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Review

The magnetic moment of elementary particles is studied by space vector and space curvature

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This paper reaffirms the basic agreement of the material space theory: (1) Space is a physical existence; (2) "Force" is the action to space, and "force" is equal to the reciprocal value of "time"; in the absence of special description, "force" is the reciprocal of time; (3) There is a steady velocity field in three-dimensional space, whose intensity is the speed of light C; (4) Mass is a property of space produced by force acting on space, there are one-dimensional to four-dimensional masses in the universe, which correspond to velocities, light, electricity and gravitational masses; (5) The "causality principle" of physical changes; (6) The "simplicity principle" of physical changes; (7) The micro world and the macro world follow the same legal system. In this paper, magnetic field and electric field are defined respectively from space vector and space curvature. Studied the properties of magnetic and electric fields. This paper studies the properties of magnetic and electric fields, and in the field of micro electromagnetic interaction are described. Based on the basic principle of the material space theory, this paper proposes a method to calculate the spin magnetic moment of electrons and protons by using the magnetic field strength, and calculates the spin magnetic moment of protons and electrons under specific parameters. The calculated spin magnetic moment of the proton is 4.04035412*10-26J/T, it is close to the reported value of 1.41049964*10-26J/T, the spin magnetic moment of electrons is 6.69044591*10-27 J/T, which is far from the reference value of 9.28674762*10-24J/T, However, if the radius of the electron charge is set as 1.553794368*10-15m, the spin magnetic moment of the electron will be consistent with the reported value in the literature. The research results show that when the magnetic moment of elementary particles is known, the spatial structure of the charge of elementary particles can be calculated by using the method in this paper. This also provides an experimental method to verify the correctness of the proposed method.

Key words: Space vector, space curvature, magnetic moment, spin, electron, proton.

INTRODUCTION

Magnetism is a widespread natural phenomenon, magnetism is widely used in our work and life. We know that all substances, have magnetic, we now know that the magnetism of matter results from the magnetism of elementary particles, in scientific research, magnetism is a physical quantity that can be precisely measured.

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Predecessors have made fruitful achievements in the study of magnetism, and 15 people have won the Nobel Prize in physics for studying the magnetic properties of matter.

In the study of magnetism, a magnetic physical quantity that can be directly measured is the magnetic moment, as for the measurement of magnetic moment of elementary particles (Odom et al., 2006), Otto Stem first used molecular beam method to observe the magnetic moment of protons (Taub and Kusch, 1978) and achieved success. Some research results of proton magnetic moment have been reported in Shirley and Lederer (1978); Sanders and Turberfield (1963) and Ulmer et al. (2014), Isidor I. Rabi established a new method for measuring nuclear magnetic moment and atomic magnetic moment by using the improved molecular beam - magnetic resonance method (John, 2005; Isidor and Otto, 1944), which laid a foundation for the establishment of more accurate condensed NMR methods in the future. Building on the work of Willis, Kusch and others, Polykarp Kusch and his collaborators used improved magnetic resonance technology to precisely measure the magnetic moment of an electron, winning the 1955 Nobel Prize in physics. Measurement method of electronic magnetic moment is magnetic resonance method, Polykarp Kusch and his collaborators first completed the accurate measurement of the electron magnetic moment. The current accurate measurement is: g/2=1.001 159 652 180 73 (28) (Hanneke et al., 2008, 2009). Because the measured result is different from the predicted value of quantum mechanics, it is called anomalous magnetic moment. Isidor I. Rabi improved molecular beam - magnetic resonance (NMR) method is used to establish the method of measuring nuclear magnetic moment.

