Why Particle Properties are Quantised.

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Abstract

We give a model for particles which explains why particle properties are quantised. We define particles as pictures. We define a pi-minus, electron, electron antineutrino and a proton. We prove the model for electrons. We aslo show how to construct antiparticles. We show why Gravity is fundamentally different from the other forces. The model predicts the Electromagnetic field of a free electron. The model also predicts that antimatter will have attractive gravity with matter. Three new particles are predicted.

1. Defining a Pi-minus

The circles of a pi-minus are arranged as follows:

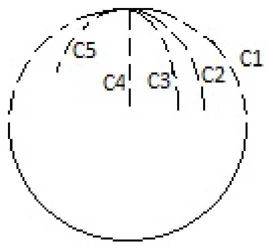

Figure 1.1

where the Cn are circles on the "sphere" (Riemann sphere-anti sphere: RSS (an anti-Riemann sphere is a Riemann sphere made out of left-out points)) where the charges are encoded into. These circles goes around the RSS and a charge on each gets duplicated symmetricly (so each one counts half the charge) so that there is balanced forces on the particle. The circle arrangement could be otherwise.

The d quark is the southern hemisphere of the particle and the anti-up quark is the northen hemsphere.

Each circle on the RSS looks like:

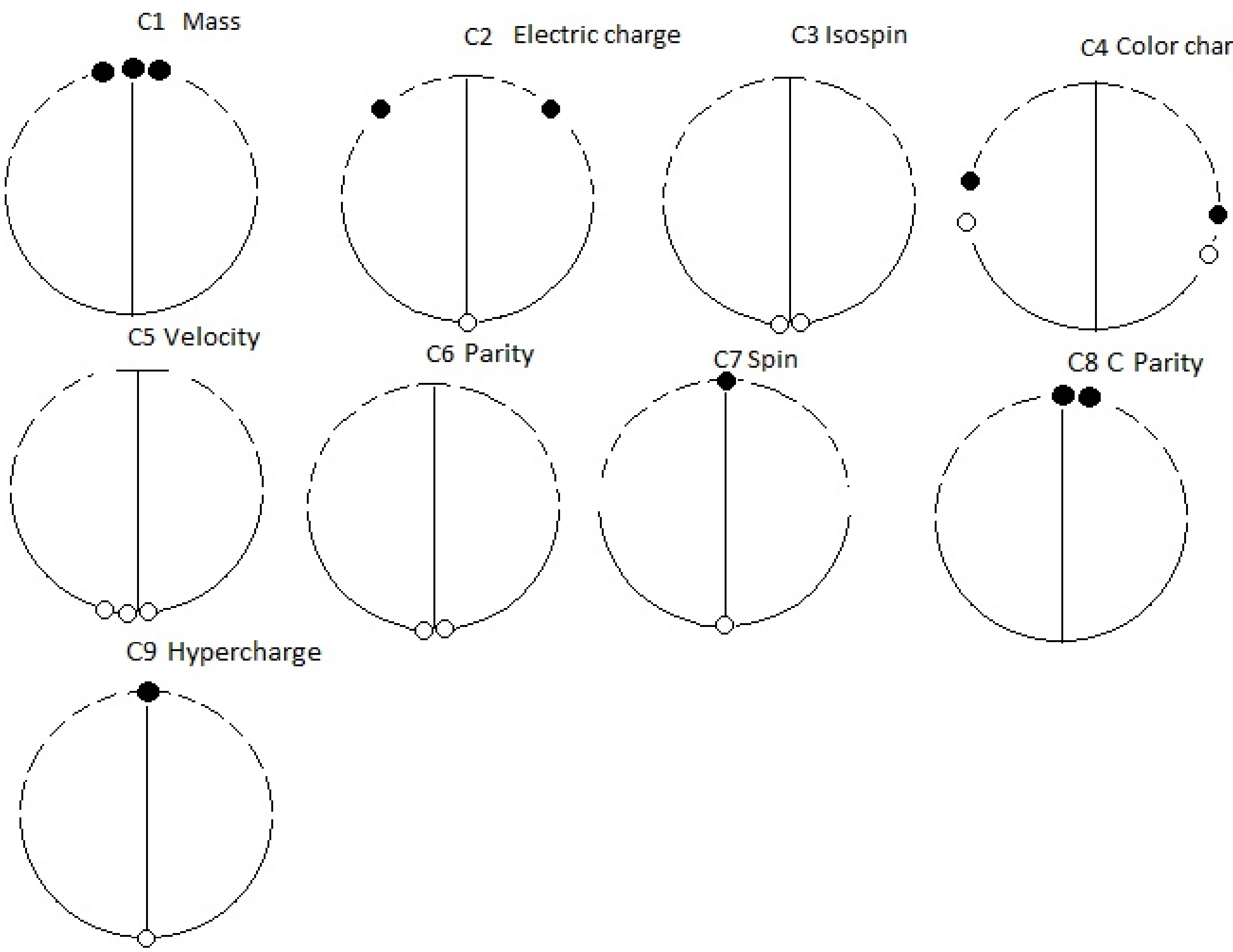

Figure 1.2

The dotted half circles represent half circles on the half anti-Riemann sphere (ARS: a Riemann half sphere made of holes in spacetime). The solid half circles represent half circles on a half Riemann sphere. The little filled circles represent added points of space and the little circles represent holes in space.

The opposite color charges keep the particle together. The opposite electric charges also helps keeping the particle together. The two negative charges stay where they are because they are attracted by the positive charge. The dotted circles are circles of an anti-quark and the solid lines are circles of a quark.

