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Javadi, Hossein; Forouzbakhsh, Farshid

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Beyond the Modern Physics and Cosmological Equations

H. Javadia and F. Forouzbakhshb

a) Invited professor of the Faculty of Science at Azad Islamic University, Tehran campuses Tehran, Iran

Javadi_hossein@hotmail.com

b) Academic Researcher, Office of the Vice Chancellor for Research and Technology, University of Tehran. Tehran, Iran

fforouz@ut.ac.ir

Abstract:

Modern physics is based on relativity and quantum mechanics. But there are some unanswered questions or complex concepts in modern physics. The questions that modern physics does not have answers for, and the physicists believe that it is due to the inability of theories. All our theories today seem to imply that the universe should contain a tremendous concentration of energy, even in the emptiest regions of space. For example; 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]. This shows that the quantum mechanics problems is inseparable of relativity, because the cosmological constant was originally introduced by Einstein in cosmological equation.

For long time seemed the Friedmann equation is able to explain universe, but in recent years, the cosmological constant was of interest to cosmologists. However, these two equations are unable to explain before the Big Bang. Thus this paper, from a new approach, turns out to merge the fundamental principles of quantum physics, relativity and classical mechanics through a new definition of rest state of particles like photon, and attempts to present the reasons and the possibilities of the existence of the superluminal speeds. So according to this new view some complex concepts and unanswered questions is explained in this paper.

Keyword: sub quantum energy, graviton, photon, relativity, color charge, magnetism color, negative and positive virtual photon, Zero point energy, Singularity

Beyond the Modern Physics and Cosmological Equations

1. Introduction

In this paper, two complex physical concepts, zero-point energy and singularity have been considered and analyzed. This review can be a step to combine general relativity and quantum mechanics.

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 [2, 3]. If the zero point energy in space (vacuum) exists, how can we explain the zero-point energy without using the uncertainty principle?

According to general relativity, the initial state of the universe, at the beginning of the Big Bang, was a singularity (with infinite density and zero volume). Both general relativity and quantum mechanics break down in describing the Big Bang. Despite its successes, the standard big bang theory was too simple to be complete. The Inflation Theory proposes a period of extremely rapid (exponential) expansion of the universe during its first few moments. It was developed around 1980 to explain several puzzles with the standard Big Bang theory, in which the universe expands relatively gradually throughout its history [4, 5, and 6]. 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? That we have answered in this paper, according to reconsidering relativistic Newton's second law, the Big Bang is explained. Regarding the sub quantum energy, the Friedmann equation is reviewed. This view can be a step to combine the general relativity and quantum mechanics.

2. About particles concepts

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 theories) of these particles. In discussion with my dear friend Daniel, we 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." [7] According to this view, in this paper we are using the particles for quantum and sub quantum particles without any imagination of them.

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

1- Some particles like the photon move only with the speed of light c, in all inertial reference frames. Let's call these kinds of particles the NR particles or Never at Rest condition particles.
2- Other particles like the electron always move with the speed $v < c$ in all inertial reference frames; they have rest mass, and could be called particles.

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

3 Reconsidering relativistic Newton's second law

In this section the relativistic Newton's second law will be discussed. Before anything else, it should be noted that mass and energy are not equal, but as $E = mc^2$ shows, mass and energy are equivalent and also it defines matter as condensed energy. It allows us to develop our understanding the relationship between mass and energy and generalize light velocity from energy into mass.

3-1 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 [8].

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

$$SQE = h\nu_{least,}\ \nu_{least} < \nu, \forall\ E = h\nu, where\ E = h\nu\ is\ detectable \qquad (1)$$

Relation (1) shows *SQE* in terms of energy. Every other photon consists of some *SQE*, so that;

$$E = nSQE,\ \ where\ n\ is\ a\ nattural\ number \qquad (2)$$

$$E = nSQE = nm_{SQE}c^2 = n(m_{SQE}c)c = np_{SQE}c\ \Rightarrow E = np_{SQE}c \qquad (3)$$

For two photons with energies E_1 and E_2 we have:

$$E_2 = h\nu_2 = n_2SQE, E_1 = h\nu_1 = n_1SQE, E_2 > E_1\ \Rightarrow\ n_2 > n_1, n \propto \nu \qquad (4)$$

There $n_1$and n_2 are natural numbers.

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 (4) 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 photon, the interactions between *SQE*s in photon will increase and the frequency that originates from the interactions 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 interactions 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 the 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. $|V_{SQE}| > |c|$.

It is considerable 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 [9]; that we could take it as a proof of $|V_{SQE}| > |c|$.

