

Quantum Level Gravitational Relationship Of Radius Of Smallest Particle And Speed Of Light

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Abstract: In this paper I am proposing that gravity is generated at quantum level by the (smallest) particle in motion which is travelling at the velocity of light. I will deduce Gravity constant's relation with Planck length (l_p) and speed of light. In my previous paper, I proposed the smallest particle radius as $l_p/2$ (Planck Length/2). This is a photon and this particle has zero mass (this zero mass as discussed in my previous paper). Using equations derived from my previous paper and Planck's Energy equations (Ref. 10), I will derive that photon travelling at the speed of light produces gravity in quantum level and a value can be attributed to it.

1. Introduction

Photon particle radius, speed of light and gravity are linked together. Photons travel at speed of light. Gravity also travels at speed of light (Ref. 12). At the speed of light, there is no plane of reference and time concept does not exist. So when a photon (here I am referring to the smallest particle in the universe with a radius equal to Planck length/2 as stated in my previous paper) is traveling at the speed of light, it generates gravity. In this paper I will derive equations to show that gravity is linked to the speed of light and the radius of the smallest photon that was discussed in my last paper (Ref. 10).

2. Existing history and calculations

a. Info from my old paper

- i. Nomenclature
- ii. Velocity of Light in a vacuum $c = (2.998)10^8 \text{ m/s}$ (4)
- iii. Planck Constant $h = (6.626)10^{-34} \text{ kg.m}^2/\text{s}$ or J s (2)
- iv. Planck's Reduced Constant $(h/2\pi) \hbar = (1.055)10^{-34} \text{ kg. m}^2/\text{s}$ or J s (3)

b. Existing theory

- i. I will start with my previous paper on "Calculation of Radius and Energy of Smallest Particle in the Universe".
- ii. The following equations were taken from this paper: (Ref. 11).
- iii. I showed KE of P_e Equation can be rewritten to consist only of Physical Constants:
- iv. Planck's Reduced Constant $\hbar = h/2\pi$ (18)
- v. KE of P_e (small Particle) $E_e = c \hbar / R_e$
- vi. KE of P_e : $E_e = c \times h / \pi \times l_p = (3.912) \cdot 10^9 \text{ J}$ (21)
- vii. $E_p = (c) h/2 \times \pi \times l_p = (1.956) \cdot 10^9 \text{ J}$ (24)
- viii. Substituting for Planck's reduced constant $\hbar = h/2\pi$
- ix. Or $E_p = c \times \hbar / l_p = (1.956) \cdot 10^9 \text{ J}$ (25)
- x. Also this is Planck's one of the famous Energy equation (26):
- xi. $E_p = \sqrt{\hbar c^5/G} = 1.956 \times 10^9 \text{ J}$ (26)

3. New Theory

- a. By combining equations 25 and 26 since they are equal, we get:
- b. $c \times \hbar / l_p = \sqrt{\hbar c^5/G}$ (1)
- c. We can rewrite this by squaring both sides:
- d. $(c \times \hbar / l_p)^2 = \hbar c^5/G$ (2)
- e. $\therefore G = c^3 \times (l_p)^2 / \hbar$ (3)
- f. Substituting radius of the smallest particle from my previous paper:
- g. Radius of smallest Particle $R_e = l_p / 2$
- h. $\therefore G = 4 \times c^3 \times R_e^2 / \hbar$ (4)
- i. From above equation (4), we can infer the following:
- j. Gravity is linked to the speed of light and the radius of smallest particle (photon). I am treating reduced Plank Constant being a constant for discussion purposes.
- k. Now Gravity is quantified with Speed of light (this is the velocity of the smallest particle) and the radius of that particle.
- l. Therefore "Gravity is generated by the smallest particle in motion which is travelling at the velocity of light. Notice that there is no mass parameter in this equation and all the parameters in these equations are constants.
- m. This particle's zero mass was discussed in my previous paper.
- n. This relation shows velocity of light and radius of the photon are related to gravity in quantum level and a specific value can be attributed to it.
- o. I will extend this equation to the area swept by the particle:
- p. $A = \pi R_e^2$ (5)
- q. $\therefore G = 4 \times c^3 \times A / \pi \times \hbar$ (6)
- r. This is the relationship with Gravity when the area swept by the particle is taken into consideration.
- s. In this screenshot below, I am giving other relationships and values as related to gravitational constant for future study.