Note that the model predict that the particle has one mass world line, three charge world lines, two isospin worldlines, two color charge world lines and one speed charge worldline.

We see that particle properties can only increase by adding a point, therefore it's properties are quantised (one cannot add half a point).

A W- looks like a pi- just with left out points indicating it is an operator particle.

We specify that the antiparticle has left-out space points where the particle has added points and vice versa (except for the following below). The two would therefore cancell into empty space. Since it is an experimental fact that all the mass is converted to momentum of the two photons emitted, we require that mass in the antiparticle be also encoded with added points of space (thus it will be encoded onto the bottom half-Riemann-anti-sphere). This brings in a fundamental difference between gravity and the other forces. It also predicts antimatter will have attractive gravity with matter.

Now the model is such that antimatter mass also gets encoded with added points of space. This leaves the problem of how mass originates (with the explanation being the Higgs mechanism). Also the model accomodates the existance of negative mass: when matter or antimatter has mass encoded by left out points of space. Such negative mass anti-matter will totally annihilate matter such that nothing remains. This would not violate energy conservation since the negative mass antimatter has negative energy.

We have that matter can be created ad infinitum since it is just copying of a slice of space-negative-space. This is like what we expect.

2. Defining Electrons.

I allow circles to rotate (spin) at different angular speeds for the electron to look the same only after 2 rotations.

The electron picture follows from the pi-minus picture.

An electron looks like:

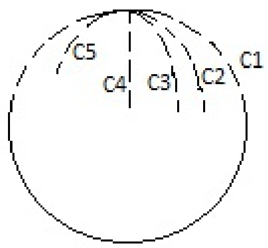

Figure 2.1

We will need Structure Conservation. We state Structure Conservation:

2.1 A structure cannot cease to exist without cancelling with its anti-structure.

2.2 A structure cannot start to exist without its antistructure also starting to exist.

Structure Conservation demands the existance of two more particles. One to transform right handed electrons into left handed ones and another to balance the structure. A pi-minus decays according to the following formula:

$$\pi^- + \bar{M}^0 + M^0 -> e_L^- + \bar{\nu}_{e,R} + L^0 + \bar{M}^0$$

and

$$e_R^- + (\bar{Z}_T^0 + Z_T^0) -> e_L^- + Z_T^0$$

where the particles is to be displayed.

The circles on the RSS for an left handed electron looks like:

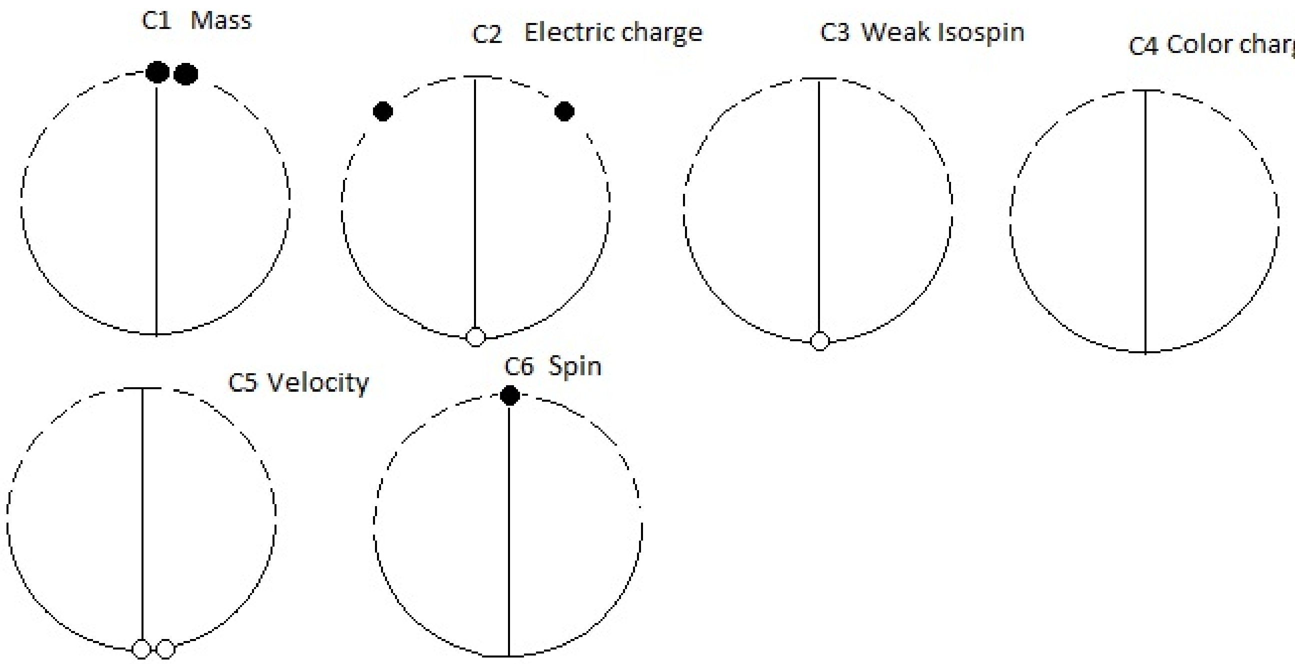

Figure 2.2

where the spin 1/2 encoding says the spin points in the down direction.

