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Graviton and Newton's second law

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Abstract

To date, there is no way to explain the process that describes how particles as photon absorb gravitons. According to the results of our years-long research we can definitely say that the best way for explain this process is using color charge concept from photon properties.

This model might be called "Creative Particles of Higgs" or CPH theory. Gravitons behave like charge particles and in interaction between gravity and photons, gravitons convert to negative and positive color charges and also magnetic color. These color charges and magnetic color form the electromagnetic energy.

Rest mass

As we know, some particles such as photons are never seen at rest in any reference frame. So, there are two kinds of particles in physics;

1- Some particles like the photon move only with the speed of light c, in all inertial reference frames. Let's call these kinds of particles the NR particles or Never at Rest condition particles.

2- Other particles like the electron always move with the speed $v < c$ in all inertial reference frames; they have rest mass, and could be called particles.

According to the above definition, photon and graviton are NR particles, while electron and proton are particles.

Properties and speed of graviton

Let's assume graviton exists, with regard to the exchange particles concept in the quantum electrodynamics theory and the existence of graviton, we will present a new definition of graviton. To define graviton, let's consider a photon that is falling in the gravitational field, and revert back to the behavior of a photon in the gravitational field. But when we define the graviton relative to the photon, it is necessary to explain the properties and behavior of photon in the gravitational field. The fields around a "ray of light" are electromagnetic waves, not static fields. The electromagnetic field generated by a photon is much stronger than the associated gravitational field. When a photon is falling in the gravitational field, it goes from a low layer to a higher layer density of gravitons.

We should assume that the graviton is not a solid sphere without any considerable effect. Graviton carries gravity force, so it is absorbable by other gravitons; in general; gravitons absorb each other and combine. During the photon is falling in the gravitational field, its energy (mass) increases. According to $W = \Delta mc^2$, the force of gravity performs work on the photon, so the mass (energy) of the photon and its frequency increase from ν to ν' that given by;

$$\nu' = \nu(1 + \frac{GM}{rc^2}) \qquad (1)$$

G is the gravitational constant; M is the mass of the body, c is the velocity of light, r is the distance from the mass center of body.

The energy of photon depends on its electric and magnetic fields. Therefore, one part of the work done by gravity converts to electrical energy and the other part converts to magnetic energy. The change of frequency of the photon in the gravitational field has been demonstrated by the Pound-Rebka experiment. The Pound–Rebka experiment is a well-known experiment to test Albert Einstein's theory of general relativity in 1959. The result confirmed the predictions of general relativity [1]. Proponents of the theory of general relativity offer three different conflicting explanations of these results that are said to be equivalent to each other and therefore are all equally correct. The main problem with this explanation lies in the conceptualization of a physical process by which mass, momentum and energy could be either added to or subtracted from a photon without changing its velocity or angular momentum. Such a mechanism has never been proposed except for a mathematical description of a four-dimensional substance called a "space-time continuum." This is a non-Doppler explanation of the shifts in which source, observer and all photons are in the same inertial reference frame and the photons move at exactly c relative to both source and observer [1].

When a photon falls in the gravitational field, it acquires energy equal to $\Delta E = \Delta mc^2$ which is divided into three parts; one part behaves like a positive electrical field and another part behaves like a negative electrical field. These neutralize each other in the structure of the photon (a photon itself is neutral) and the third part behaves like a magnetic field. In quantum

mechanics theory, every field is quantized. In addition, force is described as energy per distance shown by:

$$F = -\frac{dU}{dx} \qquad (2)$$

If we consider this equation from the aspect of quantum mechanics, a number of gravitons that are carrying gravity force enter the structure of photon. As a result, a number of gravitons disappear and the energy (and frequency) of the photon increases. Similarly, redshift has the opposite effect that given by;

$$\nu' = \nu(1 - \frac{GM}{rc^2}) \qquad (3)$$

As a photon escapes from the gravitational field, its frequency shifts to red and its energy converts to gravitons. How can we describe this interaction between photons and gravitons on a sub-quantum scale such as in the structure of a photon?

