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Physical Constants And Gravitational Field Equations Observed At Different Reference Points And Gravitational Fields

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Abstract
Physical constants such as Gravitational Constant (G) and Planck Constant (h) are constant quantities. They don't change with anything at all, no matter of the observation reference points and gravitational fields. However, the number and unit components of the physical constants measured at various reference points are different, subject to the local gravitational field and aging of the universe at the reference points (such as on earth). These can be proved by the calculation of Gravitational Constant from Newton's Law of Universal Gravitation and Newton's second law of motion, and Planck constant from photon momentum and wavelength. Furthermore, in contrast to Einstein's Field Equation that Wu's Spacetime Field Equation observed at different reference points and gravitational fields (such as on earth) can be derived based on Wu's Spacetime Equation, Principle of Parallelism and Wu's Spacetime Transformation.
Keywords: *Physical Constant, Gravitational Constant, Planck Constant, Wu Constant, Wu Spacetime Constant, Physical Unit, Wu's Spacetime Transformation, Wu's Spacetime Equation, Wu's Spacetime Field Equation, Einstein's Field Equation.*

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I. Yangton And Yington Theory

Yangton and Yington Theory [1] is a hypothetical theory based on a pair of superfine Yangton and Yington antimatter particles with built-in inter-attractive Force of Creation circulating against each other on an orbit. These pairs of Yangton and Yington circulating particles are named "Wu's Pairs" [2] which is considered as the building blocks of the universe.

Yangton and Yington Theory can be used successfully in explanation of that subatomic particles with string structures are built upon Wu's Pairs and String Force in compliance with String Theory, also String force and Four Basic Forces are induced from Force of Creation in accordance to Unified Field Theory.

Furthermore, Yangton and Yington Theory can very well bridge Quantum Theory with Relativity, also interprets and correlates space, time, energy and matter in the universe. Therefore, it is believed that Yangton and Yington Theory is a theory of everything.

II. Thermal Equilibrium Versus Subatomic Equilibrium

The quantities of the properties of an object or event are dependent on two equilibriums: (1) Thermal Equilibrium: At a constant temperature and pressure, all the atoms and subatomic particles in an object or event are stabilized with a fixed structure by thermodynamic interactions, and (2) Subatomic Equilibrium: Under thermal equilibrium, at a constant gravitational field and aging of the universe, all the Wu's Pairs of the subatomic particles in the object or event are stabilized with a fixed Wu Unit Length and Wu Unit Time by graviton bombardment. In other words, at a constant temperature and pressure (thermal equilibrium), meantime, at a constant gravitational field and aging of the universe (subatomic equilibrium), an object or event should have a fixed quantity for each properties.

III. Subatomic Equilibrium

At thermal equilibrium, temperature and pressure are fixed, and all the atoms and subatomic particles of an object or event are stabilized with a fixed structure. Under thermal equilibrium, at a constant gravitational field and aging of the universe, all the Wu's Pairs of the subatomic particles in the object or event are stabilized with a fixed Wu Unit Length and Wu Unit Time by bombardment of graviton and attraction of Force of Creation, such that a fixed quantity can be attained for each property of the object or event.. This is called "Subatomic Equilibrium" [3].

Under thermal equilibrium, as an object or event moves to a location at a constant gravitational field, because of the bombardment of gravitons caused by gravitational field based on Graviton Radiation and Contact

Interaction, complying with Gravity Affected Wu's Spacetime Shrinkage Theory, all the Wu's Pairs of the subatomic particles in the object or event shall attain a fixed quantum energy and stabilized with a fixed Wu Unit Length and Wu Unit Time.

On the other hand, as an object or event moves to a location and time at a fixed aging of the universe, because of the attraction caused by Force of Creation in Wu's Pairs, complying with Aging Affected Wu's Spacetime Shrinkage Theory and CMB radiation, all Wu's Pairs of the subatomic particles in the object or event shall attain a fixed quantum energy and stabilized with a fixed Wu Unit Length and Wu Unit Time.

IV. Principle Of Equilibrium

As an object or event under co-thermal and subatomic equilibriums at a location and time with a constant temperature and pressure, also a constant gravitational field and aging of the universe, not only all the atoms and subatomic particles in the object or event have a fixed structure, but also all Wu's Pairs of the subatomic particles in the object or event have a fixed Wu Unit Length and Wu Unit Time (a quantum energy state). Since all the quantities of the properties of an object or event are dependent on Wu Unit Length and Wu Unit Time of Wu's Pairs of the subatomic particles in the object or event, therefore, as an object or event under co-thermal and subatomic equilibriums at a location and time with a constant temperature and pressure, also a constant gravitational field and aging of the universe, all the properties of the object or event shall attain a fixed quantity. This is named "Principle of Equilibrium" [4].