Where an M^0 is defined as:

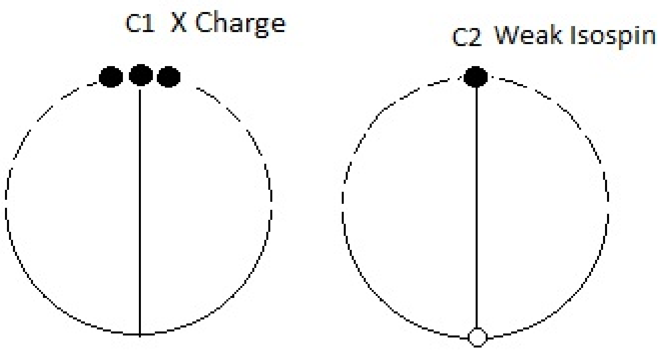

Figure 2.2.2

and a L^0 is defined as:

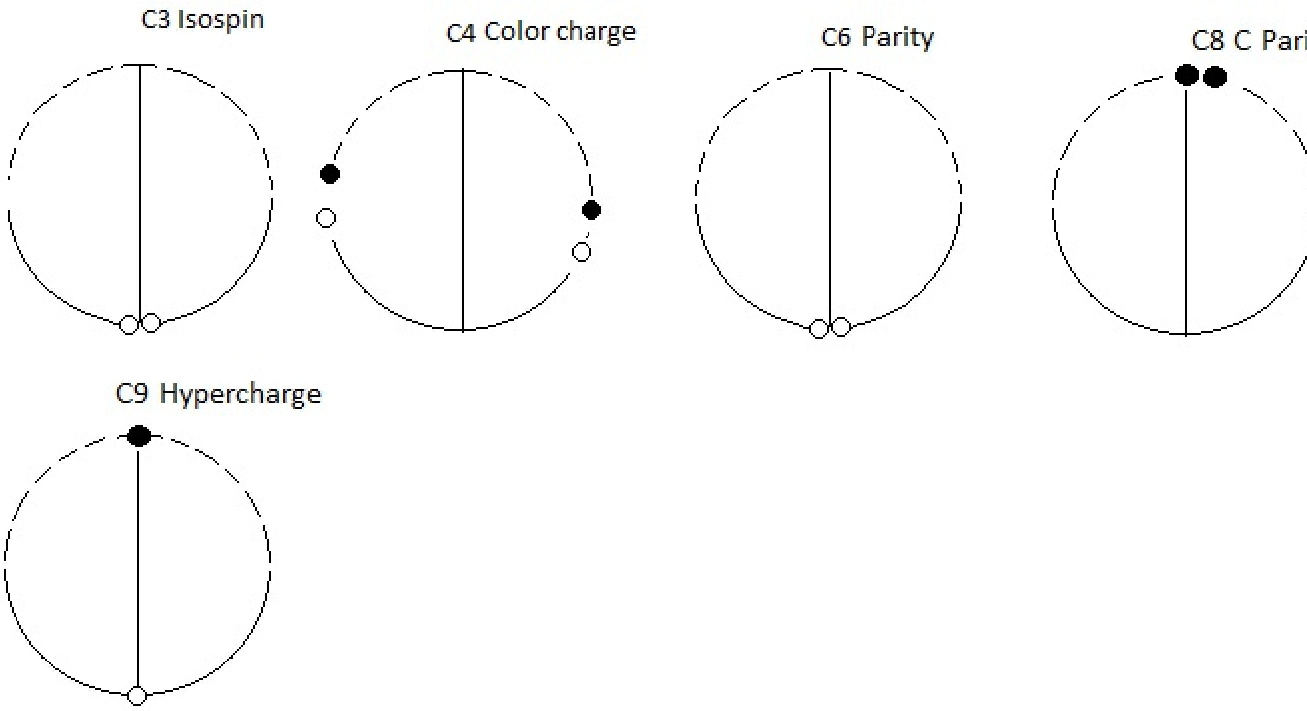

Figure 2.2.3

and the Z^0_T looks like:

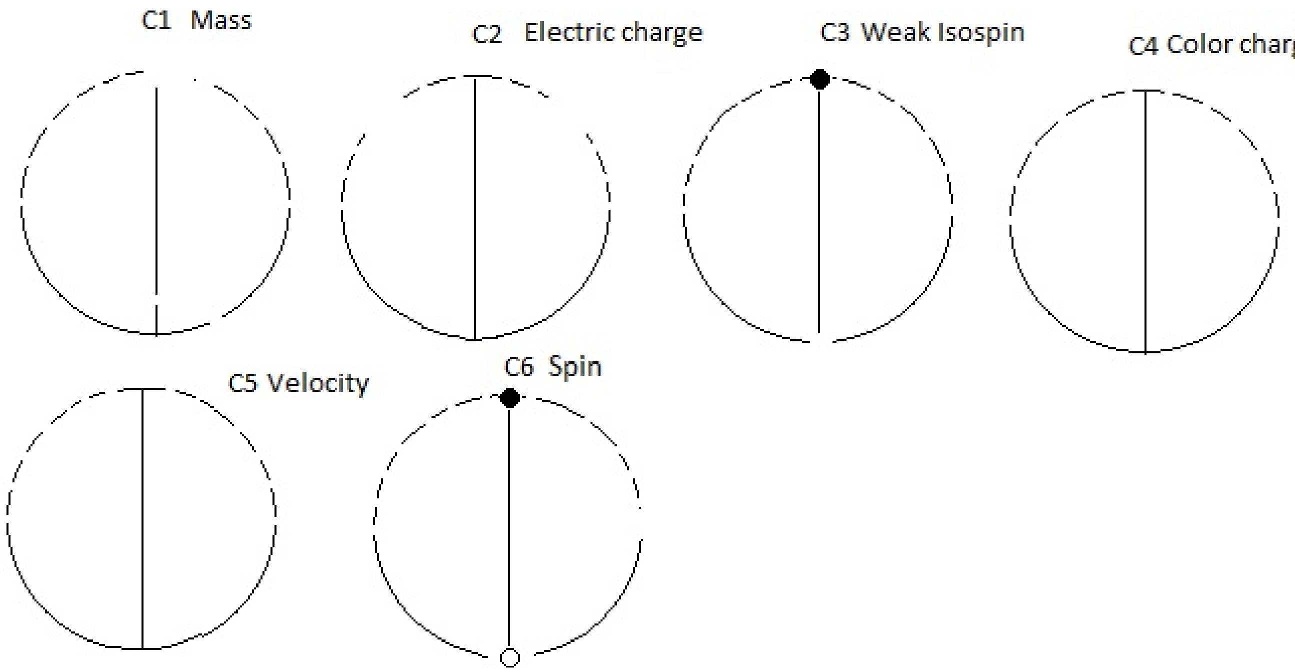

Figure 2.2.4.

Define the electric charge circle to rotate at one quarter the angular speed of the mass charge circle. This way the electron looks the same after two rotations of the mass circle. The spin for right-handed electrons is in the up direction in the figure.

We have that the electron is held together by electric attraction.

We proceed to write down the action based on Figure 2.2. We treat the charges as points. The Lagrangian (for the non-relativistic case) is (from [3]):

$$L = \sum_i (1/2) m \dot{y}_i^2 + \sum_i q \dot{x}'_i A_i - q\varphi \qquad (1).$$

where A and φ must also be in cylindrical coordinates and the derivation is with respect to time.

We only need to specify a heilical path (since the electron spins) for the charges and plug it into y_i' and x_i' of (1). We parameterise the mass circle (in cilindrical coordinates):

$$\mathbf{y}_1 = k_2 t \mathbf{i}_z \qquad (2)$$

thus: k_2 is the speed of the electron.

Since the charge circle rotates at 1/4 the angular speed we include a factor of 1/4 in the parameterisation of the charge circle, (choose the origin at the centre of the electron and assume the velocity points up) then:

$$\mathbf{x}'_1 = r_0 \cos\phi \mathbf{i}_r + (1/4) k_1 f(t) \mathbf{i}_\theta + (r_0 \sin\phi + k_2 t) \mathbf{i}_z \qquad (4)$$

and:

$$\mathbf{x}'_2 = r_0 \cos\phi \mathbf{i}_r + ((1/4) k_1 f(t) - \pi) \mathbf{i}_\theta + (r_0 \sin\phi + k_2 t) t \mathbf{i}_z \qquad (5)$$

and:

$$\mathbf{x}'_3 = (k_2 t - r_0) \mathbf{i}_z \qquad (6)$$

where $f(t) = t$, $f(0) = f(n2\pi)$ for $n \in \mathbf{N}$. Where $f(t)$ resets to zero for $t = n2\pi$. Also where ϕ is the angle between the x-axis and the radius pointing to the 2/3 charge.

We thus have three current densities:

$$\mathbf{J}_i = (2e / (3 * 3\pi r_0^3 / 4)) \dot{\mathbf{x}}'_i(t) = (8e / 9\pi r_0^3) \dot{\mathbf{x}}'_i(t) \qquad (7.1)$$

$$\mathbf{J}_3 = (-e / (3 * 3\pi r_0^3 / 4)) \dot{\mathbf{x}}'_3 = (-4e / 9\pi r_0^3) \dot{\mathbf{x}}'_3 \qquad (7.3)$$

for i =1, 2.

The superposition principle allows computing $\mathbf{A}_i$ and summing over i to obtain the total field. Note that e = -1.602*10^(-19) and r_0 is the radius at the charges. We use the observer position:

$$\mathbf{x} = r \mathbf{i}_r + \theta \mathbf{i}_\theta + z \mathbf{i}_z \qquad (8)$$

to compute $\mathbf{A}_i$ as follows:

$$\mathbf{A}_i(\mathbf{x}, t) = \mu_0 \int_{V'} \frac{\mathbf{J}_i\left(\mathbf{x}'_i, t - \frac{|\mathbf{x} - \mathbf{x}'_i|}{c}\right)}{4\pi |\mathbf{x} - \mathbf{x}'_i|} \mathrm{dv}'_i$$

or:

$$\mathbf{A}_i(\mathbf{x}, t) = \mu_0 \iiint_{V'} \frac{(8e / 9\pi r_0^3) \dot{\mathbf{x}}_i \left(t - \frac{|\mathbf{x} - \mathbf{x}'_i|}{c}\right)}{4\pi |\mathbf{x} - \mathbf{x}'_i|} r'_i \mathrm{dz}'_i \mathrm{dr}'_i d\theta'_i$$

in cylindrical coordinates for i = 1, 2. And:

$$\mathbf{A}_3(\mathbf{x}, t) = -\mathbf{A}_1(\mathbf{x}, t) / 2$$

We compute: $|\mathbf{x} - \mathbf{x}_1'| = \sqrt{(r - r_0 \cos\phi)^2 + (\theta - 1/4(k_1 f(t)))^2 + (z - r_0 \sin\phi - k_2 t)^2}$ and set this equal to: $\sqrt{g_1(\mathbf{r}, t)}$ (9)

$$\mathrm{dr}'_1 = 0\mathrm{dt}, \mathrm{dz}'_1 = k_2 \mathrm{dt}, d\theta_1' = k_1 \dot{f}(t) \mathrm{dt}$$

