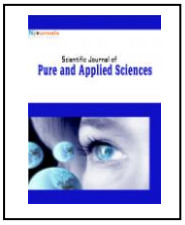
Sjournals
Scientific Journals
Scientific Journal of Pure and Applied Sciences (2013) 2(3) 116-124
ISSN 2322-2956

Contents lists available at Sjournals
Scientific Journal of
Pure and Applied Sciences
Journal homepage: www.Sjournals.com



Review article

Definition of singularity due to Newton's second law counteracting gravity

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ARTICLE INFO

Article history:
Received 09 March 2013
Accepted 20 March 2013
Available online 30 March 2013

Keywords:
Sub-quantum space-time
Sub-quantum energy
Sub-quantum divergence
Sub-quantum convergence
Absolute black hole
Singularity

ABSTRACT

With several issues being raised in the late twentieth century, modern physics was challenged and while quantum mechanics and relativity did not have the ability to respond and resolve issues also they cannot do it todays. Despite such problems, physicists are trying to find an appropriate and convincing response only on the scope of quantum physics and relativity and in this respect need to pay attention to the classical mechanics. Series of failures exist in some categories of these theories, that prior to their use, they should be clarified and resolved. Regarding on review of Newton's second law in this paper, we have been attempted to enter to the sub-quantum space by crossing the border of quantum mechanics then to survey of counteracting Newton's second law and the universal gravitation law and finally we can be analyzed and investigated the results. In sub-quantum space, we passed across the black hole and reach the formation of the absolute black hole *(a new term that has been presented for the first time in astrophysics by the authors)* by specifying the limits of Newton's second law and gravitation law, then the singularity will be explained in the explosion of an absolute black hole. In this review we will be forced to change their attitude towards the singularity and the general conclusion in the singularity state is: volume will not be zero, density will be limited, the time is not a physical quantity (absolute or relative) and a human as an observer (who is not neutral) has invented the time just for using it to the explain the ticking clock. We use the time just for the clock

ticking and in different physical situations we can only examine the working of the clocks or compare them to each other.

1. Introduction

One of the important problems at the beginning of the twentieth century in physics was the cause of stars radiation and their structures. By discovering of radioactivity, the empirical basis of mass-energy equivalence $E=mc^2$ has been prepared and up through this the stellar radiation has been described, so the development of quantum mechanics and formulation of relativistic quantum paved the way for appearing particle physics and astrophysics fields. Although by looking at the quantum structure of stars, we are able to find answers to many of questions that today physics is facing with more complex questions which quantum mechanics and relativity have no ability to answer them. Present observations show the visible world with billions of rapid-expanding galaxies and existing theories cannot explain the reasons of the Big Bang and its acceleration. There are other concepts including the cosmological constant, dark energy, dark matter and inflation, that the Standard Model of elementary particles, because of its strong frames and specifications cannot answer and will never have the ability to respond to them [Kane, 2003; Stoica, 2012].

Now the question is: "whether these phenomena can have sub-quantum nature or not?" Although answering these questions needs more extensive investigation and researches, but now we can cross the quantum boundaries and study some of the fundamental laws of physics in the sub-quantum space and we can clearly respond to some unanswered questions by looking differently to the physical phenomena.

Newton's second law and gravitational law are the fundamental laws of physics which apparently none of them cannot 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 [Senovilla, 2006; Kobayashi, Maeda, 2009]. So we meet with zero volume and infinite density (singularity) in relativity that is not acceptable in terms of observations. From sub-quantum energy view, the mentioned laws have limitations which cannot be investigated in quantum mechanics and relativity. But by sub-quantic looking at the physical phenomena and reviewing Newton's second law; can help us to specify these limitations [Javadi, et. al., 2012]. 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 (Table1).

This review strongly can change our attitude to the singularity and we will see that the time doesn't run independently of the physical existences. In other words, each physical existence is a clock and the time is a name that we use for the ticking clock (Table2).

