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Planck Length, Time And Mass Versus Wu's Unit Length, Time And Mass Based On Graviton Radiation And Contact Interaction Theory

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Abstract

Based on Graviton Radiation and Contact Interaction, a critical size cluster of gravitons (m_c) are used to calculate the three physical constants: c, G and ħ by Newton's Law of Universal Gravitation and kinetic energy and photon energy equations, which subsequently are used for calculations of Plank Length, Time and Mass. By assuming $m_c = 10^{48}\ m_{yy}$ (Wu's Unit Mass), it is calculated that the mass of the critical size cluster of gravitons (m_c) is about 10^{43} Gev (10^{16}kg, 100 million times smaller than earth 10^{24} kg), the wavelength (l_c) is about 10^{-11} m (UV light), and the period of the wave (t_c) is about 10^{-20} s. Also, Wu's Unit Mass is about 10^{-5} Gev (100 times smaller than Up Quark 2.3 Mev), Wu's Unit Length is about 10^{-43} m and Wu's Unit Time is about 10^{-20} s.
As a result, Planck Length 1.616255×10^{-35} m, Plank Time 5.39×10^{-44} s and Planck Mass 2.176434×10^{-8} kg (equivalent to 1.22×10^{19} Gev) are not associated with any specific physical object, except that it gives ratio correlations to the wavelength, the period of the wave, and the mass of the critical size cluster of gravitons, also that of Wu's Unit Length, Wu's Unit Time and Wu's Unit Mass. Furthermore, it is realized that only the parent object bigger than the critical size cluster of gravitons can generate sufficient gravitons based on Graviton Radiation and Contact Interaction Theory and to fulfill Newton's Law of Universal Gravitation. This explains why Planck Mass is much bigger than that of all the subatomic particles.

Keywords: *Planck Length, Planck Time, Planck Mass, Planck Units, Planck Constant, Wu's Pair, Wu's Unit Length, Wu's Unit Time, Wu's Unit Mass, Newton's Law of Universal Gravitation, Graviton Flux, Graviton Radiation, Wu's Spacetime Equation.*

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I. Background

Planck Length, Time and Mass are defined exclusively by three physical constants: c, G and ħ. Scientists believe that they are the smallest scales in the universe, even though the real physical meanings are not fully understood. In fact, Planck Length 1.616255×10^{-35} m and Plank Time 5.39×10^{-44} s are extremely small, but unexpectedly Planck Mass 2.176434×10^{-8} kg (equivalent to 1.22×10^{19} Gev) is much bigger than that of all the subatomic particles (for example, Top Quark 171.2 Gev) which has caused a great deal of confusion.

On the other hand, Wu's Pairs are proposed as the building blocks of all matters in the universe based on Yangton and Yington Theory [1]. It is obvious that the length, time and mass of Wu's Pairs (Wu's Unit Length, Wu's Unit Time and Wu's Unit Mass) are the smallest quantities in the universe. They should be very close or even equal to the Planck Length, Time and Mass.

In this paper, a critical size cluster of gravitons is used to calculate Planck Length, Planck Time and Planck Mass. The correlations of the wavelength and the period of the wave, as well as the mass of the critical size cluster of gravitons with respect to Planck Length, Time and Mass, and also that of Wu's Unit Length, Wu's Unit Time and Wu's Unit Mass are studied. In addition, a sound reason is proposed to explain why Planck Mass is much bigger than that of all the subatomic particles.

II. Planck Units

In particle physics and physical cosmology, Planck Units (Table 1) are a system of units of measurement defined exclusively in terms of four universal physical constants: c, G, ħ, and k_b [2]. They are a system of natural units, defined using fundamental properties of nature (specifically, properties of free space) rather than properties of a chosen prototype object. Originally proposed in 1899 by German physicist Max Planck [3][4], they are relevant in research on unified theories such as quantum gravity [5].

