EM FIELD AND MATTER

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ABSTRACT. This article tries to unified the four basic forces by Maxwell equations, the only experimental theory. Self-consistent Lorentz equation is proposed, and is solved to electrons and the structures of particles and atomic nucleus. The static properties and decay are reasoned, all meet experimental data. The equation of general relativity sheerly with electromagnetic field is discussed as the base of this theory. In the end the conformation elementarily between this theory and QED and weak theory is discussed.

CONTENTS

1. BOUND DIMENSIONS

A rebuilding of units and physical dimensions is needed. Time s is fundamental. We can define:
The unit of time: s (second)
The unit of length: cs (c is the velocity of light)

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The unit of energy: $\hbar/s$ (h is Plank constant)

The unit dielectric constant ϵ is

$$[\epsilon] = \frac{[Q]^2}{[E][L]} = \frac{[Q]^2}{\hbar c}$$

The unit of magnetic permeability μ is

$$[\mu] = \frac{[E][T]^2}{[Q]^2[L]} = \frac{\hbar}{c[Q]^2}$$

The unit of Q (charge) is defined as

$$c[\epsilon] = c[\mu] = 1$$

then

$$[Q] = \sqrt{\hbar}$$
$$\sqrt{\hbar} = (1.0546 \times 10^{-34})^{1/2} C$$

C is charge's SI unit Coulomb.

For convenience, new base units by unit-free constants are defined,

$$c = 1, \hbar = 1, [Q] = \sqrt{\hbar} = 1$$

then the units are reduced.

Define

$$UnitiveElectricalCharge : \sigma = \sqrt{\hbar}$$
$$\sigma = 1.027 \times 10^{-17} C \approx 64e$$
$$e = e/\sigma = 1.5602 \times 10^{-2} \approx 1/64$$

It's defined that

$$\beta := m/e = 1, \qquad m := |k_e|$$

Then all units are power β^n. This unit system is called *bound dimension* or *bound unit*. We always take the definition latter in this article

$$\beta = 1$$

We always take them as a standard unit.

2. Inner Field of Electron

A-potential of electron is itself wave function of matter, and of course the wave function of A-potential

$$\partial^l \partial_l A^\nu = i A^*_\mu \partial^\nu A^\mu / 2 + cc. = \mu j^\nu \tag{2.1}$$
$$\partial^\nu \cdot A_\nu = 0, \quad [A] = \beta$$

It's with definition

$$p_\nu := (E, \mathbf{p}), x^\nu = (t, x) : e^{-ip_\nu x^\nu}$$
$$(A^i) := (V, \mathbf{A}), (A_i) := (V, -\mathbf{A})$$
$$(J^i) = (\rho, \mathbf{J}), (J_i) = (\rho, -\mathbf{J})$$
$$\partial := (\partial_i) := (\partial_t, \partial_{x_1}, \partial_{x_2}, \partial_{x_3})$$
$$\partial' := (\partial^i) := (\partial_t, -\partial_{x_1}, -\partial_{x_2}, -\partial_{x_3})$$
$$g_{ij} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

The mass and charge have the same movement.

$$\mu = \frac{4\pi\alpha}{e^2}$$

3. General Electromagnetic Field

Define

$$(x', t') := (x, t - r)$$

It's found

$$\partial_x^2 - \partial_t^2 = \partial_{x'}^2 =: \nabla'^2$$

The following is the *probabilistic electromagnetic energy* of field A:

$$\varepsilon = \frac{1}{2} < A_\nu | \partial_t^2 - \nabla^2 | A^\nu > \tag{3.1}$$

under Lorentz gauge. The Hilbert bracket means 4-d integral. *This term is the same of the static gravitational mass.*

4. Solution of Electron

The solution by *recursive re-substitution* (RRS) for the two sides of the equation is proposed. For the equation

$$\hat{P}' B = \hat{P} B$$

Its algorithm is that

$$\hat{P}'(\sum_{k \le n} B_k + B_{n+1}) = \hat{P} \sum_{k \le n} B_k$$

A function is initially set and is corrected by RRS of the equation 2.1. Here is the start state

$$A_i = A_r e^{-ikt}, \partial_\mu \partial^\mu A_i = 0$$

The fields' correction A_n with n degrees of A_i is called the n degrees correction.

