The Electron-to-Muon Abundance Ratio at High Energy Proton-Proton Collisions

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Abstract: The Scale-Symmetric Theory (SST) leads to the atom-like structure of baryons containing the core (it is composed of entangled or/and confined Einstein-spacetime components) that is the modified black hole in respect of the nuclear strong interactions. The structure of the core leads to conclusion that at high energy proton-proton collisions we should detect 25% more electrons than muons. On the other hand, at the LHC Physics conference in New York City (June 2014), the LHCb collaboration announced that probably there appear 25% more electrons than muons. In the Standard Model the electrons and muons (in the SST as well) are the particles of the same type so number of electrons and muons should be the same. The 25 percent excess of electrons follows from the internal structure of the core of baryons described within SST whereas within the Standard Model such excess is incomprehensible i.e. suggests existence of new physics.

1. Introduction, motivation and summary

The Scale-Symmetric Theory (SST) [1] leads to the core of baryons that is the modified black hole in respect of the strong interactions. Modified black holes have not a central singularity but there is a circle with spin speed equal to the speed of light in "vacuum" c. The core of baryons consists of the charged torus and condensate in its centre composed of the entangled or/and confined Einstein-spacetime components i.e. composed of the neutrino-antineutrino pairs. The mass distance between the charged and neutral core is $\Delta m \approx 2.663$ MeV whereas mass of the condensate is 424.124 MeV [1A].

At high energy collisions, the atom-like structure of baryons, [1A], is destroyed so there dominate the phenomena inside the core of baryons.

On the other hand, in contrary to the real photons, the mass of virtual particles is not equal to zero. When mean mass density of a virtual photon is lower than the mean mass density of the Einstein spacetime then its mass is negative. When such density is higher than the mean mass density then mass is positive. Mass of a "hole" in the Einstein spacetime (i.e. of a region with lower mass density than the mean density) is negative and imaginary because the lacking mass has broken contact with real particles. This means that negative mass is defined as $-im$, where $i = sqrt(-1)$. This definition leads to the negative square of mass of a "hole" $(-im)^2 = -m^2$. A vortex of massless energy E has mass $m = E/c^2$ i.e. the total energy is $2E$. This means that in a field of a particle there can arise simultaneously the bare virtual particle-antiparticle pair(s) for which the sum of absolute masses of components is two times greater than the bare mass of the real particle. For example, in the electromagnetic field of a resting electron simultaneously can be produced only one virtual bare electron-positron pair [1A] – such assumption leads to theoretical results consistent with experimental date [1A].

We can see that the mass Δm can produce simultaneously 5 virtual electron-positron pairs whereas the condensate in the core of baryons can produce simultaneously 4 virtual muon-antimuon pairs. In the proton-proton collisions, the virtual particles become the real particles observed by detectors. Since $100\% \cdot 5/4 = 125\%$ so we should observe 25% more electrons than muons.

This 25 percent excess of electrons follows from the internal structure of the core of baryons described within SST whereas within the Standard Model such excess is incomprehensible i.e. suggests existence of a new physics.

References

[1] Sylwester Kornowski (2015). *Scale-Symmetric Theory*
[1A]: http://vixra.org/abs/1511.0188 (Particle Physics)
[1B]: http://vixra.org/abs/1511.0223 (Cosmology)
[1C]: http://vixra.org/abs/1511.0284 (Chaos Theory)
[1D]: http://vixra.org/abs/1512.0020 (Reformulated QCD)