The Truth about the Perihelion Precession of Venus

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Abstract: The observed and theoretical results for the perihelion precession of planets are very close except for the planet Venus - observed value is about 204 arc seconds per century whereas theoretical value is more than 5 times higher. It is assumed that the main reason for this is that Venus has an unusually low eccentricity (e = 0.0068) so its perihelion point is very sensitive to small perturbations. But such an explanation is not convincing because eccentricities of Neptune (e = 0.0086) and Earth (e = 0.0167) are very low as well whereas theoretical results are much better. Within the mainstream theories, we cannot show the origin of the precession rate for Venus. The Scale-Symmetric Theory provides a different explanation for the discrepancy for Venus and leads to the value about 204.5 arc seconds per century. The correct solution follows from the origin of the Titius-Bode law for the modified black holes and solar system. We showed also that there is a resonance between the two values obtained by applying the two very different methods in calculating the precession rate of Mercury i.e. the Newtonian Mechanics plus the General-Relativity (GR) correction and the Scale-Symmetric Theory plus the GR perihelion shift. In both methods, the central value is 574.6 arc seconds per century and is consistent with observational data.

1. Introduction

The observed and theoretical results for the perihelion precession of planets are very close except for the planet Venus – observed value is about 204 arc seconds per century whereas theoretical value that follows from the gravitational tugs of the other planets (the Newtonian physics) is more than 5 times higher [1]. It is true as well when we take into account the correction resulting from the General Theory of Relativity (GR) [2]. It is assumed that the main reason for this is that Venus has an unusually low eccentricity ($e = 0.0068$ [3]) so its perihelion point is very sensitive to small perturbations. But such an explanation is not convincing because eccentricities of Neptune ($e = 0.0086$) and Earth ($e = 0.0167$) are very low as well whereas theoretical results are much better. The Scale-Symmetric Theory (SST), [4], provides a different explanation for the discrepancy for Venus and leads to the value about 204.5 arc seconds per century. The correct solution follows from the origin of the Titius-Bode law for the modified black holes and solar system.

Within the Standard Model we still cannot calculate exact masses and spin of nucleons from the initial conditions (since 1964). On the other hand, within the Cosmological Standard Model we cannot define properties of the dark matter and dark energy and calculate their abundances from some initial conditions. We as well do not understand the origin of physical constants and applied in physics mathematical constants. It suggests that the two leading mainstream theories, i.e. the Quantum Physics and General Theory of Relativity, are the

incomplete theories and that there should be a theory superior to these two theories. Such theory should lead to initial conditions applied in these two theories and should describe the lacking part of the Theory of Everything. We showed that the Scale-Symmetric Theory described in tens of papers (http://vixra.org/author/sylwester_kornowski) is the lacking part.

The GR leads to the non-gravitating Higgs field composed of tachyons [4A]. 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 [4A]. Due to the saturation of interactions via the Higgs field and due to the law of conservation of the half-integral spin that is obligatory for all scales, 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 luminal gravitating Einstein spacetime (it is the Planck scale), cores of baryons (it is the electric-charges scale), and the cosmic structures (protoworlds; it is the cosmological scale) that evolution leads to the dark matter, dark energy and expanding universes (the "soft" big bangs) [4A], [4B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguishes particles from their antiparticles [4A]. SST shows that a fundamental theory should start from infinite nothingness and pieces of space [4A]. Sizes of pieces of space depend on their velocities [4A]. The inflation field started as the liquid-like field composed of non-gravitating pieces of space [4A]. Our Cosmos, which consists of the two-component spacetime (i.e. of the superluminal non-gravitating Higgs field, which is the remnant of the inflation field, and of the luminal gravitating Einstein spacetime) and universe(s), was created because of collisions of big pieces of space [4A], [4B]. During the inflation, the liquid-like inflation field (the non-gravitating superluminal Higgs field) transformed partially into the luminal Einstein spacetime (the big bang) [4A], [4B]. In our Cosmos, the two-component spacetime is surrounded by timeless wall – it causes that the fundamental constants are invariant [4A], [4B].

SST shows that to obtain results consistent with experimental data, the big piece of space that transformed into the inflation field had before the collision a rotational energy very low in comparison with kinetic energy [4A]. It leads to conclusion that there was low anisotropy of the inflation field i.e. of the expanding superluminal non-gravitating Higgs field. It means that to such field we can apply the Kasner metric, [5], that is a solution to the vacuum Einstein equations so the Ricci tensor always vanishes. The Kasner metric is for an anisotropic cosmos without matter so it is a vacuum solution for the Higgs field. The one of the two semi-symmetrical Kasner solutions, i.e. $(2/3,\ 2/3\ -1/3)$, we interpret as virtual Higgs cyclones with toroidal and poloidal motions. Such tori appear in the succeeding phase transitions of the Higgs field [4A].

