

# Theory of Photon Gravitation Photon's Gravitational Force and Attraction

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**Abstract-** Gravity is the weakest force of the nature and thus the effect is only seen on massive objects such as stars, planets, black holes etc. It is impossible to study gravity with particles in lab but my theory can find the gravitational force exerted by a photon. It is a bit bitter as a photon carries energy but has no mass actually it has momentum which is its relativistic Mass and so if the momentum is 0 then mass is 0 as Einstein correctly described "mass is stored Energy" and no more confusion for  $E = mc^2$  as it also states relativistic mass of photon =  $h\nu$  (energy) /  $300000000^2$  m/s. If there was a way (there is not as special relativity prohibits it) to observe a photon at rest, you would find it massless. All the relativistic mass of the photon comes from its energy. In particle physics when we say mass, we usually refer to the rest mass. This is why we usually say that photons are massless but actually it has mass but relative to energy and momentum. Photons have gravitational pull but if you go with newton's gravitation you will be confused but actually you point out on photon's rest mass that is 0. Now for a photon, it has a gravitational pull and Relativistic mass that's all my theory depends on.

**Index Terms-** Kaustubh's Formula of photonic Gravitation, Complete Derivation of The Formula, Applications of loop quantum gravity in my theory, Displacing Gravity, Kaustubh's Photon Frequency Limit, Results of the Theory, Experimental proofs that might give valid results

## I. INTRODUCTION

This Theory suggests its own opinions on Quantum Gravity that is the hardest problem in physics, the concepts and mathematics tell how can we find out extremely less Gravitation.

The derivation is given complete and all constants are given reason about their significance and Role of Frequency. It supports Ideas such as Quantization, Gravitation as a curvature, Loop quantum Gravity etc. But opposes that there is no limit for frequency of photon. It is a complete theory with a theoretical Idea of Quantum Gravity and Electromagnetism. Now the formula and this theorem if popularized can also make people Think of quantum gravity with the concept of Loop Quantum Gravity.

Kaustubh's Formula ophotonic Gravitation (quantum gravity)

$F_g = \frac{G h \nu}{c^4}$	<b>G</b>	universal gravitational constant	$6.67 \times 10^{-11}$
	<b>h</b>	Planck's constant	$6.62 \times 10^{-34}$
	<b>v</b>	Frequency of photon	
	<b>c</b>	light speed	$3 \times 10^8$

Figure: 1 'Kaustubh's Formula of Photon Gravitation'

We know photon has its own frequency and gravity can't be determined at quantum level and from these I made my formula "Kaustubh's formula of Photonic Gravitation" In which Photon gravitational Force =  $G h \nu / c^4$  ; G is the universal gravitational constant and h is Planck's constant with v as frequency which is the times of wave per second. Planck said that energy of a photon is Energy of a photon =  $h\nu$  and  $E=mc^2$  also tells relativistic mass =  $h\nu/c^2$  and as gravitational force is inversely proportional to the distance but as a photon is never at rest position and if photon attracted a particle, then after a second only the photon would be millions of kilometers far away.

## II. DERIVATION OF FORMULA USING DIMENSIONAL ANALYSIS

The statement for the formula will be – "The Force depends on the Gravitational constant, The Planck's Constant, The Frequency and speed ( c ) of The Photon where speed<sup>2</sup> is inversely proportional to the force"

Now let's put Dimensional Formulas

$$F = G h \nu c^4$$

$$[MLT^{-2}] = [M^{-1} L^3 T^{-2}]a \quad [ML^2 T^{-1}]b \quad [M^0 L^0 T^{-1}]c \quad [M^0 L^0 T^{-1}]d$$

This when solved gives out  
 $F = k G h \nu / c^4$

And that's my formula thus derivation of Formula using dimensional analysis holds true. k is dimensional constant.