3-2 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;

$$\nabla V_{SQE} = 0\text{ , in all inertial reference frames and any space} \qquad (5)$$

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 $\mathbf{p} = \mathbf{mc}$. 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.

3-3 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;

$$F = \frac{dP}{dt} = m\frac{d\mathrm{v}}{dt} \qquad (6)$$

By considering relativity and the speed limit of light, in order to propose the speed limit, the relation (6) was modified. Thus the relativistic mass and the interaction between force and mass were presented as follows:

$$F = \frac{dp}{dt} = \frac{d(m\mathrm{v})}{dt} = \mathrm{v}\frac{dm}{dt} + m\frac{d\mathrm{v}}{dt} \qquad (7)$$

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 (3) we have: At the moment t_1;

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

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

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

At the moment t_2 one could write:

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

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

Because of;

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

$$\mathrm{v} = \frac{m\mathrm{v}_1 + nm_{SQE}c}{m + nm_{SQE}} < \frac{mc + nm_{SQE}c}{m + nm_{SQE}} = c \qquad (8)$$

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

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

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

$$F = \pm \mathrm{v}\frac{dE}{c^2} + m\frac{d\mathrm{v}}{dt} \qquad (9)$$

The ± sign in relation (9) has been marked on the increasing and decreasing state of energy (collinear or non-collinear directional variations in force and speed). The relativistic mass uses in high energies just for showing the speed limit in quantum equations while for well-known subatomic particles always $\mathrm{v} < c$, in this order, only the given energy by particles must be considered and there no need to use the relativistic mass relation. We can better understand and explain the physical phenomena by using Newton's second law as a relation (9). 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 medium 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.

4 Reviewing Dirac's equation by SQE and virtual photon

The equation relating to energy-mass and momentum in special relativity is:

$$E^2 = p^2c^2 + m^2c^4 \qquad (10)$$

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 [10];

$$E = \pm mc^2 \rightarrow \; E_+ = +mc^2\,, E_- = -mc^2 \qquad (11)$$

Here the negative solution was used to predict the existence of antimatter. A 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^+;

$$\gamma \rightarrow e^- + e^+ \qquad (12)$$

According to the relations (2) and (12) we can write;

$$\gamma = nSQE = 2kSQE \; \rightarrow e^- + e^+, n = 2k$$
$$kSQE \; \rightarrow e^-\,, \; kSQE \; \rightarrow e^+ \qquad (13)$$

In relation (13), 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. We chosen k_{+}, k_- for the *SQE*s constituent, $e^+,\; e^-$ relation (13) is given by;

$$k_{-}SQE \rightarrow e^{-},\ k_{+}SQE \rightarrow e^{+} \quad (14)$$

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

$$e^{+} + e^{-} \rightarrow k_{+}SQE + k_{-}SQE = 2\gamma \quad (15)$$

Consider to definition of Sub quantum energy (relation 2), a photon is a quantum of energy, but a SQE is a sub quantum of energy. Relations (14) and shows a photon converts into two kinds of SQEs 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;

$$k_{-}SQE = k \lhd \quad (16)$$

$$k_{+}SQE = k \rhd \quad (17)$$

Therefore, generally a real photon is given by;

$$k \lhd + k \rhd = \gamma \quad (18)$$

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.

4-1 Virtual photon

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 [11]), so according relation (18) we can write;

$$E = h\nu = k \lhd + k \rhd \quad (19)$$

$$E' = h\nu' = k' \lhd + k' \rhd \quad (20)$$

$$a = k' - k \ \Rightarrow\ \Delta E = a(\rhd + \lhd) \quad (21)$$

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

$$E_{min} = \rhd + \lhd \quad (22)$$

In generaly, a photon is formed of a number of E_{min}, so we can write;

$$E_{photon} = aE_{min} = a \rhd + a \lhd \quad \text{, where a natural number} \quad (23)$$

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 [12]. The photon is a complicated object to describe. When it is very virtual, it can be considered as devoid of any internal structure, at least to first approximation [13].

However, 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? In theoretically a pure steady state spin current without charge current can induce an electric field [14]. If a charged particle as a generator has an output known as a virtual photon, what will be its input?

