About the physical quantity the Planck's momentum

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In the present paper the results of the author's researches of a problem of the Planck momentum quantity have been presented. This issue is related to the bases of a universe. The matter is a bottom of all things and phenomena in the nature. The elementary representative (carrier) of the minimum quantity of a matter in the nature is the particle of a matter which we will name atom of a matter. The atom of the matter is a concrete material embodiment in the nature of the physical quantity (idea) of the Planck momentum. More correctly here it is necessary to speak about an elementary momentum of the nature, and the Planck momentum is only analogue of this physical quantity. The atom of the matter is characterized by two basic characteristics: quantity of a matter in the atom of the matter and diameter of the atom of the matter particle of a matter. These characteristics define the basic physical quantities in the nature: an elementary matter and elementary length. It is necessary to note that in the present paper the physical quantity of the Planck momentum is viewed parallel with fundamental physical quantity of the elementary momentum.

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Content

References (12).

1. Introduction

The author is the free researcher and the dialectical materialist. The nature is material. Everything around us consists of the matter. The Universe consists of the matter. What is the matter? Vladimir I. Lenin in his book "Materialism and Empiriocriticism. Critical Comments on a Reactionary Philosophy" [1] gives the definition of matter: "Matter is a philosophical category designating the objective reality which is given to man by his sensations, and which is copied, photographed and reflected by our sensations, while existing independently of them". This is the materialistic classical definition and this is a philosophical definition. The author adheres to it. In hereafter article I will stick to this opinion. The matter as well I would say, consist of the atom of the matter. Each atom of the matter contains the same quantity of the matter. The main characteristics of the atom of matter are the total quantity of the matter in the atom, which is the constant quantity, and its diameter, which is variable quantity. Each fundamental particle is an atom of matter and has its own diameter. As I can say it is determination of the matter. You can read it also in the article "The theory of the nature (YRA-hypothesis)" [2]. In the present article you can read about the Planck momentum and about the explanation of its values, as well as about the concept of the physical quantity. I would say that this is the basic concept of the physics. There are several references to the original primary sources in the present article I can mention "International vocabulary of metrology" [3], "International Standards" [4] and the manual "Physical quantities" [5]. The concept of discreteness of the nature (discrete shapes matter) which has been used by me as well as in my article and in my researches are being discussed by many scientists. Mass and matter (quantity of matter) is being discussed for a long time in the different sources for instance in the work "Discrete space-time" [6]. I would also mention the monograph "Concept of mass in classical and modern physics" [7]. In present article I follow the definitions and classification of the International System of Quantities (ISQ) [4] and the standards of International System of Units (SI) [8-11].

2. The defining equations of the ties

The physical quantity of the Planck momentum I_{Pl} is derivative quantity (function) of the Planck quantities such as the Planck mass m_{Pl}, the Planck length l_{Pl} and the Planck time t_{Pl} Also the Planck momentum is defined by the following defining equation of the tie for the Planck physical quantities:

$$I_{\mathrm{Pl}} = \frac{m_{\mathrm{Pl}} \cdot l_{\mathrm{Pl}}}{t_{\mathrm{Pl}}}.$$

Numerical values of the Planck quantities can be found on the site NIST (National Institute of Standards and Technology, USA)[1]. The numerical value of the Planck momentum in SI is equal to:

$$I_{\mathrm{Pl}} = 6.525 \cdot \frac{\mathrm{kg \cdot m}}{\mathrm{s}}.$$

What is the material essence in nature which corresponds to the Planck system of physical quantities $U_{\mathrm{Pl}}\{\mathrm{l_{Pl}}, \mathrm{m_{Pl}}, \mathrm{t_{Pl}}\}$? How does the system of the Planck quantities $U_{\mathrm{Pl}}\{\mathrm{l_{Pl}}, \mathrm{m_{Pl}}, \mathrm{t_{Pl}}\}$ correspond to the nature? What is the meaning of «to correspond to the nature»? What is sense the physical quantity the Planck momentum? Generally there's no the answer to these questions. Let's think over these questions. Let's assume that the nature on the Planck scale (gauge) operates with the elementary substances. Let's assume that in the nature there are minimums of quantities of mass, length and time which I would name as an elementary mass, an elementary length and an elementary time. These elementary physical quantities I define as a natural system $U_{\mathrm{N}}\{\mathrm{l_N}, \mathrm{m_N}, \mathrm{t_N}\}$ of the measuring units. There is a direct analogy between the elementary physical quantities and the Planck physical quantities. Therefore it will be convenient to compare elementary physical quantities with the Planck physical quantities. There are the following equalities between unities of the metric system $U_{\mathrm{M}}\{\mathrm{m}, \mathrm{kg}, \mathrm{s}\}$ and unities of the natural system $U_{\mathrm{N}}\{\mathrm{l_N}, \mathrm{m_N}, \mathrm{t_N}\}$:

$$\begin{cases} 1 \cdot m = k_{\mathrm{l}} \cdot l_{\mathrm{N}} \\ 1 \cdot kg = k_{\mathrm{m}} \cdot m_{\mathrm{N}} \\ 1 \cdot s = k_{\mathrm{t}} \cdot t_{\mathrm{N}} \end{cases}, \text{ or } \begin{cases} l_{\mathrm{N}} = k_{\mathrm{l}}^{-1} \cdot \mathrm{m} \\ m_{\mathrm{N}} = k_{\mathrm{m}}^{-1} \cdot \mathrm{kg}. \\ t_{\mathrm{N}} = k_{\mathrm{t}}^{-1} \cdot \mathrm{s} \end{cases}$$

As I have already mentioned each atom of a matter contains the same quantity of matter. This is the minimum of quantity of a matter in the nature. I can call it an elementary quantity of the matter and designate it by symbol M_{N}. According to my understanding, the matter particle has the form of a 4-dimensional ball and is completely characterized by its two basic characteristics. This is the quantity of a matter and the size of a diameter. This is a major natural value. They define the basic physical quantities: elementary quantity of matter (M_{N}) and elementary length (l_{N}). The last two basic physical quantities determine the derived physical quantities: an elementary time (t_{N}) and an elementary mass (m_{N}). These elementary physical quantities are the natural quantities that form the natural system of the units $U_{\mathrm{N}}\{\mathrm{l_N}, \mathrm{m_N}, \mathrm{t_N}\}$. I can say that nobody knows values of these physical quantities. Usually the metric system of the measuring units $U_{\mathrm{M}}\{\mathrm{m}, \mathrm{kg}, \mathrm{s}\}$ is used. It is well-known and widely used system of the

[1] http://physics.nist.gov/sonstants.

measuring units. SI is grounded on the basis of the metric system. If I consider the elementary physical quantities as the basic physical quantities the other physical quantities will be derivative. They come from basic quantities by operations of multiplication, division, raising to the power, extraction of the root. According to the above mentioned equalities, unities of metric system also are derivative physical quantities. Such physical quantities, as the maximum speed in the nature (speed of light in vacuum), the gravitational quantity (the Newtonian constant of gravitation) and the elementary momentum (the Planck momentum) are the derivative quantities too. The physical sense of those ones and the other physical quantities is identical. The defining equations of tie are the same. Only the Planck system of quantities $U_{\mathrm{Pl}}\{\mathrm{l_{Pl}}, \mathrm{m_{Pl}}, \mathrm{t_{Pl}}\}$ is used for the second group of quantities in the basic system. Moreover, the values of corresponding physical quantities both in the first and in the second group for first two physical quantities should be identical. The values of these physical quantities are calculated experimentally. It is such physical quantities the speed of light in vacuum is $c = 299\,792\,458\ \mathrm{m\,s^{-1}}$ and the Newtonian constant of gravitation is $G = 6.673\,84 \ \cdot\ 10^{-11}\ \mathrm{m^3\,kg^{-1}\,s^{-2}}$. The defining equations of ties are the following:

$$\begin{cases} c_{\mathrm{N}} = \frac{l_{\mathrm{N}}}{t_{\mathrm{N}}} = 1 \cdot \left[\frac{\mathrm{l_N}}{\mathrm{t_N}}\right], c_{\mathrm{N}} = \frac{l_{\mathrm{N}}}{t_{\mathrm{N}}} = \frac{k_{\mathrm{l}}^{-1} \cdot m}{k_{\mathrm{t}}^{-1} \cdot s} = \frac{k_{\mathrm{l}}^{-1}}{k_{\mathrm{t}}^{-1}} \cdot \left[\frac{\mathrm{m}}{\mathrm{s}}\right] \\ G_{\mathrm{N}} = \frac{l_{\mathrm{N}}^3}{m_{\mathrm{N}} \cdot t_{\mathrm{N}}^2} = 1 \cdot \left[\frac{\mathrm{l_N^3}}{\mathrm{m_N} \cdot \mathrm{t_N^2}}\right], G_{\mathrm{N}} = \frac{l_{\mathrm{N}}^3}{m_{\mathrm{N}} \cdot t_{\mathrm{N}}^2} = \frac{(k_{\mathrm{l}}^{-3} \cdot m^3)}{(k_{\mathrm{m}}^{-1} \cdot kg) \cdot (k_{\mathrm{t}}^{-2} \cdot s^2)} = \frac{k_{\mathrm{l}}^{-3}}{k_{\mathrm{m}}^{-1} \cdot k_{\mathrm{t}}^{-2}} \cdot \left[\frac{\mathrm{m^3}}{\mathrm{kg \cdot s^2}}\right]. \\ I_{\mathrm{N}} = \frac{m_{\mathrm{N}} \cdot l_{\mathrm{N}}}{t_{\mathrm{N}}} = 1 \cdot \left[\frac{\mathrm{m_N} \cdot \mathrm{l_N}}{\mathrm{t_N}}\right], I_{\mathrm{N}} = \frac{m_{\mathrm{N}} \cdot l_{\mathrm{N}}}{t_{\mathrm{N}}} = \frac{(k_{\mathrm{m}}^{-1} \cdot kg) \cdot (k_{\mathrm{l}}^{-1} \cdot m)}{(k_{\mathrm{t}}^{-1} \cdot s)} = \frac{k_{\mathrm{m}}^{-1} \cdot k_{\mathrm{l}}^{-1}}{k_{\mathrm{t}}^{-1}} \cdot \left[\frac{\mathrm{kg \cdot m}}{\mathrm{s}}\right] \end{cases}$$

In this system of equations the values of the physical quantities have been determined as $c_{\mathrm{N}} = c$ and $G_{\mathrm{N}} = G$. Though we do not know the numerical value of the physical quantity of the elementary momentum I_{N}.

3. The private solution of the defining equations of ties

Now you can see what I mean, and here we go. Let’s search the sense of the elementary momentum. So far when we get closer to this sense, the sense of the Planck momentum $I_{\mathrm{Pl}} = 6.525 \cdot \frac{\mathrm{kg \cdot m}}{\mathrm{c}}$ will be clear. Let’s use in future for a label of numerical values of these three physical quantities above mentioned same letters without lower index. The system of the above-stated equalities in the form of system of the numerical equations will be seen as following:

$$\begin{cases} \frac{k_l^{-1}}{k_t^{-1}} = c \\ \frac{k_l^{-3}}{k_m^{-1} \cdot k_t^{-2}} = G \\ \frac{k_m^{-1} \cdot k_l^{-1}}{k_t^{-1}} = I \end{cases} \text{ or } \begin{cases} \frac{k_t}{k_l} = c \\ \frac{k_m \cdot k_t^2}{k_l^3} = G, \\ \frac{k_t}{k_m \cdot k_l} = I \end{cases}$$

where k_m, k_l, k_t is the unknown quantity. The solution of this system will be:

$$\begin{cases} k_m = I^{-1} \cdot c \\ k_l = I^{-1} \cdot c^3 \cdot G^{-1}. \\ k_t = I^{-1} \cdot c^4 \cdot G^{-1} \end{cases}$$

We do not know the numerical value (I) of the elementary impulse I_N in the metric system of the measuring units. What should we do? How should we act? Let's suppose that its numerical value is equal to 1, i.e. $I = 1$. In that case the values of the unknown coefficients k_m, k_l, k_t will be simply equal to:

$$\begin{cases} k_m = c \\ k_l = c^3 \cdot G^{-1} \\ k_t = c^4 \cdot G^{-1} \end{cases} \text{ or } \begin{cases} k_m = 299\,792\,458 \\ k_l = 4.03726 \cdot 10^{35}. \\ k_t = 1.21034 \cdot 10^{44} \end{cases}$$

Then we'll have:

$$\begin{cases} k_m^{-1} = 3.33564 \cdot 10^{-9} \\ k_l^{-1} = 2.47693 \cdot 10^{-36}. \\ k_t^{-1} = 8.26215 \cdot 10^{-45} \end{cases}$$

Since we have determined the coefficients k_m, k_l, k_t we can get the system of the natural units $U_N\{m_N, l_N, t_N\}$:

$$\begin{cases} l_N = 2.47693 \cdot 10^{-36} \cdot \mathrm{m} \\ m_N = 3.33564 \cdot 10^{-9} \cdot \mathrm{kg}, \\ t_N = 8.26215 \cdot 10^{-45} \cdot \mathrm{s} \end{cases} \begin{cases} 1 \cdot \mathrm{m} = 299\,792\,458\ \mathrm{l_N} \\ 1 \cdot \mathrm{kg} = 4.03726 \cdot 10^{35}\ \mathrm{m_N}. \\ 1 \cdot \mathrm{s} = 1.21034 \cdot 10^{44}\ \mathrm{t_N} \end{cases}$$