V. Corresponding Identical Object Or Event

Under both thermal equilibrium and subatomic equilibrium, as an object or event moves from one location and time to the other location and time, or two identical objects or events take place at two different locations and times, because that the intrinsic atomic and subatomic structures of the object or event (same structures and correlations except proportional dimensions) remain unchanged, therefore the amounts of Wu Unit Length and Wu Unit Time are also remained unchanged. As a result, the quantities of the properties of the object or event are solely dependent on Wu Unit Length and Wu Unit Time of the subatomic particles in the object or event, which according to Wu's Spacetime Shrinkage Theory are further dependent on the local gravitational field and aging of the universe. These objects or events having the same intrinsic atomic and subatomic structures except Wu Unit Length and Wu Unit Time at different gravitational field and aging of the universe are named "Corresponding Identical Object or Event" [4].

Corresponding identical object likes a stretched rope of rubber bands. Each rubber band has a unit length. The total amount (intrinsic structure) of rubber bands doesn't change, but the length of each rubber band and the total length of the rope can be different subject to the stretching force. Corresponding identical object also likes the giant in "Jack and the Beanstalk" and the dwarfs in "Snow White". They all have the same features as that of a normal man except in different sizes.

Corresponding identical event on the other hand likes a movie, where each picture runs by a unit time, the total amount (intrinsic structure) of pictures doesn't change, but the duration of each picture and the total playing time can be different subject to the running speed of the movie. Corresponding identical event also likes the Mickey Mouse cartoon pictures, the entire show can be completed by different time durations subject to the rolling speed of the pictures.

When a photon (free Wu's Pairs) [2] intrudes in earth at an extremely high speed $3x10^8$ m/s from a far distance star or a massive star, it carries Wu Unit Length and Wu Unit Time of its original light source (for example H_α) in the star, which is different from that of the photon generated from the same light source (H_α) on the present earth. In other words, the intruded photon is "quenched" from its original quantum energy state which is not in subatomic equilibrium with that on the present earth. It is a corresponding identical object having the same intrinsic atomic and subatomic structures as that on the present earth but with different Wu Unit Length and Wu Unit Time. It is believed that this "quenching effect" is the reason to cause Cosmological Redshift and Gravitational Redshift.

For better understanding, assuming H_2 absorption spectrums are obtained at star and earth respectively. A pair of corresponding characteristic lines, one from each spectrum representing the wavelength of the photon emitted from the same specific light source (for example H_α), having different wavelengths can be found. This is compliance with Wu's Spacetime Shrinkage Theory that the wavelength of photon (a corresponding identical object) is different subject to Wu Unit Length and Wu Unit Time of the subatomic particles in the object dependent on the local gravitational field and aging of the universe.

VI. Principle Of Parallelism

Furthermore, because the intrinsic atomic and subatomic structures of a corresponding identical object or event remain unchanged, the correlations between two corresponding identical objects or events should remain unchanged no matter gravitational field and aging of the universe. Therefore, for two corresponding identical objects or events at the same location and time (or at the same gravitational field and aging of the universe), the ratio (real number) between the quantities of the same property of the two objects or events remains constant, no matter gravitational field and aging of the universe. This is named "Principle of Parallelism" [5].

$P = nP'$

Where P and P' are quantities of the same property of two corresponding identical objects or events, n is a real number constant.

VII. Wu Unit Quantities

Since Wu's Pairs are the building blocks of all matters, therefore, for the measurements of the properties of an object or event, the following Wu's Units (Wu's Unit Quantities) of a reference subatomic particle at a reference location and time (or gravitational field and aging of the universe), can be used as the basic unit mass, basic unit time and basic unit length [6].

(1) Wu's Unit Mass (m_{yy}) – the mass of a single Wu's Pair
(2) Wu Unit Time (t_{yy}) – the circulation period of Wu's Pair
(3) Wu Unit Length (l_{yy}) – the diameter of Wu's Pair

VIII. Wu's Spacetime Equation

The circulation of Yangton and Yington Antimatter particles in Wu's Pair can be illustrated as the revolution of Yangton and Yington particles in a circulation orbit around an axis. Fig. 1 is a schematic diagram of the circulation.

