The Origin of Gravitational Constant

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Abstract: The Scale-Symmetric Theory (SST) shows that the gravitational constant depends on properties of the two-component spacetime i.e. on properties of the superluminal non-gravitating Higgs field and the luminal gravitating Einstein spacetime. More precisely, the gravitational constant depends on internal structure of neutrinos, inertial-mass density of the Higgs field and on dynamic viscosity and the infinitesimal spin of the tachyons the Higgs field consists of. According to SST, gravitational masses produce gradients in the Higgs field so value of inertial-mass density of the Higgs field inside the neutrino-antineutrino pairs the Einstein spacetime consists of, depends on steepness of gravitational gradients. It leads to conclusion that in experiments with steeper gravitational gradients, the gravitational constant should be lower. But such changes in gravitational constant are too low to be measured. SST shows that in expanding spacetime, value of the gravitational constant must decrease. The invariance of gravitational constant suggests that our Cosmos has boundary nontransparent for the superluminal non-gravitating Higgs field - it is consistent with SST.

1. Introduction and motivation

The General Relativity leads to the non-gravitating Higgs field composed of tachyons [1A]. On the other hand, the Scale-Symmetric Theory (SST) shows that the succeeding phase transitions of such Higgs field lead to the different scales of sizes/energies [1A]. 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 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) [1A], [1B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguishes particles from their antiparticles [1A]. SST shows that a fundamental theory should start from infinite nothingness and pieces of space [1A]. Sizes of pieces of space depend on their velocities

[1A]. The inflation field started as the liquid-like field composed of non-gravitating pieces of space [1A]. Cosmoses composed of universes are created because of collisions of big pieces of space [1A], [1B]. During the inflation, the liquid-like inflation field (the non-gravitating superluminal Higgs field) transformed partially into the luminal Einstein spacetime (the big bang) [1A], [1B]. In our Cosmos, the two-component spacetime is surrounded by timeless wall – it causes that the fundamental constants are invariant [1A], [1B].

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 interactions [1A].

Applying 7 parameters only and a few new symmetries 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 (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.

During the inflation [2], due to the Higgs mechanism [1A], [3], a significant part of the superluminal non-gravitating Higgs field transformed irreversibly into the luminal gravitating Einstein spacetime which consists of the neutrino-antineutrino pairs [1A]. The mass of a neutrino-antineutrino pair is very small (about $6.7 \cdot 10^{-67}$ kg [1A]) and its total weak charge is equal to zero so it is much difficult to detect the Einstein-spacetime components than the neutrinos.

The entanglons the Einstein-spacetime components consist of, due to their internal helicity, transform the chaotic motions of the tachyons into divergently moving tachyons [1A]. The collisions of the divergently moving tachyons with the chaotically moving tachyons in the Higgs field, produce gradients in the modified Higgs field i.e. produce the gravitational fields [1A].

Within SST, we derived formula for the gravitational constant G [1A]

$$G = g \cdot \rho_N = 6.6740007 \cdot 10^{-11} \text{ m}^3/(\text{kg s}^2), \quad (1)$$

where the g has the same value for all interactions and is equal to [1A]

$$g = v_{st}^4 / \eta^2 = 25{,}224.563 \text{ m}^6/(\text{kg}^2 \text{ s}^2), \quad (2)$$

where ρ_N is the inertial-mass density of the Higgs field, v_{st} is the mean spin speed on the equators of the tachyons whereas η is the dynamic viscosity of the free tachyons and the bound tachyons in the entanglons the neutrino-antineutrino pairs consist of.

At the end of inflation, the expanding Einstein spacetime crossed the abstract sphere for which the gravitational pressure acting on the neutrino-antineutrino pairs was equal to the dynamic pressure [1B]. It caused that the region of the Einstein spacetime outside the abstract sphere collapsed to stable boundary and it stopped the inflation [1B]. Within the SST we can calculate the radius of our Cosmos: it is about $2.3 \cdot 10^{30}$ m [1B], [4].

An increase in gravitational-mass density of the Einstein spacetime, $\Delta\rho_E$, causes that there appears a mass m of a body which can be detected

$$\Delta\rho_E = m / V = \rho, \quad (3)$$

where V and ρ are respectively the volume and gravitational-mass density of the body.

The gravitational masses of objects appear due to the entanglement and/or confinement of the Einstein-spacetime components [1A].

A local increase in gravitational-mass density of the Einstein spacetime causes that the local number densities of the tachyons decrease, i.e. the Higgs field is "stretched" i.e. the local inertial-mass densities of the Higgs field are lower i.e. the gravitational gradients are steeper. On the other hand, from formula (1) follows that value of the gravitational constant G decreases when inertial-mass density of the Higgs field decreases.

Notice that if steepest gradients only insignificantly change the mean inertial-mass density of the Higgs field inside the neutrino-antineutrino pairs the bodies consist of then the gravitational constant is practically invariant. Can we estimate such changes?

According to SST, the G, among other things, depends on structure of neutrinos. We can calculate that mass density of neutrinos is $\rho_{Neutrino} \approx 0.6 \cdot 10^{38}$ kg/m^3 [1A]. Such density leads to the G. To change significantly the inertial-mass density of the Higgs field inside the neutrino-antineutrino pairs the Einstein spacetime consists of, mass density of a body must be close to $\rho_{Neutrino}$. On the other hand, SST shows that the black holes do not contain a central singularity – they consist of the neutron black holes that mass density is about $0.2 \cdot 10^{18}$ kg/m^3 [1B]. It suggests that the relative changes in inertial-mass density of the Higgs field because of the changes in mass densities of bodies, are very low. SST shows as well that mean mass density of the Einstein spacetime is about $1 \cdot 10^{28}$ kg/m^3 [1A]. Due to the weak interactions of the virtual electron-positron pairs produced in the Einstein spacetime, the relative mass density of the Einstein spacetime can change by about $\alpha_{W(electron-muon)} \approx 0.95 \cdot 10^{-6}$ [1A]. Such changes are also too low to change the G in such a way to be measured.

Notice that in expanding spacetime, value of the gravitational constant must decrease. The invariance of G suggests that our Cosmos has boundary nontransparent for the superluminal non-gravitating Higgs field – it is consistent with the Scale-Symmetric Theory.

References

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