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Reconsidering relativistic Newton's second law and its results

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Abstract:

In this paper three things are done:

1- There are some unanswered questions or complex concepts in modern physics. In general, these issues are divided into two categories:

A: The questions that modern physics does not have answers for, and the physicists believe that it is due to the inability of theories.

B - Complex concepts that seem unrealistic, but physicists have admitted they do not know the problems of modern physics.

2 - There are concepts and equations in physics (classical mechanics, relativity and quantum mechanics) that we can use to reach an understanding that is able to be experienced and by which we can review relativistic Newton's second law.

3 - Using the revised relativistic Newton's second law, we can make it easier to express complex concepts in modern physics and respond to many unanswered questions in modern physics.

Reconsidering relativistic Newton's second law and its results

Reconsidering the relativistic Newton's second law is a powerful tool that deepens our understanding of space-time and can be an important step in understanding the nature of interactions and unifying them easier.

Keyword: sub quantum energy, graviton, photon, relativity, blueshift, pair production, color charge, magnetism color, negative and positive virtual photon, QED, QCD, interactions, broken symmetric, fermion, Zero point energy, Dirac equation, Singularity

1 Questions and complex concepts

In physics there are a lot of unanswered questions and complex concepts of which the most important parts have been propounded here:

1- Infinity in space-time: Assume that the observable universe would collapse due to gravity, is there any force that can counteract the gravity collapse in the universe? In other word, after the universe collapses, how and by which law (or force) will the universe expand again? A gravitational singularity or space-time singularity is a location where the quantities that are used to measure the gravitational field become infinite in a way that does not depend on the coordinate system. These quantities are the scalar invariant curvatures of space-time, which includes a measure of the density of matter. For the purposes of proving the Penrose–Hawking singularity theorems, a space-time with a singularity is defined to be one that contains geodesics that cannot be extended in a smooth manner. The end of such a geodesic is considered to be the singularity. This is a different definition, useful for proving theorems. The two most important types of space-time singularities are curvature singularities and conical singularities. Singularities can also be divided according to whether they are covered by an event horizon or not (naked singularities). According to general relativity, the initial state of the universe, at the beginning of the Big Bang, was a singularity. Both general relativity and quantum mechanics break down in describing the Big Bang. My question is, if the universe collapses, will it reach to infinite density and zero volume? Or is there a force that will counteract it?

2- Reviewing the special relativity postulates, always raises some questions like, “Does the constant speed of light (photon energy), result from a natural accident?” or “what is the difference between the characteristics of mass and energy while the speed rate of energy is fixed; the speed of matter can change and cannot reach the speed of light?”. Meanwhile when the physical and chemical processes occur, some amount of matter is converted into energy; what happens during this process that mass with non-constant speed is converted into energy with the constant speed?

3- According to the fundamental particle physics theories and energy issues in the production and decay of pairs of matter–antimatter are included in finding the common features between matter and energy which can be considered the constant velocity of photon as a property that can be transmitted from matter into energy and vice versa and also differences in the mass, structure of matter and its relation fields are explained by the relationship between length contraction (reduce in volume) and relativistic mass and relativistic Newton second law which show the mass variations (i.e., the infinite speed in classical mechanics is replaced by the infinite mass). Infinite mass is not observable (such as infinite velocity), how can we explain the limit of speed without infinite mass?

4- This may probably seem an unusual question in physics however, taking it into consideration may lead us to solve some of the problems in this science. As every physicist knows, in quantum mechanics and relativity, it has been accepted that field and mass-energy are two separable items. In general relativity, gravity is replaced by space-time, therefore it is not a fundamental force. Quantum mechanics is a very good set of mathematical models that show how many elementary forces work, but it does not explain how they work. What is the main obstacle in the way of uniting the four forces and all of the elementary particles? We do not know how a charged particle produces an electric field or virtual photons in quantum mechanics. And many other unanswered questions. Maybe thinking about this seems useless or maybe it can be a step in order to find a theory of super-symmetry. Is it possible for force, energy and mass to convert to each other? If not, why? If so, how?

5- Late nineteenth century physics was faced with a crisis in the speed of light and energy. Quantum characteristic of radiation was proposed by Max Planck and during the past century his theory was developed and it reached to the quantum mechanics and elementary particles models. Einstein proposed the speed of light by special relativity theory. In this theory the speed of light in inertial frame of reference is constant “c”, and also it is the limit rate of speed. On the other hand, visible light is a radiation which is the small part of electromagnetic spectrum. The question is: On the constancy of the speed of light: a nature law or a natural accident!

6- The Einstein field equations or Einstein equation are not a dynamical equations that describe how matter and energy change the geometry of space-time, this curved geometry being interpreted as the gravitational field of the matter source. Einstein tried to propound geometrical structures of space by mathematical equations. So, he used non-Euclidian geometry. There are three considerable notes on Einstein’s equations;

1- Einstein Field Equations do not come from the equivalence principle directly. These equations are simply equations that are suitable for general relativity.

2- There is a physical explanation for the path of light in a gravitational field. Although explaining the frames of reference is a physical concept, there is not any explanation of how gravitational field affects photons in general relativity. Then how can we explain this phenomenon by quantum mechanics?

3- Space-time is a continuous quantity in general relativity. But the changing of photon frequency and production of energy are quantized. That gravitational blueshift (or redshift) is a special case of gravitational field that affects the photon. My question is therefore: how can we explain the gravitational blueshift according to the relationship between photon energy and its frequency?

7- The important concept in relationship between 'mass' and energy is c, regarding the phenomena of creation and decay of electron-positron pair, why do the related photons move at constant speed, but we could change the speed of matter and antimatter? What is the unique characteristic of matter which is convertible to photons that move with constant speed c (speed of light)? The idea that object/particle could not travel at superluminal speeds, originates from the structure of matter and the mechanism of interaction between field and mass; that with presenting a postulate we could generalize the constancy of speed from energy to mass. By gravitational blueshift, the energy of photon and consequently its

frequency will increase. What is the mechanism of increasing in the photon energy that causes increase in its frequency? Are there more results than before in the energy-mass equivalence equation?

8- All our theories today seem to imply that the universe should contain a tremendous concentration of energy, even in the emptiest regions of space. The gravitational effects of this so-called vacuum energy would have either quickly curled up the universe long ago or expanded it too much greater size. The Standard Model cannot help us understand this puzzle, called the cosmological constant problem [1].

9- The expansion of the universe was long believed to be slowing down because of the mutual gravitational attraction of all the matter in the universe. We now know that the expansions accelerating and that whatever causes the acceleration (dubbed “dark energy”) cannot be Standard Model physics.[1]

10- 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]

11- The Standard Model cannot include gravity, because it does not have the same structure as the other three forces. In expressing these mysteries, when I say the Standard Model cannot explain a given phenomenon, I do not mean that the theory has not yet explained it but might do so one day. The Standard Model is a highly constrained theory, and it cannot ever explain the phenomena listed above.[1]

12- Richard Feynman once quipped that "Time is what happens when nothing else does." But Julian Barbour disagrees: if nothing happened, if nothing changed, then time would stop. For time is nothing but change. It is change that we perceive occurring all around us, not time. Put simply, time does not exist. [2] Efforts to understand time below the Planck scale have led to an exceedingly strange juncture in physics. The problem, in brief, is that time may not exist at the most fundamental level of physical reality. If so, then what is time? And why is it so obviously and tyrannically omnipresent in our own experience?

“The meaning of time has become terribly problematic in contemporary physics,” says Simon Saunders, “The situation is so uncomfortable that by far the best thing to do is declare oneself an agnostic.” [3] The question is, what is the physical nature of time? Which physical beings are not subject to the passage of time?

13- 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? If a charged particle as a generator has an output known as a virtual photon, what will be its input?

14- Zero-point energy, also called quantum vacuum zero-point energy, is the lowest possible energy that a quantum mechanical physical system may have; it is the energy of its ground state. All quantum mechanical systems undergo fluctuations even in their ground state and have an associated zero-point energy, a consequence of their wave-like nature. The uncertainty principle requires every physical system to have a zero-point energy greater than the minimum of its classical potential well. This results in motion even at absolute zero. For example, liquid helium does not freeze under atmospheric pressure at any temperature

because of its zero-point energy. If the zero point energy in space (vacuum) exists, how can we explain the zero-point energy without using the uncertainty principle?

15- In quantum mechanics, the concept of a point particle is complicated by the Heisenberg uncertainty principle, because even an elementary particle, with no internal structure, occupies a nonzero volume. There is nevertheless a distinction between elementary particles such as electrons, photon or quarks, which have no internal structure, versus composite particles such as protons, which do have internal structure. According to the quantum mechanics that photon is an unstructured particle, how can we explain the relationship between the photon energy and frequency, and also pair production and decay?

16- QED rests on the idea that charged particles (e.g., electrons and positrons) interact by emitting and absorbing photons, the particles of light that transmit electromagnetic forces. These photons are virtual; that is, they cannot be seen or detected in any way because their existence violates the conservation of energy and momentum. If the electromagnetic field is defined in terms of the force on a charged particle, then it is tempting to say that the field itself consists of photons which cause a force on a charged particle by being absorbed by it or simply colliding with it - as in the Photo-electric effect. The electric repulsion between two electrons could then be understood as follows: One electron emits a photon and recoils; the second electron absorbs the photon and acquires its momentum. Clearly the recoil of the first electron and the impact of the second electron with the photon drive the electrons away from each other. So much for repulsive forces. How can attraction be represented in this way? The uncertainty principle makes this possible. The attraction between an electron and a positron may be described as follows: the electron emits a photon with momentum directed away from the positron and thus recoils towards the positron. This entails a degree of definiteness in the momentum of the photon. There must be a corresponding uncertainty in its position - it could be on the other side of the positron so that it can hit it and knock it towards the electron. Is there a way to explain virtual photon (in fact interaction between charged particles) without using the uncertainly principle?

17- In physics, the graviton is a hypothetical elementary particle that mediates the force of gravitation in the framework of quantum field theory. If it exists, the graviton must be massless (because the gravitational force has unlimited range) and must have a spin of 2. This is because the source of gravitation is the stress-energy tensor, a second-rank tensor, compared to electromagnetism, the source of which is the four-current, a first-rank tensor. Additionally, it can be shown that any massless spin-2 field would be indistinguishable from gravitation, because a massless spin-2 field must couple to (interact with) the stress-energy tensor in the same way that the gravitational field does. This result suggests that if a massless spin-2 particle is discovered, it must be the graviton, so that the only experimental verification needed for the graviton may simply be the discovery of a massless spin-2 particle.