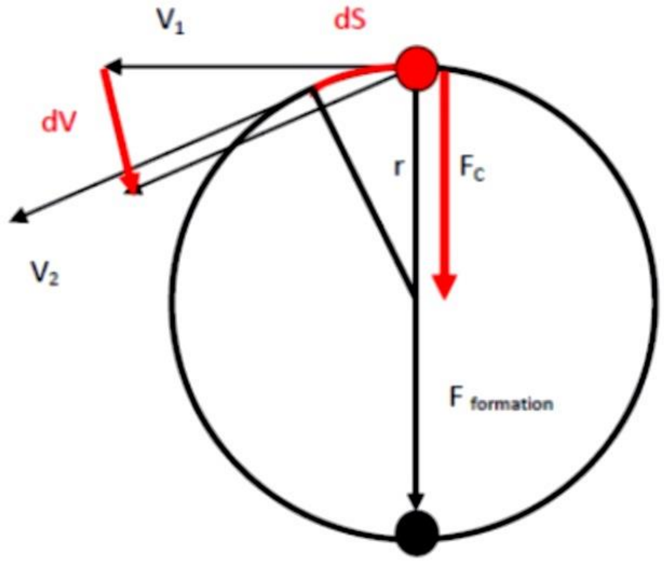

Fig. 1 Schematic diagram of a Wu's Pair.

Because of the circulation motion, the central acceleration (a_c) can be derived as follows:

$a_c = dV/dt = (VdS/r)/dt = V(dS/dt)/r = V^2/r$

And the central force can be represented as follows:

$F_c = ½\ m_{yy}\ a_c = ½\ m_{yy}\ V^2/r$

Where m_{yy} is Wu's Unit Mass, the mass of a single Wu's Pair.

Also, because of Coulomb's Law of Electrical Force,

$F_{attraction} = k_e\ q_{yy}{}^2/(2r)^2$

Where k_e is Coulomb's Constant and q_{yy} is Wu's Unit Charge, the charge of a Yangton or Yington particle (opposite charges).

And

$F_c = F_{attraction}$

Therefore,

$½\ m_{yy}\ V^2/r = k_e\ q_{yy}{}^2/(2r)^2$

$V^2r = ½\ k_e\ (q_{yy}^2/m_{yy})$
Because both q_{yy} and m_{yy} are constant quantities,
Given
$K = ½\ k_e\ (q_{yy}^2/m_{yy})$
Then
$V^2r = K$

Where K is Wu Constant (K is a constant quantity which doesn't change, but both the number and unit quantity components are dependent on the local gravitational field and aging of the universe), V is the speed of circulation and r is the radius of the circulation orbit. This is named "Wu's Pair Circulation Equation" [6].
Also,
$T = 2\pi r/V$
$T^2 = 4\pi^2r^2/V^2 = 4\pi^2r^3/V^2r = 4\pi^2r^3/K$
$T = 2\pi\ K^{-1/2}\ r^{3/2} = \pi\ (2K)^{-1/2}\ d^{3/2}$
Given
$\gamma = \pi\ (2K)^{-1/2}$
Because
$T = t_{yy}$
$d = l_{yy}$
Therefore,
$t_{yy} = \gamma l_{yy}^{3/2}$

Where t_{yy} is the circulation period (T) of Wu's Pairs, named "Wu Unit Time", l_{yy} is the size of the circulation orbit (2r = d) of Wu's Pairs, named "Wu Unit Length", and γ is "Wu's Spacetime Constant" (a real number constant) [7]. This equation is named "Wu's Spacetime Equation".

Wu's Spacetime Equation gives the correlation between Wu Unit Time and Wu Unit Length. As a result, based on Wu's Spacetime Equation, all quantities of the properties of an object or event such as dimension, duration, velocity and acceleration can be correlated to Wu Unit Length of a reference corresponding identical subatomic particle at the same location and time (gravitational field and aging of the universe) which in accompany with Principle of Parallelism and Wu's Spacetime Shrinkage Theory [6] can be used to explain many important physical phenomena such as Gravitational Redshift [8], Cosmological Redshift [6], Gravitational Time Dilation [9], Hubble's Law [10], Spacetime Reverse Expansion (Universe Expansion) [11], Deflection of Light [12], Perihelion Precession of Mercury [12] and Einstein's General Relativity [13], Spacetime [14]and Field Equations [14], etc.

IX. Reference Point

In physics, reference points are applied in the following categories:
1. System – as the origin of a three dimensional system.
2. Observation – as the observation position of vision of object and vision of light in definition of the velocity and acceleration of an object or event.
3. Equilibrium – as the location with corresponding gravitational field and aging of the universe in definition of the quantity of the property of an object or event.
4. Measurement – as the location with corresponding gravitational field and aging of the universe in definition of the unit quantity of the property of a standard object or event, or that of a standard subatomic particle.