Applying 7 parameters only and a few new symmetries, [4A], we calculated a thousand of basic physical (and mathematical) quantities (there are derived the physical and mathematical constants as well) consistent or very close to experimental data and observational facts. In SST there do not appear approximations, mathematical tricks, and free parameters which are characteristic for the mainstream particle physics and mainstream cosmology.

Due to the symmetrical decays of bosons on the equator of the core of baryons, there is valid the atom-like structure of baryons. The orbits are defined by the Titius-Bode law for the nuclear strong interactions [4A]

$$R_d = A + dB, \tag{1}$$

where $A = 0.6974425$ fm, $A/B = 1.3898$, and $d = 0, 1, 2, 4$ [4A]. The core of baryons is the modified black hole (MBH) in respect of the nuclear strong interactions [4A]. According

to SST, due to the tremendously strong shortest-distance quantum entanglement, the cores of baryons are practically indestructible [4A]. Spin speed on their equator is equal to the speed of light in "vacuum" c. Moreover, the Schwarzschild radius for such modified black hole is $2A$ so the $d = 0$ and $d = 1$ states are placed under the Schwarzschild surface for the nuclear strong interactions.

Emphasize once more that according to SST there are not in existence black holes with central singularity but there are in existence the MBHs containing a circle with spin speed equal to the c. The modified neutron black holes (MNBHs) are such MBHs – all other modified black holes consist of the MNBHs. According to SST, theory of MBHs should be dual/self-similar to the theory of baryons. Within SST we described MBHs and their accretion discs [6].

We know that radii of planets in solar system are close to the exact Titius-Bode law. Within SST we described also the mechanism that leads to all the d states, i.e. also to the $d = 96$ state for Neptune and to $d = 8$ state for the Ceres asteroid [4C].

There is very high probability that the solar system is a remnant of ancient modified neutron black hole that exploded due to an intensive inflow of dark energy. We can assume that explosion did not destroy the initial rings (they transformed into the planets and asteroids) defined by the Titius-Bode law for the gravitational interactions of MNBH. Of course, due to evolution, radii of the rings increased.

Most important are the two rings that initially had been placed under the Schwarzschild surface for the gravitational interactions of the MNBH (i.e. $d = 0$ and $d = 1$). Today, these states correspond to Mercury and Venus. Theory of baryons described within SST shows that such states are entangled. We can assume that today the two distinguished planets produce virtual fields that are still entangled due to the superluminal quantum entanglement. We will show that such entanglement leads to the correct value for the perihelion precession of Venus.

2. Calculations

According to SST, a virtual object looks as follow. There appears a virtual fermion-antifermion pair (both components have positive mass) and a hole in the Einstein spacetime (its mass is negative) in such a way that resultant mass is equal to zero [7]. Interactions of the virtual objects cause that there appear a positive radiation mass [4A].

Calculate the radiation mass of Mercury. According to SST, the virtual electromagnetic mass of Mercury is $\alpha_{EM} M_{Mercury}$, where $\alpha_{EM} = 1/137.036$ is the fine structure constant. Such virtual electromagnetic mass is composed of portions of energy each equal to the mass distance between the bound neutron and the proton $\Delta m = m_{neutron,bound} - m_{proton} = 1.2653$ MeV ($m_{neutron,bound} = 939.5378$ MeV, $m_{proton} = 938.2725$ MeV; notice that mass of free neutron calculated within SST is 939.5648 MeV) [4A]. From the portions are produced the virtual electron-positron pairs – we can see that each portion can produce only one such pair because virtual mass of pair is $2m_{electron} = 1.0219978$ MeV (we can see that $4m_{electron} > \Delta m$) [4A]. The radiation mass of the electron-positron pair (so of each portion as well) is $m_{radiation(np)} = 2m_{radiation(electron)} = 2(m_{electron} - m_{bare(electron)}) = 0.0011838$ MeV [4A]. It leads to the radiation mass of Mercury

$$M_{radiation,Mercury} = (m_{radiation(np)} / \Delta m)\, \alpha_{EM} M_{Mercury} = 2.2538 \cdot 10^{18} \text{ kg}, \qquad (2)$$

where $M_{Mercury} = 3.3011 \cdot 10^{23}$ kg [8].

The radiation mass of Mercury is distributed in a ring that width is the distance between the perihelion and aphelion. Such radiation ring behaves like mass in centre of the Sun. This

means that gravitational interaction of the abstract radiation mass of Mercury in the centre of the Sun with the radiation ring causes that there appears the spin speed of the radiation ring and this spin speed is the speed of the perihelion as well. On base of these explanations we obtain

$$v^2_{perihelion,Mercury} = G\, M_{radiation,Mercury} / R_{Orbital,Mercury}, \quad (3)$$

where $R_{Orbital,Mercury} = 5.7909 \cdot 10^{10}$ m.