Gravitons are postulated because of the great success of quantum field theory (in particular, the Standard Model) at modeling the behavior of all other known forces of nature as being mediated by elementary particles: electromagnetism by the photon, the strong interaction by the gluons, and the weak interaction by the W and Z bosons. The hypothesis is that the gravitational interaction is likewise mediated by a – yet undiscovered – elementary particle, dubbed the graviton. In the classical limit, the theory would reduce

to general relativity and conform to Newton's law of gravitation in the weak-field limit. However, attempts to extend the Standard Model with graviton has run into serious theoretical difficulties at high energies (processes with energies close to or above the Planck scale) because of infinities arising due to quantum effects (in technical terms, gravitation is non-renormalizable). Since classical general relativity and quantum mechanics are incompatible at such energies, from a theoretical point of view the present situation is not tenable. Some proposed models of quantum gravity attempt to address these issues, but these are speculative theories. As long as you think like the past, you will get the same results that you've already earned, Feynman said. Does a new definition of the graviton solve the problem of quantum gravity?

These questions and complex concepts will be answered after reconsidering relativistic Newton's second law.

2 Reconsidering relativistic Newton's second law

In this section the relativistic Newton's second law will be discussed. But before that, it is necessary to redefine the zero rest mass. The new definition of graviton in relation to the speed is presented. Before anything else, it should be noted that mass and energy are not equal, but as $E = mc^2$shows, mass and energy are also equivalent.

2-1 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 $\mathrm{v} < c$ 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.

2-2 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 [6]. 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 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 [6].

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.

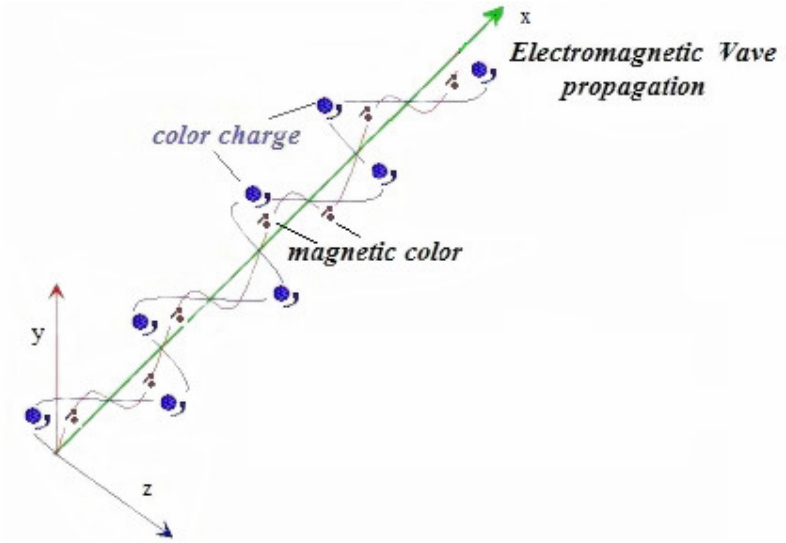


Fig1; paths of gravitons in photon structure, color charges and magnetic color have spin and curvature speed

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).

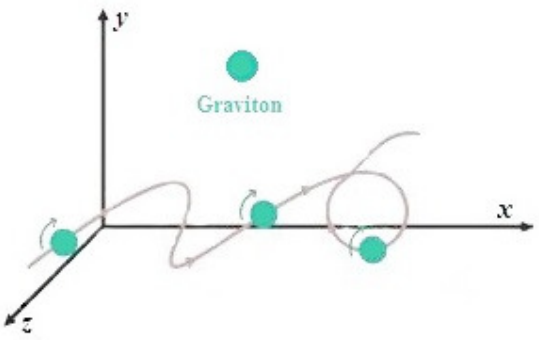


Fig2; Hypothetical path of a graviton in the Cartesian coordinate system

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;

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

2-2 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 [7]. 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;

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

2-3 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." [8]

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

2-4 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;

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

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.

2-5 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.

2-6 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 [9].

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

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

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:

$$E_2 = h\nu_2 = n_2SQE, E_1 = h\nu_1 = n_1SQE, E_2 > E_1\ \Rightarrow\ n_2 > n_1, n \propto \nu \qquad (13)$$

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 $|V_{SQE}| > |c|$.

2-7 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.

2-8 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.

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.

2-9 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 $\mathrm{m_E}$ 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 [10]). One

could always use this experiment to prove relativity mass, but could not explain the real interaction between force and mass with relativistic mass.

2-10 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;

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

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:

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

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;

$$p = mv_1$$

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:

$$mv_1 + nm_{SQE}c = (m + nm_{SQE})v$$

$$v = \frac{mv_1 + nm_{SQE}c}{m + nm_{SQE}} < c$$

Because of;

$$v_1 < c$$

$$v = \frac{mv_1 + nm_{SQE}c}{m + nm_{SQE}} < \frac{mc + nm_{SQE}c}{m + nm_{SQE}} = c \qquad (20)$$

As $v_1 < c$, so always $v < c$. 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:

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

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 $v < c$, in this order, only the given energy by particles must be considered and there is 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.

3 Results of reconsidering relativistic Newton's second law

Many theories in physics have mathematical singularities of one kind or another. Equations for these physical theories predict that the ball of mass of some quantity becomes infinite or increases without limit.

Newton's second law and gravitational law are the fundamental laws of physics which apparently none of them can limit the effectiveness of another. The mass of an object in classical mechanics can be increased illimitably (universal law of gravity) but in general relativity, there is no limit to the curvature of space [11, 12]. From sub-quantum energy view, the mentioned laws have limitations which have not been investigated in quantum mechanics and relativity. But by sub-quantum looking at the physical phenomena and reviewing Newton's second law; can help us to specify these limitations. Then we can see how each of these two laws (Newton's second law and gravity) to reach infinite value can prevent the other one. This review strongly can change our attitude to the singularity.

3-1 Singularity and Sub Quantum Energy (*SQE*)

Reconsidering relativistic Newton's second law and its results

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/objects have been made up of *SQE*s. The logical consequence of this attitude toward the mass and energy is the reason of reviewing in Newton's second law. Equation (19) is the relativistic form of Newton's second law and by using definition of sub-quantum principles of energy; it is presented as relation (21). According to the concepts and explanations have already been stated, a brief comparison is performed (Tabl 1).

In this section we are reconsidering the singularity, but without regard to the escape velocity and black hole singularity cannot be reviewed. Escape velocity is the speed at which the kinetic energy plus the gravitational potential energy of an object is zero. It is the speed needed to "break free" from the gravitational attraction of a massive body, without further propulsion. For a spherically symmetric body, the escape velocity at a given distance is calculated by the formula;

$$\mathrm{v}_{esc} = \sqrt{\frac{2GM}{R}} \qquad (22)$$

Table 1
Mass and Energy in CM, QM, SR, GR and *SQ*E

Classical mechanics	Mass and energy are two separate quantities. Mass is conserved and energy is conserved too. Newton's second law $F = m\mathrm{d}v/dt$, shows that a body can approaches at very high speed, higher than light speed or more.
Quantum mechanics	The Mass (m), Momentum (P) and Energy (E) of the particle are related by; $E = \frac{P^2}{2m}$. Energy cannot be continuous for a particle.
Relativity	Mass and energy are equivalent $E = mc^2$ and they are not separately conserved. Relativistic Newton's second law given by relation (19) and relativistic mass $m = \gamma m_0$, show that a photon with mass $m = E/c^2$, should has zero rest mass.
Sub quantum energy	Sub-quantum energy defines by relation (10), photon consists of some *SQE* (relation 11). So everything is made up of *SQEs*. According to *SQE,* Newton Second law becomes as relation (21). Light speed is constant, because photon gets its speed of *SQEs* (relation 11). If we ignore the zero rest mass of photon, much better and more real physical phenomena may be investigated.

Where G is the universal gravitational constant, M is the mass of the planet, star or other body, and r is the distance from the center of gravity. In this equation atmospheric friction (air drag) is not taken into account. The ratio nm_{SQE} to m in subatomic particles such as electrons and protons is noticeable and remarkable (e.g. in a star), because with a little work done on them, they are moving quickly to reach escape speed. Relation (22) is different for photon that moves with speed c, i.e., the number of *SQE*s will not affect on the speed of photon. In the relation (22) to convert a star into a black hole it should be [13, 14];

$$\mathrm{v}_{esc} \geq c \qquad (23)$$

Reconsidering relativistic Newton's second law and its results

When a photon is escaping from the gravitational field of the black hole; gravity does negative work on photon and so *SQE*s leave structure of photons (gravitational redshift), then the photon loses all its energy, that means there is no photon to leave out the black hole. Using relations (11), (14) and $E = mc^2$ all particles/objects are made up of *SQE*s and the concept of mass-energy equivalence in relation to speed can be expressed that at an inertial system, quantum energies are transferred with linear speed of light c, while other particles such as electrons, protons, atoms and so one move slower than light speed. Using relativity, we know that the speed v of each particle/object in the inertial frame is obtained from the following relation (24) and we have $\mathrm{v} = c$ only for the light;

$$0 \leq |\mathrm{v}| < c \quad (24)$$

Particle/object that is inside a black hole the gravitational field can greatly affect on transmission speed of *SQE*s the constitutive of electrons in the atomic orbital and even reduce the volume of atom, for example, neutron stars can be noted here that value of *SQE*s transition speed inside of electrons is reduced by gravitational collapsing and value of non-transmission speeds will be grown [15, 16]. Reduce R is being dependent on mass M in the large bodies within the gravitational collapsing; it means that the radius R will be as a function of the mass M [17]. So in the relation (22) the value R by increasing value M will be smaller. In the next section we examine this issue further.

3-1-1 An absolute black hole

There are three-variables in relation (22): mass M, radius R and escape velocity v_{esc}. Reduce R is being dependent on mass M in the large masses within the gravitational collapsing. In this case to the best explanation of physical phenomena, we should study and survey the increasing mass effect on the large amount of force and also the force greatest effect on *SQE* to better explanation of physical phenomena. According to the definition of *SQE*, relative to the inertial system we have;

$$(\mathrm{v}_{SQE})_x + (\mathrm{v}_{SQE})_y + (\mathrm{v}_{SQE})_z = V_{SQE} = constant \quad (25)$$

Acting the external force on *SQE* in the *SQE* principle (relation 14) we will get;

$$(a_{SQE})_x + (\mathrm{a}_{SQE})_y + (\mathrm{a}_{SQE})_z = 0 \quad (26)$$

Where $(a_{SQE})_x$, $(\mathrm{a}_{SQE})_y$ and $(\mathrm{a}_{SQE})_z$ are linear acceleration on the axes *x*, *y* and *z*. The acceleration on each axis is associated with reducing acceleration on the other axes, i.e. $(a_{SQE})_x = -\left(\mathrm{a}_{SQE}\right)_y - (\mathrm{a}_{SQE})_z$, likewise for other acceleration components. We conclude from relations (25) and (26) that each with its own inherent energy always moves with constant speed v_{SQE} , i.e., the external force was acted on each particle/object, just can

convert the transmission speed of its *SQE*s to the non-transmission speeds like spin or rotation around itself and vice versa. In the inertial system we show v_{SQE} as the total transmission speeds rate and S_{SQE} the total non-transmission speeds rate of a *SQE*, so will always have;

$$\mathrm{v}_{SQE} + S_{SQE} = V_{SQE} \quad (27)$$

Thus, according to the direction of external force which was affected on a particle/object, the total non-transmission speeds rate is converted to the transmission speeds or to the inverse. Mechanism of such conversion process had been explained in the absolute black hole.

