

A new Definition of Graviton

H.Javadi^a , F.Forouzbakhsh^b, H.Pour Imani^c

*a)Invited Professor of the Faculty of Science at Azad Islamic University
Tehran campuses, Tehran, Iran
Javadi_hossein@hotmail.com*

*b)Academic Researcher, Office of the Vice Chancellor for Research
and Technology, University of Tehran, Tehran, Iran
fforouz@ut.ac.ir*

*c)A Physics Student Researcher of CPH Theory, Tehran, Iran
Hamed@iwp.ir*

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.

Keywords: Graviton, Higgs, Photon, color charge, magnetic color, pair production.

A new definition of graviton

1 Introduction

Today's physics is outspread between macro and micro world. General Theory of Relativity very well describes Macro world, while Quantum Mechanics very well describes probability in micro world. But problem occurs when we want to unify these two theories into the one that would be able to describe each phenomenon in the Universe.

Authors don't claim that this model is a unified theory of general theory of relativity and quantum mechanics. But authors claim that this is a great step for explaining gravity better than formal quantum theory.

To define graviton, let's consider to a photon that is falling in the gravitational field, and revert back to the behavior of a photon in the 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.

When some gravitons are around a photon (or other particles) they convert to color charges and enter into the structure of photon. Color charges around particles/objects interact with each other. There exists so much graviton around any particle. There are many layers of gravitons around a photon. The first layer is closed with photon, so that its gravitons interact with charge and magnetic fields in the structure of photon. The second layer interacts with the first layer and third layer and so on. Therefore; when a stone is falling in the gravitational field of the Earth, two layers of gravitons are applied to it, first layer up (at high h) and second down (at high $h-dh$). In down layer, the density of graviton is greater than up, so the stone falls and its kinetic energy increases.

In this model, an attempt has been made according to the concept of gravitational blue shift, to take the Mössbauer effect, Pound-Rebka experiments and the interaction between gravity and the photon into consideration from a Higgs field point of view. Blue shift and the Mössbauer effect indicate clearly that three different Higgs bosons cause increasing photon mass when they have electromagnetic specifications. This generalizes color charge from the nuclear regime to the photon. This new view of color charge means that we can redefine the graviton and electromagnetic energy.

Gravitons behave like charged particles and in the interaction between gravity and the photon, gravitons convert to negative and positive color charges and magnetic color. These color charges and magnetic color form electromagnetic energy and then electromagnetic energy converts to matter and anti-matter such as charged particles.

2 The Photon in the gravitational field

Looking at the behavior of a photon in the gravitational field can help redefine graviton. The fields around a "ray of light" are electromagnetic waves, not static fields.

A new definition of graviton

The electromagnetic field generated by a photon is much stronger than the associated gravitational field. In during photon falls 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 increases.

However, the energy of a 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. Moreover, according to the Higgs boson, what happens to photon in during blue shift?

3 Color-charges and color-magnetic

The change of frequency of a photon in a gravitational field has been demonstrated by the Pound-Rebka experiment. When a photon falls in the gravitational field, it acquires energy equal to $E=\Delta mc^2$ which separates 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 mechanical theory, every field is quantized. In addition, force is described as energy per distance shown by:

$$F = - \frac{dU}{dx} \quad (1)$$

If we consider this equation from the aspect of quantum mechanics, a graviton enters into the structure of a photon, carrying gravitational force. As a result, a graviton disappears and the energy of the photon increases.

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

Before continue this argument, let's redefine the rest mass of a particle. As we know, some particles such as photons are never seen at rest in any reference frame. According to relativity however, they do have mass that derives from their energy. For example a photon has a mass given by:

$$E=mc^2=h\nu \Rightarrow m=\frac{h\nu}{c^2} \quad (2)$$

So, there are two kinds of particles in physics;

A new definition of graviton

- Some particles like the photon move only with the speed of light c , in all inertial reference frames. Let's call this kind the NR particles or Never at Rest condition particles.
- Other particles like the electron always move with speed $v < c$ in all inertial reference frames; they have a rest mass, and could be called PNZRM or Particles of Non Zero Rest Mass.

According the above definition, photons and gravitons are NR particles, while electrons and protons are PNZRM particles.

Suppose a photon with NR mass m and energy $E = h\nu$ falls toward the Earth relative to an inertial reference frame on the surface of the Earth. Its frequency increases from ν to ν' , and a large number of gravitons enter into the structure of the photon such that $\Delta\nu = \nu' - \nu$. The problem is; how many gravitons enter into a photon to provide the least possible photon energy change (minimum $\Delta\nu$)?