Calculated the precession rate in arc seconds per century (T = 100 years = $3.155693 \cdot 10^9$ s). Applying formulae (2) and (3) we obtain

$$[\varphi_{Mercury} / T]_{SST}\ [\text{arcsec/century}] = 3600 \cdot 360^o\, v_{perihelion,Mercury}\, T / (2\pi\, R_{Orbital,Mercury}) = \\ = 572.86\ \text{arcsec/century}. \quad (4)$$

This is the SST value but to obtain the total value we must add the correction that results from the parameterized post-Newtonian (PPN) formalism concerning the General-Relativity perihelion shift. The PPN formalism details the parameters in which a general theory of gravity can differ from Newtonian gravity. The post-Newtonian parameters characterize the weak-field behaviour of the theory. The parameter β defines how much nonlinearity is there in the superposition law for gravity g_{00}. The parameter $\beta - 1$ defines perihelion shift. According to the PPN parameters, value of the parameter for perihelion shift is $\beta - 1 = 0.003$ [9]. For the SST value (formula (4)) plus the GR perihelion shift we obtain

$$[\varphi_{Mercury} / T]_{SST+GR\text{-}shift} = [\varphi_{Mercury} / T]_{SST}\, \beta = 574.58\ \text{arcsec/century}. \quad (5)$$

This value is consistent with the theoretical result calculated within the Newtonian mechanics plus the GR correction: 574.64 ± 0.69 arcsec/century. We can see that there is a resonance between the two values obtained by applying the two very different methods in calculating the precession rate of Mercury i.e. the Newtonian Mechanics (531.63 ± 0.69 arcsec/century) plus the GR correction (42.98 ± 0.04 arcsec/century) and the Scale-Symmetric Theory (572.86 arcsec/century) plus the GR perihelion shift (1.72 arcsec/century). In both methods, the central values are 574.6 arc seconds per century. The observational result for Mercury is 574.10 ± 0.65 arcsec/century [10].

Due to the primordial quantum entanglement between the radiation masses of Mercury and Venus (more precisely: between the primordial rings that were placed under the Schwarzschild surface), the radiation mass of Venus behaves as a single-arm lever. The squared speed of the perihelion of Venus is directly proportional to the mean radius of orbit (the arm lever) and is inversely proportional to the radiation mass of Venus (greater inertia then smaller the speed of perihelion). Notice that radiation mass of a planet is directly proportional to its mass (formula (2)). Due to the single-arm lever, for Venus we obtain

$$v^2_{perihelion,Venus} = (M_{Mercury}\, R_{Orbital,Venus} / (M_{Venus}\, R_{Orbital,Mercury}))\, v^2_{perihelion,Mercury} = \\ = a\, v^2_{perihelion,Mercury} = 0.12670\, v^2_{perihelion,Mercury}. \quad (6)$$

where $M_{Venus} = 4.8685 \cdot 10^{24}$ kg, $R_{Orbital,Venus} = 1.082089 \cdot 10^{11}$ m, whereas $a = 0.12670$. We can see that there is satisfied following formula

$$v_{perihelion,Venus} = sqrt(a)\, v_{perihelion,Mercury} = 0.35595\, v_{perihelion,Mercury}. \quad (7)$$

Formulae (5) and (7) lead to the precession ratio for Venus

$$[\varphi_{Venus} / T]_{SST+GR\text{-}shift} = sqrt(a)\, [\varphi_{Mercury} / T]_{SST+GR\text{-}shift} = 204.52 \text{ arcsec/century}. \quad (8)$$

3. Summary

Here, applying the Scale-Symmetric Theory and the GR perihelion shift, we calculated the precession rate for Mercury 574.58 arcsec/century and Venus 204.52 arcsec/century. Obtained results are consistent with observational data. Within the mainstream theories, we cannot show the origin of the precession rate for Venus.

We showed that the precession rate for Venus follows from the primordial quantum entanglement of the radiation masses of the rings/precursors of Mercury and Venus that initially were placed under the Schwarzschild surface for the gravitational interactions of the modified neutron black hole. An intensive inflow of dark energy transformed the MNBH into a supernova and next into the early solar system. The mechanics of the MNBH leads to the Titius-Bode law for the radii of planets and asteroids in the today solar system.

We showed also that there is a resonance between the two values obtained by applying the two very different methods in calculating the precession rate of Mercury i.e. the Newtonian Mechanics plus the GR correction and the Scale-Symmetric Theory plus the GR perihelion shift. In both methods, the central value is 574.6 arc seconds per century.

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