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Ethereal Model of Neutron

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ABSTRACT: The work is another step in building a mathematical theory of ether, carried out by the author on request of the company "New Inflow" leading theoretical and experimental studies aimed at promoting a new concept of creating energy devices. This theory allows to understand the mechanisms of appearance of matter and its transformation into energy. Separate sections of the theory including the ethereal models of electron and proton were published in some scientific journals. In the present paper the ethereal model of neutron is presented in the form of wave solutions of the nonlinear system of ether equations derived from the laws of classical mechanics. The definitions and formulas for calculating of its charge, energy, mass and magnetic moment are given. Numerical value of the magnetic moment of neutron is almost exactly the same as the experimental so-called "anomalous" value.

KEYWORDS: Neutron, charge, energy, mass, magnetic moment, neutrino.

I. INTRODUCTION

Elementary particles, such as electron, proton and neutron are the main structural units of matter. However, today it is possible to state with regret that modern physical science has no reasonable theoretical idea, that from itself actually represent these elementary particles. Experimentally determined values of the magnetic moments of proton and neutron are "anomalous" from the point of view of modern physics. Experimental value of the magnetic moment of proton is almost three times greater than its theoretical value, called the nuclear magneton. And neutron has a negative (opposite to the proton) magnetic moment, although of modern theoretical ideas that the magnetic moment of neutron as a particle with zero charge must be zero. The ethereal models of proton and electron are constructed by the author in the kind of solutions of the nonlinear system of ether equations in the paper [1]. The formulas of their charges, energy, mass and values of their magnetic moments are found, which coincide with the experimental "anomalous" values. The mechanism of production of the particle and antiparticle from the photon of the twice energy and the mechanism of particles annihilation are described.

In the present paper the ethereal model of the third basic structural unit of matter, which is neutron, is presented. The formulas of its charge, energy, mass and value of its magnetic moment are found. The value of magnetic moment of neutron is coincide with its experimental "anomalous" value. In addition, formulas and values for the charge, energy, mass and the value of magnetic moment of neutrino are found.

II. RELATED WORK

On notions of modern physics neutron is considered as unexplained association of a proton and an electron with zero charge and with the size which is approximately equal to the size of proton. The value of the anomalous magnetic moment of neutron is due to its internal quark structure [2-5]. But modern physical science does not know the nature of the zero charge of neutron, and all the numerous searches for quarks in a free state were unsuccessful. There is also no reasonable explanation for the processes of bifurcation of neutron to proton, electron and neutrino, an essence of neutrino and a sense of the existence of neutron in nature and its role in the structures of atomic nuclei. There is also no reasonable explanation for the mass of neutron.

In [6-11], the author proposed a mathematical model of the ether in the form of dense nonviscous compressible medium in three-dimensional Euclidean space with coordinates $\vec{r}=(x,y,z)^T$, having at each time t the density $\rho(\vec{r},t)$ and the velocity vector $\vec{u}(\vec{r},t)=(u_1(\vec{r},t),u_2(\vec{r},t),u_3(\vec{r},t))^T$ of propagation of small perturbations of the density. It was

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proposed to describe the dynamics of the ether by two nonlinear equations. They follow from the equations of classical mechanics of Newton and are invariant under Galilean transformations:

$$\frac{\partial \rho}{\partial t} + div(\rho \vec{u}) = 0, \quad \frac{d(\rho \vec{u})}{dt} = \frac{\partial(\rho \vec{u})}{\partial t} + (\vec{u} \cdot \nabla)(\rho \vec{u}) = 0, \tag{1}$$

where the first equation is the continuity equation, and the second - the law of conservation of ether momentum.

In [6-9] the equations of Maxwell and Dirac, the laws of Coulomb and Biot-Savart-Laplace were derived from the system of equations (1). The correction of Ampere's law was found, which is valid not only for parallel, but also for perpendicular currents. The basic formulas of quantum mechanics, the formulas for magnetic induction and for intensities of electric and magnetic fields of an element of the current were obtained, the appearance of an electromotive force in the conductor, the forces of Ampere and Lorentz were explained from the standpoint of classical mechanics. There were found not only the well known values of the energy levels of the excited states of the hydrogen atom, which coincide with the experimental values, but also new stable nonradiative hydrinos states of the hydrogen atom, that can not be described by the Schrödinger equation [10-11]. In [12] it is shown that the dimensions of all physical quantities determined from the system of equations (1) coincide with the dimensions of these quantities in the CGS system. In [1] the ethereal models of proton and electron were constructed in the kind of solutions of the nonlinear system of ether equations (1). The formulas of their charges, energy, mass and values of their magnetic moments were found, which coincide with the experimental "anomalous" values. The mechanism of production of the particle and antiparticle from the photon of the twice energy and the mechanism of particles annihilation were described.