Name	Dimension	Expression	Value (SI units)
Planck length	length (L)	$l_P = \sqrt{\frac{\hbar G}{c^3}}$	$1.616\ 255(18) \times 10^{-35}$ m
Planck mass	mass (M)	$m_P = \sqrt{\frac{\hbar c}{G}}$	$2.176\ 434(24) \times 10^{-8}$ kg
Planck time	time (T)	$t_P = \sqrt{\frac{\hbar G}{c^5}}$	$5.391\ 247(60) \times 10^{-44}$ s
Planck temperature	temperature (Θ)	$T_P = \sqrt{\frac{\hbar c^5}{G k_B^2}}$	$1.416\ 784(16) \times 10^{32}$ K

Table 1 Values of Planck Length, Planck Mass, Planck Time and Planck Temperature. (speed of light C = 299792458 ms^{-1}, gravitational constant G = 6.673(10) x 10^{-11} $m^3kg^{-1}s^{-2}$, Planck's constant (reduced) ħ = h/2π = 1.054571596(82) x 10^{-34} kgm^2s^{-1}, Boltzmann constant K_b = 1.3806502(24) x 10^{-23} $kgm^2s^{-2}K^{-1}$).

Planck length

Since the 1950s, it has been speculated that the Planck Length 1.616255×10^{-35} m is the shortest physically measurable distance, since any attempt to investigate the possible existence of shorter distances, by performing higher-energy collisions, would result in black hole production. Higher-energy collisions, rather than splitting matter into finer pieces, would simply produce bigger black holes [6]. In addition, the strings of string theory are modeled to be on the order of the Planck Length [7]. In contrast, because Wu's Pairs are proposed as the building blocks of all matters [8], Wu's Unit Length (diameter of Wu's Pair) must be the smallest length in the universe. Also Wu's Pairs can be break down and destroyed in the black hole. Therefore, Planck Length could very well be the same as Wu's Unit Length.

Planck time

Planck time t_P is the time required for light to travel a distance of 1 Planck length in vacuum, which is a time interval of approximately 5.39×10^{-44} s. No current physical theory can describe timescales shorter than the Planck time, such as the earliest events after the Big Bang [9]. Some speculate states that the structure of time need not remain smooth on intervals comparable to the Planck time [10]. In contrast, Wu's U 'ime is the period of the circulation of Wu's pairs. According to Wu's Spacetime Equation [11], $t_{yy} = \gamma l_{yy}^{3/2}$. However, approximately $l_p = \lambda_{yy} = l_{yy}$ then $t_{yy} = l_{yy}/C = l_p/C = t_p$. Therefore, Planck Time could also be the same as Wu's Unit Time.

Planck Mass

It is unexpected that Planck Mass 2.176434 x 10^{-8} kg (equivalent to 1.22 x 10^{19} Gev)) is much bigger than the mass of all the subatomic particles (for example, the mass of top quark is 171.2 Gev). Since Wu's Pairs are proposed as the building blocks of all matters in the universe, therefore Wu's Unit Mass must be smaller than that of all the subatomic particles. Why Planck Mass is much bigger than Wu's Unit Mass remains a great confusion.

Planck Scale

The term Planck scale refers to quantities of space, time, energy and other units that are similar in magnitude to corresponding Planck units. This region may be characterized by energy-equivalent Planck Mass of around 10^{19} GeV or 10^9 J, Planck Time of around 5×10^{-44} s and Planck Length of around 10^{-35} m. At the Planck scale, the predictions of the Standard Model, quantum field theory and general relativity are not expected to apply, and quantum effects of gravity are expected to dominate. One example is represented by the conditions in first 10^{-43} seconds of our universe after the Big Bang, approximately 13.8 billion years ago. In contrast, based on Yangton and Yington Theory, it is believed that Yangton and Yington Bubbles [12] were generated in the very early stage of the universe (such as in the first 10^{-43} seconds). Then Wu's Pairs, the building blocks of all matters in the universe were formed.

III. Yangton and Yington Theory

Yangton and Yington Theory 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" 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.

IV. Wu's Units

Since Wu's Pairs are proposed as the building blocks of all matters [8], therefore, for the measurements of the properties of an object or event, the following 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.

