Section B:

NEW THEORY

"*Stardust has a conscious*"

Carl Sagan (1934–1996)

Chapter 4

Unifying Gravitational Force and Electromagnetic Force using Corrected Formulas of Relativity

4.1 Unified Theory of Relativity and Quantum Theory Using Corrected Formulas

Equation 4-1-1,

$$\gamma = [1 - \frac{v^2}{c^2}(\frac{1 \mp \frac{z\hbar}{2v}}{1 \pm \frac{\hbar}{2v}})]^{-½} \qquad 4\text{-}1\text{-}1$$

which was produced from the force line special theory of relativity, includes Planck's constant $\hbar$ and the speed of light c as the limit of the velocity. These two factors show that the special theory of relativity unifies with quantum theory. Infinity cannot appear in Eq. 4-1-1 under the limit of speed c, and therefore when $v = c$, Eq. 4-1-1 becomes

$$\gamma = (\left|\frac{\hbar}{c}\right|)^{-½} \qquad 4\text{-}1\text{-}2$$

Now, given that $c = 2.99792458 \times 10^8$ m/s and

$$\hbar = \frac{6.626176 \times 10^{-34}\ \text{Js}}{2\pi} \qquad 4\text{-}1\text{-}3$$

$$\left|\frac{\hbar}{c}\right| = \left|\frac{\frac{6.626176 \times 10^{-34}\ \text{Js}}{2\pi}}{2.99792458 \times 10^{8}\ \text{m/s}}\right| = 3.517730 \times 10^{-43} \qquad 4\text{-}1\text{-}4$$

$$\left|\frac{c}{\hbar}\right| = 2.842742 \times 10^{42} \qquad 4\text{-}1\text{-}5$$

This number above is called the unification constant.

$$\gamma = (\left|\frac{c}{\hbar}\right|)^{½} = 1.686044 \times 10^{21} \qquad 4\text{-}1\text{-}6$$

This number above is called the increase quantization constant.

Equation 4-1-1 can be applied to mass increase under the limit of speed:

$$m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}} \rightarrow m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}\alpha}} = m_0 \left(\left|\frac{c}{\hbar}\right|\right)^{-½} \qquad \text{4-1-7}$$

This result shows that under the limit of speed, mass cannot increase infinitely.

Because $E = \hbar\nu$, and $\lambda\nu = c$, we obtain

$$m = m_0 \left(\left|\frac{c^2}{\lambda E}\right|\right)^{-½} \qquad \text{4-1-8}$$

Equation 4-1-8 shows that the mass of a particle is inversely proportional to the wavelength of an electromagnetic wave, and hence Eq. 4-1-8 demonstrates the relation between mass and the electromagnetic wave, and finally the relation between gravitational force and electromagnetic force.

4.2 Establishing New Theories

4.2.1 Obtaining mass screening theory using corrected formulas

Most physicists believe that the electron is the lightest and simplest particle in nature, which infers that the electron has no substructure. Thus, these physicists have chosen to observe various physical changes of the electron, like when it accelerates $a = k$,

$$v = v_0 < v_1 < v_2 < v_3 \ldots v_E$$

From the perspective of Eq. 4-1-8

$$m = m_0 \left(\left|\frac{c^2}{\lambda E}\right|\right)^{-½}$$

First, according to classical electrodynamics as a force line theory, an electron has to have an electromagnetic field as follows:

$$E(\mathbf{r}.t) = \frac{q}{4\pi\varepsilon_0} \frac{\boldsymbol{\mathcal{R}}}{(\boldsymbol{\mathcal{R}}.u)^3} [u(c^2 - v^2) + \boldsymbol{\mathcal{R}} \times (u \times a)] \qquad \text{4-2-1}$$

$$B = \nabla \times A = -\frac{1}{c} \cdot \frac{q}{4\pi\varepsilon_0} \cdot \frac{1}{(u.\boldsymbol{\mathcal{R}})^3} \cdot \boldsymbol{\mathcal{R}} \times \; [v\,(c^2 - v^2) + v\,(\boldsymbol{\mathcal{R}}.a) + a\,(\boldsymbol{\mathcal{R}}.u)] \qquad \text{4-2-2}$$

Second, electrons have to emit electromagnetic waves as follows:

$$\nabla^2 E = \mu_0 \varepsilon_0 \frac{d^2 E}{dt^2} \qquad \text{4-2-3}$$

$$\nabla^2 B = \mu_0 \varepsilon_0 \frac{d^2 B}{dt^2} \qquad \text{4-2-4}$$

$$\nabla \cdot E = 0 \qquad \text{4-2-5}$$

$$\nabla \cdot B = 0 \qquad \text{4-2-6}$$

$$\nabla \times E = -\frac{dB}{dt}$$

$$\nabla \times B = \mu_0 \varepsilon_0 \frac{dE}{dt} \qquad \text{4-2-7}$$

Third, this wavelength has to become shorter and shorter, according to quantum theory $\lambda = \frac{\hbar}{p}$

as follows:

$$\lambda_0 > \lambda_1 > \lambda_2 > \lambda_3 \ldots \lambda_c \qquad \text{4-2-8}$$

Fourth, at the same time, this wavelength shortening satisfies the De Broglie formula

$$\lambda = \frac{\hbar}{mv} \qquad \text{4-2-9}$$

and the Heisenberg formula

$$\Delta x \geq \frac{\hbar}{\Delta mv} \qquad \text{4-2-10}$$

as well as the theory of relativity formula

$$L = L_0 \sqrt{1 - \frac{v^2 \alpha}{c^2}} \qquad \text{4-2-11}$$

Finally, the electron's mass has to increase according to the theory of relativity formula 4-2-11-2, as follows:

$m_0 < m_1 < m_2 < m_3 \ldots m_c$ 4-2-12

$$m = m_0 \sqrt{1 - \frac{v^2\alpha}{c^2}} \quad 4\text{-}2\text{-}13$$

To explain such physical changes, we need to postulate that the "electromagnetic field of an electron has a physical property that can be used to screen the bar mass of an electron."

The logical starting point of these assumptions is $m = m_0 \left(\left|\frac{c^2}{\lambda E}\right|\right)^{-1/2}$. The logical justification that ensures this is in keeping with gauge symmetry is explained more fully in §5.1, but I will touch on this briefly here. In gauge theory, an electromagnetic field as a compensations field has to have the physical property of mass screening when phase transformation put into operation. Without such physical property, gauge invariance cannot be maintained because of the changed momentum caused by gauge transformation.

Thus, any analysis of the absorption of the changed momentum by a compensations field ought to also involve analysis of the mass and related changed momentum screen by the inserted electromagnetic field. Such Mass Screening Theory provides a connection between classical dynamics, classical electrodynamics, quantum dynamics, quantum electrodynamics, relativity theory, gravitational force, and electromagnetic force.

4.2.2 Introduction of electromagnetic monopole force line elements

According to classical electrodynamics,

- particles that have different charges are interconnected with the force line introduced by M. Faraday
- force lines start from a particle that has a positive charge and ends at a particle that has a negative charge
- when a particle stays alone, its force lines must diverge
- when a particle moves with $v = k$, a magnetic field appears when a particle accelerate with $a = k$, the electromagnetic force line snaps and this force line bundle is emitted as an electromagnetic wave

According to QED and wave mechanics,

- this electromagnetic force line bundle transports quantized energy and momentum that is called photon
- when an emitted electromagnetic force line bundle is absorbed by a particle, the electromagnetic force line of photon becomes an electromagnetic field
- during the absorbing and emitting processes, the charge conservation law must be maintained
- divergence of B is not 0; namely, $\nabla \cdot B \neq 0$ (cf. §7, §14, §17, and §18)
- Because result of quantization of field of all space (degree of freedom is infinite) is quanta by second quantization ($[\ x, p] = i\hbar \Longrightarrow [A_{\mu}(x)\Pi_{\nu}(x')] = i\hbar\eta_{\mu\nu}\delta(x-x')$), these quanta must be changed material grains (photon) according to Einstein and de Broglie relation. This quantum we can one more double quantize ($i\hbar\eta_{\mu\nu}\delta(x-x')$ $=[A^{i}_{3\mu}(x)\Pi^{i}_{3\nu}(x')]$, $[A^{i}_{3\mu}\Pi^{i}_{3\nu}(x')]= i\hbar\eta^{i}_{4\mu\nu}\delta^{i}_{4}(x-x')$) for weak field and gravitational field as figure4-2-2-1 , for charge conservation's law, gauge symmetry and more degree of freedom for spin to satisfy by creation operator f and annihilation operator $f^{\dagger}$($[f\ ,f^{\dagger}]= \hbar_{i}$). Because another field quanta to obtain is needed this physical process, this process is called fourth quantization as figure 4-2-2-2.

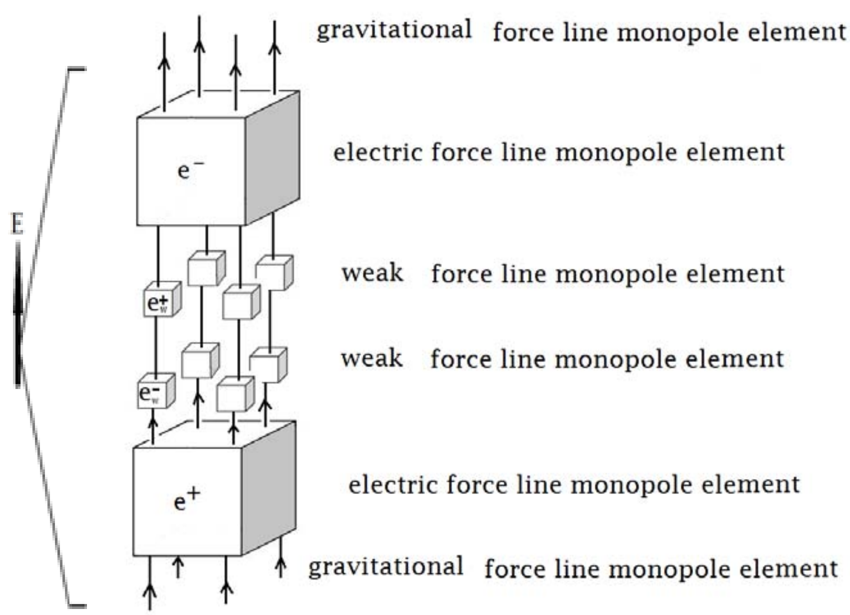

Figure 4-2-2-1

● For extra gauge freedom with that general mass less gauge boson couple with goldstone boson, to obtain is needed monopole element.Two gauge freedom of electromagnetic field can be changed more freedom by monopole element. Otherwise Higgs mechanism become physically meaningless and have to stays only mathematical level.

