heat, temperature, laws of thermodynamics, general theory of relativity, perturbation of the geometry of space-time, entropy and quantum information, but somehow linking gravity and electrostatic force has failed in all these works that eventually drift to the Einstein equation and repeatedly use the constant of universal gravitation Newton (G).

Derive a gravity equation that eliminates the universal gravitational constant and link the gravitational acceleration with electrostatic acceleration requires first that the equation derived from the principal component of gravity, energy and its corresponding relationship with the invariance of Planck area, and the two tension vectors emerging from this area and generate electrostatic and gravitational waves as seen in the present work.

Newton's equation establishes the relationship between mass and gravity, while the equation Einstein relates the Energy-Momentum Tensor with the modification or distortion of space:

$$R_{\mu v} - \frac{1}{2} R g_{\mu v} + \Lambda g_{\mu v} = \frac{8\pi}{c^4} G T_{\mu v}$$

For particles at absolute rest, Einstein's equation has only one active component (T^{00}) of the Energy-Momentum Tensor ($T_{\mu v}$), dimensionally same as is defined by the equation:

$$T^{00} = \Upsilon^2 c^2 \mathrm{p}^2 \qquad (1.1)$$

Where Υ is the Lorentz factor, c the speed of light and p the energy density, so if you divide T^{00} between c^2 we simply obtain the energy density. That is, in real terms the Einstein equation defines the energy density is the curving space.

The problem of the Einstein equation is that the energy density in order to be equivalent to the curvature of space, requires the tensor ($T_{\mu v}$) is multiplied by the constant of universal gravitation Newton (G) and their corresponding dimensions.

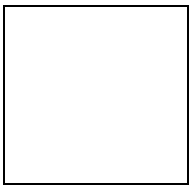
In view of the above, this paper begins from the energy (E) component and distribution or displacement in the area occupied promptly in space.

2. GRAVITATIONAL ENERGY DERIVED FROM PLANCK AREA

To derive the gravity equation, I need to hypothesize a priori that the particles at absolute rest, energy its distributed in a specific area of space and that this area has two main components (x, y) from which emerge two tension vectors on the space with different action and different time.

The first tension vector is considered by Einstein and in principle only generates the electrostatic force and the related electromagnetic phenomena, as the second tension vector becomes the cause of the gravitational interaction. However, the immediate question is where did emerge the second Tension vector?

To explain the above and get the answer, consider a priori a hypothetical particle whose Plank energy distribution in space is the area of a perfect square:



Y = $(lp * 2\pi) = \lambda_{[g]}$ = 1,0155241E-34 m

X = $(lp * 2\pi) = \lambda_{[e]}$ = 1,0155241E-34 m

Both the axis (X) and the axis (Y) corresponding to the Planck length (lp), if we multiply it by 2π then we get the Planck wavelength $\lambda_{[p]}$. Then immediately notice that the Planck energy density, has not one (1) but two (2) waves associated interaction.

Both sides of the square shafts or exert pressure on space, or in terms of Einstein, produce a Tension Vector. In the case of Axis (X) the Vector of Tension is exactly the same as Einstein, but in the case of axis (Y), a hypothetical still correspond Second Tension Vector or in the words of M. W. Evans, a Torque Vector.

However, in the case of the hypothetical particle Planck because either axes, or sides of the same length, and in the case of (Y) the Vector Pressure is perpendicular and contractive (from infinity to the X axis), then the two Tension Vectors cancel each other. In terms of the de Broglie wavelength to be exactly equal in length and width but opposite to each other, they cancel each other, so that an external observer cannot feel the presence of the particle or Planck on electrostatic terms or in gravity terms. It is then a particle "Null" or space "Empty".

By the law of conservation of the area, an electron or any other particle in the universe at absolute rest always retains the Planck area.

