

## On the constancy of the speed of light: a nature law or a natural accident!?

By:

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### **Abstract;**

I have tried to describe the summary of relativity, quantum mechanics problems, concepts that I have thought about, and solutions that I have for them. I hope this new point of view can help you to reconsider the concept of point particles in quantum mechanics.

Theories of relativity and quantum mechanics have been verified with experimental results. But both theories have problems and ambiguities. These problems cannot be considered as a weakness of the theories, but indication of scientific progress and the evolution of human knowledge.

Relativistic form of Newton's second law shows the mass varies. And the infinite speed in classical mechanics is replaced by the infinite mass. Also according to general relativity, singularity, space and time exist with zero volume and infinite density. I never accepted zero volume and infinite mass or density.

**Keyword:** Zero point energy, graviton, photon, sub quantum energy, color-charge, magnetism color, virtual photon, vacuum, singularity

### **1 Introduction;**

The Standard Model of particle physics is at a pivotal moment in its history: it is both at the height of its success and on the verge of being surpassed. Also there are many reasons for extending the Standard Model. For example: there is very good evidence that in the first fraction of a second of the big bang the universe went through a stage of extremely rapid expansion called inflation. The fields responsible for inflation cannot be Standard Model ones. (1) In addition to the above problems that quantum mechanics is involved with, let me add that point particles and unstructured photon are also not acceptable to me.

The uncertainty principle is certainly one of the most famous and important aspects of quantum mechanics. The notion of "uncertainty" occurs in several different meanings in the physical literature. It may refer to the lack of knowledge of a quantity by an observer, or to the experimental inaccuracy with which a quantity is measured, or to some ambiguity in the definition of a quantity, or to a statistical spread in an ensemble of similarly prepared systems.

Let's take a different look at some physical phenomena and to review the results of the uncertainty principle. As long as you think like the past, you will get the same results that you've already earned, Feynman said.

According to the stress-energy momentum tensor of general relativity, zero point energy, Casimir effect, gravitational blueshift, concept of virtual photons, and the quantum vacuum, there should be a strong relationship between gravity and electromagnetic energy.

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". Today, the photon is considered a Boson in the standard model, mediating the electromagnetic force. Being governed by quantum mechanics, photons exhibit properties of both waves and particles; known as wave-particle duality.

## **2 Rest mass of particles**

Let's assume gravitons exist, with regard to the exchange particles concept in the quantum electrodynamics theory and the existence of gravitons, I am trying to explain the above phenomena.

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, photons and gravitons are NR particles, while electron and proton are particles.

## **3 Relationship between graviton and photon**

The Weinberg Low-Energy theorem implies that the massless spin-2 particle couples to all particles in the same way at low energies, then together with the conclusion of this subsection this demonstrates that the massless spin-2 particle is the graviton. (2) Many physicists believe the graviton does not exist, at least not in the simplistic manner in which it usually envisioned. Superficially speaking, quantum gravity using the gauge interaction of a spin-2 field (graviton) fails to work the way that the photon and other gauge bosons do. However, in the present review the photon is made up of gravitons. To resolve this, I need to continue with the definition of graviton. Defining the graviton must be of theoretical and empirical support, but from a different and new viewpoint. 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. (3) 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 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 both 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.

As a photon flies from  $x_1$  to  $x_2$  its potential energy increases and it therefore needs to release a bit of its internal energy  $E_1 = hf_1$ . At location  $x_2$  it has the smaller energy  $E_2 = hf_2$ , the frequency of the radiation is thus slightly smaller. With a new look at graviton (since quantum mechanics emphasizes graviton) how can we explain the change of frequency and the photon's energy?

Suppose photon is structured. According to the properties of photon and its behavior in gravitational field, we should explain the gravitational redshift by using the interactions between gravitons and photon. In gravitational redshift, photon loses part of its energy and its frequency decreases. In fact, photon moves from the strong

gravitational intensity to the weak gravitational intensity, and loses part of its energy. According to  $F=-dU/dx$ , a part of photon energy is converted to gravitons. But energy of photon is electromagnetic energy. So, in gravitational redshift, the electromagnetic properties of photon also be transmitted to gravity (gravitons). In other words gravitons have carried the electromagnetic effects.

During the gravitational redshift, photon loses its energy part by part. The minimum energy that leaves the photon structure, has carried the electromagnetic energy properties. Let's show it with photon (minimum) or  $P_m$  that given by;

$P_m=hf$ , so that  $P_m$  is detectable

Perhaps our tools could not detect  $P_m$ , but it does not influence the above definition.

According to  $F=-dU/dx$  and  $P_m$  leaving photon structure (in gravitational redshift),  $P_m$  converts to gravity force, in fact  $P_m$  converts to gravitons.

But a photon becomes energy-laden by revolving. We know this because the electromagnetic fields around a "ray of light" are electromagnetic waves not static fields. Relativistic ally, the electromagnetic field generated by a photon is much stronger than the associated gravitational field.

So when  $P_m$  leaves the photon structure, it has carried all properties of photon. And when  $P_m$  decays to gravitons, they behave like electric and magnetic fields. But photon is electrically neutral, so a number of gravitons carry the negative electric field and the same number of gravitons carry the positive electric field and some of the gravitons carry the magnetic field. Let's name these, negative and positive color charges and magnetic colors. Also, when a photon falls in the gravitational field, its energy and frequency increases, gravitons in interaction with photon, first convert to negative and positive color charge and magnetic color, then they enter the photon structure.

