Fine Structure Decoded

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***Abstract*—This paper defines relationship between fine alpha structure constant and real numbers $\sqrt[3]{\frac{7}{18013664}}$ which matches exactly to value (7.297352533(27) x 10-3) recommended by CODATA 1998. With the help of real and imaginary space this paper explains structure of electron, positron, photon, electric field, magnetic field and gravitation. ψ in quantum mechanics which was termed as probability density function is defined as real or imaginary space coming out of charge particle.**

***Index Terms*—Fine alpha structure constant, electron, positron and photon structure, psi in quantum mechanics, special theory of relativity, electric field and magnetic field.**

I. Complex Space Time Coordinates and Special Theory of Relativity

The space coordinates in 3 dimensions can be expressed as (*x*, *y*, *z*).For simplicity, imagine an entity in one dimensional world just as shown in diagram below.

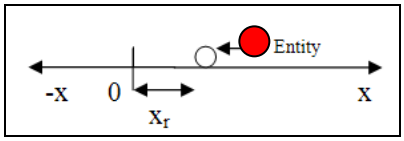

Fig. 1.1. Entity in one dimensional world.

Space coordinates for entity above can be written as $\{x_r\}$ and in vector notation $\vec{r} = x_r\vec{i}$

Now suppose space is curved in proximity of entity as shown below.

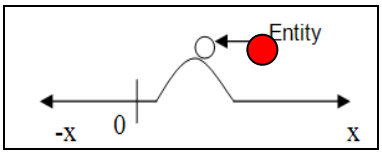

Fig. 1.2. Entity in 1 dimensional world but in curved space time.

If you want to find space coordinates you cannot use previous approach because space coordinate cannot be only expressed in terms of $\{x_r\}$ now you would think it's easy to express space coordinate in 2 dimension and express position in terms of $\{x, y\}$ but as told earlier entity is in one dimensional world. This can be resolved when we modify the diagram as shown below.

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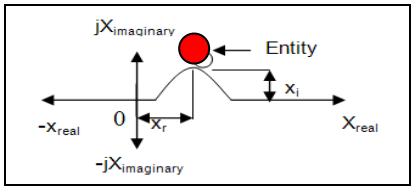

Fig. 1.3. Entity in 1 dimensional world but in curved space time.

Now we can say that entity is in one dimension but it's in complex plane. The space coordinates can now be expressed in real and imaginary number $\{x_r, x_i\}$ .In terms of vector it can be written as $\vec{r} = x_r\vec{i} + jx_i\vec{i}$. Hence we can write space coordinates as $\{xr + jxi\}$ or $\{< xr, xi >\}$

Now this can be extended easily to three dimensional world, space coordinate as

$\{x_r + jx_i, y_r + jy_i, z_r + jz_i\}$ And in Vector notation as

$$\vec{r} = (x_r + jx_i)\vec{i} + (y_r + jy_i)\vec{j} + (z_r + jz_i)\vec{k} \qquad (1)$$

Similarly there can be one more scenario where entity is in imaginary plane and the curved space is in real. Till now we have found out that there are 2 different types of space one real and imaginary. But from where they come from? We can say it comes from zero space. Zero space is something where no entity can move where time stalls. But this space is very unstable as it divides into real and imaginary space (As you know when you square real and imaginary number of same magnitude, you will get result as 0).Why we see space around us? Why can't be there no space at all? If nothing was there, there would be something which covers space, but that is not possible, so zero space has to be unstable. Electron and positron are conjugate of each other in terms of complex plane. What you see above the curvature is where entity is oscillating and the original plane is where it moves laterally. If we say that electron oscillate in imaginary space and moves in real plane, we can say that positron oscillates in real plane and moves in imaginary plane. Because there are 2 kinds of space, there are 2 types of charge exists positive and negative. True velocity of any particle can be derived as

$$v_t = v_r + jv_i$$

v_t is true velocity of particle, v_r velocity in real plane and v_i is velocity in imaginary plane.

