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V.F. TIMKOV
The Office of National Security and Defense Council of Ukraine
S.V. TIMKOV, V.A. ZHUKOV
Research and Production Enterprise «TZHK»

ELECTRIC CHARGE AS A FUNCTION OF THE MOMENT OF MASS. GRAVITATIONAL FORM OF COULOMB'S LAW

Annotation – *The law "The Universal Proportions of Planck" allows you to establish a connection between gravity and electromagnetism. The electromagnetic force interaction is a special case of gravitational force interaction. A moving electric charge is a function of the moment of the mass, so the Coulomb law may be introduced in the form of gravity. Bohr Magneton is also a function of the moment of the mass. The basic unit of electromagnetism: Coulomb, Volt, Ampere, Tesla, Ohm, Henry, Farad can be expressed in terms of units of length, mass and time. The fine structure constant is the coefficient of proportionality between the moment of the Planck mass and moment of the electron mass. The reduced Planck's constant can be expressed in terms of mass of an electron.*

Keywords: Planck's constant, Universal Proportions of Planck, units of measure, charge, magneton of Bohr, moment of mass, gravity, electromagnetism.

В.Ф. ТИМКОВ
Аппарат Совета национальной безопасности и обороны Украины
С.В. ТИМКОВ, В.А. ЖУКОВ
Научно-производственное предприятие «ТЖК»

ЭЛЕКТРИЧЕСКИЙ ЗАРЯД КАК ФУНКЦИЯ МОМЕНТА МАССЫ. ГРАВИТАЦИОННАЯ ФОРМА ЗАКОНА КУЛОНА

Закон "Универсальные пропорции Планка" позволяет установить связь между гравитацией и электромагнетизмом. Электромагнитное силовое взаимодействие является частным случаем гравитационного силового взаимодействия. Движущийся электрический заряд является функцией момента массы, поэтому закон Кулона может быть представлен в гравитационной форме. Магнетон Бора также является функцией момента массы. Основные единицы измерения электромагнетизма: Кулон, Вольт, Ампер, Тесла, Ом, Генри, Фарада могут быть выражены через единицы измерения длины, массы и времени. Постоянная тонкой структуры является коэффициентом пропорциональности между моментом массы Планка и моментом массы электрона.

Редуцированная постоянная Планка может быть выражена через массу электрона.

Ключевые слова: константы Планка, универсальные пропорции Планка, единицы измерения, заряд, магнетон Бора, момент массы, гравитация, электромагнетизм.

1. Introduction

As we know [1] the standard model of physics describes the electromagnetic, strong and weak interactions, but does not describe the gravitational interaction. The electromagnetic and weak interactions are unified in the theory of electroweak interaction. Currently there is no unified theory of physics of fundamental interactions. Trying to combine the gravitational interaction with the electromagnetic, weak and strong interactions on the basis of the theory of quantum gravity has not brought success.

At the same time, some indirect evidence, for example, similar structure of Coulomb's law and the law of universal gravitation, the presence of gravitational-electromagnetic resonance [2,3,4,5], allows to make the assumption that the basis of the electromagnetic and gravitational of interactions have common processes and phenomena.

According to law "Universal Plank Proportions" (law UPP) [2], in the observable Universe anybody having mass m, creates a gravitational field that curves the surrounding space with a radius of curvature S (actually S -is the length of a gravitational wave) and introducing into this space time delay t_{dm} in the dissemination of signal. Body characteristics m, S, t_{dm} interconnected universal proportions Planck:

$$m = \frac{m_p}{l_p} S; m = \frac{m_p}{t_p} t_{dm}; S = \frac{l_p}{t_p} t_{dm}; S = \frac{l_p}{m_p} m; t_{dm} = \frac{t_p}{l_p} S; t_{dm} = \frac{t_p}{m_p} m, \quad (1)$$

where l_p, m_p, t_p - is the Planck constant, respectively - length, mass and time.