Firstly

$$\nabla^2 \phi = -k^2 \phi$$

is solved. Exactly, it's solved in spherical coordinate

$$-k^2 = \nabla^2 = \frac{1}{r^2} \partial_r (r^2 \partial_r) + \frac{1}{r^2 \sin\theta} \partial_\theta (\sin\theta \partial_\theta) + \frac{1}{r^2 \sin^2\theta} (\partial_\varphi)^2$$

Its solution is

$$\Omega_k := \Omega_{klm} = k j_l(kr) Y_{lm}(\theta, \varphi) e^{-ikt}$$
$$\phi_k := k \phi_{klm} e^{-ikt} := k h_l(kr) Y_{lm}(\theta, \varphi) e^{-ikt}$$
$$\omega_k := k j_1(kr) Y_{11}(\theta, \varphi) e^{-ikt}$$

After normalization it's in effect

$$h = \frac{e^{\pm ir}}{r}, \quad j = \frac{\cos r, \sin r}{r}$$

And

$$\frac{\sin(kr)}{kr} = N \int_0^{2\pi} d\varphi \int_0^\pi d\theta \cdot \sin\theta \cdot e^{i\mathbf{k}\cdot\mathbf{r} = ikr\cos\theta}$$
$$\omega_1(\mathbf{r}) = < \rho(\widehat{\mathbf{w}}) \delta(w-1) e^{i\mathbf{w}\cdot\mathbf{r}} >_{\mathbf{w}}$$
$$\delta(t) := \lim_{u\to\infty} \int_{-u}^{u} e^{ikt} dk, \quad \widehat{x} := \frac{x}{|x|}$$

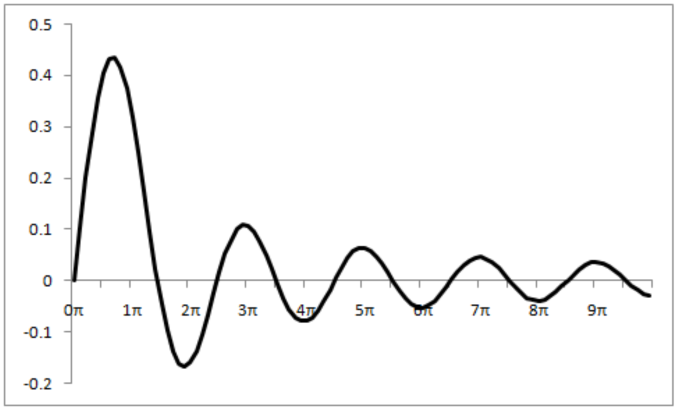

FIGURE 1. The function of j_1

Define

$$2\pi\delta_\beta(t) := \lim_{u\to\infty}\int_{-u}^{u} e^{-\beta^+|k|}e^{ikt}dk = \frac{-i}{i\beta^+ + t} + cc.$$

This means

$$\mathcal{F}^{-1}(e^{-\beta^+|w|}) = \delta_\beta(t)$$

$$< \delta_\beta(t) >_t = 1$$

Define

$$f_\beta(t) := e^{-\beta^+|t|}f(t)$$

It's called Smoothly Truncated Function (STF). *The cosmos is finite,*

$$\lim_{\beta^+\to 0^+} < T_\beta(t) >_t = < T(t) > \tag{4.1}$$

The term T_β is composed with *concordantly* truncated functions and $T_{\beta=0}$ is finite.