For such physical process to be possible, photon build electromagnetic field lines that are treated in classical electrodynamics ought to be composed of many body, is called quanta. Then each quantum ought to be composed of force line. That is called third quantization. This force line can be changed a force line monopole element by fourth quantization. This is illustrated by Figure 4-2-2-2.

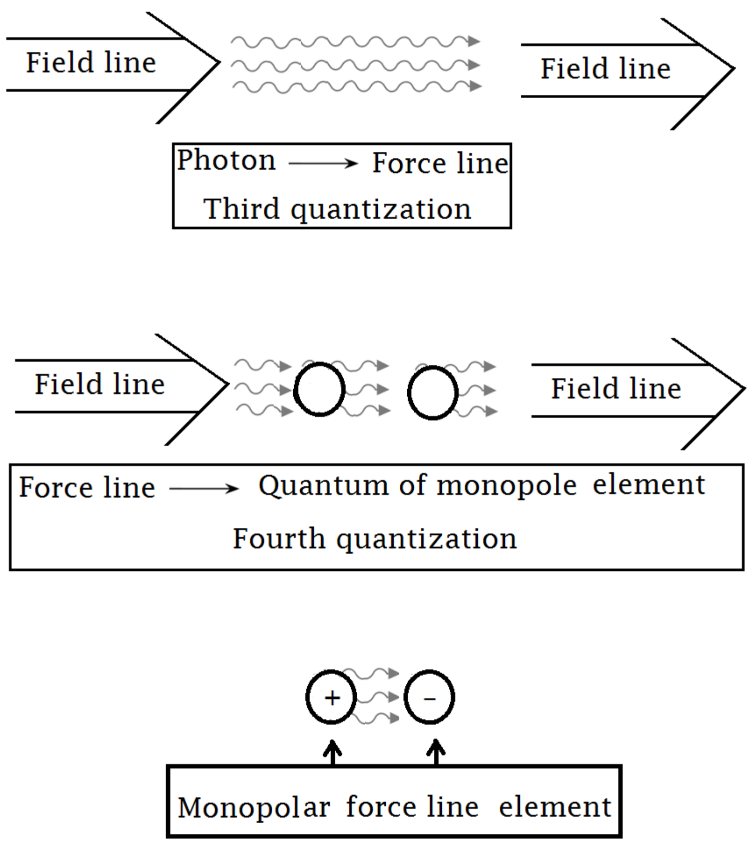

Figure 4-2-2-2

Without this composition, the field line could not snap and consequently become the electromagnetic wave of a field line bundle when a particle accelerates. Moreover, the field line could not connect as a field line bundle and field line bundle could not become field when the particle absorbs this electromagnetic wave and its energy momentum. Furthermore, the field line could not diverge as one part of the field repulses another part of the field.

Such physical situations can be expressed Figure 4-2-2-3:

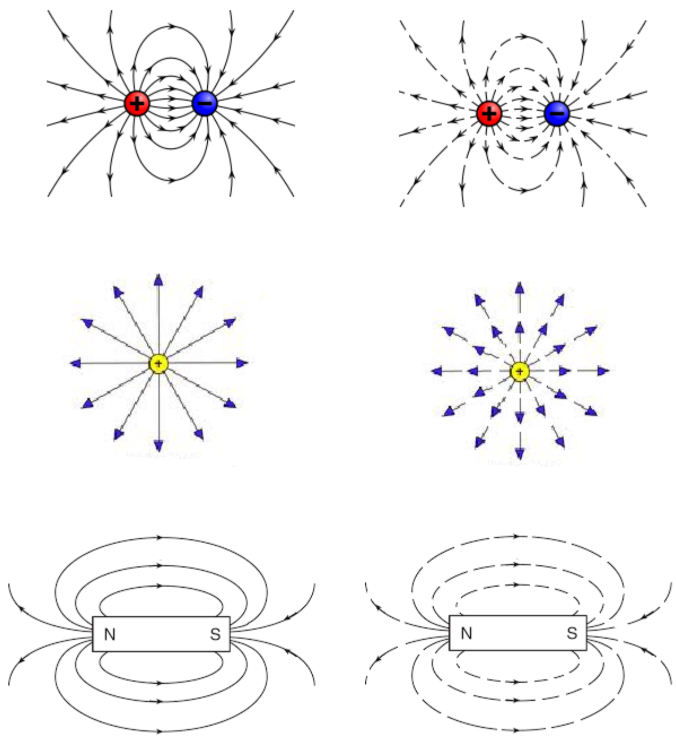

Figure 4-2-2-3

4.3 Theoretical Existence of the Gravitational Monopole (Positive Mass m^{+}, Negative Mass m^{-})

In order for an electric force line to have the property of mass screening, the physical property of a gravitational ±monopole is required. Thus, each electric force line ought to consist of a gravitational ±monopole, with one gravitational monopole being a positive mass monopole and the other being a negative mass monopole. The mathematical and logical justifications of such a requirement are identified by the fundamental integral theorem of quantum theoretical vector displacement that is combined with Heisenberg's uncertainty principle and the physical analysis of the pair annihilation and pair creation by Dirac's equation (discussed in §7, §14, §17, §18and §19)."

The physical justification of such a requirement is identified by relativistic gauge symmetry to maintaining phase transformation (discussed in §7, §14, §17, and §18) and accelerating expansion of the universe (discussed in §7, §14, §17, and §18).

Such a physical situation is like that of a polarizable dielectric screen of a free charge, as shown in Figure 4-3-1.

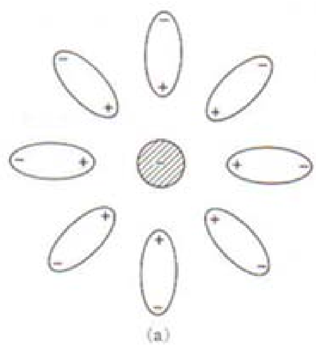

Figure 4-3-1

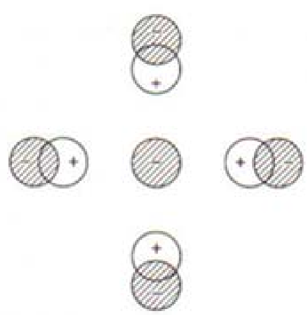

Figure 4-3-2

Another example is the result of vacuum polarization by virtual positron-electron pairs screening of the charge around a real electron, as shown in Figure 4-3-2

Thus, in the same way as that screening of an electric charge requires an electric dipole, so too does screening of a gravitational charge (mass) require a gravitational dipole that has a positive mass monopole and a negative mass monopole, as demonstrated in Figure 4-3-3.

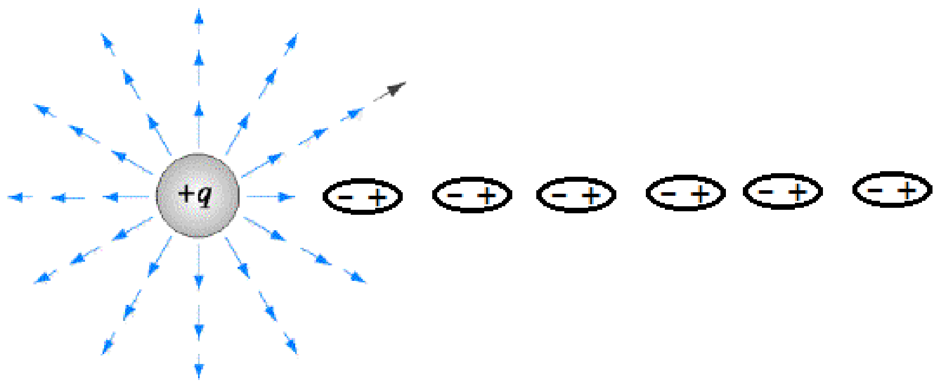

Figure 4-3-3 Illustration of a significantly enlarged force line

To summarize, each gravitational dipole factor, called an electric force line element, comprises a positively charged monopole and a negatively charged monopole. The electric monopole is called the source monopole of a gravitational force line, also called a force line element. Such force lines and their force line elements change position and arrangement when the physical situation changes. The theory that treats such physical change is called the curved force line elements (CFLE) theory—corresponding to the theory of curved space-time of the classical general relativity theory. The theory of curved force line elements uses the symbol “< ” for the positive charge and the symbol “⊸” for the vector connection and negative charge.

Demonstration of the vector property of one pair of force line elements ⊂+⊃ is made possible by using the classical electrodynamics symbol of an electric force line ← that was introduced by M. Faraday, as illustrated in Figure 4-3-4.

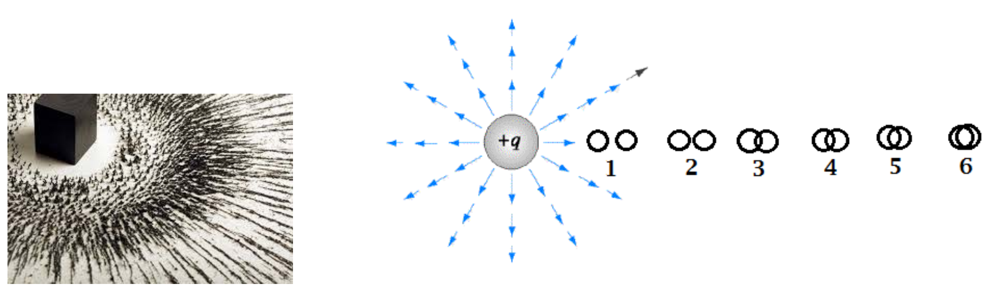

Figure 4-3-4

Figure 4-3-4 shows the electrostatic situation of force lines being used to screen the bar mass of an electron. One of the 8 force lines is exaggerated to a degree to screen the mass by force line elements. As seen in the figure, we can split the electron structure into two parts according to CFLE theory. One part can be that of the bar mass, called the seed. The other part is that of the force line, called the screening bark. The most outer screening bark is called the surface of the particle. The force line of the surface is called the shallow force line, whereas the force line near the mass seed is called the deep force line.

