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The Space-Time Structure of the Microscopic Domain

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Abstract: *In this paper, the characteristics of matter are studied from the perspective of space. Based on the basic principle of the material space theory [1], the spatial properties of velocity field, light, electricity and gravitational mass are described by means of vector field and differential geometry. It USES space-time measurement to express physical quantities such as velocity, light quantity, light intensity, electric field intensity, magnetic field intensity, current intensity, electric quantity, momentum, energy, angular momentum, gravitational mass, and interaction force, etc. The dispersion equation of the optical quantity field, the electromagnetic field equation and the electromagnetic force equation in the microscopic field and the gravitational force equation in the microscopic field are established.*

Using the properties of space curvature and winding rate, the electromagnetic force and gravitational force are described, and the structure and properties of hydrogen atom are studied.

*This paper describes the space structure of electrons and protons in a steady state. The results show that:The gravitational mass of the proton is: $1.6726216378*10^{-27}$Kg, the radius is: $8.4087*10^{-16}$m, and the shape is a four-dimensional sphere; The proton is closely bound to a positive charge, and the charge of the positive charge is: $1.140152226*10^{-15}m^3/s$（1.602176462*10^{-19} coulombs）, The structure of positive charge is as follows: The radius $8.4117893*10^{-16}$m, height $2.0873379*10^{-15}$m, the spiral of the cylinder encircles the cylindrical space. The gravitational mass of the electron is $9.10938215*10^{-31}$Kg, the radius is $6.8693998·10^{-17}$m, and the shape is a four-dimensional sphere. The electron is closely combined with a negative charge. The electric quantity of the negative charge is $1.140152226*10^{-15}m^3/s$（1.602176462*10^{-19}coulombs). The structure of the negative charge is $1.36291308*10^{-16}$m in radius and $3.456377266*10^{-16}$m in height.*

Based on the characteristics of electron charge density coefficient and light, we put forward the view that light with the same density coefficient of charge can be superimposed with charge in space, thus explaining the energy level characteristics of hydrogen atom under the principle of Newtonian mechanics, and reasonably explaining the variation of hydrogen atom spectrum in the external magnetic field.

Keywords: *micro field , Light, electricity, gravity , Space curvature, space winding rate*

PREFACE

At present, it is generally believed that quantum mechanics [2] is the correct theory to describe the microscopic field. General relativity [3] and Newtonian mechanics [4] have achieved great success in the macroscopic field, but they have encountered difficulties in describing physical phenomena in the microscopic field, which means that there are two sets of incompatible physical theories in our world.

According to the material space theory, "the world is a collection of existence that abides by the same system of laws". The incompatibility between Newtonian and quantum mechanics suggests that there should be a more complete theory to make our world conform to the same system of laws.

We will describe the physical world from the perspective of space-time, and try to describe the microscopic world with the basic principles of Newtonian mechanics under the framework of the material space theory, so as to find a new direction for the establishment of a general applicable physical theory in the microscopic field and the macroscopic field.

1.ESTABLISHMENT OF REFERENCE SYSTEM

1.1The basic view of the material space theory

Let's first make the following agreement according to the view of the material space theory:

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(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.

1.2 Establishment of reference system

First of all, as observers, we set up three-dimensional orthogonal coordinates, which are mathematical tools, not physical ones. Our observations are made in three-dimensional orthogonal coordinate systems, and our task is to describe the laws of space and time in three-dimensional orthogonal coordinate systems. Since matter is a property of space under the definition of the material space theory, we do not need to describe the relationship between matter and space as a frame of reference, we only need to describe the change law of space and time in the three-dimensional orthogonal coordinate system. In this way, our research will reduce one coordinate transformation, which will greatly simplify the research process.

We first set up the three-dimensional plane rectangular coordinate system: $: \mathrm{V} = \{x, y, z\}$, there are orthogonal basis vectorse_i, e_j, e_k, which meet the definition rules of the plane rectangular coordinate system.

Since in the material space theory, space is physical existence, the reciprocal of time is force, force is the action on space, and matter is the spatial property of space under the action of force (the reciprocal of time),So we put the plane rectangular coordinate system in space, and in the plane rectangular coordinate system, we can define the measure of the length of the space, the area, the volume, and so on, and we can also define the coordinate position of the space,This definition is to describe the relationship between physical quantities in space.

When we study physical existence, we need to study the properties of space under the action of forces in the coordinate system, and these properties need to be expressed in terms of physical quantities.These physical quantities can be expressed in the combination of space and time in the material space theory. Therefore, we need to study the properties of space in its coordinate position, so that we need to define the "field".

1.3Three dimensional space and one dimensional mass field in the universe

According to the material space theory, we make the following definition:

There is a three-dimensional space in a three-dimensional rectangular coordinate system, and we approximately consider this three dimensional space to be continuously differentiable; When the influence of other Spaces is not considered, the three-dimensional space overlaps with the rectangular coordinate system and has an orthogonal basis vector.

According to the theory of material space, under the action of force (reciprocal of time), three-dimensional space is constructed into a one-dimensional mass field. Due to the constraint of the only restrictive law, the one-dimensional mass field is a steady field C, and the following relations exist:

$$\mathbf{r} \cdot \mathbf{F} = \mathrm{C}$$

Where:r is a space vector in three dimensions, F is the force acting on that vector, r and F are vectors in any direction that are always the same.

2.ONE DIMENSIONAL MASS INTERACTS WITH THREE DIMENSIONAL SPACE

2.1Consider the case where a one-dimensional mass enters a three-dimensional space

When a one-dimensional mass (such as neutrino) with a spatial quantity r_1 and force F_1 enters three-dimensional space, the one-dimensional mass field in three-dimensional space interacts with the newly entered one-dimensional mass:

$$\mathbf{r_1} \cdot \mathbf{F_1} = \mathrm{v} \leftrightarrow \mathbf{r} \cdot \mathbf{F} = \mathrm{C}$$

Increment r_1 and F_1 are obtained respectively for the spatial quantity and force of three-dimensional space.

After the action, the quantity in the r direction of three-dimensional space is changed to r ', and the force is changed to F ',

The space and force contained in three-dimensional space and one-dimensional mass are changed according to the one-dimensional space-time transformation formula [5]:

$$\begin{cases} r' = r_1\left(1+\frac{1}{\frac{V}{2C}+\sqrt{\frac{V^2}{4C^2}+\frac{V}{C}}}\right) \\ F' = F_1\left(1+\frac{1}{\frac{V}{2C}-\sqrt{\frac{V^2}{4C^2}+\frac{V}{C}}}\right) \end{cases} \cdots\cdots\cdots\cdots 1$$

Multiply the two equations of equation 1 respectively to get:

$$r'F' = -r_1F_1\frac{C}{V} = -C \cdots\cdots\cdots\cdots 2$$

From the above two formulas, we can see that the interaction of one-dimensional mass entering three-dimensional space results in that the space and force of three-dimensional space and one-dimensional mass recombine, while the mass remains unchanged. The negative sign in front of the mass indicates that the increment of space and the increment of force are opposite.

Under the action of force, the three-dimensional space forms a one-dimensional mass field. When the one-dimensional mass enters the three-dimensional space, the interaction is the superposition of the field.Due to the constraint of the only restrictive law, the one-dimensional mass field is a steady field, and the superimposed result is not the change of the field intensity, but the reorganization of the one-dimensional mass space and force.The field of one-dimensional mass and the field of three-dimensional space belong to the same property and cannot produce the result of multiplying interaction.

2.2Neutrino properties

According to the material space theory, one-dimensional mass obeys the only restrictive law, so one-dimensional mass entering three-dimensional space V=C,According to the results of the material space theory, corresponding to the physical existence in the universe, the one-dimensional mass is neutrino [6]. Therefore, the speed of neutrino is C, and V=C can be substituted into formula 1 to obtain:

$$\begin{cases} r' = r_1\left(1+\frac{1}{\frac{V}{2C}+\sqrt{\frac{V^2}{4C^2}+\frac{V}{C}}}\right) \\ F' = F_1\left(1+\frac{1}{\frac{V}{2C}-\sqrt{\frac{V^2}{4C^2}+\frac{V}{C}}}\right) \end{cases} = \begin{cases} r' = 1.618033989r_1 \\ F' = -0.618033989F_1 \end{cases} \cdots\cdots 3$$

The negative sign indicates that the force increment is negative.

Here's how neutrinos behave when they enter three-dimensional space:

⑴In three-dimensional space, in the direction of the neutrino space, the original space with the same amount of neutrino expansion as the original 1.618033989 times, the space combined force reduced to the original 0.618033989 times.

⑵The space held by neutrinos shrinks by 0.618033989 times as much as before, and the combined force of neutrinos space increases by 1.618033989 times as much as before.

⑶We should realize that the amount of space that neutrinos hold and the force that binds them depend on how they are made.When we are in a three-dimensional space during a measurement, we chose a one dimensional space, according to the only restrictive law, inevitably involves a certain amount of force,We should be able to observe the difference in force (time) when we choose the same space as the neutrino holds,When the force we choose to combine in space is the same as the force that neutrinos combine in time, we should be able to observe the difference in space.We need further research observation method, validation of neutrinos properties in three-dimensional space.