$$< \delta_\beta(t)e^{-iwt} >_t = \mathcal{F}(\delta_\beta(t)) = e^{-\beta^+|w|}$$

$$\delta_\beta(t) * \delta_\beta(t) = \delta_{2\beta}(t)$$

The β has the effect of compressing spectrum,

$$< \delta_{k\beta}(t - C) >_t = \widehat{k} < \delta_\beta(t - \frac{C}{k}) >_t$$

$$< e^{iwt}\delta_{k\beta}(t - z) >_t = k < e^{ikwt}\delta_{k\beta}(k(t - \frac{z}{k})) >_t = < e^{iwt}\delta_\beta(t - \frac{z}{k}) >_t, \quad k > 0$$

$$< \delta^2_{k\beta}(w - k)e^{iwt} >_w = \frac{2}{2\pi k\beta^+}e^{-\beta^+|t|}\cos t + O(1/\beta^+), \quad k > 0$$

$w/(w - k)$ is expanded on $|w| > |k|$ hence is integrated at the contour that is harmonic inside and neighboring if $|k| = 1^+$.

$$< \nabla^2\frac{1}{r} >_{\mathbf{r}} = -4\pi, \quad \nabla^2\frac{1}{r}|_{r\neq 0} = 0$$

$$\partial^2 u = \delta(t, \mathbf{r}), \quad u := \frac{\delta(t - r)}{4\pi r}$$

5. Electrons

It's the start electron function for the RRS of the equation 2.1:

$$A_i^\nu := il\partial^\nu \omega_k(x,t), \quad l \approx 1$$

Some states are defined as the core of the electron, such are the start functions $A_i(x,t)$ for the RRS of the equation 2.1 to get the whole electron function of A-potential: $A = e$

$$e_r^+ : \omega_m(\varphi,t), \quad e_l^- : \omega_m(-\varphi,-t)$$
$$e_l^+ : \omega_m(-\varphi,t), \quad e_r^- : \omega_m(\varphi,-t)$$
$$e_r^+ \to e_l^+ : (x,y,z) \to (x,-y,-z)$$

The electron function is normalized with charge as

$$e =< A^\mu | i\partial_t | A_\mu >_3 /2 + cc.$$

It's also a normalization on A_i,

$$< A_i^\mu / l | A_{i\mu} / l >_3 = 1$$

The MDM (Magnetic Dipole Moment) of electron is calculated as the second degree proximation

$$\mu_z =< A_\nu | -\partial_\varphi \partial_t | A^\nu > /2 + cc.$$
$$= \frac{e}{2m}$$

The spin is

$$S_z = 1/2$$

The correction in RRS of the equation 2.1 is calculated as

$$A - A_i = \frac{(A_i^* \cdot i\partial A_i/2 + cc.) * u}{1 - \cdot i\partial(A_i - A_i^*)/2 * u}$$

The function of e_r^+ is decoupled with e_l^+

$$< (e_l^+)^\nu (-) | (e_r^+)_\nu > /2 + cc. = 0$$

The following is the increment of the energy ε on the coupling of e_r^+, e_l^-, mainly between A_2

$$\varepsilon_e = - < (e_r^-)^\nu (-) | (e_l^+)_\nu > /2 + cc.$$
$$\approx -2e^2 = -\frac{1}{4.12804 \times 10^{-20} s}$$

The following is the increment of the energy ε on the coupling of e_r^+, e_r^-, mainly between A_4

$$\varepsilon_x = - < (e_r^-)_\nu (-) | (e_r^+)^\nu > /2 + cc.$$
$$\approx -\frac{1}{2} e^6 = -\frac{1}{2.78685 \times 10^{-12} s}$$

The reflection of coordinates causes the reverse of variable φ, especially the integral direction.

