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Universe End by Phase Transition Due to Vacuum Energy Change According to the Black Hole Model

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Abstract

In this work, a new scenario was propose 8d for the end of the present universe through a phase transition which is based on the expression of the mass in the potential dependent special relativity. For negative attractive vacuum energy exceeding half rest mass energy all rest masses of particles become imaginary with means that they leave the present ordinary universe to become a big black hole.

The model indicated that present universe can undergo phase transition, which causes it to disappear by being transformed to another new one. In this new universe, which resembles a black hole, the universal constants like Planck constant and the speed of light are different from that of the present universe

Keywords: universe, phase transition, black hole, potential, special relativity, Planck constant, energy conservation, rest mass

Introduction

Human life on the earth planet is affected by the surrounding universe. Therefore it is very important to study the nature of the universe. It is well known that the sun radiation is responsible for the life of almost all living organisms through plants which convert sun light energy into useful vital energy. Solar energy is also responsible for providing us with fresh water by evaporation of oceans water to form clouds that are one of the main sources of fresh water. Wind generation requires sun radiation also. Too many examples can be given showing the direct impact of the universe on the human life. Many cosmological models were proposed to describe the universe.

One of the earliest attempts was proposed by classical Newtonian Laws . These laws uses the Euclidian space and the three well known Newton's laws [1]. Newton's laws succeeded in explaining a wide variety of astronomical observations including the stability of the solar system. But unfortunately recent observations at the beginning of the 20th century concerning the Doppler red shift and the the universe expansion [2] .

The failure of Newton's laws encourages Einstein to utilise his relativy theory

to construct a useful cosmological model .This cosmological model is based on the so called general relativity (GR) [3] .

The GR theory emerged as a natural extension of special relativity (SR) theory [4] . Special relativity theory promoted Newtonian laws due to the failure of the later in explaining the findings of Mickelson and Morley experiment which indicated that the speed of light is a universal constant that is not affected by the motion of the source or observer [5]. Special relativity theory succeeded in constructing new laws of motion and new energy relations, beside changing radically the concept of space and time. According to the SR theory the length and time intervals are not constants but are affected by the relative uniform motion of the observer with respect to the physical system. For accelerated non uniform motion the space time continuum is no longer Euclidean, but becomes curved. This leads to the emergence of GR which describes accelerated frames using Reeman geometry. Since the gravitational field causes particles to be accelerated, thus the gravitational field causes the space to the curved.Thus all gravitational phenomena can be described using a curved space time Reeman geometry.

Since the gravitational interaction is the dominant one for the universe, thus the behaviour of the universe can be explained using Reeman geometry and tensors.The so called Einstein gravitational field equation was

proposed by Einstein [6]. This equation was used to construct the so called big bang (BB) model to describe the behaviour of the universe.The BB model successfully described the expansion of the universe, the existence of the relic microwave background, and the deflection of light by the sun.

Despite the remarkable successes of the BB model but it suffers from some noticeable cet backs specifically at the early universe. These are known as the singularity, horizon , flatness and entropy problems. The model suffers from fully explaining the behaviour of some exotic objects like black holes, quasars and pulsars. According to the BB model the universe may expand for ever ending up by the total consumption of the sun energy. Or it may collapse when the gravitational field causing collapse becomes very strong compared to the thermal energy which forces the universe to expand . The collapse scenario can be proposed to be more possible due to the collapse observed in many parts of the universe like black holes and quasars. This collapse process may gradually increase to include the whole universe. According to this scenario the universe will become a very big black hole. This means that the laws of physics for the whole universe will resemble that of the black holes.The astronomical observations and the proposed models indicated that the laws of physics inside block holes are different from that of the ordinary universe.

Due to the complex mathematical framework of GR and the BB model many alternative models were proposed. These attempts are based on the string theory by introducing multi dimensions , beside using quantum field theory (QFT),.in addition to unified theories (UT) beside superstring theories (SST).

At the early universe on needs quantum gravity theory.