3.THE PROPERTIES OF LIGHT IN THREE DIMENSIONS

3.1In the material space theory, the two-dimensional mass is the amount of light, and the material space theory describes the two-dimensional mass as a two-dimensional spatial wave train [7].The research results show that the two-dimensional mass is generated by

the change of electric field. Let's ignore the generation mode of two-dimensional mass for the moment and focus on the properties of two-dimensional mass in three-dimensional space.

If the two-dimensional mass is placed in the three-dimensional space, and one end of the two-dimensional mass spatial wave column is superposed with the origin of the coordinate system, and one dimension of the two-dimensional mass is consistent with the X-axis direction of the coordinate system, then the two-dimensional mass is represented as a series of two-dimensional space sine (or cosine) curves, and the parametric equation of the curve is:

$$f(x,\ y) = \begin{cases} x \cdot F_S = C \\ y = a_0 \cdot \sin(b_0 \cdot \alpha + c_0) \end{cases} \quad \text{.....4}$$

$$f(x,\ y) = \begin{cases} x \cdot F_S = C \\ y = a_0 \cdot \cos(b_0 \cdot \alpha + c_0) \end{cases} \quad \text{.....5}$$

According to the parametric equation, the two-dimensional mass is composed of two vectors, one is the one-dimensional mass in the propagation direction of the wave train in the extended space, and the other is the space vector perpendicular to the one-dimensional mass direction.And since these two vectors have different properties, they can't be added, and when they're multiplied, the number times zero doesn't make any physical sense, the cross product forms a new vector, which is the quantity of light,Therefore, the two-dimensional mass is a vector whose direction is perpendicular to the plane formed by the propagation direction and amplitude direction of the spatial wave train, and conforms to the right-handed spiral relationship.

The material space theory defines the size of two-dimensional mass as the space volume of two-dimensional mass multiplied by force, and the expression is as follows:

$$L_S = 4F_S \cdot b_0 \cdot {a_0}^2 \text{.....6}$$

A two-dimensional mass is a two-dimensional space wave train with a period of b_0 and a amplitude of a_0.

3.2The properties of light

3.2.1Quantity of light

In three-dimensional space, the light emitted by the light source radiates in all directions from the light source to the three-dimensional space. We put the light source at the origin of the coordinate system to study the properties of two-dimensional mass in three-dimensional space.

Light emitted from the origin of coordinates is also isotropic when three-dimensional space is isotropic. Therefore, the propagation direction of light is rays starting from the origin, and the form of light is the spatial wave train emitted from the origin.The magnitude of the amount of light is represented by the two-dimensional mass, which is a vector perpendicular to the wave train in space,Therefore, the light emitted by the light source in three-dimensional space will construct a vector field whose direction is tangent to the sphere centered at the origin.

The light in our universe is generated by changes in electric fields, and according to the results of the material space theory, light is always generated in the form of conjugate wave train.When the electric field changes, a pair of spatial wave columns are always generated, which are the sine two-dimensional mass and the cosine two-dimensional mass respectively, as shown in equations 4 and 5. These two wave columns have the same propagation direction and the amplitude direction is perpendicular to each other.

The light quantity is expressed as follows:

$$\begin{cases} \mathbf{L} = \left| \begin{matrix} \mathbf{x} \cdot F_S = C \\ \mathbf{y} = a_0 \cdot \sin(b_0 \cdot \alpha + c_0) \end{matrix} \right. \times \\ \mathbf{L}' = \left| \begin{matrix} \mathbf{x} \cdot F_S = C \\ \mathbf{y} = a_0 \cdot \cos(b_0 \cdot \alpha + c_0) \end{matrix} \right. \times \end{cases} \quad \text{.....7}$$

Figure 1 shows the spatial wave train structure of light quantity:

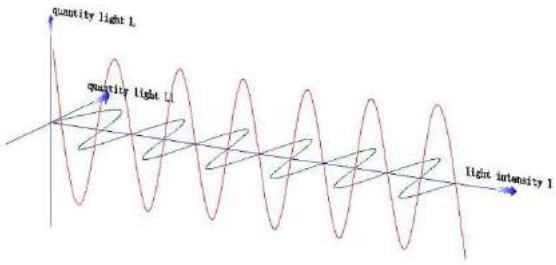

Figure 1.*Spatial wave train structure of light quantity*

So we can draw the magnitude field like this:

The light emitted by the light source is isotropic conjugate space wave column in three-dimensional space, which is composed of mutually perpendicular amplitude vector and velocity vector. The spatial wave column forms the optical quantity field along the tangent direction of the spherical surface, and the direction of the optical quantity field is the mutually perpendicular vector pair generated by conjugate wave column.

The unit of light quantity is:m^2/s.

3.2.2The light intensity

We cross product the vector of conjugate light quantity field to obtain a new vector, which is generated by the right hand spiral relationship and points to the direction of light propagation. We define this vector as the light intensity:

$$\mathbf{I} = \mathbf{L} \times \mathbf{L}' \cdots\cdots 8$$

The unit of light intensity is:m^4/s^2.

To describe the physical significance of the light intensity vector, take the light intensity vector microelement$d\mathbf{I}$, the space sphere radius microelement dR, and set:$d\mathbf{P} = dR d\mathbf{I}$

Definition: $d\mathbf{P}$ is momentum infinitesimal,The integral can be obtained as follows:

$$\mathbf{P} = \iint dR\, d\mathbf{I} = \int_0^R dR \int_{I_0}^{I_1} d\mathbf{I} \cdots\cdots 9$$

The field formed by the light intensity vector is called the light intensity field, and $\mathbf{P}$ is defined as the momentum of the light intensity field.

Momentum units are:m^5/s^2.

3.2.3The energy of the light

When the two-dimensional mass enters the three-dimensional space, according to the relation of formula 1, the two-dimensional mass will shrink in the propagation direction, which is shown as the length of the wave column shrinks by 0.618033989 times as much as the original, and the combined force of the spatial wave column increases by 1.8033989 times as much as the original.

When the two-dimensional mass enters the three-dimensional space, it forms the light intensity field. The light intensity field will interact with the stable one-dimensional mass field existing in the three-dimensional space.The direction of the steady-state one-dimensional mass field is consistent with the light intensity field. The result of the cross product is zero, which has no physical significance. The result of the dot product is the generation of the quantity field, which is expressed as follows:

$$E = \mathbf{P} \cdot \mathbf{C} \cdots\cdots 10$$

We define E as energy, therefore, the light intensity field generated by the light source has energy characteristics in three-dimensional space.

The units of energy are:m^6/s^3.

Substituting equation 6 into equation 8, it can be obtained that the light intensity of conjugate wave column is:

$$\mathbf{I} = \mathbf{L} \times \mathbf{L}' = 16F^2 b_0^2 a_0^4 \cdots\cdots 11$$

Where, F is the combined force of conjugate wave column, b_0 is the period number of conjugate wave column, and a_0 is the amplitude of conjugate wave column.

Suppose: the length of the conjugate wave column is R, then the momentum of the conjugate wave column is:

$$\mathbf{P} = R\mathbf{I} = R\mathbf{L} \times \mathbf{L}' = 16RF^2 b_0^2 a_0^4 \cdots\cdots 12$$

The energy of conjugate wave train is:

$$E = \mathbf{P} \cdot \mathbf{C} = 16CRF^2 b_0^2 a_0^4 \cdots\cdots 13$$

Where: C ~ speed of light, R ~ length of wave train, F ~ force (reciprocal of time), b_0 ~period number of wave train, a_0 ~amplitude of wave train.

3.2.4Divergence of the light field

We're talking about light intensity, momentum, energy for a conjugate space wave train,In the macro field, when the conjugate space wave pairs emitted by the light source are filled with spherical space regions with the origin of the light source and radius r, the number of space wave pairs is n.At this point, the intensity field, momentum field and energy field of the light source will be formed. What we can observe and study are the momentum field and energy field of the light source.

Take spherical element ds at radius r, and the divergence of momentum field and energy field

generated by the light source can be obtained as follows:

$$\nabla \cdot \mathbf{P} = \lim_{V\to 0} \frac{\oiint_S nPds}{V} \cdots\cdots 14$$

$$\nabla \cdot \mathrm{E} = \lim_{V\to 0} \frac{\oiint_S nEds}{V} \cdots\cdots 15$$

From the above discussion, we can see that the momentum field and energy field generated by the light source are active divergence fields, and the field quantity depends on the properties of the light source in three-dimensional space.When the light source is determined, we can calculate momentum and energy at any point in space according to equations 14 and 15.

At the same time, we can also find that the field of light is characterized by momentum and energy, and there is no interaction force on the field of light, so there is no interaction force on the field of light.

3.2.5The frequency and wavelength of light

The frequency of light defined by physical optics is defined on the basis of energy quantization, according to the formula:

$$\mathrm{E} = \mathrm{h} \cdot \nu$$
$$\nu \cdot \lambda = \mathrm{C}$$

The physical meaning of the frequency of light is the number of energy units of the light wave in Planck constant, and the physical meaning of the wavelength is the contribution of each energy number to the speed of light.

The wavelength and frequency of physical optics do not represent the period length and the number of cycles per unit time of mechanical waves.

The material space theory does not define the wavelength and frequency of two-dimensional mass. The period number, period length and wave length of space wave column have no corresponding relationship with the wavelength and frequency of physical optics.We can derive the expression of the frequency and wavelength of the material space theory from equation 13 and the definition of physical optics on the wavelength and frequency of light.

