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Vladimir Gorunovich.

28.05.2011

V.A. Gorunovich, ELEMENTARY PARTICLES – THE SIGHT FROM WITHIN.

THE SUMMARY

Substantive provisions of the field theory of elementary particles are popularly stated.

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1. INTRODUCTION AND THE SPECTRUM

From experiments we authentically know that elementary particles have a constant electric field and a constant magnetic field. Besides elementary particles possess wave properties that is characteristic feature of a variable electromagnetic field. Thus, it is possible to assert that in elementary particles there is also a variable electromagnetic field.

But according to classical electrodynamics the variable electromagnetic field should move with a velocity of light. Hence, it rotates in an elementary particle with a velocity of light.

Let's unite a constant electric and constant magnetic field in a constant to a component of an electromagnetic field. Thus, we will receive the answer to a question «from what» - namely elementary particles consist of a variable electromagnetic field from a constant component. As to quarks with gluons and other fantastic objects – them anybody never in a free kind saw, and it is possible to search for what isn't present infinitely long.

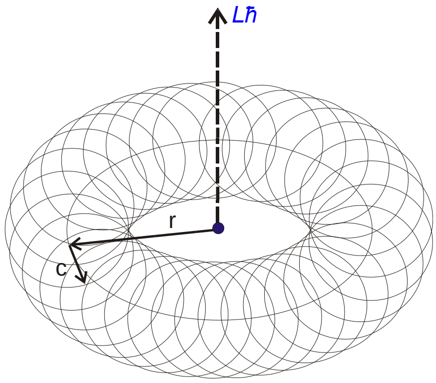

Figure 1 Schematic image of an elementary particle.

The law of preservation of an electric charge follows from classical electrodynamics. Hence, the electromagnetic field in an elementary particle should be polarized – differently this law of the nature all time would be broken. But the electric charge of elementary particles is quantized; hence, polarization will be quantized also.

Thus, rotation of an electromagnetic field can be carried out or in a plane of an electric component, or in a plane of a magnetic component. In the first case the pair of the charged particles ("particle" and «antiparticle), different a sign on an electric charge and a sign on the magnetic moment (to tell electric more precisely and magnetic water) will turn out. In the second case the pair of the neutral particles, different a sign on a magnetic field and a sign on dipolar electric field will turn out. As we see a **microcosm is the world of dipolar fields**.

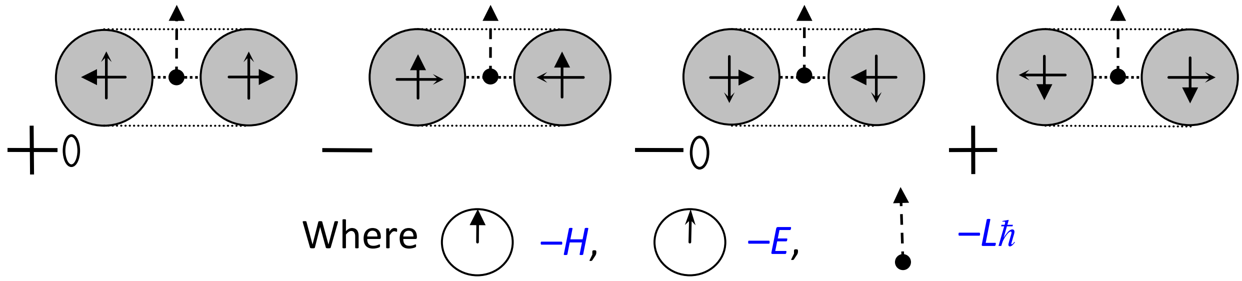

Figure 2 Cross-section of elementary particles (4 variants of polarization).

But fir-trees are the rotating weight should be and the rotary moment. The size of the rotating weight $m_{0\sim}$, speed of rotation is equal to a velocity of light (c) and average radius of rotation we name r. Then the rotary moment will be equal $m_{0\sim}cr$.

Has come it is time to connect the quantum mechanics. Quantize the rotary moment multiply $\hbar/2$ (where $\hbar$ - Planck's constant) also we will consider that particle backs (its rotary moment) can be result of several rotations. I.e. we enter new quantum number L – the main quantum number - the internal rotary moment of the elementary particle, accepting the following set of values:

$$L = 0;\ {}^{1}/_{2};\ 1;\ {}^{3}/_{2};\ 2;\ {}^{5}/_{2};\ 3;\ \ldots..$$

The given quantum number is responsible for division of elementary particles into groups.