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

V. Planck Length versus Wu's Unit Length

According to Newton's Law of Universal Gravitation, assuming a single Wu's Pair can be applied either as parent object or target object, then the gravitational force F_{yy} between two adjacent Wu's Pairs is proportional to the square of Wu's Unit Mass (m_{yy}) and the inverse square of Wu's Unit Length (l_{yy}).

$F_{yy} = Gm_{yy}^2/l_{yy}^2$

Thus the potential energy of a Wu's Pair E_{yy} can be represented as follows:

$E_{yy} = Gm_{yy}^2/l_{yy}$

Therefore,

$G = E_{yy}l_{yy}/m_{yy}^2$

In addition, the kinetic energy of the Wu's Pair converted from the potential energy caused by universal gravitation can be represented as follows:

$K_{yy} = E_{yy} = ½\ m_{yy}\,C^2$

This kinetic energy is further converted to the bonding energy (string energy) between the two Wu's Pairs to form a part of subatomic particle (string structure).

Furthermore, as a Wu's pair separates from subatomic particle to become a photon (free Wu's Pair) [8], it possesses a kinetic energy E that is converted from string energy. Therefore,

$E = h\nu$

Where the frequency of the photon ν is the same as that of Wu's circulation frequency.

Assuming the wavelength λ of the photon is equal to the diameter of Wu's Pair l_{yy},

$C = \lambda\,\nu = l_{yy}\,\nu$

Therefore,

$E = hC/l_{yy}$

And

$h = El_{yy}/C$

Also

$\hbar = h/2\pi$

Planck Length is defined as $l_p = (G\hbar/C^3)^{1/2}$, therefore Planck Length l_p can be calculated as follows:

$l_p = (G\hbar/C^3)^{1/2} = (2\pi)^{-1/2}\,(Gh/C^3)^{1/2} = (2\pi)^{-1/2}[(½\ m_{yy}\,C^2)(l_{yy}/m_{yy}^2)(½\ m_{yy}\,C^2)(l_{yy}/C)/C^3]^{1/2} = ½\ (2\pi)^{-1/2}\ l_{yy}$

$l_{yy} = 2(2\pi)^{1/2}\ l_p$

As a result, Planck Length is in the same magnitude as that of Wu's Unit Length. Since Wu's Pairs are the building blocks of all the matters in the universe, therefore, Planck Length 1.616255×10^{-35} m as Wu's Unit Length is the smallest nature length in the universe.

VI. Planck Time versus Wu's Unit Time

Planck Time is defined as the time required for light to travel a distance of 1 Planck length in vacuum, therefore Planck Time t_p can be calculated as follows:

$t_p = l_p/C = (G\hbar/C^5)^{1/2} = (2\pi)^{-1/2}\,(Gh/C^5)^{1/2} = ½\ (2\pi)^{-1/2}\ l_{yy}/C = ½\ (2\pi)^{-1/2}\ (1/\nu_{yy})$

Because
$t_{yy} = 1/\nu_{yy}$
Therefore,
$t_{yy} = 2(2\pi)^{1/2} t_p$

As a result, Planck Time has the same magnitude as that of Wu's Unit Time. Since Wu's Pairs are the building blocks of all the matters in the universe, therefore, similar to that of Planck Length, Planck Time 5.39×10^{-44} s as Wu's Unit Time is the smallest nature time in the universe.

VII. Planck Mass versus Wu's Unit Mass

Planck Mass is defined as $m_p = (\hbar C/G)^{1/2}$, therefore Planck Mass m_p can be calculated as follows:
$m_p = (2\pi)^{-1/2} (hC/G)^{1/2} = (2\pi)^{-1/2} El_{yy}/(El_{yy}/m_{yy}^2)^{1/2} = (2\pi)^{-1/2} m_{yy}$
$m_{yy} = (2\pi)^{1/2} m_p$