#### 4 Graviton and sub quantum energy

Considering the electric and magnetic fields of electromagnetic wave (or a single photon) they are made up of gravitons (color charges and magnetic color). Gravitons move with linear speed  $c$  in the photon structure, and since they are also forming components of electric and magnetic fields, they have a nonlinear speed, as well. That is always as follows:  $V(g)>c$ , that  $V(g)$  is the total linear and nonlinear speeds of graviton.

**Graviton principle;** graviton with NR mass which moves at  $V(g)>c$ , relative to inertial reference frame and in every interaction between graviton with other particles or fields the speed value of graviton remains constant; as in every physical condition we have:

$\text{grad } V(g)=0$  , in all inertial reference frames and any space

Above relation shows that in every condition, the speed value of graviton remains constant and only the linear speed of graviton converts to nonlinear speed and vice versa.

Sub Quantum Energy (SQE)

Definition:  $P_m$  is formed of two SQEs, positive SQE and negative SQE, that given by;

$SQE=hf(\text{sqe})$  , that  $hf(\text{sqe}) < hf$  for any detectable  $E=hf$

So, a real photon is made up of a number of SQEs, so that  $E=hf=nSQE$ , and it does not mean  $n=f$ . This proportion simply represents the physical fact that frequency has a direct relation with the number and interaction of SQEs in photon.

Therefore, based on SQE definition we could relate the relation between photon's energy and frequency and the interactions between SQEs in photon's structure, i.e. with increasing the number of SQEs in photon, the interactions between SQEs in photon and consequently the frequency originating from these interactions will also increase but vice versa in redshift.

Besides the relation between SQEs and, could conclude that the SQE linear speed in vacuum relative to the inertial frames of reference, is actually the speed of light  $c$ . Since SQE in 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 motions. Thus, it has only linear motion. In other words the limit speed of SQE is  $V(\text{sqe})$  which is faster than light speed  $c$ , i.e.  $V(\text{sqe}) > c$ .

**SQE Principle:** SQE is a sub quantum energy with NR mass which moves at  $V(\text{sqe}) > c$ , relative to inertial reference frame and in every interaction between SQEs with other particles or fields the speed value of SQE remains constant; as in every physical condition we have:

$\text{grad } V(\text{sqe}) = 0$ , In all inertial reference frames and any spaces.

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. Thus, according to the equivalence of mass-energy  $E=mc^2$ , all particles have been made of SQEs.

Photon moves with constant speed  $c$  in vacuum. But in a non-vacuum environment (such as water) it moves with linear speed  $v=c/n$  ( $n$  is refractive index), it does not mean that light loses its speed, but it means that in a non-vacuum environment, a part of the linear speed of SQEs that belong to photon, becomes non-linear speed. Once photon passes through non-vacuum environment and enters the vacuum, it moves with speed  $c$  again. The photon speed is from SQE, and SQE speed is fed by gravitons. So according the definitions of graviton, SQE and photon we can show that  $V(g) > V(\text{sqe}) > c > V(\text{particles})$ . and the constancy speed of light is a law. According to relativistic time dilation and photon definition in quantum mechanics, time does not exist in sub quantum level and existence of graviton.

**Note;** According to  $V(g) > V(\text{sqe}) > c > V(\text{particles})$ , when  $v < c$ . spontaneous symmetry breaking has occurred.

## 5 A Review of Newton's Relativistic Second law

The true understanding of physical entity of energy and the structure of photon, enables us to understand the structure of matter. Moreover, Newton's second law is the only relation that shows the interaction between force and matter. This equation has the sufficient efficiency to explain and investigate physical phenomena, when it would be formulated based on the natural reality of matter and the effect of force on the matter. The reality is that the external force, no way and under any physical condition, could not change the speed value and it only could convert the linear motion of the constituting particles of matter and energy to the nonlinear motion and vice versa. Moreover, one could explain the expansion of the universe better and more real through reviewing Newton's second law.

<http://article.sapub.org/10.5923.j.jnpp.20120203.02.html>

### Zero Point Energy and Casimir effect

Space is full of gravitons. Gravitons interact with each other and convert to color charges. Intensity of interaction between gravitons depends on their density in a given volume. According to the above expression, we are able to explain the mechanism of ZPE. Some gravitons with the same NR mass  $m$  (graviton) convert to color-charges and magnetic color, and two negative and positive SQE forms. Then a  $P_m$  does appear.

### Virtual photon

In quantum electrodynamics (QED) a charged particle emits exchange force particles continuously. This process has no effect on the properties of a charged particle such as its mass and charge. How is it explainable? Theoretically a pure steady state spin current without charge current can induce an electric field (4). If a charged

particle as a generator has an output known as a virtual photon, what will be its input? According to SQE, the generator (charged particle) input is graviton and the output is virtual photon.

<http://sjournals.com/index.php/SJPAS/article/view/678>

### Singularity

According to SQE, we are able to show there is not a zero volume with infinite density in singularity (also before the Big Bang). Also everything is a clock, and time begins with everything such as a man (or an electron, earth, sun...) or our visible universe is clock. Maybe when we are speaking about time, in fact we are comparing a clock (a man) with another clock (visible universe).

<http://www.sjournals.com/index.php/SJPAS/article/view/602/pdf>

### Conclusion;

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 electromagnetic energy. Electromagnetic energy converts to matter and anti-matter as charged particles. Space is full of gravitons. Gravitons interact with each other and convert to colorcharges. These color charges and magnetic color form electromagnetic energy.

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