4.THE PROPERTIES OF ELECTRICITY IN THREE DIMENSIONS

4.1The spatial structure of electric quantity

The material space theory defines three dimensions is electricity, and in the material space theory, the three-dimensional mass is the space field of a cylindrical spiral structure, which is described as:

$$\mathrm{f}(\mathrm{x},\ \mathrm{y},\ \mathrm{z}) = \begin{cases} \mathrm{x}\cdot \mathrm{F_S} = \mathrm{C} \\ \mathrm{y} = \mathrm{a_0}\cdot \sin(\mathrm{b_0}\cdot\alpha) \\ \mathrm{z} = \mathrm{a_0}\cdot \cos(\mathrm{b_0}\cdot\alpha) \end{cases} \sim \text{3D sine} \cdots\cdots 16$$

$$\mathrm{f}(\mathrm{x},\ \mathrm{y},\ \mathrm{z}) = \begin{cases} \mathrm{x}\cdot \mathrm{F_S} = \mathrm{C} \\ \mathrm{y} = \mathrm{a_0}\cdot \cos(\mathrm{b_0}\cdot\alpha) \\ \mathrm{z} = \mathrm{a_0}\cdot \sin(\mathrm{b_0}\cdot\alpha) \end{cases} \sim \text{3D cosine} \cdots 17$$

The expression of three-dimensional mass is:

$$\mathrm{Q_S} = \mathrm{C}\cdot\pi\cdot \mathrm{b_0}^2\cdot \mathrm{a_0}^2 \cdots\cdots 18$$

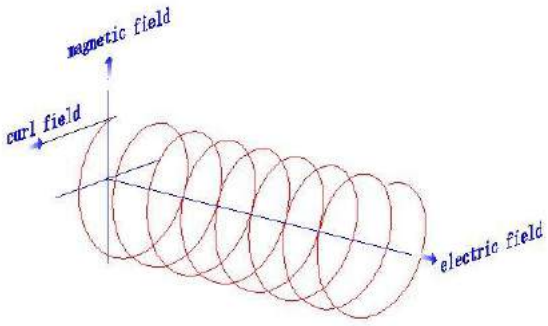

Figure 2.*Spiral space structure of charge*

The units of mass in three dimensions are:m^3/s（Coulomb）.

The three-dimensional mass is composed of two space vectors and a velocity vector, and the three vectors are perpendicular to each other. Since the space vector and the velocity vector cannot be added, the vector relationship of the three-dimensional mass can be expressed as follows:

$$\mathbf{B} = \mathbf{C}\times(\mathbf{y}+\mathbf{z}) = \mathbf{C}\times\mathbf{y} + \mathbf{C}\times\mathbf{z} \cdots\cdots 19$$

As can be seen from the above equation, when the three-dimensional mass is stable, the space mass is added and multiplied by the velocity vector, which is shown as the property of the three-dimensional mass; when the three-dimensional mass is unstable, the velocity vector is multiplied by the space vector, which is shown as the two-dimensional mass of conjugate relationship.

4.2The properties of stable three dimensional mass

4.2.1Electric magnetic field

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

$$\mathbf{r} = \mathbf{y} + \mathbf{z} \cdots\cdots 20$$

According to the parallelogram rule of vector addition and parametric equations of equations 16 and 17, the vector r is a circle equation, and the sagittal curve represents a circle.According to the relationship between equations 16 and 17, 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:

$$\mathbf{B} = \mathbf{C} \times \mathbf{r} \ldots\ldots 21$$

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:

$$\nabla \times \mathbf{B} = \lim_{s\to 0} \frac{\oint_l \mathbf{B} dl}{S} \ldots\ldots 22$$

4.2.2Electric 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:

$$\mathbf{E} = (\nabla \times \mathbf{B})\mathbf{C} = \mathrm{C} \lim_{s\to 0} \frac{\oint_l \mathbf{B} dl}{S} \ldots\ldots 23$$

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 asource field. The source field can be expressed as the gradient of a scalar function, so the following formula is true:

$$\mathbf{E} = -\nabla\varphi \cdots\cdots 24$$

We define a function φ as a potential function of the electric field E.

So what we're 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.

4.2.3The relationship between electric and magnetic fields

The three-dimensional mass defined by the material space theory is a physical existence with a definite spatial structure. It is a three-dimensional spiral space with a definite spiral radius and height.According to the previous discussion, we know that the three-dimensional mass has magnetic vector along the tangent direction of the spiral and electric vector perpendicular to the spiral circular surface.

The electric field and magnetic field described by the classical electromagnetic theory [8] belong to the macroscopic description. In the classical electromagnetic theory, there is no structure or size of charge.When we start from the material space theory and discuss the properties of the three-dimensional mass under the principle of the material space theory in the macro field, we consider the three-dimensional

mass approximately as the point-like three-dimensional mass, and then we will get the properties of the electric field and magnetic field in the macro field.

Suppose, there is a static three-dimensional spherical space, which contains n three-dimensional masses, then the magnetic field intensity and electric field intensity it has are expressed as follows:

$$\boldsymbol{B} = \sum_1^n \mathbf{B}_i = \sum_1^n \mathbf{C} \times \mathbf{r}_i \text{.....25}$$

$$\boldsymbol{E} = \sum_1^n \mathbf{E}_i = \sum_1^n (\nabla \times \mathbf{B}_i)\mathbf{C} \text{.....26}$$

When we ignore the volume of spherical space, since magnetic field B is a vector along the tangent direction of the sphere, the symmetry of the sphere makes the sum of magnetic vectors zero, so the magnetic field intensity of the stationary space sphere is zero.

The direction of the electric field E vector is pointing to the normal direction of the sphere. When there is only one three-dimensional mass in the three-dimensional space, the vector sum is the algebraic sum of radial vectors in the spherical space.Therefore, when a three-dimensional spherical space contains a three-dimensional mass, it has an electric field intensity, which is the electrostatic field defined by classical electromagnetic theory.We can see that the electric field properties of spherical three-dimensional space are completely consistent with the electrostatic field properties of classical electromagnetic theory.

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:

$$\mathbf{B} = \mathrm{Cr} \text{.....27}$$

The curl of the magnetic field is:

$$\nabla \times \mathbf{B} = \lim_{s\to 0} \frac{\oint_l \mathbf{B} dl}{S} = \frac{2\pi r B}{\pi r^2} = \frac{2B}{r} = 2C \text{.....28}$$

The electric field intensity is:

$$\mathbf{E} = (\nabla \times \mathbf{B})\mathbf{C} = 2C^2 \text{.....29}$$

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:

$$\mathbf{B} = b_0^2 \mathrm{Cr} \text{.....30}$$

$$\mathbf{E} = 2b_0^2 C^2 \text{.....31}$$

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:

$$\nabla \cdot \mathbf{E} = \lim_{V\to 0} \frac{\oiint_S \mathbf{E} dS}{V} = \frac{4\pi r^2 \boldsymbol{E}}{\frac{4}{3}\pi r^3} = \frac{6b_0^2 C^2}{r} \text{.....32}$$

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

$$\nabla \cdot \mathbf{B} = \mathbf{0} \text{.....33}$$

$$\nabla \times \mathbf{E} = \mathbf{0} \text{.....34}$$

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.

But it should be clear that the electric field is generated by the curl of the magnetic field, and the magnetic field is generated by the spatial structure of the three-dimensional mass and the action of the force,Therefore, the concepts of "induced magnetic field" and "induced charge" in classical electromagnetic theory do not have logically reasonable causal relationship.

Can be obtained from equations 25 and 32:

$$\nabla \cdot \mathbf{E} = -\nabla \cdot \nabla\varphi = -\nabla^2\varphi = \frac{6b_0^2C^2}{r}$$

$$\nabla^2\varphi = -\frac{6b_0^2C^2}{r} \text{.....35}$$

At any point outside the three dimensional mass, the potential satisfies Laplace's equation;

$$\nabla^2\varphi = 0 \text{.....36}$$

Equation 35 is the potential equation of the three-dimensional mass boundary and the three-dimensional mass interior, and equation 36 is the potential equation of the three-dimensional mass exterior.

4.2.4Electric current

(1) Discussion on speed:

In the microscopic domain, we define velocity as the ratio of the momentum of a four-dimensional mass to its mass, and since momentum is an intrinsic property of a four-dimensional mass in three-dimensional space, velocity is also an intrinsic property of a four-dimensional mass.Since the material space theory defines a one-dimensional mass field as the speed of light, one-dimensional mass and velocity take the same mathematical form, but there is a difference between velocity and one-dimensional mass.

$$\mathbf{v} = \mathbf{P}/\mathrm{M} \text{.....37}$$

In the macro field, velocity is defined as the product of space and unit force:

$$\mathbf{v} = \Delta\mathbf{r}\Delta\mathrm{F} \text{.....38}$$

$\boldsymbol{\Delta}$F is the reciprocal of time.

It is important to point out that, here, that vector r is a vector of mathematical space, not a spatial vector of physical presence, but a vector defined by the distance between the points of the coordinate system,It corresponds to the distance vector between points in physical space. Therefore, the macroscopic velocity is a coordinate reference quantity in mathematical sense, rather than a physical quantity in physical sense.