So magnitude would be $\|v_t\| = \sqrt{(\|v_r\|^2 + \|v_i\|^2)}$

As we know from Dirac equation, electron even at rest

moves with speed of light i.e. c_o . So we can say that at rest its v_r =0 and $v_i = c_o$. Similarly for positron we can say at rest its v_i =0 and $v_r = c_o$.

Hence we can rewrite the 1st postulate of special theory of relativity: True velocity of particle postulate: True velocity of any particle in free space has same value c_o in all direction in all inertial reference frames.

II. Structure of Empty Space

As we earlier said that empty space is divided into equally spaced real and imaginary space. And it covers entire area; means there is no void space between them. We need a structure in 3D which is tessellating in nature. Rhombic dodecahedron is best choice because it is tessellate (as shown below) and very close to sphere.

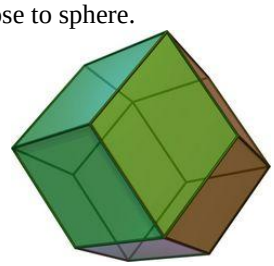

Fig. 1.3. Rhombic dodecahedron.

Fig. 2.2. Rhombic dodecahedron structure occupying complete space

In each intersection of real and imaginary space, there is a reaction between them. These intersections are converted into zero space and later divide back to normal real and normal imaginary. This behavior is observed in vacuum polarization.

III. Structure of Electron

First we will focus on some known constants of electrons. The classical electron radius is based on a classical (i.e., non-quantum) relativistic model of the electron. Its value is calculated as

$$r_e = \frac{kq}{mc^2} = 2.8181x10^{-15} m \quad [1]$$

So we can say that there is a sphere of radius $\mathbf{r_e}$, let's say we assume a sphere of radius $\mathbf{r_e}$

Let's denote it by yellow color as shown below

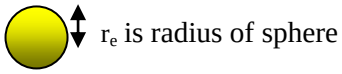

Fig. 3.1. Electron structure (1 membrane).

Electron has wavelength λ_e where $\lambda_e = \frac{h}{mc}$ [2] .Relationship between r_e and λ_e is

$$r_e = \lambda_e \frac{\alpha}{2\pi} \quad [3] \qquad (2)$$

If we assume that above sphere is rotating with speed of light in uniform circular motion whose circumference is equal to λ_e .So we can say that electron has freedom to move in imaginary space even when it is at rest. The wavelength of the electron λ_e can be assumed as circumference of circle as shown below.

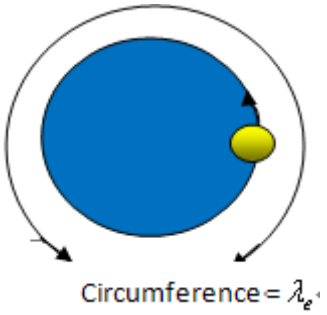

Fig. 3.1. Electron structure (2 membranes).

Then radius of the blue sphere will be

$$\mathbf{R_0} = \frac{\lambda_e}{2\pi} \qquad (3)$$

Electron oscillates in imaginary plane, so we can say that blue sphere is imaginary space.

The small sphere (yellow sphere is made up of zero space), but for that we need one more membrane covering blue sphere which is made up of real space (And the shape of the membrane should be rhombic dodecahedron because electron is the basic and smallest stable particle, so it should be close to what normal space is made up of).

So now picture will look like this

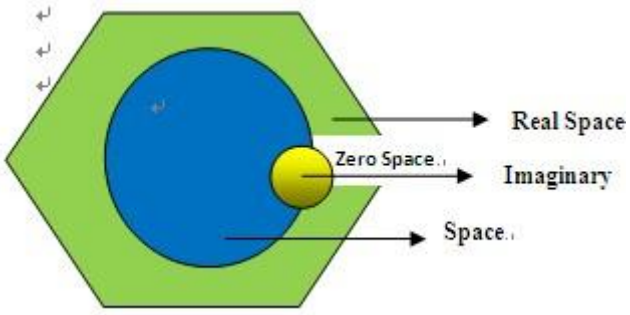

Fig. 3.2. Electron structure (3 membranes).