Look at the charged particle. A charged particle is in the center of a spherical space and contains a number *SQE*s. This rotational sphere-like (charged particle spinning) is in a look into gravitons. The charged particle interacts on gravitons around it, compress them and converts to virtual photon. Also, magnetic field around the charged particle repels the virtual photon. 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. When a virtual photon from the negative charged particle reaches to around the positive charged particle, it combines with opposite virtual photon and they form a quantum energy. [15, 16, and 17] So, we can write:

$$a \rhd = \gamma^{+} \qquad (24)$$

$$a \lhd = \gamma^{-} \qquad (25)$$

$$a \rhd + a \lhd = \gamma^{+} + \gamma^{-} = \gamma \qquad (26)$$

This quantum energy is transferred to the positive charged particle, and positive charged particle accelerates toward the negative charged particle. Same process happens for negative charge particle.

4-2 Zero point energy (ZPE)

This attitude can explain zero-point energy [18, 19]. Under the terms of *SQE*, any space that has the gravitational effects can produce electromagnetic energy, and here the photon or a charged particle in the conversion of gravitons into γ^{-}, γ^{+} 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.

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;

$$E = \iiint_V \rho_{\partial G} dxdydz \qquad (27)$$

If we analyze the three relations (23) and (26) 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 [20]. Also for understanding and giving the super symmetric [21], we should study photon structure and mechanism of virtual photon production.

5 Beyond the Friedmann Equation

The Einstein universe is one of Friedmann's solutions to Einstein's field equation for dust with density ρ, cosmological constant Λ_E, and radius of curvature R_E. It is the only non-trivial static solution to Friedmann's equations. The key idea is that the universe is expanding. Consequently, the universe was denser and hotter in the past. Also the big bang cannot be described using any known equations of physics until 10^{-6} seconds had elapsed. In this section we are using the sub quantum energy form of Friedmann equation, the inflationary Big Bang theory is reviewed.

A static universe, is a cosmological model in which the universe is both spatially infinite and temporally infinite, and space is neither expanding nor contracting. Such a universe does not have spatial curvature; that is to say that it is 'flat'. A static infinite universe was first proposed by Giordano Bruno [22]. In contrast to this model, Albert Einstein proposed a temporally infinite but spatially finite model as his preferred cosmology in 1917, in his paper cosmological considerations in the General Theory of Relativity. Einstein wrote in his 1931 paper [23]; "In my original investigation, we proceeded from the following assumptions:

1. All locations in the universe are equivalent; in particular the locally averaged density of stellar matter should therefore be the same everywhere.

2. Spatial structure and density should be constant over time."

The Einstein cosmological equation may be written in the form:

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R + g_{\mu\nu}\Lambda = \frac{8\pi G}{c^4} T_{\mu\nu} \qquad (28)$$

Where $R_{\mu\nu}$ is the Ricci curvature tensor, R is the scalar curvature, $g_{\mu\nu}$ is the metric tensor, Λ is the cosmological constant, G is Newton's gravitational constant, c is the speed of light in vacuum, and $T_{\mu\nu}$ is the stress–energy tensor.

Einstein's static universe is closed and contains uniform dust and a positive cosmological constant with value precisely $\Lambda_E = 4\pi G\rho/c^2$, where ρ is the energy density of the matter in the universe and c is the speed of light. The radius of curvature of space of the Einstein universe is equal to:

$$R_E = \frac{c}{\sqrt{4\pi G\rho}} \qquad (29)$$

Now let's review the Friedmann equations which is in the heart of the standard model of cosmology. We will deal with the original equation;

$$\left(H^2 - \frac{8}{3}\pi G\rho\right) R^2 = -kc^2 \qquad (30)$$

$$\left[\left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho\right] R^2 = -kc^2 \qquad (31)$$

Where $H = (\frac{1}{R})\frac{dR}{dt}$ is Hubble "constant", G is the gravitational constant , ρ is the universe mass density , c the speed of light and the parameter k is 0 , +1 or -1 . One can write $\rho = \rho_0(R_0/R)^3$, where ρ_0 and R_0 are the present day values of the density and radius of the universe.

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. 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 [9], and relation (31) is propounded for real space.

In addition, in quantum field theory, the vacuum state is the quantum state with the lowest possible energy. The uncertainty principle requires every physical system to have a zero-point energy greater than the minimum of its classical potential well. Also under the terms of *SQE* (sub quantum energy), any space that has the gravitational effects can produce electromagnetic energy. Look at the principle of sub quantum energy, and this fact that $|V_{SQE}| > |c|$, it means;

$$(\mathrm{v}_{SQE})_x + (\mathrm{v}_{SQE})_y + (\mathrm{v}_{SQE})_z = V_{SQE} = constant \qquad (32)$$