So, we have got the connection between the unities of the natural system and the metric system (SI). Now it is possible to present the same dependence in the following view:

$$U_N\{\mathrm{l_N}, \mathrm{m_N}, \mathrm{t_N}\} \equiv U_N\{4.03726 \cdot 10^{35},\ 299\,792\,458,\ 1.21034 \cdot 10^{44}\},$$

$$U_N\{\mathrm{l_N}, \mathrm{m_N}, \mathrm{t_N}\} \equiv U_N^*\{2.47693 \cdot 10^{-36},\ 3.33564 \cdot 10^{-9},\ 8.26215 \cdot 10^{-45}\}.$$

Labels are clear.

4. The general law of the universe

The special case, when value of the elementary impulse equal to 1 has been considered above. This formula shows the elementary impulse equal to 1:

$$I_N = 1 \cdot \left[\frac{\mathrm{kg \cdot m}}{\mathrm{s}}\right],$$

Let's ask a question about sense of the physical quantity of the elementary momentum. Now I’m going to speak about the question about the physical quantity of the elementary momentum. According to the definition of the elementary momentum which has been above mentioned, we have the following equality for elementary physical quantities of mass, length and time:

$$\frac{m_{\mathrm{N}} \cdot l_{\mathrm{N}}}{t_{\mathrm{N}}} = 1 \text{ or } m_{\mathrm{N}} \cdot l_{\mathrm{N}} = t_{\mathrm{N}}.$$

These equalities show the connections (ties) among the elementary physical quantities in the nature on the Planck scale. Another conclusion follows from these equations: the elementary mass, the elementary length and the elementary time are not independent elementary physical quantities. They are dependent in the aggregate. Their tie is defined by the above-stated formula. Let’s imagine that in the nature there is a certain elementary particle of a matter or the atom of a matter what is characterized by the elementary length, the elementary mass and the elementary time. The atom of the matter itself defines these elementary characteristics. In other words I can suppose that an atom of the matter has such characteristic. Then I can unit all these characteristics with the formula $\frac{m_{\mathrm{N}} \cdot l_{\mathrm{N}}}{t_{\mathrm{N}}} = 1$, which is the law of the nature. Let’s say that this is the general law of the universe (nature). Each atom of the matter contains the information about the values of the elementary physical quantities. From the philosophical point of view last equality means that a matter, space and time have appeared strongly inseparably connected among themselves on the Planck life scale. This tie materializes in the atom of the matter. How it follows from the previous equalities, at least, one of these elementary physical quantities is dependent on other two physical quantities. For example the elementary time can be such physical quantity.

5. The metric unit of the time

In this part I am going to speak about the metric system $U_M\{\mathrm{m}, \mathrm{kg}, \mathrm{s}\}$ of units. The indissoluble ties of the three elementary physical quantities in the atom of matter and the reflection of this fact in the formula of the elementary momentum allows to explain correctly the sense of quantity of the elementary momentum. Then the equation will be as follows:

$$I_{\mathrm{N}} = \frac{k_{\mathrm{m}}^{-1} \cdot k_{\mathrm{l}}^{-1}}{k_{\mathrm{t}}^{-1}} \cdot \left[\frac{\mathrm{kg} \cdot \mathrm{m}}{\mathrm{s}}\right] = 1 \left[\frac{\mathrm{kg} \cdot \mathrm{m}}{\mathrm{s}}\right].$$

The necessary and the sufficient condition of equality of the elementary momentum to the value 1 is the another equation:

$$\frac{k_{\mathrm{m}}^{-1} \cdot k_{\mathrm{l}}^{-1}}{k_{\mathrm{t}}^{-1}} = 1 \text{ or } \frac{k_{\mathrm{t}}}{k_{\mathrm{m}} \cdot k_{\mathrm{l}}} = 1, \text{or } k_{\mathrm{m}} \cdot k_{\mathrm{l}} = k_{\mathrm{t}}.$$

What does it mean? Let's say that we know the elementary physical quantities of the mass(m_{N}), the length (l_{N}) and the time (t_{N}). Let's choose a new metric unit of the mass (for example, 1 kg) and the new metric unit of the length (for example, 1 m). Then I find the coefficients and get the following equations:

$$k_{\mathrm{m}} = \frac{1\ \mathrm{kg}}{m_{\mathrm{N}}}, k_{\mathrm{l}} = \frac{1\ \mathrm{m}}{l_{\mathrm{N}}}.$$