In short electron is imaginary space trapped inside real space, due to which there is always reaction between them and then they create zero space of radius re. This zero space is highly unstable it tries to spit into real and imaginary space and comes back to zero space. This zero space is responsible for the frequency associated with electron.

Take derivate w.r.t to time t on both sides we get of (1) we get

$$c = (v_{rx} + jv_{ix}) + (v_{ry} + jv_{iy}) + (v_{rz} + jv_{iz})$$

where c is velocity of light and v_{rx} is velocity of electron in real plane in x-axis and v_{ix} is velocity of electron in imaginary plane of x axis. v_{ry}, jv_{iy}, v_{rz} and jv_{iz} are electron velocities in y and z axis in complex plane respectively. In magnitude representation we can say that

$$c = \sqrt{v_r^2 + v_i^2} \tag{4}$$

where v_r is relative velocity of electron in real plane (This is what we measure speed of electron) and v_i is speed of electron in imaginary plane.

At rest electron speed v_r =0 and v_i =*c*.

We can conclude that as the speed of the electron increases in real plane (which is actual speed of electron that we measure) its imaginary component decreases so that its true velocity is always speed of light.

When we put value of R_0 in Eq-3 in Eq-2 we get.

$$\frac{r_e}{R_o} = \alpha \tag{5}$$

We know that imaginary space (blue sphere) is rotating, so we can say above equation looks similar to gear ratio. Let's say both rotate with same angular frequency ω .Multiplying and dividing L.H.S by ω we get $\frac{r\omega_e}{R_o\omega} = \alpha$ **.** We know that when radius of rotating sphere is multiplied by angular velocity we get velocity of the sphere.

$$\frac{v_e}{\mathbf{c}} = \alpha \tag{6}$$

Speed of imaginary space is speed of light**).** Where v_e speed of zero is space and V_o is speed of imaginary space. Positron will be conjugate of electron so picture of positron will be like real space trapped inside imaginary space.

IV. Boundary Condition of Value N and Limit on Number of Elements Which Can Be There in Periodic Table

As we know radius of the zero space inside particle directly proportional square of n in Bhor hydrogen atom. We can generalize equation 5 to $\frac{r_n}{R_o} = n^2\alpha$ But if n value touches 12 value of square of n becomes 144 and when multiplied by fine alpha structure constant which is approximately equal to inverse of 137 , radius grows bigger than R_o , which should not happen.

So possible values of n is from 1 to 11 ($1 \le n \le 11$) That's why we can say that there can be only 11 kind of stable sub atomic particle pair (matter and anti matter pair)

Same n^2 value do exists in Bhor hydrogen model, it can be said that periodic table cannot have elements more than 121 (Currently there are only 118 which 3 less than our prediction). So our prediction on keeping a limit on the value n is right so it proves one more point our universe empty space quantization of space is done with rhombic dodecahedron of size R_o **.**

V. Fine Alpha Structure Constant a in Terms of Real Numbers

As we already discussed electron is trapped imaginary space inside real space. So at the intersection there should be zero space formation which is not there in the model. It seems that this zero space collapses to sphere of no space of radius re .More or less like one bubble burst made up of water it collapses to spherical ball. Volume of the sphere depends upon the thickness of the bubble. Let's assume that that such kind of bubble burst in the electron to form a sphere.

Bubble is of radius X and thickness of the bubble film is X-R_o. R_o

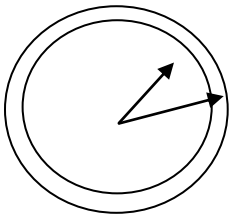

Fig. 3.3. Electron Bubble.