III. Neutron structure

There are two natural combinations of the interaction of waves of perturbations of ether density inside the proton and the electron: the combination with opposite spins and the combination with the same spins. As shown earlier by the author in [10-11], a simple combination of the interaction (superposition) of the waves of electron and proton with opposite spins is a hydrogen atom, having a radius of its ground state is much larger than the radius of the electron. We will now show that the other simple combination of interaction (superposition) of the waves of the electron and proton with the same spins is a neutron, having a radius of its ground state approximately equal to the radius of the proton.

Following the work of the author [1], electron and proton are the balls of radius r_0, within which along each parallel (circle of radius $r\sin\theta$, $r \le r_0$) as a result of small radial oscillations of the ether density the waves propagate around the axis z along the angle φ with constant angular velocity (frequency) $\omega = c/r_0$. These wave solutions $\vec{u} = (V_r, V_\theta, V_\varphi) = (V, 0, W)$ of the system of ether equations (1) have a kind in the stationary spherical system of coordinates

$$V(r,\theta,\varphi,t) \approx \frac{V(\theta)\cos((\omega t - \varphi)/2)}{r}, \qquad \frac{d\varphi}{dt} = \omega, \quad W = \omega r \sin\theta. \tag{2}$$

Function $V_e(\theta)$ and $V_p(\theta)$ for an electron (positron) and proton (antiproton) in the formulas (2) have a series expansion in the angle θ:

$$\begin{aligned} V_e(\theta) &= V_0(a + \sin\theta + b\sin 2\theta + c_e \sin 3\theta), \\ V_p(\theta) &= V_0(a + \sin\theta - b\sin 2\theta + c_p \sin 3\theta), \end{aligned} \tag{3}$$

where the constants a, b, c_p, c_e are defined in the paper [1]. Charge density waves for proton and electron carrying only positive or only negative charges were defined in [1] as

$$\delta_p(r,\theta,\xi) = \frac{\rho_0 \omega_p}{8\pi r^2} V_p(\theta) \sin\xi/2, \qquad 0 \le \xi < 2\pi,$$

$$\delta_e(r,\theta,\xi) = \frac{\rho_0 \omega_e}{8\pi r^2} V_e(\theta) \sin\xi/2, \qquad -2\pi \le \xi < 0,$$

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The next results were obtain in [1] for charges q, magnetic moments p_m and internal energies ε of electron and proton:

$$|q_e| = |q_p| = \frac{\rho_0 c}{2\pi} V_0 \int_0^{\pi} (a \sin\theta + \sin^2\theta) d\theta = \frac{\rho_0 c V_q}{2\pi} = \frac{\rho_0 c V_0}{4}(1 + \frac{4a}{\pi}) = q,$$

$$p_{me} = -\frac{4\pi V_{me}}{3V_q} \frac{qcr_e}{2} = \beta_e \mu_B, \qquad p_{mp} = \frac{4\pi V_{mp}}{3V_q} \frac{qcr_p}{2} = \beta_p \mu_N,$$

$$\varepsilon_e = \pi^2 \rho_0^2 c V_\varepsilon \omega_e / 4 = \hbar\omega_e, \quad \varepsilon_p = \pi^2 \rho_0^2 c V_\varepsilon \omega_p / 4 = \hbar\omega_p, \quad V_\varepsilon = \int_0^{\pi} V_{e,p}^2(\theta) \sin^3\theta \, d\theta,$$

where μ_B and μ_N are the Bohr magneton and the nuclear magneton, $\hbar$ is the Planck constant,

$$V_{me,p} = V_0 \int_0^{\pi} (a + \sin\theta + b\sin 2\theta + c_{e,p} \sin 3\theta) \sin^3\theta \, d\theta = V_0(\frac{4}{3}a + \frac{3\pi}{8} - \frac{\pi}{8} c_{e,p}) = \frac{\pi}{8}(\frac{32a}{3\pi} + 3 - c_{e,p})V_0,$$

and

$$V_\varepsilon = \int_0^{\pi} V_0^2 (a + \sin\theta \pm b\sin 2\theta + c_{e,p} \sin 3\theta)^2 \sin^3\theta \, d\theta = V_0^2(\frac{4a^2}{3} + \frac{3a\pi}{4} + \frac{16}{15} + \frac{64}{105}b^2 - (\frac{32}{35} + \frac{a\pi}{4})c_{e,p} + \frac{208}{315}c_{e,p}^{\ 2}) = V_0^2 d.$$