The effects of external force on *SQE*s, can be divided into two categories: The first one is the transmission external forces $F_{E\mathrm{v}}$ and the second one is the non-transmission external forces F_{ES}.

a) We show the transmission of external forces by $F_{E\mathrm{v}}$. These forces are converting the non-transmission speeds to the transmission speeds. According to the relation (21), we are applying the force $F_{E\mathrm{v}}$ to a *SQE*, so in a similar way applying to the all *SQE*s constituents of each particle/object. The energy of each *SQE* is constant i.e. $dE = 0$, using the new revision of Newton's second law, we get;

$$F_{E\mathrm{v}} = m_{SQE}\frac{d\mathrm{v}}{dt} \Rightarrow d\mathrm{v} = \frac{F_{E\mathrm{v}}}{m_{SQE}}dt$$

Assuming the initial transmission speed of *SQE* equals zero (*SQE*s have not transmission speed in relation (27)), we take the integral over the above differential equation;

$$\int_0^{V_{SQE}} d\mathrm{v} = \frac{1}{m_{SQE}}\int_0^t F_{E\mathrm{V}}\,dt = V_{SQE} \Rightarrow \int_0^t F_{E\mathrm{v}}\,dt = m_{SQE}V_{SQE} = P_{SQE} \quad (28)$$

When the transmission speed of *SQE* reach V_{SQE}, the force $F_{E\mathrm{v}}$ does not effect on the speed value of *SQE* and it only can freeze the direction of motion.

b) We show the transmission of external forces by F_{ES}. These forces are converting the transmission speeds to the non-transmission speeds. Actually, the torque is applied on *SQEs* by effecting of the forces F_{ES}, because the linear motion cannot be turned into the rotational motion without applying torque. By affecting this torque, the non-transmission speeds of *SQEs* will increase or *SQE* will rotate around itself. With attention to details of the relation (27), when speed gets $\mathrm{v}_{SQE} = 0$, the speed components S_{SQE} will be reached the highest value $S_{SQE} = V_{SQE}$. It should be noted that in a real environment (the Earth, stars, or the space between the stars), complex (set of) forces $F_{E\mathrm{v}}$ and F_{ES} are acted on a *SQE* and each *SQE* will be got transmission and non-transmission speeds (Table2).

Reconsidering relativistic Newton's second law and its results

Now we can define an absolute black hole. But before explanations, it is necessary to describe a few terms (Figure3);

1- *Sub-quantum Divergence:* if a particle/object affected when a force F_{Ev} acts on it, so the linear speed of its *SQE*s will be V_{SQE} and we say that the object has sub-quantum divergence. There is $v_{SQE} = V_{SQE}$ in the sub-quantum divergence (relations 27, 28).

2- *Sub-quantum Convergence:* if a particle/object affected when a force F_{ES}, acts on it, so the nontransmission speed of its *SQE*s will be V_{SQE} and we say that the object has sub-quantum convergence. There is $S_{SQE} = V_{SQE}$ in the sub-quantum convergence (relations 27, 28).

Table2
Singularity in CM, QM, GR and *SQE.*

Classical mechanics	A massive body can continue to grow by absorbing mass from its surroundings. Also, Gravity is described as an attractive force between masses. In CM, absolute time and space respectively are independent aspects of objective reality.
Quantum mechanics	Quantum mechanics is based on uncertainty and probability. According to these laws, elementary particles are not the infinitesimally. The occurrence of quantum mechanical singularities in certain spherically symmetric and cylindrically symmetric (including infinite line mass) space times is considered [19].
General relativity	At a singularity, space and time cease to exist as we know them. Thus the usual laws of physics break down near such a singularity [20]. So it's not really possible to envision something with infinite density and zero volume. In the SR and GR, time dilation is an actual difference of elapsed time between two events as measured by observers either moving relative to each other or differently situated from gravitational masses.
Sub quantum energy	Everything is made up of *SQEs*, relations (11, 14). A *SQE* is not the infinitesimally. *SQE* has volume and non-zero rest mass. We considered to interactions between a *SQE* and external force that applied on *SQE*, (relations (27, 28)), also see Sub-quantum Divergence Sub-quantum convergence). In singularity of an absolute black, gravity force changes of attractive force to repulsive force. The time is not included *SQE*s. And each physical existence is a clock and the time is a name that we use for the ticking clock.

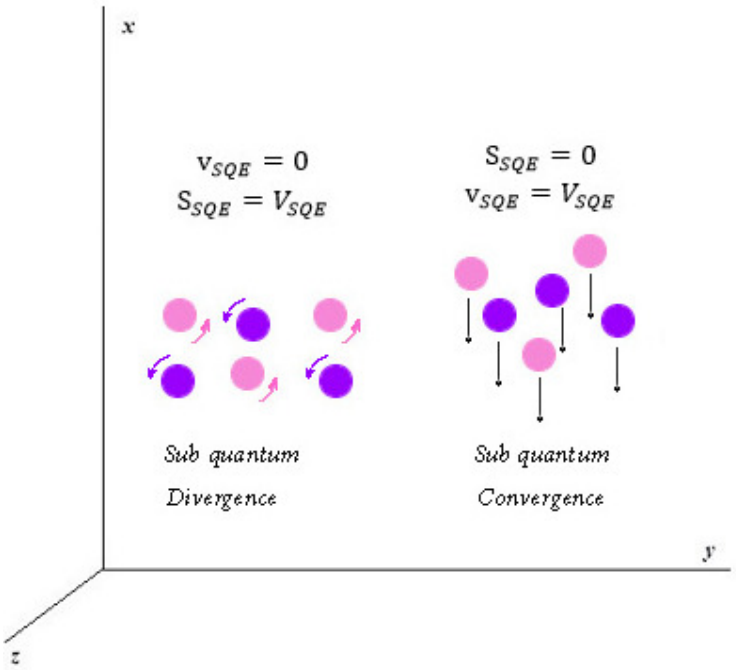


Fig3; Sub-quantum Divergence and Convergence

Definition of an absolute black hole: If a particle/object falls down into the absolute black hole, it will be involved in sub-quantum divergence before reaching the surface of the absolute black hole.

Significant point: The definition of an absolute black hole shows that on its surface the limited speed is $v_{SQE} > c$.

Consider the absolute black hole swallowing more matter; its mass and thus its gravitational field intensity will be increase. By increasing the mass, volume is reducing, its constituent *SQEs* are condensed and its transitional space will be limited (such as a capsule filled with the gas pressure, gas volume is reduced and the gas molecules have less space to move).

As the amount of $v_{SQE} \to 0$ is reduced, the value of S_{SQE} will be added, also the distance between *SQEs* become less. We assume in the vicinity of a *SQE*, k-numbers of *SQE* are located at distances $d_j, j = 1, 2, \dots k$. We show the average distance between each *SQE* till adjacent *SQEs* inside of all black holes by *d*. After increasing the density, the average distance (*d*) between *SQEs* go towards zero and they are scattered around. Due to collision with each other the absolute black hole will be into the explosion and decay sates (Like discs at a time when they are colliding with each other) [18].

Note: It is possible that an explosion occurred in a small area (smaller than the mass of absolute black holes) by reducing distance between *SQEs* and their scattering inside the absolute black hole or even ordinary black hole. This situation can be controlled and subsided by gravity of the black holes. But in the absolute black hole who is ready to explode (high density); collisions between *SQE*s are so broaden and intensive therefore the gravity has no ability to deal with the explosion and decay.

Definition of Singularity: An absolute black hole with very high density under two followed conditions reaches the singularity state:

1) Its constituent *SQEs* reach sub-quantum convergence state i.e. $S_{SQE} = V_{SQE}$.
2) Due to the gravitational pressure, the average distance *d* between *SQEs* goes to zero.

Once the speed of *SQE*s reach $S_{SQE} = V_{SQE}$, the average distance d goes to zero due to intensive collision.

They are scattered around and these chain scattering are spread everywhere inside the absolute black hole and therefore the singularity is occurred. The density is very high in the singularity state, but not infinite. In addition, the volume does not reach zero, but the average the distance d between *SQEs* reach zero. Given above descriptions can easily explain counteracting Newton's second law and gravity. When an object falls into the absolute black hole, the force $F_{E\mathrm{v}}$ is the gravitational force. While the object falls down, the energy increase and the force by maximum acting on the object will be changed non-linear speed of *SQEs* to linear speed.

Non-transmission force $F_{E\mathrm{v}}$ also is the gravitational force in the singularity and converting the nontransmission speed of *SQEs* to $S_{SQE} = V_{SQE}$. The average distance d attaining to zero, it is the major acts of force $F_{E\mathrm{v}}$ on the object. When the distance d reaches zero, *SQEs* will be scattered together and not follow F_{ES}. The absolute black hole will be exploded after collisions of *SQEs* with each other. *SQEs* are scattered around with a maximum transmission speed V_{SQE}, then particles and objects are formed as the same situation that occurred in the Big Bang by re-coupling *SQEs*, (re-convergence quanta of energy). Given the above themes, there are three basic limitations: transmission speed, non-transmission speed and density that they are the reason of creation the observable universe and all physical phenomena existing in it.

3-2 Gravitational blueshift

When a photon with energy E_1 and frequency v_1 is falling in a gravitational field, after moving the distance h it takes the energy E_2 and the frequency v_2. Considering the relation (11) could write as below;

$$E_1 = hv_1 = n_1 SQE, \qquad E_2 = hv_2 = n_2 SQE$$
$$k = n_2 - n_1, \;\; \Delta E = E_2 - E_1 = h(v_2 - v_1) = kSQE$$

The energy of photon while falling in a gravitational field, increases as ΔE and consequently causes to increase in the frequency of photon as $\Delta v = v_2 - v_1$. The change in frequency only originates from increasing in ΔE. The more ΔE increases, the more increase occurs in Δv, i.e. the number of *SQE*s that entered the structure of photon is more (figure 4).