In this case of the selection of the metric units of the mass and the length, the metric unit of the time should be unequivocal and equal to the value $(k_{\mathrm{m}} \cdot k_{\mathrm{l}}) \cdot t_{\mathrm{N}}$. Let's this time metric unit will be named second (s). Consequently, the following equality will take place $k_{\mathrm{t}} = k_{\mathrm{m}} \cdot k_{\mathrm{l}}$ Thus, in this case the value of elementary momentum will be equal to 1: $I_{\mathrm{N}} = 1 \left[\frac{\mathrm{kg \cdot m}}{\mathrm{s}}\right]$. The value of the elementary momentum in the natural system $U_{\mathrm{N}}\{\mathrm{l_N}, \mathrm{m_N}, \mathrm{t_N}\}$ of units will be equal to 1 too:

$$I_{\mathrm{N}} = 1 \cdot \left[\frac{\mathrm{m_N \cdot l_N}}{\mathrm{t_N}}\right].$$

You can see that in this case ($k_{\mathrm{t}} = k_{\mathrm{m}} \cdot k_{\mathrm{l}}$) the units of the metric system $U_{\mathrm{M}}\{\mathrm{m}, \mathrm{kg}, \mathrm{s}\}$ as physical quantities are related to the similar tie (dependence) such as the elementary quantities in the atom of matter. To comprehend it I'll overview the following. Let's consider that an "exotic" rectangle $m_{\mathrm{N}} \times l_{\mathrm{N}}$, where one edge is the elementary mass and the second edge is the elementary length. This "exotic" rectangle has the "exotic" area $[m_{\mathrm{N}} \times l_{\mathrm{N}}]$ equal to t_{N}, where t_{N} is the elementary time (it is the general law of a universe). Then an "exotic" rectangle $(k_{\mathrm{m}} \cdot m_{\mathrm{N}}) \times (k_{\mathrm{l}} \cdot l_{\mathrm{N}})$ should have the "exotic" area $(k_{\mathrm{m}} \cdot m_{\mathrm{N}}) \cdot [m_{\mathrm{N}} \times l_{\mathrm{N}}] = (k_{\mathrm{m}} \cdot k_{\mathrm{l}}) \cdot t_{\mathrm{N}}$. But it means that the free select of the unities of the length and the mass uniquely determinates the unit of the time. I would not say for sure whether the second is the unit of the time in this case. Probably, not. It is connected with the free selection of the second (1 s) as a unit of the time. The real selection of the second as a unit of the time has not been connected with the selection of the units for the mass (1 kg) and for the length (1 m). I would overview the situation from the point of view of the vector theory. As you know the cross product of two vectors is a vector. If to consider the elementary quantities as the vector quantities, it is possible to write down following equality for the absolute value of the cross product (length of the vector):

$$\left|\overrightarrow{m_{\mathrm{N}}} \times \overrightarrow{l_{\mathrm{N}}}\right| = \left|\left[\overrightarrow{m_{\mathrm{N}}}, \overrightarrow{l_{\mathrm{N}}}\right]\right| = \left|\overrightarrow{m_{\mathrm{N}}}\right| \cdot \left|\overrightarrow{l_{\mathrm{N}}}\right| \cdot \sin\left(\widehat{\overrightarrow{m_{\mathrm{N}}}, \overrightarrow{l_{\mathrm{N}}}}\right).$$

If vectors $\overrightarrow{m_{\mathrm{N}}}$ and $\overrightarrow{l_{\mathrm{N}}}$ are orthogonal, $\sin\left(\widehat{\overrightarrow{m_{\mathrm{N}}}, \overrightarrow{l_{\mathrm{N}}}}\right) = 1$ and hence,

$$\left|\overrightarrow{m_{\mathrm{N}}} \times \overrightarrow{l_{\mathrm{N}}}\right| = \left|\left[\overrightarrow{m_{\mathrm{N}}}, \overrightarrow{l_{\mathrm{N}}}\right]\right| = \left|\overrightarrow{m_{\mathrm{N}}}\right| \cdot \left|\overrightarrow{l_{\mathrm{N}}}\right|.$$