The degree of polarization of a deep force line is larger than that of a shallow force line. That is

- 1 > 2> 3> 4> 5> 6>

The sixth force line is the most neutral, and it almost does not polarize. The outer surface force line element has the smallest degree of polarization.

At this point, the entire mass of each surface force line element is not observed because of neutralization by the mass dipole of the force line elements. Only the smallest fine mass, the rest mass of a resting particle, is observed after polarization of the surface force line elements.

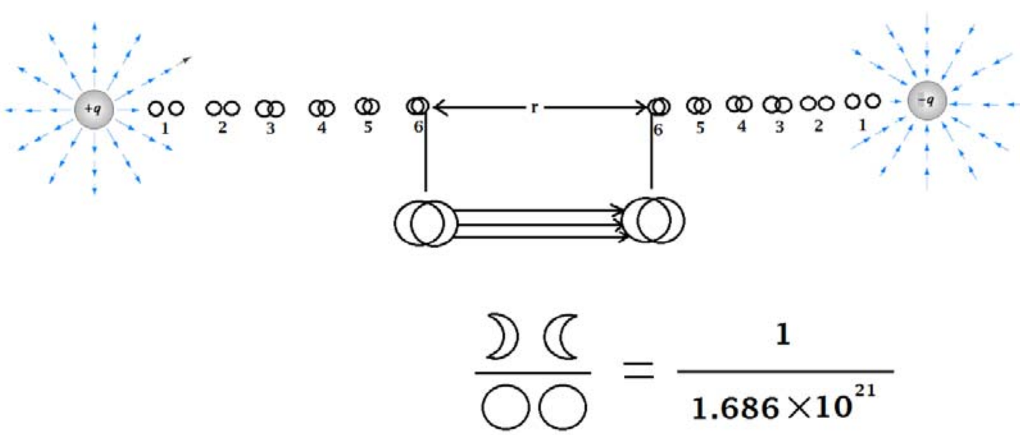

Figure 4-3-5

The law explaining the force interactions between such observable rest mass by polarized surface force line elements of different gravitational charged (mass) particles (positive charged particle m^+ and negative charged particle m^-) became Newton's law of universal gravitation.

Here, the distance between the two particles is *r*. However, the distance *r* between the force lines elements of the two particles is much closer, as shown in Figure 4-3-6, causing the force line elements to interact differently.

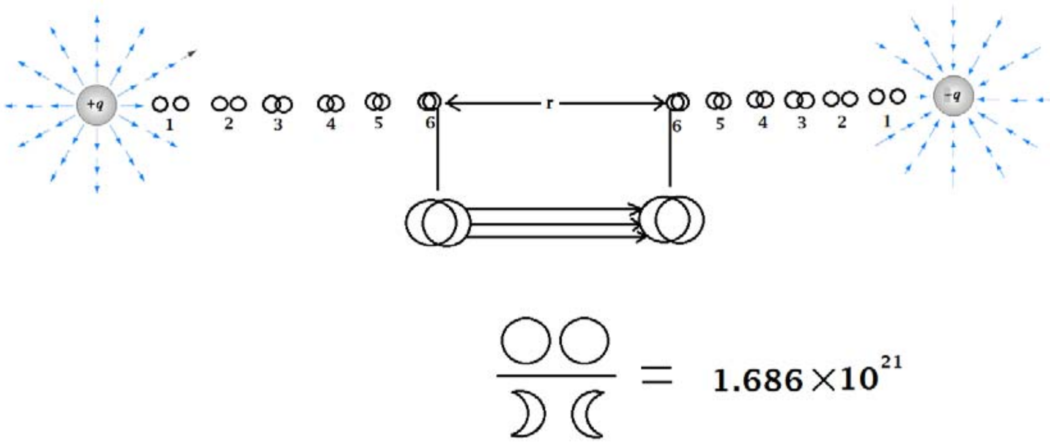

Figure 4-3-6

As seen in Figure 4-3-6, when the huge mass of a surface force line element monopole interacts with another monopole of the counter particle, this force becomes the classical electromagnetic force. The law of interaction of this point is Coulomb's law. Without knowledge about the huge mass neutralization between dipole force line elements and the fine unneutralization of the rest mass by dipole force line elements, one would assume a single qualitatively (smaller than 10^{-21} of mass neutralization and screening) similar force to be two qualitatively different forces. That is, the huge weak electrical force of interaction between rest masses by mass of unneutralization is determined to be Newton's gravitational force, and the huge gravitational force between neutralizations by the monopole mass of dipole force line elements is determined to be Coulomb's electrical force. (The original monopole mass before polarization is 10^{21}!!! bigger than polarized force line elements). Thus, the bar mass of the electron ($m_{eb} = 1.535908 \times 10^{-9}$ kg) is the same as the electrical charge of the electron ($e = 1.602189 \times 10^{-19}$ C). However, if knowledge about this fact is lacking, one would use a different dimension system for the same qualitative single force. Consequently, one would need a conversion factor to unify the two different dimensions into one dimension. Such a conversion constant would be

$$1.602189 \times 10^{-19}\ \text{C} = Tr\ (1.535908 \times 10^{-9}\ \text{kg})$$

$Tr = 1.043153 \times 10^{-10}$ C/kg 4-3-1

Figure 4-3-7 summarizes this previous discussion.

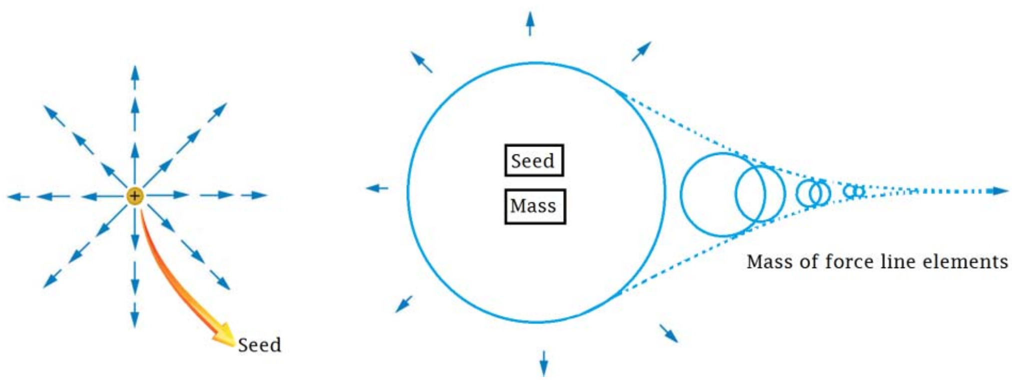

Figure 4-3-7

This structure of an electron is the mechanical structural model that physicist want to find without any infinite quantity. As seen in Figure 1-3-1 in the first chapter, renormalization is possible, and the new theory thus provides a new way to calculate data from this new mechanical structural model of the electron, because the electron in this new model has finite mass and finite size. Furthermore, the electron in the new model is no longer a point-like particle, but instead can move without any inconsistencies even though it moves according to relativity theory and quantum theory. Therefore, from here on, we can start to discuss quantum gravitational mechanics by using this new electron model and mass screening theory.

4.4 Disclosing Physical Entity of Spin by the Monopole Force Line Elements of CFLE theory

From a force line elements theoretical point of view, when a positron moves near light speed ($v = 0.8c$), not only can we obtain a relation between the positron's electric field E, magnetic field B, and spin field S, but we can also clearly visualize these parameters. Figure 4-4-1(a) presents a coordination system in which a charge q is motionless, whereas Figure 4-4-1(b) present a coordination system in which a charge q moves at a constant velocity of $v = k$.

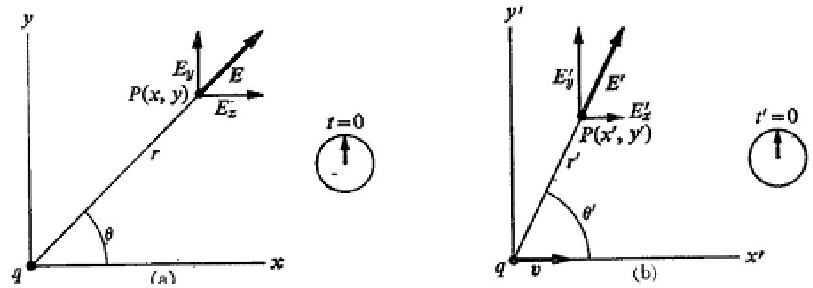

Figure 4-4-1

The electric field at the point when *q* is motionless is

$$E = \frac{q}{4\pi\varepsilon_0 r^2} \qquad \text{4-4-1}$$

The electric field when charge q moves with *v* = *k* is

$$E' = \frac{q}{4\pi\varepsilon_0 r^2}\,\frac{(1-\frac{v^2}{c^2}\alpha)}{(1-\frac{v^2}{c^2}\alpha\sin^2\theta')^{3/2}} \qquad \text{4-4-2}$$

Figure 4-4-2 show this electric field when *v* = 0.8*c*.