(2) The properties of three-dimensional mass in motion state

Velocity is an intrinsic property of four-dimensional mass, and since three-dimensional mass cannot exist alone in the universe, it always coexists with four-dimensional mass, so three-dimensional mass also has momentum.The velocity of the three dimensional mass that we're going to talk about is going to be the same as the velocity of the four dimensional mass that coexists.

(3) The definition of electric current

Set:

Three-dimensional mass has velocity **v**, enters three-dimensional space and goes through distance *l*. The motion direction is opposite to the electric field direction of three-dimensional mass, and the following equation exists:

$$\mathbf{i} = b_0^2 \int_0^l \mathbf{B} \times \mathbf{v}\, dl \text{.....39}$$

We define **i** as the electric current intensity of the moving three-dimensional mass.

The unit of electric current intensity is:m^4/s^2（C• m/s）.

It can be seen that the current intensity **i** is an integration variable, and the current intensity is generated by the magnetic field intensity of the three-dimensional mass of motion. Since the magnetic field intensity changes in the direction, the current intensity also changes in the direction.The direction of the current intensity is perpendicular to the plane formed by the direction of the magnetic field intensity and the direction of the velocity, and conforms to the right-handed spiral relationship.If the direction of motion of the three-dimensional mass is opposite to the direction of the electric field intensity, the direction of current intensity points to the direction of the center of the three-dimensional mass spiral.It can be seen that the direction of current intensity is perpendicular to the direction of electric field intensity and magnetic field intensity.

Macroscopic electromagnetic theory defines current intensity as the amount of electricity per unit time passing through the conductor's cross-sectional area. This definition does not accurately describe the properties of three-dimensional mass movement, and it is not accurate for the three-dimensional mass in the microscopic field.In the dimension of the mathematical expression, the current intensity of the three-dimensional mass defined by matter-space theory is

the same as the current intensity defined by classical electromagnetic theory, which is C•m/s (coulomb •m/s). However, the physical significance is not the same.The current intensity defined by the material space theory is a vector, which is generated from the magnetic field intensity and has a clear causal relationship with the intrinsic properties of three-dimensional mass. The direction is perpendicular to the direction of the three-dimensional mass motion,however, classical electromagnetic theory generally believes that the direction of current intensity is consistent with the direction of charge movement, and it is along the direction of conductor movement.

4.2.5Three dimensional mass interactions in motion

When two three-dimensional masses move in parallel directions, the interaction between magnetic fields will be generated. The magnetic field direction is tangent to the spiral of three-dimensional masses.When the helix direction (charge property) is the same, the current intensity between the two three-dimensional masses will generate a force of phase attraction; when the helix direction (charge property) is opposite, the current intensity between the two three-dimensional masses will generate a force of repulsive force.The interaction force is as follows:

$$\mathbf{F}_{\boldsymbol{A}} = \mathbf{B}_{\mathbf{1}} \times \mathbf{v} \times \mathbf{B}_{\mathbf{2}} \quad \text{.....40}$$

The unit of action is m^5/s^3 (Newton's N).

Formula 40 is the expression of ampere's law in the microscopic field of the material space theory, which is only related to the state of the moving charge.

The ampere law of classical electromagnetic theory gives the macroscopic force of electric current between wires, but it cannot explain the essence of the force, and there is no reasonable causal conclusion.

The formula of the interaction between the three dimensional masses obtained from the material space theory shows the properties of the three dimensional mass motions in the microscopic field and reveals the basic laws of the motion of electric charges.

From the material space theory of single three dimensional mass motion properties, quality promotion to multiple three-dimensional movement properties of quality, can be consistent with the classical electromagnetic theory of ampere's law experiment conclusion.

4.2.6Static three dimensional mass interactions

It can be seen from equation 31 that, in three-dimensional space, two static three-dimensional masses will interact with each other through electric field intensity, and the interaction force can be expressed as follows:

$$\boldsymbol{F}_{1,2} = \boldsymbol{E}_{\mathbf{1}} Q_2$$

$$\boldsymbol{F}_{2,1} = \boldsymbol{E}_{\mathbf{2}} Q_1$$

The absolute value of the two equations can be obtained by multiplying:

$$\left|\boldsymbol{F}_{1,2}\right|\left|\boldsymbol{F}_{2,1}\right| = \left|\boldsymbol{E}_{\mathbf{1}} Q_2\right|\left|\boldsymbol{E}_{\mathbf{2}} Q_1\right|$$

Due to:

$$\boldsymbol{F}_{\boldsymbol{A}} = \left|\boldsymbol{F}_{1,2}\right| = \left|\boldsymbol{F}_{2,1}\right|$$

Available:

$$\boldsymbol{F}_{\boldsymbol{A}} = \sqrt{\left|\boldsymbol{E}_{\mathbf{1}} Q_2\right|\left|\boldsymbol{E}_{\mathbf{2}} Q_1\right|} \quad \text{.....41}$$

Formula 41 is the expression of coulomb's law in the microscopic field under the theory of material space.

Electrodynamics is a complete theoretical system based on a large number of experiments. However, since electrodynamics examines the properties of charge from a macro perspective, there will be some difficult self-consistent explanations at the micro level.The introduction of physical quantities such as induced magnetic field, induced current, displacement current and polarization current can solve theoretical and computational problems macroscopically, but at the same time will complicate the problem.These quantities are more mathematical descriptions than the existence of physical fields.

The discussion of the three dimensional mass properties in material space theory makes up for the deficiency of electrodynamics, reveals the essence of charge and its motion, gives a clear explanation of the causal relationship between various physical quantities, and unifies the physical units of electrodynamics into the basic space-time combination.

Electrodynamics studies the properties of electromagnetic fields in the macro field, has been very perfect, this paper is not intended to overthrow the electrodynamics and establish a new set of three-

dimensional mass dynamics, therefore, we will not discuss the properties of a large number of three-dimensional mass aggregates, these work for those who are interested in in-depth discussion of friends to study.

4.3Properties of unstable three dimensional masses

As shown in equation 19, when the three-dimensional mass is unstable, it will be decomposed into two two-dimensional masses, which are conjugate space wave columns whose amplitudes are perpendicular to each other. From equation 4 to equation 15, we have discussed the properties of two-dimensional masses in three-dimensional space.

From natural phenomena, we can know that charge systems can absorb light or emit light. Therefore, we can judge that the three-dimensional mass can absorb the two-dimensional mass with the same spatial density coefficient.This two dimensional mass, which can be either a conjugate wave train or a polarized wave train, when you absorb the two dimensional mass, the spatial structure of the three dimensional mass deforms and accepts the momentum of the two dimensional mass, and the result is that the three dimensional mass and the four dimensional mass combined with it produce energy level transitions.

If the three-dimensional mass in the transition state cannot establish a new equilibrium with the four-dimensional mass system, it will release the absorbed two-dimensional mass and return to the original equilibrium state, which will produce the emission of light.

And we can see that if a three-dimensional mass absorbs a two-dimensional polarized wave train, then it emits a two-dimensional polarized wave train,At the same time, since polarized wave train will change the symmetry of three dimensional mass, it can be judged that the absorption of polarized wave train is more difficult and the emission is easier, which should be more easily confirmed by experiments.

The stable three-dimensional mass, which represents the intrinsic properties of electric field and magnetic field, will become an unstable three-dimensional mass when the three-dimensional mass absorbs the two-dimensional mass. At this time, the three-dimensional mass will have momentum and emit conjugate spatial wave train.It can be seen from equation 7-10 that the cross product of spatial wave columns will generate momentum and generate energy in three-dimensional space. Therefore, three-dimensional mass can also show the property of energy, but the property of energy is the representation of the interaction between three-dimensional mass and two-dimensional mass.

5. THE QUALITY OF GRAVITATIONAL MASS IN THREE DIMENSIONS

5.1The spatial structure of gravitational masses

The material space theory defines four-dimensional mass as gravitational mass. In the material space theory, four-dimensional mass is the spatial field of the four-dimensional spherical structure. The structure of the field equation can be described as follows:

$$f=\begin{cases} x\cdot F_S=C \\ y=a_0\cdot\sin(b_0\cdot\alpha+c_0) \\ z=a_0\cdot\cos(b_0\cdot\alpha+c_0)\cdot\sin(b_0\cdot\beta+c_0) \\ w=a_0\cdot\cos(b_0\cdot\alpha+c_0)\cdot\cos(b_0\cdot\beta+c_0) \end{cases}\sim\text{Sine mass on the Y-axis}\quad\ldots\ldots 42$$

$$f=\begin{cases} x\cdot F_S=C \\ z=a_0\cdot\sin(b_0\cdot\alpha+c_0) \\ y=a_0\cdot\cos(b_0\cdot\alpha+c_0)\cdot\sin(b_0\cdot\beta+c_0) \\ w=a_0\cdot\cos(b_0\cdot\alpha+c_0)\cdot\cos(b_0\cdot\beta+c_0) \end{cases}\sim\text{Sine mass on the Z-axis}\quad\cdots 43$$

The expression of four-dimensional mass is:

$$M_S=\frac{4}{3}\pi\cdot C\cdot {a_0}^3\cdot {b_0}^3=\frac{4}{3}\pi\cdot F_S\cdot x\cdot {a_0}^3\cdot {b_0}^3\quad\ldots\ldots 44$$

The units of four dimensional mass are m^4/s (Kg).