Each body characteristics: m, S, t_{dm} separately from other uniquely determines him the energy parameters:

$$E = mc^2 = F_p S = h_e t_{dm}, \quad (2)$$

where: c - is the speed of light in vacuum; $h_e = \frac{E_p}{t_p}$ – is the quantum of Planck energy, where E_p - Planck

energy: $E_p = m_p c^2$; F_p - is the Planck force: $F_p = m_p a_p$, where a_p - is Planck accelerating: $a_p = \frac{l_p}{t_p^2}$, and for two bodies with weight m_1 and m_2, length of a gravitational wave S_1 and S_2, the time delay t_{dm1} and t_{dm2} at a distance R from each other, the law of gravity is given by:

$$F = G\frac{m_1 m_2}{R^2} = F_p \frac{S_1 S_2}{R^2} = F_p c^2 \frac{t_{dm1} t_{dm2}}{R^2}. \quad (3)$$

Where G – is the gravitational constant, c - is the speed of light in vacuum.

Before this law, we know only one characteristic of the object - its mass. On the basis of the law UPP openly and confirmed by experiments a new property of matter – its gravitational -electromagnetic resonance (GER) [3,4]. It is known that today in astrophysics is not possible to accurately determine the mass of distant objects observable Universe, and using the law UPP and the GER we can accurately calculate their mass. It is sufficient to measure the frequency of the envelope of the radiation spectrum [4]. On the basis of the law UPP and GER, we can create new sources of energy. The versatility, efficiency, stability and repeatability of Planck of proportions also lies in the fact that for the gravitational constant G, of constants of Planck: l_p, m_p, t_p, of the relevant characteristics of the observable Universe: R_{Ue}, M_{Ue}, T_{Ue}, as well as of the relevant characteristics of any her body: S, m, t_{dm} is true [5]:

$$G = \frac{l_p^3}{m_p t_p^2} = \frac{R_{Ue}^3}{M_{Ue} T_{Ue}^2} = \frac{S^3}{m t_{dm}^2} = 6.67408 \cdot 10^{-11} \left[m^3 \cdot kg^{-1} \cdot s^{-2} \right] \quad (4)$$

On the basis of the Planck of proportions, we can also go to the geometrical system of units in physics, that additionally underscores their versatility.

Most dynamic physical processes have two basic states - steady state and transient state. In the steady state (when there is no movement of the masses with an acceleration when there is no merging of massive bodies) the gravitational field of the body, which has a mass, bends space around itself [2,5,6,7]. This forms a kind of standing gravitational waves that are can be found only indirect methods, for example, based on gravitational-electromagnetic resonance. The LIGO experiment observed the process of transition, which occurred as a result of deformation of surrounding curved space formed to move in space gravitational wave. The parameters of curved space in steady state (standing gravitational waves) and the parameters of gravitational waves in the transition process to the same bodies are different.

2. Electric charge as a function of the moment of mass

It is known [8,9], that the charge of Planck q_p is equal to :

$$q_p = \sqrt{4\pi\varepsilon_0 \hbar c} = \sqrt{2ch\varepsilon_0} = \frac{e}{\sqrt{\alpha}}, \quad (5)$$

where: $\varepsilon_0 = \frac{10^7}{4\pi c^2}$ - electric constant, $h = \frac{2\pi m_p l_p^2}{t_p}$ - Planck's constant, $\hbar = \frac{h}{2\pi} = \frac{m_p l_p^2}{t_p}$ - the reduced Planck's constant, e - elementary electric charge, α - fine structure constant.

Then, based on (5):

$$e^2 = \frac{10^7 h\alpha}{2\pi c} = \frac{\frac{10^7 \alpha 2\pi m_p l_p^2}{t_p}}{2\pi \frac{l_p}{t_p}} = 10^7 \alpha m_p l_p \left[\; kg \cdot m \; \right]. \quad (6)$$

Or:

$$e = \sqrt{10^7 \alpha m_p l_p} \left[\; kg^{\frac{1}{2}} \cdot m^{\frac{1}{2}} \; \right]. \quad (7)$$

The fractional dimension of physical quantities $\left[kg^{\frac{1}{2}} \cdot m^{\frac{1}{2}} \right]$ proved, for example, in [10,11,12].

It is known [13], that the Bohr radius a_0 is equal to:

$$a_0 = \frac{4\pi\varepsilon_0\hbar^2}{m_e e^2} = \frac{h}{2\pi m_e \alpha c}, \tag{8}$$

where: m_e - is the mass of electron.