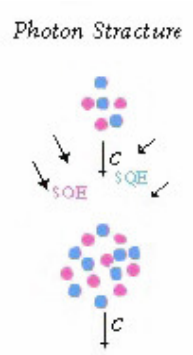


Fig4; in blueshit a number of *SQE*s is entered the structure of photon

3-3 Pair Creation and Decay

A photon with energy E in collision with a nuclei converts to an electron-positron pair. Considering the definition of photon and relation (11) we have;

$$E = nSQE$$

From *SQE* principle it is concluded that the *SQEs* exist in photon move at speed v_{SQE}, some of which are in the form of linear motion with the value of c and the rest of them is in the form of nonlinear motions. When photon collides with a nucleus, the forces exerted to *SQE*s cause the conversion of some other linear motions of *SQE*s to nonlinear motions, and electron-positron pair is created. In the inverse procedure, with absorbing each other, electron and positron decay and convert to energy. While electron-positron pair decays, the force that electron and positron exert on each other causes the conversion of some of electron and positron nonlinear motion to linear motion, and thus the created photons move at c, considering relation (12) could write;

$$E = nP_{SQE}c$$

In order to create electron-positron pair could write;

$$E = nP_{SQE}c = 2k_1P_{SQE}c + k_2P_{SQE}c$$

$$n = 2k_1 + k_2$$

$$2k_1P_{SQE}c = m_{e^-}c^2 + m_{e^+}c^2$$

The linear momentum of electron and positron after creation is as;

$$P_{e^-} = k_1m_{SQE}\mathrm{v}_1$$

$$P_{e^+} = k_1m_{SQE}\mathrm{v}_1$$

$$nP_{SQE} = P_{e^-} + P_{e^+} + k_2m_{SQE}\mathrm{v}$$

And $k_2m_{SQE}\mathrm{v}$ is the pure momentum that transfers from photon to nuclei. The effect of nuclei reaction on the rest of existing *SQE*s within the photon is the change of their momentum from linear to nonlinear. Even if $k_2 = 0$, while colliding, the stroke from the

nuclei to *SQE*s of photons cause the conversion of linear momentum of *SQE*s to nonlinear momentum and the reaction of *SQE*s on nuclei is that nuclei is recoiled (figure 5-A). Thus;

$$E = nP_{SQE}c \rightarrow e^- + e^+$$

Within the time distance of electron-positron pair creation, in reaction between nuclei and photon, some of the *SQE*s linear velocity converts to nonlinear speeds within the structure of electron and positron, and their linear speed decreases from c to v_1. But concerning the *SQE* principle there would be no change in their speed value. If suppose two photon produced in pair decay (figure 5- B), then we will have;

$$m_{e^-}c^2 + m_{e^+}c^2 = P_{e^-}c + P_{e^+}c = 2k_1 m_{SQE}c^2 = 2hv$$

In pair decay, because of the force that electron and positron exert on each other, some of the *SQE*s nonlinear speeds which constitute the structure of these two particles convert to linear speed and two photons are created and move at c (we will become back in this paper). Thus, the constancy of the speed of light does not rise from a natural event, but it is axiomatic and that is because matter (condensed energy) also consists of sub-quantum energy that moves at constant and limit speed value of $|V_{SQE}|$.When the binding forces among some of *SQE*s and matter lose their effect (e.g., chemical reactions, combustion, nuclear explosion etc.) some of *SQE* is released in form of energy and move at linear speed c. If the released energy, even when it is a portion of matter and before converting to energy, move at constant speed, logically the constancy the speed of light would be possible.

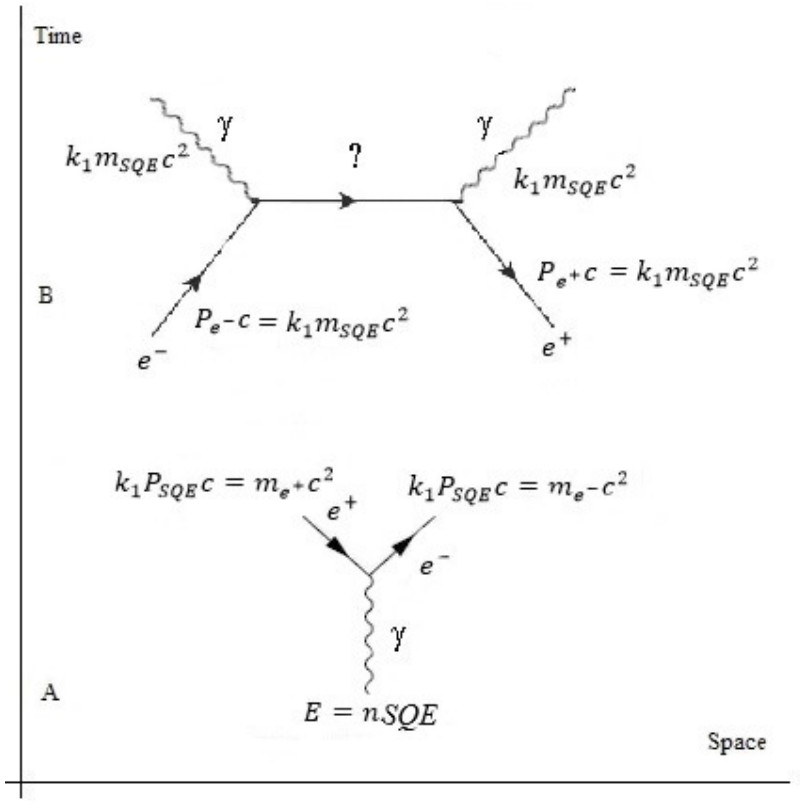


Fig5; pair production and decay, about (?) in above figure see figure 13

At the beginning of the 20th century, Newton's second law was corrected considering the limit speed c and the relativistic mass. At that time there has not been a clear understanding of the subatomic particles and basically there was little research in high energy physics. Moreover, the approach of relativity toward the physical phenomena is hyper structural and explains the observations of the observer while there is little consideration to the intrinsic entity of the phenomena. However, in this paper, through various arguments and investigation of some physical phenomena, it has been attempted to show the necessity of reviewing Newton's second law. Today Physics literature faces numerous problems and questions that without considering the internal structure of the particles, they would remain unanswered. Moreover, the classical definition of energy that defines energy as the ability to do work, could not explain the interaction among the particle in high energies. The true understanding of physical entity of energy and the structure of photon, enable 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.

3-4 The Fresnel drag and sub quantum energy

Why the Fizeau Experiment (dependence of the Fresnel drag) is important?

Fizeau Experiment is important because it demonstrated experimentally the validity of both the FitzGerald - Lorentz transformation equations (developed 1889 - 1892) and Einstein's relativistic addition of velocities whereby Einstein's special relativity mathematics could explain prior conundrums in 19th century physics as well as bringing illumination into 20th century astronomical and atomic physics.

The Fizeau experiment was carried out by Hippolyte Fizeau in 1851 to measure the relative speeds of light in moving water. Fizeau used a special interferometer arrangement to measure the effect of movement of a medium upon the speed of light [21].

According to the theories prevailing at the time, light traveling through a moving medium would be dragged along by the medium, so that the measured speed of the light would be a simple sum of its speed through the medium plus the speed of the medium. Fizeau indeed detected a dragging effect, but the magnitude of the effect that he observed was far lower than expected. His results seemingly supported the partial aether-drag hypothesis of Fresnel, a situation that was disconcerting to most physicists. Over half a century passed before a satisfactory explanation of Fizeau's unexpected measurement was developed with the advent of Albert Einstein's theory of special relativity. Einstein later pointed out the importance of the experiment for special relativity.

Assume that water flows in the pipes at velocity v_w. According to the non-relativistic theory of the luminiferous aether, the speed of light should be increased when "dragged"

along by the water, and decreased when "overcoming" the resistance of the water. The overall speed of a beam of light should be a simple additive sum of its speed through the water plus the speed of the water, that given by;

$$\mathrm{v} = \frac{c}{n} \pm \mathrm{v}_w\left(1 - \frac{1}{n^2}\right) \qquad (29)$$

Where n is refraction of water, c light speed in vacuum, v_w velocity of water and v the relative speed of light in moving water.

Einstein wrote: "The Fizeau experiment "decides in favour of (the velocity addition law) derived from the theory of relativity, and the agreement is, indeed, very exact" [22]. The Fizeau experiment is "a crucial turning point between old and modern conceptions of light and space-time" [23] Recently, by using the concept and principle of sub quantum energy Fresnel drag is explainable easy.

This relation has been justified by the relativistic velocity addition formula, but there is no explanation regarding the physical structure of light yet. We give a short and direct explanation of this relation based on the properties of *SQE* and photon structure. The speed of electromagnetic waves depends on the interaction between *SQE*s and fields (or particles) in the propagation medium. There is not any interaction between light and other particles in a vacuum, so it moves with constant speed c. According to the relations (11 and 27), when light moves in a medium such as water, a part of *SQE's* linear speed converts to non-linear speed, we can propound linear speed as $\frac{1}{r}\mathrm{v}_{SQE}$, so we have;

$$\frac{1}{r}(\mathrm{v}_{SQE} = c) + S_{SQE} = V_{SQE,}\ r\ is\ a\ real\ number \qquad (30)$$

There in vacumm $r = 1$, in water $r = 1.3330$, in air $r = 1.000293$ and so on. But when the medium moves, we should add the coefficient to the propagation medium. Because according to the *SQE* principle (relation 11), the speed of *SQE* never changes.

Assume a beam of light enters the Earth's atmosphere from the vacuum, passes the air and enters the ocean, it will be reflected back through the air into the vacuum again. The air or water may be stormy, but when light enters the vacuum, it moves with the same constant speed c again. Because according to the definition and principle of *SQE* shown in relation (27), in every condition the speed value of *SQE* remains constant and only the linear speed of *SQE* converts to nonlinear speed and vice versa, and its linear speed depends on the interaction between *SQE*s of the particles and fields in the medium.

Note: Here, according to the properties of *SQE*s and photon structure the change of light speed in different propagation media, has been explained. But there is nothing wrong with the formula for computing the sum of relativistic velocities.

