LETTERS TO PROGRESS IN PHYSICS

On the Deviation of the Standard Model Predictions in the Large Hadron Collider Experiments

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The newest Large Hadron Collider experiments targeting the search for New Physics manifested the possibility of new heavy particles. Such particles are not predicted in the framework of Standard Model, however their existence is lawful in the framework of another model based on J. A. Wheeler's geometrodynamcs.

The main task of the Large Hadron Collider is to look for true deviations from the Standard Model (SM) if any. The collider has done hundreds of such experiments already. Some experimental results of these really deviate from the theoretical results predicted in the framework of SM. The newest Large Hadron Collider experiments done in look for New Physics manifested the possibility of new heavy particles.

The ATLAS collaboration team and the CMS collaboration team reported on the experimental search for heavy particle-resonances [1–3]. So, the ATLAS team, while experimental search for heavy resonances of a mass in the scale from 1 to 3.5 TeV decaying into a pair of bosons (i.e., into WW-, WZ-, or ZZ-pairs), discovered an anomalous number of events having an invariant mass of ∼ 2 TeV. While the CMS team looked for the events in which many hadrons and an electron-positron pair were born then scattered with high energies. In the scale of invariant masses of ∼ 2 TeV, they registered an anomalous many events. The obtained picture is like the production and decay of new heavy particles.

Such particles are not predicted in the framework of SM. However their existence is lawful in the framework of a model based on J. A. Wheeler's geometrodynamic concept.

In this geometrodynamic model, any elementary particle is considered as a trace appeared due to that a vortical tube (Wheeler's wormhole) transits the surface of our world (i.e. as a fermion), and also as a contour or a vortical tube (i.e. as a boson). So there can be connected contours of the first and higher order, which give birth to a few generations of the elementary particles [4]. As a result, any particle corresponds to two quantum numbers depending on that the particle is considered either as a fermion (an analogy of a proton joined into the large contour of the next family of particles), or as the boson mass of the contour of the previous family of particles.

In this way, only three families of the elementary particles can exist.

The first generation of the particles is a proton contour (a proton itself) having the same fermionic and bosonic masses, the sum of which is approximately equal to the sum of all π-mesons and K-mesons (1899 MeV).

The second generation is the standard proton-electron contour (the μ-analogy of the proton) having a bosonic mass close to the summary mass of the W and Z-bozons (229 GeV; the fermionic masses of the contour and those of the following contour are neglected).

The third generation is the largest contour wherein the parameters of the vortical tube reach its critical numerical values (the τ-analogy of the proton). The mass of the vortical tube is 3.1 TeV. It is logically lawful to guess that, in analogy to the second generation, this mass consists as well of three bosons (the average mass of each is 1 TeV).

According to the formulae obrained in [4] on the basis of Wheeeler's geometrodynamics, the aforementioned mass can be expressed in the $m_e c^2$ units as

$$M_y = \frac{1}{3}\left(\frac{2a^3}{c_0^{1/3}}\right)^{7/4} = 2.1 \times 10^6 \ \ (1.07\ \text{TeV}), \qquad (1)$$

where a is the reverse fine structure constant, while c_0 is the dimensionless light speed.

The characteristic mass close to 1 TeV can also be found proceeding from other consideration. As was found in [5, 6], the mass of the active part of the proton (the mass of its quark) enrolled into a circulation contour having a quantum contour parameter n_y answers the relation $m_k = c_0^{2/3}/(a n_y)^2$. It is shown in [4, 6] that not only 1/3 but also 1/4 of this value can be the minimally possible charge (mass). Thus, in the ultimate small value can be $m_k = \frac{1}{4} m_e$. As a result, the ultimate heavy bosonic mass of the contour (in its excited state) is equal to

$$M_y = (a n_y)^2 = 4\, c_0^{2/3} = 1.79 \times 10^6 \ \ (0.916\ \text{TeV}). \qquad (2)$$

At last, it was found in [6] while considering the process of appearance of the neutrino that, if the mass-energy of a $p^+ - e^-$-contour is close to the mass of a W-boson, replacing the electron mass with the τ-particle mass we obtain

$$M_y = c_0^{4/9} m_\tau^{1/3} \left(2\pi\gamma\rho_e \times [\text{sec}^2]\right)^{1/3} = \\ = 2.29 \times 10^6 \ \ (1.17\ \text{TeV}) \qquad (3)$$

that corresponds to the mass of the guessed boson of the third generation. Herein, m_τ is the τ-particle mass in the m_e units, γ is the gravitational constant, ρ_e is the density inside the electron ($m_e/r_e^3 = 4.071 \times 10^{13}$ kg/m^3).

Thus, proceeding from the viewpoint of the suggested model, such heavy particles decaying into the boson pair having a summary mass of ~ 2 TeV are very possible.

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References

1. ATLAS Collaboration. Search for high-mass diboson resonances with boson-tagged jets in proton-proton collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector. arXiv: 1506.00962; CERN Report: CERN-PH-EP-2015-115.
2. CMS Collaboration. Search for massive WH resonances decaying to $\ell\nu b\bar{b}$ final state in the boosted regime at $\sqrt{s} = 8$ TeV. CERN Report: CMS-PAS-EXO-14-010.
3. CMS Collaboration. Search for heavy neutrinos and W bosons with right-handed couplings in proton-proton collisions at $\sqrt{s} = 8$ TeV. arXiv: 1407.3683; CERN Reports: CMS-EXO-13-008, CERN-PH-EP-2014-161.
4. Belyakov A.V. Macro-analogies and gravitation in the micro-world: further elaboration of Wheeler's model of geometrodynamics. *Progress in Physics*, 2012, v. 8, issue 2, 47–57.
5. Belyakov A.V. Nuclear power and the structure of a nucleus according to J. Wheeler's geometrodynamic concept. *Progress in Physics*, 2015, v. 11, issue 1, 89–98.
6. Belyakov A.V. Determination of the neutrino mass. *Progress in Physics*, 2016, v. 12, issue 1, 34–38.