In the paper published by Haitao (2019) the forms of electromagnetic interaction in the micro field from different perspectives were discussed. One is to define the magnetic field strength and electric field strength of electric charge under the framework of the material space theory (HaiTao, 2018) through the property of space vector, and obtain the expression of electromagnetic interaction force. The other is based on the principle of differential geometry (Spivak, 1979). By using the description of the relationship between curved space and force by general relativity (Carmeli, 1982), the magnetic field strength and electric field strength of charge are defined by the curvature and winding rate of space. The two definitions are consistent in terms of magnetic field strength and magnetic field interaction, but differ by one inverse of the time factor in terms of electric field strength and electric field interaction. In this paper, the author will use the above two definitions to discuss the forms of electromagnetic interaction in the microscopic field by comparing the calculated magnetic moment of electrons and protons with the measured results. For the first time to understand the readers convenient reading of the material space theory, we restate the material space theory of the basic agreement:

(1) Space is a physical existence;
(2) "Force" is the action to space, and "force" is equal to the reciprocal value of "time"; in the absence of special description, "force" is the reciprocal of time;
(3) There is a steady velocity field in three-dimensional space, whose intensity is the speed of light C.
(4) Mass is a property of space produced by force acting on space, There are one-dimensional to four-dimensional masses in the universe, which correspond to velocities, light, electricity and gravitational masses.
(5) The "causality principle" of physical changes.
(6) The "simplicity principle" of physical changes.
(7) The micro world and the macro world follow the same legal system.

The electromagnetic interaction in the microscopic field is expressed through the properties of space vectors

Description of electric charge in material space theory

Material space theory defines three-dimensional mass as electric charge, and its space description and mass expression are as follows:

In the material space theory, three-dimensional mass is defined as electric quantity. In the material space theory, three-dimensional mass is the space field of cylindrical spiral structure, whose field equation structure can be described as:

$$f(x,\ y,\ z) = \begin{cases} x \cdot F_S = C \\ y = a_0 \cdot \sin(b_0 \cdot \alpha) \\ z = a_0 \cdot \cos(b_0 \cdot \alpha) \end{cases} \sim \textbf{3D sine} \quad (1)$$

$$f(x,\ y,\ z) = \begin{cases} x \cdot F_S = C \\ y = a_0 \cdot \cos(b_0 \cdot \alpha) \\ z = a_0 \cdot \sin(b_0 \cdot \alpha) \end{cases} \sim \textbf{3D cosine} \quad (2)$$

The expression of three-dimensional mass is:

$$Q_S = C \cdot \pi \cdot {b_0}^2 \cdot {a_0}^2 \quad (3)$$

Magnetic field with electric charge

Add the space vectors of electric quantity, and we get a new vector r, which can be expressed as follows:

$$\mathbf{r} = \mathbf{y} + \mathbf{z} \quad (4)$$

According to the parallelogram rule of vector addition and parametric equations of the vector r is a circle equation, and the sagittal curve represents a circle. According to the relationship between the sagittal curve is drawn in the opposite direction (counterclockwise and clockwise). When the two space vectors are added, they are multiplied by the velocity vector. The multiplication method of the vector is cross product. We get a new vector:

$$\mathbf{B} = \mathbf{C} \times \mathbf{r} \quad (5)$$

The vector B and C & r conform to the right-handed spiral relationship, and are in the same direction as the tangent line of the sagittal curve of the space vector r. We define vector B as the magnetic vector of a three-dimensional mass, and the intensity of the field is the intensity of the magnetic field. The unit of magnetic field intensity is: m^2/s. Since the vector r is a variable vector whose direction extends to the rotation of the circle with radius r, the magnetic field intensity vector is also a variable vector whose direction extends to the tangential rotation of the circle with radius r.

We can find that the vector field made up of magnetic field intensity is a vector field with curl. We integrate the circle l of the vector B with radius r, and then ratio it to the circle area S. When the limit of the circle area is 0, the curl of the vector B field can be obtained as:

$$\nabla \times \mathbf{B} = \lim_{s\to 0} \frac{\oint_l \mathbf{B} dl}{S} \quad (6)$$