But according to quantum mechanics one more quantum number M_L – the quantum number responsible for division of particles on subgroups and accepting following values is automatically entered also:

$ML = -L; -L+1; \ldots ; L-1; L$ - in total $2L+1$ value

Splitting on quantum number Q has been received earlier at discussion of polarization of an electromagnetic field.

$$Q = \pm e; \pm 0.$$

But elementary particles have still a rotary moment named spin. So at a photon (an elementary particle with zero weight of rest) quantum number L will be equal to zero and backs is equal 1. Hence, it is necessary to add the communication equation between the internal rotary moment and spin:

$$J = \begin{cases} 1 - L\ ; & L <= 1 \\ L - 1\ ; & L >= 1 \end{cases} \qquad (1)$$

As the theory field that weight of rest of an elementary particle (m_0), and also the gravitational field connected with it are defined by energy (W) the sums of electromagnetic fields.

$$m_0 = W/c^2 \qquad (2)$$

On the other hand the weight of rest of an elementary particle (m_0) consists of two making – weights of a rotating variable electromagnetic field ($m_{0\sim}$) and weights of constants electric and magnetic fields ($m_{0=}$).

The set from **three quantum numbers** L, M_L and Q unequivocally defines an elementary particle. But elementary particles with $L>0$ can be and in wild spirits, different from the core presence of the additional rotary moment (V). The additional rotary moment (V) is multiple $\hbar$, is the **fourth quantum number** and can accept the following set of values:

$$V = \begin{cases} 0;+1;+2;+3;\ \ldots \\ -1;\ \ldots\ ; \quad |V| <= |L| \end{cases} \qquad (3)$$

Where $V = 0$ means that the particle is basically (unexcited) a condition, the sign «+» means that directions of the additional rotary moment and the internal rotary moment coincide, and the sign «–» means that their directions are opposite.

Backs of the raised condition of an elementary particle can differ from a back of the basic condition, it is equal

$$J=\begin{cases}(L+V)-1; & (L+V)>=1\\ 1-(L+V); & (L+V)<=1\end{cases} \tag{4}$$

It is necessary to add that all transitions (reactions) between elementary particles, irrespective of their condition – the basic or raised, are carried out by means of other elementary particles and submit to laws of conservation of energy, an impulse, a back (the rotary moment), and also to laws of an electromagnetic field (the equations of Maxwell) as they are electromagnetic processes.

To receive a spectrum of elementary particles it is enough to substitute admissible values of quantum numbers. Any unitary symmetry, and also it is not necessary to