X. Reference Object Or Event And Reference Subatomic Particle

According to Principle of Equilibrium, under thermal equilibrium at a constant temperature and pressure, and subatomic equilibrium at a constant gravitational field and aging of the universe, all the quantities of the properties including length, time, velocity and acceleration of an object or event have fixed values dependent on the gravitational field and aging of the universe. Therefore, the Normal Unit Length (meter) and Normal Unit Time (second) of a reference object (ruler) or event (clock), as well as Wu Unit Length and Wu Unit Time of a reference subatomic particle (up quark) also have fixed values dependent on the gravitational field and aging of the universe. Because these quantities of the same property of different objects or events are one to one corresponding to each others, therefore, the quantity of the property of an object or event are dependent on the Normal Unit Length (meter) and Normal Unit Time (second) of a reference object (ruler) or event (clock), also that on Wu Unit Length and Wu Unit Time of a reference subatomic particle (up quark) at the same location and time (same gravitational field and aging of the universe) [3]. As a result, these quantities of standard objects or events such as meter and second, or Wu Unit Length and Wu Unit Time can be used as unit quantities for measurements.

XI. Wu's Spacetime Shrinkage Theory

Under both thermal equilibrium and subatomic equilibrium, an object or event at a massive graviton bombardment (or at a large gravitational field in a stationary single parent object system) or in an early stage aging of the universe should have a larger Wu Unit Length and Wu Unit Time (Wu's Spacetime Equation $t_{yy} = \gamma\ l_{yy}^{3/2}$) than that at a less intensive graviton bombardment (or at a small gravitational field in a stationary single parent object system) or in a later stage aging of the universe. This is named "Wu's Spacetime Shrinkage Theory" [6].

More specifically, under thermal equilibrium, for an object or event at a massive graviton bombardment or at a large gravitational field, because of the heavy graviton attraction bombardment caused by Graviton Radiation and Contact Interaction [15], the circulation speed of Wu's Pairs is getting slower. As a consequence, large Wu Unit Length (Wu's Pair Circulation Equation $V^2R = K$ [6]) and Wu Unit Time (Wu's Spacetime Equation $t_{yy} = \gamma\ l_{yy}^{3/2}$ [6]) of all the subatomic particles in the object or event can be gradually achieved under subatomic equilibrium. This is named "Gravity Affected Wu's Spacetime Shrinkage Theory" [6].

On the other hand, under thermal equilibrium, for an object or event at a long time aging of the universe, because of the attraction caused by the built-in Force of Creation in Wu's Pairs based on Five Principles of the Universe [16] and complying with Cosmic Microwave Background Radiation (CMB) [17], the circulation speed of Wu's Pairs is getting faster. As a consequence, small Wu Unit Length and Wu Unit Time of all the subatomic particles in the object or event can be gradually achieved under subatomic equilibrium. This is named "Aging Affected Wu's Spacetime Shrinkage Theory" [6].

Furthermore, according to Principle of Parallelism based on the intrinsic atomic and subatomic structures, a bigger dimension and duration, and a smaller velocity and acceleration of a corresponding identical object or event, as well as a larger wave length and a smaller light speed and slower clock rate can also be expected at a massive graviton bombardment (large gravitational field) or in an early stage aging of the universe. As a result, Wu's Spacetime Shrinkage Theory can be used to explain many important physical phenomena such as Gravitational Redshift, Cosmological Redshift, Gravitational Time Dilation, Hubble's Law, Spacetime Reverse Expansion (Universe Expansion), Deflection of Light, Perihelion Precession of Mercury and Einstein's General Relativity, Spacetime and Field Equations, etc.

XII. Wu's Spacetime Transformation

Under both thermal equilibrium and subatomic equilibrium, based on Wu's Spacetime Equation $t_{yy} = \gamma l_{yy}^{3/2}$, all the quantities of the properties of an object or event can be transformed to Wu Unit Length of a reference subatomic particle at the same gravitational field and aging of the universe (same location and time). These transformations are called "Wu's Spacetime Transformation".

Because

$L = l\ m\ l_{yy}$

$T = t\ n\ t_{yy} = t\ n\ \gamma\ l_{yy}^{3/2}$

$V = v\ (m/n)(l_{yy}/t_{yy})$

$A = a\ (m/n^2)(l_{yy}/t_{yy}^2)$

And

$t_{yy} = \gamma l_{yy}^{3/2}$

Therefore,

$L = l\ m\ l_{yy}$

$T = t\ n\ \gamma\ l_{yy}^{3/2}$

$V = v\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$

$A = a\ m\ n^{-2}\ \gamma^{-2}\ l_{yy}^{-2}$

Also, wavelength is a property of photon (object) and light speed is a property of light traveling (event), therefore,

$\lambda = \lambda_0\ m\ l_{yy}$

$C = c\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$

All these quantities represented by l_{yy} are called "Wu's Spacetime Quantities". Accordingly, the correlations between the properties of an object or event and the local gravitational field and aging of the universe can be realized based on Wu's Spacetime Shrinkage Theory.