2. Theoretical formalism of reviewing

In reviewing of Newton's second law [Javadi, et. al., 2012], we were presented the new definition of mass and energy as follows:

Definition: Sub-quantum energy is the lowest or the least rate of energy that is defined as below:

$$SQE = h\omega_{least}$$

$$\omega_{least} < \omega \ \forall \ E = h\omega \qquad (1)$$

Where ω is detectable, and ω_{least} is not detectable. We have to note that the lowest sub-quantum energy ω_{least} will be detectable only at least with two *SQE*s. The relation (1) shows that a *SQE* is the smallest photon in nature (the smallest base of energy). Every other photon consists of some *SQE*.

$$E = n \cdot SQE \qquad (2)$$

Where *n* is an integer number and the total number of *SQEs.*

With increasing in photon's energy, its frequency increase too. Thus here should be a logical explanation between energy increases as the frequency increases. Therefore, based on *SQE* definition and relation (2) could relate the relation between the energy and frequency of photons and the interaction between *SQEs* in structure of photons.

Besides the relation between *SQE*s and ω, could conclude that the *SQE* linear speed in vacuum relative to the inertial frames of reference, is actually the speed of light *c* [Behera, Mukhopadhyay, 2011]. Since *SQE* in structure of photons has a nonlinear motions and linear speed equal to *c.* So when all *SQEs* nonlinear motions turn into linear motions and it only takes linear motion the real speed of *SQE* is V_{SQE}. In other words the limit speed of *SQEs* is V_{SQE} which is faster than light speed *c*, i.e. $|V_{SQE}| > |c|$.

Sub-Quantum Energy Principle: One *SQE* is a very small energy with nonzero mass (m_{SQE}) 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:

$$\nabla V_{SQE} = 0 \qquad (3)$$

In all inertial reference frames and any space *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 or vice versa. Thus, according to the equivalence of mass-energy $E=mc^2$, all particles/objects have been made of *SQEs*. The logical consequence of this attitude toward the mass and energy is the reason of reviewing in Newton's second law. Equation (4) is the relativistic form of Newton's second law and by using definition of sub-quantum principles of energy; it can be presented as follows (for more details see [Javadi, et. al., 2012]):

$$F = \frac{dP}{dt} = \frac{d(m\nu)}{dt} = m\frac{d\nu}{dt} + \nu\frac{dm}{dt} \qquad (4)$$

$$\frac{dm}{dt} = n \cdot m_{SQE} = \frac{dE}{c^2} \qquad (5)$$

$$F = m\frac{d\nu}{dt} \pm \nu\frac{dE}{c^2} \qquad (6)$$

The relation (6) is the new revision of Newton's second law. According to the concepts and explanations in this section, we can consider the infinite expressed that were raised in the introduction.

Table1

Mass and Energy in CM, QM, SR, GR and *SQE*[1].

CM: Mass and energy are two separate quantities. Mass is conserved and energy is conserved too. Newton's second law *F= mdv/dt,* shows that a body can approaches at very high speed, higher than light speed or to infinite.
QM: The Mass (m), Momentum (P) and Energy (E) of the particle are related by $E=P^2/2m$. Energy cannot be continuous for a particle.
SR and **GR:** Mass and energy are equivalent $E=mc^2$ and they are not separately conserved. Relativity Newton second law given by relation (4) and relativity mass $m=m_0/(1-(v/c)^2)^{1/2}$, show that a photon with mass $m=E/c^2$ should has zero rest mass [Zheng-Johansson, Johansson, 2006].
SQE: Sub-quantum energy defines by relation (1), a photon consists of some SQE (relation (2)), so everything is made of *SQEs*. According *SQE,* Newton Second law becomes as relation (6). Light speed is constant, because photon gets its speed of *SQEs* (relation 3). If we ignore the zero rest mass of photon, much better and more real physical phenomena may be investigated [Javadi, et. al., 2011]

[1]CM (Classical Mechanics), QM (Quantum Mechanics), SR (Special Relativity), GR (General Relativity), SQE (Sub-Quantum Energy)

3. Sub-quantum aspect on astrophysics

We suppose that the force F_1 during the rate of changing of time Δt is acted upwards on the bullet with mass m. The bullet will be affected by net force F as follow:

$$F = F_1 - F_g > 0 \Rightarrow F = F_1 - GMm \cdot \frac{1}{R^2} \quad (7)$$

Where F_g -is gravitational force, M -is the Earth mass, R -is the Earth radius and G -is the constant of gravitation.