and we get:

$$\mathbf{A}_i(\mathbf{x},t)=\mu_0\frac{8ek_1k_2}{9\pi r_0}\iint\frac{\dot{\mathbf{x}}_i\left(t-\frac{|\mathbf{x}-\mathbf{x}'_i|}{c}\right)}{4\pi|\mathbf{x}-\mathbf{x}'_i|}\,\mathrm{dt}\,\dot{f}(t)\mathrm{dt} \tag{10}$$

and this collapses into a single integral:

$$\mathbf{A}_1(\mathbf{x},t)=\mu_0\frac{2ek_1k_2}{9\pi^2r_0}\int_{t_1}^{t_2}\frac{\dot{\mathbf{x}}_1\left(t-\frac{|\mathbf{x}-\mathbf{x}'_1|}{c}\right)}{|\mathbf{x}-\mathbf{x}'_1|}\dot{f}(t)\mathrm{dt} \tag{11}$$

Integrating this is quite a mission, we will therefore calculate the integral by computer (see [4] for the App).

$$\dot{\mathbf{x}}_1\left(t-\frac{|\mathbf{x}-\mathbf{x}'_1|}{c}\right)=(1/4)k_1\dot{f}\big(t-g_1^{1/2}(\mathbf{r},t)/c\big)\big(1-(1/2c)g_1^{-1/2}(\mathbf{r},t)\dot{g}_1(\mathbf{r},t)\big)\mathbf{i}_\theta+k_2\big(1-(1/2c)g_1^{-1/2}(\mathbf{r},t)\dot{g}_1(\mathbf{r},t)\big)\mathbf{i}_z =((2c-1)/8c)k_1\dot{f}(t-g_1(\mathbf{r},t)/c)\dot{g}_1(\mathbf{r},t)/\big(\sqrt{g_1(\mathbf{r},t)}\big)\mathbf{i}_\theta+k_2((2c-1)/2c)\dot{g}_1(\mathbf{r},t)g_1^{-1/2}(\mathbf{r},t)\mathbf{i}_z \tag{12}$$

For $\mathbf{A}_2(\mathbf{x},t)$ we use (11), with and the other expression for (9) and with:

$$\dot{\mathbf{x}}_2\left(t-\frac{|\mathbf{x}-\mathbf{x}'_2|}{c}\right)=(1/4)k_1\dot{f}\big(t-\sqrt{g_2(\mathbf{r},t)}/c\big)\big(1-(1/2c)g_2^{-1/2}(\mathbf{r},t)\dot{g}_2(\mathbf{r},t)\big)\mathbf{i}_\theta+k_2\big(1-(1/2c)g_2^{-1/2}(\mathbf{r},t)\dot{g}_2(\mathbf{r},t)\big)\mathbf{i}_z \tag{17}$$

so it produces nearly the same potential as $\mathbf{A}_1$.

For $\mathbf{A}_3(\mathbf{x},t)$ we use (11), with (9) suitably adjusted and with:

$$\dot{\mathbf{x}}_3\left(t-\frac{|\mathbf{x}-\mathbf{x}'_3|}{c}\right)=k_2\big(1-(1/2c)g_3^{-1/2}(\mathbf{r},t)\dot{g}_3(\mathbf{r},t)\big)\mathbf{i}_z \qquad (18).$$

Then the total potential follows by the superposition principle as the sum of the 3 potentials. Computer calculation shows a smooth function like an exponential for $A_z(r)=A_{1z}(r)+A_{2z}(r)+A_{3z}(r)$ where the other variables are taken as constants, and piecewise-smooth (becoming discontinuous for large r) function for $A_\theta(r)$. $A_z(\theta)$ is like $A_z(r)$. $A_\theta(z)$ is smooth with one unstable peak. $A_z(z)$ is piecewise linear and continuous. These last two facts are very unexpected. $A_\theta(\theta)$ is smooth. $A_z(t)$ is a straight line. $A_\theta(t)$ is piecewise-smooth.

To compute φ we use:

$$\varphi_i(\mathbf{x},t)=\int_{V'}\frac{\rho_i\left(\mathbf{x}'_i,t-\frac{|\mathbf{x}-\mathbf{x}'_i|}{c}\right)}{4\pi\epsilon_0|\mathbf{x}-\mathbf{x}'_i|}\mathrm{dv}'_i \tag{20}$$

where the index i is a wordline number. Using (20) with:

$$\rho_i\left(\mathbf{x}'_i,t-\frac{|\mathbf{x}-\mathbf{x}'_i|}{c}\right)=(8e/9\pi r_0^3)=\mathbf{J}/\dot{\mathbf{x}}_i \tag{21}$$

to find:

$$\varphi_i(\mathbf{x},t)=1/(\epsilon_0)\frac{2ek_1k_2}{9\pi^2r_0}\int_{V'}\frac{1}{|\mathbf{x}-\mathbf{x}'_i|}\mathrm{dv}'_i \tag{22}$$

or:

$$\varphi_i(\mathbf{x},t)=\frac{2ek_1k_2}{\epsilon_0 9\pi^2r_0}\int_{t_1}^{t_2}\frac{1}{|\mathbf{x}-\mathbf{x}'_i|}\dot{f}(t)\mathrm{dt} \tag{23}$$

or:

$$\varphi_1(\mathbf{x},t)=\frac{2ek_1k_2}{\epsilon_0 9\pi^2 r_0}\int_{t_1}^{t_2}\frac{1}{\sqrt{g_1(\mathbf{r},t)}}\,\dot{f}(t)\mathrm{dt} \qquad (25).$$

φ_2 is the same as (25) just with:

$$\sqrt{g_2(\mathbf{r},t)}=\sqrt{(r-r_0\cos\phi)^2+(\theta-1/4(k_1f(t))-\pi)^2+(z-r_0\sin\phi-k_2t)^2} \qquad (32)$$

For i=3 we have φ_3 the same as (25)*(-1/2) just with:

$$\sqrt{g_3(\mathbf{r},t)}=\sqrt{(r)^2+(\theta)^2+(z-k_2t+r_0)^2} \qquad (34).$$

Computer calculation shows: $\varphi(r)$ is smooth with a peak close to r =0 and then it tends to zero.