Electric field of electric quantity

After entering the three-dimensional space, the three-dimensional mass interacts with the inherent one-dimensional mass field in the three-dimensional space. The curl vector of the three-dimensional mass magnetic field B interacts with the one-dimensional mass field C in the three-dimensional space. The inherent one-dimensional mass field in three-dimensional space is a steady field. We can apply the inherent one-dimensional mass in three-dimensional space as the quantity. Therefore, the result of the action will produce a new vector field:

$$\mathbf{E} = (\nabla \times \mathbf{B})\mathbf{C} = \mathbf{C} \lim_{s\to 0} \frac{\oint_l \mathbf{B} dl}{S} \quad (7)$$

We define the vector field E as the electric field of the three-dimensional mass, and the field intensity as the electric field intensity.
The unit of electric field intensity is: m^2/s^2. The electric field intensity is generated by the curl of the magnetic field intensity, so the electric field is a source field. The source field can be expressed as the gradient of a scalar function, so the following formula is true:

$$\mathbf{E} = -\nabla \varphi \quad (8)$$

We define a function φ as a potential function of the electric field E. So what we are talking about here is in the microscopic domain, the properties of a three dimensional mass entering three dimensional space, and obviously, this property is generated in the form of a vector field, Therefore, it can be considered that after entering three-dimensional space, three-dimensional mass will have intrinsic properties of magnetic field intensity and electric field intensity, and the properties of magnetic field intensity and electric field intensity are determined by the spatial structure of three-dimensional mass and combined forces.

Single three-dimensional mass

For a single three-dimensional mass, its magnetic field intensity and electric field intensity are calculated as follows:

Suppose: the spiral radius of the three-dimensional mass is r, and can be obtained from Equation 21:
The magnetic field intensity is:

$$\mathbf{B} = \mathrm{C}\mathrm{r} \quad (9)$$

The curl of the magnetic field is:

$$\nabla \times \mathbf{B} = \lim_{s\to 0} \frac{\oint_l \mathbf{B} dl}{S} = \frac{2\pi r B}{\pi r^2} = \frac{2B}{r} = 2C \quad (10)$$

The electric field intensity is:

$$\mathbf{E} = (\nabla \times \mathbf{B})\mathbf{C} = 2C^2 \quad (11)$$

The above results are the intensity of magnetic field and electric field generated by the space with a three-dimensional mass density of 1. When the density coefficient of three-dimensional mass is b_0, the intensity of magnetic field and electric field need to be multiplied by b_0^2, so the formula for the intensity of magnetic field and electric field of a single three-dimensional mass is:

$$\mathbf{B} = b_0^2 \mathrm{C}\mathrm{r} \quad (12)$$

$$\mathbf{E} = 2b_0^2 C^2 \quad (13)$$

The above magnetic field intensity and electric field intensity are the intensity of three-dimensional mass surface and the intensity of their source. As we can see, the electric field intensity is not related to the spatial measurement of three-dimensional mass, but related to

the density coefficient of three-dimensional mass. The magnetic field intensity is related to the spatial structure of three-dimensional mass, and is also related to the density coefficient of three-dimensional mass.
Suppose: spherical space with radius r has a three-dimensional mass, then the divergence of electric field of three-dimensional mass can be expressed as follows:

$$\nabla \cdot \mathbf{E} = \lim_{V \to 0} \frac{\oiint_S \mathbf{E} dS}{V} = \frac{4\pi r^2 E}{\frac{4}{3}\pi r^3} = \frac{6b_0^2 C^2}{r} \quad (14)$$

According to the properties of vector field, we can get:

$$\nabla \cdot \mathbf{B} = \mathbf{0} \quad (15)$$

$$\nabla \times \mathbf{E} = \mathbf{0} \quad (16)$$

From the above discussion, we can see that electric field and magnetic field are intrinsic properties of the existence of three-dimensional mass in three-dimensional space, and their properties do not depend on the external environment to change. Three-dimensional mass itself has both the properties of electric field and magnetic field, and we call the source of these properties charge, because the first property we can observe is the property of electric field, and when the three-dimensional mass moves, we can observe the property of magnetic field.

