

The Origin of the Illusory Periodic Changes in the Gravitational Constant

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Abstract: Anderson *et al.* have found that experimental values for gravitational constant, G , are oscillatory with a period of $P = 5.899 \pm 0.062$ yr and an amplitude of $A = (0.001619 \pm 0.000103) F$, where F is a factor that is the inverse of the 11 powers of ten expressed in SI Base Units. The period P correlates with the 5.9 year periodic signal in length of day (LOD). Previously it was assumed that changes in LOD follow from fluid core motions and inner-core coupling. But the origin of the G /LOD correlation is still not explained. Next, Schlamminger *et al.* have found that corrections to the G data reported by Anderson *et al.* significantly weaken the G /LOD correlation. But in Table III there appears the fit sinusoidal function for G with period fixed at 5.93 year. Here, applying the Scale-Symmetric Theory (SST), we show the origin of the periodic changes in LOD and the illusory changes in G and the origin of the experimental amplitude of G that is illusory as well. The calculated period of LOD and illusory period of G are both 5.941 yr whereas illusory amplitude of G is 0.00183 F . Here, the 5.941 year periodic signal in LOD we interpret as due to advection of the virtual cloud, composed of the virtual electron-positron pairs produced by Earth, caused by its interactions with the dark-matter (DM) structures that overlap with the Earth orbit. Such advection follows from the confinement and entanglement of virtual electrons and positrons and DM structures. The advection causes periodic increase in mass of Earth and measuring apparatus. The amplitude of the changes in mass of Earth follows directly from masses of nucleons (we must take into account the nuclear binding energy) and electrons. The changes in mass lead to the illusion of periodic changes in G . The SST results are consistent with experimental data. Moreover, SST shows that the real changes in G can be infinitesimal only.

1. Introduction

Anderson *et al.* have found that experimental values for gravitational constant, G , are oscillatory with a period of $P = 5.899 \pm 0.062$ yr and an amplitude of $A = (0.001619 \pm 0.000103) F$, where $F = 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$ [1]. The period P correlates with the 5.9 year periodic signal in length of day (LOD) [2]. Previously it was assumed that changes in LOD follow from fluid core motions and inner-core coupling. But the origin of the G /LOD correlation is still not explained. Next, Schlamminger *et al.* have found that corrections to the

G data reported by Anderson *et al.* significantly weaken the G /LOD correlation [3]. But in Table III there appears the fit sinusoidal function for G with period fixed at 5.93 year [3]. Notice as well that the CODATA (2014) recommended value of G is $G_{CODATA(2014)} = 6.67408(31) F$ [4].

Here, applying the Scale-Symmetric Theory (SST) [5], we show the origin of the periodic changes in LOD and the illusory changes in G and the origin of the experimental amplitude of G that is illusory as well.

The General Relativity leads to the non-gravitating Higgs field composed of tachyons [5A]. On the other hand, the Scale-Symmetric Theory shows that the succeeding phase transitions of such Higgs field lead to the different scales of sizes/energies [5A]. There consequently appear the superluminal binary systems of closed strings (entanglons) responsible for the quantum entanglement (it is the quantum-entanglement scale), stable neutrinos and luminal neutrino-antineutrino pairs which are the components of the Einstein spacetime (it is the Planck scale), cores of baryons (it is the electric-charges/condensates/loops/quantum-physics scale), and the cosmic structures/protoworlds (it is the cosmological scale) which evolution leads to the dark matter, dark energy and expanding universes (the “soft” big bangs) [5A], [5B].

The inflation field started as the liquid-like field composed of non-gravitating tachyons [5A]. During the inflation, the liquid-like inflation field (the non-gravitating superluminal Higgs field) transformed partially into the gravitating luminal Einstein spacetime (the big bang) [5A], [5B]. In our Cosmos, the two-component spacetime is surrounded by timeless wall – it causes that the fundamental constants are practically invariant [5A], [5B].

Due to the symmetrical decays of bosons on the equator of the core of baryons, there appears the atom-like structure of baryons described by the Titius-Bode orbits for the nuclear strong-weak interactions [5A].