Volume of the film should be equal to the volume of the collapsed sphere.

$$\frac{4\pi}{3}X^3 - \frac{4\pi}{3}R_o^3 = \frac{4\pi}{3}r_e^3 \tag{8}$$

$X^3 - R_o^3 = r_e^3$ Divide above equation with R_o^3 we get

$\frac{X^3}{R_o^3} - 1^3 = \frac{r_e^3}{R_o^3}$ We know that $\frac{r_e}{R_o}$ = **α,** putting it in above equation we get

$\frac{X^3}{R_o^3} = 1 + \alpha^3$ Let say that RHS can be equated to δ^3

$\delta^3 = 1 + \alpha^3$

Putting the value of fine alpha structure constant in above equation we get value of δ^3 as δ^3 = **1.000000389** This number should ratio of two real numbers. And we make a simple algorithm to check which this 2 numbers are 18013671 and 18013664.

$$\delta^3 = \frac{18013671}{18013664} \tag{9}$$

As we know $\delta^3 = 1 + \alpha^3$ we can say $\alpha^3 = \delta^3 - 1$

$$\alpha = \sqrt[3]{\frac{7}{18013664}}$$

$\alpha = 7.297352533052697399308169551773 \times 10^{-3}$

And according to CODATA $\alpha_{original}$ is equal to $7.29735253(27) \times 10^{-3}$

$\Delta\alpha = \left|\alpha_{calculated} - \alpha_{original}\right|$ Taking minimum of the

$\alpha_{original}$ into consideration we get

$$\Delta\alpha = 2.173026000691830448827468272007 7 X 10^{-13}$$

Observed difference is very small but if we consider fine alpha structure constant variation with time this variation which is negligible is acceptable. So it seems the value of alpha current or old has to be in terms of real numbers.

A. Significance of 7 and 18013664

As we know α^3 is ratio of contained space to container volume. This ratio if multiplied my integer number on denominator and numerator will yield same result. So it may be that this is residue of some larger number. As we know electron is stable particle with infinite half life. So it should be made up of parts which satisfy rhombic dodecahedron number. So numerator which relates to the volume of confined space should be rhombic dodecahedron. And this number should be divisible by 7 same time. When you do simple math minimum number which matches the above 2 condition is 175, which means we need to multiply both the numerator and denominator with 25. After multiplying we get 2 numbers as 175(which is tier of 4) and 450341600.Denominator should also be number related to rhombic number and it should be divisible by 25. Closest number which satisfies this condition is 463430175 which is more than 450341600(which is tier of 488). We can conclude that current denominator value doesn't satisfy the rhombic number. But it should be rhombic dodecahedron number when universe started. We can conclude that confined space remained as it is but the container space slowly started losing one cell gradually with time. As denominator is changing with time and it is reducing that means α value is increasing with time. If we assume that 463430175 is the number with which our universe was born α value will be. $\alpha_{start} = \sqrt[3]{\frac{175}{463430175}}$ or $\alpha_{start} = 7.227996165 \text{ X } 10^{\wedge -3}$. Why is it changing? Only reason can be the space quantized is reducing as time passes. And this change will be different from how far we are from center of the universe. That's why we see variation of α with respect to space and time.If our assumed α value of start of the universe is right. Let see rate at which is changing.

$\Delta\alpha = \frac{\alpha_{start} - \alpha_{now}}{Ua}$ .As we know universe age (Ua) is approximately 13.75 billion years.

$\Delta\alpha = -9.563137556 \text{ X } 10^{\wedge -11}$ / year.

What if inside container was not exactly multiple of 25 but is rhombic dodecahedron number? This number should be greater than 450341600. And the number which satisfies this condition is 452116015 (Which are 484 tiers).

Then above values will be.