We have studied the properties of four-dimensional mass in three-dimensional space from the expression of four-dimensional mass, and found that four-dimensional mass has intrinsic properties of spin angular momentum and appearance of spatial curvature [9].

5.2Theproperties of the gravitational mass

5.2.1The curvature of the gravitational mass in space

Next, from the perspective of vector space, we study the field equation of four-dimensional mass, and find the vector properties of four-dimensional mass in three-dimensional space.

From the structure equation of the four-dimensional mass field, we can judge that:

(1) Four-dimensional mass is composed of four space vectors, the four space vectors are perpendicular to each other, therefore, four-dimensional mass is a four-dimensional space structure;

(2) In the four-dimensional mass of three equal weight space vectors, they are periodic functions, the three space vectors at the end of the vector is described as a sphere.

(3) Four dimensional mass of three equal weight space vector described by the sphere has two structural properties, their large circle along an axis of rotation in the opposite direction.

(4) There is a fourth dimension in the four dimensions of mass, this dimension combined with the force, it and the relationship between the force to abide by the only restrictive law of constraints, the fourth dimension of the vector is a one-dimensional mass vector (constant vector).

When we put a four-dimensional mass into three-dimensional space, the four-dimensional mass in three-dimensional space represents a space sphere with period number b_0. As a sphere in three-dimensional space, it should have mean curvature and Gaussian curvature.

We know that the average curvature of a space sphere is:

$$\overline{\mathbf{K}} = \frac{1}{R} \cdots\cdots 45$$

The Gaussian curvature of the space surface is:

$$\mathrm{K} = \frac{1}{R^2} \cdots\cdots 46$$

When we put the four-dimensional mass into the three-dimensional space, the curvature of the four-dimensional mass sphere will be obtained in the space where the three-dimensional space overlaps with the four-dimensional mass sphere, and the curvature of the three-dimensional space whose distance from the four-dimensional mass is r can be calculated as follows:

$$\mathbf{K} = \frac{1}{b_0^3}\frac{1}{r}\int_r^0 \frac{1}{R+r}dr \cdots\cdots 47$$

Note: the density period of three-dimensional space is 1, while the density period of each dimension of four-dimensional mass is b_0.Therefore, the curvature of three-dimensional space needs to be multiplied by $\frac{1}{b_0^3}$, where $\frac{1}{r}\int_r^0 \frac{1}{R+r}\boldsymbol{dr}$ is the average curvature of a point in three-dimensional space outside the four-dimensional mass.

As we can see, the curvature of space formed by four-dimensional mass has the maximum value, and the inverse of the minimum space measure of four-dimensional mass is the maximum curvature of three-dimensional space.In thematerial space theory, the smallest four-dimensional mass element is a space sphere with radius a_0, so the maximum curvature is:

$$\mathbf{K}_{max} = \frac{1}{a_0} = 5.54325573012 \cdot 10^{19}$$

In fact, due to mass degradation, the maximum curvature of three-dimensional space is the curvature formed by the spherical space of protons.When all matter is made up of the smallest four-dimensional units of mass, the largest gravitational field in the physical world is formed. The radius of this gravitational field is equivalent to the Schwarzschild radius of general relativity.

The results of general relativity show that gravity is generated by space bending, and the mathematical description of space bending is the curvature and winding rate of space.

5.2.2Gravitational field of gravitational mass

The mixed product of three equal weight space vectors of a four-dimensional mass field is the volume contained in a four-dimensional mass sphere, and physically, volume is quantity,When you multiply the volume times the fourth vector of the four-dimensional mass, you form a new vector, which is the gravitational mass,So the gravitational mass is actually a vector pointing to the fourth dimension, and its magnitude is the property of the gravitational mass of the material that we observe.

The force in modern physics, by Newtonian definition, is actually an observation of the mass properties of gravity, it's not an intrinsic property of matter.When the gravitational mass interacts with the Gaussian

curvature quantity of the space surface as a vector, the action mode is number multiplication:

$$\mathbf{G} = \mathrm{K}\mathbf{M} \cdots\cdots 48$$

There is a steady one-dimensional mass field C in three-dimensional space, and the vector **G** differentiates the area element of the spatial point:

$$\mathrm{d}\mathbf{N} = \mathrm{C}\frac{\mathrm{dK}\,\mathbf{M}}{\boldsymbol{dS}} = \mathrm{CK}\frac{\mathrm{dM}}{\mathrm{dS}} \cdots\cdots 49$$

We define **N** as the strength of a four-dimensional mass gravitational field.

Among them: K ～Gaussian curvature of gravity mass surface, S ～plane element of gravity mass sphere at a certain point, C ～ speed of light, M ～ mass measurement of gravity mass.

The strength unit of the gravitational field is: m/s^2

Equation 49 establishes the relationship between Gaussian curvature of space, strength of gravitational field and gravitational mass.

$\frac{\mathrm{d}|\mathbf{M}|}{\mathrm{dS}}$isthe surface density of the gravitational mass, for the standard gravitational mass with radius R, Due to the$\frac{\mathrm{d}|\mathbf{M}|}{\mathrm{dS}} = \frac{|\mathbf{M}|}{4\pi R^2}$, , then, the gravitational field strength of the gravitational mass is:

$$\mathbf{N} = \frac{\mathrm{CK}}{4\pi \mathrm{R}^2}\mathbf{M} \cdots\cdots 50$$

If there are two gravitational masses in three-dimensional space, the interaction can be expressed as follows:

$$\mathbf{F_{1,2}} = \frac{\mathrm{CK}_1}{4\pi \mathrm{R}^2{}_1}\mathbf{M_1}|\mathbf{M}_2|$$

$$\mathbf{F_{2,1}} = \frac{\mathrm{CK}_2}{4\pi \mathrm{R}^2{}_2}\mathbf{M}_2|\mathbf{M_1}|$$

Since F $\mathbf{F_{1,2}}$=$\mathbf{F_{2,1}}$, multiply the two equations and then take the square root to get:

$$\mathbf{F_G} = \frac{C|\mathbf{M_1}||\mathbf{M_2}|}{4\pi R_1 R_2}\sqrt{\mathrm{K}_1\mathrm{K}_2} \cdots\cdots 51$$

Formula 10 is the gravity equation in the microscopic field obtained from Gaussian curvature of the space surface.

As we know, Gaussian curvature is the dot product of curvature of two principal directions of a curved surface. For two gravitational masses with a distance of r in three-dimensional space, the equation of gravity can be written as:

$$\mathbf{F_G} = \frac{C|\mathbf{M_1}||\mathbf{M_2}|}{4\pi R_1 R_2}\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0 \frac{1}{R_1+r}\,dr\right)\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0 \frac{1}{R_2+r}\,dr\right) \cdots\cdots 52$$

Calculate the gravitational attraction of two protons in three-dimensional space when they are 10^{-10}m apart:

$$\mathbf{F_G} = \frac{C|\mathbf{M_1}||\mathbf{M_2}|}{4\pi R_1 R_2}\frac{1}{b_0^6}\frac{1}{r^2}(|\ln R| - |\ln(R+r)|)^2 = 2.57426 \cdot 10^{-13}\,\mathrm{N}$$

Note: proton radius: $8.4087*10^{-16}$m, b_0:1308, proton mass: $1.6726216378*10^{-27}$kg.

Calculate the gravitational attraction of a proton and an electron in three-dimensional space when they are 10^{-10}m apart:

$$\mathbf{F_G} = \frac{C|\mathbf{M_1}||\mathbf{M_2}|}{4\pi R_1 R_2}\frac{1}{b_0^6}\frac{1}{r^2}(|\ln R_1| - |\ln(R_1+r)|)(|\ln R_2| - |\ln(R_2+r)|) = 2.08397 \cdot 10^{-15}\,\mathrm{N}$$

Note: proton radius: R_1=$8.4087*10^{-16}$m; b_0:1308; proton mass: $1.6726216378*10^{-27}$kg; electron mass: $9.10938215\cdot 10^{-31}$kg; Radius :R_2=$6.8693998\cdot 10^{-17}$m.

Calculate the gravitational attraction between two electrons separated by 10-10m in three-dimensional space:

$$\mathbf{F_G} = \frac{C|\mathbf{M_1}||\mathbf{M_2}|}{4\pi R_1 R_2}\frac{1}{b_0^6}\frac{1}{r^2}(|\ln R| - |\ln(R+r)|)^2 = 1.1888258 * 10^{-18}\,\mathrm{N}$$

6.THE INTERACTION OF ELECTROMAGNETIC FIELDS IS STUDIED BASED ON THE PROPERTIES OF SPACE BENDING

6.1Space curvature and winding rate of three dimensional 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 16 and 17, 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 [10], 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 16 or equation 17, 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:

$$\mathbf{Q} = \pm|\boldsymbol{C}|(\mathbf{y} \times \mathbf{z}) \cdots\cdots 53$$

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:

$$\boldsymbol{B} = \mathbf{Q} \times \mathbf{K} \cdots\cdots 54$$

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.