Now, according to this argument, in order to calculate the number of gravitons involved in $\Delta\nu$ and to explain their properties, suppose a photon with frequency ν is formed of n_1 elements, and with a frequency ν' it contains n_2 elements. These elements are not the same, because they exhibit different properties. Let us propose a 1×4 matrix:

$$[A \ B \ C \ D].$$

Now we need to calculate A, B, C and D so that they satisfy the properties of a photon. When gravity works on a photon, gravitons enter into the photon and the intensity of its electric field increases. The photon has no electrical effect; therefore A and B must carry electric field around the photon with opposite effect. So, according to the relative intensity of electric and magnetic fields $E=cB$, we can write;

$$A=cH^+, \quad B=cH^-, \quad c \text{ is the speed of light}$$

Here H^+ is positive color-charge and H^- is negative color-charge. In addition, in the above relation c is a mathematical constant that relates E and B in electromagnetism. So, let us show $c=\kappa$. Then the above relation becomes:

$$A=\kappa H^+, \quad B=\kappa H^-, \quad \kappa \text{ is a mathematical constant}$$

When a large count of H^+ enters into a photon, the intensity of its positive electric field increases. According to the Maxwell equations, the intensity of its magnetic field increases as well.

Also, element C must carry a magnetic effect around the positive color-charges and the same applies to the D element for the negative color-charges. Therefore, C and D are the same but with opposite direction. So, according to the relationship between the intensity of electric and magnetic fields, we can write;

$$C=H^m, \quad D=-H^m$$

A new definition of graviton

Then the matrix $[A \ B \ C \ D]$ takes the following form, here named the CPH matrix;

$$[CPH] = [\kappa H^+ \ \kappa H^- \ H^m \ H^m] \quad (3)$$

According to the above expression, we are now able to define the least magnitude of a photon. A photon of minute energy contains some positive color-charges H^+ , negative color-charges H^- , right rotation color-magnetism H^m and left rotation color-magnetism $-H^m$ as shown in the CPH matrix (relation 3). This very small energy can be express as the following;

$$\text{Minute electromagnetic energy} = (2\kappa + 2)E_{CPH} \quad (4)$$

Note; the energy of a CPH (E_{CPH}) is defined later in relation (6).

The argument is now in a position to offer some supportable propositions about the photon and a new definition of the graviton. However, in the present article the photon is made of gravitons. To resolve this, we need to continue with the definition of CPH and the Principle of CPH and then return to properties of a graviton.

4 Definition of a CPH

What is a CPH? It is the Creative Particle of Higgs, or, CPH is an existence unit of nature. In other words, everything is made of CPH. Therefore, a CPH is appropriately referred to as the unit of nature, although this not meant to be a “particle” as this concept has been traditionally referred to in physics.

A CPH is a NR particle, with a constant NR mass m_{CPH} , that moves with a constant magnitude speed of $|V_{CPH}| > |c|$ in any inertial reference frame, where c is the speed of light.

According to the mass-energy relation, the NR mass of a CPH is defined relative to a photon's NR mass by;

$$m_{CPH} < m = \frac{h\nu}{c^2} \quad \forall \nu \quad (5)$$

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

A new definition of graviton

$$\langle E_{\text{CPH}} \rangle = \langle |P_{\text{CPH}}| \rangle V_{\text{CPH}} = \text{constant} \quad (6)$$

Relation (6) shows that the energy of every CPH is constant, in any interaction between two (or more) CPH. So, given $|V_{\text{CPH}}|$ cannot alter, they must take on spin to conserve the total energy. In other words, in any inertial reference frame and Cartesian components;

$$|V_{\text{CPH}}(x)| + |V_{\text{CPH}}(y)| + |V_{\text{CPH}}(z)| = |V_{\text{CPH}}|, \text{ CPH has no spin} \quad (7)$$

$$|V_{\text{CPH}}(x)| + |V_{\text{CPH}}(y)| + |V_{\text{CPH}}(z)| < |V_{\text{CPH}}|, \text{ CPH has spin} \quad (8)$$

When a CPH has spin, it is called a graviton

Simply, a lone graviton without spin is a CPH. When;

$$|V_{\text{CPH}}(x)| + |V_{\text{CPH}}(y)| + |V_{\text{CPH}}(z)| \geq c \quad (9)$$

There is no difference between bosons and fermions. In this case, a CPH carries gravitational force and behaves like a fermion. Therefore, there are color-charges, only.