Consequently,

$$\beta_e = -\pi(\frac{32a}{9\pi} + 1 - c_e/3)/(\frac{4a}{\pi} + 1); \qquad \beta_p = \pi(\frac{32a}{9\pi} + 1 - c_p/3)/(\frac{4a}{\pi} + 1).$$

So, if electron is sitting on the proton under the influence of an electric field of proton, so that their centers coincide, and they have the same spins, then the angular velocities of propagation of perturbations of the ether density inside the electron and proton should be increased, and their radii should be reduced. Structure, resulting in such superposition of waves of perturbations of ether density inside the electron and the proton should be like that shown in Figure 1.

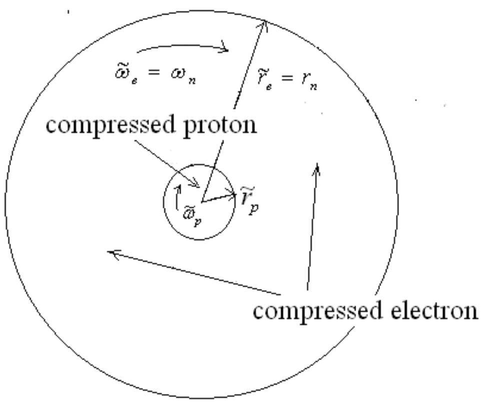

Fig.1. Scheme of formation of a neutron from the compressed proton and electron (top view).

At this figure ω□□$_p$ > ω_p is the angular velocity of propagation of perturbations of ether density inside the compressed proton, which is a positively charged ball with a radius r□$_p$ < r_p. And ω□$_e$ = ω_n >> ω_e is the angular velocity of propagation of perturbations of ether density inside the compressed electron, which is a negatively charged ball with a radius r□$_e$ = r_n<<r_e . Inside the ball of compressed proton ether is slightly compressed, and inside the ball of compressed electron ether is a slightly sparse. Radius of compressed electron r□$_e$ will be a radius of the thus

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obtained structure, i.e. radius of the neutron r_n. And $\omega_n r_n = \omega□_p r□_p = c$. Thus, the neutron has a central part (core) with the radius $r□_p$, which is a superposition of waves of positive and negative charges, and the peripheral part (coat) with radius $r□_e = r_n$, charged as well as the electron (negatively). It is natural to assume that the parts of radial components of velocities of change in the ether density, which depend on the angle θ, are identical in both parts of the neutron and equal to the average value (half-sum) of these components inside the electron and the proton, i.e.

$$V_n(\theta) = V_0\left(a + \sin\theta + \frac{(c_e + c_p)}{2}\sin 3\theta\right). \qquad (4)$$

This assumption means that the proton energy is consumed for compression of the electron before coincidence of radial components of their velocities which depend on the angle θ. In addition the frequencies of waves of density perturbations of ether in both parts of the neutron must be in the ratio of the resonance, i.e. their attitude should be good rational and better integer number $k = \omega□_p / \omega_n = r_n / r□_p$. Also expected, that frequency of wave of density perturbations of ether in electron should be increased and radius of electron should be reduced in an integer times $m = \omega_n / \omega_e = r_e / r_n$.