3-5 Reviewing Dirac's equation by *SQE*

The equation relating to energy-mass and momentum in special relativity is (relation 16):

Reconsidering relativistic Newton's second law and its results

$$E^2 = p^2c^2 + m^2c^4$$

In the special case of a particle at rest (i.e. p=0), the above equation is reduced to $E^2 = m^2c^4$, therefore, the correct equation to use to relate energy and mass in the Hamiltonian of the Dirac equation is [24];

$$E = \pm mc^2 \rightarrow E_+ = +mc^2 , E_- = -mc^2 \qquad (31)$$

Here the negative solution was used to predict the existence of antimatter as the positron. The high-energy photon (γ) with 10.2 MeV energy loses its entire energy when it collides with nucleus. Then, it makes a pair of electron (e^-) and positron (e^+);

$$\gamma \rightarrow e^- + e^+ \qquad (32)$$

According to the relations (11) and (32) we can write;

$$\gamma = nSQE = 2kSQE \rightarrow e^- + e^+, n = 2k$$
$$kSQE \rightarrow e^- , \; kSQE \rightarrow e^+ \qquad (33)$$

In relation (33), there are two ks numerically equal, but the pair production process shows there two $kSQE$ are not physically identical, because a $kSQE$ converts to e^- and another to e^+. Maybe we simply pass this issue, but with careful study of the properties of *SQE*s in the photon structure we can get some interesting results (figure 6). We chosen k_+, k_- for the *SQE*s constituent, e^+, e^- relation (33) is given by;

$$k\_SQE \rightarrow e^- , \; k_+SQE \rightarrow e^+ \quad (34)$$

In pair annihilation, e^+ and e^- combine with each other and annihilate. So;

$$e^+ + e^- \rightarrow k_+SQE + k\_SQE = 2\gamma \qquad (35)$$

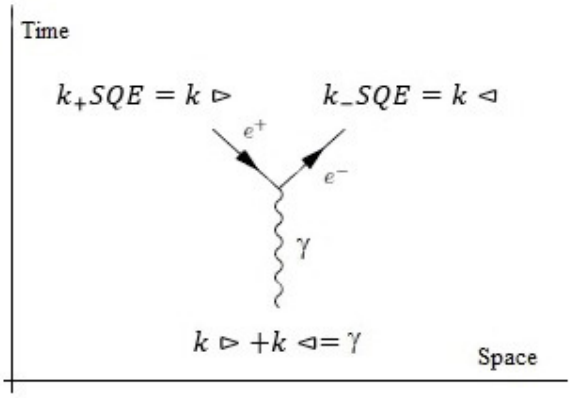


Fig 6; pair production

Consider to definition of Sub-quantum energy (relation 11), a photon is a quantum of energy, but a *SQE* is a sub quantum of energy. Relations (33) and shows a photon converts into two kinds of *SQE*s and vice versa. So, an electron is formed of k_SQE and a positron is formed of k_+SQE. We will show the minimum of k_SQE by $\lhd$ and the minimum of k_+SQE by $\rhd$, so that;

$$k\_SQE = k \lhd \qquad (36)$$
$$k_+SQE = k \rhd \qquad (37)$$

Therefore, generally a real photon is given by;

$$k \lhd + k \rhd = \gamma \qquad (38)$$

A photon has no charge and it carries electric and magnetic fields. These properties will be acceptable only when two opposite charged sub energies form a photon. Such an approach to photons and charged particles is accompanied by some questions which have to be answered. A charged particle as an electron has been formed of the same $\lhd$, but why does it not decay? What are the interactions between components of the photon? For studying the photon structure, we cannot split or bombard it by other particles. But for explaining photon structure we can offer a model that is consistent with laboratory experiments and the experience.

Let's consider a photon with energy $E = h\nu$ which falls from the position $r + \Delta r$ to the position r with energy $h' = h\nu'$ in the earth gravitational field (same as The Pound- Rebka experiment), so according relation (38) we can write;

$$E = h\nu = k \lhd + k \rhd \qquad (39)$$

$$E' = h\nu' = k' \lhd + k' \rhd \qquad (40)$$

$$a = k' - k \;\Rightarrow\; \Delta E = a(\triangleright + \triangleleft) \qquad (41)$$

There, a is a natural number, and $a = 1$ is defined the minimum unit of electromagnetic energy (the longest wavelength detection). So;

$$E_{min} = \triangleright + \triangleleft \qquad (42)$$

Equation (42) shows that even a photon with minimum energy is a carrier of electric field and magnetic field. Interaction between photon and the gravitational field is in a way that can change the photon electric and magnetic fields [25]. Summarized in a simple conclusion:

$$Gravitational\ energy \;\Leftrightarrow Electromagnetic\ energy \qquad (43)$$

$$Electromagnetic\ energy \;\Leftrightarrow Matter + Anti - matter \qquad (44)$$

For identifying and understanding the mechanism of physical relationship between the two sides (43), and converting gravitational energy into electromagnetic energy and vice versa, we must use the equations of Maxwell's electromagnetic theory to explain gravitons. For understanding the mechanism of relation (44), using pair production and decay mechanisms, we investigated the production of virtual photons. When a photon in a gravitational field as Δr falls, graviton's density in the vicinity of the photon electric field changes the value of ∂G_E, because the intensity of electric field changes as E_G (E is the electric field arising from gravitons). In fact gravitons enter the structure of photon, and the intensity of electrical and magnetic fields which depends on photon increases. Two types of gravitons should enter the photon structure, so that they are able to increase the intensity of photon electric field without any charge effect. Thus the interaction between gravitons and photon, negative and positive G^-, G^+gravitons are produced and enter the photon structure. The photon moves in the same direction as the increasing intensity of the gravitational field does, and the photon electric field is perpendicular to the photon movement direction that is compatible with the following equation:

$$\nabla \times E_G = -\frac{\partial G_E}{\partial t} \qquad (45)$$

By changing the photon electric field, magnetic field also changes. In this case also, the gravitons are converted into magnetic carrier particles G^m and enter the structure of photon that is given by;

$$\nabla \times B_G = \mu_0 \varepsilon_0 \frac{\partial E_G}{\partial t} \qquad (46)$$

Considering the relations (35) and (42) around of $k \lhd$, $k \rhd$, the G^ms move in two different directions, magnetic field is a flow of G^ms without any starting point. Relations (45) and (46) indicate the process of converting gravitational energy into electromagnetic energy (relation 41). The inverse of this process is gravitational redshift that gravitons leave photon structure. 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 non-linear speed, as well (relations 8, 15), that is always as follows (figure 7);

$$|\mathrm{v}_G| , |\mathrm{v}_{G^-}|, |\mathrm{v}_{G^+}|, |\mathrm{v}_{G^m}| > \left|V_{SQE}\right| > |c|$$

These are the best reasons for the constant speed c.

3-6 Zero point energy (ZPE)

This attitude can explain zero-point energy [26, 27]. Under the terms of *SQE*, any space that has the gravitational effects can produce electromagnetic energy, and here the photon in the conversion of gravitons into G^-, G^+, G^m, and electromagnetic energy acts only as a catalyzes. When intensity of gravitational field increases or interfere gravitational fields of two massive bodies that are moving adjacent each other, gravity produces the electromagnetic energy. In this case the relation (45) becomes as follows, but the relation (46) remains the same.

$$\nabla \times G_E = -\frac{\partial G}{\partial t} \qquad (47)$$

In equation (47), ∂G shows that even without the electric field, when density of gravitons increases, gravitons take the electrical properties. The energy produced in space is a function of the graviton's density changes in the space. If we suppose the variation in graviton's density in the sample space is $\rho_{\partial G}$, then integral on the volume V of space, will be equal to the electromagnetic energy that is given by;

$$E = \iiint_V \rho_{\partial G} dx dy dz \qquad (48)$$

Relations (45) and (46) have been completed by equation (48). Things mentioned above, are logical explanation for relation (43). If we analyze the three relations (15), (43) and (44) carefully, the relationship between the emergence of pair electron-positron (generally fermions and bosons) and speed reduction can be understandable. In high energy physics one of the key parameters is speed, because accelerate particles can reach the conditions of before

spontaneous symmetry breaking conditions [28]. Also for understanding and giving the super symmetric [29], we should know the interaction of photon and gravitons. The gravitons move at higher speed than the speed of light (relation 15), and the first symmetry is broken when gravitons enter to photon structure and they are converted to electromagnetic energy. Gravitons have the same properties as fermions and bosons have (figure 7). So while G^-, G^+, G^m, behave like fermions, bosons also have a role in interaction with other particles. In relation (33) a photon is converted into a pair of matter-antimatter, and an additional symmetry is spontaneously broken, so the different behavior of fermions and bosons can be observed.

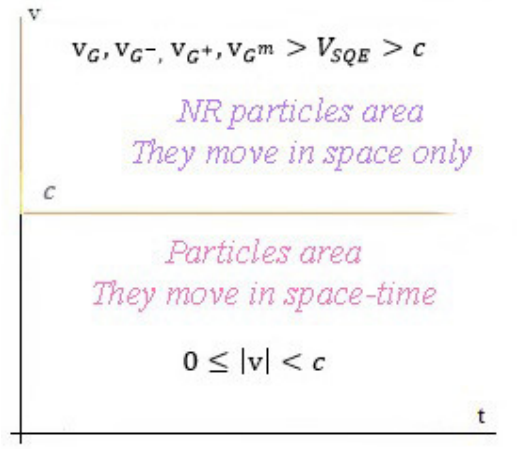


Fig7; particles and NR particles areas

In addition, electron and positron (generally all particles) are drowning in a sea of G^+, G^-, G^m and G that move faster than light speed. They also have the role transferring information, so details of each event in space are transmitted faster than the speed of light.

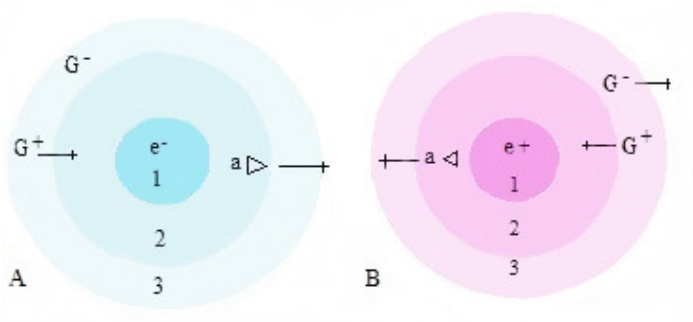
3-7 Sub quantum electrodynamics fields (SQED)

While the classical, wavelike behavior of light interference and diffraction has been easily observed in undergraduate laboratories for many years, explicit observation of the quantum nature of light i.e., photons is much more difficult. For example, while well-known phenomena such as the photoelectric effect and Compton scattering strongly suggest the existence of photons, they are not definitive proof of their existence [30].

However, in particle physics, quantum field theories such as the Standard Model describe nature in terms of fields. Each field has a complementary description as the set of particles of a particular type. A force between two particles can be described either as the action of a force field generated by one particle on the other, or in terms of the exchange of virtual force carrier particles between them. The energy of a wave in a field (for example, electromagnetic waves in the electromagnetic field) is quantized, and the quantum excitations of the field can be interpreted as particles. 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? In theoretically a pure steady state spin current without charge current can induce an electric field [31]. If a charged particle as a generator has an output known as a virtual photon, what will be its input? Now we will explain the mechanism of electrodynamics fields around the electron and positron.