Definition of current

3d mass has velocity v. After entering 3d space, the direction of motion is opposite to the direction of the electric field of 3d mass, and the following equation can be found:

$$\mathbf{i} = \boldsymbol{B} \times \boldsymbol{v} \quad (17)$$

Let's define **i** as the current intensity of the moving three dimensional mass. The unit of current intensity is m^3/s^2(C•1/s). It should be noted here that the definition of current intensity was wrong in the previous articles published by Haitao (2019), which should be corrected here.

Calculate the magnetic moment of electron and proton through the characteristics of space vector

Magnetic moment of spin of electron outside nucleus

According to the definition of magnetic moment:

$$\boldsymbol{\mu} = \boldsymbol{i} \times \boldsymbol{S} \quad (18)$$

$\boldsymbol{i}$ ～ toroidal current intensity vector, S ～ toroidal current area vector. The structure of the electron outside the nucleus of the ground state hydrogen atom calculated by the material space theory is as follows:

The radius r of the electron charge is $1.39291308*10^{-16}$m, and the height H is $3.456377266*10^{-16}$m. The electron charge is a cylindrical spiral surrounded by a cylindrical space, and the density coefficient of the charge is: b_0=7899.

The electric field direction of the electron charge in the hydrogen atom is coaxial with the electric field direction of the proton charge in the hydrogen atom nucleus. Therefore, the spin magnetic moment of the electron is:

$$\boldsymbol{\mu}_{自旋} = \boldsymbol{i} \times \boldsymbol{S} = \boldsymbol{B} \times \boldsymbol{v} \times \boldsymbol{S} = (b_0^2 \mathrm{Cr}) \times \boldsymbol{v} \times \boldsymbol{S}$$

In three-dimensional space, the boundary of electron charge has a constant velocity field C. Taking the spin velocity of electron as C and the spin radius as the radius of charge, we can get:

$$\mu_e = i \times S = B \times v \times S = \pi b_0^2 \mathrm{C}^2 \mathrm{r}^3 = 4.76110277 * 10^{-23}\ m^5/_{s^2}$$

In material space theory, electric quantity unit has the following conversion relationship:

$$1\, m^3/_s = 1.405230307 * 10^{-4} C$$

Converted to standard physical units:

$$\boldsymbol{\mu}_e = \boldsymbol{i} \times \boldsymbol{S} = \boldsymbol{B} \times \boldsymbol{v} \times \boldsymbol{S} = \pi b_0^2 \mathrm{C}^2 \mathrm{r}^3 = 6.69044591 * 10^{-27}\ \mathrm{J/T}$$

Magnetic moment of proton

The charge parameters of protons calculated by material space theory are as follows:

The radius r of the positive charge is $8.4117893*10^{-16}$m, and the height H is $2.0873379*10^{-15}$m. The proton charge is a cylindrical spiral enclosed in the cylindrical space, and the density coefficient of the proton charge is b_0=1308. Similarly, the spin magnetic moment of proton can be calculated as:

$$\boldsymbol{\mu}_P = \boldsymbol{i} \times \boldsymbol{S} = \boldsymbol{B} \times \boldsymbol{v} \times \boldsymbol{S} = \pi b_0^2 \mathrm{C}^2 \mathrm{r}^3 = 4.04035413 * 10^{-26}\ \mathrm{J/T}$$

Electromagnetic interactions in microscopic fields are expressed through properties of spatial curvature and winding rate

Spatial curvature and winding rate of 3d mass

General relativity describes the gravitational forces generated by curved space, according to the results of the material space theory, the forces generated by the deformation of space, is a representation of the curvature of space, So electromagnetic interaction should also be a representation of the changing shape of space, electromagnetic interaction is the interaction between three dimensional masses in the material space theory, Next, we describe the interaction between three dimensional masses from the perspective of space curvature.