Then in view of (5) and (6) the Bohr radius is equal to:

$$a_0 = \frac{4\pi\varepsilon_0 m_p^2 l_p^4}{10^7 \alpha m_e m_p l_p t_p^2},$$

Considering that: $c^2 = \frac{10^7}{4\pi\varepsilon_0}$, then:

$$a_0 = \frac{c^2 m_p l_p}{c^2 \alpha m_e} = \frac{m_p l_p}{\alpha m_e}, \tag{9}$$

or:

$$a_0 \alpha m_e = m_p l_p ; \alpha = \frac{m_p l_p}{a_0 m_e} ; m_p = \frac{a_0 \alpha m_e}{l_p} ; l_p = \frac{a_0 \alpha m_e}{m_p} ; m_e = \frac{m_p l_p}{a_0 \alpha}. \tag{10}$$

From (10) it follows that the fine structure constant is the ratio of the moments of the Planck mass and the electron mass, that is the fine structure constant is a scale factor between the values of these moments. The electron mass is uniquely determined by the Planck constant: the length l_p and mass m_p, as well as the Bohr radius a_0 and the fine structure constant α.

In view of (10) the reduced Planck constant is equal to:

$$\hbar = c a_0 \alpha m_e = \frac{c e^2}{10^7 \alpha}. \tag{11}$$

In view of (6,7,10) electric charge is equal to:

$$e^2 = 10^7 \alpha^2 a_0 m_e. \tag{12}$$

Considering that the mass of the proton m_{pr} is: $m_{pr} = m_e d$,where $d = 1836.15267389$ [14], the formula (12) can be represented as:

$$e^2 = 10^7 \frac{\alpha^2}{d} a_0 m_{pr}. \tag{13}$$

From (6,7,12,13)) it follows that the electric charge is a function of the moment of mass.

3. Gravitational form of Coulomb's law

Coulomb force module F for two point charges $e_1 = e_2 = e$, which are at a distance r_{12} from each other, equal to:

$$F = k_e \frac{e^2}{r_{12}^2}, \tag{14}$$

where k_e – is the proportionality factor (Coulomb's constant, or the electric force constant), which is in the international units SI is equal to [15]:

$$k_e = \frac{1}{4\pi\varepsilon_0} = 8.9875517873681764 \cdot 10^9 \left[\ kg^1 \cdot m^3 \cdot s^{-2} \cdot C^{-2} \ \right]. \tag{15}$$

Represent k_e through a system of units of Planck:

$$k_e = \frac{m_p l_p^3}{t_p^2 q_p^2} = \frac{m_p l_p^3}{t_p^2 10^7 m_p l_p}. \tag{16}$$

Then the Coulomb force module (14) is equal to:

$$F = k_e \frac{e^2}{r_{12}^2} = \frac{m_p l_p^3}{t_p^2 10^7 m_p l_p} \cdot \frac{10^7 \alpha m_p l_p}{r_{12}^2} = \frac{\alpha m_p l_p^3}{t_p^2 r_{12}^2}. \tag{17}$$

Multiply (17) by $\left(\frac{m_p}{m_p}\right)$ and considering that $G=\frac{l_p^3}{m_p t_p^2}$, the Coulomb force module is equal to:

$$F=k_e\frac{e^2}{r_{12}^2}=G\alpha\frac{m_p^2}{r_{12}^2}. \tag{18}$$

From (18) it follows that:

$$G=\frac{k_e}{\alpha}\cdot\frac{e^2}{m_p^2};k_e=G\alpha\frac{m_p^2}{e^2}. \tag{19}$$

In view of (10) the Coulomb force module through mass of the electron and the Bohr radius is equal to:

$$F=k_e\frac{e^2}{r_{12}^2}=G\alpha\frac{m_p^2}{r_{12}^2}=G\alpha^3\frac{a_0^2}{l_p^2}\cdot\frac{m_e^2}{r_{12}^2}. \tag{20}$$

Module of Coulomb force through the proton mass, and Bohr radius is equal to:

$$F=k_e\frac{e^2}{r_{12}^2}=G\alpha\frac{m_p^2}{r_{12}^2}=G\alpha^3\frac{a_0^2}{l_p^2}\cdot\frac{m_e^2}{r_{12}^2}=G\frac{\alpha^3}{d^2}\cdot\frac{a_0^2}{l_p^2}\cdot\frac{m_{pr}^2}{r_{12}^2}. \tag{21}$$