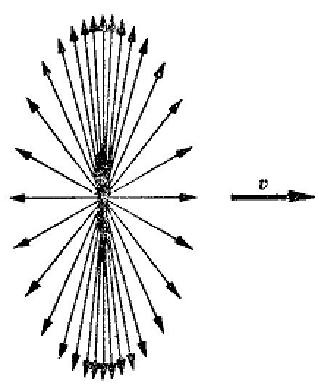

Figure 4-4-2 *v* = 0.8*c*

However, classical electromagnetic theory satisfies the relativity theory approximately:

$$E' = \frac{E}{k} = \frac{q}{4\pi\varepsilon_0 r^2}\,\frac{1-\frac{v^2}{c^2}\alpha}{(1-\frac{v^2}{c^2}\alpha\sin^2\theta')^{3/2}}$$

$$= E(1-\frac{v^2}{c^2}\alpha\sin^2\theta')^{-½}$$

$$= E(1 + \frac{1}{2}\frac{v^2}{c^2}\alpha\sin^2\theta') = E + (\frac{1}{2}\frac{v^2}{c^2}\alpha\sin^2\theta')\,E \qquad \text{4-4-3}$$

However, $A \times B = AB\sin\theta$ and

$$E' = E + V \times \frac{v}{c^2} \times E \qquad \text{4-4-4}$$

Because $\frac{v}{c^2} \times E = B$, we can obtain

$$E' = E + V \times B = E + VB \qquad \text{4-4-5}$$

The Lorentz formula is the empirical formula, whereas Eq. 4-4-5 is the theoretically derived formula, because the result by α is finite, and we can establish the limit of light speed too. Therefore, according to relativity theory, an increased electric field *E* becomes a magnetic field *B*. However, these quantitative changes can be explained qualitatively by the curved force line elements theory, where the following relation is also found. When a particle that has an electric field *E* moves at a constant velocity, more electric force lines and their force line elements are packed at the central part of the seed, as seen in Figure 4-4-2. This is a relativistic increase of the electric field *E*, which is a vertical component of the direction of movement. However, there are still only regular attractive forces between the seeds and force line elements under the condition of per unit strength, despite the excessive packing of the force lines and force line elements. Therefore, there appears to be a deficiency of attractive forces between these new excessive force line elements and seeds, causing them collectively to enter into an excited state, which is observed as a magnetic field. This process of magnetic field formation can be demonstrated using a suitable positron and it force line, as shown in Figure 4-4-3.

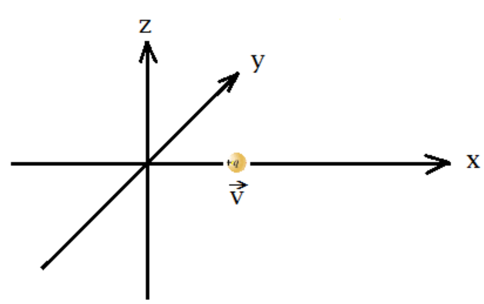

Figure 4-4-3

At this point, the electric field E' of the positron packs to the vertical plane (*yz* plane) of the direction of movement, according to relativity theory, causing the electric field E to curl on the vertical plane. This field is called the magnetic field, so this *yz* plane is called the magnetic plane.

These magnetic planes are shown in Figure 4-4-4

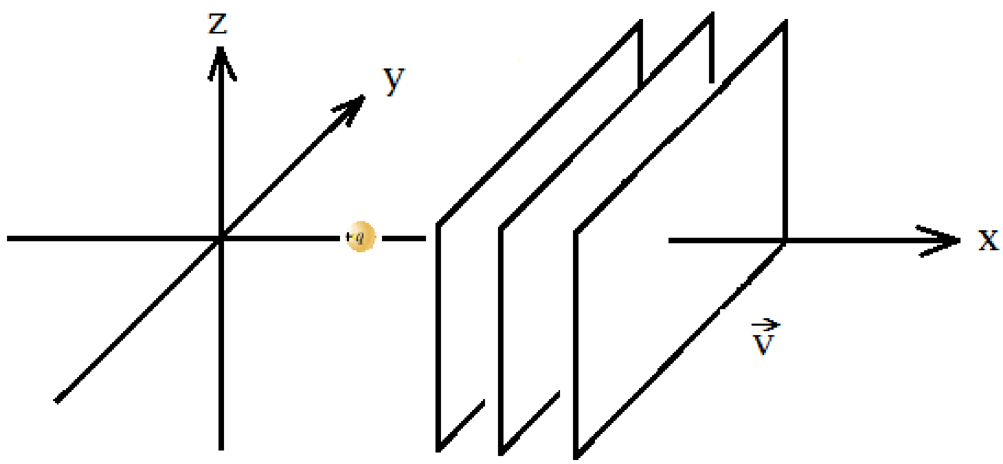

Figure 4-4-4

When the coordination system is omitted, only the 3rd magnetic plane is expressed, which is through the center of the particle (see Figure 4-4-5).

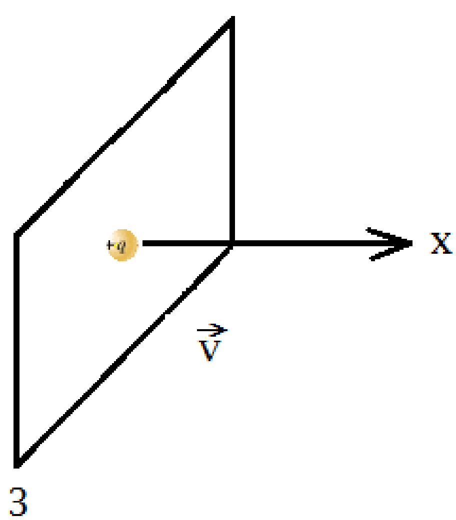

Figure 4-4-5

Such excited state of the electric field E′ can be expressed at the magnetic plane (see Figure 4-4-6).

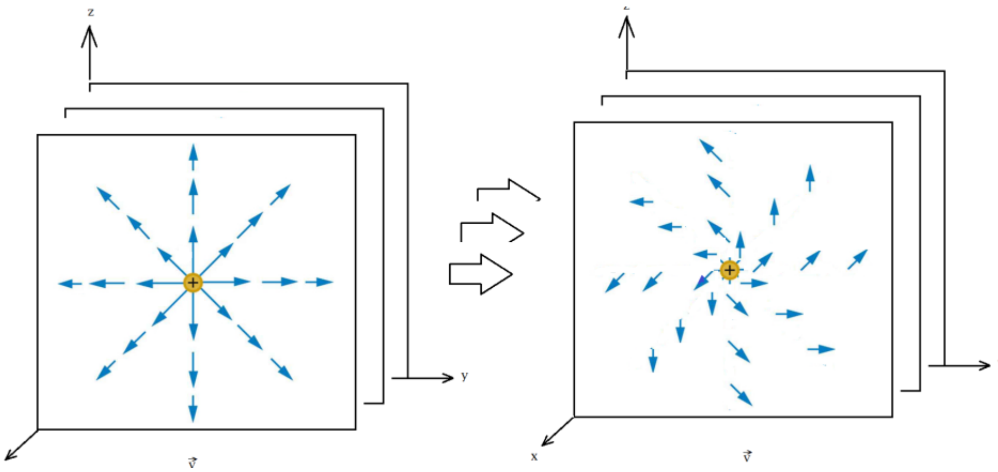

Figure 4-4-6

Figure 4-4-7 expresses this situation with only one magnetic plane.

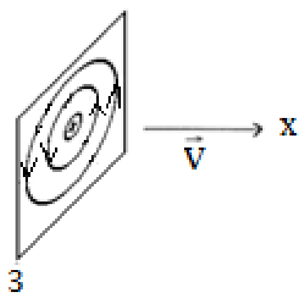

Figure4-4-7

At this point, a curl of the magnetic field is formed by the excited force line elements. This collective curl can be expressed with a traditional electric component and a magnetic component, as shown in Figure 4-4-8.

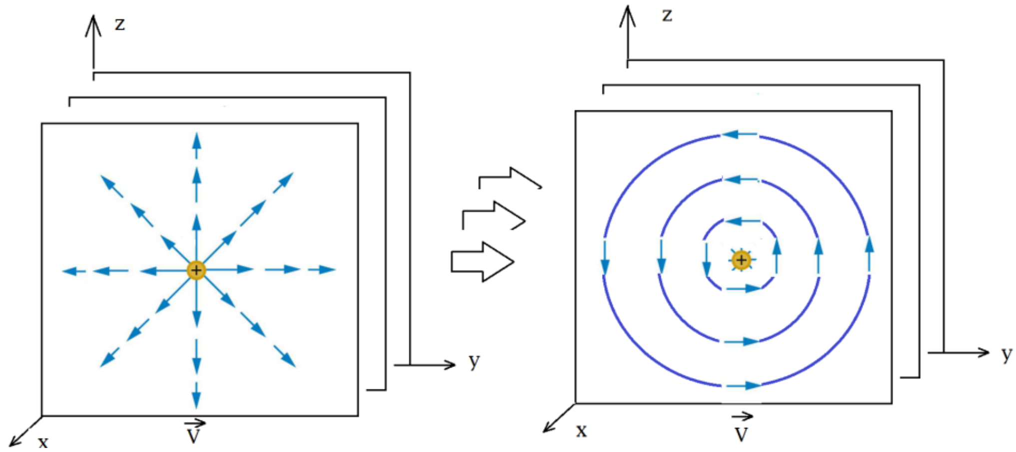

Figure 4-4-8

The electric field E and electric field E' are now expressed only by $B = \frac{1}{c^2}(V \times E)$ in the coordination system (Figure 4-4-9).

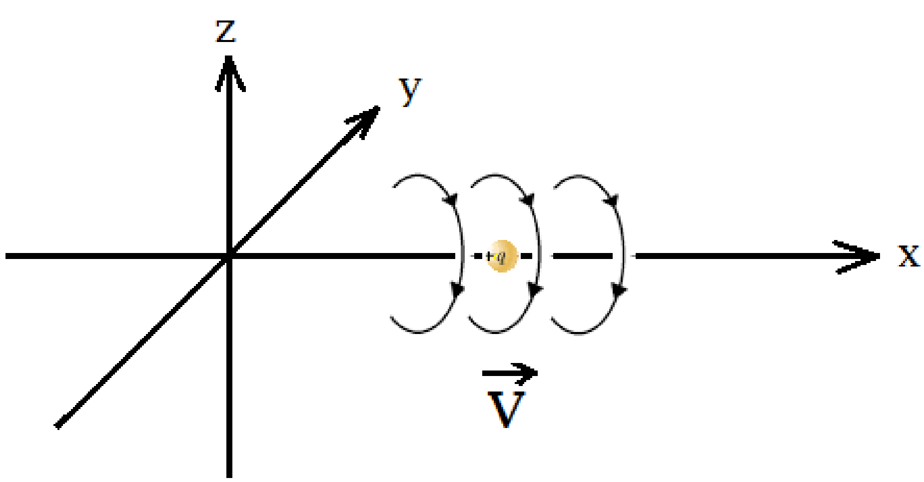

Figure 4-4-9

However, because of this magnetic excited state, another new repulsive force appears between the like charges (positive and positive, negative and negative) of the monopole force line elements. The new repulsive force results in a secondary curl, which is observed as the spin field. This spin field S can be visualized as in Figure 4-4-10.

