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Limits of weight and area of localization of elementary particles for our Universe

In recent years searches of a limit of variety of elementary particles gained the extreme heuristic importance.

It is necessary to understand borders of a hierarchical structural ladder from elementary particles which each step through two - three orders of length open qualitatively new form of a microcosm as a limit.

Recognition of that fact that our Universe has the beginning in time and final volume, assumes not only quantitative limitation of number particles it components, but also qualitative, - consisting in imposing of a limit on number of structural levels.

According to M. A. Markov such limit is so-called the "plankovsky length" made of three constants: a gravitational constant - G, action quantum - h and velocity of light - c. Having grouped them in the theory of dimensions, we will receive required limit area of localization of particles or plankeon (maksimon):

$$\lambda_M = \sqrt{G*h/c^3} = 4{,}045696 \bullet 10^{-33} \text{ sm.} \quad (1);$$

We will find the limit mass of elementary particles or a plankeon (maksimon) now - corresponding to this wavelength, having used the same theory of dimensions:

$$m_M = \sqrt{h*c / G} = 5{,}455896 * 10^{-5} \text{ gr.} \quad (2)$$

We will check, how received expressions adequately reflect a real physical picture of the world.

For this purpose we will use a known ratio of de Broil:

$$\lambda = h/m*c; \quad (3)$$

Substituting in a formula (3) the mass of a plankeon (maksimon) from expression (2) we will find to within the sixth sign value of plankovsky length from a formula (1):

$$\lambda_M = h/m_M * c = 4{,}045696 * 10^{-33} \text{ sm;}$$

It is obvious that the values received from formulas (1) and (2) smolder real physical sense; they give us the top limit of mass of particles in a structural ladder of elementary particles which can be identified with a condition of the Universe during end of its gravitational collapse.

And now we will find the lower limit of a structural ladder, having used analogy from electrodynamics.

It is known that the relation of Compton wavelength of an electron to the first "Bohr" radius is a constant of thin structure:

$h/m*c / h^2 / m*e^2 = e^2 / h*c = 1/137;$

In our case when all structural ladder of the elementary particles making the Universe, perhaps is considered and it is necessary to use the wavelength relation, - opening qualitatively new level of a microcosm — to the top limit of length λ_M:

$\lambda / \lambda_M = h / m*c;$

where m - the mass of any particle.

I received a dimensionless variable - g:

$g = \sqrt{h*c} / G / m;$

but: $\sqrt{h*c} / G = m_M;$

Then:

$g = m_M / m;$

Thus:

$\lambda / \lambda_M = m_M / m;$ (4)

We will write down expression for the mass of a typical star and we will try to open its deep meaning:

$h*c / G^{3/2} * m_p^{-2} = 3,77 * 10^{33}$ gr. (5);

The mass of the nucleon - m_p to replace the mass of a nucleon with any other particle and using a formula (2) to transform to the following look:

$M = m_M^3 / m^2$ (6);

where:
M - the mass of any astronomical object from a macrocosm of our Universe.

At $m = m_M$ the mass of a plankeon (maksimong) precisely equals to the mass of t Installed in a $t = 10^{-43}$ seconds and density of $P = 10^{94}$ gr/sm. Therefore the ratio (6) reveals the fundamental relationship micro and - a macrocosm.

The formula (5) gives the exact mass of a star. However, actually, probability of that the created star of aunts such weight will be insignificant is small; the nature and here brought essential uncertainty of our laws.

And now we will define the lower limit (masses and lengths of particles) in this structural ladder.

Total number of nucleons in the Universe - as was counted by P. Dirac, makes about 10^{80} particles.

Then the mass of our Universe (but not in general the Universe is it is necessary to distinguish) will be following: $10^{80} * m_p \approx 10^{56}$ gr.

We will substitute the received value in a ratio (6). Thus we accept the mass of an unknown particle of m_x - minimum possible mass of an elementary particle in our Universe, that is m_m (minimon):

$$m_M^3 / m_m^2 \approx 10^{56} \text{ gr.}$$

Here we find that $m_m = 4*10^{-35}$ gr. and by means of a formula (3) area of localization of this particle which will make:

$$\lambda_m = 5{,}5 \bullet 10^{-3} \text{ sm.}$$

Thus, we received the highest and lowest limits of structural levels of a microcosm.

It is possible to assume that a particle weighing $4*10^{-35}$ gr. and with a wavelength of $5{,}5 \bullet 10^{-3}$ sm. can be still an unknown elementary particle.

Whether there is actually such particle? Only successful experimental supervision can answer this question.

A little processed scheme of hierarchy of lengths of structural levels taken from M. A. Markov very conditional, but rather evident will be in summary provided:

<u>Hierarchy of lengths - hierarchy of regularities:</u>

Minimon – the light particle, perhaps a component of "dark matter) - mm particle - m_m:

$\lambda = 5{,}5 *10^{-3}$ sm.

World of molecular physics:

$\lambda \approx 10\text{-}^{6} - 10\text{-}^{7}$ sm.

World of the nuclear phenomena / Nuclear ranges:

$\lambda = 10^{-8}$ sm.

Opening of the birth of e^+ and e^- of couples, quantum theory of Dirac, quarks:

$\lambda = 10^{-11}$ sm.

Physics of an atomic nucleus:

$\lambda = 10^{-13}$ sm.

World of strange particles:

$\lambda = 10^{-14}\ 10^{-15}$ sm.

Disclosure of the nature of weak interactions:

$\lambda = 10^{-17}$ sm.

Plankeon (maximón) unification of the four interactions - m_M:

$\lambda = 4 * 10^{-33}$ sm.