Fig. 2 shows the properties of various corresponding identical objects and events under subatomic equilibrium at different gravitational field and aging of the universe with the correlations between Wu's Spacetime Shrinkage Theory, Principle of Equilibrium, Principle of Parallelism and Principle of Correspondence. Fig. 2 provides a road map for Wu's Spacetime Transformation, and it is called "Wu's Spacetime Transformation Diagram".

As a result, Wu's Spacetime Transformation in accompany with Principle of Parallelism and Wu's Spacetime Shrinkage Theory can be used in explanation of the properties of various corresponding identical objects or events affected by gravitational field and aging of the universe such as Cosmological Redshift, Gravitational Redshift, Time Dilation, Light Deflection, Perihelion Precession of Mercury, etc. Furthermore, it can be used in the derivation of Wu's Spacetime Field Equation in comparison to Einstein's Field Equation.

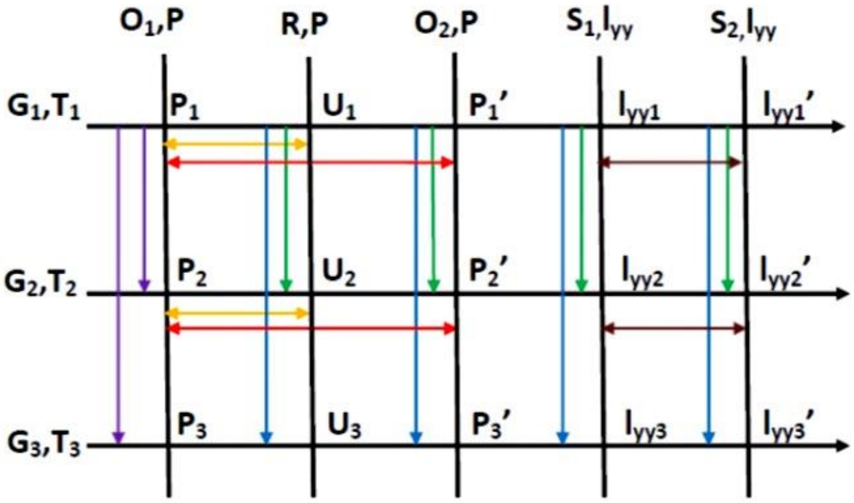

Fig. 2 Wu's Spacetime Transformation Diagram shows the effects of gravitational field and aging of the universe on objects and events under thermodynamic equilibrium and subatomic equilibrium, including Principle of Equilibrium that all properties have fixed quantities (P_i, U_i, l_{yyi}), Principle of Correspondence P = mU (Yellow Lines), Principle of Parallelism P = nP' (Red, Yellow, Brown Lines), **Wu's Spacetime Shrinkage Theory** (Purple, Green, Blue Lines) (G = gravitational field, T = aging of the universe, O = object or event, R = reference, S = subatomic particle, P = property and l_{yy} = **Wu's Unit Length**).

XIII. Physical Constants

Physical constant contains two components: real number and unit quantities with arithmetic operations. The physical constant is a constant quantity, it doesn't change at all. But both the real number and the physical units are subject to change dependent on the local gravitational field and aging of the universe except mass (kg and m_{yy}) and charge (C and q_{yy}) (this is revised from my previous publication [18] in which I have mistakenly proposed that physical constants can change with the gravitational field and aging of the universe).

XIV. Gravitational Constant

Assuming a target object m at a distance R from a star M, because of Newton's Law of Universal Gravitation and Newton's second Law of Motion,

$F = GMm/R^2$

$F = mA$

Therefore,

$A = GM/R^2$

And

$G = AR^2/M$

Acceleration is defined by the infinitesimal velocity divided by infinitesimal traveling time [Annex 72].

$A = \Delta V/\Delta T$

Where A is acceleration, $\Delta V = (V'-V)$ is infinitesimal velocity and $\Delta T = (T'-T)$ is infinitesimal traveling time.