Look at the electron and positron given by relation (34). Electron is in the center of a spherical space (Figure 8-A). This rotational sphere-like (electron spinning) is in a look into gravitons. The electron has two opposite interactions on gravitons around itself, and converts them to G^-, G^+(relation 20), so there is a lot of G^-, G^+in area 3 (Figure 8-B) G^-s escape from electron's locality and G^+s move toward the electron and enter the area 2, near the magnetic field of electron spinning. Magnetic field (electron spinning) compresses positive gravitons G^+s and repels them.



A. Electron; Area3, G convert to G^-, G^+, then G^- moves to far and G^+ moves to area2
Area2: Spinning electron, magnetic field compacts G^+s and repels virtual positive photon that shown by $a \rhd$

B. Positron; Area3, G convert to G^-, G^+, then G^+ moves to far and G^- moves to area2
Area2: Spinning electron, magnetic field compacts G^-s and repels virtual negative photon that shown by $a \lhd$

Fig8; around charged particles

Now we can define an operator for the production of positive electric force particle. Let's show this operator by $a \lhd$ per time that acts on the electron and produces positive electric force, it is given by;

$$\frac{d}{dt} \lhd s = a \rhd \qquad (49)$$

There, a is a natural number. Operator $\lhd s$ compresses G^+s and pushes them; a magnetic field which contains G^ms is formed up around G^+s set. According to the Larmor (cyclotron) radius can be prevented from scattering [32]. Each process in the laboratory is feasible, realistic and easier to occur in nature.

Operator $\lhd s$ shows a magnetic field which presses the positive gravitons G^+s around electron (spinning electron) and makes a virtual positive particle of electric force

continuously that we show by γ^+. In general, a charged particle is a generator that its input is gravitons and its output is virtual exchange particles that form the electric field. So, for electron we can write;

$$\frac{d}{dt} \lhd s(G^+) = a \rhd = \gamma^+ \qquad (50)$$

Same as electron, positron's behavior is like a generator, but spinning positron produces and emits negative virtual particles continuously. So;

$$\frac{d}{dt} \rhd s(G^-) = a \lhd = \gamma^- \qquad (51)$$

When $a \rhd = \gamma^+$ from the electron reaches to area2 around the positron, it combines with $a \lhd = \gamma^-$ and they form a quantum energy (figure 9), so that;

$$a \rhd + a \lhd = \gamma^+ + \gamma^-$$

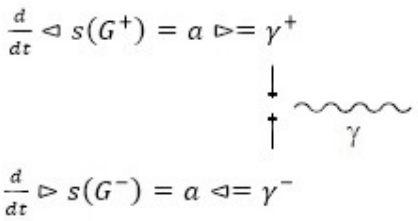


Fig9; virtual photons and real photon

This quantum energy is transferred to the positron, and positron accelerates toward the electron. Let's zoom at the positron and its area2 (Figure 10), when γ^+ reaches to area2, what happens there? Area2 is full of G^-s that acts as reporters are affected on every other particle. (Remember$|V_G| > |c|$), so that;

1- Two opposite virtual particles $\gamma^+$and γ^-attract each other and magnetic fields effect on γ^- cancels gently.

2- Positron and γ^+ repel each other by the F_{1e}.

3- Positron and γ^-absorb each other by the F_{2e}.

4- Positron gets energy $\gamma^- + \gamma^+ = \gamma$ and accelerates by force $F_e = F_{2e} - F_{1e}$ toward the electron.

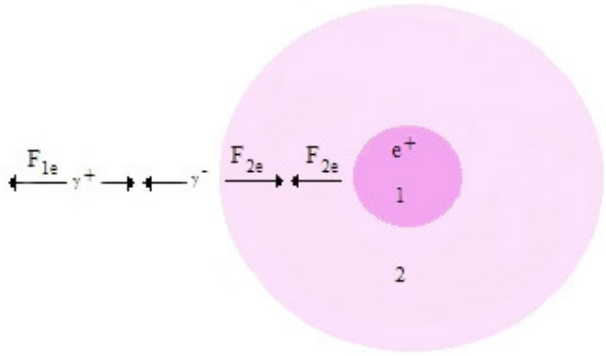


Fig10; Interactions between two exchanging particles (virtual positive and negative particles) and positron

Look at this phenomenon as electric fields which effect on the positron. Positron feels two electric fields of $\gamma^-$and γ^+ that are given by;

$$F_{1e} = \frac{E(\gamma^+)e^+}{r_1^2}, \qquad F_{2e} = \frac{E(\gamma^-)e^+}{r_2^2}$$

$$r_1 > r_2 \Rightarrow F_{2e} > F_{1e}$$

$$F_{e=}F_{2e} - F_{1e} = m_{e^+}a$$

The same process repeat, when next γ^+reaches to area2, and positron accelerates again toward the electron, and so on (figure 11).

The same process happens for the electron, in fact a γ^- reaches to area2 of electron, it combines with γ^+, and real quantum energy appears and it is transferred to electron, then electron accelerates toward the positron (figure 11).

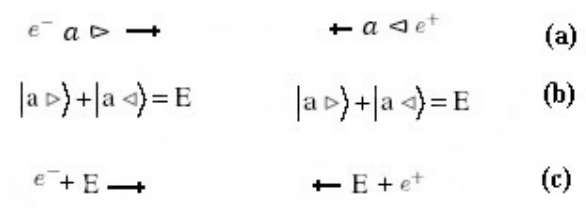


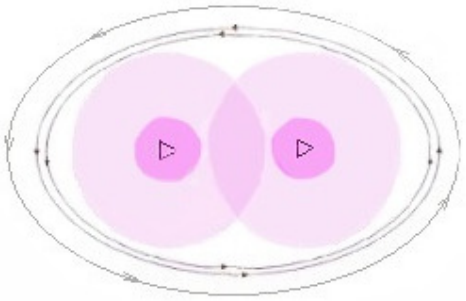
Fig11; electrodynamics interaction

Note: With the discovery of charged particles and electric fields, it was assumed that the charged particle and the surrounding fields are the same. Our examination shows that the electron produces positive virtual photon, emits and pushes the negative charges, because each negative charged particle behaves on the other, the same as electron and produces positive virtual particle. Likewise, positive charged particles such as positron, also provides a negative electric field that drives the positive virtual photon.

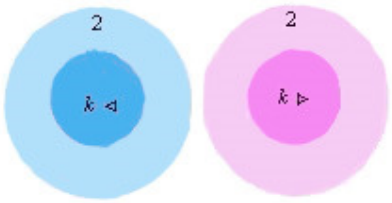
Note2: Other forces, including the influence of the moment magnetic or magnetic positron have been ignored, although they are effective.

3-8 Virtual photon in Structure of photon

The attention inside the photon structure is very useful and important for understanding *QCD* phenomena. Equivalence relation of mass-energy conception is beyond converting matter into energy and vice versa. Because what is at the core of the interaction between quarks in the proton structure occurs is the logical result of interaction between the *SQE*s (or $\rhd, \lhd$) in photon structure. When you convert that energy into matter, the properties of interaction between *SQE*s are also transferred from the photon to particle–antiparticle.



A. Magnetic field around two same *SQEs.*



B. A photon is formed of $k \rhd + k \lhd$, but magnetic fields around $\rhd$ (s) and $\lhd$ (s) prevent them from this combination

Fig12; A set of *SQEs*

In relation (34) we saw that the amount of the positron mass is equivalent to energy k_+SQE and according to relation (50) we can write $k_+SQE = k \rhd$. Now we will see that how the electrical properties of $\rhd s$ (which are positive), stay together in the photon's space. This phenomenon is explainable by using Ampere's law. As the two wires carrying electrical flow due to magnetic flux around the wires, they attract or repel each other, the same charged particles (or particles carrying the same electric field) affected by their own magnetic fields, then they interact with each other. We assume that two same sub particles $\rhd$ are in a position that the magnetic fields of these two particles cause them to attract each other (Figure 12-A). In this case, a number of magnetic loops are formed around the sub particles $\rhd$ and prevent them from being dispersed and a quantum positive particle is formed. But a photon is not formed of same sub particles $\rhd$, there are equal numbers of $\rhd$ and $\lhd$ in the structure of photon (Figure 12-B). As two opposite charged particles interact with each other, these two particles also tend to combine together, but magnetic fields around $k \rhd and\ k \lhd$ prevent

them from this combination (figure 13-A). With this approach, let's look at pair production and decay (relation 34) which is given by;

$$k_{+}SQE = k \triangleright\!\!\rightarrow e^{+}\ ,\ \ k\_SQE = k \triangleleft\!\!\rightarrow e^{-}$$

For two photons (figure 13-B):

$$k \triangleright + k \triangleleft = 2\gamma = \left(\frac{k}{2} \triangleright + \frac{k}{2} \triangleleft\right) + \left(\frac{k}{2} \triangleright + \frac{k}{2} \triangleleft\right)$$

For three photons:

$$k \triangleright + k \triangleleft = 3\gamma = 3\left(\frac{k}{3} \triangleright + \frac{k}{3} \triangleleft\right)$$

This approach to photon is a useful step to explain the real-photon processes and the quantum chromo dynamic. In $p\bar{p} \rightarrow \gamma\gamma$ annihilation in *QCD* [33], compare decay of electron-positron and proton-antiproton using the *SQE*s;

$$p\bar{p} \rightarrow \gamma + \gamma \quad (52)$$

Charges of proton and anti-proton with positron and electron are equal. But the mass of proton is about eighty times greater than the sum of the rest masses of the quarks that make it up, while the gluons have zero rest mass. Quark's charge is given by;

$$k_{+}SQE = k \triangleright = e^{+}\ , k\_SQE = k \triangleleft = e^{-}$$

$$u = \frac{2}{3}k \triangleright\ , d = \frac{1}{3}k \triangleleft$$

$$\bar{u} = \frac{2}{3}k \triangleleft\ , \bar{d} = \frac{1}{3}k \triangleright$$

So relation (52) is given by;

$$p + \bar{p} = (uud + n_1\mathrm{g}) + \left(\bar{\mathrm{u}}\bar{\mathrm{u}}\bar{\mathrm{d}} + \mathrm{n}_2\mathrm{g}\right) \rightarrow \gamma + \gamma = n(\triangleright + \triangleleft)$$

Where, n_1 and n_2 are integer numbers and g is symbol of gluon.