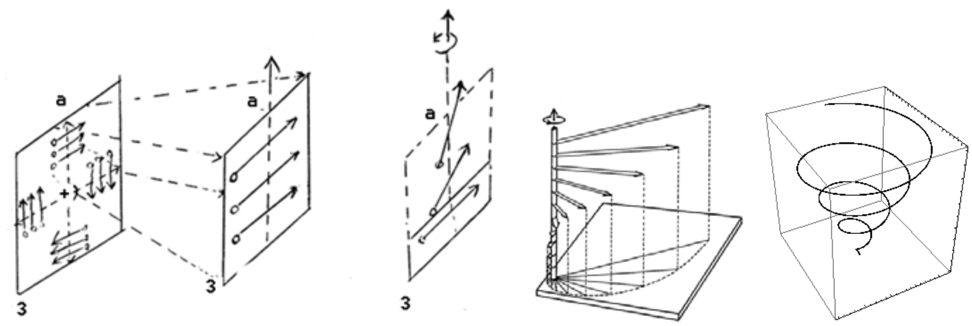

Figure 4-4-10

Figure 4-4-11 expresses these secondary curls of force line elements on one magnetic plane with a few force lines.

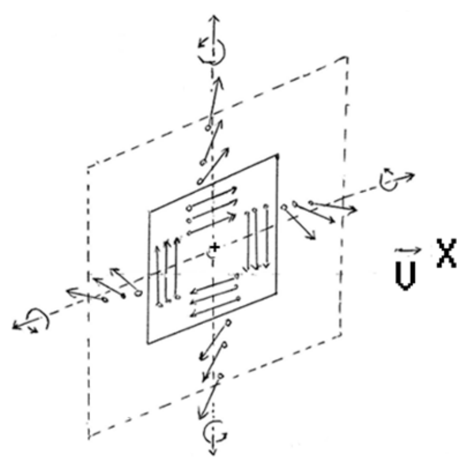

Figure 4-4-11

Figure 4-4-12 shows this situation expressed without the magnetic plane.

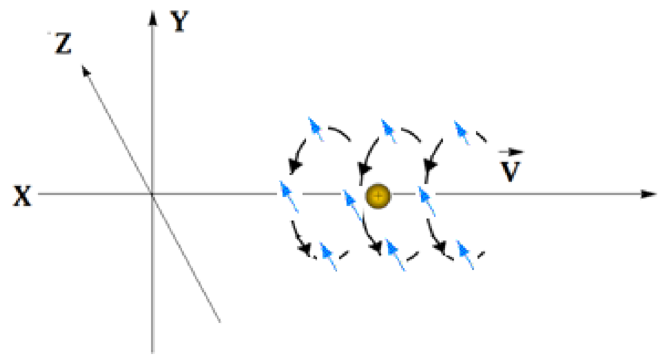

Figure 4-4-12

Figure 4-4-13 shows the same situation expressed on another magnetic ZX plane.

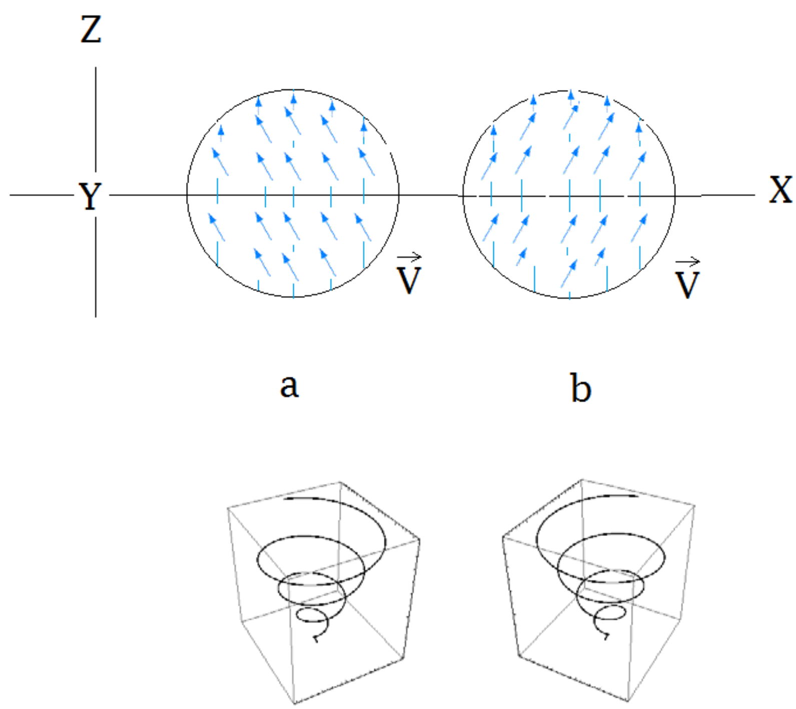

Figure 4-4-13

When a particle with a secondary curl of its force line elements moves into a non-uniform magnetic field,the particle beam can be separated into two parts. This can be demonstrated in the same way as the Stern–Gerlach experiment that splits a particle beam into two symmetrically deflected components (Figure 4-4-14)

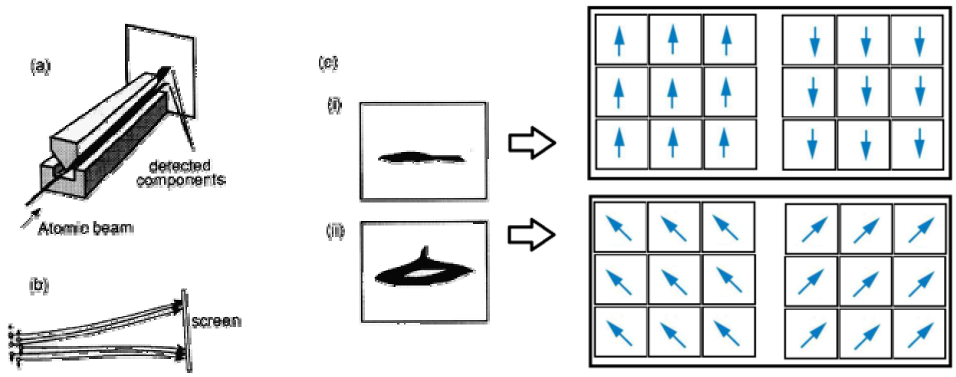

Figure 4-4-14

Therefore, physical entity of spin is different direction of collective rotation of magnetic monopole force line elements not direct rotation of particle (cf.§8.6) as Figure 8-6-1 .

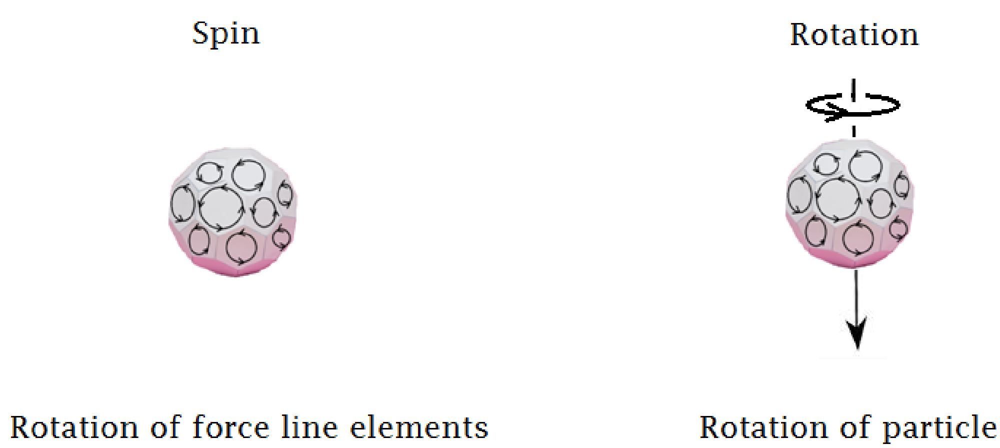

Figure 8-6-1

Because classical electrodynamics and quantum electrodynamics don't have needed monopole force line elements, physical entity of spin cannot be explained 90 years long. By experimental fact and theoretical need is demanded to accept existence of spin that's physical property is only intrinsic form of angular momentum.

However, when the magnetic field occurs, another serious phenomenon results; that is, the appearance of an unusual magnetic attractive force between like charges (i.e., between positive and positive, and negative and negative). That is dependant only on the direction of movement but is charge independent. The curved force line element theory can explain this unusual phenomenon clearly.