Many researches were made about the space-time behavior and the existence of extra dimensions in some exotic objects like black holes [10]. A research was made by Ibrahim and others speaking about the existence of short range force using uncertainty principle [11]. The same researcher suggests transition of particles having critical masses from micro to macro world [12]. He also tried to link the masses, times and dimensions of the micro and macro world by introducing the so called the cosmic universal quantum number [13]. Mohamed S. Amir also proved that elementary particles can be generated inside the black hole. The massed and dimensions are related to plank mass and radius [14]. Mubarak Dirar also proves that the neutrino speed can sometimes exceed the speed of light using his generalized SR (GSR) theory [15].

Potential Dependent Special Relativity for

Sudden Destruction of The Present Universe Through Phase Transition

Due to Vacuum Potential Change

According to the potential-dependent special relativity (PSR) proposed by some authors [ ], the test mass m_0 depends strongly on the vacuum energy, according to the relation:

$$m_0 = m_{00}\sqrt{g_{00}} = m_{00}\sqrt{1 + \frac{2\Phi_v}{c^2}} \qquad (1)$$

With m_{00} standing a universal constant, c is the speed of light in vacuum. One of the possibilities that leads to phase transition through

The change of vacuum energy to be negative and extremely large such that

$$\Phi_v = -\Phi_{0v} \qquad (2)$$

$$2\Phi_{0v} > c^2 \qquad (3)$$

Or

$$2m_0\Phi_{0v} > m_0c^2 \qquad (4)$$

$$2v_{0v} > E_0 \tag{5}$$

Where

$$v_{0v} = m_0 \Phi_{0v} \tag{6}$$

stands for the vacuum potential, and

$$E_0 = m_0 c^2 \tag{7}$$

represents the rest mass energy. Equation (2) signifies that vacuum energy is attractive. Inserting (2) in (1) yields

$$m_{0c} = m_{00}\sqrt{1 - \frac{2\Phi_{0v}}{c^2}} \tag{8}$$

with c signifies that the quantity to complex the aid of equation with (3) one can re-write equation (8) to become

$$m_{0c} = \sqrt{-1}m_{00}\sqrt{\frac{2\Phi_{0v}}{c^2} - 1}$$

$$m_{0c} = im_{00}\sqrt{\frac{2\Phi_{0v}}{c^2} - 1} = g_{00}\, m_{00} i \tag{9}$$

$$g_{00} = \sqrt{\frac{2\Phi_{0v}}{c^2} - 1} \tag{10}$$

This means that the mass in such universe is imaginary. Thus such mass disappears from our universe and does not exist at all.

This means that all astronomical objects suddenly permeated with cosmic vacuum coming from a black hole such that the vacuum energy undergo.

the transformation

$$\Phi_v = \Phi_{cv} \tag{11}$$

within the constraints described by equations (2) and (3) leads to a sudden destruction of our ordinary universe transforming to another universe with new imaginary rest mass.

The time in our ordinary universe takes the form

$$t_v = t_{00}\sqrt{g_{00}} \tag{12}$$

$$t_v = t_{00}\sqrt{1 + \frac{2\Phi_v}{c^2}} \tag{13}$$

When the universe undergo phase transition given by equations (11) with the constraints in equations (2) and (3), the time is given by

$$t_{vc} = i\sqrt{\frac{2\Phi_{0v}}{c^2} - 1} \tag{14}$$

where c signifies complex time. Considering the transformation which requires

$$|t_{vc}| = \gamma_0 t_v$$

Gives

$$\frac{2\Phi_{0v}}{c^2} - 1 = \gamma_0^2\left(\frac{2\Phi_v}{c^2} + 1\right)$$

$$\Phi_{0v} = \frac{c^2\gamma_0^2}{2} + \gamma_0^2\Phi_v + \frac{c^2}{2} \qquad (16)$$

$$\Phi_{0v} = \gamma_0^2\Phi_v + \frac{c^2}{2}(\gamma_0^2 + 1) \qquad (17)$$

Thus equation (17) gives

$$\gamma_0 = 360000 \qquad (18)$$

$$\Phi_{0v} = (36\times10^4)^2\Phi_v + \frac{c^2}{2}(((36\times10^4)^2 + 1) \qquad (19)$$