At a reference point with fixed gravitational field and aging of the universe (G,T), acceleration A can be measured by the local MKS units as follows:

$L = ym$ and $L' = y'm$ and $L'' = y''m$

$T = xs$ and $T' = x's$ and $T'' = x''s$

$V = (L'-L)/(T'-T) = ((y'-y)/(x'-x))m/s$

V' = (L"-L')/(T"-T') = ((y"-y')/(x"-x'))m/s
A = (V' – V)/(T"– T')
= [(y"-y')/(x"-x') – (y'-y)/(x'-x)](m/s)/(x"– x')s
= {[(y"-y')/(x"-x') – (y'-y)/(x'-x)]/(x"– x')} (m/s^2)
Given
a = [(y"-y')/(x"-x') – (y'-y)/(x'-x)]/(x"–x')
Therefore,
A = a (m/s^2)

Where A is acceleration, "a" is amount of Normal unit Acceleration and m/s^2 (meter/second^2) is Normal Unit Acceleration measured at the reference point with fixed local gravitational field and aging of the universe (G,T).

According to Wu's Spacetime Shrinkage Theory, Wu Unit Length and Wu Unit Time are bigger at massive gravitational field and early aging of the universe, as is the Normal Unit Length (meter) and Normal Unit Time (second). Therefore, the amounts of acceleration and distance of the same target object measured on moon are different from that measured on earth. As a consequence, both the number and unit components of gravitational constant measured on moon are also different from that measured on earth. Therefore,
Gravitational constant measured on moon can be represented as follows:
$G = A R^2/M = a_m (m_m/s_m^2) r_m^2 (m_m^2)/w$ (kg)
$G = (a_m r_m^2/w)(m_m^3/s_m^2$ kg)

Where A is acceleration, R is distance, M is mass (they don't change with the gravitational field and aging of the universe at reference point), a_m is amount of acceleration, r_m is amount of distance, and w is amount of mass, measured by MKS system on moon based on m_m (the meter on moon), s_m (the second on moon) and kg (constant). Similar notations and measurements can also be applied to all the corresponding quantities on earth. Therefore,
Gravitational constant measured on earth can be represented as follows:
$G = AR^2/M = a_e (m_e/s_e^2) r_e^2 (m_e^2)/w$ (kg)
$G = (a_e r_e^2/w)(m_e^3/s_e^2$ kg)

As a result, $a_m r_m^2/w$ is the number component of gravitational constant measured on moon, which is different from $a_e r_e^2/w = 6.674 \times 10^{-11}$ the number component of gravitational constant measured on earth. However, gravitational constant is the same on both moon and earth, $G = a_m r_m^2/w$ (m_m^3/s_m^2 kg) $= 6.674 \times 10^{-11}$ (m_e^3/s_e^2 kg).

XV. Planck Constant

For a photon, the infinitesimal energy is equal to the momentum multiplying infinitesimal velocity,
$\Delta E = P\Delta V$
Therefore,
$E = PC$
Because
$E = h\nu$
$PC = h\nu$
$h = PC/\nu = P\lambda$
Therefore,
$h = P\lambda$
Also,
$\Delta E = P\Delta V$
$\Delta E = F\Delta X$
$P\Delta V = F\Delta X$

At a reference point with fixed gravitational field and aging of the universe (G,T), momentum of a photon P can be measured by the local MKS units as follows:
$P = F\Delta X/\Delta V = f$ (kg m/s^2) Δx(m)/Δv(m/s) = ($f\Delta x/\Delta v$) ms^{-1} kg

Where f is the amount of force F, Δx is the amount of ΔX (infinitesimal distance) and Δv is the amount of ΔV (infinitesimal velocity). They can all be calculated by their definitions like the amount of acceleration "a" calculated by the definition of acceleration A in Gravitational Constant.
Given
$p = f\Delta x/\Delta v$
Then
$P = p\ ms^{-1}kg$
Therefore,
$h = P\lambda = p\ (ms^{-1}kg)\ _{\lambda}\ (m) = (p_{\lambda})\ m^2s^{-1}kg$

Where p is the amount of momentum P and $_\lambda$ is the amount of wavelength λ.

As a result, $p_{m\ \lambda m}$ is the number component of Planck Constant measured on moon, which is different from $p_{e\ \lambda e}$= 6.626 x 10^{-14} the number component of Planck Constant measured on earth. However, Planck Constant is the same on both moon and earth, therefore h = $p_{m\ \lambda m}$ ($m_m^2 s_m^{-1}$kg) = 6.626 x 10^{-14} ($m_e^2 s_e^{-1}$kg).

XVI. Wu's Spacetime Field Equation

According to Newton's Law of Universal Gravitation and Newton's Second Law of Motion, the remote gravitational force F generated between a target object m and a parent object M at a distance R can move the target object toward the parent object at acceleration A as follows:

$F = G\ m\,M/R^2$

$F = m\,A$

Therefore,

$A = GM/R^2$

Where A is the acceleration of the target object, G is Newton's gravitational constant, m is the mass of target object, M is the mass of the star (parent object), R is the distance between the target object and the star. This equation is called "Field Equation" (gravitational field $F_g = GM/R^2$).

