Neutrino Quantum Gravity

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Abstract: According to the Scale-Symmetric Theory (SST), there is the two-component spacetime composed of the SST Higgs field (which consists of tachyons) and the Einstein spacetime (which consists of the neutrino-antineutrino pairs). The neutrinos are built of the superluminal binary systems of closed strings (we call them the gravitons or entanglons). The closed strings in a graviton have parallel spins and opposite internal helicity. Gravitons are placed in the SST Higgs field so they carry the smallest "piece" of gravitational field. Neutrinos produce gradient in the SST Higgs field - it is the elementary gravitational field defined by the gravitational constant G. Generally, the gradients/gravitational-fields are the classical fields but at distances smaller than 3510.1831 multiplied by the equatorial radius of neutrinos there appear the groups of gravitons emitted and absorbed by the core of neutrinos. Here we described phenomena that concern the quantum region of neutrinos. The Neutrino Quantum Gravity (NQG) leads to the volumetric quantum confinement of the neutrino-antineutrino pairs that is the origin of the masses of scalars in physics.

1. Introduction

Within the Scale-Symmetric Theory (SST) [1] we calculated more than a thousand basic results which are consistent with experimental data. The non-perturbative SST starts from 7 parameters and a few new symmetries – there do not appear free parameters. Within SST we calculated, for example, the exact mass, spin and charge of proton [1] and its magnetic moment [2] – such exact results are not available in the Standard Model. The SST is indeed the lacking part of the Final Theory.

The SST gravitons/entanglons appeared as a result of the phase transitions of the inflation field [1]. Their inertial mass is $M_{Graviton;inertial-mass} = 4.68 \cdot 10^{-87}$ kg while radius is $R_{Graviton} = 0.944 \cdot 10^{-45}$ m [1] i.e. it is below the Planck length.

The Neutrino Quantum Gravity (NQG) follows from the internal structure of neutrinos which is similar to the core of baryons – there is torus/charge and central condensate/scalar. The NQG and the theory of baryons are dual because both are the result of similar phase transitions of the SST Higgs field. It leads to conclusion that the dimensionless numbers which are ratios of physical quantities have the same value in both theories. We can investigate the internal structure of baryons so a theory dual to the theory of baryons (here it is the NQG) has reliable foundations despite the fact that it applies to scales smaller than the Planck scale.

Neutrinos and cores of baryons try to equalize density in spacetime so they emit and absorb some objects. Neutrinos emit groups of gravitons while cores of baryons emit the large loops which are responsible for the nuclear strong interactions [1]. The quantum entanglement is directional and causes that the tori/electric-charges are the stable objects while the NQG (we call it also the Volumetric Quantum Confinement (VQC)) is responsible for creation of the scalars such as the Higgs boson or the condensate in centre of the core of baryons or the condensates in centres of the charged leptons [1].

Masses of the scalars follow from the difference in the mean distances between the neutrino-antineutrino pairs inside the scalars and between such pairs in the Einstein spacetime.

Here we present the unrolling-rolling mechanism which leads to the range R_{NQG} of the NQG. We already calculated such range applying other method [1]

$$R_{NQG} = 3510.1831\ R_{Neutrino} = 3.925984 \cdot 10^{-32}\ \mathrm{m}\,, \qquad (1)$$

where $R_{Neutrino}$ is the equatorial radius of single neutrino [1].

2. Calculations

The unrolling-rolling mechanism (URM) is as follows. The large loop (in baryons its mass is M_{LL} = 67.54441 MeV) with circumference equal to $L_{LL} = 4\pi R_{Neutrino}/3$ transits to radius of the loop so it mass increases 2π times: $Y^* = 2\pi M_{LL}$ = 424.39405 MeV. Next, such mass returns on the initial loop as a condensate which has a form of spiral/compact-solenoid. Assume that the two scalars in the virtual electron-positron pair occupy one loop so the Y^* is a spiral containing $F_{Y^*} = Y^*/(2M_{electron,scalar})$ = 831.4816 loops, where $2M_{electron,scalar}$ = 0.510407011 MeV [1]. Such a spiral interacts electromagnetically so its length increases. The mean density for the quantum region of neutrinos is about 10^{28} kg/m^3 [1] so it is much higher than in baryons. It leads to conclusion that we must apply the value of the fine structure constant at high energies, $\alpha_{el\text{-}mag,high\text{-}energy}$.

We can calculate the approximate value of the fine structure constant at low energies for baryons applying following formula (masses of electron and pion are from [3])

$$\alpha_{el\text{-}mag} = (e^+ + e^-) / (\pi^+ + 2M_{electron,scalar}) = 1 / 137.066\,. \qquad (2)$$

We can see that a charged pion produced inside a baryon interacts electromagnetically via one virtual electron-positron pair [1].

By an analogy we can calculate value of the fine structure constant at high energy (mass of the W^+ boson is from [3])

$$\alpha_{el\text{-}mag,high\text{-}energy} = (X^+ + X^-) / (W^+ + 2Y^*) = 1 / 127.598(19)\,, \qquad (3)$$

where $X^{+,-}$ = 318.295537 MeV is the mass of the torus/electric-charge in the core of baryons [1].

But within SST we also calculated mass of the W^+ boson – we obtained 80,427 MeV and 80,385 MeV [4]. The SST values lead to $\alpha_{el\text{-}mag,high\text{-}energy,SST}$ = 1/127.640(33). On the other hand, the exact value which leads to the mass of the Higgs boson [1] is

$$\alpha_{el\text{-}mag,high\text{-}energy,SST,best\text{-}fit} = 1/127.6671 \qquad (4)$$

which is consistent with the SST result.

Due to the electromagnetic interaction at high energy, number of loops in the spiral is

$$F^* = F_{Y^*} (1 + \alpha_{el\text{-}mag,high\text{-}energy,SST,best\text{-}fit}) = 837.99449 , \qquad (5)$$

and each loop has circumference equal to L_{LL}.

From the above we can calculate the radius R_{NQG} of the region around neutrinos defined by the SST quantum gravity which follows from the unrolling-rolling mechanism

$$R_{NQG} = L_{LL} F^* = 3510.1831 R_{Neutrino} = 3.925984 \cdot 10^{-32} \text{ m} , \qquad (6)$$

In scalars, the neutrino-antineutrino pairs try to be in a mean distance equal to the range calculated in (6).

References

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