That is, if the axis (X) corresponding to the first Tension Vector (Wavelength De-Broglie) extends beyond the Planck length (*lp*), then proportionally the axis (Y) which corresponds to the Second Tension Vector is shortened (gravitational wave length). But also at the time, in which the wavelengths (X) and (Y) are different, they cease to cancel each other and so the electrostatic and gravitational effects are "visible" to outside observers.

In other words, we insist, Planck area is invariant when all particles are in absolute rest or even to non-relativistic speeds.

For example, let's see here graphically proportional representation of an electron according to Planck area:

Y = $(lp * 2\pi) = \lambda_{[g]}$ = 4,2504295E-57 m

X = $(lp * 2\pi) = \lambda_{[e]}$ = 2,4263178E-12 m

Note: The graph of the rectangle is not exactly proportional to the scalar quantities for obvious reasons.

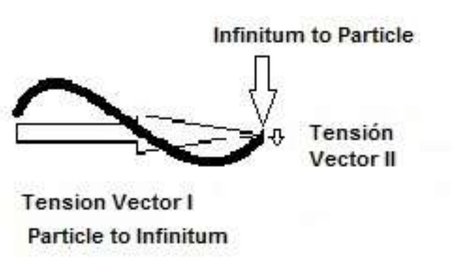
As can be observed in the electron because (X) is extended too much relative to the Planck length, then (Y) is shortened proportionately then being a wavelength excessively small but sufficient to generate the gravitational effects of the electron.

In the case of the electron, the Compton wavelength is about 2.4263170 E-12 meters, while the gravitational wave length is approximately 4.2504295 E-57 meters.

In the case of the earth, being an object (particle) with a large mass, the proportion is reversed, the Compton wavelength is about 3.7009 E-67 meters, while the gravitational wave length is about 0.027866232 meters, according to calculations using the equations, described later.

In other words, the particles and the mass objects have a spatial configuration with respect to the wave packet associated vibrating like strings or threads whose length in the X axis is much longer or shorter with respect to the Planck length but a width or thickness (Y axis) is proportional to the axis X excessively longer or shorter, but enough to be the sources of the gravitational effects..

To understand this, let's draw a conceptually wave example:

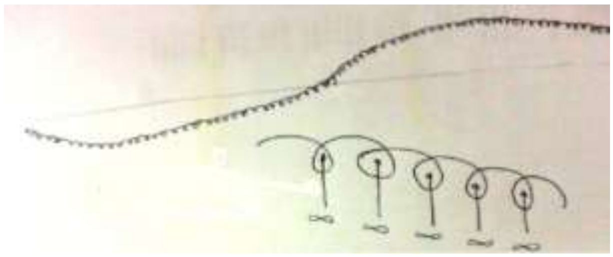


The physical interpretation of the Tension Vector I, not a major problem, because it is the product of the tangential acceleration of energy distributed in the wave curve along the wavelength (X axis) with the corresponding pressure on space.

While the physical interpretation of tension Vector II corresponds to the component of normal acceleration (gravitational acceleration) occurring Wave inward, ie towards the center of mass-energy. In this regard there are two possible interpretations:

I) The energy density distributed in the Wave, has a "thickness or wide" limit set by the Planck area (yarn thickness wave). In this case, the energy density pressure inside the particle itself.

II) A second possible interpretation is that the wave to advance, the vector has a torque space that causes progress turning on itself elliptical. Therefore the rotation or tension energy density causes a second acceleration towards the center of the elliptical rotation, then this acceleration corresponding to the gravitational acceleration.



Whatever the correct physical interpretation of Tension Vector II, in the end, this also generates a second emission wavelength with a corresponding length.

Moreover to calculate both wavelengths: Compton wave length (Tension Vector I), and wave length Gravitational (Tension Vector II), then we have to set the "Energy" which is the source of both.