Within the rate of changing of time Δt, the net force F changed the bullet speed $v = 0$ to v and then after throwing, it will go up to the distance r. The classical form of energy is:

$$W = -\Delta U \Rightarrow$$

$$\frac{1}{2}mv^2 = GMm \cdot (\frac{1}{R} - \frac{1}{r}) \quad (8)$$

W -is the work done by a conservative force F and U -is the potential energy associated.

Now we consider the classical equation (8) based on sub-quantum energy within the time interval Δt, the force F acting on the bullet; using the work-energy theorem we have:

$$W_F = \Delta K_E$$

W_F -is resultant work of the force F upon the bullet and ΔK_E -is the rate of change of the bullet's kinetic energy. According to equation (3), the force F converts some part of non-linear motions of *SQEs* constituent part of the bullet in line of force F to linear motions. According to the definition of *SQE* and relation (2) can be written:

$$\Delta K_E = n \cdot SQE = n \cdot P_{SQE} c = n \cdot m_{SQE} c^2$$

$$m \times 0 + n \cdot m_{SQE} c = (m + n \cdot m_{SQE})v \quad (9)$$

Where *n*- is the total number of *SQEs*. The initial speed of the bullet equals zero, but in throwing moment (when the force F_1 stop to acting on it), the energy mass equivalent $n \cdot m_{SQE}$ should be added to the mass of bullet. It means that the mass change should be considered in relationship (8), so:

$$\frac{1}{2}(m + n \cdot m_{SQE})^2 = GM(m + n \cdot m_{SQE})(\frac{1}{R} - \frac{1}{r}) \quad (10)$$

When the bullet goes up, gravity does negative work on it and its *SQEs* are left out; the speed of bullet changes from v to v_1 where $v > v_1$, leaving each *SQE* from the bullet structure and by leaving other *SQEs* in a similar way, the rate of bullet speed is decreased. When *SQEs* are all out, bullet speed reaches zero and it will fall down. During downward, the work by gravity on it is positive and *SQEs* enter into the mass of bullet. Mass and kinetic energy of the bullet at the moment of reaching the launch site will be as follows:

$$m_{bullet} = m + n \cdot m_{SQE}$$

$$K_{E_{bullet}} = \frac{1}{2}(m + n \cdot m_{SQE})v^2 \quad (11)$$

In the relation (9) the number of *SQEs* (n), should be more enough for throwing the bullet with escape speed, so:

$$r \to \infty, \quad W_F \to 0$$

It means that, the last *SQE* will leave the bullet at infinity distance. In this case, according to equation (10) we have:

$$\frac{1}{2}(m + n \cdot m_{SQE})v^2 = GM(m + n \cdot m_{SQE})\frac{1}{R} \quad (12)$$ Where $v_{esc} = \sqrt{\frac{2GM}{R}}$.

The ratio $n \cdot m_{SQE}$ 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 (equation (9)). This relation is different for photon that moves with speed *c*, i.e., the number of *SQEs* will not affect on the speed of photon. In the relation (12) to convert a star into a black hole it should be [Crothers, 2008; Nazarenko, et. al., 2008]:

$$v_{esc} \geq c \qquad (13)$$

We assume a photon contains *n* number of *SQEs* (relation (2)) which is escaping from the gravitational field of the black hole; gravity does negative work on photon and so *SQEs* 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 (2), (3) and $E=mc^2$ all particles/objects are made of *SQEs* 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 (14) and we have $v = c$ only for the light [Javadi, et. al., 2011]:

$$0 \leq v \leq c \qquad (14)$$

Also, according to equation (9), by the speed of light, the energy is transferred from one system to another system. But for the particle/object that is inside a black hole the gravitational field can greatly effect on transmission speed of *SQEs* 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 *SQEs* transition speed inside of electrons is reduced by gravitational collapsing and value of non- transmission speeds will be grown [Barcelo, et. al., 2011; Joshi, Malafarina, 2012]. 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 [Giambo, 2008]. So in the relation (12) the value R by increasing value M will be smaller. In the next section we examine this issue further.

Table2

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

CM: 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.
QM: 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 [Konkowski, 2004].
GR: 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 [Joshi, Malafarina, 2012]. 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.
SQE: Everything is made of *SQEs*, relations (2) and (3). 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 (17) and (18)), also see Sub-quantum Divergence Sub-quantum convergence). In singularity of an absolute black, gravity force changes of attractive force to repulsive force (section 5). 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 (section 6).