As can be seen from Equations 1 and 2, the three-dimensional space of mass is a three-dimensional space enclosed by a cylinder spiral. The Gaussian curvature of the cylinder of the cylinder spiral is zero, and we cannot use Gaussian curvature to describe the properties of electromagnetic field. Therefore, we use the space curve of the cylinder spiral to describe the properties of the electromagnetic field, but we should note that the three-dimensional mass is the field quantity of the three-dimensional space enclosed by the cylinder spiral, rather than the cylinder spiral itself.

By using the method of differential geometry, the basic triangulation of cylindrical spiral is established. Then, cylindrical spiral has curvature and winding rate. The curvature direction is consistent with the normal direction of the magnetic field of the three-dimensional mass, and the winding rate is consistent with the electric field direction of the three-dimensional mass. Therefore, we can describe the magnetic field of the three-dimensional mass with the curvature of the cylinder spiral, and describe the electric field of the three-dimensional mass with the winding rate of the cylinder spiral. As can be seen from Equation 1 or Equation 2, a three-dimensional mass consists of three vectors, two pure space vectors and a one-dimensional mass vector. We cross two pure space vectors, multiply them by the magnitude of the one-dimensional mass, and we get a vector of the three-dimensional mass, its module is the three-dimensional mass, its direction, and the right hand spiral relationship formed by two pure space vectors:

$$\mathbf{Q} = \pm|\boldsymbol{C}|(\mathbf{y} \times \mathbf{z}) \tag{19}$$

We define Q as three dimensional mass ~ electric quantity. The electric quantity Q cross the curvature of the spiral of the cylinder, and we get another vector:

$$\boldsymbol{B} = \mathbf{Q} \times \mathbf{K} \tag{20}$$

We define vector B as the magnetic field intensity of the three-dimensional mass, and we see that vector B is a vector that forms a right-handed spiral relationship with the electric quantity vector and the curvature vector, pointing in the tangent direction of the spiral of the cylinder. Equation 1 is written as follows:

$$f\ (x,\ y,\ z) = \begin{cases} x = \frac{C}{F_S}\frac{b_0\alpha}{b_0\alpha} \\ y = R\sin b_0\alpha \\ z = R\cos b_0\alpha \end{cases} \tag{21}$$

Then, the curvature of the cylinder spiral is:

$$\boldsymbol{K} = \frac{\boldsymbol{R}}{\boldsymbol{R}^2 + \left(\frac{C}{F_S b_0 \alpha}\right)^2} \tag{22}$$

The winding rate of cylindrical spiral is:

$$\boldsymbol{\tau} = \frac{\frac{C}{F_S b_0 \alpha}}{\boldsymbol{R}^2 + \left(\frac{C}{F_S b_0 \alpha}\right)^2} \tag{23}$$

By multiplying the vector modulus of the three-dimensional mass times the winding rate of the spiral of the cylinder, we get the new vector:

$$\boldsymbol{E} = \pm|\mathbf{Q}|\boldsymbol{\tau} \tag{24}$$

We define E to be the electric field intensity of a three dimensional mass. We can see from the properties of magnetic field vector and electric field vector that the magnetic field vector is a variable vector whose direction changes along the tangent line of the spiral of a cylinder. It is a vector with circular symmetry. For a complete three-dimensional mass, the sum of the magnetic vectors is zero. The electric field vector, which is opposite or identical to the direction of the one-dimensional mass, is a fixed vector.

Interaction of three dimensional mass magnetic fields

When two stationary three dimensional masses exist in three dimensional space, their respective magnetic vector sum is zero, so there is no interaction. When two three-dimensional masses are moving at a relative velocity v, the cross product of the magnetic vector and the velocity vector and the magnitude of the other magnetic vector will generate a new vector:

$$\boldsymbol{F_B} = |\boldsymbol{B_1}|\mathbf{V} \times \boldsymbol{B_2} = \boldsymbol{B_1} \times \mathbf{V}|\boldsymbol{B_2}| \tag{25}$$

Equation 25 is the interaction force between moving charges. According to the right-handed spiral relationship, we can see that when the charges are the same, the force is positive, which is the attraction; when the charges are opposite, the force is negative, which is the repulsive force. Formula 25 is the ampere law in the micro field. By extending formula 25 to the macro field, the ampere law of electromagnetism can be obtained.