Therefore, if I designate vector $\overrightarrow{m_{\mathrm{N}}} \times \overrightarrow{l_{\mathrm{N}}}$ as $\overrightarrow{t_{\mathrm{N}}}$ ($\overrightarrow{t_{\mathrm{N}}} = \overrightarrow{m_{\mathrm{N}}} \times \overrightarrow{l_{\mathrm{N}}}$) then three vectors $\{\overrightarrow{m_{\mathrm{N}}}, \overrightarrow{l_{\mathrm{N}}}, \overrightarrow{t_{\mathrm{N}}}\}$ corresponding to the elementary quantities, will be orthogonal. These three vectors express the interior natural tie among the characteristics of the atom of the matter. I wall also name the interval of the time $(k_{\mathrm{m}} \cdot k_{\mathrm{l}}) \cdot t_{\mathrm{N}}$ the natural unit of the time. Let's call it the natural unit of time the masking N_{t}. So, by definition it is $N_{\mathrm{t}} = (k_{\mathrm{m}} \cdot k_{\mathrm{l}}) \cdot t_{\mathrm{N}}$. The natural unit of time N_{t} corresponds to pair "1 kg-1 m". How the two units of the time second and the natural unit of the time are correlated? Now, I am going to explore it.

6. The sense of an elementary momentum

I can tell that if we choose the natural unit of time as the second it will be the full conformity (total identity) to the nature. It is possible to tell that if we have chosen the natural unit of time as our second it would be the full conformity to the nature. We do not know real values of the elementary physical quantities of the mass (m_{N}), the length (l_{N}) and the time (t_{N}), so selection of the metric system $U_{\mathrm{M}}\{\mathrm{m}, \mathrm{kg}, \mathrm{s}\}$ is arbitrary. The metric system of the units does not answer the basic principle: the elementary momentum for the natural system of units must correspond to the nature and should have dimensionless value equal to 1. Therefore the metric system of the units is not correlated with the nature. Let's say that $I_N = I \cdot \left[\frac{\mathrm{kg} \cdot \mathrm{m}}{\mathrm{s}}\right]$, and $\mathrm{I} \neq 1$. If the equality $I_{\mathrm{N}} = \frac{k_{\mathrm{m}}^{-1} \cdot k_{\mathrm{l}}^{-1}}{k_{\mathrm{t}}^{-1}} \cdot \left[\frac{\mathrm{kg} \cdot \mathrm{m}}{\mathrm{s}}\right]$ takes place, means the equality $I = \frac{k_{\mathrm{m}}^{-1} \cdot k_{\mathrm{l}}^{-1}}{k_{\mathrm{t}}^{-1}}$ will take place too. Last equality can be written down in the following kind:

$$k_{\mathrm{m}} \cdot \mathrm{k_l} = I^{-1} \cdot k_{\mathrm{t}}, \text{ or } k_{\mathrm{t}} = I \cdot (k_{\mathrm{m}} \cdot k_{\mathrm{l}}).$$

We know that N_{t} there is a natural unit of the time which is equal to the interval of the time, $(k_{\mathrm{m}} \cdot k_{\mathrm{l}}) \cdot t_{\mathrm{N}}$. The second as unit of the time is designated by equality:

$$1\ \mathrm{s} = k_{\mathrm{t}} \cdot t_{\mathrm{N}}, \text{ or } 1\ \mathrm{s} = I \cdot (k_{\mathrm{m}} \cdot k_{\mathrm{l}}) \cdot t_{\mathrm{N}}.$$

The equality $k_{\mathrm{t}} = I \cdot (k_m \cdot k_{\mathrm{l}})$ means that the numerical value of the elementary momentum is the tie coefficient between the natural unit of the time and our usual unit of the time which is the second. The formula of the tie between the second and the natural unit of the time N_{t} is as follows:

$$1\ \mathrm{s} = I \cdot N_{\mathrm{t}}, 1\ N_{\mathrm{t}} = I^{-1} \cdot \mathrm{s}.$$

Let me remind you that I in this formula is a numerical value of the elementary momentum in the metric system: $I_N = I \cdot \left[\frac{\mathrm{kg \cdot m}}{\mathrm{s}}\right]$. I say that the equality $I = \frac{k_\mathrm{m}^{-1} \cdot k_\mathrm{l}^{-1}}{k_\mathrm{t}^{-1}}$, or the equality $I = \frac{k_\mathrm{t}}{k_\mathrm{m} \cdot k_\mathrm{l}}$ has the consequence not only one equality $k_\mathrm{t} = I \cdot (k_\mathrm{m} \cdot k_\mathrm{l})$, what we have viewed. Other, alternative variant is possible also. We will view it. We will present value *I* in a view:

$$I = \frac{I_\mathrm{m} \cdot I_\mathrm{l}}{I_\mathrm{t}}.$$

The following chain of equalities will take place:

$$\frac{k_\mathrm{t}}{k_m \cdot k_\mathrm{l}} = \frac{I_\mathrm{m} \cdot I_\mathrm{l}}{I_\mathrm{t}},\ \frac{(I_\mathrm{t} \cdot k_\mathrm{t})}{(I_\mathrm{m} \cdot k_\mathrm{m}) \cdot (I_\mathrm{l} \cdot k_\mathrm{l})} = 1.$$