Write equation 16 as follows:

$$f(x, y, z) = \begin{cases} x = \frac{C}{F_S}\frac{b_0\alpha}{b_0\alpha} \\ y = R\sin b_0\alpha \\ z = R\cos b_0\alpha \end{cases} \cdots\cdots 55$$

Then, the curvature of the cylinder spiral is:

$$\boldsymbol{K} = \frac{\boldsymbol{R}}{\boldsymbol{R^2}+(\frac{C}{F_S b_0\alpha})^2} \cdots\cdots 56$$

The winding rate of cylindrical spiral is:

$$\boldsymbol{\tau} = \frac{\frac{C}{F_S b_0\alpha}}{\boldsymbol{R^2}+(\frac{C}{F_S b_0\alpha})^2} \cdots\cdots 57$$

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:

$$\boldsymbol{E} = \pm|\mathbf{Q}|\boldsymbol{\tau} \cdots\cdots 58$$

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.

6.2Interaction 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:

$$\boldsymbol{F_B} = |\boldsymbol{B_1}|\mathbf{V} \times \boldsymbol{B_2} = \boldsymbol{B_1} \times \mathbf{V}|\boldsymbol{B_2}| \cdots\cdots 59$$

Equation 59 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 59 is the ampere law in the micro field. By extending formula 59 to the macro field, the ampere law of electromagnetism can be obtained.

6.3Interaction 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:

$$\boldsymbol{F_E} = (\boldsymbol{E_1} \cdot \mathbf{C})\boldsymbol{E_2} = (\boldsymbol{E_2} \cdot \mathbf{C})\boldsymbol{E_1} \cdots\cdots\cdots\cdots 60$$

Formula 60 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.

6.3Electromagnetic 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:

$$\bar{\mathbf{K}} = \frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\boldsymbol{R}+\frac{\mathbf{1}}{\boldsymbol{R}}(\frac{\mathrm{C}}{\mathrm{F_S}\mathrm{b}_0\alpha})^{\mathbf{2}}+\boldsymbol{r}}\,dr \cdots\cdots\cdots\cdots 61$$

$$\bar{\boldsymbol{\tau}} = \frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\frac{\mathrm{F_S}\mathrm{b}_0\alpha R^2}{C}+\frac{\mathrm{C}}{\mathrm{F_S}\mathrm{b}_0\alpha}+\boldsymbol{r}}\,dr \cdots\cdots\cdots\cdots 62$$

From equations 59, 60, 61 and 62, we can calculate the magnetic field force and electric field force between any two charges in three-dimensional space.

The spatial dimension of charge is calculated from equation 18:

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:

$$\mathrm{R} = \mathrm{a}_0 = \sqrt{\frac{\mathrm{Q_S}}{\mathrm{C}\cdot\pi\cdot\mathrm{b}_0{}^2}} = \sqrt{\frac{1.140152226*10^{-15}}{\mathrm{C}\cdot\pi\cdot 1308^2}}$$

$$= 8.4117893*10^{-16}m$$

$$\mathrm{x} = 2.481401965\mathrm{a}_0 = 2.08730306*10^{-15}m$$

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

In equations 61 and 62, a period of three dimensional mass α is 2π to calculate the curvature and winding rate of a three dimensional mass surface as follows:

$$\boldsymbol{K} = \frac{\boldsymbol{R}}{\boldsymbol{R^2}+(\frac{\mathrm{C}}{\mathrm{F_S}\mathrm{b}_0\alpha})^{\mathbf{2}}} = 1.1888077*10^{15}1/m$$

$$\boldsymbol{\tau} = \frac{\frac{\mathrm{C}}{\mathrm{F_S}\mathrm{b}_0\alpha}}{\boldsymbol{R^2}+(\frac{\mathrm{C}}{\mathrm{F_S}\mathrm{b}_0\alpha})^{\mathbf{2}}} = 3.5893939*10^{11}1/m$$

The curvature and winding rate at 10^{-10}m of the external three-dimensional space of three-dimensional mass are:

$$\bar{\mathbf{K}} = \frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\boldsymbol{R}+\frac{\mathbf{1}}{\boldsymbol{R}}(\frac{\mathrm{C}}{\mathrm{F_S}\mathrm{b}_0\alpha})^{\mathbf{2}}+\boldsymbol{r}}\,dr = 6.83039468\cdot 10^4 1/m$$

$$\bar{\boldsymbol{\tau}} = \frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\frac{\mathrm{F_S}\mathrm{b}_0\alpha R^2}{C}+\frac{\mathrm{C}}{\mathrm{F_S}\mathrm{b}_0\alpha}+\boldsymbol{r}}\,dr = 2.10890362\cdot 10^4 1/m$$

Thus, the magnetic field force with a velocity V when the two charges are 10^{-10}m apart can be calculated as follows:

$$\boldsymbol{F_B} = \boldsymbol{B_1}\times\mathbf{V}|\boldsymbol{B_2}| = \mathrm{Q_S}{}^{\mathbf{2}}\bar{\mathbf{K}}^{\mathbf{2}}\mathrm{V} = 6.06481108*10^{-21}V(N)$$

When two charges are 10^{-10}m apart, the electric field force is:

$$\boldsymbol{F_E} = (\boldsymbol{E_2}\cdot\mathbf{C})\boldsymbol{E_1} = \mathrm{Q_S}{}^{\mathbf{2}}\bar{\boldsymbol{\tau}}^{\mathbf{2}}\mathrm{C} = 1.73324456*10^{-13}N$$

When the electric field of two charges is the same, it's repulsive, and when the electric field of two charges is different, it's attractive.

7. THE MICROSCOPIC STRUCTURE OF HYDROGEN ATOMS IN THREE DIMENSIONS

7.1The space structure of protons and electrons

Hydrogen atom is a simple atom composed of a proton and an electron. A proton has a basic gravitational mass and a unit charge, and an electron has a small gravitational mass and a basic charge. We have discussed the structure of the gravitational mass and charge of a proton and an electron in the material space theory, which can be summarized as follows:

The gravitational mass of the proton is: $1.6726216378*10^{-27}$Kg, the radius is: $8.4087*10^{-16}$m, and the shape is a four-dimensional sphere; The proton is closely bound to a positive charge, and the charge of the positive charge is: $1.140152226*10^{-15}m^3/s$ （$1.602176462*10^{-19}$C）, The structure of positive charge is as follows: Radius $8.4117893*10^{-16}$m, height $2.0873379*10^{-15}$m, the spiral of the cylinder encircles the cylindrical space.

The spatial structure of the proton is as follows:

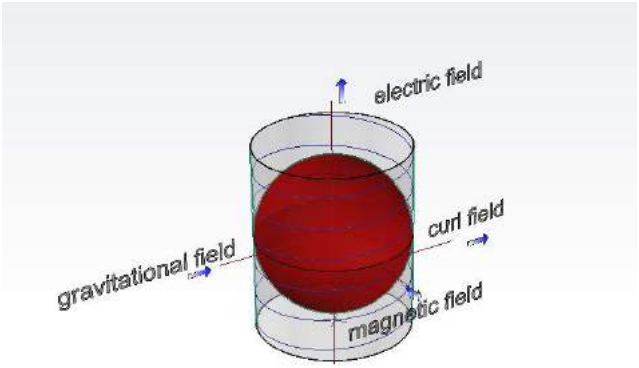

Figure 3.*Protons space structure*

The gravitational mass of the electron is $9.10938215*10^{-31}$Kg, the radius is $6.8693998·10^{-17}$m, and the shape is a four-dimensional sphere. The electron is closely combined with a negative charge. The electric quantity of the negative charge is $1.140152226*10^{-15}m^3/s$ （ $1.602176462*10^{-19}$coulombs). The structure of the negative charge is $1.36291308*10^{-16}$m in radius and $3.456377266*10^{-16}$m in height. The density coefficient of negative charge is b_1=7899, and the spatial structure of the electron is shown as follows:

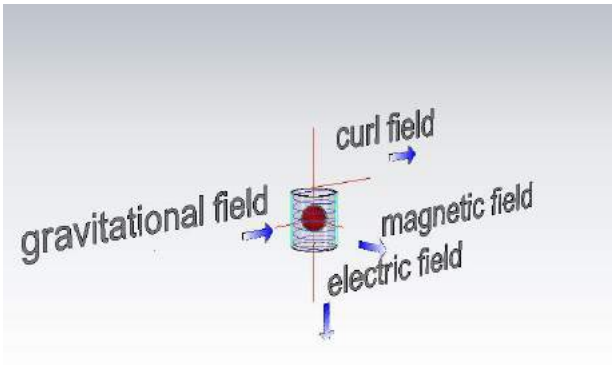

Figure 4.*Spatial structure of electrons*

Proton charge and electron charge have opposite spiral direction and winding rate. The gravitational masses of electrons and protons are surrounded by cylindrical Spaces of charges bound to them.

7.2The interaction of electrons and protons in hydrogen atoms

When electrons and protons are in three-dimensional space at the same time, they will produce gravitational field interaction, magnetic field interaction, electric field interaction, but also have the centrifugal force generated by the angular momentum of electrons.

Electrons and protons have different charges, so the force of the electric field is gravity, and the gravitational field is also gravity, so the force of the electric field is acting in the same direction as the force of gravity.Electron and proton have different charge, accordingly, the electron that has motion and proton have magnetic force, the direction of magnetic force is repulsive force, the centrifugal force that electron motion also is repulsive force, accordingly, magnetic field force and centrifugal force action direction are same, it is repulsive force, their action direction and electric field force and gravitational force are opposite.