The following are stable naked particles:

particle	*electron*	*photon*	*neutino*
notation	e_r^+	γ_r	ν_r
structure	e_r^+	$(e_r^+ + e_l^-)$	$(e_r^+ + e_r^-)$

6. System and TSS of Electrons

The following is the isolated system of particle x

$$A = \Phi * e_x *_4 \sum_c e_c = \Phi * x$$

$$e_c := *e, \pm e, \quad d := (r, l)$$

There are transforms for the initial wave

$$\Phi * e_{xc} \cdot h(-t) * -e_c := (\Phi * e_{xc} \cdot h(-t))(-x, -t) * e_c$$

$$\Phi * e_{xc} \cdot h(-t) * *e_c := (\Phi * e_{xc} \cdot h(-t))^* * e_c$$

These four split orbits of SO_4 divided by Lorentz Transform, is with the same dense of matter, hence they have the same scenic painting (independent of phase factor). In calculation, the difference between the initial and final state is considered,

$$H(-t) := h(-t)\widehat{t}$$

$$\Delta P =< \Phi * e_{xc} \cdot H(-t) * e_c|\hat{P}|\Phi * e_{xc} \cdot h(-t) * e_c >$$

Φ, e_x are (complex) *probability* of matter, the single particle. define the *probability* meets on events (functions) $P(A), P(B)$ and sample events A, B

$$P(A) \vee P(B) := P(A \vee B)$$

$$P(A \vee B) := P(A) + P(B), \quad A \wedge B = \phi$$

$$P(A) \wedge P(B) := P(A \wedge B)$$

and *dependency*

$$P(A)P(B) := P(A)P(A \wedge B)$$

$$(P(A) + P(A'))P(B) := P(A)P(B) + P(A')P(B)$$

$$P(A)P(B) \vee P(A')P(B) := (P(A) \vee P(A'))P(B)$$

$$P(A)P(B) \wedge P(A')P(B) := (P(A) \wedge P(A'))P(B)$$

and United Probabilities

$$P(A, B) := P(A) \cdot P(B)$$

There are calculations

$$< P(x) >_{x \in I}= 1 =< P(x)|P(x) >_{x \in I}$$

$$P(A)P(B) = P^2(A \wedge B)$$

$$P(A)P(B) \cdot P(A')P(B') = (P(A) \cdot P(A'))(P(B) \cdot P(B'))$$

$$P(I_A) \cdot P(I_A \to A) = \sqrt{P(I_A)P(I) \cdot P(I)P(I_A \to A)} = P(A)$$

$$P(I \to A) = P(I \to I_A) \cdot P(I_A \to A)$$

Particle is hung (i.e. convolution) on the wave branches of the number. They are normalized with *dependency*,

$$< e_x|e_x >_3= 1, \quad < \Phi|\Phi >_3= 1, \quad < e_x|e_x >= 1, \quad < \Phi|\Phi >= 1$$

and particle number

$$< e_c|e_c >_3^c= 1, \quad < e_c|e_c >^c= 1$$

$$< e_{xc} * e_c|e_{xc} * e_c >_3= 1, \quad < e_{xc} * e_c|e_{xc} * e_c >= 1$$

This A-potential is called *EM field*. A whole particle appears average one time in space, also appears one time in time-space. So that the truncated and normalized function is like

$$\Omega_\beta / < \Omega_\beta, \Omega_\beta >^{1/2}$$

And make the truncated functions *similar* because their Fourier transforms are absolutely integrable, to set them concordant (4.1).

Make the action of EM energy *to find the law of physics.* For the isolated particle x,

$$\delta(< x^\nu | \partial^\mu \partial_\mu | x_\nu > /4 + cc.) = 0$$

Transient steady state (TSS) is monochromatic,

$$\partial^\mu \partial_\mu e_x = 0$$

$$e_x := \Omega_{k_x}(x)$$

e_x here is called a light state (LS).

By calculation the normalization of the number of isolated particle x in probability

$$1 =< e_{xc} * e_c^\nu | e_{xc'} * e_{c'\nu} > \tag{6.1}$$

$$|k_x| = n_x, \quad n_x :=< e_{xc} | e_{xc} >$$

The number of electron (i.e. branch) is verified as

$$< \sqrt{N_c} \Phi * e_{xc} * e_c^\mu | \sqrt{N_c} \Phi * e_{xc} * e_{c\mu} >^c = 1$$

Its mechanical or probabilistic physical subjected by number is calculated so, such as static charge and momentum, angular momentum. Probabilistically, the momentum is

$$p_{\nu c} =< \sqrt{N_c} \Phi_\nu * e_{xc} * e_c | - \frac{\sqrt{N_c}}{m} i\partial \cdot \Phi_\nu * e_{xc} * i\partial_t e_c >^c /2 + cc. \tag{6.2}$$

for each electron. The sign between charge and Mass is negative for electron.

