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## On the Electron Nature

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# On the Electron Nature

Anatoly V. Belyakov

**Abstract-** A mechanistic interpretation of J. Wheeler's geometrodynamical idea of the existence of closed contours between charged microparticles makes it possible to create the model of an electron which it is not a point particle in, but, on the contrary, has a «hidden» mass. This mass motion as some medium's moving determines its charge (momentum) and its spin (angular momentum). It is shown that the identification of a charge as a momentum transforms successfully all electromagnetic dimensions into mechanical ones. The numerical values of the charge and the angle of its projection onto our world (additional one to the Weinberg mixing angle) are calculated.

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## I. INTRODUCTION

The electron nature remains obscure and the main reason for this is the charge and spin presence in it, which in no way agrees with the electron as a point object to exist. Although the introduced electric and magnetic dimensions in the CGSE and CGSM systems are expressed in terms of mass, length and time units (Ampere is added in the SI system), they seem strange and bizarre. The charge (Coulomb) and electric current (Amperes) units and their derivatives ones only indicate the electron properties and electromagnetic phenomena, but do not in any way clarify their physical nature. The exception is the electrical capacity unit in the CGSE system, the dimension of which (centimeters) looks convincing.

In essence, the actual electrical dimensions, especially Amperes (or Coulomb) are not needed, because the basic formulas reflecting the electrical forces of interaction between charges and the magnetic forces of interaction between conductors with current can be represented in such a way that the charge dimension does not matter, only the amount of charges matters.

For example, the Coulomb and Ampere formulas can be obtained in a uniform form with a single dimensional parameter  $\mu_0$ :

$$F_e = z_{e1}z_{e2} \mu_0^{-1}(r_e/r_0)^2, \quad (1)$$

$$F_m = z_{e1}z_{e2}\mu_0^{-1}Lr_e^2/(2\pi r_0 c^2 \times [c]^2), \quad (2)$$

where  $m_e, r_e, r_0, L, c, z_{e1}, z_{e2}$  - are the electron mass, classical electron radius, distance between charges or conductors, length of conductors with current, speed of light, number of unit charges. Here

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$$\mu_0 = (\epsilon_0 c^2)^{-1} \quad (3)$$

there is analogue of the magnetic constant, and

$$\epsilon_0 = m_e / r_e \quad (4)$$

there is analogue of the electrical constant.

Thus, the dimensional coefficient  $\mu_0^{-1}$  is the centrifugal force arising when an electron moves with the speed of light along the radius  $r_e$ ; it is equal to the force of interaction between two elementary charges at a given distance, which numerically is a very ordinary value of 29.06 N.

It is clear that the electron has some specific properties, but which ones? In what physically meaningful units should an electric charge be measured?

## II. ON THE ELECTRON NATURE

To explain the properties of the charge, J. Wheeler proposed a geometrodynamical concept, where charged microparticles are the singular points on the three-dimensional surface of our world, connected by a "wormhole" (i.e. a vortex tube or a current force line) of the drain-source type in an additional dimension [1]. With this mechanistic model the charge is not a special matter, but it characterizes the disequilibrium of the physical vacuum, its ability to "circulate" along the current tubes.

Thus, by virtue of physical analogy, the charge becomes proportional to the amount of medium motion along the vortex current tube contour, the spin, respectively, to the angular momentum relative to the contour longitudinal axis, and the magnetic interaction between the conductors turns out to be similar to the forces acting between the current tubes. Of course, in this model, a point or a line is considered physical objects with certain dimensions and mass, and the electron size with mass  $m_e$  and radius  $r_e$  can be taken as a medium unit element, and then the circulation contour mass  $M$  becomes proportional to its length  $L$ :

$$M = m_e L / r_e = \epsilon_0 L, \quad (5)$$

where the electric constant  $\epsilon_0$  is the vortex tube (contour) linear density.

Moreover, the matter itself can eventually be organized by the sequential complication of the initial elementary contours and woven into a "tissue", which in turn is deformed into the objects we observe, which are in fact highly fractalized, up to the microworld

parameters *the surfaces* with fractal dimensions. Perhaps this dimension does not reach three and is presumably equal to the number  $e$  [2, 3]. So an undeformed surface may be logically interpreted as empty space or physical vacuum; this is confirmed by the fact of the numerical determination the speed of light on the basis of the well-known equations of waves propagation over the liquid surface [4].

In such a scheme a free charged particle appears as a part of an open contour, i.e. an uni-polar vortex resting on the surface of our world and directed along the "additional" dimension, where its charge and spin are determined by the dynamics of "hidden" mass [5]. This mass has gravity, which explains some microworld properties of the [6]. However, there is apparently no need to consider the additional dimension in Wheeler's model as spatial; rather, it is only an additional degree of freedom, reflecting the presence of electromagnetic forces.

The most expedient, as it turned out, is to accept the charge to be proportional to the ultimate electron momentum  $m_e c$ . This approach has justified itself in determining the numerical value of the electron charge and radiation constants [7]. Assuming the charge as momentum and replacing Coulomb dimension with it, one can sure that the dimensions of electrical and magnetic quantities are strikingly simplified and take on the meaningful and physically obvious form: the electric current becomes simply a force [kg m/sec<sup>2</sup>] or [N], the potential becomes the speed [m/sec], capacity becomes the electrons mass accumulated on the capacitor plates [kg], conductivity becomes the mass velocity [kg/sec], the inductance becomes the value inverse to mass acceleration [sec<sup>2</sup>/kg], the magnetic field strength becomes the mass acceleration [kg/sec<sup>2</sup>], the solenoid magnetic induction becomes the density of its turns winding [m<sup>-1</sup>], etc. [8].