Therefore, we find that there are four forces in hydrogen atom, and they have the following relations at equilibrium:

$$\boldsymbol{F_B + F_L = F_E + F_G} \cdots\cdots 63$$

Where: F_B～magnetic field force, F_L～ centrifugal force, F_E～ electric field force, F_G～gravity.

Substituting the formula in the paper, it can be obtained that:

$$Q_S{}^2\bar{K}^2V + |\boldsymbol{M_2}|r\omega^2 = Q_S{}^2\bar{\tau}^2C + \frac{C|\mathbf{M_1}||\mathbf{M_2}|}{4\pi R_1R_2}\sqrt{K_1K_2} \cdots 64$$

The following equations can be obtained from equations 52, 61, 62 and angular momentum:

$$Q_S{}^2\left(\frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\boldsymbol{R}+\frac{\mathbf{1}}{\boldsymbol{R}}(\frac{C}{F_S b_0\alpha})^2+\boldsymbol{r}}dr\right)^2 V + |\boldsymbol{M_2}|\frac{V^2}{r} =$$

$$Q_S{}^2\left(\frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\frac{F_S b_0\alpha R^2}{C}+\frac{C}{F_S b_0\alpha}+\boldsymbol{r}}dr\right)^2 C +$$

$$\frac{C|\boldsymbol{M_1}||\boldsymbol{M_2}|}{4\pi R_1R_2}\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0 \frac{1}{R_1+r}dr\right)\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0 \frac{1}{R_2+r}dr\right) \cdots\cdots 65$$

According to the results of the calculation of charge structure by the material space theory, α = 2π,C/F$_S$ = x = 2.481401965 R;

The above formula can be obtained:

$$Q_S{}^2\left(\frac{1}{b_0^2}\frac{1}{r}\int_r^0\frac{1}{R+\frac{1.5393389}{b_0^2\pi^2}R+r}dr\right)^2 V+|M_2|\frac{V^2}{r}$$

$$=Q_S{}^2\left(\frac{1}{b_0^2}\frac{1}{r}\int_r^0\frac{1}{0.80599348b_0\pi R+\frac{1.2407048}{b_0\pi}R+r}dr\right)^2 C$$

$$+\frac{C|M_1||M_2|}{4\pi R_1R_2}\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0\frac{1}{R_1+r}dr\right)\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0\frac{1}{R_2+r}dr\right)$$

Ignore the relatively small amount in the formula, substitute in the proton and electron property parameters, can be sorted out:

$$Q_S{}^2\left(\frac{1}{b_0^2}\frac{1}{r}(\ln(R+r)-\ln R)\right)^2 V+|M_2|\frac{V^2}{r}=$$

$$Q_S{}^2\left(\frac{1}{b_0^2}\frac{1}{r}(\ln(0.80599348b_0\pi R+r)-$$

ln0.80599348b0πR2C+CM1M24πR1R21b061r2lnR 1+r−lnR1lnR2+r−lnR2……66

In three-dimensional space, the angular momentum of electrons is conserved, and the following formula holds:

$$\boldsymbol{L_R+L_S=L}$$

That is:

$$|\boldsymbol{M_2}|Vr+\boldsymbol{L_S}=|\boldsymbol{M_2}|R_2C\cdots\cdots\cdots\cdots\cdots 67$$

Ignoring the spin angular momentum of the electron, the following equation can be obtained:

$$\boldsymbol{Vr}=R_2C\cdots\cdots\cdots\cdots\cdots 68$$

Equations 66 and 68 constitute the equations, and the equations are solved as follows:

Due to: r ≫ 0.80599348b$_0$πR ≫ R\R$_1$\R$_2$Ignoring the relatively small terms, equation 68 is substituted into equation 66:

$$Q_S{}^2\frac{CR_2}{r^3b_0^4}(\ln r-\ln R)^2+|\boldsymbol{M_2}|\frac{C^2R_2^2}{r^3}$$

$$=Q_S{}^2\frac{C}{r^2b_0^4}(\ln r-\ln 0.80599348b_0\pi R)^2+\frac{C|\boldsymbol{M_1}||\boldsymbol{M_2}|}{4\pi R_1R_2}\frac{1}{r^2b_0^6}(\ln r-\ln R_1)(\ln r-\ln R_2)$$

Both sides is multiplied$r^3b_0^4$ available:

$$Q_S{}^2CR_2(\ln r-\ln R)^2+|\boldsymbol{M_2}|C^2R_2^2b_0^4=Q_S{}^2rC(\ln r-$$

$$\ln 0.80599348b_0\pi R)^2+\frac{C|\boldsymbol{M_1}||\boldsymbol{M_2}|}{4\pi R_1R_2}\frac{r}{b_0^2}(\ln r-$$

$$\ln R_1)(\ln r-\ln R_2)\cdots\cdots\cdots 69$$

Substituting the parameters of electrons and protons, we can get:

$$2.67710358*10^{-38}(\ln r+34.7117172)^2+1.13083408\cdot10^{-33}=3.89714336\cdot10^{-22}r(\ln r+26.60642248)^2+3.68141298\cdot10^{-25}r(\ln r+37.2168698)(\ln r+34.7120946)$$

Since r is much larger than 10^{-16}m in hydrogen atom and the first term on the right is much larger than the second term, equation 69 can be simplified as follows:

$$\frac{1}{r}|\boldsymbol{M_2}|C^2R_2^2b_0^4=Q_S{}^2C(\ln^2 r-2\ln 0.80599348b_0\pi R\cdot$$

$$\ln r+\ln 20.80599348b0\pi R\cdots\cdots 70$$

Take two derivatives of both sides to get:

$$r=\frac{|\boldsymbol{M_2}|CR_2^2b_0^4}{2Q_S{}^2}\cdots\cdots\cdots\cdots\cdots 71$$

By calculation, it can be obtained that:

$$r=1.450849985*10^{-12}m$$

Substituting equation 68, the velocity of the electron outside the nucleus can be calculated as:

$$V=1.4194398*10^4m/s$$

The above calculation is the orbital radius of the electron outside the hydrogen nucleus, not the wavefunction value of quantum theory.

7.3The spatial structure of hydrogen atoms

Bohr's hydrogen structure model successfully describes the energy level structure of hydrogen atom. When electrons and protons are approximately regarded as point masses and point charges, the structure of hydrogen atom described by Bohr has good experimental coincidence.

The electrons and protons described in this paper are a combination of the four-dimensional mass and the three-dimensional mass that determine the spatial structure. In the three-dimensional space, electrons and protons may have a variety of mutual states. The two special states are shown in fig.5 and fig.6:

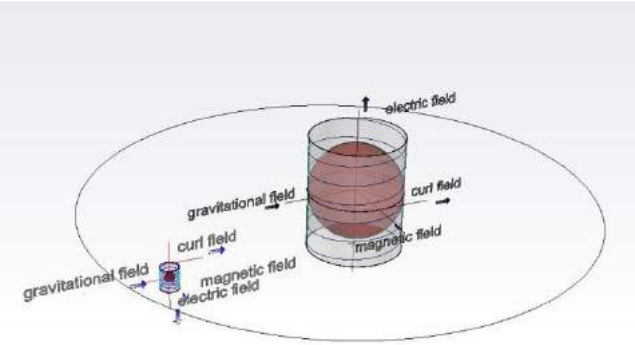

Figure 5.*The direction of electric field intensity of protons and electrons is parallel*

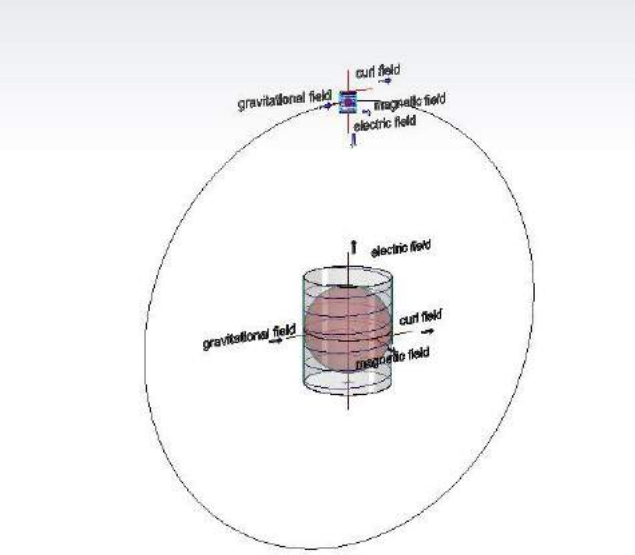

Figure 6.*The electric field intensity of protons and electrons is aligned*

In FIG. 5, since the intensity direction of proton and electron electric field is parallel, there is no interaction between electric field and proton, and there is no relative movement of electron and proton to generate magnetic field. Therefore, there is no interaction between magnetic field and proton.Therefore, the space state between the electron and proton shown in figure 5 is only centrifugal force and gravity, which does not conform to the actual situation of hydrogen atoms.

As shown in figure 6, there are electric field force, centrifugal force and gravity in the space state between electrons and protons. Only when electrons transition can magnetic field force be generated, which conforms to the actual existence state of hydrogen atoms.So in hydrogen, the electrons and protons are in the state shown in figure 6.

