The Strong CP Problem and the Transition from Linearity to Non-Linearity

Sylwester Kornowski

Abstract: The internal helicity distinguish particles from antiparticles. Fermions, due to the internal helicity, produce weak jets (they are produced in both the Higgs field composed of non-gravitating tachyons and the luminal Einstein spacetime) that are responsible for the CP (so T as well) violation. Generally, according to the Scale-Symmetric Theory (SST), the weak interactions are along the jets whereas the nuclear strong interactions are in plane perpendicular to the jets. It causes that the nuclear strong interactions are CP (so T as well) invariant – it solves the strong CP problem. Both interactions, due to the thermal motions, can be volumetric. According to SST, there is the two-component spacetime i.e. the Higgs field associated with gravitational fields and the Einstein spacetime associated with the Standard-Model (SM) interactions. To cancel turbulences, there must be produced virtual or/and real particle-antiparticle pairs. But in the gravitational fields, due to their very low density, pairs cannot be produced - it causes that gravity is non-linear and non-linear are phenomena with dominating gravity i.e. phenomena that follow from dynamic viscosity of the non-gravitating tachyons all objects consist of such as friction or motions of the atmosphere of Earth. On the other hand, the quantum mechanics is linear, i.e. superposition and quantum entanglement are linear because in the luminal Einstein spacetime can be produced fermion-antifermion pairs, especially electron-positron pairs. Range of electrons to move in a superconductive manner is equal to the radius of the Bohr orbit in the hydrogen atom - it leads to the threshold for density of bound and free electrons for superconducting materials (about 1.5 kg per cubic meter).

The Scale-Symmetric Theory (SST) shows that the succeeding phase transitions of the superluminal non-gravitating Higgs field during its inflation (the initial big bang) lead to the different scales of sizes/energies [1A]. Due to a few new symmetries, 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-charge scale), and the cosmic-structures/protoworlds (it is the cosmological scale) that evolution leads to the dark-matter structures (they are the loops and filaments composed of entangled non-rotating-spin neutrino-antineutrino pairs), dark energy (it consists of the additional non-rotating-spin

neutrino-antineutrino pairs interacting gravitationally only) and expanding universes (the "soft" big bangs due to the inflows of the dark energy into protoworlds) [1A], [1B]. The electric-charge scale leads to the atom-like structure of baryons [1A].

The internal helicity distinguish particles from antiparticles [1A]. Fermions, due to the internal helicity, produce weak jets (they are produced in both the Higgs field and Einstein spacetime) that are responsible for the CP (so T as well) violation [2]. Generally, according to SST, the weak interactions are along the jets whereas the nuclear strong interactions are in plane perpendicular to the jets [1A]. It causes that the nuclear strong interactions are CP (so T as well) invariant – it solves the strong CP problem. Both interactions, due to the thermal motions, can be volumetric.

According to SST, there is the two-component spacetime i.e. the Higgs field associated with gravitational fields and the Einstein spacetime associated with the Standard-Model (SM) interactions [1A].

To cancel turbulences, there must be produced virtual or/and real particle-antiparticle pairs.

But in the gravitational fields, in the present-day Universe, due to their very low density (about $4 \cdot 10^{42}$ times lower than the Einstein spacetime associated with the Standard-Model interactions [1A]), pairs cannot be produced – it causes that gravity is non-linear and non-linear are phenomena with dominating gravity i.e. phenomena that follow from dynamic viscosity of the non-gravitating tachyons all objects consist of such as friction or motions of the atmosphere of Earth. On the other hand, the quantum mechanics is linear, i.e. superposition and quantum entanglement are linear because in the luminal Einstein spacetime can be produced fermion-antifermion pairs, especially electron-positron pairs. Range of electrons to move in a superconductive manner is equal to the radius of the Bohr orbit in the hydrogen atom: *Range of electromagnetic mass of bare electron* ($\alpha_{em}\, m_{bare(electron)}$) *is* $L = r_{bare(electron)} / \alpha_{em} \approx 0.53 \cdot 10^{-10}$ m (range is inversely proportional to exchanged mass), where α_{em} is the fine-structure constant and $r_{bare(electron)} = 3.8661 \cdot 10^{-13}$ m is the equatorial radius of bare electron [1A] – it leads to the threshold for density of bound and free electrons for superconducting materials: $\rho_{Threshold} = m_{bare(electron)} / (4\, \pi\, L^3 / 3) \approx 1.5$ kg/m^3.

References

[1] Sylwester Kornowski (2015). *Scale-Symmetric Theory*
[1A]: http://vixra.org/abs/1511.0188 (Particle Physics)
[1B]: http://vixra.org/abs/1511.0223v2 (Cosmology)
[2] Sylwester Kornowski (28 December 2015). "CPT Symmetry and Symmetry-Breaking in the Scale-Symmetric Theory"
http://vixra.org/abs/1303.0188