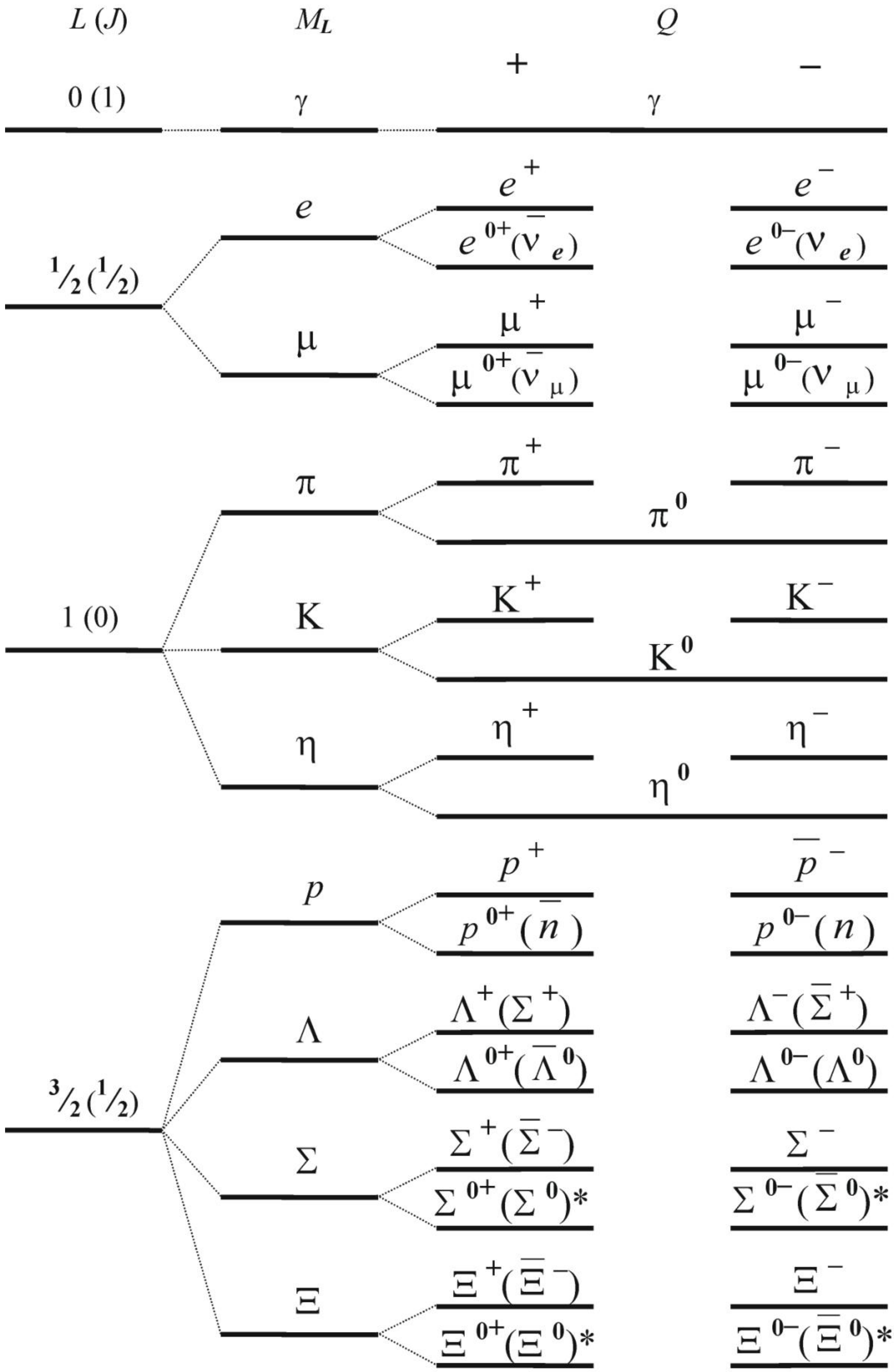

Figure 3 Fragment of a spectrum of the basic conditions of elementary particles (quantum number V=0).

*The symbol * marks elementary particles, the sign on which magnetic moment isn't established yet.*

As historical names of particles often don't correspond to the theory, in drawing the designation of power level corresponding to a particle (following of the theory), and then in brackets the historical name of a particle (if it differs) at first is given.

So, in the **base of the field theory of elementary particles has been put: the quantum mechanics (without virtual particles) and classical electrodynamics**. It was necessary to refuse virtual particles, as they deny action of laws of the nature and by that contradict classical electrodynamics.

According to a structure of elementary particles in their interactions it is possible to allocate two components: interactions of variable electromagnetic fields on which action of quantum mechanics and interaction of constants electric extends and magnetic fields on which action of classical electrodynamics extends.

2. STRUCTURE OF THE ELEMENTARY PARTICLE

2.1. Structure of a variable electromagnetic field

Diameter of cross-section section of a variable electromagnetic field (Figure 4) as well as radius of an elementary particle is defined by weight of a variable electromagnetic field and it is supposed equal $d=\hbar/m_{0\sim}c$. Hence, the section radius will be equal

$$r_d = \hbar/2m_{0\sim}c \tag{5}$$

Why the nature has again chosen Planck's constant – the reason for that the quantum mechanics which underlies a microcosm. As to multiplier on the one hand r_d should be no more r for any group of elementary particles, so and for leptons ($L={}^1/_2$). On the other hand such size r_d allows separating leptons from other groups of elementary particles.

Polarization of a variable electromagnetic field most likely coincides with polarization of the constant.

I don't offer any equations of a field. We will simply assume that there is some distribution of a variable electromagnetic field such that almost all its weight is concentrated in section with radius r_d and it rotates on average radius r_d.

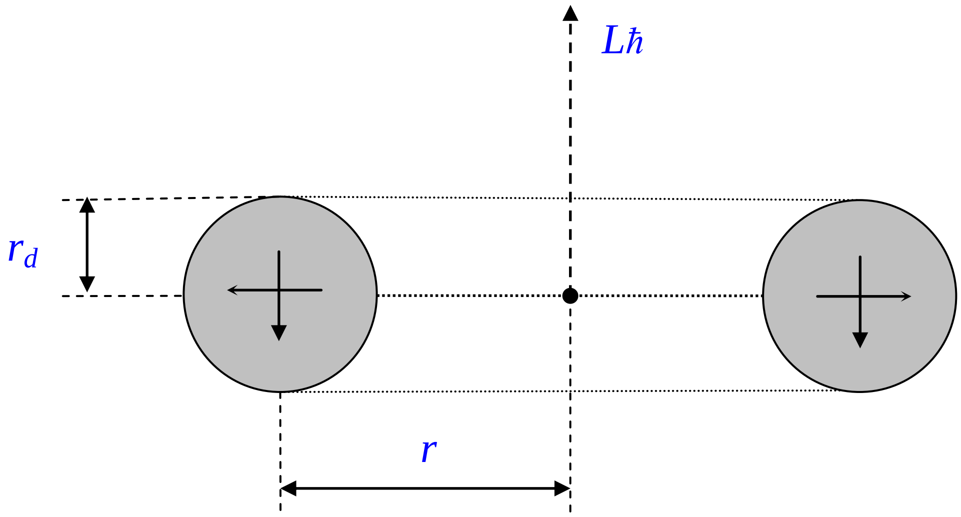

Figure 4 Cross-section of the charged elementary particle.

2.2. Structure of constant electric field

In drawings constant electric field charged (Figure 5) and neutral (Figure 6) elementary particles-antiparticles are schematically presented.

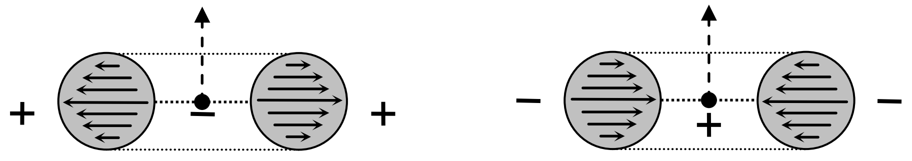

Figure 5 Cross-section of the charged elementary particles.