In interaction between gravity and photon (blueshift), when gravity acts on photon and gravitons enter the photon, gravitons do change the intensity of electric and magnetic fields which belong to photon. So, gravitons behave so that they are carrying the charge and magnetic effects in the structure of photon. When gravitons enter the photon, the intensity of electric and magnetic fields increases, but photon has no electric effect. So, there should be two groups of gravitons one that behaves like electric field and the other one that neutralizes the electric effect of other group. So, a group of gravitons behaves like positive electric field and the other one behaves like negative electric field and they neutralize each other's electric effect. But they are moving, so a group of gravitons behave like magnetic field, and the intensity of two vertical electric and magnetic fields increases. So, gravitons are either color charge or color magnet. When a photon shifts to blue in the gravitational field, gravitons convert to electromagnetic energy. In fact gravitons convert to color charge and magnetic color and enter electric and magnetic fields of photon. It is acceptable because when photon is falling in the gravitational field, the intensity of its electric and magnetic fields increase. So, a photon is made up of color charges and magnetic color that have linear speed equal c with photon motion and nonlinear speed in the structure of photon, so they move faster than light speed (Figure1). So, the amount of passed path per unit of time is not equal c and it is greater than c, in the other word graviton moves faster than light speed.

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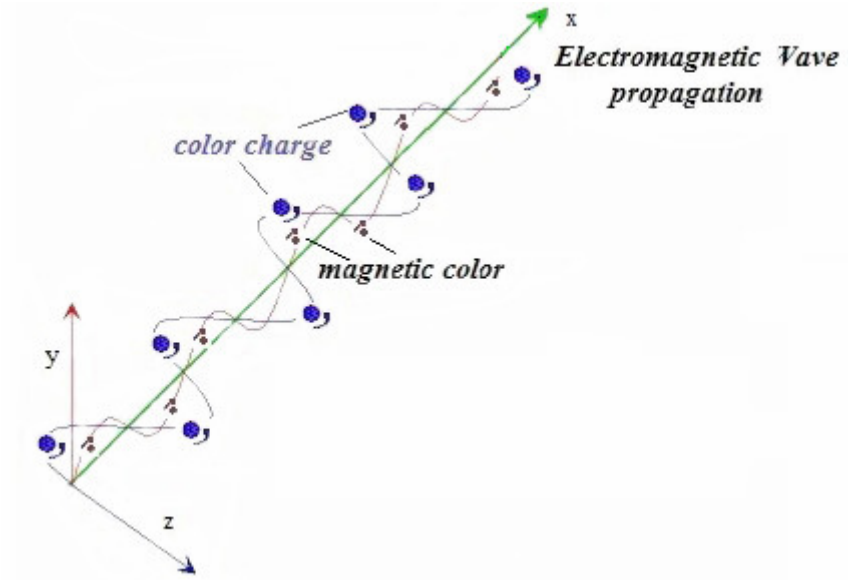

Fig1; paths of gravitons in photon structure, color charges and magnetic color have spin and curvature speed

It is important that we note the speed of graviton (also color charge and magnetic color) that is given with V_G and as explained before, its speed is faster than light speed, so $V_G > c$, that V_G is the total speed of linear and nonlinear of graviton or color charge and magnetic color (figure2).

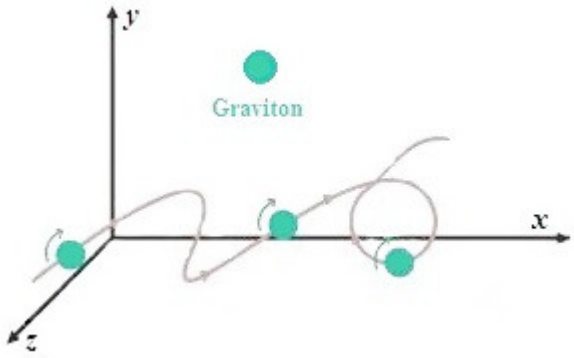

Fig2; Hypothetical path of a graviton in the Cartesian coordinate system

According to the above explanation and Figures 1 and 2 we can write;

$$V_{Gx} + V_{Gy} + V_{Gz} = V_G > c$$

And also note that as figure1 shows we can write;

$$(V_{Gx} = c) + V_{Gy} + V_{Gz} = V_G > c \qquad (4)$$

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On the Influence of Gravitation on the Propagation of Light