If we make this definition from the Planck hypothetical particle that transforms into another particle conserving Planck area, then we need to be the axis (X) or Tension Vector I, which corresponds to the energy at absolute rest and which also corresponds to the extension or horizontal length, then we have to multiply the Energy Plank, quantified for this energy density at absolute rest. While the axis (Y) or Tension Vector II corresponds to the "gravitational energy", which in turn correspond to the width or orthogonal extension, then we also divided quantified according to the following equation:

$$\mathrm{E}_{\mathrm{p}}^{2} = (EpN)\left(\frac{Ep}{N}\right) \qquad (2.1)$$

Where Ep *is* Planck's energy and N is the ratio of the rest energy of any particle or object mass and the Planck energy given by the equation:

$$N = \frac{\mathrm{E}}{\mathrm{Ep}} \qquad (2.2)$$

Substituting N into Equation (2.1) then the energy distribution in an area Planck is given by:

$$(\mathrm{E})\left(\frac{\mathrm{E}_{\mathrm{p}}^{2}}{E}\right) - \mathrm{E}_{\mathrm{p}}^{2} = 0 \qquad (2.3)$$

In this case (E) corresponds to the rest energy of any known particle or massive object, while $\frac{\mathrm{E}_{\mathrm{p}}^{2}}{E}$ is the "Gravitational Energy".

However, here I must clarify that the "gravitational energy", which is excessive and inexplicable in the case of the electron and the proton, does not correspond to an existing energy within the particle, because if so would violate the very principles of Plank, but which is the sum of the energy of all Plank particles which are displaced towards the axis (X) by the contraction of (Y).

By then calculating said sum of displaced Planck energy (Y) to the axis (X) occupies the following equation:

$$\mathrm{E}_{[g]} = \left(\frac{\mathrm{E}_{\mathrm{p}}^{2}}{E}\right) \qquad (2.4)$$

Should clarify here, first, that the boundaries of physics established by the laws of Planck, not defined in linear terms of length or Planck energy, (lp, Ep) because then we would have a universe whose total contained energy not would be greater than Ep.

In that sense, the limits of Planck must actually correspond to the Planck area (Ap) and about the limits of energy, the multiplication of the energy corresponding to the Tension Vector I (E) for the energy corresponding to the Tension Vector II $(E_{[g]})$, and whose both product becomes Planck energy squared (E_p^2) as defined by equation 2.1.

Moreover, to calculate the "gravitational energy" of an electron, a proton, a neutron or other particle those are located in the "absolute vacuum" we get a magnitude of such "gravitational energy" which apparently violates the limit of Planck (Ep) but not the limit in equation 2.1.

I should also clarify that Tension Vector I corresponding to the energy at absolute rest (E) has a direction from the particle to infinity, so that almost all the energy is contained within the particle itself.

Meanwhile, the Tension Vector II $(\mathrm{E}_{[g]})$ corresponding to the "gravitational energy" has an inverse direction from infinity to the particle, so that the majority of the "gravitational energy" is outside of the particle.

Thus "gravitational energy" is the sum of quanta energies of Planck that is moved from infinity to the Tension Vector I (axis X) by the contraction of Tension Vector II (Y) at a rate defined by equation 2.4.

Both the rest energy (E) as the "gravitational energy" (Eg) is "moving" or "distributed along the corresponding axis (X, Y), and thus generate their own wave packet with pilot wave associated to the front.

The two waves have a corresponding Pilot wavelength according to the principles of Broglie known equation given by:

$$\lambda = \frac{hc}{E}$$

That in the case of "gravitational energy" or Tension vector II, its wavelength can be obtained directly from the following equation:

$$\lambda_{[g]} = \left(\frac{hcE}{\mathrm{E}_{\mathrm{p}}^{2}}\right) \qquad (2.5)$$

Where *(E)* is the energy at rest.

The product of two wave lengths, corresponding to the wavelength squared Planck. As Planck area, the product of both wavelengths is invariant in all of the particles:

$$\lambda_{\mathrm{p}}^{2} = \left(\frac{hc}{E}\right)\left(\frac{hcE}{\mathrm{E}_{\mathrm{p}}^{2}}\right) = \lambda_{[e]}\lambda_{[g]} \qquad (2.6)$$

Where h is Planck's constant and c is the speed of light and where $\lambda_{[e]}$ the wavelength of Broglie (Tension Vector I) is and $\lambda_{[g]}$ is the gravitational wave length (Tension Vector II).