When;

$$|V_{\text{CPH}}(x)| + |V_{\text{CPH}}(y)| + |V_{\text{CPH}}(z)| \leq c, \text{ the magnetic effect appears.}$$

For particles like electrons or quarks;

$$|V_{\text{CPH}}(x)| + |V_{\text{CPH}}(y)| + |V_{\text{CPH}}(z)| < c \quad (10)$$

Other bosons also occur. For example, reconsider pair production. Before pair production, there is a photon only. There is an electron, positron and virtual photon (boson) that carries electromagnetic force, after pair production. So, we can write:

$$|V_{\text{CPH}}(x)| + |V_{\text{CPH}}(y)| + |V_{\text{CPH}}(z)| < c \quad (11)$$

Spontaneous Symmetry Breaking has occurred.

A new definition of graviton

Accordingly, a CPH with spin is called a graviton, so space is full of CPH. Increasing density of CPH in space causes their separation to decrease until they feel and absorb each other.

Suppose two CPH are moving in the x-axis direction and absorb each other, such that their paths change without decreasing the magnitude of V_{CPH} . According to relation (6), two interacting CPH rotate each other, but they cannot have same direction of spin. They have spin in opposite directions. If positive color-charge has up spin, then negative color-charge must take on down spin.

5 Principle of the CPH theory

CPH is a unit of minuscule energy with a constant NR mass (m_{CPH}) that moves with a constant magnitude of speed such that $|V_{\text{CPH}}| > |c|$, in all inertial reference frames. Any interaction between CPH and other existing particles represents a moment of inertia \mathbf{I} where the magnitude of V_{CPH} (a scalar) is constant and never changes. Therefore,

$$\nabla V_{\text{CPH}} = 0 \text{ in all inertial reference frames and any space}$$

Based on the principal of CPH, a CPH has two types energy generated by its movement within its inertial frame. One is translational and the other is spin. 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 CPH, we use a Hamiltonian to describe the summation of energy generated by translation and spin as follows:

$$E_{\text{CPH}} = T + S \quad (12)$$

Where T is translational and S is spin energy of a CPH respectively. Since the speed and mass of CPH are constant, then $E_{\text{CPH}} = \text{constant}$. CPH produces energy and energy produces Matter and Anti-Matter. In fact, everything has been formed of CPH.

6 CPH and the cyclic group

As explained in section 3, gravitons in interaction with each other convert to color-charges and color-magnetic. In addition, when a CPH has spin, it is calling a graviton. Therefore, we can define a cyclic group for electric field that is generated by gravitons.

A new definition of graviton

So, $G\langle g \rangle$ given by;

$$G\langle g \rangle = \{nH^+, nH^- \mid n \in \mathbb{Z}\} \quad (13)$$

Suppose $2n$ color-charges (nH^+ and nH^-) combine and move in space. There are two electric fields with opposite sign in that space. About each such field a magnetic field forms, produced by gravitons. According to the signs of these fields, the directions of these magnetisms are different, so their elements are same. Therefore, there is a cyclic group given by:

$$G\langle g \rangle = \{kH^m \mid k \in \mathbb{Z}\} \quad (14)$$

Therefore, when the intensity of color-charges grows, about each field (negative and positive fields) a magnetic field forms. This magnetic field maintains the electric field. This mechanism is explainable by the Larmor radius (gyroradius or cyclotron radius) given by;

$$r_g = \frac{mv_{\perp}}{|q|B} \quad (15)$$

Where r_g is the gyroradius, m is the mass of the charged particle, v_{\perp} is the velocity component perpendicular to the direction of the magnetic field, q is the charge of the particle, and B is the constant magnetic field.

This defines the radius of circular motion of a charged particle in the presence of a uniform magnetic field. When color-charges change in the structure of a photon, then magnetic-color changes too. Therefore the electric fields do not decay in the structure of a photon. In general, a photon has been formed of two parts;