Figure 6 Cross-section of neutral elementary particles.

Constant electric field is created by the polarized sphere with power lines. Depending on polarization we will receive the charged elementary particle-antiparticle with a charge $\pm e$ or a neutral particle-antiparticle different signs on dipolar electric field. The charged elementary particles also possess dipolar electric field.

2.3. Structure of a constant magnetic field

In drawings the constant magnetic field charged (Figure 7) and a neutral (Figure 8) elementary particle is schematically presented.

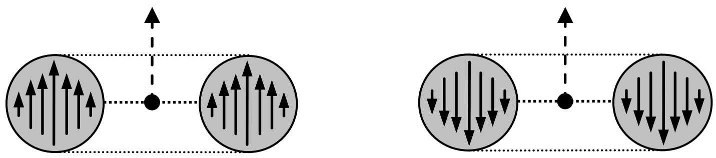

Figure 7 Cross-section of the charged elementary particles

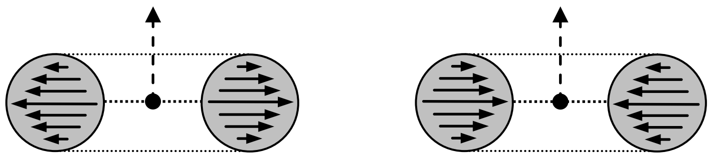

Figure 8 Cross-section of neutral elementary particles

The constant magnetic field is created by the polarized sphere with power lines. Depending on polarization we will receive a magnetic field of the charged elementary particle-antiparticle or a magnetic field of a neutral particle-antiparticle. The magnetic field of the charged elementary particle-antiparticle creates the magnetic moment of an order $\mu_L = eL\hbar/m_0c$. The Magnetic field of neutral particles presented on figure 8 doesn't create the magnetic moment. But neutral elementary particles have one more constant magnetic field creating the magnetic moment – a field of an internal ring current of radius $r=L\hbar/m_{0\sim}c$.

Unlike an electric charge the magnetic moments on a straight line aren't quantized.

3. STRUCTURE OF THE CHARGED ELEMENTARY PARTICLE

3.1. Structure of constant electric field

Constant electric field of the charged elementary particle consists of following areas (figure 9 see):

- ring area with the power lines generating a field, lying in a plane of rotation of a particle. Power lines are directed in parallel a plane of rotation of a particle. In this area the variable electromagnetic field rotates;
- other area - areas of an external and internal constant field of an elementary particle.

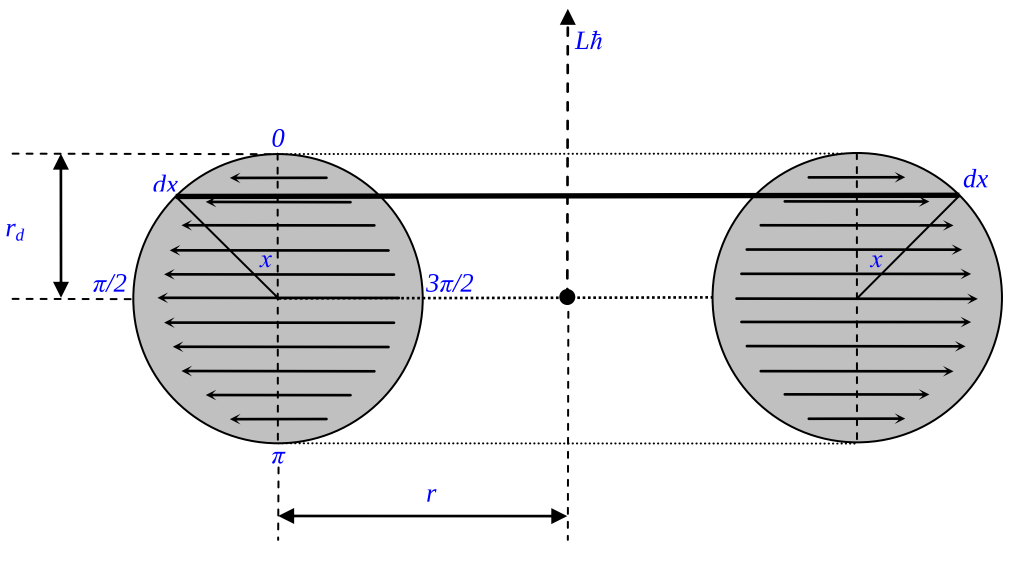

Figure 9 Cross-section of electric field of the charged elementary particle.

Thus, electric field is dipolar. The external field is created by an external hemisphere of ring area, and an internal field – an internal hemisphere.

The stream creating a constant field of an electric charge doesn't depend on an accessory of an elementary particle to this or that group (from quantum number L).