$\alpha_{start} = \sqrt[3]{\frac{175}{452116015}}$ $\alpha_{start} = 7.2877793402 \text{ X } 10^{\wedge -3}$

$\Delta\alpha = -6.952095148 \text{ X } 10^{\wedge -16}$ / year

$\Delta\alpha^{-1} = -1.307236987 \text{ X } 10^{\wedge -11}$ / year (Which is approximately -0.1797 in 13.75 billion years)

When we divide 484 tiers upon 4 tier of confined space we get 121, which is exactly equal to square of 11 (121 is the number is the limit of atomic number). So there is likelihood that denominator value was 452116015 (or 484 tiers) From above we can infer that fine alpha structure is not constant but it varies with time and space.

B. Impact of These Numbers on Electron Structure on Above Integer Numbers

It means the container space is made up of integral part, it means this space is actually not made up of 1 kind of space but both real and imaginary space. But if we assume that the confined space is also made up of same kind of quantization of space like container the model will fail because there would be no difference between confined space and container space. As we know the Ro is α times the Bhor radius a_o, this process continues 11 times inside the confined space.

If we assume that it divides 11 times the last radius would be α^{11} times the r_e.

When we calculate this ultimate radius (r_u) we get.

$r_u = \alpha^{11} r_e = 8.805426314 \text{ X } 10^{-39}$ m

This r_u when divided by Planck length (l_p) we get

$$\frac{r_u}{l_p} = 1835.342645$$

Above ratio is very close to proton mass to electron mass which is equal to 1,836.15267245(75) [4].

As denominator corresponds to electron numerator should correspond to proton (or anti proton).

As we clearly know that electrons are not affected by gravity because they are very small and our all atoms are made up of protons and neutrons, which are responsible for the gravity. That's why we see relationship between the ultimate final radius of proton to Planck, gravity and speed of light.

VI. What is in Quantum Mechanics?

As we know the wave function in quantum mechanics is written in terms of ψ Only knowledge we have about ψ is that its scalar and complex number. As discussed earlier electron goes on shrinking to finally collapse to ultimate zero space. We know that in quantum mechanics electrostatic force of attraction is due to exchange of virtual photons. It can be said that there is something coming out of electron. All part of electron is made up of space (it is complex space time quantization to very minute scale).We can say the only thing which can come out of the structure is complex space. It's safe to say that there are two kinds of space which can come out one is real (V_{real}) and other one is imaginary ($V_{imaginary}$) space.

$$V = V_{real} + jV_{imaginary}$$

This volume coming out of the electron should be function of frequency. And it varies with time but repeat itself.

$$V = |V|e^{-jwt}$$ (In complex form)

If volume coming out of the electron is coming out continuously then it should lose energy as space is getting out of the electron. But as we discussed earlier electron shrinks to ultimate zero space which cannot be further divided, this ultimate space is highly unstable it can split again to real and imaginary space from which it was generated. While doing so the volume of the electron tends to increase, some of the space which is over the electron capacity to hold goes out of the electron confined space. But ultimate space is kind of space which has the tendency to create unlimited real and imaginary space within its bound to grow. And finally again it comes back to its original state. So from above discussion we can say that changes in space configuration in ultimate space gives rise to emission of real and imaginary space. Electron is made up of imaginary space which has real space confined into it. So when real component comes out of the ultimate zero space the residue is taken from the electron outer shell and later outer shell gets back the difference from the leak inside. Only thing which comes out of the outer shell of the electron is imaginary space. In case of positron would be real space coming out. So putting in terms of math's we can say divergence of imaginary $\nabla V_{imaginary}$ space coming out of the electron is non zero and negative and for positron ∇V_{real} will be non zero and negative number. That's why we see 2 different kinds of charges in this universe i.e. negative and positive. We can say that ψ is change in ultimate zero space contents.