As a result, Planck Mass is in the same magnitude as that of Wu's Unit Mass. Since Wu's Pairs are the building blocks of all matters, Planck Mass as Wu's Unit Mass, should have the smallest mass in the universe. Unexpectedly Planck Mass 2.176434 x 10^{-8} kg (equivalent to 1.22 x 10^{19} Gev) is much bigger than that of all subatomic particles (For example, top quark has a mass of 171.2 GeV). It is very confusing. One possible reason is that Wu's Pairs cannot be applied as the parent object and target object in Newton's Law of Universal Gravitation. This is because that Newton's Universal Gravitation (static remote gravitational force) is generated by static graviton flux [13] emitted from parent object to target object based on Graviton Radiation and Contact Interaction Theory [14]. In other words, only the parent object with sufficient amount of gravitons is capable of generating graviton flux to reach and interact with the gravitons on the target object. Obviously a single Wu's Pair is not qualified for these criterions.

VIII. Planck Units versus Graviton Cluster Units

To avoid the confusion, instead of Wu's Pair (m_{yy}), a critical size cluster of gravitons (m_c) that could fulfill Newton's Law of Universal Gravitation and Graviton Radiation and Contact Interaction Theory, is applied for the calculations of Planck Length, Time and Mass. Similar to that of Wu's Pair, a group of corresponding terms for the critical size cluster of gravitons can be obtained as follows:
Each Wu's Pair in the critical size cluster of gravitons will have a potential energy by a ratio of m_{yy}/m_c.
$E_{yy} = (Gm_c^2/l_c)(m_{yy}/m_c) = Gm_{yy}(m_c/l_c)$
Therefore,
$G = E_{yy}l_c/m_{yy}m_c$
Where l_c is the closest distance between two m_c.
E_{yy} will be converted to kinetic energy K_{yy} of the Wu's Pair in the critical size cluster of gravitons.
$K_{yy} = E_{yy} = ½ m_{yy} C^2$
Finally K_{yy} will become the string energy to bond the Wu's pair to target object.
When a photon emitted from target object, this string energy K_{yy} will become the kinetic energy of the photon E.
$E = K_{yy} = E_{yy}$.
Also,
$E = h\nu$
Assuming the wavelength λ is equal to l_c.
$\lambda = l_c$
$\nu = 1/t_c$
$C = \lambda\nu = l_c/t_c$
Therefore,
$h = El_c/C$
Also,
$\hbar = h/2\pi$
Therefore,
$l_p = (G\hbar/C^3)^{1/2}=(2\pi)^{-1/2} (Gh/C^3)^{1/2} = (2\pi)^{-1/2}[(½ m_{yy} C^2)(l_c/m_{yy}m_c)(½ m_{yy} C^2)(l_c/C)/C^3]^{1/2} = ½ (2\pi)^{-1/2}(m_{yy}/m_c)^{1/2} l_c$
$l_c = 2(2\pi)^{1/2} (m_c/m_{yy})^{1/2}l_p$
And
$t_p = l_p/C = (G\hbar/C^5)^{1/2} = (2\pi)^{-1/2} (Gh/C^5)^{1/2} = ½ (2\pi)^{-1/2} (m_{yy}/m_c)^{1/2}l_c/C = ½ (2\pi)^{-1/2} (m_{yy}/m_c)^{1/2} t_c$
$t_c = 2(2\pi)^{1/2} (m_c/m_{yy})^{1/2} t_p$
Also,
$m_p = (\hbar C/G)^{1/2} = (2\pi)^{-1/2} (hC/G)^{1/2} = (2\pi)^{-1/2} (E_{yy}l_c/(E_{yy}l_c/m_{yy}m_c))^{1/2} = (2\pi)^{-1/2} (m_{yy}m_c^2/m_c)^{1/2} = (2\pi)^{-1/2} (m_{yy}/m_c)^{1/2}m_c$
$m_c = (2\pi)^{1/2} (m_c/m_{yy})^{1/2} m_p$