Last equality means that the system $\{\mathrm{m_N}/\mathrm{I_m}, \mathrm{l_N}/\mathrm{I_l}, \mathrm{t_N}/\mathrm{I_t}\}$ of units is also the natural system of the units along with the system $U_\mathrm{N}\{\mathrm{m_N}, \mathrm{l_N}, \mathrm{t_N}\}$ of the units. But in the nature there is only one natural system of units. So, it would be the necessity $\mathrm{I_m} = \mathrm{I_l} = \mathrm{I_t} = 1$ and in that case would be $\mathrm{I} = 1$, but now, I'm telling of the case when $\mathrm{I} \neq 1$. The case when $\mathrm{I} = 1$ has already been reviewed. This is the contradiction. These two cases are to conclude all mentioned above I can say. If we have the equality like this $\frac{k_\mathrm{t}}{k_\mathrm{m} \cdot k_\mathrm{l}} = \mathrm{I}\ (\mathrm{I} \neq 1)$ the equality cam be as following $k_\mathrm{t} = \mathrm{I} \cdot (k_\mathrm{m} \cdot k_\mathrm{l})$. Now, we can have the hereinafter theorem.

Theorem Let's assume that the elementary quantities of the mass (m_N), length (l_N) and time (t_N) exist in the nature. Suppose, there are correlations between these elementary quantities and the corresponding units (quantities) of the metric system $U_\mathrm{M}\{\mathrm{kg, m, s}\}$:

$$\begin{cases} k_\mathrm{l} \cdot l_\mathrm{N} = 1 \cdot \mathrm{m} \\ k_\mathrm{m} \cdot m_\mathrm{N} = 1 \cdot \mathrm{kg}. \\ k_\mathrm{t} \cdot t_\mathrm{N} = 1 \cdot \mathrm{s} \end{cases}$$

Let's suppose the elementary momentum in the metric system of units is not equal to 1, i.e.

$$I_N = \mathrm{I} \cdot \left[\frac{\mathrm{kg \cdot m}}{\mathrm{s}}\right],$$

where $\{I_\mathrm{N}\} = \mathrm{I} \neq 1$. This equality is possible only in the condition when $k_\mathrm{t} = \mathrm{I} \cdot (k_\mathrm{m} \cdot k_\mathrm{l})$.

NB! The theorem says that the invariance of the units of mass (1 kg) and lengths (1 m) is supposed.

7. The sense of the fine structure constant

Hypothesis The inverse value of a fine structure constant is numerical value of the elementary momentum in the metric system:

$$I_{\mathrm{N}} = \alpha^{-1} \cdot \left[\frac{\mathrm{kg\cdot m}}{\mathrm{s}}\right], \qquad \{I_{\mathrm{N}}\} = \mathrm{I} = \alpha^{-1}.$$

Let me remind you that the value of fine structure constant is equal to:

$$\alpha = 7.297\,352\,5698 \cdot 10^{-3}$$

(site NIST: http://physics.nist.gov/sonstants).The reciprocal value of fine structure constant is equal to $\alpha^{-1} = 137.035\,999\,07$. According to the hypothesis, the conclusion of the theorem can be as following:

$$k_{\mathrm{t}} = \alpha^{-1} \cdot k_{\mathrm{m}} \cdot k_{\mathrm{l}}.$$

The next formula comes from the previous one:

$$\alpha = \frac{k_{\mathrm{m}} \cdot k_{\mathrm{l}}}{k_{\mathrm{t}}} \text{ or } \alpha = \frac{(k_{\mathrm{m}} \cdot k_{\mathrm{l}}) \cdot t_{\mathrm{N}}}{k_{\mathrm{t}} \cdot t_{\mathrm{N}}} = \frac{1\,N_{\mathrm{t}}}{1\,s}.$$

So, in the metric system (or SI) such the physical quantities as the unit of the time second (1 s), the natural unit of the time ($1\ \mathrm{N_t}$), the numerical value of the elementary momentum ($\{I_N\} = \mathrm{I}$) and the fine structure constant are connected by the following relations:

$$\{I_{\mathrm{N}}\} = \frac{1\,\mathrm{s}}{1\,N_{\mathrm{t}}},\ \{I_{\mathrm{N}}\} = \alpha^{-1}, 1\,\mathrm{s} = \alpha^{-1} \cdot N_{\mathrm{t}},\ 1\,N_{\mathrm{t}} = \alpha \cdot \mathrm{s}.$$

