Motion of stellar objects and variability of gravitational constant G

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Abstract

Recently we develop a model of dynamic quantum vacuum in which a given stellar object increases curvature of space and diminishes density of quantum vacuum. Motion of stellar objects is diminishing density of dynamic quantum vacuum in the areas of their motion. Diminished density of quantum vacuum is causing minimal increasing of gravitational constant G. We propose experiment which will confirm that G has the same value when measured at the same time on places which are situated close the same meridian and have equal distances to the moon and planets of the solar system.

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1. Introduction

In General Relativity gravity is described by the curvature of space-time. We develop a model of dynamic quantum vacuum where curvature of space-time has origin in density of quantum vacuum [1]. In this model time is merely a mathematical parameter of a given particle motion in quantum vacuum [2]. This model has similarity with "gravitational ether model" of Einstein universe [3]. In such an universe where fundamental arena is gravitational ether (we call it "dynamic quantum vacuum" which structure is defined by Planck units) value of gravitational constant G_N has a minimal variability which depends on density of gravitational ether/dynamic quantum vacuum.

Gravitational constant G_N has been measured by several groups in different places on the globe and the values are variable from 0,1% to 0,7% [4]. This variability of G_N cannot be explained with existing models [5]. Results of last 30 years of measurement of gravitational constant show that there is some measurement error or either some "strange" influence is affecting most of G_N measurement: The situation is disturbing — clearly either some strange influence is affecting most G measurements or, probably more likely, measurements of G since 1980 have unrecognized large systematic errors. The need for new measurements is clear [6].

In our model this "strange" influence which is affecting most of G_N measurements is a variable density of quantum vacuum. We propose a model of dynamic quantum vacuum where stellar objects changes density of quantum vacuum ρ_{qv} according to the formalism (1):

$$\rho_{qv} = \rho_P - \frac{m}{V} = \rho_P - \frac{3m}{4\pi \cdot r^3} \qquad (1)\ [7],$$

where m is the mass of the material object, r is radius of material object.

Out of formalism (1) follow we can develop a formalism (2) with which we can calculate density of quantum vacuum at point T on the distance d from the centre of a given stellar object:

$$\rho_{qv} = \rho_P - \frac{3m}{4\pi (r+d)^3} \qquad (2),$$

where d is the distance from the centre of the material object to a given point T (see figure 1). When $d = 0$ one get density of dynamic quantum vacuum (from now on "DQV") in the centre. When $d = r$ one get density of DQV on the surface of the stellar object. When $d \to \infty$ one get Planck density ρ_P of DQV in intergalactic empty space far away from stellar objects.

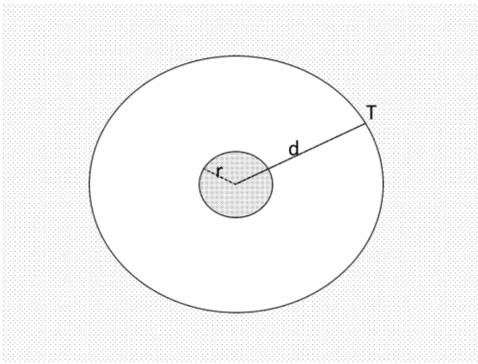

Figure 1: density of quantum vacuum on the distance d from the centre of stellar object

Value of gravitational constant G_N in intergalactic space far away from stellar objects can be expressed with Planck units:

$$G_N = \frac{l_P^3}{m_P \cdot t_P^2} \qquad (3),$$

where l_P^3 is Planck volume, m_P is Planck mass and t_P is Planck time.
Formalism (3) can also be written:

$$G_N = \frac{1}{\rho_P \cdot t_P^2} \qquad (4),$$

where ρ_P is Planck density.

Combining formalism (2) and (4) value of G_N at the given point T from the distance d from the centre of a given stellar object can be written:

$$G_N = \frac{1}{\left(\rho_P - \frac{3m}{4\pi(\mathrm{r}+\mathrm{d})^3}\right) \cdot t_P^2} \qquad (5).$$

Using formalism (5) we can calculate value of gravitational constant G_N on the Earth surface, in the earth centre and for example on the satellite which is 20000 km above the surface:

$$G_{earth.surface} = 6{,}746469 \cdot 10^{-11} m^3 Kg^{-1} s^{-2}$$
$$G_{earth.centre} = 6{,}7464714 \cdot 10^{-11} m^3 Kg^{-1} s^{-2}$$
$$G_{satellite} = 6{,}745427 \cdot 10^{-11} m^3 Kg^{-1} s^{-2}.$$

Calculated difference between value of gravitational constant G_N in the centre of the earth and on its surface is:

$$\Delta G_{earth.centre-earth.surface} = 6{,}7464714 \cdot 10^{-11} - 6{,}746469 \cdot 10^{-11} = 0{,}0000024 \cdot 10^{-11} m^3 kg^{-1} s^{-2}$$

. Calculated difference between value of gravitational constant G_N on the surface of the earth and satellite 20000 km above the surface is:

$$\Delta G_{earth.surface-satellite} = 6{,}746469 \cdot 10^{-11} - 6{,}745427 \cdot 10^{-11} = 0{,}001042 \cdot 10^{-11} m^3 kg^{-1} s^{-2}$$

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Calculations of G_N in the centre, on the surface of planet earth and 20000 km from the earth surface show that differences between centre and surface are in range of 10^{-6} and differences between surface and 20000 km from the surface are in range of 10^{-3}. This indicates that value of G_N depends on some “external” causes and not on earth geological structure under the places where G_N was measured.

2. Measurement of G_N at the same time on different places which are close to the same meridian

In our model of dynamic quantum vacuum motion of a given stellar object is causing that density of quantum vacuum in the surrounding area of object motion diminishes. This diminished density causes increasing of space curvature and minimal increasing of G_N value. According to our model value of G_N when measured on the earth surface at different places and different times will have different values because of different positions of moon and planets. Experimental data confirms that this prediction of our model is right [4].

Our model predicts that when measuring G_N at the same time on places which are close to a given meridian, values of G_N will be the same because distances from these places to the moon and planets will be the same and so density of quantum vacuum will be the same. We chose two following groups of places. In first group are towns Napoli and Trieste in Italy and Potsdam in Germany. In second group are towns San Petersburg in Russia, Minsk in Belorussia, Kiev in Ukraine and in Moldova. We plan to carry out this experiment in December 2015.

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