3. GRAVITATIONAL COUPLING

Because the two wavelengths are extremely different in most massive particles or objects, as these originate practically in a "simultaneous", the gravitational wave length $\lambda_{[g]}$ to be coupled to the length of wave energy $\lambda_{[e]}$, which generates a coupling factor for the gravitational force given by:

$$\alpha_g = \frac{\lambda_{[g]}}{\lambda_{[e]}} \qquad (3.1)$$

Where α_g is the factor of gravitational coupling.

For the electrostatic force, value coupling is considered constant (Fine Structure) about 7.297352568E-03.

In the case of gravity, said coupling depends on the ratio of both wavelengths as shown in the equation 2.1.

Defining the gravitational engagement is critical to the development of a theory of gravity on the equivalence to approach the electrostatic force and to calculate the force of gravity, but such coupling is not necessary to calculate the gravitational acceleration on the arguments presented here and as it will show at the end of this paper.

4. THE EQUATION OF GRAVITY FORCE WITHOUT CONSTANT GRAVITATION

In short, the "gravitational energy (E_g) "moves" or "distributed" from infinity to the center of the distribution of particle energy, generating a curvature or contraction of space defined by the length "gravitational wave ($\lambda_{[g]}$), in turn generating component of normal acceleration towards the center of the particle which we interpret as gravitational acceleration.

Thus if we have defined or calculated the "Gravitational Energy" derived from the Second Vector Tension of Planck area, its Gravitational wavelength associated and Gravitational coupling factor, we can then derive an equation for the gravitational attraction between two particles or identical mass or with the same amount of mass objects:

$$F = \left(\frac{E_g\ \lambda_{[g]}\,\alpha_g}{2\pi d^2}\right) \qquad (4.1)$$

Where E_g is the "gravitational energy" (equation 2.4), $\lambda_{[g]}$ is the length of gravitational wave (equation 2.5), α_g is the gravitational coupling (equation 3.1) and d is the ratio between the two particles interacting or massive objects.

And for the case of two different particles or objects mass:

$$F = \left(\frac{\sqrt{(E_{g1}\ \lambda_{[g1]}\alpha_{g1})\,(E_{g2}\ \lambda_{[g2]}\alpha_{g2})}}{2\pi d^2} \right) \quad (4.2)$$

Then comes to be an equation for calculating the gravitational interaction without the use of the gravitational constant of Newton and use the length of de Broglie wave, for particle or massive objects at rest.

But due to the existence of a constant in this equation, it is possible to reduce it further.

$Ћ = E\lambda =$ 1.986451698E-25 joules per meter

(4.3)

Due to this constant, we can use the equation 4.2, only the values of "gravitational energy" and gravitational wave length of the particle or object with higher energy (or mass) and then the equation is abbreviated :

$$F = \left(\frac{E_g\,\lambda_{[g]}\sqrt{\ \alpha_{g1}\,\alpha_{g2}}}{2\pi\, d^2} \right) \quad (4.4)$$

$$F = \left(\frac{Ћ\sqrt{\ \alpha_{g1}\,\alpha_{g2}}}{2\pi d^2} \right) \quad (4.5)$$

Keeping 2π in the equation is to finally remind us that the ratio between two particles or massive objects is not straight but curved.