It is known [16] that the Bohr magneton μ_B is equal to:

$$\mu_B=\frac{e\hbar}{2m_e}, \tag{22}$$

Then, if $\hbar=ca_0\alpha m_e=\frac{ce^2}{10^7\alpha}$, that the Bohr magneton μ_B is equal to:

$$\mu_B=\frac{e\hbar}{2m_e}=\frac{\alpha}{2}\cdot\frac{l_p}{t_p}a_0\sqrt{10^7\alpha m_p l_p}\left[kg^{\frac{1}{2}}\cdot m^{\frac{5}{2}}\cdot s^{-1}\right]. \tag{23}$$

Formulas (7), (11), (12), (13), (16), (19), (21) and (23) shows that the mass is the basis of the gravitational and electromagnetic interactions.

4. Planck's constants for electromagnetism, expressed in terms of units of mass, of time and of length

Current of Planck I_p:

$$I_p=\frac{q_p}{t_p}=3.47892851\cdot10^{25}\left[\mathrm{A}\right],\left[\mathrm{kg}^{\frac{1}{2}}\cdot m^{\frac{1}{2}}\cdot s^{-1}\right], \tag{24}$$

where [15]: $q_p=1.875546\cdot10^{-18}\left[\ C\ \right];t_p=5.39116\cdot10^{-44}\left[\ s\ \right]$

Voltage of Planck V_p:

$$V_p=\frac{E_p}{q_p}=\frac{m_pc^2}{q_p}=1.04295691\cdot10^{27}\left[V\right],\left[kg^{\frac{1}{2}}\cdot m^{\frac{3}{2}}\cdot s^{-2}\right], \tag{25}$$

where [15]: $m_p=2.17647\cdot10^{-8}\left[\ kg\ \right];c=299792458\left[\ m^1\cdot s^{-1}\ \right]$.

Impedance of Planck Z_p:

$$Z_p=\frac{V_p}{I_p}=29.97925675\left[\Omega\right],\left[m^1\cdot s^{-1}\right] \tag{26}$$

Electric capacitance of Planck C_p:

$$C_p=\frac{q_p}{V_p}=1.798296751\cdot10^{-45}\left[F\right],\left[m^{-1}\cdot s^2\right] \tag{27}$$

Inductance of Planck L_p:

$$L_p = \frac{2E_p}{I_p^2} = \frac{2m_p c^2}{I_p^2} = 3.2324593952 \cdot 10^{-42}\left[H\right], \left[\Omega^1 \cdot s^1\right], \left[m\right]. \quad (28)$$

Module of magnetic induction of Planck B_p:

$$B_p = \frac{F_p}{q_p c} = 2.1524977678 \cdot 10^{53}\left[Tl\right], \left[kg^{\frac{1}{2}} \cdot m^{-\frac{1}{2}} \cdot s^{-1}\right], \quad (29)$$

where [15]: $F_p = m_p \frac{l_p}{t_p^2} = 1.210295 \cdot 10^{44}\left[kg^1 \cdot m^1 \cdot s^{-2}\right]; l_p = 1.616229 \cdot 10^{-35}\left[\mathrm{m}\right]$.

Module of magnetic field strength of Planck H_p:

$$H_p = \frac{B_p}{\mu_0} = 1.7129 \cdot 10^{59}\left[A^1 \cdot m^{-1}\right], \left[kg^{\frac{1}{2}} \cdot m^{-\frac{1}{2}} \cdot s^{-1}\right], \quad (30)$$

where μ_0 - is the magnetic constant, with [15] $\mu_0 = 1.256637061 \cdot 10^{-6}\left[H^1 \cdot m^{-1}\right]$.

Planck's constant for electromagnetism can be expressed in terms of units of measurement: mass, length and time. This also means that the units of electromagnetism: Coulomb, Volt, Ampere, Tesla, Ohm, Henry, Farad also can be expressed in terms of units of measurement: mass, length and time.

5. Conclusions

Electromagnetic force interaction is a special case of gravitational force interaction. This is based on the fact that:

1. Planck's constant for electromagnetism can be expressed in terms of units of measurement: mass, length, and time;
2. There is a gravitational form of Coulomb's law;
3. The electric charge is a function of the moment of mass;
4. Experimentally confirmed the existence in nature of gravitational - electromagnetic resonance.

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