In special relativity the speed of light in a vacuum is the same for all observers, regardless of the motion of the light source. But in the presence of gravity the speed of light becomes relative [2]. Contrary to special relativity, the measured speed of light in a gravitational field is not constant, but these variations depend upon the reference frame of the observer; what one observer sees as true another observer sees as false. However, the speed of light in general relativity is not constant that given by;

$$c' = c(1 + \frac{GM}{rc^2}) \qquad (5)$$

About concept of particle

Generally, we have almost the same understanding and imagination of large objects (at the level of molecules and larger). But in the case of subatomic particles, there is no clearly defined and visualized concept, and there are many uncertainties, especially in the case of photon and graviton. Therefore, any theory offers certain understanding (such as loop and string) of these particles. In discussion with my dear friend Daniel, I enjoyed his imagination. He wrote; "...since I consider gravity to be a localized phenomenon with rapid attenuation and to be a space deformation like the rubber sheet of Einstein, I maintain that gravitons are not particles -- indeed, I believe all bosons are a wavelike field phenomena. Even Higgs never proposed a Higgs particle -- he proposed the Higgs Field that "clusters" many wavelets to a denser state. He was a Field Theorist as I am. To me all is field and condensed energy moving wavelets at different frequencies." [3]

However, in this paper we are using the particles for graviton and photon without any imagination of them.

Definition of graviton

A graviton is appropriately referred to as the existence unit of nature, although this does not mean to be a “particle” as this concept has been traditionally referred to in physics.

A graviton is a NR particle, with the constant NR mass m_G , that moves with the constant magnitude of speed of $|V_G| > |c|$ in any inertial reference frame, where c is the speed of light. According to the gravitational redshift, the NR mass of graviton is defined relative to a photon's NR mass by;

$$m_G < m = \frac{h\nu}{c^2} \quad \forall\, \nu \qquad (6)$$

And the relationship between energy and momentum for the NR mass of graviton given by;

$$\langle E_G \rangle = \langle |P_G| \rangle V_G = constant \qquad (7)$$

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In all inertial reference frame and any condition

Relation (7) shows that the energy of graviton is constant, in any interaction between gravitons or with other particles. The space is full of gravitons. While the density of gravitons increases in space, the distance between them decreases, but they do not attach to each other, their paths change without decreasing the magnitude of V_G.

Graviton principle

Graviton is the most minuscule unit of energy with constant NR mass m_G that moves with a constant magnitude of speed so that$|V_G| > |c|$, in all inertial reference frames. Any interaction between graviton and other existing particles represents a moment of inertia **I** where the magnitude of V_G remains constant and never changes.Therefore;

$$\nabla V_G = 0 \text{ , in all inertial reference frame and any space} \qquad (8)$$

Based on the principle of graviton, a graviton carries two types of energy generated by its movement in inertial reference frame. One is transmission energy and the other one is non-transmission energy. In physics, we represent energy summation (both kinetic and potential) by a Hamiltonian equation and energy difference by a LaGrangian. Therefore, in the case of graviton, we use a Hamiltonian to describe the summation of energy generated by transmission energy T and non-transmission energy S as follows:

$$E_G = T + S \qquad (9)$$

Since the speed and mass of graviton are constant, then $E_G = constant$. Graviton produces energy and energy produces matter and anti-matter. In fact, everything has been formed of graviton.

Sub-Quantum Energy

According to the principles of modern physics, Sub-quantum energy (*SQE*) is preferred and defined in a way that it could be generalized and by using it, quantum and relativistic phenomena could be explained [4].

Definition: Sub-quantum energy is the least electromagnetic energy that is defined as below:

$$SQE = h\nu_{least,}\ \nu_{least} < \nu, \forall\ E = h\nu, where\ E = h\nu\ is\ detectable \qquad (10)$$

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Relation (10) shows *SQE* in terms of energy. Every other photon consists of some *SQE*, so that;

$$E = nSQE,\ where\ n\ is\ an\ integer \qquad (11)$$

$$E = nSQE = nm_{SQE}c^2 = n(m_{SQE}c)c = np_{SQE}c \Rightarrow E = np_{SQE}c \qquad (12)$$

For two photons with energies E_1 and E_2 we have:

$$E_2 = h\nu_2 = n_2 SQE, E_1 = h\nu_1 = n_1 SQE, E_2 > E_1 \Rightarrow n_2 > n_1, n \propto \nu \qquad (13)$$

There n_1 and n_2 are integers.