Moreover, also in the case of the gravitational interaction between a massive object and a smaller, we can eliminate the two gravitational couplings of equation 4.4 by exchanging the component of the gravitational energy ($E_{[g]}$) for the energy in rest (E) of the massive object while retaining the gravitational wave length :

$$F = \left(\frac{E\ \lambda_{[g]}}{2\pi d^2} \right) \quad (4.6)$$

Where F is the force of gravitational interaction, (E) the rest energy of the massive object, and ($\lambda_{[g]}$) the length of pilot gravitational wave associated with the gravitational energy gained by the equation 2.5**.**

5. DERIVATION OF THE EQUATION OF GRAVITATIONAL ACCELERATION

Then we can use Equation 4.6 to derive a new equation for calculating the gravitational acceleration of a massive body like the earth. According to Newton, force (F) is equal to mass (m) by acceleration (a):

$$F = ma$$

We make the Newton equation equal to equation 4.6:

$$\left(\frac{E\ \lambda_{[g]}}{2\pi d^2} \right) = ma \quad (5.1)$$

Convert (E) to the Einstein equation:

$$\left(\frac{mc^2\ \lambda_{[g]}}{2\pi d^2} \right) = ma \quad (5.2)$$

Spent the terms:

$$\left(mc^2\ \lambda_{[g]} \right) = ma2\pi d^2 \quad (5.3)$$

Then we exchanged the term corresponding to the mass to remove it from the equation:

$$\left(\frac{mc^2\ \lambda_{[g]}}{m} \right) = a2\pi d^2$$

Eliminates m:

$$\left(c^2\ \lambda_{[g]} \right) = a2\pi d^2 \quad (5.5)$$

We returned the radius

$$\left(\frac{c^2\ \lambda_{[g]}}{2\pi d^2} \right) = a$$

And Eureka:

$$\boldsymbol{a} = \left(\frac{c^2\,\lambda_{[g]}}{2\pi d^2}\right) \qquad \textbf{(5.6)}$$

That is, the gravitational acceleration is equal to the length gravitational wave of the mass object (eg earth) by the speed of light squared divided radius squared.

As we can see in equation 5.6, noticeably disappear two components: force (F) and mass (m). The immediate interpretation of this is that the energy density and the corresponding wavelength do not exert a force on objects that attracts, but this force is exerted actually about the same surrounding space which is accelerated in a contraction towards the center of Energy density in proportion to the length of dominant gravitational wave.

Ensure in the Earth:

Mass: 5.9722 E +24 Kg

Energy: mc^2 = 5.3675E+41 kg Kg $m^2/\ s^2$

Gravitational energy of the Earth: $E_{[g]} =$

$\left(\frac{E_p^2}{E}\right) = \left(\frac{3{,}82627E+18}{5{,}3675E+41}\right) =$ **7,12853E-24** Kg $m^2/\ s^2$

Wavelength Gravitational of the Earth:

$$\lambda = \frac{hc}{E}$$

$$= \frac{6{,}626089633E-34 * 299792458}{7{,}12853E-24}$$

$=$ **0,027866232 m**

Squared radius of the Earth: **4,05896E+13** m

Substituting the values for the gravitational acceleration of the earth:

$$a = \left(\frac{89875500000000000 * 0{,}027866232}{2*3{,}1416* 4{,}05896E+13}\right)$$

$$a = (\mathbf{9{,}820272866\ m/s2})$$

Which is the same result obtained with Newton's equation.

6. DERIVATION OF EQUATION CALCULATING ELECTROSTATIC INTERACTION

Over the original arguments, calculating the electrostatic interaction between two particles is even simpler because the constant of electrostatic coupling or fine structure. In this case leads us to a broad general constant that shall term Universal Electrostatic Constant:

$\hbar_e = E\,\lambda_{[e]}\alpha_e =$ 1.4495849660E-27 joules per meter (6.1)

No matter how much rest energy of the particle, the electrostatic force is always the same and only vary depending on the distance. In this case, this energy corresponds to the Tension vector I (X axis of Planck area)

That is, the calculation of the electrostatic interaction between two identical or different particles is given by the general equation:

$$F = \left(\frac{E\,\lambda_{[e]}\alpha_e}{2\pi\,d^2}\right) = \left(\frac{\hbar\,\alpha_e}{2\pi d^2}\right) \qquad (6.2)$$