Assume also that an additional perturbation of the ether density is imposed on the structure of the compressed proton. This perturbation has a half-wave of the charge density

$$\delta_+(r,\theta,\xi) = \frac{\rho_0 \tilde{\omega}_p}{8\pi r^2} V_0 \tilde{b} \sin(2\theta) \sin\xi_p / 2, \qquad 0 \le \xi_p = \tilde{\omega}_p - \varphi < 2\pi, \qquad (5)$$

energy of which is needed to harmonize the relationship between the resonant frequencies of the waves of density perturbations of ether within compressed electron and proton. It is obvious that the particle, having a half-wave of density of charge distribution in the form (5), has an energy, but has no charge, magnetic moment, and mass, since the corresponding integrals of the charge, magnetic moment and medium density changes of ether in the ball of the particle are zero. Therefore, we can identify this additional density perturbation of ether, having a size of compressed proton and half-wave of density of the charge distribution (5), with a particle of antineutrino. Then the particle, which has a negative half-wave of the density of the charge distribution, additional to (5), can be called a neutrino. This approach to the modeling of neutron describes the reaction of its natural decay into a proton, an electron and an antineutrino

$$n \to p + e + \bar{\nu}.$$

Based on the above assumption, the densities of distributions of the electric charges inside a compressed electron and proton can be written as

$$\delta_e = \frac{\rho_0 \omega_n}{8\pi r^2} V_n(\theta) \sin\xi_n / 2 < 0, \qquad -2\pi \le \xi_n = (\omega_n t - \varphi) < 0,$$

and

$$\delta_p = \frac{\rho_0 \tilde{\omega}_p}{8\pi r^2}\left(V_n(\theta) + V_0 \tilde{b} \sin(2\theta)\right) \sin\xi_p / 2 > 0, \qquad 0 \le \xi_p = (\omega_p t - \varphi) < 2\pi.$$

The full densities of distributions of electrical charges within the compressed electron and proton can be written as: $\Delta_e = 4\pi\delta_e$, $\Delta_p = 4\pi\delta_p$.

IV. Charge and Magnetic Moment of Neutron

Charge of the neutron q_n, as the sum of the charges of compressed proton and electron, is obviously equal to zero, since

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$$q_n = \int_0^{\pi}\int_0^{2\pi}\int_0^{\tilde{r}_p} \tfrac{\rho_0\tilde{\omega}_p}{8\pi r^2} V_n(\theta)\sin(\xi_p/2) r^2 \sin\theta\, dr d\xi_p\, d\theta - \int_0^{\pi}\int_0^{2\pi}\int_0^{r_n} \tfrac{\rho_0\omega_n}{8\pi r^2} V_n(\theta)\sin(\xi_n/2) r^2 \sin\theta\, dr\, d\xi_n\, d\theta = \frac{\rho_0 cV_n}{2\pi} - \frac{\rho_0 cV_n}{2\pi} = 0.$$

We now calculate the neutron magnetic moment $\vec{p}_m$ as the sum of the magnetic moments of the compressed proton and electron, using the well-known formula

$$\vec{p}_m = \frac{1}{2}\int_{\Omega} \Delta\left[\vec{W}\cdot\vec{r}\right] d\Omega,$$

where electric charges with density distribution Δ are moved within the volume Ω at a linear rate $\vec{W}$. Then

$$p_{mn} = \frac{1}{2}\int_0^{\pi}\int_0^{2\pi}\int_0^{\tilde{r}_p} \tfrac{\rho_0\tilde{\omega}_p}{2r^2} V_n(\theta)\sin(\xi_p/2)\tilde{\omega}_p r\sin\theta\, r\sin\theta\, r^2\sin\theta\, dr d\xi_p\, d\theta -$$

$$-\frac{1}{2}\int_0^{\pi}\int_0^{2\pi}\int_0^{r_n} \tfrac{\rho_0\omega_n}{2r^2} V_n(\theta)\sin(\xi_n/2)\omega_n r\sin\theta\, r\sin\theta\, r^2\sin\theta\, dr\, d\xi_n\, d\theta =$$

$$\frac{\rho_0\tilde{\omega}_p^2\,\tilde{r}_p^3}{3}V_{mn} - \frac{\rho_0\omega_n^2\, r_n^3}{3}V_{mn} = \frac{\rho_0 c^2}{3}V_{mn}(\tilde{r}_p - r_n),\ V_{mn} = \int_0^{\pi} V_n(\theta)\sin^3\theta\, d\theta.$$

Since $\tilde{\omega}_p/\omega_n = r_n/\tilde{r}_p = k$, the magnetic moment of neutron can be written as

$$p_{mn} = -\frac{\rho_0 c^2 r_n V_{mn}}{3}(1-\frac{1}{k}) = -\frac{2\rho_0 c^2 r_n}{3}(1-\frac{1}{k})\frac{\pi}{8}(\frac{32a}{3\pi} + 3 - \frac{(c_e + c_p)}{2})V_0,$$

or in terms of the nuclear magneton (see [1])

$$p_{mn} = -\frac{qcr_p}{2}\left[\pi\frac{r_n}{r_p}(1-\frac{1}{k})(\frac{32a}{9\pi} + 1 - \frac{(c_e + c_p)}{6})\right]/(\frac{4a}{\pi} + 1). \quad (6)$$