With increasing a photon's energy, its frequency also increases. Thus there should be a logical explanation between energy increase and frequency increase. Therefore, based on *SQE* definition and relation (13) we can relate the relation between photon's energy and frequency and the interaction between *SQE*s in a photon's structure, i.e. with increasing the number of *SQE*s in photons, the interaction between *SQE*s in photons will increase and the frequency that originates from the interaction between *SQE*s will increase too.

Note: Although $n \propto \nu$, this proportion does not necessarily represent an equation, but simply represents the physical fact that frequency has direct relation with the number and interaction of *SQE*s in a photon. Besides the relation between *SQE*s and ν, could conclude that the linear speed of *SQE* in a vacuum relative to the inertial frames of reference, is actually the speed of light c. Since *SQE* in a photon's structure has a linear speed equal to c and also it has nonlinear motions, the real speed of *SQE* is when all *SQE* nonlinear motions turn into linear motion and it only takes linear motion. In other words the limit speed of *SQE* is V_{SQE} which is faster than light speed c, i.e. $|V_{SQE}| > |c|$.

Consider that in special relativity the light speed is constant, and in general relativity besides increasing of photon frequency while falling in a gravitational field, its speed also increases (relation 4); that we could take it as a proof of $|V_{SQE}| > |c|$.

Sub-Quantum Energy Principle

One *SQE* is a very small energy with *NR* mass m_{SQE} that moves at $|V_{SQE}| > |c|$ relative to inertial reference frame and in every interaction between *SQE*s with other particles or fields the speed value of *SQE* remains constant; as in every physical condition we have;

$$\nabla V_{SQE} = 0\ , \text{in all inertial reference frames and any space} \qquad (14)$$

SQE principle shows that in every condition the speed value of *SQE* remains constant and only the linear speed of *SQE* converts to nonlinear speed and vice versa. Considering the

definition of *SQE*, every photon consists of some *SQE*, if we ignore the zero rest mass of photon, much better and more real, physical phenomena may be investigated. Thus, a photon with energy *E* has mass $m = E/c^2$ and a linear momentum **p** = **mc**. In other words, a photon is a part of matter and has nonzero mass before creation that after converting to photon carries the same mass that had in the matter and after absorption by a particle (e.g. an electron) the mass of photon is added to the mass of the particle.

According the definitions of graviton, *SQE* and photon we can write;

$$|V_G| > |V_{SQE}| > |c| > |V_{particles}| \qquad (15)$$

So the constancy speed of light is a law. In standard model the photon is the basic unit of electromagnetism, the quantum of the electromagnetic field and the basic "unit" of all forms of electromagnetic radiation. Having zero rest mass, and traveling always at the speed of light, a photon does not experience "time passing". Thus, however long its journey, even billions of light years, from the photon's perspective, it is instantaneous. Also according to relativistic time dilation and photon definition in quantum mechanics, time does not exist in sub quantum level and existence of graviton.

Relativistic mass

In classical mechanics, kinetic energy and momentum are expressed as;

$$\mathrm{E_k} = \frac{1}{2}\mathrm{mv}^2\,,\ \ \mathrm{p} = \mathrm{mv}$$

Special relativity predicts that the speed of light is constant in all inertial frames of references. The relativistic energy–momentum relation gives with;

$$E^2 - (pc)^2 = (mc^2)^2 \qquad (16)$$

From which the relations for rest energy E_0, relativistic energy (rest + kinetic) E, kinetic energy, and momentum p of massive particles follow:

$$E_0 = mc^2\,,\ E = \gamma mc^2\,,\ p = \gamma m\mathrm{v}\,,\text{where}\ \gamma = 1/\sqrt{1-(\mathrm{v}/c)^2} \qquad (17)$$

So relativistic energy and momentum significantly increase with speed, thus the speed of light cannot be reached by massive particles. In some relativity textbooks, the so called "relativistic mass" $m = \gamma m_0$ is used as well. However, this concept is considered disadvantageous by many authors; instead the expressions of relativistic energy and momentum should be used to express the velocity dependence in relativity, which provide the same experimental predictions.

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First experiments capable of detecting such relations were conducted by Walter Aufmann, Alfred Bucherer and others between 1901 and 1915. These experiments were aimed at measuring the deflection of beta rays within a magnetic field so as to determine the mass-to-charge ratio of electrons. Since the charge was known to be velocity independent, any variation had to be attributed to alterations in the electron's momentum or mass.