Its wave-function of e-current is explained as

$$\mu J =< \Phi * e_{xc} * e_c^\nu | i\partial \cdot \Phi * e_{xc} * i\partial_t e_{c\nu} > /2 + cc. \tag{6.3}$$

The electromagnetic physical related to e-field such as MDM, interactive potential, etc. is calculated so.

There is by calculation

$$< A^\nu | \frac{1}{2} \partial^\mu \partial_\mu | A_\nu > /2 + cc. = \frac{1}{2} < \mu(\hat{J}^\nu A^\mu) * u | \mu \hat{J}_\nu A_\mu > /2 + cc.$$

7. Muon

$$\mu^- : e_{\mu r} * (e_r^- - *e_r^- + *e_r^+), \quad e_\mu = e_x(k_x = -3\beta)$$

μ is approximately with mass $3m/e = 3 \times 64m$ [3.2][1] (The data in bracket is experimental by the referenced lab), spin S_e (electron spin), MDM $\mu_B m / k_\mu$. In the four transforms, only conjugation "$*$" changes the angular-momentum.

The first one of the four split orbits means our world (light cone), with positive direction of wave front, or the matter is transported in reversed direction, such will change the classical mechanics, and only the reflection of time-space can set it normal.

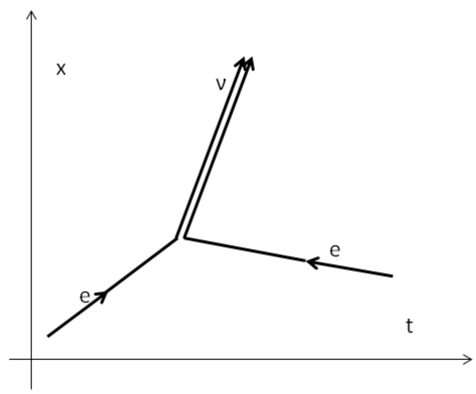

FIGURE 2. neutrino radiation

The main channel of decay is

$$\mu^- \to e_r^- + \nu_r$$
$$e_\mu * e_r^- + e_\mu * (- * e_r^- + * e_r^+) \to e_\mu * (e_r^- + * \nu_r) \Rightarrow \phi * e_r^- + \phi' * \nu_r$$

Its main life is

$$\varepsilon_\mu := < e_\mu * (e_r^+)_\nu | e_\mu * (i\partial_t)^2 (e_r^-)^\nu > /2 + cc.$$
$$= \frac{\beta e^3 \varepsilon_x}{k_\mu} = -\frac{1}{2.2015 \times 10^{-6} s} \quad [2.1970 \times 10^{-6} s]$$

Best use the measure $m = 1$ that's the best normalization. It's used for the conservations of momentum and angular-momentum in mass-center frame.

8. Pion

The pion is perhaps an atom,

$$\pi^- : (e_l^- + e_r^-, e_l^+)$$

Decay Channels:

$$\pi^- \to e_r^- + \nu_l, \quad e_r^- \to -e_r^+ + \nu_r$$

The mean life approximately is

$$-e^2 \varepsilon_x / 2 = \frac{1}{2.3 \times 10^{-8} s} \quad [(2.603 \times 10^{-8} s][1]$$

The precise result is calculated with successive decays.