The area of a surface of an external hemisphere creating external electric field is equal

$$S_{+}= 2\pi^{2} \cdot r \cdot r_{d} + 4\pi \cdot r_{d}^{2} \tag{6}$$

In case of distribution 1 (when the stream is proportional to a thickness of a layer of a segment creating electric field) to it there corresponds a stream:

$$\Phi_{+}= \pi^{2} \cdot r \cdot r_{d} \cdot E_{m} + 8\pi/3 \cdot r_{d}^{2} \cdot E_{m} \tag{7}$$

E_m – the maximum intensity of electric field on a surface of ring area.

The area of a surface of an internal hemisphere creating internal electric field is equal

$$S_{-}= 2\pi^{2} \cdot r \cdot r_{d} - 4\pi \cdot r_{d}^{2} \tag{8}$$

The electric charge of an elementary particle is created by a difference of these areas ΔS (and accordingly a difference of streams $\Delta\Phi$) a geometrical figure arising owing to feature. For distribution 1 will be

$$\Phi_{-}= -\pi^{2} \cdot r \cdot r_{d} \cdot E_{m} + 8\pi/3 \cdot r_{d}^{2} \cdot E_{m} \tag{9}$$

Other distributions (are considered in the second part of the theory) aren't so important.

$$\Delta\Phi/\Delta S = (16\pi/3) \cdot r_{d}^{2} \cdot E_{m}/(8\pi \cdot r_{d}^{2})= 2/3 \cdot E_{m} \equiv e \tag{10}$$

The electric charge of an elementary particle doesn't depend on an accessory of an elementary particle to this or that group (from quantum number L) from its weight of rest. At the heart of the mechanism of quantization of an electric charge of elementary particles the geometry and a structure of elementary particles lie.

Dipolar electric charge

$$Q_d = \pm (3/4) \cdot e \tag{11}$$

3.2. Structure of a constant magnetic field

The constant magnetic field of the charged elementary particle consists of following areas:

– ring area with the power lines generating a field, lying in a plane of rotation of a particle (figure 10 see). Power lines are directed perpendicularly to a plane of rotation of a particle;

– areas of a field with the magnetic moment of an order $er = eL\hbar/m_0c$ (where: e – an elementary electric charge, r – radius of an elementary particle). The given field arises simultaneously with electric field, instead of owing to spin rotation of an electric charge.

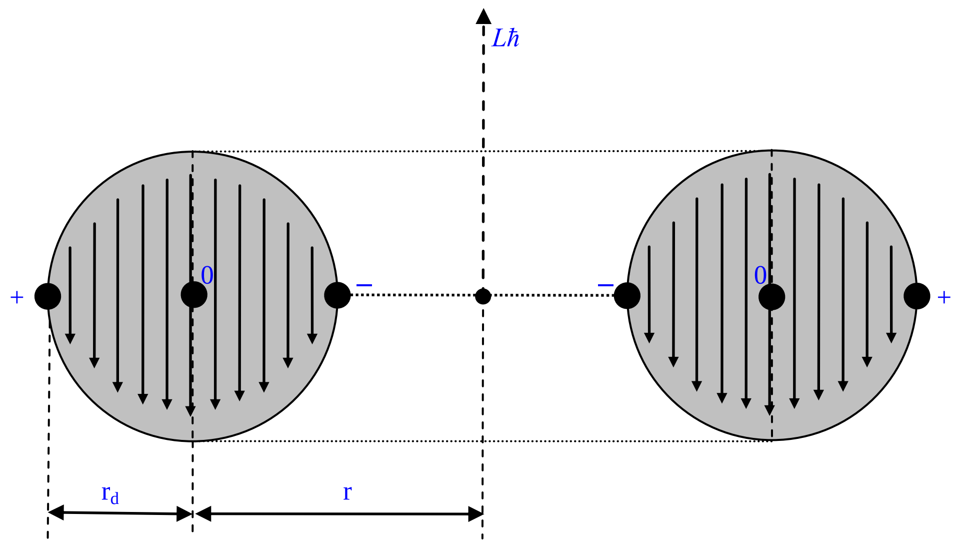

Figure 10 Cross-section of a magnetic field of the charged elementary particle.

As well as in case of electric field, intensity of a magnetic field is proportional to a thickness of a layer of a segment creating a field. Thus, the intensity maximum is reached in the top and bottom points of ring area. We will assume that there is such distribution of currents.

The magnetic field of the charged elementary particle basically is created by two distributed currents (+ and –), lying in a plane of the particle, identical size, average radiuses ($r + r_d$) and ($r - r_d$) and an opposite direction.

The magnetic dipolar moment of an external current (we name it μ_{L+}) is equal

$$\mu_{L+} = (I/c) \cdot \pi \cdot (r + r_d)^2 = (I/c) \cdot \pi \cdot r_d^2 \cdot (2L + 1)^2 \quad (12)$$

Similarly magnetic dipolar moment of an internal current (we name it μ_{L-}) is equal

$$\mu_{L-} = (I/c) \cdot \pi \cdot (r - r_d)^2 = (I/c) \cdot \pi \cdot r_d^2 \cdot (2L - 1)^2 \quad (13)$$

The magnetic dipolar moment of a particle as a whole μ_L is equal to their difference

$$\mu_L = (I/c) \cdot \pi \cdot r_d^2 \cdot [(2L + 1)^2 - (2L - 1)^2] = (I/c) \cdot 8\pi \cdot L \cdot r_d^2 \equiv eL\hbar/ m_0c \quad (14)$$

Now it is possible to express μ_{L+} and μ_{L-} through μ_L.

