The Exact Mass of Tau Lepton

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Abstract: The predicted within the Scale-Symmetric Theory (SST) the exact mass of the tau lepton is 1776.833 MeV. It is consistent with experimental result 1776.86 +- 0.12 MeV. We claim that higher accuracy of measurement should give a result with the central value closer to the SST value.

The Scale-Symmetric Theory (SST) [1] shows that electric charges are tori composed of the Einstein-spacetime components which are the spin-1 neutrino-antineutrino pairs. The spins of the pairs are perpendicular to surface of the tori. It is obvious that the electric charges of proton and electron must be built of the same number of the neutrino-antineutrino pairs but radii of the tori are different. SST shows that the mean side of square occupied by a pair in electron is $F_{Ratio} = 554.321081$ times larger than in proton (see formula (33) in [1]).

It is very difficult to detect the torus/charge of electron because it is only the polarized Einstein spacetime so there are not some changes in density of the spacetime. The same concerns the loop inside the torus (it has mass) and the central condensate (it has mass too) because such masses follow from rotations of the neutrino-antineutrino pairs – such rotations decrease local pressure so mass density of spacetime inside such regions is slightly higher but such regions are very transparent for particles used to detect them.

The effective distances (the side of a square) between the neutrino-antineutrino pairs (the pairs are in vertices of the squares) on the electron torus are

$$L_{o,Electron} = 3510.21208\ R_{neutrino}\,, \qquad (1)$$

where $R_{neutrino}$ is the equatorial radius of neutrinos – such a value follows from the density of the Einstein spacetime, $\rho_{ES} = 1.10220055 \cdot 10^{28}\ \mathrm{kg/m^3}$, which, in SST, is the initial parameter [1].

In reality, the distances on the electron torus are equal to ranges of loops created on the equator of the neutrinos

$$L_{o,Range} = F_{Ratio}\ 2\ \pi\ R_{neutrino} = 3482.\ 9021\ R_{neutrino}\,, \qquad (2)$$

but due to the exchanges of places on the electron torus by the pairs, the effective distances are $L_{o,Electron}$.

Due to the electromagnetic interactions, distances in electric charge of electron decrease

$$L_{Electron,interaction} = 3510.21208 (1 – \alpha_{EM}) R_{neutrino} = 3484.5968 R_{neutrino} , \quad (3)$$

where $\alpha_{EM} = 1 / 137.035999084(21)$ [2].

Assume that tau lepton is created because the distances decrease from $L_{o,Range}$ in bare electron to

$$L_{Tau} = R_{neutrino} L_{Electron,interaction} / L_{o,Range} = 1.0004866 R_{neutrino} . \quad (4)$$

We know that mass is inversely proportional to range so we have following relation

$$M_{bare,Electron} = M_{Tau} L_{Tau} / L_{o,Range} , \quad (5)$$

where $M_{bare,Electron} = M_{Electron} / a = 0.510407011$, where $a = 1.0011596522$ [1].

From (5) we obtain

$$M_{Tau} = 1776.833 \text{ MeV} . \quad (6)$$

It is consistent with experimental result: 1776.86 ± 0.12 MeV [3]. We claim that higher accuracy of measurement should give a result with the central value closer to the SST value.

References

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