4. An absolute black hole

There are three-variables in relation (12): mass M, radius R and escape speed 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:

$$(V_{SQE})_x + (V_{SQE})_y + (V_{SQE})_z = const \qquad (15)$$

Acting the external force on *SQE* in the relation (3) we will get:

$$(a_{SQE})_x + (a_{SQE})_y + (a_{SQE})_z = 0 \qquad (16)$$

Where $(a_{SQE})_x$, $(a_{SQE})_y$ and $(a_{SQE})_z$ 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., $(a_{SQE})_x = -(a_{SQE})_y = -(a_{SQE})_z$, likewise for other acceleration components.

We conclude from relations (15) and (16) that each SQE 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 or vice versa. In the inertial system we show ν_{SQE} as the total transmission speeds rate and s_{SQE} the total non-transmission speeds rate of a *SQE*, so will always have:

$$\nu_{SQE} + s_{SQE} = V_{SQE} \qquad (17)$$

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 section.

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

a) We show the transmission of external forces by $F_{E\nu}$. These forces are converting the non-transmission speeds to the transmission speeds .According to the relation (5), we are applying the force $F_{E\nu}$ 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 (relation (6)), we get:

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

Assuming the initial transmission speed of *SQE* equals zero (*SQE*s have not transmission speed in relation (20)), we take the integral over the above differential equation:

$$\int_0^{V_{SQE}} d\nu = \frac{1}{m_{SQE}}\int_0^t F_{E\nu}dt = V_{SQE} \Rightarrow$$

$$\int_0^t F_{E\nu}dt = m_{SQE}\cdot V_{SQE} \qquad (18)$$

When the transmission speed of *SQE* reach V_{SQE}, the force $F_{E\nu}$ 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 (20), when speed gets $\nu_{SQE} = 0$, 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 $F_{E\nu}$ and F_{Es} are acted on a *SQE* and each *SQE* will be got transmission and non-

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

a) *Sub-quantum Divergence:* if a particle/object affected when a force $F_{E\nu}$ 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 $\nu_{SQE} = V_{SQE}$ in the sub-quantum divergence (relations (17), (18)).

b) *Sub-quantum Convergence:* if a particle/object affected when a force F_{Es}, acts on it, so the non-transmission 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 (relation (17), (18)).

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 $V_{SQE} > c$.

5. Beyond the singularity

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 $\nu_{SQE} = 0$ is reduced, the value of ν_{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 $d_j, i = 1,2,3,...,k$. 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 holes will be into the explosion and decay sates (Like discs at a time when they are colliding with each other) [Stoica, 2012].

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* reaches 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. According to the relation (5), when an object falls into the absolute black hole, the force $F_{E\nu}$ 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, i.e. $s_{SQE} = V_{SQE} > c$.

Non-transmission force F_{Es} also is the gravitational force in the singularity and converting the non-transmission speed of *SQEs* to $s_{SQE} = V_{SQE}$. The average distance *d* attaining to zero, it is the major acts of force

F_{Es} 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 collapsed 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 world and all physical phenomena existing in it.

6. Time and structure of matter

According to special relativity as we know; a clock in a moving frame will be seen to running slow [Field, 2009]. The time T_0 always is shortest as measured in its rest frame *T*, so

$$T_0 = T\sqrt{1-\frac{v^2}{c^2}} \qquad (20)$$

By considering an arbitrary physical object (photons, atoms, trees, animals, stars,… and even the world) that here this object is denominated as *Existence (Ex)*; " What really can be observed by the *SQE* observer who exists inside the *Ex* structure?"

By the *SQE* observer, some of *SQE*s in interaction with each other create the *Ex* and influenced by internal or external factors were scattered and so there is no *Ex* but *SQE*s exist now, and they are forming new *Ex*s. 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 *SQE*s energy is constant and they always move with constant speed $\left|V_{SQE}\right| > c$ [Yan et al., 2012].

According to relations (20) it can be easily concluded that the time is not included *SQE*s 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. In other words, contrary to everyone and especially the physicists, no moment of lifetime of the world's constituent particles has been elapsed.

7. Conclusion

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 $\left|V_{SQE}\right| > \left|c\right|$. 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.

Acknowledgment

The authors would like to express theirs sincere appreciation to Ms. Matin Vaez Tehrani.

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