For reception of the definitive magnetic moments of currents it is necessary to consider two more factors.

First: the Size of the magnetic moment of an elementary particle is defined by quantum numbers L and M_L. Therefore the size of the magnetic moments of currents is necessary for increasing by function

$$1 + f_e(M_L,L) \approx 1 + [1- (|M_L|/L)^{L/2}]/2L \quad (15)$$

For simplicity it is possible to consider $f_e(M_L,L)=0$, when $|M_L|=L$ (for a proton, electron and a muon).

Secondly: the Size of the magnetic moment of an elementary particle is defined by percent of energy concentrated in a variable electromagnetic field. Thus, the received value is necessary for increasing by the relation $m_{0\sim}/m_0$.

As a result we will receive:

$$\mu_{L+} = m_{0\sim}/m_0 \cdot (1 + f_e(M_L,L)) \cdot [(2L+1)^2/8L]\cdot eL\hbar/m_0c \qquad (16)$$

$$\mu_{L-} = m_{0\sim}/m_0 \cdot (1 + f_e(M_L,L)) \cdot [(2L-1)^2/8L]\cdot eL\hbar/m_0c \qquad (17)$$

the charged elementary particles besides have a magnetic field created by spin rotation. Its magnetic moment is equal

$$\mu_0 = (I_0/c) \cdot \pi \cdot r^2 \cdot J = 0.0265\cdot J\ e\hbar/m_0c \qquad (18)$$

And it can be considered as an additive to the magnetic moments of external and internal currents. The given size of the magnetic moment is taken from calibration for the magnetic moment electron. Probably, further it will be specified.

The total magnetic dipolar moment of a particle as a whole μ_L is equal

$$\mu_L = (m_{0\sim}/m_0 \cdot (1 + f_e(M_L,L)) \cdot L + 0,0265\cdot J)\ e\hbar/\ m_0c \qquad (19)$$

4. STRUCTURE OF THE NEUTRAL ELEMENTARY PARTICLE

4.1. Structure of constant electric field

Constant electric field of a neutral elementary particle (*Q=0*) consists of following areas:

- ring area with the power lines generating a field, lying in a plane of rotation of a particle (figure 11 see). Power lines are directed perpendicularly to a plane of rotation of a particle. In this area the variable electromagnetic field rotates;
- areas of a zero external constant field had on distances much more radius of an elementary particle;
- areas of an internal constant field had on distances of an order of radius of the elementary particle consisting of two symmetric zones with an opposite sign, divided by a plane of rotation of a particle.

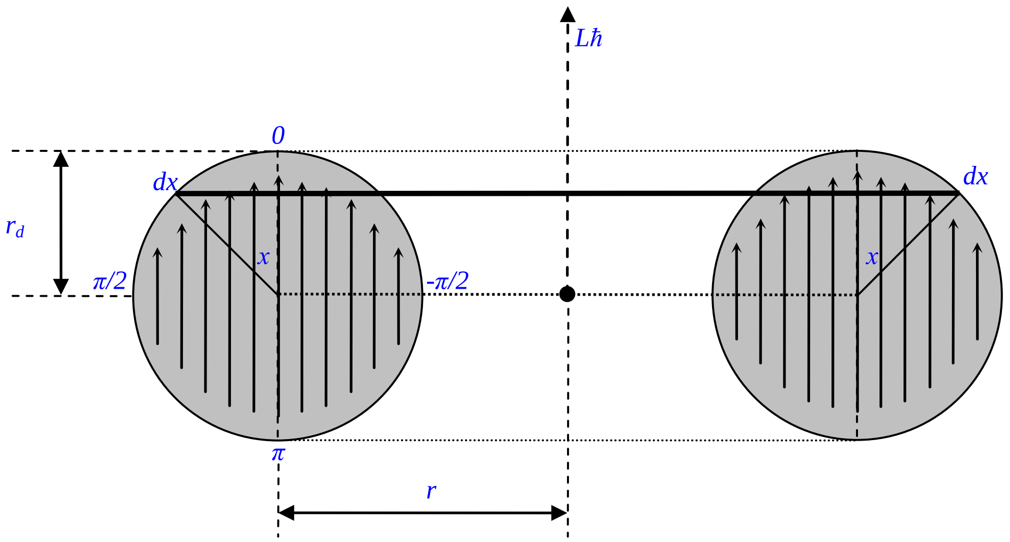

Figure 11 Cross-section of electric field of a neutral elementary particle.

Thus, electric field is dipolar. The top field is created by the top hemisphere of ring area, and the bottom field – the bottom hemisphere.