Applying 7 parameters only and a few new symmetries, [5A], we calculated a thousand of basic physical quantities (there are derived the physical and mathematical constants as well) which are consistent or very close to experimental data and observational facts (http://vixra.org/author/sylwester_kornowski). In SST there do not appear approximations, mathematical tricks, and free parameters which are characteristic for the mainstream particle physics and mainstream cosmology.

According to SST, the stable neutrinos are the “sources” of the gravitational constant G [5A], [6]. Stable neutrinos (i.e. the electron-neutrino, muon-neutrino and their antiparticles) consist of the entanglons which transform the chaotic motions of tachyons in the Higgs field into divergently moving ones – due to collisions of the divergently and chaotically moving tachyons, there are produced gradients in the Higgs field i.e. the gravitational fields. The collisions decrease local number density of tachyons in the Higgs field. It means that number density of tachyons depends on number density of the Einstein-spacetime components. But SST shows that due to the very strong shortest-distances quantum entanglement, the cores of baryons are practically indestructible [5A]. It leads to conclusion that upper limit for mass density of nuclear plasma is about 10^{10} times lower than the Einstein spacetime (the General-Relativity black holes are not in existence [7]). Since G is directly proportional to inertial mass density of the Higgs field, [5A], [6], so we can see that the first nine significant digits in value of G are in our Universe invariant. Calculated value of G within SST is $G_{SST} = 6.6740007 F$, [5A], [6] – this value is consistent with the CODATA recommended value of G [4]. Here we show that the observed periodic changes in G are illusory and follow from periodic changes in mass of Earth and measuring device. The Newtonian gravitational force is

directly proportional to the product GM so the still undetected small changes in mass of Earth, ΔM_{Earth} , cause that G can be invariant.

SST shows that the condensate in the centre of the core of baryons has a mass of $Y = 424.124$ MeV whereas the condensate in the centre of electron has mass equal to the half of the mass of bare electron $M_{C,electron} = 0.255204$ MeV [5A].

Here, the 5.941 year periodic signal in LOD we interpret as due to advection of the virtual cloud, composed of the virtual electron-positron pairs produced by Earth, caused by its interactions with the dark-matter (DM) structures that overlap with the Earth orbit. Such advection follows from the confinement and entanglement of virtual electrons and positrons and DM structures. The advection causes periodic increase in mass of Earth and measuring apparatus.

2. Calculations

According to SST, each electric charge produces one virtual electron-positron pair (e^-e^+ pair). Such virtual pair disappears in one place of the Einstein spacetime and appears in another one, and so on. Using such model we calculated, for example, the magnetic moments of electrons and muons with very high accuracy [5A]. We can see that Earth produces a cloud composed of the virtual e^-e^+ pairs. On the other hand, initially, instead the Earth there was a ring/loop composed of plasma which had circled the Sun. Such plasma loop created the dark-matter (DM) structures i.e. the loops composed of entangled Einstein-spacetime components i.e. of entangled neutrino-antineutrino pairs. Today, the DM loops/structures overlap with the Earth orbit and their spin speed is equal to the speed of light in “vacuum” c . The condensates in centres of the components of the virtual cloud (their mass is $M_{C,electron}$), produced due to the weak interactions by the condensates in centres of the protons (mass of the proton condensates is Y) the Earth consists of, interact due to the confinement and entanglement, [5A], with the DM loops/structures so there appears the advection of the virtual cloud i.e. the cloud orbits the Sun as well but its orbital speed differs from the orbital speed of Earth. The speed of advection of the virtual cloud we can calculate from formula derived within SST [8]

$$v_{advection} = c (2 \alpha_i m / m_o)^{1/2}, \quad (1)$$

where α_i is the coupling constant that represents the proton-lepton-DM interactions whereas m / m_o is the ratio of the interacting/intermediating mass (here it is the mass $M_{C,electron}$ of the condensates in centres of the virtual electrons and positrons in the virtual cloud) to the upper limit for mass of the source of interactions (here it is the mass Y of the condensates in the centres of protons the Earth consists of). Applying formula (1) we calculated the non-Newtonian orbital speeds of stars in galaxies, [8], and the external radii of the accretion discs around the black holes [7]. Value of α_i depends on type of interaction. Here it is the coupling constant for the weak interactions of protons with virtual e^-e^+ pairs in the presence of the DM structures. According to SST, such coupling constant is [5A], [5B]

