The Truth about the Solar Gravitational Deflection of Light

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Abstract: Earlier we proved that the virtual electromagnetic interactions in Quantum Physics (QP) mimic the electroweak interactions described within the Scale-Symmetric Theory (SST). Here we show that General Theory of Relativity (GR) mimics the inspiral of the luminal Einstein spacetime near masses that is described within SST. This phenomenon leads to value about 1.75 arc seconds for the deflection of light by Sun for distance equal to its radius. Superiority of SST over QP and GR follows from the fact that described phase transitions during the inflation lead to the internal structure and interactions of the two-component spacetime and of bare particles. Knowing this part of Nature, we can significantly simplify the mathematical descriptions of fundamental phenomena.

Introduction and motivation

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 (QP) and General Theory of Relativity (GR), 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 (SST) 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 [1A]. 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 [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 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) [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]. 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 [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 practically invariant [1A], [1B].

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 [1A]. 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, [2], 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 [1A].

Applying 7 parameters only and a few new symmetries, [1A], we calculated a thousand of basic physical (and mathematical) quantities (there are derived the physical and mathematical constants as well) which are 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 – there are about 30 parameters (the physical and mathematical constants applied in physics, when not derived from initial parameters, are the parameters as well) and tens of free parameters.

Emphasize that according to SST, there are not in existence black holes with central singularity but there are in existence the modified black holes (MBHs) containing a circle with spin speed equal to the speed of light in "vacuum" c – such a circle we will refer to as the equator of MBHs. The modified neutron black holes (MNBHs) are such MBHs – all other modified black holes consist of the MNBHs. The equator of MNBHs is physical whereas of bigger MBHs is abstract. Within SST we described MBHs and their accretion discs [3]. For the MNBHs is satisfied following formula

$$c^2 = G\ m_{MNBH} / r_{MNBH}, \tag{1}$$

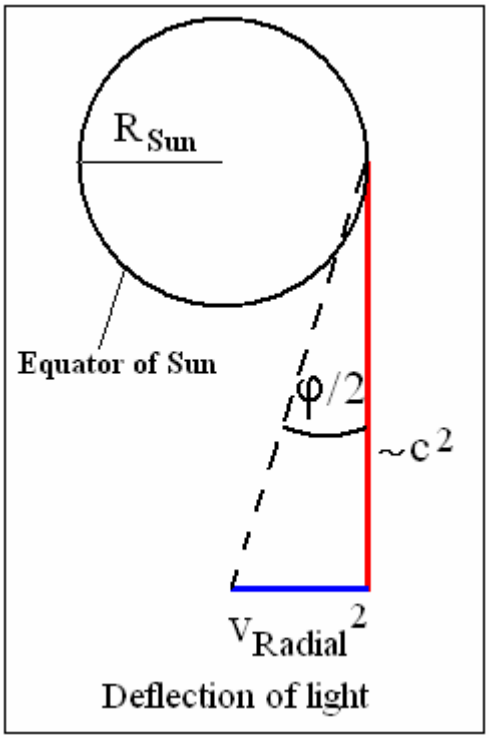
where $m_{MNBH} = 4.935 \cdot 10^{31}$ kg i.e. about 24.81 solar masses, and $r_{MNBH} = 3.664 \cdot 10^{4}$ m i.e. 36.64 km is the equatorial radius [1B].

According to SST, photons are the pure rotational energies (i.e. massless) of the neutrino-antineutrino pairs the Einstein spacetime consists of, i.e. the carriers of photons have infinitesimal gravitational mass about $6.67 \cdot 10^{-67}$ kg and their total weak charge is equal to zero so their detection is much, much difficult than neutrinos [1A]. Masses bend trajectories of photons not due to a mass-photon interaction but due to the mass—carrier-of-photon interaction. It causes that due to the gravitational interaction of masses with the carriers of photons the luminal Einstein spacetime consists of, the Einstein spacetime inspirals towards each mass and flows out along the axes of rotation of the masses. Such processes are very

strong near and inside black holes, [3], and very weak near and inside, for example, the Sun. Emphasize as well that in SST, photons do not follow from interactions of neutrinos in their pairs as it is postulated in other theories – they are the rotational energies of very stable neutrino-antineutrino pairs so in SST do not appear the known paradoxes.

We can see that due to the inspiral of the Einstein spacetime near each mass, there is a deflection of light from a radial direction for photons initially moving along such direction towards a mass. Due to the gravitational interactions, the carriers of photons (i.e. the neutrino-antineutrino pairs) have additionally both orbital and radial velocities but the resultant speed must be equal to the c. According to Newtonian mechanics, squared orbital speed is $v_{Orbital}^{\ 2} = G\,M / R$ whereas radial speed is v_{Radial} = sqrt(2) $v_{Orbital}$. These speeds cause that Einstein spacetime inspirals towards each mass.

Notice as well that magnitude of deflection does not depend on velocities of the neutrino-antineutrino pairs but on the work done over the pairs which is directly proportional to squared velocities.



Consider very weak gravitational fields i.e. $v_{Orbital} << c$ and $v_{Radial} << c$. Then we can neglect the change in speed of light in direction of motion (the change is small in relation to the c) and we can assume that trajectory of photons that connects "infinity" with the equator of Sun is the straight line. Consider photons moving initially tangentially to the equator. Then the tangent of a half of deflection angle (a half is for the approach to the Sun and a half for moving away from the Sun; see FIG.)

$$tan\,(\varphi / 2) = v_{Radial}^{\ 2} / c^{\,2} = 2\,G\,M_{Sun} / (R_{Sun}\,c^{\,2}). \qquad (2)$$

From this formula follows that the total deflection angle is

$$\varphi = 4.867 \cdot 10^{-4}\,[^{o}] = 1.752 \text{ arc seconds}. \qquad (3)$$

This result is consistent with theoretical result obtained within GR and with observational facts [4].

Superiority of SST over QP and GR follows from the fact that described phase transitions during the inflation lead to the internal structure and interactions of the two-component spacetime and of bare particles [1A]. Knowing this part of Nature, we can significantly simplify the mathematical descriptions of fundamental phenomena. For example, within the Scale-Symmetric Theory we calculated the basic quantities that are the classical tests of general relativity i.e. the perihelion precession of Mercury's orbit [5], or the deflection of light by the Sun (this paper). Moreover, we calculated the total perihelion precession of Venus with very high accuracy [5] – it is impossible to do this within GR. We proved as well that in reality, the observed GR "gravitational waves" mimic the mass flows in the luminal Einstein spacetime [6]. But we must emphasize that many phenomena cannot be explained without the Special Theory of Relativity (SR) i.e. this theory is a part of the Theory of Everything.

Emphasize as well that the periods of the electromagnetic, weak and nuclear strong interactions cause that the grainy spacetime looks for the interacting particles as a continuous object so we can apply the Noether theorem.

But when we neglect the grainy nature of spacetime and internal structure of bare particles then theories become mathematically very complicated.

References

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