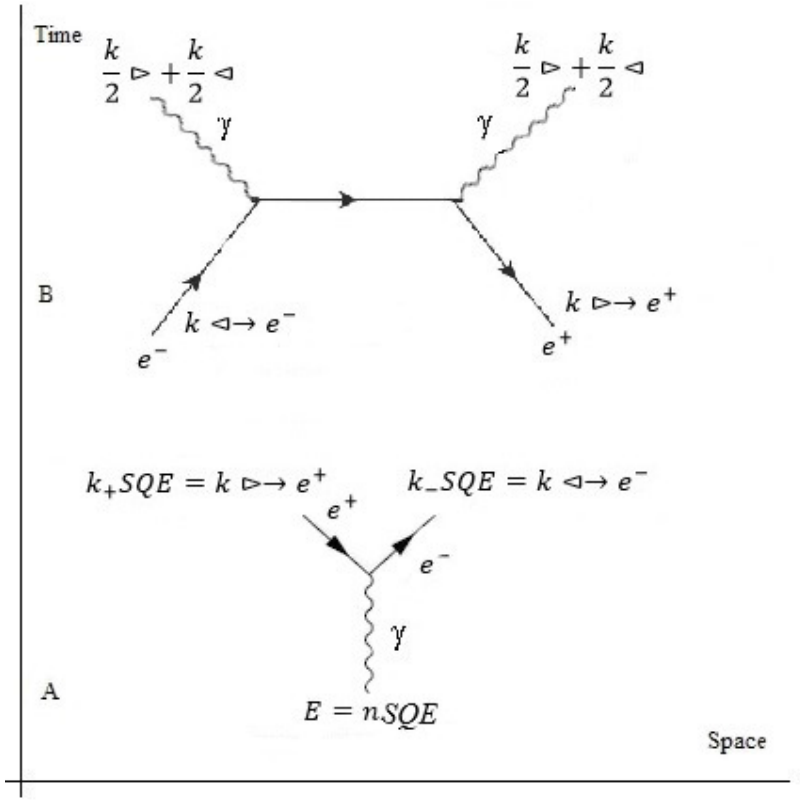


Fig 13; pair production and decay by using negative and positive *SQE*

Pairs in the decay of electron-positron and proton-antiproton (quarks, anti-quarks and gluons) are converted into energy. In high energy physics, input particles accelerate. As a result of this acceleration the number of *SQE*s increases and the heavier particles are produced with different properties. The reactions $e^-e^+ \rightarrow \pi^+\pi^-$ and $e^-e^+ \rightarrow \bar{N}N$ with $N = p$, N are studied in a non-perturbative quark model [34]. In relation $e^-e^+ \rightarrow \pi^+\pi^-$ two fermions convert into two bosons.

In all these processes there is a physical reality that must be considered. The fact is that in high energy physics, from energy, the particles with different physical properties are produced. Interaction between the *SQE*s or interactions between the collections of them together, in the photon structure create phenomena and its existence before spontaneous symmetry breaking [35]. Physicists in high energy physics are trying to create conditions which have existed before spontaneous symmetry breaking. The same existing condition in the photon structure hasn't been considered enough yet, unfortunately.

3-9 Unification and *SQE*

As we know in quantum mechanics the strong interaction is observable in two areas: on a larger scale (about 1 to 3 (fm)), it is the force that binds protons and neutrons (nucleons) together to form the nucleus of an atom. On the smaller scale (less than about 0.8 fm, the radius of a nucleon), it is the force (carried by gluons) that holds quarks together to form protons, neutrons, and other hadrons particles.

Reconsidering relativistic Newton's second law and its results

Thus far, physicists have been able to merge electromagnetic and the weak nuclear force into the electroweak force and work is being done to merge electroweak and quantum chromodynamics into a *QCD*-electroweak interaction. Beyond grand unification, there is also speculation that it may be possible to merge gravity with the other three gauge symmetries into a grand unified theory. But there is no way to explain how particles produce exchange particles in modern physics. A new and different way (that we have suggested) for unifying the interactions is generalizing color charge from nuclear to photon structure. This new view on color charge means that we can redefine graviton and electromagnetic energy (Sub quantum energy). This looking shows how two same charged particles repel each other in far distance and absorb each other at a very small distance.

In generally, since it appears that all known interactions between objects can be described with only negative and positive color charges. According to quantum chromodynamics, a proton is made up of two up quarks (u) with $(+\frac{2}{3})$ charge and a down quark (d) with $(-\frac{1}{3})$ charge. How two up quarks with positive charged do not repel each other? Let's show how two positive charged particles produce bining energy, in small distances. Suppose two positive charged particles A and B is at distance d from each other. There are three locations around each positive charged particle (figure 14).

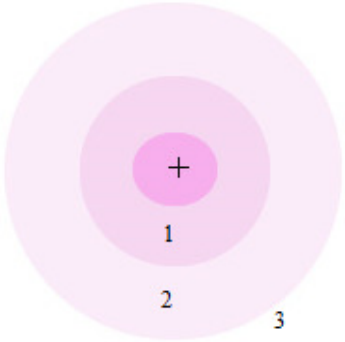


Fig14; Locations around each positive charged particle

In real space, every charged particle is plunging in a sea of gravitons. Location3 (figure 14) is full of gravitons that move with speed of $v > c$. When gravitons reach to location2, electric field (and magnetic field) of charged particle acts on them so that gravitons convert to positive and negative color charges. Positive charged particle repels positive color charges and absorbs negative color charges. Therefore, negative color charges enter into location1 (figure 14). In location1, negative color charges convert to negative photon that given by (relation 51);

$$\frac{d}{dt} \rhd s = a \lhd = \gamma^{-}$$

In general, location3 is full of gravitons; location2 is full of negative and positive color charges, and positive charged particle generates negative virtual photon in location1.

Now suppose two positive charged particles A^{+} and B^{+} are near each other that location2 interferes with each other (figure 15).

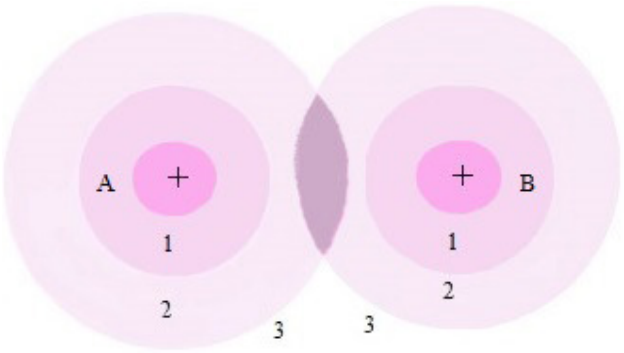


Fig15; interconnect two positive charged particles

There is a set color charges in location2 of A and B interconnect (grey part of figure 15) that is generated by particle A, described as follows:

$$\{(G^-, G^+) \,|\, G^-, G^+ \in \text{field of A}\}$$

Charged particle A repels positive color charges G^+, they move toward B particle, and negative color charges G^- move toward A. Also, charged particle B generates a set of positive and negative color charges G^-, G^+as follows;

$$\{(G^-, G^+) \,|\, G^-, G^+ \in \text{field of B}\}$$

Their direction movement is the opposite of A production. Therefore, in location2, positive color charges $G^+$from A and negative color charges $G^-$from B, have the same direction movement that is toward the B particle. They combine and convert to electromagnetic energy and transfer to the particle B. The same action happens for positive color charges $G^+$from B and negative color charges G^- from A; so, they form quantum energy that moves toward A. This shown as follows;

$$a \rhd +a \lhd = \gamma$$

These are energies form the binding energy between A and B. In a heavy nucleus, that contains a lot of protons, every quark interacts with each other and produces binding energy. Consider the center of stars, two hydrogen ions (protons) move toward each other, when their distance decreases, then locations2 of them interconnect and produce binding energy.

3-10 Nature of Time

There exist various and contradictory opinions about the nature of time. Including:

Whatever else may be said about time, one thing is certain. It defies definition. The best we can say is that we all know what time is, intuitively. It cannot be expressed in terms of other things, though some try. The Seventh Edition of Webster's Collegiate Dictionary tells us that time is "the measured or measurable period during which an action, process, or

condition exists or continues." Of course, what the lexicographer has done here is to tell us that time is defined by its measurement and that that measurement is of a period during which something occurs. He has not told us what time really is [36].

Of the many philosophical assumptions in physics about the nature of reality, none is more mysterious than the existence of time. Time can be relatively easily discredited by imagining deserted islands or other settings devoid of conscious beings. Yet, despite the logical acceptance of the unreal nature of time, we do know that a year from now, we will be a year older. Why is it that we cannot escape the unrelenting hold of time? The reason is that the origin of time is linked to our most basic knowledge—our self-awareness, the knowledge that we exist.

If we did not have a sense of time, would that mean there was no time? Does time have an existence independent of our minds?

Physical concept of time began by Galileo. In the Galilean view of space and time, the physical existence of an absolute and global time is assumed. Isaac Newton defined it as follows: “Absolute, true and mathematical time, in itself, and from its own nature, flows equally, without relation to anything external; and by other name called Duration.”

The Minkowski view of reality is fundamentally different. In this notion of space and time, there is no absolute, global time that is physically meaningful. This notion of time is based on Albert Einstein’s revolutionary relativity theory. It implies, in contrast to Galilean time, that simultaneity is not an absolute physical quality, but a relative one, depending on the motion of the observer (i.e., the reference frame). Mathematically, it mixes space and time. The Minkowski picture is a generalization of the Galilean notion of space-time. This is absolutely true, in a mathematical sense. However, we lose something in this generalization—we lose the sense of a global absolute time. Along with that, we lose our ability to say whether two events take place at the same time simultaneity. In other words, we lose the fundamental qualities of our natural sense of time. If we are willing to sacrifice these qualities, are we also willing to forgo our natural sense of time altogether and think of it as a mathematical construct? This construct may be unnecessary for our understanding of nature and the universe [37].

Time is an illusion. Although the laws of physics create a powerful impression that time is flowing, in fact there are only timeless `nows'. In The End of Time, the British theoretical physicist Julian Barbour describes the coming revolution in our understanding of the world: a quantum theory of the universe that brings together Einstein's general theory of relativity - which denies the existence of a unique time - and quantum mechanics - which demands one. Barbour believes that only the most radical of ideas can resolve the conflict between these two theories: that there is, quite literally, no time at all. The End of Time is the first full-length account of the crisis in our understanding that has enveloped quantum cosmology. Unifying thinking that has never been brought together before in a book for the general reader, Barbour reveals the true architecture of the universe and demonstrates how physics is coming up sharp against the extraordinary possibility that the sense of time passing emerges from a universe that is timeless. The heart of the book is the author's lucid description of how a world of stillness can appear to be teeming with motion: in this timeless world where all possible instants coexist, complex mathematical rules of quantum mechanics bind together a special selection of these instants in a coherent order that consciousness perceives as the flow of time. Finally, in a lucid and eloquent epilogue, the author speculates on the philosophical implications of his theory: Does free will exist? Is time travel possible? How did the universe begin? Where is heaven? Does the denial of time make life meaningless? Written with exceptional clarity and elegance, this profound and original work presents a dazzlingly

powerful argument that all will be able to follow, but no-one with an interest in the workings of the universe will be able to ignore [2].