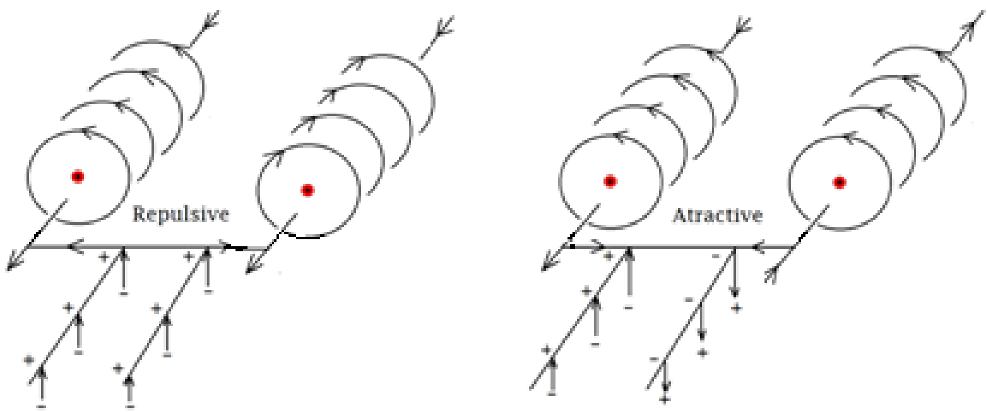

Figure 4-4-15

As seen in Figure 4-4-15, when a magnetic field occurs, monopole elements also appear that have anti charge, and these interact with the force line elements and finally interact with the particle and electric current flow line. A similar phenomenon is observed in quantum mechanics. For example, triplet state electrons repel one another, whereas singlet state electrons attract one another. The cause of this phenomenon is the same cause visualized in Figure 4-4-15.

Therefore, the generated repelling force and attractive force is dependant only on the direction of movement and are charge independent. The total force strength that appears at this point is a proportional curve of the force line and its element (e.g., strength of magnetic field) or degree of force line element rotation (curl of force line), as shown in Figure 4-4-16.

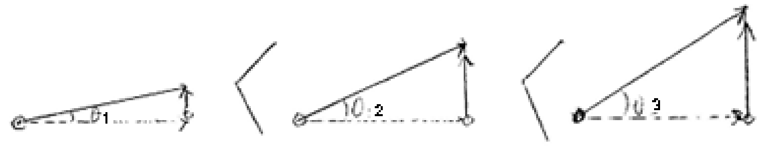

Figure 4-4-16

Positive force line elements and negative force line elements have 6 degrees of freedom each. Because 2 of them (2 positive monopoles and 2 negative monopoles) are used for the electrostatic force, the maximum electric force strength should increase 8 times (4 times from positive monopoles, and 4 times from negative monopoles). It is at this point that the unusual observations of particle anti charge and anti mass are observed. This phenomenon is called monopole symmetry breaking.

For example, although the observed particle is a positron, it appears partly negatively charged because of the negative force line element generated by rotation of the force line element.

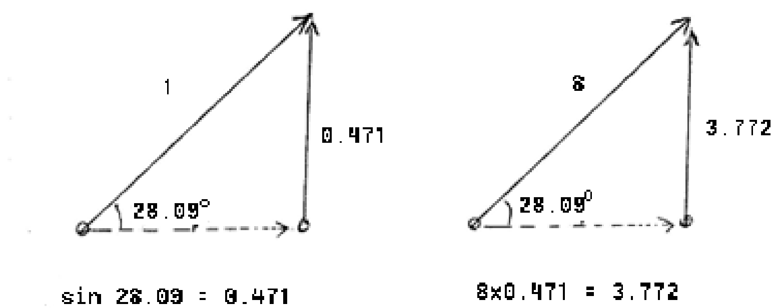

Figure 4-4-17

We can now calculate any change of the force line state. For example, if the force line inclines at 28.09° as in Figure4-4-17, there is a maximum increase of force strength of 3.772 times before symmetry breaking of the monopole occurs. This new force is called the neutrolateral force

4.5 Relation Between the Neutrolateral Force and *g* Factor

When force line elements rotate, new forces such as the magnetic force appear, which are called neutrolateral forces, because they interact between the dipoles of force line elements when monopole symmetry breaks (i.e., positive charges interact with negative charges, negative charges from force line elements interact with positive charges from force line elements). This neutrolateral force strength is determined by the rotation angle of the force line element. This strength is just the *g* factor, which must be introduced as a separate postulate without direct relation of Schrödinger quantum mechanics. (Recent spectroscopic measurements by Lamb, using a technique of extreme accuracy, have actually shown that g_s = 2.002319304. However, in almost all situations, it suffices to say that the spin g factor for an electron is twice as large as its orbital g factor.) Monopole symmetry breaking by dipole elements of force lines can be considered using Figures 4-5-1 and 4-5-2.

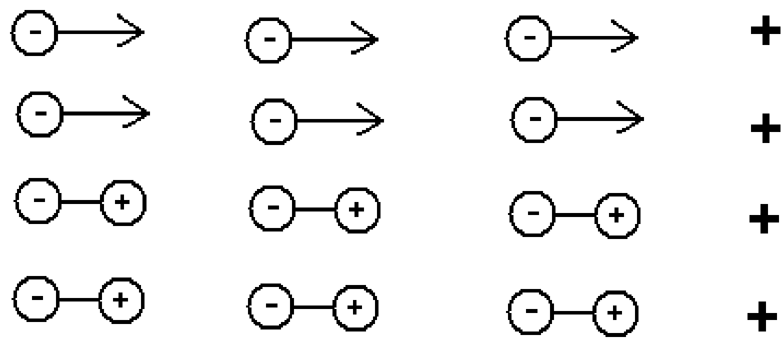

Figure 4-5-1

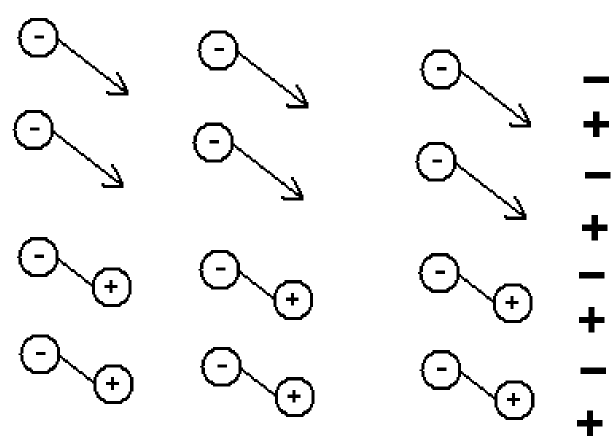

Figure 4-5-2

Figure 4-5-1 shows the monopole symmetry state, which experiences only the positive charges.

Figure 4-5-2 shows the monopole symmetry breaking state, where both positive charges and negative charges are experienced. Therefore, when symmetry breaks occur, positively charged particles can have partially the properties of negatively charged particles, and negatively charged particles can have partially the properties of positively charged particles.

4.6. Solving Contradiction between electromagnetic mass and relativistic mass

While studying the interaction of charged particles J.J.Tomson (1881) found that the kinetic energy of a charged sphere increases by its motion through a medium of finite specific inductive capacity. He pointed out that the increase in the kinetic energy was due to the self induced magnetic field of the charged sphere. This idea was worked out in more detail by Oliver Heaviside (1889), George F.C.Searle (1897), Max Abraham (1902), and Hendrik Lorentz (1904). The electrostatic energy E_{em} and rest mass m_{em} of an electron was calculated to be

$$E_{em}=\frac{1}{2}\frac{e^2}{a},\ m_{em}=\frac{2}{3}\frac{e^2}{ac^2} \qquad 4\text{-}6\text{-}1$$

Where e is distributed charge, a is the classical electron radius.

The electromagnetic energy-mass relation is

$$E_{em}=\frac{3}{4}m_{em}c^2 \qquad 4\text{-}6\text{-}2$$

In 1905 Albert Einstein found out that the entire mass of a body is a measure of its energy content as result of special relativity by

$$E_{rel}=m_{rel}c^2 \qquad 4\text{-}6\text{-}3$$

Einstein's considerations were independent from assumptions about the constitution of matter. Now, here two results contradicted as much as factor of $\frac{1}{4}$. However, this contradiction is not essential problem, because energy integral of electromagnetic field is usual field momentum moving with $v=k$.that is

$$p=\frac{8\pi\varepsilon_0 v}{3c^2}\int E^2r^2dr \qquad 4\text{-}6\text{-}4$$

But relativistic energy integral with $a=\frac{d(mv)}{dt}$ is

$$E_{rel}=\int_0^s[\frac{d(\gamma mv)}{dt}]ds \qquad 4\text{-}6\text{-}5$$

This contradiction can be solved by Abraham-Lorentz force (radiation reaction force) or self interaction energy. From self-energy of electron by acceleration can get deficit energy of $\frac{1}{4}$ from Eq.4-7-22

$m = 2m_0 + [\frac{1}{4\pi\varepsilon_0}][\frac{q^2}{4dc^2}]$ 4-7-22

Therefore total electromagnetic energy is

$$E_{em} = \frac{3}{4}m_{em}c^2 + \frac{1}{4}m_{em}c^2$$

$$= m_{em}c^2$$ 4-6-6

Now, two energy is same as

$$E_{em} = E_{rel}$$ 4-6-7

Therefore we want think as Wilhelm Wien stated: if it is assumed that gravitation is an electromagnetic effect too, then there has to be proportionality between electromagnetic energy, inertial mass and gravitational mass. However, before such dream of unification realize in 1916 Albert Einstein declared that empty space is curved by mass. With this declaration in general relativity Einstein killed all dream of classical electrodynamics and Newtonian dynamics. Same time's contradictions in self–energy of charged particles remain notorious paradoxes as §4.7 100 years long. Another solution of self-energy problems was found by authors such as Enrico Fermi (1922), Paul Dirac (1938), Fritz Rohlich (1960) and Julian Schwinger (1983) who pointed out that the electron's stability and the 4/3 –problem are two different things. By R.P. Feynman and J.A. Wheeler was given absorber theory for contradiction of self–energy to solve. Because Einstein, other relativistic physicists and related curved space physicists destroyed classical electrodynamics and Newtonian dynamics, they have to bring curved space electrodynamics, curved space weak dynamics and curved space chromo dynamics. However, they did not bring any such theories to date.