And, since $r_n/r_p = \omega_p/\omega_n = (\omega_p/\omega_e)(\omega_e/\omega_n) = (\omega_p/\omega_e)/m$, the value of the neutron magnetic moment in the units of nuclear magneton is equal to

$$\beta_n = -\left[\frac{\pi}{m}\frac{\omega_p}{\omega_e}(1-\frac{1}{k})(\frac{32a}{9\pi} + 1 - \frac{(c_e + c_p)}{6})\right]/(\frac{4a}{\pi} + 1). \quad (7)$$

V. ENERGY AND MASS OF NEUTRON

We calculate the energy of neutron as the sum of the energies of compressed proton and electron. First, we calculate the work done by the fields of internal forces of compressed proton, electron and neutrino over charges moving in them (see [1]):

$$A_e(t) = \frac{1}{8}\int_0^{\pi}\int_0^{2\pi}\int_0^{r_n} \rho_0^2\omega_n^2 V_n^2(\theta)\frac{\partial}{\partial\varphi}(\varphi\sin((\omega_n t - \varphi)/2))^2 \sin^3\theta\, dr\, d\varphi\, d\theta = \frac{1}{2}\pi^2\rho_0^2\omega_n^2 r_n \sin^2(\omega_n t/2)V_{\varepsilon n}.$$

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$$A_p(t)=\frac{1}{8}\int_0^{\pi}\int_0^{2\pi}\int_0^{\tilde r_p}\rho_0^2\tilde\omega_p^2V_n^2(\theta)\frac{\partial}{\partial\varphi}(\varphi\sin((\tilde\omega_p t-\varphi)/2))^2\sin^3\theta\, dr\, d\varphi\, d\theta=\frac{1}{2}\pi^2\rho_0^2\tilde\omega_p^2\tilde r_p V_{\varepsilon n}\sin^2(\tilde\omega_p t/2),$$

$$V_{\varepsilon n}=\int_0^{\pi}V_n^2(\theta)\sin^3\theta\, d\theta.$$

$$\tilde A(t)=\frac{1}{8}\int_0^{\pi}\int_0^{2\pi}\int_0^{\tilde r_p}\rho_0^2\tilde\omega_p^2V_0^2(\tilde b\sin 2\theta)^2\frac{\partial}{\partial\varphi}(\varphi\sin(\tilde\omega_p t-\varphi)/2))^2\sin^3\theta\, dr\, d\varphi\, d\theta=\frac{1}{2}\pi^2\rho_0^2\tilde\omega_p^2\tilde r_p\sin^2(\tilde\omega_e t/2)\tilde V_\varepsilon,$$

$$\tilde V_\varepsilon=V_0^2\tilde b^2\int_0^{\pi}(\sin 2\theta)^2\sin^3\theta\, d\theta.$$

Averaging the resulting expressions over the period of time, we find the energy and mass of the neutron as

$$\varepsilon_n=\pi^2\rho_0^2c((\tilde\omega_p+\omega_n)V_{\varepsilon n}+\tilde\omega_p\tilde V_\varepsilon)/4=\pi^2\rho_0^2c((k+1)V_{\varepsilon n}+k\tilde V_\varepsilon)\omega_n/4,\quad m_n=\varepsilon_n/c^2,$$

where

$$V_{\varepsilon n}=V_0^2\left[\frac{4a^2}{3}+\frac{3a\pi}{4}+\frac{16}{15}-(\frac{32}{35}+\frac{a\pi}{4})\frac{(c_e+c_p)}{2}+\frac{208}{315}(\frac{c_e+c_p}{2})^2\right]=V_0^2d_n;\quad \tilde V_\varepsilon=V_0^2\frac{64}{105}\tilde b^2. \qquad (8)$$