If one consider additional constraint or transformation which preserves the quantum energy to be invariant give

$$E_{0c} = E_0 \qquad (20)$$

$$h_c f_{0c} = hf_0 \qquad (21)$$

$$\frac{h_c}{T_{0c}} = \frac{h}{T_0} \qquad (22)$$

But according to equation (15)

$$T_{0c} = \gamma_0 T_0 \qquad (23)$$

Thus

$$\frac{h_c}{\gamma_0 T_0} = \frac{h}{T_0} \qquad (24)$$

$$hc = \gamma_0 h \qquad (25)$$

thus, the new Plank constant in the imaginary universe is given by

$$h_c = 36\times10^4 h_0 \qquad (26)$$

Let us see what is the value of the new rest mass in the complex imaginary universe according to the

$$|E_{0c}| = E_0 \qquad (27)$$

$$|m_{0c}|c^2 = m_0c^2 \qquad (28)$$

This requires

$$\left(\frac{2\Phi_{0v}}{c^2} - 1\right) = \left(\frac{2\Phi_v}{c^2} + 1\right)$$

$$\Phi_{0v} = \Phi_v + c^2 \qquad (29)$$

is in direct conflict with equation (17). This contra version and conflict can be removed by assuming that the speed of light in vacuum in the imaginary universe is c_c instead of c. Thus (28) gives

$$|m_{0c}|c_c^2 = m_0c^2 \qquad (30)$$

Therefore

$$|m_{0c}|^2c_c^4 = m_0^2c^4 \qquad (31)$$

$$\left[\frac{2\Phi_{0v}}{c_c^2} - 1\right]c_c^4 = \left[\frac{2\Phi_v}{c^2} + 1\right]c^4$$

$$2\Phi_{0v}c_c^2 - c_c^4 = 2\Phi_vc^2 + c^4$$

$$c_c^4 - 2\Phi_{0v}c_c^2 + 2\Phi_vc^2 + c^4 = 0 \qquad (32)$$

Comparing with

$$ax^2 + bx + c_0 = 0 \qquad (33)$$

With

$$a = 1 \quad b = -2\Phi_{0v}$$

$$c_0 = 2\Phi_vc^2 + c^4 \qquad (34)$$

The new speed of light is given by

$$c_c^2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad (35)$$

For zero vacuum energy in both the current and the new universe:

$$\Phi_{0v} = 0 \qquad \Phi_v = 0 \qquad (36)$$

Thus, the speed of light in the new universe becomes

$$c_c = \frac{1}{\sqrt{2}}(1 + i)c \qquad (37)$$

Which is different from that of the present universe.

But when only vacuum in the new universe vanishes i.e

$$\Phi_{0v} = 0 \qquad (38)$$

In this case equation (32) gives

$$c_c = \frac{1}{\sqrt{2}}(1 + i)(c^4 + 2\Phi_v c^2)^{\frac{1}{4}} \qquad (39)$$

Discussion

The conditions which leads to phase transition from the ordinary present universe to the black holes new universe

is based on the mass expression in the potential dependent special relativity. The rest mass is shown to be dependent on the vacuum energy. as shown by equation (1). The condition of the black holes universe requires the vacuum energy to be negative attractive and exceeding half of the rest mass energy as shown by equations

(2) and (5). In this case the rest mass of all particles imaginary according to equation (9). This means that all particles does not exist in the present universe and they leave to another new universe. When the transformation to the new universe preserves energy as shown by equations (20) and (30) the new Plank constant and the speed of light are different from that of the present universe as shown by equations (25) and (37). The speed of light in the new universe is complex as shown by equations (37,38,39).The real part signifies that some of the black holes light can propagate to reach the present universe. The imaginary part however indicated that the light can propagate inside the black holes with speed different from that of the present universe depending on the values of the vacuum energy in both present and new universes

Conclusion

The model based on the potential dependent special relativity indicated that present universe can undergo phase transition which causes it to disappear by being transformed to another new one .In this new universe which resembles a black hole the universal constants like Plank constant and the speed of light are different from that of the present universe

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