Boucherer Experiment

In Boucherer experiment if we consider the initial mass of electron m_0 and the output electron, we have;

$$m = m_0 + m_E$$

There m_E is the gained mass of energy by electron in acceleration (exerting external force). Considering the relation (11) we have:

$$E = nSQE\ , m_E = \frac{E}{c^2} = \frac{nSQE}{c^2} = nm_{SQE}$$

Thus;

$$m = m_0 + m_E = m_0 + nm_{SQE}$$

In reality is that in Boucherer experiment, an electron in acceleration gains energy and after exiting from the accelerator tunnel, because of collision with another particle or because of passing through a field that gives it negative acceleration, it loses the energy and in terms of mass it returns back to its former state (the inverse form of Compton effect [5]). One could always use this experiment to prove relativity mass, but could not explain the real interaction between force and mass with relativistic mass.

Newton's second law and Sub Quantum Energy

Newton's second law in classical mechanics which the mass was given as constant value and it was defined as follows;

$$F = \frac{dP}{dt} = m\frac{\mathrm{dv}}{dt} \qquad (18)$$

By considering relativity and the speed limit of light, in order to propose the speed limit, the relation (18) was modified. Thus the relativistic mass and the interaction between force and mass were presented as follows:

$$F = \frac{dp}{dt} = \frac{d(m\mathrm{v})}{dt} = \mathrm{v}\frac{dm}{dt} + m\frac{\mathrm{dv}}{dt} \qquad (19)$$

Due to the relations (17) and (19), no force could extend/transmit the object/particle's speed faster than the speed of light. It would be acceptable that the external force action is limited, but the reason is not the mass variations rather as it accented above, the reason of the

speed limit should be sought in the structure of matter. According to the definition of the photon and *SQE*, Newton's second law could be reconsidered.

By assuming an electron at moment t_1, with the mass m and the speed v_1 along an axis in the field (on an inertial frame in the gravitational or electrical field), under the force F and at the moment t_2, so its speed becomes v. Electron takes energy dE in the interval $dt = t_2 - t_1$. According to relation (12) we have: At the moment t_1;

$$p = m\mathrm{v}_1$$

Within the time $dt = t_2 - t_1$, the electron gains energy as dE. At this time the electron momentum changes to the following value:

$$dE = np_{SQE}c = nm_{SQE}c^2$$

At the moment t_2 one could write:

$$m\mathrm{v}_1 + nm_{SQE}c = (m + nm_{SQE})\mathrm{v}$$

$$\mathrm{v} = \frac{m\mathrm{v}_1 + nm_{SQE}c}{m + nm_{SQE}} < c$$

Because of;

$$\mathrm{v}_1 < c$$

$$\mathrm{v} = \frac{m\mathrm{v}_1 + nm_{SQE}c}{m + nm_{SQE}} < \frac{mc + nm_{SQE}c}{m + nm_{SQE}} = c \qquad (20)$$

As $\mathrm{v}_1 < c$, so always $\mathrm{v} < c$. Here one could correlate increased mass to the gain of energy in Newton's second law, i.e, so;

$$\frac{dm}{dt} = \frac{nm_{SQE}}{dt} = \frac{1}{c^2}\frac{dE}{dt}$$

And Newton's second law could be rewritten as below:

$$F = \pm\frac{\mathrm{v}}{c^2}\frac{dE}{dt} + m\frac{d\mathrm{v}}{dt} \qquad (21)$$

The ± sign in relation (21) has been marked on the increasing and decreasing state of energy (collinear or non-collinear directional variations in force and speed). The relativistic mass uses in high energies just for showing the speed limit in quantum equations while for well-known subatomic particles always $\mathrm{v} < c$, in this order, only the given energy by particles must be considered and there no need to use the relativistic mass relation. We can better understand and explain the physical phenomena by using Newton's second law as a relation (21). Through such a view of physical and astrophysical phenomena, the explanation of the universe would be more real. According to the Sub-Quantum Energy Principle the speed value of all subatomic particles would be always constant and external force could only convert the *SQE*'s linear motions to nonlinear motions and vice versa. The speed of the created particles is a function of the internal interaction and the mechanism of creation of subatomic particles, and the external forces that are exerted on them. Thus light speed is

constant in vacuum but it changes in air or water and as soon as it enters vacuum it travels at former constant speed.

Moreover, concerning the speed of other subatomic particles, the reason behind the speed is a function of the internal interaction of the particles and the interaction among the *SQE*s within the structure of those particles.

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