The Origin of the X-Boson with a Mass of 16.70(85) MeV Discovered by the ATOMKI Group

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Abstract: The ATOMKI group discovered the X-vector-boson with a mass of 16.70(85) MeV in the decays of highly excited nuclei. Here, applying the atom-like structure of baryons described within the Scale-Symmetric Theory (SST), we show the origin of such light, neutral boson. We show that the sum of the nuclear weak mass of a pair of Einstein-spacetime condensates produced by nucleons and the mass of electron-positron pair is 16.904 MeV (these two pairs can interact due to the confinement or quantum entanglement described within SST) - this value is consistent with ATOMKI data. We should modify the Standard Model by incorporating the SST.

1. Introduction and calculations

The ATOMKI group discovered the X-vector-boson with a mass of 16.70(85) MeV in the decays of highly excited nuclei [1]. Here, applying the atom-like structure of baryons described within the Scale-Symmetric Theory (SST) [2], we show the origin of such light, neutral boson. We show that the sum of the nuclear weak mass of a pair of Einstein-spacetime condensates produced by nucleons and the mass of electron-positron pair is 16.904 MeV (these two pairs can interact due to the confinement or quantum entanglement described within SST [2A]) – this value is consistent with experimental data.

The General Relativity leads to the non-gravitating Higgs field composed of tachyons [2A]. On the other hand, SST shows that the succeeding phase transitions of expanding Higgs field (i.e. of the inflation field) lead to the different scales of sizes/energies [2A]. Due to a few new symmetries, there consequently appear the superluminal binary systems of closed strings (the entanglons) responsible for the quantum entanglement, stable neutrinos and luminal neutrino-antineutrino pairs which are the components of the gravitating luminal Einstein spacetime (it is the Planck scale), cores of baryons, and the cosmic structures that evolution leads to the dark matter, dark energy and expanding universes [2A], [2B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguish particles from their antiparticles [2A].

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 (TB) orbits/tunnels/loops for the nuclear strong-weak interactions [2A].

The SST leads to internal structure of nucleons [2A]. There is the core composed of torus/electric-charge with central condensate both composed of confined or/and entangled neutrino-antineutrino pairs. The central condensate has mass $Y = 424.12$ MeV [2A]. According to SST, such condensates are responsible for the nuclear weak interactions – according to SST, the coupling constant for such interactions is $\alpha_{W(proton)} = 0.0187229$ [2A]. The nuclear weak mass of the nucleon central condensate (it is $\alpha_{W(proton)}Y$) can interact, due to the confinement or entanglement [2A], with the central condensate in electrons [2A]. The pairing of nucleons causes that there can be created pairs of the Y condensates. The nuclear weak mass of an YY pair can interact, due to the confinement or entanglement, with electron-positron (e^+e^-) pair carrying mass about 1.022 MeV. Mass of such light, neutral boson is

$$M_{X\text{-}boson} = (\alpha_{W(proton)}\, 2\, Y) + e^+e^- = 16.904 \text{ MeV}. \quad (1)$$

Such slow-moving X boson can decay to electron and positron with particle paths at a wide angle. This mass is consistent with the ATOMKI data.

We should modify the Standard Model by incorporating the SST.

References

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[2A]: http://vixra.org/abs/1511.0188 (Particle Physics)
[2B]: http://vixra.org/abs/1511.0223 (Cosmology)