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1 $R_p = \frac{2P}{c} = (8.081 \cdot 10^{-30}) \text{ m}$

2 $A = \pi \cdot R_p^2 = (2.052 \cdot 10^{-59}) \text{ m}^2$

3 $G = 4 \cdot c^3 \cdot \frac{R_p^2}{h} = (6.674 \cdot 10^{-11}) \frac{\text{m}^3}{\text{kg} \cdot \text{s}^2}$

4 $G = 2 \cdot \pi \cdot c^3 \cdot \frac{A}{h} = (6.674 \cdot 10^{-11}) \frac{\text{m}^3}{\text{kg} \cdot \text{s}^2}$

5 $h \cdot \pi \cdot c^3 \cdot \frac{R_p^2}{h} = (6.674 \cdot 10^{-11}) \frac{\text{m}^3}{\text{kg} \cdot \text{s}^2}$

6 $h \cdot c^3 \cdot \frac{A}{h} = (6.674 \cdot 10^{-11}) \frac{\text{m}^3}{\text{kg} \cdot \text{s}^2}$

3 Summary:

The significance of Equations (3) and (4) are as follows:

- Gravity is linked to the speed of light and the radius of the smallest particle (photon) as discussed in my last paper. I am treating reduced Planck constant as a constant for discussion purposes.
- Quantifying gravity with speed of light (this is the velocity of Photon (smallest particle) and the radius of that particle.
- Therefore "Gravity is generated by the smallest particle in motion which is travelling at the velocity of light".
- This particle's zero mass was discussed in my previous paper.
- It is important to note that I extended the same argument above a similar relationship with the swept area of smallest Particle P_e (6).
- I also extended similar relationships in the screenshots above as related to gravitational constant for future studies.

4. Analysis:

This quantum level gravity generation is not known before and is new. This is a significant link. I showed in this paper that gravity can be generated by the smallest particle travelling at the speed of light. Since there is no mass component in the (3), (4) and (6) equations, just the motion of photon causes gravity. Speed of light and gravity are linked together. Photons travel at speed of light. Gravity also travels at speed of light (Ref. 12). At the speed of light, there is no plane of reference and time concept does not exist. So when a photon (here I am referring to the smallest particle in the universe with a radius equal to Planck length/2 as stated in my previous paper), is traveling at the speed of light it exerts gravity. The above derived equations show that gravity is linked to the speed of light and the radius of the smallest photon.

5. Conclusions:

The relationship between the speed of light and photon as related to gravity is very significant and further studies are required. Also Equations 3, 4 and 6 for G only involve physical constants and gives insight into how photons operate at the quantum level. No mass parameter is involved here.

6. References:

- [1]. [^ Latest \(2010\) Values of the Constants; NIST, 2011.](#)
- [2]. [^ CODATA — Planck length](#)
- [3]. [^ CODATA — Planck constant over 2 pi](#)
- [4]. Table1from http://en.wikipedia.org/wiki/Speed_of_light
- [5]. Table2from http://en.wikipedia.org/wiki/Planck_length
- [6]. Table 3 from Planck's constant and variation table from the section heading Black body Radiation, <http://physics.info/planck/>
- [7]. Planck's Energy info taken from: In [physics](#), Planck energy, denoted by E_p , is the unit of [energy](#) in the system of [natural units](#) known as [Planck units](#).
- [8]. Gravitational constant info was taken from: Where c is the [speed of light](#) in a vacuum, \hbar is the [reduced Planck's constant](#), and G is the [gravitational constant](#). E_p is a *derived*, as opposed to *basic*, Planck unit. http://en.wikipedia.org/wiki/Gravitational_constant
- [9]. http://en.wikipedia.org/wiki/Planck_units
- [10]. (Emani, 2014) Volume 3, Issue 4 April 2014 IJSTR: Calculation of Radius and Energy of Smallest Particle
- [11]. http://en.wikipedia.org/wiki/Gravitational_constant
- [12]. http://en.wikipedia.org/wiki/Speed_of_gravity The speed of gravitational waves in the [general theory of relativity](#) is equal to the [speed of light](#) in vacuum, c .^[1] Within the theory of [special relativity](#), the constant c is not exclusively about light; instead it is the highest possible speed for any physical interaction in nature. Formally, c is a conversion factor for changing the unit of time to the unit of space.^[2] This makes it the only speed which does not depend either on the motion of an observer or a source of light and/or gravity. Thus, the speed of "light" is also the speed of gravitational waves and any other [massless particle](#).

7. Tables of Universal constants:

Table 1

Quantity	Symbol	Value	Uncertainty
speed of light in vacuum	c	299 792 458 m·s ⁻¹	defined
Planck constant	h	6.626 069 57(29) × 10 ⁻³⁴ J·s	4.4 × 10 ⁻⁸
reduced Planck constant	ħ = h/2π	1.054 571 726(47) × 10 ⁻³⁴ J·s	4.4 × 10 ⁻⁸

Table 2

Name	Dimension	Expression	Value ^[11] (SI units)
Planck length	Length (L)	$l_P = \sqrt{\frac{\hbar G}{c^3}}$	1.616 199(97) × 10 ⁻³⁵ m ^[12]

Table 3

Symbol	Name	Joules
h	Planck constant	6.62606896 × 10 ⁻³⁴ J s
hc	"h c"	1.986445 × 10 ⁻²⁵ J m
$\hbar = \frac{h}{2\pi}$	"h bar", dirac constant, Reduced plank constant	1.054571628 × 10 ⁻³⁴ J s