9. Pion Neutral

The pion neutral is perhaps

$$\pi^0 : (e_r^+ + e_l^+, e_l^- + e_r^-)$$

It's the main decay mode as

$$\pi^0 \to \gamma_r + \gamma_l$$

The loss of interaction is

$$-2e^2 \varepsilon_e = \frac{1}{8.48 \times 10^{-17} s} \quad [8.4 \times 10^{-17} s][1]$$

10. Proton

The proton may be like

$$p^+ : e_{pl} * (4e_r^- + 3e_r^+ - *2e_r^+), \quad e_p = e_x(k_x = 29\beta)$$

The mass is $29 \times 64m$ [29][1] that's very close to the real mass. The MDM is calculated as $3\mu_N$, spin is S_e. The proton thus designed is eternal.

Decay is a discrete Malcov process. Figure out its transitional map to find its feasibility. Its life are calculated like (13.1).

11. Neutron

Neutron is the atom of a proton and a muon

$$n = (p^+, \mu^-)$$

The muon take the first orbit, with the decay process

$$\Phi * e_\mu * (e_r^- - *e_r^- + *e_r^+) \to \Phi * e_\mu * (e_r^- + *\nu_r) \Rightarrow \phi * e_r^- + \phi' * \nu_r$$

Calculate the variation of the action of open system, the conservative amount: the inner EM energy adding the kinetic energy of muon,

$$i\partial_t \Phi + \frac{1}{2m_\mu}\nabla^2\Phi = -\frac{\alpha m}{m_\mu r}\Phi \tag{11.1}$$

Two of the terms of EM energy are neglected.

$$\Phi = Ne^{-r/r_0}e^{-iE_1 t}, \quad \phi(\mathbf{r}) = Ne^{-r/r_0}$$

$$E_1 = E_B \cdot \frac{m}{m_\mu}$$

$$E_B = -\frac{\alpha^2 m}{2} = -13.60517eV, \quad a_0 = 0.5291772 \times 10^{-10}m,$$

$$E_R = - < (\phi| * |\phi)| \cos r >_{\mathbf{r}} = 1.12549E_1$$

It's approximately the decay life of muon in the orbit that

$$\varepsilon_n = -\beta^{-1}E_R \cdot \varepsilon_\mu = -\frac{1}{905s}$$

12. Atomic Nucleus

We can find the equation for the fields of Z' ones of proton: Φ_i, and the fields of n ones of muon: $\phi_i = \Phi_{Z'+\nu}$,

$$\Phi = \sum_i \Phi_i, \quad \phi = \sum_i \phi_i$$

$$\varphi_\nu := \Phi_\nu * (p/\mu)$$

The gross even EM energy is conservative by system. The interactive EM potential belongs to mechanical energy, needs the output of self-EM-energy of agents.

$$I = \sum_\mu < \varphi^\mu|\frac{1}{2}\partial^\nu\partial_\nu|\varphi_\mu > /2 + \sum_\mu < \varphi^\mu|\frac{1}{2}\partial^\nu\partial_\nu|\sum_{i\neq\mu}\varphi_i > /2 + cc.$$

The variation acts on the abstract function that doesn't include its self-variable. Make this action to find the TSS

$$\partial^\nu\partial_\nu\Phi_i = 0$$

By the *principle of the lowest (extreme) energy* I, and the invariant self-crossings in herewith logics,

$$< \Phi_i|\Phi_j >= \delta_{ij}$$

Naked muon and proton are coupling indeed. It's to magnify the $-k_\mu$ to k_p legally, because the argument exists with this (Lorentz) covariance. Use the argument of space-dimension, with the conservative part respective to time is deleted form the variation,

$$(\frac{1}{2}\partial_t^2\Phi - ik_p\partial_t\Phi + \frac{1}{2}\nabla^2\Phi + 12(Z'+1)\Phi - 12n\phi)|_{t=0} = 0 \tag{12.1}$$

$$(\frac{1}{2}\partial_t^2\phi - ik_p\partial_t\phi + \frac{1}{2}\nabla^2\phi - 12Z'\Phi + 12(n-1)\phi)|_{t=0} = 0$$