4.7. Solving Notorious Paradox of the Abraham–Lorentz Formula and Its Meaning by CFLE Theory

In the chapter§15, I will discussed about force line arrangements by acceleration, and §15.8 discussed about changes in force line arrangements due to inertial force. These two factors and their respective force line arrangements have an effect on other force lines, and in the final step, a particle is driven to emit its force line bundle. All these phenomena can be described as being the net force exerted by the fields generated by different parts of the charge distributions acting on one other. For a particle, the total power radiated is given by the Larmor formula[3]

$$P = \frac{1}{4\pi\varepsilon_0}\frac{2q^2}{3}\frac{a^2}{c^3} \qquad \text{4-7-1}$$

Because $P = \mathbf{F}_{\text{rad}} \cdot \mathbf{v}$, the Larmor formula can be substituted into 4-7-1

$$\mathbf{F}_{\text{rad}} \cdot \mathbf{v} = -\frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2 a^2}{c^3} \qquad \text{4-7-2}$$

This equation is actually wrong. Its corrected form is

$$\int_{t_1}^{t_2} \mathbf{F}_{\text{rad}} \cdot \mathbf{v}dt = -\frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\int_{t_1}^{t_2} a^2\, dt \qquad \text{4-7-3}$$

What this corrected formula establishes is that the state of the system is identical at t_1 and t_2. Now, the right side can be integrated by parts.

$$\int_{t_1}^{t_2} a^2\, dt = \int_{t_1}^{t_2} \left(\frac{d\mathbf{v}}{dt}\right) \cdot \left(\frac{d\mathbf{v}}{dt}\right)dt = \left(\mathbf{v} \cdot \frac{d\mathbf{v}}{dt}\right)\Big|_{t_1}^{t_2} - \int_{t_1}^{t_2} \frac{d^2\mathbf{v}}{dt^2} \cdot \mathbf{v}dt$$

$$\int_{t_1}^{t_2} \left[\, \mathbf{F}_{\text{rad}} - \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\dot{a}\right] \cdot \mathbf{v}dt = 0 \qquad \text{4-7-4}$$

This formula is satisfied as

$$\mathbf{F}_{\text{rad}} = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\dot{a} \qquad \text{4-7-5}$$

Equation 4-7-5 is essentially the corrected form of the Abraham–Lorentz formula.

But the Abraham–Lorentz formula itself contains a notorious paradox that has baffled physicists for centuries. If one examines the case where a particle has no external forces acting upon it, then Newton's second law for this particle becomes

$$\mathbf{F}_{\text{rad}} = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\dot{a} = ma$$

3. Equations 4-7-1 through 4-7-7 adapted from the classical equations in Griffiths, David J. 1989. *Introduction to Electrodynamics*, pp. 466–467, 3rd Edition. © 1989 Prentice-Hall, Inc., Upper Saddle River, New Jersey.

From this,

$$a = a_0 \mathrm{e}^{t/\tau} \qquad 4\text{-}7\text{-}6$$

where

$$\tau = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{mc^3} \qquad 4\text{-}7\text{-}7$$

Equation 4-7-6 predicts that the particle's acceleration would increase exponentially with time (spontaneously!), despite there are no external forces acting upon it. This is, of course, physically impossible! One proposed way to circumvent such an erroneous prediction was to set a_0 always equal to 0. This only helped to create another conundrum, because should an external force actually be applied to the particle, setting $a_0 = 0$ predicts that for a brief burst of time t, the particle would accelerate even before the external force has acted upon it! This was another prospect that goes against all grains of logical reasoning. In CFLE theory, we cannot find such inconsistency, because the factor α exists (cf. §4.4). That is,

$$\tau = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\frac{1}{m} \rightarrow \tau = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\frac{\sqrt{1-\frac{v^2}{c^2}}}{m_0} \qquad 4\text{-}7\text{-}8$$

can be corrected by CFLE theory to

$$\tau = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\frac{1}{m} \rightarrow \tau = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\frac{\sqrt{1-\frac{\alpha v^2}{c^2}}}{m_0} \qquad 4\text{-}7\text{-}9$$

The difference between the classical theory and CFLE theory is as follows:

Classical theory: $\sqrt{1-\frac{v^2}{c^2}}$

CFLE theory: $\sqrt{1-\frac{\alpha v^2}{c^2}}$

Therefore, the factor α in the CFLE-corrected formula restrains any infinite increase of $a = a_0 \mathrm{e}^{t/\tau}$. However this solution to the paradox of the Abraham–Lorentz formula is not enough, because force lines and their elements have gravitational charge screening ability. Namely, $\mathbf{F}_{\text{rad}} = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}a^{\cdot}$ would show such ability.

To elucidate the mechanism at work behind $\mathbf{F}_{\text{rad}}$, David E. Griffiths (in his book "Introduction to Electrodynamics") uses a "dumbbell" model, in which the total charge q is divided into two halves (positions 1 and 2) separated by a fixed distance d. As arranged on an x/y-plane, position 1 with charge $\frac{q}{2}$ lies above the x-axis, and position 2 (also with $\frac{q}{2}$ charge) lies equidistance below the x-axis. [4]

This is the simplest possible arrangement of the charge that permits the essential mechanism to function. (Griffith also states that the fact that this is an unlikely model for an elementary particle can be ignored.) Thus, with conservation of energy alone dictating the answer, given the point limit ($d \rightarrow 0$), this and any other model should yield the Abraham–Lorentz formula.

As the dumbbell moves in the positive x direction, from a retarded position $x(t_r)$ toward a present position $x(t)$, it is instantaneously at rest at the retarded time. The electric field at position 1 due to position 2 is [5]

$$\mathbf{E_1} = \frac{\frac{q}{2}}{4\pi\varepsilon_0}\frac{\mathcal{R}}{(\boldsymbol{\mathcal{R}}\cdot\mathbf{u})^3}[u\,(C^2 - \boldsymbol{\mathcal{R}}\cdot\mathbf{a}) - \mathbf{a}(\boldsymbol{\mathcal{R}}\cdot\mathbf{u})] \qquad \text{4-7-10}$$

where

$$\mathbf{U} = c\mathcal{R}^\wedge, \text{ and } \mathcal{R} = l\mathbf{i}^\wedge + d\mathbf{j}^\wedge,\ \mathcal{R}\cdot\mathbf{u} = c\mathcal{R},\ \boldsymbol{\mathcal{R}}\cdot\mathbf{a} = la,\ \mathcal{R} = \sqrt{l^2 + d^2} \qquad \text{4-7-11}$$

Therefore,

$$u_x = \frac{cl}{\mathcal{R}} \qquad \text{4-7-12}$$

4. To view the graph of this dumbbell model, see Griffiths, David J. 1989. *Introduction to Electrodynamics*, pp. 470, 3rd Edition. © 1989 Prentice-Hall, Inc., Upper Saddle River, New Jersey.

5. Equations 4-7-13 through 4-7-24 adapted from the equations in Griffiths, David J. 1989. *Introduction to Electrodynamics*, pp. 466–467, 3rd Edition.

Hence,

$$E_{(1)x} = \frac{\frac{q}{2}}{4\pi\varepsilon_0}\frac{(l - \frac{ad^2}{c^2})}{(l^2 + d^2)^{\frac{3}{2}}} \qquad \text{4-7-13}$$

By symmetry, $E_{(2)x} = E_{(1)x}$, so the net force on the dumbbell is

$$\mathbf{F}_{\text{self}} = \frac{q}{2}\left(\mathbf{E}_{(1)} + \mathbf{E}_{(2)}\right) = \frac{2(\frac{q}{2})^2}{4\pi\varepsilon_0}\frac{(l - \frac{ad^2}{c^2})}{(l^2 + d^2)^{\frac{3}{2}}}\,\mathbf{i}\hat{} \qquad \text{4-7-14}$$

This has to be expanded in the power of d. When the size of the particle goes to 0, all positive powers will disappear. Applying Taylor's theorem of

$$x(t) = x(t_r) + x^{\cdot}(t - t_r) + \frac{1}{2}x^{\cdot\cdot}(t - t_r)^2 + \frac{1}{3!}x^{\cdot\cdot\cdot}(t_r)(t - t_r)^3 + \dots$$

4-7-15

gives

$$l = x(t) - x(t_r) = \frac{1}{2}aT^2 + \frac{1}{6}\dot{a}T^2 + \dots \qquad \text{4-7-16}$$

which can be shortened to

$T \equiv t - t_r$

where T is determined by the retarded time condition

$$(cT)^2 = l^2 + d^2 \qquad \text{4-7-17}$$

Thus,

$T = \frac{d}{c} + (\quad)\, d^3 + (\quad) d^4 \dots$; and inserting this into Eq. 4-7-16 gives

$$l = \frac{a}{2c^2}d^2 + \frac{\dot{a}}{6c^3}d^3 + (\quad)d^4 + \dots \qquad \text{4-7-18}$$

Re-applying this to $\mathbf{F}_{\text{self}}$, we get

$$\mathbf{F}_{\text{self}} = \frac{q^2}{4\pi\varepsilon_0}\left(-\frac{a}{4c^2 d} + \frac{\dot{a}}{12c^3} + (\quad)d + \cdots\right)\mathbf{i}^\wedge \qquad \text{4-7-19}$$

In terms of the present time t,

$$a\,(t_r) = a\,(t) + \dot{a}(t)\,(t_r - t) + \ldots$$

$$= a\,(t) - \dot{a}(t)\,T + \ldots$$

$$= a\,(t) - \dot{a}(t)\,\frac{d}{c} + \ldots \qquad \text{4-7-20}$$

Therefore, the result is

$$\mathbf{F}_{\text{self}} = \frac{q^2}{4\pi\varepsilon_0}\left[-\frac{a(t)}{4c^2 d} + \frac{\dot{a}(t)}{3c^3} + (\quad)d + \cdots\right]\mathbf{i}^\wedge \qquad \text{4-7-21}$$

The total inertia of the charged dumbbell is

$$m = 2m_0 + \left[\frac{1}{4\pi\varepsilon_0}\right]\left[\frac{q^2}{4dc^2}\right] \qquad \text{4-7-22}$$

The potential energy of this configuration is

$$E = \frac{1}{4\pi\varepsilon_0}\left[\frac{(\frac{q}{2})^2}{d}\right] \qquad \text{4-7-23}$$