The area of a surface of the top hemisphere creating the top electric field is equal

$$S_+ = \int_{-\pi/2}^{+\pi/2} ds = 2\pi \cdot r \cdot r_d \cdot \int_{-\pi/2}^{+\pi/2} dx + 2\pi \cdot r_d^2 \cdot \int_{-\pi/2}^{+\pi/2} \sin(x)\, dx = 2\pi^2 \cdot r \cdot r_d + 0 \quad (20)$$

Similarly the area of a surface of the bottom hemisphere creating the bottom electric field is equal

$$S_- = \int_{+\pi/2}^{+3\pi/2} ds = 2\pi \cdot r \cdot r_d \cdot \int_{+\pi/2}^{+3\pi/2} dx + 2\pi \cdot r_d^2 \cdot \int_{+\pi/2}^{+3\pi/2} \sin(x)\, dx = 2\pi^2 \cdot r \cdot r_d + 0 \quad (21)$$

The total stream of electric field created by the top hemisphere in case of the considered distribution is equal

$$\Phi_+ = 2\pi \cdot r \cdot r_d \cdot E_m \cdot \int_{-\pi/2}^{+\pi/2} \cos^2(x)dx + 2\pi \cdot r_d^2 \cdot E_m \cdot \int_{-\pi/2}^{+\pi/2} \cos^2(x) \cdot \sin(x)dx = \pi^2 \cdot r \cdot r_d \cdot E_m + 0 \quad (22)$$

Similarly, the total stream of electric field created by the bottom hemisphere is equal

$$\Phi_- = -\{2\pi \cdot r \cdot r_d \cdot E_m \cdot \int_{+\pi/2}^{+3\pi/2} \cos^2(x)dx + 2\pi \cdot r_d^2 \cdot E_m \cdot \int_{+\pi/2}^{+3\pi/2} \cos^2(x) \cdot \sin(x)dx\} = -\pi^2 \cdot r \cdot r_d \cdot E_m + 0 \quad (23)$$

The electric charge of an elementary particle created by a difference of these areas (and accordingly a difference of streams) is always equal to zero as

$$\Delta S = S_+ - S_- = 0 \quad (24)$$

$$\Phi_+ = \Phi_d \quad (25)$$

$$\Phi_- = -\Phi_d \quad (26)$$

The constant electric dipolar field is available.

The dipolar electric charge is defined by the relation Φ_d to S_d. For the first distribution will be

$$\Phi_d/S_d = \pi^2 \cdot r \cdot r_d \cdot E_m /(2\pi^2 \cdot r \cdot r_d) = 1/2 \cdot E_m \qquad (27)$$

Or having substituted value for e received at calculation of electric field of the charged elementary particles, we will receive

$$Q_d = \pm\, (3/4) \cdot e \qquad (28)$$

The same value as for the charged elementary particles has turned out.

Other distributions (are considered in the second part of the theory) aren't so important.

As won't seem strange, but neutral elementary particles also possess electric field and accordingly dipolar electric charges. On the big distances this field is imperceptible, if don't guess their existence.

4.2. Structure of a constant magnetic field

The magnetic field of a neutral elementary particle ($Q=0$) consists of following areas:

– ring area with the power lines generating a field, lying in a plane of rotation of a particle (figure 12 see). Power lines are directed in parallel a plane of rotation of a particle;
– areas of an external field had on distances much more radius of an elementary particle;
– areas of an internal field had on distances of an order of radius of an elementary particle.

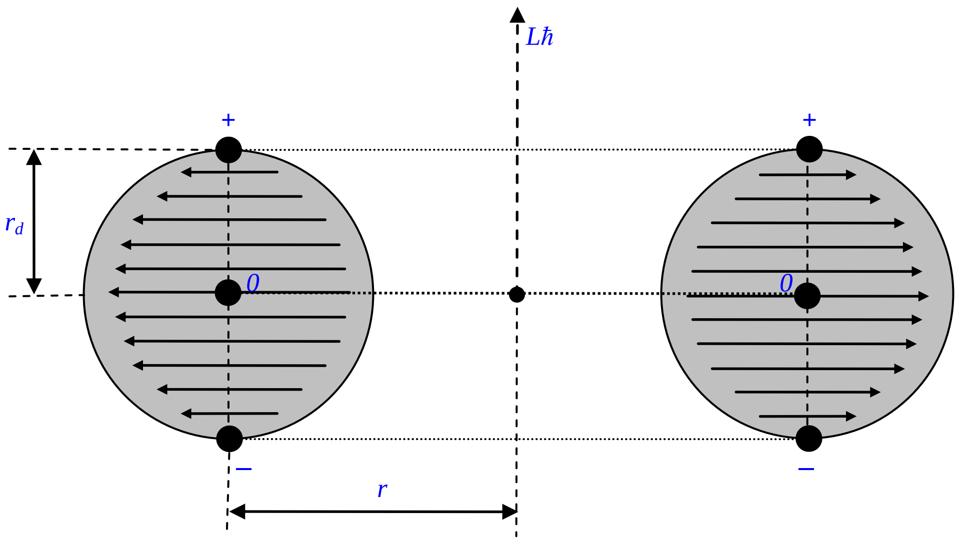

Figure 12 Cross-section of a magnetic field of a neutral elementary particle.