We may verify these by plugging the derivative of $\mathbf{x}_i$, $\mathbf{A}_i(\mathbf{x},t)$ and $\varphi_i(\mathbf{x},t)$ into $\delta(1)$ and integrate to time to find: $\delta\boldsymbol{S}=0$ (just take care to use: $(e/3)\dot{\mathbf{x}}'_i\mathbf{A}_j-(e/3)\varphi_j$ for $i\neq j$). This is since the point of the particle moves in the field of the other two points.

We may also compute the energy of the electron has as a result of these moving charges:

$$W=(\epsilon_0/2)\mathbf{E}_i\cdot\mathbf{E}_i+(\mu_0/2)\mathbf{H}_i\cdot\mathbf{H}_i \qquad (35)$$

We need:

$$\mu_0\mathbf{H}_i=\nabla\times\mathbf{A}_i \qquad (36)$$

thus the curl operator in cylindric coordinates:

$$\nabla\times\mathbf{A}_i=\mathbf{i}_r\left[\frac{1}{r}\frac{\partial A_{\mathrm{iz}}}{\partial\theta}-\frac{\partial A_{i\theta}}{\partial z}\right]+\mathbf{i}_\theta\left[-\frac{\partial A_{\mathrm{iz}}}{\partial r}\right]+\mathbf{i}_z\left[\frac{1}{r}\frac{\partial}{\partial r}(\mathrm{rA}_{i\theta})\right] \qquad (37)$$

thus:

$$(\mu_0/2)\mathbf{H}_i\cdot\mathbf{H}_i=(1/2\mu_0)\left[\left(\frac{1}{r}\frac{\partial A_{\mathrm{iz}}}{\partial\theta}-\frac{\partial A_{i\theta}}{\partial z}\right)^2+\left(-\frac{\partial A_{\mathrm{iz}}}{\partial r}\right)^2+\left(\frac{1}{r}\frac{\partial}{\partial r}(\mathrm{rA}_{i\theta})\right)^2\right]$$

For the equation for $(\mu_0/2)\mathbf{H}_i\cdot\mathbf{H}_i$ we have to solve the integral and computing these terms is an effort. Instead we will compute the integral directly on computer. I have written a Visual Basic App the reader can play with see [4]. Note that we can adjust k_1 as we please (k_2 is determined by the speed of the electron), so we need a way to fix k_1. The app gives an idea of the shapes of the graphs (r_0 and l_P are not given their true values) just scaled appropriately.

We know $H_\theta(r)$ is not zero, but the computer says it is therefore we choose to integrate (11) symbolically so that $\partial A_z/\partial r$ can be correctly computed. We discard higher order terms in the denominator (so this is just true for values of the variables larger than 1). We use integration by parts:

$$\mathbf{A}(\mathbf{x},t)=\frac{\mu_0 2ek_1k_2}{9\pi^2 r_0}\left[\frac{\dot{\mathbf{x}}_1\left(t-\frac{|\mathbf{x}-\mathbf{x}'_1|}{c}\right)}{|\mathbf{x}-\mathbf{x}'_1|}+\frac{\dot{\mathbf{x}}_2\left(t-\frac{|\mathbf{x}-\mathbf{x}'_2|}{c}\right)}{|\mathbf{x}-\mathbf{x}'_2|}-\frac{\dot{\mathbf{x}}_3\left(t-\frac{|\mathbf{x}-\mathbf{x}'_3|}{c}\right)}{2|\mathbf{x}-\mathbf{x}'_3|}\right]f(t)$$

so:

$$A_z(\mathbf{r},t)=\frac{\mu_0 2ek_1k_2}{9\pi^2 r_0}[k_2((2c-1)/2c)\dot{g}_1(\mathbf{r},t)g_1^{-1}(\mathbf{r},t)+k_2(1-(1/2c)g_2^{-1}(\mathbf{r},t)\dot{g}_2(\mathbf{r},t))+k_2(1-(1/2c)g_3^{-1}(\mathbf{r},t)\dot{g}_3(\mathbf{r},t))]f(t)$$

and:

$A_\theta\,(\mathbf{r},\,t) = \frac{\mu_0 2ek_1k_2}{9\pi^2 r_0}\big[(1/4)k_1\dot{f}\,\big(t - g_1^{1/2}(\mathbf{r},\,t)/c\big)(1 - (1/2c)g_1^{-1}(\mathbf{r},\,t)\dot{g}_1\,(\mathbf{r},\,t)) + (1/4)k_1\dot{f}\,\big(t -$
$\sqrt{g_2\,(\mathbf{r},t)}\,/c\big)\big(1 - (1/2c)g_2^{-1/2}(\mathbf{r},t)\dot{g}_2\,(\mathbf{r},t)\big)\big]\,f\,(t)$

I will input these formulae into the code of the App and use the definition of differentiation to compute $-\partial A_z/\partial r$ numericly on computer. We report about the H field; $H_r\,(r)$ is zero and so are the other functions of H_r. $H_\theta\,(r)$ is also zero (I can't find an error in the code). $H_z\,(r)$ is smooth and continuous and goes to zero for r large. $H_z\,(\theta)$ starts out smooth but then goes discontinuous in steps that get shorter. It goes to zero for large θ. $H_z\,(z)$ is smooth and continuous. It starts off with a peak and then tends to zero. $H_z\,(t)$ is discontinuous and rises in a curve, becoming nearly continuous for large t. It flattens off for large t.