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;

$$\mathrm{v}_{SQE} + S_{SQE} = V_{SQE} \qquad (33)$$

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

1- *Sub quantum Divergence:* if a particle/object falls in the gravitational toward a massive body, and the linear speed of its *SQE*s will be V_{SQE}, we say that the object has sub quantum divergence. There is $\mathrm{v}_{SQE} = V_{SQE}$ in the sub quantum divergence. So;

$$Sub - quantum\ Divergence;\ \ S_{SQE} = 0 \ \rightarrow\ \mathrm{v}_{SQE} = V_{SQE} \qquad (34)$$

2- *Sub quantum Convergence:* if total transmission speeds *SQE*s of a particle/object go to zero, $\mathrm{v}_{SQE} \rightarrow 0$, we say that the object has sub quantum convergence. There is $\mathrm{S}_{SQE} \rightarrow V_{SQE}$ in the sub quantum convergence. So;

$$Sub - quantum\ Convergence;\ \ \mathrm{v}_{SQE} \rightarrow 0, then\ \ \mathrm{S}_{SQE} \rightarrow V_{SQE} \qquad (35)$$

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.

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.

Definition of Singularity: An absolute black hole with very high density under two followed conditions reaches the singularity state [24]:

1) Its constituent *SQEs* reach sub quantum convergence state i.e. $S_{SQE} \rightarrow V_{SQE}$. So the linear speed of everything on the surface of absolute black hole goes to zero, $\mathrm{v}_{SQE} \rightarrow 0$

2) Due to the gravitational pressure, the average distance between *SQEs* of an absolute black hole goes to zero.

Once the speed of *SQE*s reach $S_{SQE} \rightarrow V_{SQE}$, the average distance 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 to zero, but the average the distance between *SQEs* reach to zero. Given above descriptions can easily explain counteracting Newton's second law and gravity [16].

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.

Now, by using the relations (34) and (35), the Friedmann equation and then the Big Bang will be reviewed. So, the limit of linear speed in the universe is:

$$\mathrm{v}_{SQE} = V_{SQE} \qquad (36)$$

And the Friedmann equation (relation 31) can be written as follows [16]:

$$\left[\left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho\right]R^2 = -k\mathrm{v}_{SQE}^2 \qquad (37)$$

But there is $\mathrm{v}_{SQE} = 0$ and $S_{SQE} = V_{SQE}$ on the surface of absolute black hole at the moment of Big Bang [16]. So;

$$\left[\left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho\right]R^2 = 0 \qquad (38)$$

$$R^2 \neq 0 \Rightarrow \left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho = 0 \Rightarrow \left(\frac{1}{R}\frac{dR}{dt}\right)^2 = \frac{8}{3}\pi G\rho$$

$$\frac{1}{R}\frac{dR}{dt} = \pm\sqrt{\frac{8}{3}\pi G\rho}$$

Let's ignore the minus part, so we can write:

$$\frac{dR}{R} = \sqrt{\frac{8}{3}\pi G\rho}\, dt$$

$$L_n R = \sqrt{\frac{8}{3}\pi G\rho}\, t + C\,, \qquad C \text{ is integer constant}$$

$$R = e^{\sqrt{\frac{8}{3}\pi G\rho}\, t + C} = e^C e^{\sqrt{\frac{8}{3}\pi G\rho}\, t} \qquad (39)$$

For $t = 0$, it gives the initial universe radius R_0, $R_0 = e^C$, So;

$$R = R_0 e^{\sqrt{\frac{8}{3}\pi G\rho}\, t} \qquad (40)$$

Equation (40) is an exponential function that shows the rapid expansion of the universe in the early moments of Big Bang. According to the Big Bang, because Newton’s second law counteracts gravity, the physical laws malfunction for moments, and after passing some time the physical laws will return to their normal conditions so the gravitons, also *SQE*s combine with each other and produce other particles, then Friedmann equation will be valid as follows:

$$\left[\left(\frac{1}{R}\frac{dR}{dt}\right)^2 - \frac{8}{3}\pi G\rho\right]R^2 = -k\mathrm{v}_{SQE}^2 \qquad (41)$$

It is considerable that $|\mathrm{v}|$ depends to external forces that act on SQEs, so that $|\mathrm{v}|$ might be greater or smaller than light speed c. This view might also be a step closer to solving a major riddle in modern physics.

4 Conclusion

Classical mechanics and relativity (special and general) describe the acceleration is an explanation of outward of phenomena regardless the properties of sub quantum scales. It should be noted that the interaction between large objects (e.g. collision of two bodies) under the action of the quantum layer (in fact sub quantum layer) 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. According to SQE, we are able to show there is not a zero volume with infinite density in singularity also before the Big Bang. So, regardless to reconsidering the relativistic Newton's second law, how can we resolve the dark energy problem?

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