Now I will tell you how I came to this formula,

I started reframing the Formula of gravitation and made the equation by joining two formulas,

1 –  $G / c^2$  : This is the first formula where the gravitational constant is divided by speed of light square ( $c^2$ ) that eventually originated by  $G m m / r^2$ . Actually this part is  $G / r^2$  but in the gravitation formula r was distance? So The answer is that for measuring distance we need two fixed points out of which one is frame of reference but at quantum level as all particles are moving, we cannot tell precise location of a particle specially when in case of a photon thus The problem was that the distance before displacement of a photon about 300,000,000 meters away was less and after displacement was far and so considering both distance would be c (constant of speed of light) multiplied by itself that would be  $c^2$ . This is the cause of changing the force unit from newton into newton/second and this is for all quantum particles as we can't know their precise location

2-  $H \nu / c^2$ : This formula describes relativistic mass and energy of a photon as told previously that all its relativistic mass comes from its energy. The energy of the Photon is  $h \nu$  that is Planck's constant multiplied by frequency and with respect to  $E = m c^2$  the relativistic mass becomes –

$$E^2 = p^2 c^2 + m_{rest}^2 c^4 = (m_{rel} c^2)$$

$$m_{rest} = \text{zero} \quad (\text{for photon})$$

$$m_{rel} = \text{relativistic mass}$$

$$m_{rel}^2 c^4 = p^2 c^2 + 0$$

$$m_{rel} = \left( \frac{p^2}{c^2} \right)^{\frac{1}{2}}$$

$$m_{rel} = \frac{p}{c} \quad p = \frac{h}{\lambda}$$

$$m_{rel} = \frac{h}{\lambda c} = \frac{E}{c^2}$$

$$E = m c^2$$

$$E = h \nu$$

$$h \nu = m_{rel} c^2$$

$$m_{rel} = h \nu / c^2$$

And as energy of a photon =  $h \nu$  the formula becomes  $h \nu / c^2$

When we unify both formulas gives out

$$\frac{G}{c^2} \times \frac{h \nu}{c^2} = \frac{G h \nu}{c^4}$$

### III APPLICATIONS OF LOOP QUANTUM GRAVITY IN MY THEORY

Loop Quantum Gravity suggests that space-time fabric is made of infinite individual loops just like single fiber threads in a cloth. Now imagine if you bend a single thread of cloth, Will there be any change observed in the cloth? Obviously not as curvature in one single thread is not capable for any change to be observed in the cloth. Similarly, at Quantum level the photon bends individual loops of space time fabric and thus effect is not seen at quantum level

### IV. DISPLACING GRAVITY

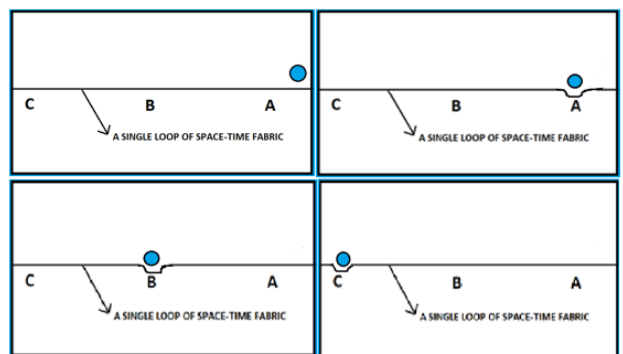


Figure: 2 'Displacing Gravity'

This is my concept of Displacing Gravity which is a simple phenomenon that works on newton's law of Inertia that states "An object at rest continues to be at rest till any force is applied on it".

Here in the first picture, that line is a single loop of space-time fabric and blue particle is a photon. On the loop there are 3 points A, B and C. Now check the next picture where the photon bends point A at the loop and then (in 3rd picture) it displaces itself and bends the point B but see, As mass (due to momentum) is removed from point A That comes in its original position and same is shown in last picture. Because of displacing gravity and less gravitational force the effect is not seen at quantum gravity.

### IV. FREQUENCY LIMIT OR LIMITATION OF THE FORMULA

When I calculated the limit of the formula it stated that there's a frequency limit under which this formula can be true but beyond it, It can give invalid results. As every theory has its