This deceptively simple question is the single most important problem facing science as we probe more deeply into the fundamentals of the universe. All of the mysteries physicists and cosmologists face—from the Big Bang to the future of the universe, from the puzzles of quantum physics to the unification of forces and particles—come down to the nature of time. The fact that time is real may seem obvious. You experience it passing every day when you watch clocks tick, bread toast, and children grow. But most physicists, from Newton to Einstein to today's quantum theorists, have seen things differently. The scientific case for time being an illusion is formidable. That is why the consequences of adopting the view that time is real are revolutionary. Lee Smolin, author of the controversial bestseller The Trouble with Physics, argues that a limited notion of time is holding physics back. It's time for a major revolution in scientific thought. The reality of time could be the key to the next big breakthrough in theoretical physics. What if the laws of physics themselves were not timeless? What if they could evolve? Time Reborn offers a radical new approach to cosmology that embraces the reality of time and opens up a whole new universe of possibilities. There are few ideas that, like our notion of time, shape our thinking about literally everything, with huge implications for physics and beyond—from climate change to the economic crisis. Smolin explains in lively and lucid prose how the true nature of time impacts our world. [38].

It is important to note that our discussion about time is based on physical laws. After Lorentz,

Einstein changed our understanding of time. But relativity does not talk about the nature of time, and the only thing it explains, is comparing clocks with each other. In Albert Einstein's theories of relativity, time dilation in these two circumstances can be summarized:

1- In special relativity (or, hypothetically far from all gravitational mass), clocks that are moving with respect to an inertial system of observation are measured to be running more slowly. This effect is described precisely by the Lorentz transformation.

2- In general relativity, clocks at lower potentials in a gravitational field – such as in closer proximity to a planet – are found to be running more slowly.

"Time has no independent existence apart from the order of events by which we measure it'", Einstein said. So time is an intrinsic property of physical events. But the physical events occur in relation to physical beings. There are no physical events without physical beings. The time cannot be separated from the physical events and the physical events are inseparable from the physical beings. In general, time is an inherent property of physical beings.

By considering an arbitrary physical object (photons, atoms, trees, animals, stars,… and even the world) that here this object is denominated as Ex (Existence); " What really can be observed by the *SQE* observer who exists inside the Ex structure?" By the SQE observer, some of SQEs in interaction with each other create the Ex and influenced by internal or external factors were scattered and so there is no Ex but SQEs exist now, and they are forming new Exs. Compare this example with your own: You and others are invited to a conference. The conference is started and finished.

You with other participants join the conference or with other persons attend a dinner party. The conference and the dinner party are an Ex therefore each Ex can be considered as a clock. Each word that was expressed in the conference by the speaker is ticking of a clock and in the dinner party every moving, speaking or eating a piece of food is ticking of a clock that we marked it as "dinner".

The ticking of these clocks is not regular and exact as the atomic clock, but really each clock works regular and accurate or not?! Have you ever participated in such configurations of clocks (Ex)

yet? All these clocks were disintegrated, but you're still here and you can participate in another new configuration of clocks.

Now, we return to the sub-quantum topic. Your energy is not constant, but the SQEs energy is constant and they always move with constant speed $|V_{SQE}| > c$ (For similar to explain see [39]). According to time dilation (special relativity) and relation (15) that shown below;

$$T_0 = T\sqrt{1-(\mathrm{v}/c)^2}$$

$$|V_G| > |V_{SQE}| > |c| > |V_{particles}|$$

It can be easily concluded that the time is not included gravitons and SQEs while each Ex has a beginning and an end. Each Ex is a clock and if compare them with each other, some of them running faster, slower or they work more accurate. But running clock faster or slower is affected by the physical conditions such as speed and intensity of gravity so can change clock ticking towards each other. Humans as an Ex or clock can be observed and measured the difference between other clocks ticking. Due to a natural need to survive the Human's attention and sensitivity to duration of life, it is made to imagine the time as independent physical inventory or Ex. While only a few hours (clock) are in the world and the human is selected the "time" for all clock ticking.

3-11 Rapid expansion early on holds the solutions

In trying to understand the universe, two major problems remained: the flatness problem and the horizon problem. To solve these, the big bang theory is modified by the inflation theory, which states that the universe expanded rapidly shortly after it was created. The horizon problem (also sometimes called the homogeneity problem) is that no matter which direction you look in the universe, you see basically the same thing. The cosmic microwave background radiation (CMBR) temperatures throughout the universe are, to a very high level of measurement, almost exactly the same temperature in every direction. This really shouldn't be the case, if you think about it more carefully. The flatness problem has to do with the geometry of our universe, which appears (especially with recent WMAP evidence) to be a flat geometry [40].

In 1980, astrophysicist Alan Guth proposed the inflation theory to solve the horizon and flatness problems (although later refinements by Andrei Linde, Andreas Albrecht, Paul Steinhardt, and others were required to get it to work). In this model, the early universal expansion accelerated at a rate much faster than we see today.

It turns out that the inflationary theory solves both the flatness problem and horizon problem (at least to the satisfaction of most cosmologists and astrophysicists). The horizon problem is solved because the different regions we see used to be close enough to communicate, but during inflation, space expanded so rapidly that these close regions were spread out to cover the entire visible universe [41].

The flatness problem is resolved because the act of inflation actually flattens the universe. Picture an uninflected balloon, which can have all kinds of wrinkles and other abnormalities. According to inflation theory, this happens to the fabric of the universe as well.

In addition to solving the horizon and flatness problems, inflation also provides the seeds for the structure that we see in our universe today. Tiny energy variations during inflation,

due simply to quantum uncertainty, become the sources for matter to clump together, eventually becoming galaxies and clusters of galaxies.

One issue with the inflationary theory is that the exact mechanism that would cause — and then turn off — the inflationary period isn't known. Many technical aspects of inflationary theory remain unanswered, though the models include a scalar field called an *inflation field* and a corresponding theoretical particle called inflation. Most cosmologists today believe that some form of inflation likely took place in the early universe [42].

According the sub quantum energy, we have analyzed relationship between gravity and electromagnetic waves and show graviton exists indirectly. Existence of graviton means that gravitational field is ocean of gravitons. So, interaction between gravity and electromagnetic wave replaced with interaction between photon and gravitons.

It is important that we note to speed of graviton that shown with Vg and explained before, its speed is faster than light speed, so that $|V_G| > |V_{SQE}| > |c|$.

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.

It is very well consistent with the inflation theory. In addition, we showed that how we can use the sub-quantum space to describe nature of time in order to understand better the nature of space-time.

Also about dark energy, dark energy is the most accepted hypothesis to explain observations since the 1990s that indicate that the universe is expanding at an accelerating rate.

Of the first, what we know about acceleration? And what is the definition of acceleration? In physics, is the rate at which the velocity of an object changes over time that in classical mechanics is given with $a = F/m$. In special relativity an accelerating particle has a world-line which is not straight. This is not difficult to handle. The 4-vector acceleration can be defined as the derivative with respect to proper time of the 4-velocity. It is possible to solve the equations of motion for a particle in electric and magnetic fields, for example. Accelerating reference frames are a different matter. In general relativity the physical equations take the same form in any co-ordinate system. In special relativity they do not but it is still possible to use co-ordinate systems corresponding to accelerating or rotating frames of reference just as it is possible to solve ordinary mechanics problems in curvilinear co-ordinate systems. This is done by introducing a metric tensor.

However, classical mechanics and relativity (special and general) describe the acceleration is an explanation of outward of phenomena regardless the properties of sub quantum.

It should be noted that the interaction between large objects (e.g. collision of two bodies) under the action of the quantum layer quantum (in fact sub quantum) done. In sub quantum level, the amount of speed is constant, in any condition and any space, and in any interaction linear momentum changes to nonlinear momentum and vice versa. So, regardless to reconsidering the relativistic Newton's second law, how can we resolve the dark energy problem?

3-12 Conclusion:

At the beginning of the 20th century, Newton’s second law was corrected considering the limit speed c and the relativistic mass. At that time there has not been a clear understanding

of the subatomic particles and basically there was little research in high energy physics. Moreover, the approach of relativity toward the physical phenomena is hyper structural and explains the observations of the observer while there is little consideration to the intrinsic entity of the phenomena. However, in this paper, through various arguments and investigation of some physical phenomena, it has been attempted to show the necessity of reviewing relativistic Newton's second law. Today Physics literature faces numerous problems and questions that without considering the internal structure of the particles, they would remain unanswered. Moreover, the classical definition of energy that defines energy as the ability to do work, could not explain the interaction among the particle in high energies. The true understanding of physical entity of energy and the structure of photon, enable us to understand the structure of matter.

Due to needing new approaches in solving physics problems, we have tried using the relativity to explain sub-quantum particles in the new sub-quantum space and through them analyzed and described the physical phenomena by intervening classical mechanics in this article. The limitations of Newton's second law and gravity were surveyed and the transformation of a black hole to the absolute black hole was explained. We described the singularity in the explosion state of an absolute black hole with regards to.

To date, there is no way to explain the process that describes how particles produce exchange particles in modern physics. According to the results of reconsidering relativistic Newton's second law, we can definitely say that the best way for unifying the interactions is generalizing interaction between charged particles to photon structure and vice versa. This new view on photon means that we can redefine the graviton and electromagnetic energy. Electromagnetic energy converts to matter and anti-matter such as charged particles. Charged particles use gravitons and generate electromagnetic field. This way of looking at the problem shows how two same charged particles repel each other in far distance and absorb each other at a very small distance.

There are many ambiguities in modern physics that standard model is not able to answer them. For solving these ambiguities we need to change our approach to fundamental particles. One of the greatest scientific achievements in the history is E=mc2. Is it logical that we have accepted an unstructured photon with zero rest mass is convertible to two fermions with non-zero mass and different charges?

Attention to photon structure and using new definitions for graviton, charged and exchange particles, will change our perspective on modern physics. It also provides us with a new tool to be able to overcome physics problems in a better way. This approach will show us how particles are formed and when physical symmetries are broken spontaneously.

It is very well consistent with the inflation theory. In addition, we showed that how we can use the sub-quantum space to describe nature of time in order to understand better the nature of space-time. With a detailed look at the sub-quantum space, we can investigate better the interaction between quarks in a very small space of proton. Using such approach to generate matter-anti matter, we can explain that how Bosons are generated from fermions and then can provide an important context for the unification of forces.

Moreover, one could explain the expansion of the universe better and more real through reviewing relativistic Newton's second law.

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Conclusion