Radiation reaction is

$$\mathbf{F} = \frac{1}{4\pi\varepsilon_0}\left[\frac{q^2}{3c^3}\right]\dot{a}$$

Therefore total radiation reaction is

$$\mathbf{F} = \frac{1}{4\pi\varepsilon_0}\left[\frac{q^2}{3c^3}\right]\dot{a}2 \qquad \text{4-7-24}$$

It is concluded that the radiation reaction is due to the force of the charge on itself, or, more elaborately, the net force exerted by the field generated by different parts of the charge distributions acting on one another. This result shows that the Abraham–Lorentz formula is physically correct. Yet, despite such satisfactory success, there is yet another notorious paradox that has been the subject of much debate over the years. That is, the fact that the numbers work out perfectly is a lucky feature of this configuration. If it should do the same calculation for the dumbbell in longitudinal motion, the mass correction is only half of what it should be, namely

$$m_c = \frac{q^2}{4\pi\varepsilon_0}\left[\frac{1}{4dc^2}\right] \Rightarrow m_c = \frac{q^2}{4\pi\varepsilon_0}\left[\frac{1}{2dc^2}\right] \qquad 4\text{-}7\text{-}25$$

For a sphere, it is off by a factor of ¾, namely,

$$m_c = \frac{q^2}{4\pi\varepsilon_0}\left[\frac{1}{4dc^2}\right] \Rightarrow m_c = \frac{q^2}{4\pi\varepsilon_0}\left[\frac{3}{4dc^2}\right] \qquad 4\text{-}7\text{-}26$$

But, by CFLE theory, these results are no paradox. Because force lines have charge screening ability, the mass correction term can be changed according to the charge configuration. Consider the dumbbell moving in the x-axis. The force line arrangement and mass increase are as shown in Figure 4-7-2.

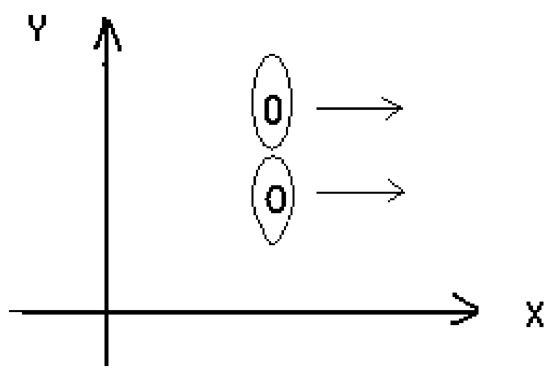

Figure 4-7-2

The increased force lines of charges 1 and 2 offset its median side (Figure 4-7-3).

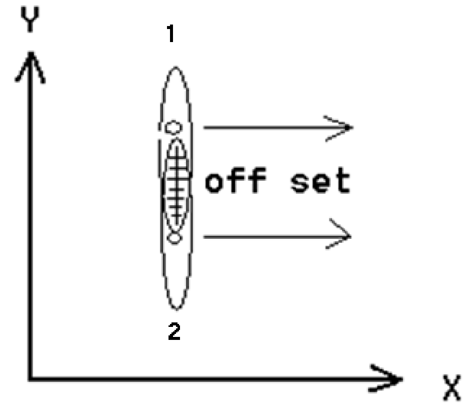

Figure 4-7-3

The results of this configuration is

$$m_c = \frac{q^2}{4\pi\varepsilon_0}\left[\frac{1}{4dc^2}\right] \qquad 4\text{-}7\text{-}27$$

Figure 4-6-4 demonstrates the case of longitudinal motion of the dumbbell.

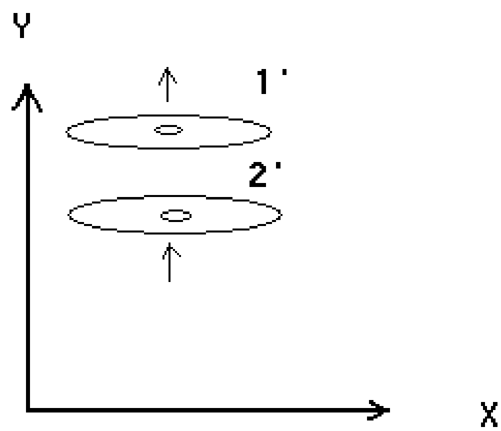

Figure 4-7-4

In this case, the increased force lines of the charges $1'$ and $2'$ are not offset, and the result of this configuration is double that of the previous configuration. That is,

$$m_c = \frac{q^2}{4\pi\varepsilon_0}\left[\frac{1}{4dc^2}\right]2$$

$$= \frac{q^2}{4\pi\varepsilon_0}\left[\frac{2}{4dc^2}\right]$$

$$= \frac{q^2}{4\pi\varepsilon_0}\left[\frac{1}{2dc^2}\right] \qquad \text{4-7-28}$$

The configuration of a sphere is the sum of the previous two cases (see Figures 4-7-5 and 4-7-6).

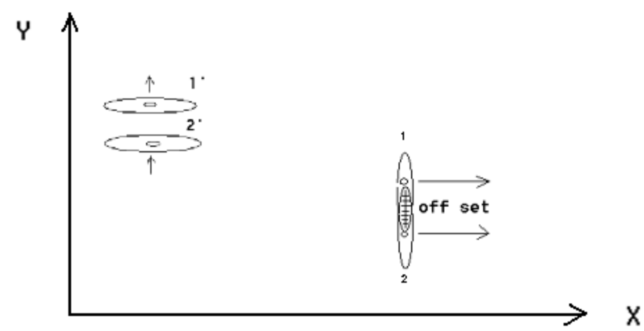

Figure 4-7-5

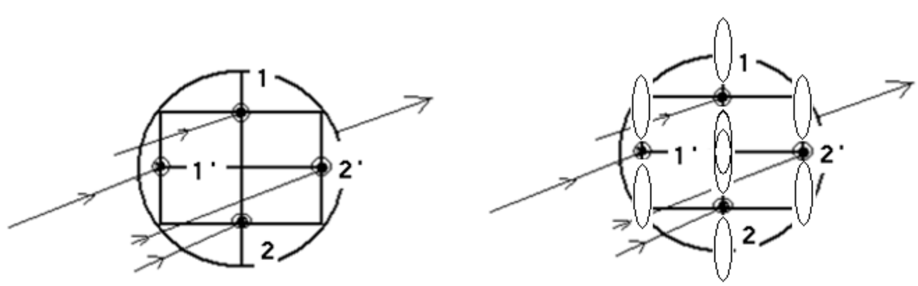

Figure 4-7-6

Therefore, the result is

$$m = \frac{q^2}{4\pi\varepsilon_0}\left[\frac{1}{4dc^2}\right] + \frac{q^2}{4\pi\varepsilon_0}\left[\frac{2}{4dc^2}\right]$$

$$= \frac{q^2}{4\pi\varepsilon_0}\left[\frac{3}{4dc^2}\right] \qquad \text{4-7-29}$$

These results show that the Abraham–Lorentz formula is physically correct and the formula shows that the gravitational charge (mass) is transported by electromagnetic force line elements. Therefore, the previous notorious paradox of the Abraham–Lorentz formula is in fact not a paradox at all, but is a regular phenomenon by the electric force line elements property that acts not only as a compensations field for maintaining gauge symmetry but also for screening the gravitational charge (mass).Most important point is that for such paradoxes to solve is used electric force line with gravitational mass. This means that Einstein's general relativity is wrong, because his theory don't accept any force line only permitted empty space. Cause of those paradoxes is special relativity and general relativity. Now classical electromagnetic theory is changed correct as much as theory of special relativity. Therefore we can understand last puzzle of self-energy.

Abraham-Lorentz formula is

$$\mathbf{F}_{\mathrm{rad}} = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\dot{a} \qquad \text{4-7-5}$$

The Abraham Lorentz formula has distributing implications, which are not entirely understood a century after the formula was first proposed.

For suppose a particle is subject to no extra forces; then by Newton's second law to be

$$\mathbf{F}_{\mathrm{rad}} = \frac{1}{4\mu\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\dot{a} = ma$$

From this,

$$a = a_0 \mathrm{e}^{t/\tau} \qquad \text{4-7-6}$$

where

$$\tau = \frac{1}{4\pi\varepsilon_0}\frac{2}{3}\frac{q^2}{mc^3} \qquad \text{4-7-7}$$

For electron time is $\tau = 6\times 10^{-24}$s

The acceleration spontaneously increases exponentially with time.

Infinite problem of self interaction is corrected already in EQ 4-7-9 by CFLE theory.

However, serious last remain problem is what physical essence of exponential increases of acceleration is. The correct answer by CFLE theory is; because in this scene Newton's second law is so primitive for Abraham-Lorentz formula to keep company. When we change term of $\dot{a}$ as

$$\dot{a} = \frac{da}{dt} = \frac{d}{dt}\left(\frac{GM}{r^2}\right) \qquad \text{4-7-30}$$

We can newly define

$$\frac{GM}{r^2} = \mathbb{E} \qquad \text{4-7-31}$$

Where

$\mathbb{E}$ is gravitational field qualitatively same as electrical field $E = \frac{q}{4\pi\varepsilon_0 r^2}$

We can rewrite formula $\mathbf{F}_{\text{rad}} = \frac{1}{4\mu\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\dot{a}$

$$\mathbf{F}_{\text{rad}} = \frac{1}{4\mu\varepsilon_0}\frac{2}{3}\frac{q^2}{c^3}\dot{a} = \tau\frac{\mathrm{d}\mathbb{E}}{\mathrm{dt}} \qquad \text{4-7-32}$$

With this new term $\frac{\mathrm{d}\mathbb{E}}{\mathrm{dt}}$ we can expect gravitational wave in de Broglie's matter wave as

$$\frac{d^2\mathbb{E}}{dx^2} = \frac{1}{c^2}\frac{d^2\mathbb{E}}{dt^2} \qquad \text{4-7-33}$$

Difference between $\mathbb{E}$ and E is only diameter of force line

$$D_{\mathbb{E}} = \frac{D_E}{10^{21}} \qquad \text{4-7-34}$$

Conclusion: Abraham-Lorentz formula says; Gravitational force line ought to be there in Newton's second law instead Einstein's curved space time.