Furthermore, according to Wu's Spacetime Transformation, the acceleration of the target object can be transformed to Wu Unit Length of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe) as follows:

$A = a\ m\ n^{-2}\ \gamma^{-2}\ l_{yy}^{-2}$

Where A is the acceleration of the target object, a is the amount of normal unit acceleration, γ is Wu Spacetime Constant (a real number constant), m is the reference-dependent real number constant of normal unit length, n is the reference-dependent real number constant of normal unit time, and l_{yy} is Wu Unit Length of the reference subatomic particle at the same location and time (same gravitational field and aging of the universe) as target object.

In addition, according to Wu's Spacetime Transformation, the Absolute Light Speed of a photon emitted from a light source can also be transformed to Wu Unit Length of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe) as target object:

$C = c\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$

Where C is the Absolute Light Speed of a photon, c is the amount of normal unit velocity of the photon (3 x 10^8), γ is the Wu Spacetime Constant, m is the reference-dependent constant of normal unit length, n is the reference-dependent constant of normal unit time, and l_{yy} is Wu Unit Length of the reference subatomic particle at the same location and time (same gravitational field and aging of the universe) as target object.

Because

$A = GM/R^2$

$A = a\ m\ n^{-2}\ \gamma^{-2}\ l_{yy}^{-2}$

$C = c\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$

Also,

$C^{-4} = c^{-4}\,m^{-4}\,n^4\,\gamma^4\,l_{yy}^2$

Given

$\sigma = m^{-1} n^2$

$\delta = m^3 n^{-2} c^4$

Because c is the amount of normal unit velocity of photon (3 x 10^8), m is the reference-dependent constant of normal unit length, n is the reference-dependent constant of normal unit time, such that σ and δ are also real number constants no matter of gravitational field and aging of the universe. Therefore,

$a = \sigma \gamma^2 l_{yy}^2 (GM/R^2)$

$a = \delta \gamma^{-2} C^{-4} (GM/R^2)$

Where a is the amount of normal unit acceleration of target object measured on target object, σ and δ are reference-dependent real number constants associated with the reference subatomic particle, γ is Wu Spacetime Constant, l_{yy} is Wu Unit Length of the reference subatomic particle and C is the Absolute Light Speed on target object (C = 3×10^8 m/s, 3×10^8 is a constant number and m/s are target units). M is the mass of the star (measured by target units), G is Newton's gravitational constant (measured by target amount and units) and R is the distance between target object and the star (measured by target units). These equations are named "Wu's Spacetime Field Equations" [19].

Wu's Spacetime Field Equation represents the correlation between the amount of normal unit acceleration "a" and Wu Unit Length l_{yy} of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe) as target object, which reflects the changes of distribution of energy and motion of matter. Instead of σ and Wu Unit Length l_{yy} of the reference subatomic particle (associated with the reference subatomic particle), δ and Absolute Light Speed C at the same location and time are used, which are dependent only on the location and time (gravitational field and aging of the universe) no matter the reference subatomic particles.

Fig. 3 shows that at the same location and time (same gravitational field and aging of the universe), both acceleration of target object A and Absolute Light Speed C can be represented by Wu Unit Length l_{yy} of the reference subatomic particle as follows:

$A = a\, m\, n^{-2} \gamma^{-2} l_{yy}^{-2}$

$C = c\, m\, n^{-1} \gamma^{-1} l_{yy}^{-1/2}$

Where Fig. 3 is named Wu's Spacetime Transformation Diagram.

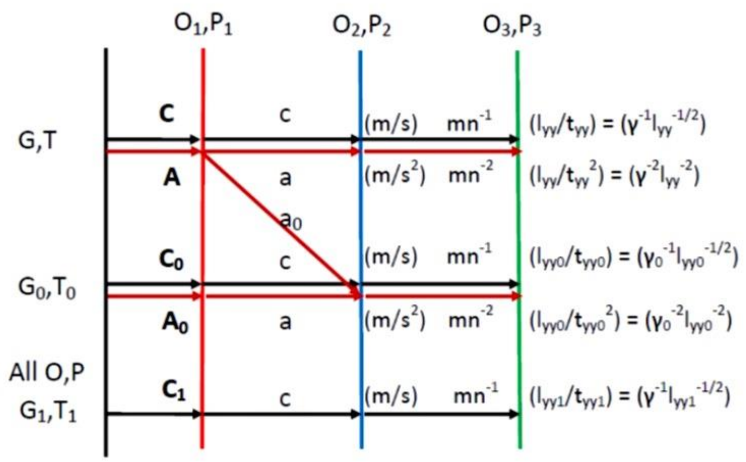

Fig. 3 Wu's Spacetime Transformation Diagram shows the correlations and transformations between the properties of different corresponding identical objects or events (O, P) at the same subatomic equilibrium state (G,T) and that at different equilibrium states (G, T). (G = gravitational field, T = aging of the universe, O = object or event, P = property, A = acceleration, C = Absolute Light Speed).