As well as in the previous cases, intensity of a magnetic field created by a segment is proportional to a thickness of a layer of a segment. Thus, the intensity maximum is reached in a particle plane. We will assume that there is such distribution of currents.

The magnetic field of a near zone of a neutral elementary particle is created by two distributed parallel currents (+ and –), with distance to a particle plane equal (r_d), identical size, average radiuses (r) and an opposite direction.

The magnetic dipolar moment of the top current (we name it μ_{L+}) is equal

$$\mu_{L+} = (I/c) \cdot \pi \cdot r^2 = (I/c) \cdot \pi \cdot r_d^{\,2} \cdot (2L\,)^2 \tag{29}$$

Similarly magnetic dipolar moment of the bottom current (we name it μ_{L-}) is equal

$$\mu_{L-} = (-I/c) \cdot \pi \cdot r^2 = -\,(I/c) \cdot \pi \cdot r_d^{\,2} \cdot (2L)^2 \tag{30}$$

Both these of the magnetic moment are equal on size and is differ only a sign.

The magnetic dipolar moment of a particle as a whole is created by an internal ring current (0) radiuses (r) and is equal

$$\mu_0 = (I_0/c) \cdot \pi \cdot r^2 = f_0(M_L,L) \cdot e\hbar/m_0c \qquad (31)$$

This current creates an external magnetic field of a neutral elementary particle which is measured by means of devices. $f_0(M_L,L)$ it is possible to define function by means of quantum mechanics. As the simplified approximate replacement it is possible to use the following sedate function:

$$f_0(M_L,L) \approx (|M_L|/L)^{L/2} \cdot M_L/|M_L| \qquad (32)$$

At neutron $M_L = -(3/2)$ and $L = (3/2)$ therefore the magnetic moment is equal $-e\hbar/m_{0n}c$ (increased by percent of energy concentrated in a variable electromagnetic field). At Λ^0 hyperon $M_L = -(1/2)$ and, hence, the magnetic moment will be approximately equal $-0.5 \cdot e\hbar/m_{0\Lambda}c$ (the energy percent here will be another). While there are no sufficient experimental data that it was possible to check up or specify dependence of the magnetic moment on quantum numbers.

As the size of the magnetic moment of an elementary particle is defined by percent of energy concentrated in a variable electromagnetic field the received value is necessary for increasing by the relation $m_{0\sim}/m_0$.

Now we can express μ_{L+} and μ_{L-} through $eL\hbar/m_0c$ received for the charged elementary particles considering $f_0(M_L,L)$.

$$\mu_{L+} = m_{0\sim}/m_0 \cdot f_0(M_L,L) \cdot [(I/c) \cdot \pi \cdot r_d^2 \cdot (2L)^2]/[(I/c) \cdot 8\pi \cdot L \cdot r_d^2] \cdot eL\hbar/m_0c = m_{0\sim}/m_0 \cdot f_0(M_L,L) \cdot \ (L^2/2) \cdot e\hbar/m_0c \qquad (33)$$

$$\mu_{L-} = -\, m_{0\sim}/m_0 \cdot f_0(M_L,L) \cdot [(I/c) \cdot \pi \cdot r_d^2 \cdot (2L)^2]/[(I/c) \cdot 8\pi \cdot L \cdot r_d^2] \cdot eL\hbar/m_0c = -\, m_{0\sim}/m_0 \cdot f_0(M_L,L) \cdot (L^2/2) \cdot e\hbar/m_0c \qquad (34)$$

It is necessary to substitute quantum number L to receive the magnetic moments of the currents creating a constant magnetic field of neutral elementary particles.

5. FIELDS OF ELEMENTARY PARTICLES

As a part of each elementary particle (except a photon) are available:

– A dipolar constant electric field;

– A dipolar constant magnetic field;

– A variable electromagnetic field.

First two fields don't rotate and submit to laws of classical electrodynamics. They define an electric charge and the magnetic moment.

The variable electromagnetic field continuously rotates on a radius ring $r=L\hbar/m_{0\sim}c$ with a velocity of light and submits to the quantum mechanics. It defines the sizes of elementary particles, sizes of electric charges and currents. It is responsible for all casual events and likelihood processes.

Classical electrodynamics in turn allows to calculate interactions of constants electric and magnetic fields and to calculate the amendment to size of the magnetic moment. The magnetic moment of elementary particles is generally quantized according to quantum mechanics. But for reception of real size it is necessary to increase quantum value by a parity $m_{0\sim}/m_0$. And classical electrodynamics allows to calculate the energy containing in constant electric and magnetic fields, so also weight of this field $m_{0=}$.

As we see the quantum mechanics and classical electrodynamics in a microcosm supplement each other. It is possible to look at results of their joint activity in chapter 5 of the second part of the theory.

Vladimir Gorunovich

12.05.2011