Assuming $m_c = 10^{48}\ m_{yy}$, then $l_c \approx 10^{24}\ l_p$, $t_c \approx 10^{24}\ t_p$, $m_c \approx 10^{24}\ m_p$, also $m_p \approx 10^{24}\ m_{yy}$, $l_p \approx 10^8\ l_{yy}$ and $t_p \approx 10^8\ t_{yy}$ (3 orders smaller than mass) and $t_c \approx\ t_{yy}$ (same frequency). In other words, if the mass of the critical size cluster of gravitons (m_c) is 10^{48} times bigger than Wu's Unit Mass (m_{yy}), then Planck Mass (m_p) should be 10^{24} times bigger than Wu's Unit mass (m_{yy}), while Planck Length (l_p) is 10^8 times bigger than Wu's Unit Length (l_{yy}) and Planck Time (t_p) is about the same as Wu's Unit Time (t_{yy}).

As a result, by the definition, it is calculated that Planck Mass (m_p) is about 10^{19} Gev, Planck Length (l_p) is about 10^{-35} m and Planck Time (t_p) is about 10^{-44} s, also according to the above analysis, by assuming $m_c = 10^{48}\ m_{yy}$, then the mass of the critical size cluster of gravitons (m_c) is about 10^{43} Gev (10^{16}kg, 100 million times smaller than earth 10^{24} kg), the wavelength (l_c) is about 10^{-11} m (UV light), and the period of the wave (t_c) is about 10^{-20} s. Also, Wu's Unit Mass (m_{yy}) is about 10^{-5} Gev (100 times smaller than Up Quark 2.3 Mev), Wu's Unit Length (l_{yy}) is about 10^{-43} m and Wu's Unit Time (t_{yy}) is about 10^{-20} s.

IX. Conclusion

Planck Length, Time and Mass are defined exclusively by three physical constants: c, G and ħ. Scientists believe that they are the smallest scales in the universe, even though the real physical meanings are not fully understood. In fact, Planck Length 1.616255×10^{-35} m and Plank Time 5.39×10^{-44} s are extremely small, but unexpectedly Planck Mass 2.176434×10^{-8} kg (equivalent to 1.22×10^{19} Gev) is much bigger than that of all the subatomic particles (for example, Top Quark 171.2 Gev) which has caused a great deal of confusion.

On the other hand, Wu's Pairs are proposed as the building blocks of all matters in the universe based on Yangton and Yington Theory. It is obvious that the length, time and mass of Wu's Pairs (Wu's Unit Length, Wu's Unit Time and Wu's Unit Mass) are the smallest quantities in the universe. They should be very close or even equal to the Planck Length, Time and Mass.

Based on Graviton Radiation and Contact Interaction, a critical size cluster of gravitons (m_c) are used to calculate the three physical constants: c, G and ħ by Newton's Law of Universal Gravitation and kinetic energy and photon energy equations, which subsequently are used for calculations of Plank Length, Time and Mass. By assuming $m_c = 10^{48}\ m_{yy}$ (Wu's Unit Mass), it is calculated that the mass of the critical size cluster of gravitons (m_c) is about 10^{43} Gev (10^{16}kg, 100 million times smaller than earth 10^{24} kg), the wavelength (l_c) is about 10^{-11} m (UV light), and the period of the wave (t_c) is about 10^{-20} s. Also, Wu's Unit Mass is about 10^{-5} Gev (100 times smaller than Up Quark 2.3 Mev), Wu's Unit Length is about 10^{-43} m and Wu's Unit Time is about 10^{-20} s.

As a result, Planck Length 1.616255×10^{-35} m, Plank Time 5.39×10^{-44} s and Planck Mass 2.176434×10^{-8} kg (equivalent to 1.22×10^{19} Gev) are not associated with any specific physical object, except that it gives ratio correlations to the wavelength, the period of the wave, and the mass of the critical size cluster of gravitons, also that of Wu's Unit Length, Wu's Unit Time and Wu's Unit Mass. Furthermore, it is realized that only the parent object bigger than the critical size cluster of gravitons can generate sufficient gravitons based on Graviton Radiation and Contact Interaction Theory and to fulfill Newton's Law of Universal Gravitation. This explains why Planck Mass is much bigger than that of all the subatomic particles.

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