In addition, while observing the same target object and parent object on earth, Fig. 3 shows that the acceleration of the target object A can be represented by Wu Unit Length l_{yy0} of the reference subatomic particle on earth as follows:

$A = a_0\ m\ n^{-2}\ \gamma^{-2}\ l_{yy0}^{-2}$

Also, the Absolute Light Speed C_0 of photon on earth can be represented by Wu Unit Length l_{yy0} of the reference subatomic particle on earth as follows:

$C_0 = c\ m\ n^{-1}\ \gamma^{-1}\ l_{yy0}^{-1/2}$

Given

$\sigma = m^{-1}\ n^2$

$\delta = m^3 n^{-2} c^4$

Therefore, Wu's Spacetime Field Equation observed on earth can be represented as follows:

$a_0 = \sigma\ \gamma^2\ l_{yy0}^2\ (GM/R^2)$

$a_0 = \delta\ \gamma^{-2}\ C_0^{-4}\ (GM/R^2)$

Where a_0 is the amount of normal unit acceleration of target object measured on earth, σ and δ are real number constants, γ is Wu Spacetime Constant, l_{yy0} is Wu Unit Length of the reference subatomic particle and C_0 is the Absolute Light Speed on earth ($C_0 = 3x10^8$ m/s, 3 $x10^8$ is a constant number and m/s are earth units), M is the mass of the star (measured by earth units), G is gravitational constant (G is a constant quantity, G= $6.674x10^{-11}\ m^3kg^{-1}s^{-2}$ measured by earth amount and units) and R is the distance between the target object and the star (measured by earth units).

XVII. Wu's Spacetime Field Equations Versus Einstein's Field Equations

Einstein's Field Equation [20] represents the correlation between acceleration and the derivative of potential energy. Einstein's Field Equation gives a solution, a property function (Einstein's Spacetime), the potential energy, reflecting the curvature with derivative in compliance with the acceleration reflecting the distribution of energy and matter. It is a four dimensional space-time continuum originated from a nonlinear geometry system (geodesics) and transformed to a Normal Spacetime System on earth.

In contrast, Wu's Field Equation represents the correlation between acceleration and gravitational field. Wu's Field Equation gives a solution, a property function (amount of normal unit acceleration a_0) to the distribution of energy and matter in a Normal Spacetime System on earth.

$a_0 = \delta\ \gamma^{-2}\ C_0^{-4}\ (GM/R^2)$

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

Because the same terms GC_0^{-4} and G/C^4 (C in Einstein's Field Equation is the Absolute Light Speed on earth $C = C_0$) appeared in both equations, Einstein's Field Equation and Wu's Spacetime Field Equation are considered equivalent. However, there is no gravitational force in Einstein's Field Equation. Acceleration is the derivative of the curvature of space-time continuum, which reflects the distribution of matter and energy in the universe. On the other hand, in Wu's Spacetime Field Equation, matter does exist, as is the gravitational field. Also, the acceleration is caused by the gravitational field. More specifically, Einstein's Field Equation is Energy and Acceleration correlated field equation, and Wu's Spacetime Field Equation is Acceleration and Gravity correlated Field Equation.

Furthermore, Einstein's Field Equation applies Geodesic Transformation between Geodesics System and Cartesian System. In contrast, Wu's Spacetime Field Equation applies Wu's Spacetime Transformation between two Cartesian Systems from Normal Spacetime System to Wu's Spacetime System.

XVIII. Conclusion

Physical constants such as Gravitational Constant (G) and Planck Constant (h) are constant quantities. They don't change with anything at all, no matter of the observation reference points and gravitational fields. However, the number and unit components of the physical constants measured at various reference points are different, subject to the local gravitational field and aging of the universe at the reference points (such as on earth). These can be proved by the calculation of Gravitational Constant from Newton's Law of Universal Gravitation and Newton's second law of motion, and Planck constant from photon momentum and wavelength. Furthermore, in contrast to Einstein's Field Equation that Wu's Spacetime Field Equation observed at different reference points and gravitational fields (such as on earth) can be derived based on Wu's Spacetime Equation, Principle of Parallelism and Wu's Spacetime Transformation.

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