Interaction of three dimensional mass electric fields

When two static three-dimensional masses exist in three dimensional space, they have their own electric field vectors, which are in the same direction as the winding rate of the cylinder spiral. Since steady field C exists in three-dimensional space, dot product of electric field vector with steady field in three-dimensional space, and then multiply by another electric field vector to obtain a new vector:

$$F_E = (E_1 \cdot C)E_2 = (E_2 \cdot C)E_1 \tag{26}$$

Formula 26 is the expression of the three-dimensional mass electric field force in the micro field, which is extended to the macro field to obtain coulomb's law.

Electromagnetic interaction in three dimensions

The curvature and winding rate of the three-dimensional mass surface are the curvature and winding rate with the spatial density coefficient of b_0. In three-dimensional space, the spatial density coefficient is 1. Therefore, the curvature and winding rate of the three-dimensional space outside the three-dimensional mass need to be divided by b_0^2, so the average curvature and winding rate of the point outside the three-dimensional space are:

$$\bar{K} = \frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{1}{R+\frac{1}{R}(\frac{C}{F_S b_0 \alpha})^2+r}dr \tag{27}$$

$$\bar{\tau} = \frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{1}{\frac{F_S b_0 \alpha R^2}{C}+\frac{C}{F_S b_0 \alpha}+r}dr \tag{28}$$

From Equations 25, 26, 27 and 28, we can calculate the magnetic field force and electric field force between any two charges in three-dimensional space.

Calculate the space dimension of the charge

The spatial dimension of charge is calculated from Equation 3.

Suppose: during the formation period of material structure, the mass of each dimension maintains the same change rule, and the spatial density coefficient of the three-dimensional mass and the four-dimensional mass is consistent, then the following parameters can be taken: b_0=1308, x=2.481401965a_0, and the electric quantity is: 1.14015226*$10^{-15}m^3/s$ (1.602176462*10^{-19} coulomb C). By calculation, it can be obtained that:

$$R = a_0 = \sqrt{\frac{Q_S}{C \cdot \pi \cdot b_0^2}} = \sqrt{\frac{1.140152226 * 10^{-15}}{C \cdot \pi \cdot 1308^2}} = 8.4117893 * 10^{-16} m$$

$$x = 2.481401965 a_0 = 2.08730306 * 10^{-15} m$$

$$F_S = \frac{C}{x} = 1.43626704 * 10^{23}\, 1/s$$

In Equations 27 and 28, a period of three dimensional mass α is 2π to calculate the curvature and winding rate of a three dimensional mass surface as follows:

$$K = \frac{R}{R^2 + (\frac{C}{F_S b_0 \alpha})^2} = 1.1888077 * 10^{15}\, 1/m$$

$$\tau = \frac{\frac{C}{F_S b_0 \alpha}}{R^2 + (\frac{C}{F_S b_0 \alpha})^2} = 3.58939395 * 10^{11}\, 1/m$$

Above is the space dimension of proton charge. In hydrogen atom, the structure of electron charge is changed, and its space dimension is calculated as follows:

$$R_e = \sqrt{\frac{Q_S}{C \cdot \pi \cdot b_0^2}} = \sqrt{\frac{1.140152226 * 10^{-15}}{C \cdot \pi \cdot 7899^2}} = 1.39291308 * 10^{-16} m$$

$$x = 2.481401965 a_0 = 3.45637726 * 10^{-16} m$$

$$F_S = \frac{C}{x} = 8.6736034 * 10^{23}\, 1/s$$

In Equations 27 and 28, a period of three dimensional mass α is 2π to calculate the curvature and winding rate of electron charge surface as follows:

$$K = \frac{R}{R^2 + (\frac{C}{F_S b_0 \alpha})^2} = 7.17919886 * 10^{15}\, 1/m$$

$$\tau = \frac{\frac{C}{F_S b_0 \alpha}}{R^2 + (\frac{C}{F_S b_0 \alpha})^2} = 3.58939395 * 10^{11}\, 1/m$$