Thus, the true sense of the elementary momentum is that the ratio of the homogeneous quantities of time. One unit of time is the second and the other unit is the natural time N_{t}. The true sense of the fine structure constant is the ratio of the natural unit of time to the second. The fine structure constant is equal to the value of the inverse numerical value of the elementary momentum. As for the sense of the Planck momentum $I_{\mathrm{Pl}} = 6.525 \cdot \left[\frac{\mathrm{kg\cdot m}}{\mathrm{s}}\right]$ its numeric value ($\{I_{\mathrm{Pl}}\} = 6.525$) is the ratio of the transition from the Planck values to the elementary values

$$m_{\mathrm{N}} = \frac{m_{\mathrm{Pl}}}{6.525}, l_{\mathrm{N}} = \frac{l_{\mathrm{Pl}}}{6.525}, t_{\mathrm{N}} = \frac{t_{\mathrm{Pl}}}{6.525}.$$

As $I_{\mathrm{N}} = \alpha^{-1} \cdot \left[\frac{\mathrm{kg\cdot m}}{\mathrm{s}}\right]$ and $I_{\mathrm{Pl}} = 6.525 \cdot \left[\frac{\mathrm{kg\cdot m}}{\mathrm{s}}\right]$ then the following equalities take place:

$$I_{\mathrm{N}} = (6.525 \cdot \alpha)^{-1} \cdot I_{\mathrm{Pl}} = 21.00169 \cdot I_{\mathrm{Pl}},$$

$$I_{\mathrm{N}} = 1 \cdot \left[\frac{\mathrm{kg\cdot m}}{\mathrm{N_t}}\right] = 137.03600 \cdot \left[\frac{\mathrm{kg\cdot m}}{\mathrm{s}}\right],$$

$$I_{\mathrm{Pl}} = 6.525 \cdot \alpha \cdot I_{\mathrm{N}} = 4.76152 \cdot 10^{-2} \ \cdot I_{\mathrm{N}},$$

$$I_{\mathrm{Pl}} = 4.76152 \cdot 10^{-2} \cdot \left[\frac{\mathrm{kg \cdot m}}{\mathrm{N_t}}\right] = 6.525 \cdot \left[\frac{\mathrm{kg \cdot m}}{\mathrm{s}}\right].$$

8. Inference

In the present article the results and deductions of my researches are presented. I list it again. The matter is essence of the nature. The matter is the basic essence of the nature. The matter is the basic unique substance of the nature. At the heart of a universe the atom of a matter lies. All atoms of a matter are identical. The atom of a matter contains minimum quantity of the matter. The atom of a matter is the unique matter's carrier in the nature. The atom of the matter is not destroyed, is not annihilated and is indestructible. It is the law of the nature. The atom of the matter with its characteristics designates the minimum values of the physical quantities in the nature. These are such quantities as the elementary quantity of the matter (the elementary unit of the matter) and the diameter of the atom. These are the basic nature quantities and also the basic physical quantities. All other physical quantities are derivative. The derivative physical quantities are the elementary unit of the time (minimum), the elementary unit of the length (minimum) and the elementary unit of the mass (maximum). Let's notice that the diameter of atom of the matter is the elementary unit of the length. The elementary unit of the time is equal to the elementary unit of the matter. In the atom of the matter the basic physical elementary quantities are related by indissoluble tie. It is the nature general law. In the mathematical shape this tie is expressed by the elementary (not Planck) momentum. The value of the elementary momentum is equal to 1 in the natural system of units. If arbitrarily to choose a unit of the mass and a unit of the length the natural unit of the time is designated by this select. Second as the time unit has been chosen any way and irrespective of the units of length and mass. The time unit second is distinct from a natural time unit. In the natural system of the units the Planck momentum is equal to the inverse value of a fine structure constant. Three fundamental physical quantities the speed of light in vacuum, the Newtonian constant of gravitation and the elementary charge (charge of electron) have been designate experimentally. In the present paper the theoretical substantiation is given for two of them. The author expresses gratitude to the grandson Maksim for joint walks during which time it was well thought over the problems which decision is presented in the present paper. Author is grateful to Smolin L. for his book "The Trouble with Physics…" [12]. Author has found a lot of useful to itself in this book. This fine book became incentive motive in researches of the author.

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