An Holographic confirmation of Eddington's Proton/Tau symmetry

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Abstract. It is shown that the ratio of two c-free formulas for the Hubble radius exhibits overwhelming mathematical properties implying an holographic formula between the muon and tau masses, induced by an Eddington's symmetry argument.

In his Fundamental Theory [1], Eddington had predicted the *tau* particle, calling it the 'heavy mesotron', with a right order mass, using a symmetry argument between the 'heavy' proton and the muon, he called 'mesotron'. But, this theory was heavily criticised and forgotten. So, when the tau lepton was finally discovered, 35 years later, it was a *total surprise*. Moreover, at first sight, one can hardly admit a symmetry between a lepton (tau) and a baryon (proton).

The aim of this note is to show that such a symmetry really exist, since it leads to a precise holographic relation involving the muon, proton and tau masses.

It may appear strange that the starting point is a cosmological one. But, we have shown that, contrary to general belief, cosmology is the simplest of all scientific domains [2] [3].

We recall that in the famous 'cube of theories' based on the three axis showing *1/c, G and ħ*, the plane without *ħ* represents classical physics, while the one without *G* represents the microphysics. This is completly misleading, since *ħ* enters permanent cosmology (no Primordial Big Bang), as we recall here.

Moreover, no mention is made on the *c*-free physics. Now, by looking for a length in function of *G, ħ* and a mass *m*, one gets the formula $\hbar^2/Gm^3$. It was shown, by using a Coherence Principle [4], that the radius involving the proton, Hydrogen and electron masses $R = 2\hbar^2/Gm_p m_H m_e \approx 13.81$ Glyr is compatible with *c* times the so-called standard 'Universe age', so favouring a steady-state model (with invariant Hubble radius).

Now, there is a simpler *c*-free length formula, by eliminating *c* between the Planck length and the classical electron radius $r_e = ƛ_e/a$, with $ƛ_e = \hbar/cm_e$ and $a = 137.036$. One gets $R' = 2\hbar^2/Gm_N^3$, where $m_N = am_e$ is the Nambu mass, of central importance in particle physics [5].

One notes a spectacular property of $R'/R = pH/a$, where *p* and *H* are the proton and Hydrogen masses relative to the electron one: $R'/R \approx p^2/a^3 \approx \ln(a^2)/\ln p$, implying :

$$p\hat{\ }p^2 \approx a^2\hat{\ }a^3$$

which shows a spectacular geometrical interpretation: the combination side^area for a square of radius *p* is close to that of area^volume for a cube of side *a*.

By applying the Eddington's symmetry $p \rightarrow \tau$, and $a \rightarrow \mu$, one observes that

$$\tau\hat{\ }\tau^2 \approx \mu\hat{\ }(2\pi\mu^3/3)$$

implying again a geometrical interpretation: the combination side^area for a square of side τ is close to radius^half-volume for a sphere of radius μ.

So, the 'Maruani ratio' $\ln\tau/\ln\mu$ writes $\ln\tau/\ln\mu \approx (2\pi/3)\mu^3/\tau^2$, correct to 0.1%, and, moreover, is also close to $2R/R' \approx 2a^3/p^2$. So $(\pi/3)(\mu/a)^3 \approx (\tau/p)^2$, correct to 0.3%, which, by involving the corresponding wavelengths, shows the holographic form :

$$(\pi/3)(r_e/ƛ_\mu)^3 \approx (ƛ_p/ƛ_\tau)^2$$

This result milits in favor of an Holographic Great Theory, confirming earlier dramatic holographic relations [2]. Moreover, it shows that the unusual symmetry proton-tau must be taken seriously, probably meaning *an intervention of supersymmetry.*

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[5] Nambu H., "An Empirical Mass Spectrum of Elementary Particles", Prog. Theor. Phys. Vol 7, n°5, 595-6, (1952).