$$\alpha'_{W(proton-electron)} = 1.11943581 \cdot 10^{-5}. \quad (2)$$

The above remarks lead to following value for the orbital speed of the virtual cloud caused by the advection

$$v_{advection,virtual-cloud} = c (2 \alpha'_{W(proton-electron)} M_{C,electron} / Y)^{1/2} = 34.796 \text{ km/s}. \quad (3)$$

This value is greater than the orbital speed of Earth [9]

$$v_{orbital,Earth} = 29.783 \text{ km/s.} \quad (4)$$

Calculate the period P_{SST} between successive coverings of the virtual cloud and Earth

$$(1 + P_{SST}) / v_{advection,virtual-cloud} = P_{SST} / v_{orbital,Earth}. \quad (5)$$

From formula (5) we obtain $P_{SST} = 5.941 \text{ year}$. This theoretical result obtained within SST is consistent with the period found by Anderson *et al.*, [2], and is very close to the period found by Schlamminger *et al.* [3].

According to the Newtonian gravity, gravitational force is directly proportional to the product GM . On the basis of the experimental values of G , we can assume that M is invariant whereas G changes (SST shows that such assumption is incorrect) or the vice versa (it is consistent with SST). Notice that the illusory, for example, higher G in reality means greater mass of Earth so lower angular velocity of Earth so longer LOD – it is consistent with experimental data [1].

Calculate the amplitude A of G which in fact concerns the masses of Earth and measuring apparatus.

Notice that total mass of the virtual cloud is equal to zero. But the quantum behaviour of the virtual cloud causes that in places of the disappearing of the virtual e^-e^+ pairs, the local mass density of the Einstein spacetime is lower than the mean value whereas in places of the appearing is higher. Moreover, to stabilize the virtual cloud, there should appear a sine wave with one crest and one trough similar to the de Broglie wave in the ground state of electron in atoms.

To simplify the calculations, we assume that in Earth and a measuring device the number of protons and neutrons is the same and that mean nuclear binding energy per nucleon is $\Delta E_{binding-energy} = 8 \text{ MeV}$. Notice that each proton produces one virtual e^-e^+ pair. Then the ratio R_{SST} of the increase in mass of Earth, ΔM_{Earth} , to the lower limit of mass of Earth, M_{Earth} , is

$$\begin{aligned} R_{SST} &= \Delta M_{Earth} / M_{Earth} = \\ &= 2 m_{bare(electron)} / (m_p + m_n - 2 \Delta E_{binding-energy} + m_{electron}) = \\ &= 0.000548, \end{aligned} \quad (6)$$

where $m_{bare(electron)} = 0.510407 \text{ MeV}$, $m_p = 938.272 \text{ MeV}$, $m_n = 939.565 \text{ MeV}$ and $m_{electron} = 0.5109989 \text{ MeV}$ [5A].

The amplitude A_{SST} is the half of the R_{SST} multiplied by physical quantity so for the illusory amplitude of the gravitational constant we obtain

$$\underline{A_{SST} = G R_{SST} / 2 = 0.00183 F.} \quad (7)$$

We can see that following interval calculated within SST defines the illusory changes in G

$$(6.67217, 6.67583) F. \quad (8)$$

3. Summary

Here we showed that the observed periodic changes in G are illusory and follow from periodic changes in mass of Earth and measuring apparatus.

The 5.941 year periodic signal in LOD and mass of Earth we interpret as due to advection of the virtual cloud composed of the virtual electron-positron pairs, produced by the protons in Earth, caused by its interactions with the dark-matter (DM) structures that overlap with the Earth orbit. Such advection follows from the confinement and entanglement of the virtual electron-positron pairs and DM structures. The advection causes periodic increase in mass of Earth and measuring device.

Calculated here the illusory amplitude of G (in reality there changes the mass of Earth; the G is invariant) is $A = 0.00183 F$.

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