7.4Energy level of hydrogen atom

7.4.1The first Bohr radius

The first Bohr radius of hydrogen atom is $5.2917721067*10^{-11}$m, and the minimum orbital radius of hydrogen atom calculated by space curvature and rotation rate is $1.450849985*10^{-12}$m, which is quite different from each other.The first Bohr radius of hydrogen atom is the data accurately verified by experiments, so it can be judged that there is parameter error in calculating the minimum orbital radius of hydrogen atom by space curvature.Looking at equation 65, we find that the parameters of proton and the mass and charge of electron are determined parameters.The spatial structure and density coefficients of the electrons are what we assume to be the same values as the parameters of the protons, which can vary.

Set:

The density coefficient of the electron charge is b_1, the charge radius of the electron is R_e, the gravitational mass and radius of the electron are M_2 and R_2, and the density coefficient is b_0. We can rewrite equation 65 as:

$$Q_S{}^2\left(\frac{1}{b_1^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\boldsymbol{R_e}+\frac{\mathbf{1}}{\boldsymbol{R_e}}(\frac{C}{F_S b_1 \alpha})^2+\boldsymbol{r}}dr\right)^2 V+|\boldsymbol{M_2}|\frac{V^2}{r}$$
$$=Q_S{}^2\left(\frac{1}{b_1^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\frac{F_S b_1 \alpha R_e^2}{C}+\frac{C}{F_S b_1 \alpha}+\boldsymbol{r}}dr\right)\left(\frac{1}{b_0^2}\frac{1}{r}\int_r^0 \frac{\mathbf{1}}{\frac{F_S b_0 \alpha R^2}{C}+\frac{C}{F_S b_0 \alpha}+\boldsymbol{r}}dr\right)C$$
$$+\frac{C|\boldsymbol{M_1}||\boldsymbol{M_2}|}{4\pi R_1 R_2}\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0 \frac{1}{R_1+r}dr\right)\left(\frac{1}{b_0^3}\frac{1}{r}\int_r^0 \frac{1}{R_2+r}dr\right)$$

Ignoring magnetic force, gravitational force and relatively small terms, the following equation can be obtained:

$$|\boldsymbol{M_2}|\frac{V^2}{r}=$$

$$Q_S{}^2\frac{\mathbf{1}}{b_1^2 b_0^2 r^2}\left(\int_r^0 \frac{\mathbf{1}}{\frac{F_S b_1 \alpha R_e^2}{C}+\boldsymbol{r}}dr\right)\left(\int_r^0 \frac{\mathbf{1}}{\frac{F_S b_0 \alpha R^2}{C}+\boldsymbol{r}}dr\right)C$$

α =2 π , C/F_S=2.481401965 can be obtained:

$$|\boldsymbol{M_2}|\frac{V^2}{r}=$$

$$Q_S{}^2\frac{\mathbf{1}}{b_1^2 b_0^2 r^2}\left(\int_r^0 \frac{\mathbf{1}}{0.80599348\, b_1 \pi R_e+r}dr\right)\left(\int_r^0 \frac{\mathbf{1}}{0.80599348\, b_0 \pi R+r}dr\right)C\cdot$$

……72

Substitute into equation 68, multiply both sides by 4, and the integral is:

$$|\boldsymbol{M_2}|C^2R_2^2b_1^2b_0^2 = Q_S{}^2\mathrm{rC}(\ln r - \ln 0.80599348\mathrm{b}_0\pi\mathrm{R}_e)(\ln r - \ln 0.80599348\mathrm{b}_0\pi\mathrm{R})$$

Solve the equation to get:

$$\mathrm{r} = \frac{|\boldsymbol{M_2}|CR_2^2b_1^2b_0^2}{2{Q_S}^2} \cdots\cdots\cdots\cdots 73$$

Substituting the first Bohr radius into equation 73, the density coefficient of the electron charge can be calculated as follows: b_1=7899

The space size of calculated charge is:

$$\mathrm{R}_e = \sqrt{\frac{\mathrm{Q_S}}{\mathrm{C}\cdot\pi\cdot{\mathrm{b}_1}^2}} = \sqrt{\frac{1.140152226*10^{-15}}{\mathrm{C}\cdot\pi\cdot 7899^2}} = 1.36291308*10^{-16}m$$

$$\mathrm{x} = 2.481401965\mathrm{R}_e = 3.456377266*10^{-16}m$$

Therefore, the structure of the electron charge is as follows: radius 1.36291308*10^{-16}m, height 3.456377266*10^{-16}m, the spiral of the cylinder is surrounded by cylindrical space, and the density coefficient of the charge is b_1=7899,Under these conditions, the minimum orbital radius of the hydrogen atom is the same as the first Bohr radius.

7.4.2Quantization condition of hydrogen atom model

Bohr proposed the angular momentum quantization condition of electrons in the hydrogen atom model:

$$\mathrm{p} = \mathrm{mvr} = \mathrm{n}\frac{h}{2\pi} = n\hbar \cdots\cdots\cdots\cdots 74$$

As can be seen from equation 74, if the mass of the electron is fixed, both the velocity and orbital radius of the electron must be quantized.Although this quantization condition is a good explanation for the energy level structure of hydrogen atoms, it lacks causal completeness and Bohr does not explain how quantization is generated. Therefore, this is a hypothesis with only results and no causes.

The fundamental principle of the material space theory requires that our theory conform to the principle of causality, so we need to find the reason for the discontinuity of the energy level structure of hydrogen atom.

When light ACTS on hydrogen atoms, light with the same density coefficient as the charge of electrons can generate spatial superposition with the spatial helical structure of the charge, while light with different density coefficient as the charge of electrons cannot interact with the charge space of electrons. Therefore, the absorption of light by electrons is selective.

Since light is a two-dimensional spatial wave train, the spatial wave train with density coefficient b_1 is a complete spatial wave train, so the charge of electrons can only absorb integer times of spatial wave train b_1.Therefore, in formula 73, b_1 can only be an integer multiple of 7899, thus generating the quantization condition of hydrogen energy level.

7.4.3Magnetic properties of hydrogen energy levels

The electrons outside the nucleus of hydrogen atom are in axial motion during the transition process, and magnetic field force will be generated. When the external magnetic field exists, the transition of hydrogen atom will be affected by the external magnetic field.

Therefore, in the external magnetic field, the energy levels of hydrogen atoms will shift and split [11].

8.DISCUSSION

(1)This paper discusses the material properties of the micro world from the perspective of the space, studies the properties of the substance as a space in the discussion,The results show that space curvature and space winding rate are the sources of various field forces.

(2)In this paper, only a three-dimensional plane rectangular coordinate system is selected as the mathematical reference system, and the space is studied as the physical existence, so as to avoid the complexity of coordinate transformation.

(3)In the study of the field of light, the momentum and energy characteristics of light were revealed, while it was noted that no force was generated by the amount of light. The research results obtained the momentum expression of the light quantity field generated by the light source and the derivative form of the energy expression.

(4)We studied the properties of electromagnetic fields by means of vector field and differential geometry, and obtained the expressions of ampere's law and coulomb's law in the microscopic field under the condition of the material space theory.The form of the expression is consistent with that of classical electromagnetic theory. However, there are no artificially specified dielectric constant and electric field force constant in the research results.This avoids the discussion of causality of these constants, and also indicates that dielectric constant and electric field force constant are not sufficient and necessary conditions for the study of electromagnetic field properties in the microscopic field.

(5)In our research results, the direction of current intensity is not the direction of charge movement, but perpendicular to the direction of charge movement, which can better explain the direction of ampere law force.

(6)We use the vector characteristics of space curvature to describe the characteristics of the gravitational field, and the research results show the same form as general relativity, which plays a positive role in the application of general relativity in the micro field.

In the process of studying the gravitational field with space curvature, we did not introduce any constants and obtained the complete law of gravity in the microscopic field.This result suggests that, in the microscopic domain, the introduction of gravitational constants is not necessary.Therefore, the gravitational constant is not a sufficient and necessary condition when it is extended from the microscopic domain to the macroscopic domain.

(7)In describing the structure of hydrogen atoms, we find that the charge density coefficient of electrons assumed by the theory of matter space has errors under the same condition as the mass density coefficient of gravity.We use the first Bohr radius of hydrogen atom to calculate the spatial density coefficient of electron charge and the spiral radius, and get the formula of the first Bohr radius of hydrogen atom.

In this paper, we reconsidered Bohr's assumption about the quantization condition of hydrogen atom model, and concluded that Bohr's quantization condition of electron orbit lacked sufficient condition.

(8)Based on the characteristics of electron charge density coefficient and two-dimensional mass, we propose that light with the same density coefficient can be spatially superimposed with charge.Therefore, the energy level characteristics of hydrogen atom are explained under the principle of Newtonian mechanics, and the variation of hydrogen atom spectrum in the external magnetic field is reasonably explained.

(9)The research results of this paper unify the unit dimensions of physical quantities of electromagnetism, optics and Newtonian mechanics, and express all physical quantities in terms of space and time.Moreover, the transformation relationship between these physical quantities is consistent with the classical electromagnetic theory and Newtonian mechanics theory, which will lay a foundation for the study of broader fields by using the material space theory.

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