Where E is the energy at rest, $\lambda_{[e]}$ the wavelength of de Broglie, α_e coupling constant or Fine structure, d is the distance between the two particles. This equation is equivalent to:

$$F = \left(k\,\frac{q_{[1]}q_{[1]}}{d^2}\right)$$

Coulomb's law for electrostatic interaction between only two particles (electron-electron, proton-electron, proton-proton). we have the following equivalence:

$$F = \left(k\,\frac{q_{[1]}q_{[1]}}{d^2}\right) = \left(\frac{E\,\lambda_{[e]}\alpha_e}{2\pi\,d^2}\right)$$

Again, I must point out here that the develop equations for calculating the force of gravity are for particles or massive objects at rest or in non relativistic speeds. My next job will be related to cases of relativistic velocities integrated into the Einstein Tensor.

7. DERIVATION OF EQUATION OF ELECTROSTATIC ACCELERATION

Following the same reasoning as in 5, then we have:

$$\left(\frac{E\ \lambda_{[e]}\alpha_e}{2\pi d^2}\right) = ma \tag{7.1}$$

$$\left(\frac{mc^2\ \lambda_{[e]}\alpha_e}{2\pi d^2}\right) = ma \tag{7.2}$$

$$\left(mc^2\ \lambda_{[e]}\alpha_e\right) = ma2\pi\, d^2 \tag{7.3}$$

$$\left(\frac{mc^2\lambda_{[e]}\alpha_e}{m}\right) = a2\pi d^2 \tag{7.4}$$

$$\left(c^2\ \lambda_{[e]}\alpha_e\right) = a2\pi d^2 \tag{7.5}$$

$$\left(\frac{c^2\ \lambda_{[e]}\alpha_e}{2\pi d^2}\right) = a$$

Y Eureka:

$$\boldsymbol{a} = \left(\frac{\boldsymbol{c^2\ \lambda_{[e]}\alpha_e}}{\boldsymbol{2\pi d^2}}\right) \tag{7.6}$$

That is, the electrostatic acceleration equals the de Broglie wavelength of the particle by the speed of light between the squared distance between the interacting particles.

Since equations can be observed 7.6 and 5.6, are virtually identical, with the slight difference that in the case of the electrostatic acceleration have to stop for the time the fine structure constant.

Despite the existence of the fine structure constant in equation 7.6, we can also say that the electrostatic force is not exerted on the mass of the second particle interaction but on it's surrounding space which is accelerated so repulsive or contractionary depending of the signs of the charge of the particles in interaction

7. CONCLUSION

Having derived clean and natural equation gravity and shape of the same equation gravitational acceleration without using the gravitational constant of Newton, for a different Newton and even to Einstein way, using as components only terms of energy and wavelength or speed of light and wavelength, the way for a new interpretation of gravity opens:

1. That to derive the equations of gravity in terms electrostatic necessarily need to include the concept of "Gravitational Energy" and the concept of Second Tension Vector derived Planck area and the limit defined by the Planck Energy Square.

2. That it is possible to derive equations for the electrostatic acceleration and gravitational acceleration on the basis of the same principles.

3. That in the case of Equation of Gravitational Force, because the wavelength Pilot of Energy in rest and wavelength Pilot of "Gravitational Energy" originating practically in a "simultaneous", the wavelength Gravitational should fit variable with electrostatic wavelength form, which had hitherto hampered their electrostatically calculation.

4. However, to derive the equation of gravitational acceleration (5.6), gravitational coupling factor disappears, generating a surprising equivalence of gravitational wave length and gravitational acceleration.

5. Energy density and its corresponding wavelength does not exert a gravitational force on objects that attracts, but this force is exerted on it actually surrounding space is so rapid contraction towards the center of density of

energy in proportion overriding the gravitational wave length.

6. The electrostatic force is not exerted on the mass of the second particle in interaction but surrounding space there on which is accelerated in a repulsive or contraction depending on the signs of the charge of the particles interact.

7. Here the equation developed for computing the gravitational acceleration, is actually an electrostatic acceleration equation in which the fine structure constant disappears.

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