1- A large number of negative color charges and magnetic color. Magnetic color maintains color charges in a tube-like distribution, so negative magnetic color forms an appropriate negative electric field. In addition, the same happens for positive electric field in the opposite sense. So it is now possible to demonstrate the least possible negative color charges with their magnetic color by $\langle \kappa H^-, -H^m \rangle$, so that;

$$\langle \kappa H^-, -H^m \rangle \quad (16)$$

A new definition of graviton

2- Similarly to the above; positive color charges with their magnetic color can be shown by $>$, so that;

$$|> = (\kappa H^+, +H^m) \quad (17)$$

The sign (+and -) of $(+H^m), (-H^m)$ depend on the direction of movement around the color charges. In fact, there is a kind of magnetic color in the structure of a photon. Therefore, generally, a photon is given by;

$$n|< + n|> = |E\rangle \quad (18)$$

In the quantum mechanics of any general field, plane waves of specific spin can always be written in terms of photons with a simple spin state and a general spatial wave function. Thus the fundamental entity, the photon, can be considered quite generally to be a plane wave with a circularly polarized spin component (Any field can be built from these basic ingredients). For simplicity, consider a photon traveling in the x direction, or consider the direction of the photon as choosing the coordinate axis so that x points along the photon's momentum vector. Every element in the photon (relation 18) moves with linear speed in the same direction as the photon.

This phenomenon shows that an electric field has no charge effect when formed of two kinds of color-charge, namely negative color-charge and positive color-charge. Moreover, in pair production, negative color-charges combine with each other and make a negatively charged particle, and positive color-charges combine with each other to make a positively charged particle. The magnetic colors with different direction move around the electron and positron. So that;

$$\text{electron: } e^- = n|< = n(\kappa H^-, -H^m) \quad (19)$$

$$\text{positron: } e^+ = n|> = n(\kappa H^+, +H^m) \quad (20)$$

The pair annihilates each other to form energy. In addition, there is no electric effect around the photons, so;

$$n|< + n|> = \gamma + \gamma \quad (21)$$

A new definition of graviton

In this process, each particle (electron and positron) decomposes to two parts. Each part of the electron combines with each part of the positron and converts to quantum energy. This phenomenon shows that the electron is divisible. Physicists use this phenomenon as a way to confirm the mass-energy equation $E=mc^2$, but in fact, there is another important concept inherent in pair annihilation since;

$$n < +n > = \left(\frac{n}{2} < +\frac{n}{2} >\right) + \left(\frac{n}{2} < +\frac{n}{2} >\right) = \gamma + \gamma \quad (22)$$

These photons are neutral and they carry two electric and magnetic fields. This phenomenon is acceptable only where two opposite charged particles separate and recombine again.

Summary;

According to this article we have generalized color charge from the nuclear regime to the photon. This new view of color charge means that we can redefine the graviton and electromagnetic energy. Gravitons behave like charged particles and in the interaction between gravity and the photon, gravitons convert to negative and positive color charges and magnetic color. These color charges and magnetic color form the electromagnetic energy. Electromagnetic energy converts to matter and anti-matter as charged particles.

Acknowledgment:

The authors would like to express their sincere thanks to William M. MacArthur (wilmac@aapt.net.au) and Sean McCarthy (seanmac@cablenet.ie) for editing the current article.

References;

1- Richard Cushman. and Wilberd van der Kallen. (2005). 'A new interpretation for the mass of a classical relativistic particle', Elsevier Journal, Physics Letters Volume 24, Issue 3, May 2006, Pages 230-234

2- Ravindran V. (2006) 'Higher-order threshold effects to inclusive processes in QCD', Elsevier Journal, Physics Letters B, Available online 11 July 2006

Perelstein M. (2006) 'Little Higgs models and their phenomenology', Elsevier

A new definition of graviton

- 3- Journal, Progress in Particle and Nuclear Physics, Available online June 2006
- 4- Gupta G. P. and Lal K. C. (1971) '*On the equivalence of gravitational red shift and temperature shift in the Mossbauer effect*', Elsevier Journal, Physics Letters A Volume 36, Issue 5, September 1971, Pages 421-422
- 5 - Peter S. Riseborough, E-book, Advanced Quantum Mechanics March 14, 2007
- 6- Stefan Waner, E-book, Introduction to Differential Geometry & General Relativity
4th Printing January 2005
- 7- <http://www.daviddarling.info/encyclopedia/C/Casimir.html>
- 8- * advanced string theory <http://superstringtheory.com/basics/basic3a.html>
- 9- F. Smarandache, V. Christianto, Fu Yuhua, R. Khrapko, J. Hutchison, E-book, *Unfolding the Labyrinth: Open Problems in Physics*, (University of Microfilm International)
- 10- General relativity forces Masataka Mizushima Department of Physics, University of Colorado, Boulder, CO 80309, USA November 2004. 30 November 2005-15 December 2005, Pages e369-e378