Calculate magnetic moment by space curvature

Spin magnetic moment of electron

Substituting Equation 20 into Equation 18, we can get:

$$\mu_e = i \times S = B \times v \times S = Q \times K \times v \times S$$

$$\mu_e == 1.602176462 * 10^{-19} \times 7.17919886 * 10^{15} \times C \times \pi \times (1.39291308 * 10^{-16})^2 = 2.10181558 * 10^{-26} J/T$$

Spin magnetic moment of proton

Substituting Equation 20 into Equation 18, we can get:

$$\mu_p = i \times S = B \times v \times S = Q \times K \times v \times S$$

$$\mu_p = 1.602176462 * 10^{-19} \times 1.188807713 * 10^{15} \times C \times \pi \times (8.4117893 * 10^{-16})^2$$
$$= 1.26931469 * 10^{-25} J/T$$

DISCUSSION

Comparison between reported values of magnetic moment in literature and calculated values in this paper

The comparison between reported values of magnetic moment in literature and calculated values in this paper is listed in the following Table 1. As can be seen from Table 1, the calculation results of proton spin magnetic moment in this paper are close to those reported in literatures, and the calculation of electron spin magnetic moment is quite different. The author holds that the calculation of the magnetic moment of electrons and protons by the method in this paper depends on the space structure of the charge of electrons and protons, including the radius and density coefficient of the charge. In the calculation in this paper, the spatial structure of electrons is calculated by material space theory based on the first Bohr radius, and the spatial structure of protons is calculated by material space theory based on the mass and radius of protons. These values may differ from the actual values. In particular, the spatial structure of electrons has a wide range of changes in the structure of their charges. We are not able to determine the spatial structure of electrons and protons when the measured values of magnetic moment are obtained, so we cannot assume that there is a method error in the calculation results of this paper.

Comparison of calculated values of space vector and space curvature

We found that the calculation of electron and proton magnetic moment using space curvature is about PI times the calculation of electron and proton magnetic moment using space vector. This result suggests that the electromagnetic field defined by space vector and the electromagnetic field defined by space curvature exist as a shape factor PI, and we will improve the theory in the future work to find out the causes of the shape factor.

Space structure of electron and proton charge is calculated by reference value of electron and proton magnetic moment

Calculate the space structure of electron and proton charge by space vector method

By the type:

$$\mu = i \times S = B \times v \times S = \pi b_0^2 C^2 r^3$$

Substitute the reference values of electron and proton magnetic moment, take density coefficient b of electron charge =7899, density coefficient b of proton charge =1308, and calculate the radius of electron and proton charge as follows:

$$r_e = 1.553794368 * 10^{-15} m$$
$$r_p = 5.92297048 * 10^{-16} m$$

Calculate the spatial structure of the charge of electrons and protons by the method of spatial curvature

By the type:

$$\mu = i \times S = B \times v \times S = Q \times K \times v \times S = QKC\pi r^2 \approx QC\pi r$$

By substituting the reference values of electron and proton magnetic moment, the radius of electron and proton charge is calculated as follows:

$$r_e = 6.15164639 * 10^{-14} m$$
$$r_p = 9.34742645 * 10^{-17} m$$

CONCLUSION

This paper uses the method of space vector and space curvature of material space theory to define the magnetic field and electric field in the micro field. The spin magnetic moment of electrons and protons was calculated by the definition of magnetic field strength. The results show that the calculated results are close to the reference values of proton magnetic moment, but there is a big gap between the reference values of electron magnetic moment, which may come from the spatial structure parameters of electron charge.

Using this method, we calculate the space structure of the charge of electrons and protons, and now, the accuracy of measuring the magnetic moment of elementary particles is getting higher and higher (Schneider et al., 2017; Nagahama et al., 2017). Therefore, this method may also be applied as a method to measure the spatial structure of elementary particles through the magnetic moment.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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