### III. DETERMINATION THE ELECTRON CHARGE VALUE

Apparently, the electron charge and spin are projected onto our world from the "additional" dimension, being distorted. Let us introduce the angle  $q$ , which determines the momentum projection onto the surface of our world, as well as the circulation velocity (and rotation about the contour longitudinal axis) projection  $v$  onto the preferred direction, for example, the proton-electron axis. Then  $(\sin q)^i$  characterizes the ratio of the projection value to the velocity value, where  $i = 1, 2, 3$  (for all degrees of freedom) depending on the velocity vector position.

Among the possible contours with different masses  $M$  and velocities  $v$ , there is one for which the unit electron energy is maximum  $E_m$ . Let us take into account that the potential in a mechanistic,

"Coulombless" system corresponds to a velocity of  $m$ /sec, then for such a contour it is possible to write:

$$v = m_e c^2 / e = E_m / e, \quad (6)$$

where  $e$  is the total charge, which is identical to the momentum (in contrast to its projection, the observed charge  $e_0$ ), while for an arbitrary contour the standard unit of potential (velocity) is

$$[M/c] = m_e v^2 / e. \quad (7)$$

From (6) and (7) we find:

$$v = c_0^{2/3} \times [M/c], \quad (8)$$

where the dimensionless speed of light is introduced  $c_0 = c / [m/sec]$ , and

$$e = m_e c_0^{2/3} \times c_0^{2/3} \times [M/c]. \quad (9)$$

Since the charge (momentum) is equal to  $Mv$  by definition, the contour mass  $M$  turns out to be equal to  $m_e c_0^{2/3} = 4.48 \times 10^5$  electron mass, which is close to the total mass of bosons  $W^+, W, Z^0$ . It is for this contour (let's call it "standard") the maximum energy of a "point-like" electron  $m_e c^2$  is equal to that of the current tube, i.e.  $Mv^2$ . The charge and spin numerical values remain unchanged for any contour, and have a common component — the contour's momentum  $Mv$ . It should be noted that, despite the electric charge dimension corresponds to the momentum dimension, it is not common to both entities, thus cannot be divided by the mass dimensions and velocity dimensions.

The magnitude of the observed charge is the projection of the total charge (momentum):

$$e_0 = m_e c_0^{4/3} (\sin q)^i \times [M/c], \quad (10)$$

where, obviously, here  $i = 1$ .

To determine the projection angle  $q$ , let us assume the vortex tube total angular momentum (i.e. Planck's constant  $h = \pi 2 a m_e c r_e$ ) reduced to the electron radius can define as a vector reconstructed from the observed charge magnitude in the most general form, when  $i = 3$ :

$$h / r_e = e_0 / (\sin q)^3 = 2\pi a m_e c, \quad (11)$$

where  $a$  is the inverse fine structure constant.

Bearing in mind (10), it follows from (11):

$$\sin q = c_0^{1/6} / (2\pi a)^{1/2} = 0.881, \quad (12)$$

whence the projection angle is  $61.8^\circ$ , which actually coincides with the angle complementary to *the Weinberg mixing angle*  $q_w$  in the weak interaction. The value  $(\sin q_w)^2 = 0.231$  was determined experimentally, i.e.  $q_w = 28.7^\circ$  and the additional angle is  $61.3^\circ$ . At this angle value the electric charge is calculated accurately:

$$e_0 = m_e c_0^{4/3} \sin 61.3^\circ \times [M/c] = 1.60 \times 10^{-19} \text{ } \kappa \text{ } \mathcal{M} / c. \quad (13)$$

Taken by definition, the "point-like" electron charge itself and belonging to the area where the current tube crosses our world surface, constitutes an insignificant part of  $e_0$ :

$$m_e c = e_0 / (c_0^{1/3} \sin q) = e_0 / 590 . \quad (14)$$

The mane "standard" quantum number  $n_s$  can be expressed in terms of the contour mass  $M$  and its linear density (electrical constant)  $\epsilon_0$ :

$$n_s = (m_e c_0^{2/3} / (\epsilon_0 R_b))^{1/2} = c_0^{1/3} / a = 4.884 , \quad (15)$$

where  $R_b = a^2 r_e$  - is the Bohr radius.

#### IV. CONCLUSION

Thus, such a mechanistic interpretation of Wheeler's concept makes it possible to construct the model of the electron that is free of contradictions. An electron is not a point formation and has a "hidden" mass, which moving determines its charge and spin. The charge nature lies in the medium (physical vacuum) own motion along the contour (current tube) connecting charged particles, and the spin nature lies in the medium vortex rotation motion relative to the contour longitudinal axis. The correctness of the proposed interpretation of the electron nature is confirmed by both the effective transformation of electromagnetic dimensions into mechanical ones, as well as the numerical determination of the charge value, the projection angle (Weinberg mixing angle) value, and the fact that the mass of the contour connecting charged microparticles and the total mass of bosons  $W^+$ ,  $W^-$ ,  $Z^0$  are close in value.

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