VI. Comparison with Experimental Data

It was shown in [1] that $c_p = 1/3$. It follows from the equality $Q_p=0$ for quadruple moment Q_p of proton. Then the numerical value for c_e is defined in [1] from the condition that c_p and c_e are the roots of the same quadratic equation

$$\frac{4a^2}{3}+\frac{3a\pi}{4}+\frac{16}{15}+\frac{64}{105}b^2-(\frac{32}{35}+\frac{a\pi}{4})c+\frac{208}{315}c^2-d=0.$$

Further, it was shown in [1] that if $d = 5$, $a = \pi/20$ and $\gamma = 4a/\pi = 0.2$, then the values of the magnetic moments of proton $\beta_p = 2.79253$, electron $\beta_e = -2.00295$ and the fine structure constant $\alpha = 0.00729514$ which were obtained from the formulas of the considered above ether theory are different from their experimentally determined values $\beta_p \approx 2.7928$, $\beta_e \approx -2.0023$ and $\alpha \approx 0.00729735$ less than on 0.04%.

Let us find the numerical values of the integer constants k, m in the above proposed ethereal model of neutron and compare the numerical values of its characteristics obtained by formulas of ether, with the experimental data. Let mass (energy, frequency) of proton is in l times more than the mass (energy, frequency) of electron and let 1.53 of electron energy corresponds to antineutrino energy in the neutron energy that follows from experimental data. Then $\varepsilon_p = l\varepsilon_e$, $\pi^2\rho_0^2ck\tilde V_\varepsilon\omega_n/4=1.53\varepsilon_e$. And as the total energy of the compressed electron and proton in neutron is equal to the total energy of proton and electron, then

$$\pi^2\rho_0^2c(k+1)V_{\varepsilon n}\omega_n/4=\varepsilon_p+\varepsilon_e=(l+1)\varepsilon_e=(l+1)\pi^2\rho_0^2cV_\varepsilon\omega_e/4.$$

Therefore $(k+1)V_{\varepsilon n}\omega_n=(l+1)V_\varepsilon\omega_e$ or $(k+1)md_n=(l+1)d$. But it follows from (8) that for d = 5 and $\gamma = 0.2$

$$5(l+1)=(k+1)m(\frac{\pi^2}{12}\gamma^2+\frac{3\pi^2}{16}\gamma+\frac{16}{15}-(\frac{32}{35}+\frac{\pi^2}{16}\gamma)(\frac{9}{13}+\frac{315}{208}\frac{\pi^2}{32}\gamma)+\frac{208}{315}(\frac{9}{13}+\frac{315}{208}\frac{\pi^2}{32}\gamma)^2)=$$

$$=(k+1)m(0.678406\gamma^2+1.4235\gamma+0.750182)=1.06202(k+1)m.$$

Let's accept now $k=4$, $m=1730$. Then

$$l = 1.06202 \cdot 1730 - 1 = 1836.29,\ \varepsilon_p = 1836.29\varepsilon_e,\ \varepsilon_n = \varepsilon_p + \varepsilon_e + 1.53\varepsilon_e = 1838.82\varepsilon_e,$$

$$\beta_n = -\frac{\pi}{(1+\gamma)}\frac{l}{m}(1-\frac{1}{k})(\frac{8\gamma}{9} + 1 - (\frac{3}{13} + \frac{105}{208}\frac{\pi^2}{32}\gamma)) = -\frac{1.7984l}{m} = -1.909.$$

Thus, the values of masses of proton and neutron are different from their experimentally determined values $m_p \approx 1836.15m_e$, $m_n \approx 1838.68m_e$ less than on 0.01%, and the value of magnetic moment of neutron, which is obtained from the formulas of the ether theory, is different from its experimentally determined value $\beta_n = -1.913$ less than on 0.2%. The electron is compressed in neutron in 1730 times and the proton - approximately in 3.76 times.

VII. Conclusion

In this paper, based on the ether equations derived on the basis of common sense and the laws of classical mechanics, ethereal mathematical model of the neutron is constructed, the reasonable definitions and the formulas for its charge, energy, mass and magnetic moment are given. Their numerical values are almost exactly coincide with the experimental so-called "anomalous" values.

The results of the work are one of the parts of the mathematical theory of ether, which is developed in the company "New Inflow" (Moscow, Russia) in the framework of projects financed by the company, and in close cooperation with the directions of theoretical and experimental studies, numerical modeling of physical processes. Some other parts of the theory have been published in [1,6-12]. The following parts of the theory will be published in the future.

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Biography

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