VII. What is Electric Field?

Here will try to explain what electric field is. Electric field is generated because there is gradient of space coming of charged particle is none zero number. By Schrödinger equations [5] it is clearly visible the product of electric field to ψ is directly proportional to $\nabla^2\psi$.

$$E\psi \propto \nabla^2\psi$$

And proportional constant in above equation is

$$\frac{e}{\varepsilon_o}.\ E\psi = \frac{e}{\varepsilon_o}\nabla^2\psi \tag{10}$$

VIII. What is Magnetic Field?

We know that when charge particle in our case electron or positron moves in space they produce magnetic field. Products of magnetic field to ψ is directly proportional to $\frac{\partial^2\psi}{\partial^2 t}$ (2nd magnitude of rate of change of space going through particular position)

$$B\psi \propto \frac{\partial^2\psi}{\partial^2 t} \tag{11}$$

And proportional constant in above equation is $e\mu_o$ and velocity of electron moving with constant velocity v.

$$B\psi = e\mu_o v\frac{\partial^2\psi}{\partial^2 t} \rightarrow \text{Eq 12} \tag{12}$$

IX. What is Gravitation?

For explaining gravity in terms of space distortion or so called space time curvature we will take simple example of cyclotron as shown below.

Fig. 3.4. Cyclotron structure.

Steel ball away from the center will be moving faster than those closer to center. Because of centrifugal force, these steel balls are accelerated towards the outer edge. So according to special theory of relativity the balls which are moving slower will see faster ball reduce in size. So we can assume it appears that for slower moving steel ball that faster steel ball is going though reduced space quantization.

Now we will take this analogy to actual gravity. Near the planet gravity is highest and as we go further it reduces. Higher gravitational pull means more acceleration which means that space quantized at this location is different than the normal quantized space and it is smaller than the normal space.

As the space quantization size reduces the velocity of confined space has to adjust and reduce. But the speed needs to be constant speed of light. This difference pushes the particle to attain this difference velocity. And when we put it in formula we will get it as $\sqrt{c^2 - v^2_{internal}}$. But as it gets pushed it enters in new quantized space which is again less than the previous space quantization, due to this it is pushed further, so there appears acceleration. As internal velocity changes there is time dilation in particle near graviton and clocks will run slightly slower.

X. Photon Structure

If electron and positron can be explained in terms of space, photon can also be expressed in terms of space. As we know photon possesses no charge that means the gradient of space coming out of the photon is zero. But both electron and positron has non zero gradient. And we also know that electron and positron is conjugate of each other. Photon that means are made up two different systems one acts like positive charge and one acts like negative charge.

Positive charge gradient of space coming out goes into negative charge and gradient of space of coming out of negative charge goes inside positive charged particle.

As we know that speed of light is fixed which is equal to c (2999792458 m/s).

Internal velocity of photon structure would be equal

to $v_{\text{int}ernal} = \alpha c$. This space doesn't move but 2 charge particles do move inside them. Electric field and Magnetic field equations should also apply to photon too because it's a combination of two different particles. When we divide equation 10 by equation 12 we get $\frac{E}{B} = \frac{\nabla^2\psi}{\varepsilon_o\mu_o v\frac{\partial^2\psi}{\partial^2 t}}$ And we know that $\nabla^2\psi = k^2\psi$ (where k is wave number) and $\frac{\partial^2\psi}{\partial^2 t} = \omega^2\psi$ (where ω is angular frequency of electron/positron but here charged particles We also know that $k = \frac{2\pi}{\lambda}$ (where λ is wavelength) and $\omega = 2\pi f$ (where f is frequency) Putting all this value in ratio of E/B we get $\frac{E}{B} = \frac{1}{\varepsilon_o\mu_o v(\lambda f)^2}$ .As we know it's moving with velocity at speed of light c and λf is also speed of light and E/b is 1/c by Maxwell equation we get $c = \sqrt{\frac{1}{\varepsilon_o\mu_o}}$ [6] (This matches the Maxwell equation speed of light formula).

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