We have:

$$\mathbf{E}_i = -\nabla\varphi_i + \frac{\partial\mathbf{A}_i}{\partial t} \qquad (39)$$

with Grad φ computed in cylindrical coordinates:

$$\nabla\varphi_i = \mathbf{i}_r\frac{\partial\varphi_i}{\partial r} + \mathbf{i}_\theta\frac{1}{r}\frac{\partial\varphi_i}{\partial\theta} + \mathbf{i}_z\frac{\partial\varphi_i}{\partial z} \qquad (40)$$

so:

$$(\epsilon_0/2)\mathbf{E}_i\cdot\mathbf{E}_i = (\epsilon_0/2)\left(\left(-\frac{\partial\varphi_i}{\partial r}\right)^2 + \frac{1}{r^2}\left(-\frac{\partial\varphi_i}{\partial\theta} + \frac{\partial\mathbf{A}_{i\theta}}{\partial t}\right)^2 + \left(-\frac{\partial\varphi_i}{\partial z} + \frac{\partial\mathbf{A}_{\mathrm{iz}}}{\partial t}\right)^2\right) \qquad (41)$$

To compute $E_r(\theta)$ we must compute: $-\partial\varphi/\partial r$. For this we compute the integrals (25) using integration by parts: choose:

$$\mathrm{dv} = \dot{f}\,(t)\mathrm{dt}$$

$$u = g_1^{-1/2}(\mathbf{r},t) + g_2^{-1/2}(\mathbf{r},t) + g_3^{-1/2}(\mathbf{r},t)$$

so:

$$E_r\,(\mathbf{r},t) = -\frac{2ek_1k_2}{\epsilon_0 9\pi^2 r_0}\frac{\partial}{\partial r}\big(f(t) * \big(g_1^{-1/2}(\mathbf{r},t) + g_2^{-1/2}(\mathbf{r},t) + g_3^{-1/2}(\mathbf{r},t)\big)\big) \qquad (42)$$

using $g_i(\mathbf{r},t) = |\mathbf{x} - \mathbf{x}'_i\,(\mathbf{r},t)|^2$ we find:

$E_r\,(\mathbf{r},t) = \frac{-ek_1k_2}{\epsilon_0 9\pi^2 r_0}\,f(t) * \big((r - r_0\cos\phi)g_1^{-3/2}(\mathbf{r},t) + (r - r_0\cos\phi)g_2^{-3/2}(\mathbf{r},t) + (r - r_0\cos\phi)r * g_3^{-3/2}(\mathbf{r},$
$t)\big)$ (43)

with terms of higher order terms in the denominator left out in (42). Computer calculation shows: $E_r(r)$ is like a 1/r function, just ofsetted to the right. $E_r(z)$ looks similarly, just moved to the right. $E_r(\theta)$ looks like a bell-shaped curve and is continuous and smooth. $E_r(t)$ is highly discontinuous and makes a nice pattern in the plane. The pattern seems to be a mixture of bell-shaped curves and $E_r(r)$ curves: the pattern stops close to the line: $E_r(r)$.

Since we may choose k_1 and k_2 we may choose them to exactly cancell r_0 i.e. $k_1 = k_2 = \sqrt{r_0}$ so that (43) reduces to:

$E_r\,(\mathbf{r},t) = \frac{-e}{\epsilon_0 9\pi^2}\,f(t) * \big((r - r_0\cos\phi)g_1^{-3/2}(\mathbf{r},t) + (r - r_0\cos\phi)g_2^{-3/2}(\mathbf{r},t) + (r - r_0\cos\phi) * g_3^{-3/2}(\mathbf{r},$
$t)\big)$ (44)

For $E_\theta(r)$ we need:

$$E_\theta(\mathbf{r},t) = -\frac{1}{r}\frac{\partial\varphi}{\partial\theta} + \frac{\partial A_\theta}{\partial t}$$

We compute the derivatives easily on computer and report the results here. $E_r(r)$ and $E_r(\theta)$ are smooth and continuous and run like a bell shaped curve. $E_r(z)$ is smooth and continuous and has a large peak and then goes to zero. $E_r(t)$ is discontinuous. $E_\theta(r)$ is discontinuous. $E_\theta(\theta) = 0$. $E_\theta(z)$ is discontinuous and negative for large z although it becomes more continuous as z gets larger. $E_\theta(t)$ is discontinuous and for largish t: is distributed between two values at a ratio of 1:2. $E_z(r)$ and $E_z(\theta)$ is bell-shaped with small discontinuities. $E_z(z)$ is smooth and continuous, starts out positive, then makes an (left-right inverted) "s" and goes negative and constant. $E_z(t)$ is constant for large t with small discontinuities.

Note that if we find a value for k_1 that implies faster than the speed of light rotation: this is no problem since the mass is concentrated on the axis of rotation and only space points are required to rotate faster than lightspeed.

We prove that the electron is made of a Riemann Sphere-Antisphere:

We notice that if the model for an electron is true, then there must be a direction along which an electron will not emit a photon. We must thus show that there is a direction in which an electron will not emit a photon. The shape of the Hydrogen atom can be as drawn in the following figure:

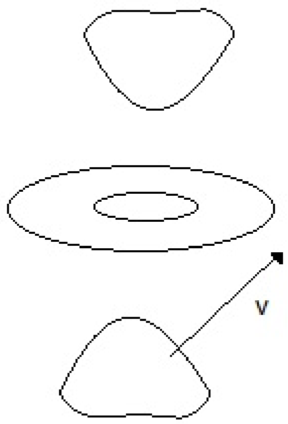

Figure 2.3

We see that there is a direction (v) along which an electron will not jump, hence in the direction opposite v it will not emit a photon. Hence the model for the electron is proven. QED.

3. Defining Electron Anti-neutrinos

An electron antineutrino follows from the picture for a pi-minus. It looks like:

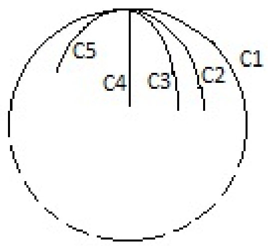

Figure 3.1

The circles of the electron antineutrino looks as follows (follows form circles for pi-minus and electron):

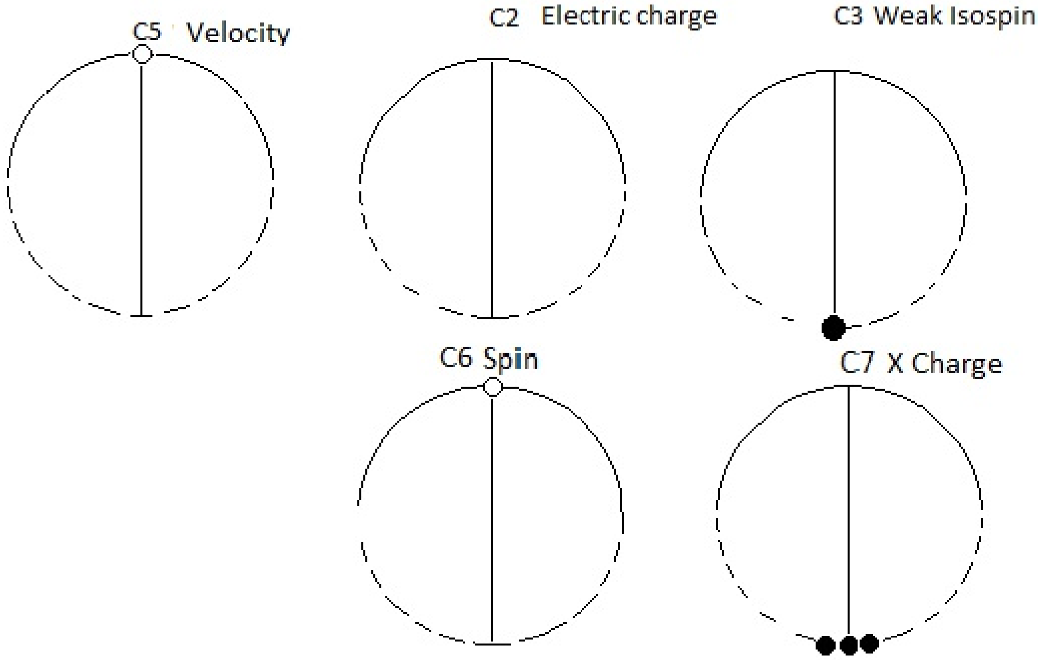

Figure 3.2

Note that the spin -1/2 is measured as |-1/2| and that the little circle codes for spin in the up direction.

4. Defining protons.

The two up quarks are like cups, one inside the other, and the down quark couples to a gluon that is bound to the area halfway between the two up quarks on the equator where the two "cups" end. See figure 4.1.

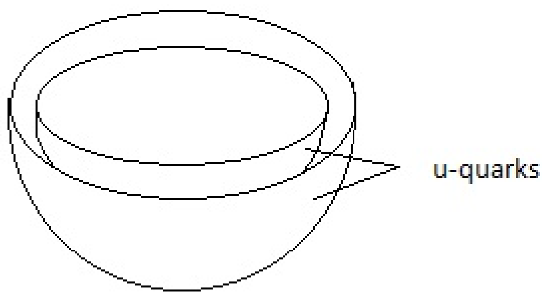

Figure 4.1

The down quark sits atop of this with its equator halfway between the two up quarks. Three gluons fills the space at the equator (as rings) and their intersection would make upside-down Y-shapes. A consequence of this is that only one color is available for inter-nucleon forces and that a proton and neutron will bind with their opposite quark types facing each other. The two cups overlaps in reality as they are not the same color.

Bibliography

[1] Esterhuyse W. F., Physics from Axioms, JOURNAL OF ADVANCES IN PHYSICS, 16(1), 326-334. https://doi.org/10.24297/jap.v16i1.8382

[2] Carroll, S. Black holes and Firewalls. https://www.youtube.com/watch?v=_8bhtEg88Mo. Time stamp: 34:18. Internet.

[3] Wikipedia. Minimal Coupling. ⟨hlink | | https://en.wikipedia.org/wiki/Minimal_coupling#Non-relativistic_charged_particle_in_an_electromagnetic_field⟩. December 2020. Internet.

[4] Visual Basic App: Electromagnetic Field of an Electron. Available at: talanum1@yahoo.com