It's important to discriminate whether variation is on function or on variable. Make combination of the both functions

$$\zeta = (\Phi + \phi\eta)|_{t=0}$$

$$(Z'+1) - \eta Z' = -n/\eta + (n-1) =: N$$

$$\eta = \frac{(Z'-n+2) \pm \sqrt{(Z'-n+2)^2 + 4Z'n}}{2Z'}$$

$$N(Z',n) = \frac{1}{2}(Z'+n-\sqrt{(Z'+n)^2+4(Z'-n)+4}) \tag{12.2}$$

$$\approx -\chi \qquad \chi := \frac{Z'-n}{Z'+n}$$

then

$$-(E^2/2 + Ek_p)\zeta + \frac{1}{2}\nabla^2\zeta + 12N\zeta = 0$$

hence

$$E^2 + Ek_p - 12N = 0$$

$$E = -\frac{1}{2}(k_p + \sqrt{k_p^2 + 48N})$$

$$\approx -(k_p + \frac{12N}{k_p})$$

For $N = \chi = 1/3$

$$E \approx -k_p + \Delta, \quad \Delta = 4.52MeV$$

The groups of muon or proton are with waves of the third layer

$$\Phi_i = e^{-iEt}\Omega_{Elm}$$

12.1. **Decay Energy.** The life-involved energy of proton or muon under the solved wave Φ is averaged as

$$\varepsilon =< \Phi_i * (p,\mu)^l | \hat{J}_0 | \Phi_i * (p,\mu)_l > /4 + cc.$$
$$= (3/58 - \frac{1}{|E|}, \quad 1/6 + \frac{2}{|E|})e^3$$

The difference of $e^3/|E|$ is

$$E_\Delta \approx \frac{1}{3.23 \times 10^{-14} s}, \qquad \Delta E = \Delta$$

The decay

$$_{14}C \rightarrow {}_{14}N + \mu_C$$

is with zero energy decrease unless the neglected weak crossings are considered.

12.2. **β-stable and Neutron Hide.** In the solutions when a proton combine with a muon the both have the same wave function:

$$\Phi_\mu = \phi_\mu$$

then this terms will quit from the interactional terms of the previous equations

$$(Z'_x, n_x) \rightarrow (Z'_x - 1, n_x - 1)$$

This will change the *flag* energy E. If a β-decay can't happen then a dismiss of this *neutron hide* will help *before the timeless departure*. The ratio $2 : 1 = Z' : n$ between interactive protons and muons is critic (sign) point of gross energy. z is the number of departed muons. So that if

$$-N(Z' - z, n) \leq -N(Z' + \max(z) + z, n + \max(z) + z)$$

the β-decay will not happen likely. The number and charge of particles conserve. The $n + z$ is the charge of the right (final) particles.

$$\frac{Z + \kappa - h - z}{3(Z+\kappa) - z} \leq \frac{Z + \kappa - h}{3(Z+\kappa) + 2\max(z) + 2z}, \qquad 8h := 3\kappa^2 + 8\kappa - 16 \tag{12.3}$$

It's found for a critic point

$$\kappa \approx -8 : \quad h \approx 14$$

(between seven and eight) and

$$Z \approx 29$$

By the following result 12.4, conditions $\chi = 1/3$ and $\max(z) = 0$ are specific for this critical point, for the other Z or κ, the both of which are incompatible.

The condition 12.3 is solved to

$$2(z + \max(z))z < 2\max(z)(Z + \kappa) - (2\max(z) + z)h$$

hence as

$$\frac{1}{4} < \chi \leq \frac{1}{3}, \quad z \leq \max(z) = ((Z+\kappa) - 1.5h)/2 \tag{12.4}$$

the reaction is very weak.

Near the stable χ, it's the *Average Binding Mass Per Nucleon* according to charge number that

$$\overline{M}(Z) = X \cdot (-E - k_p)$$
$$X = (Z \leq 29) + (Z > 29)\frac{2.0}{2.5 - 10.5/(Z-8)}$$

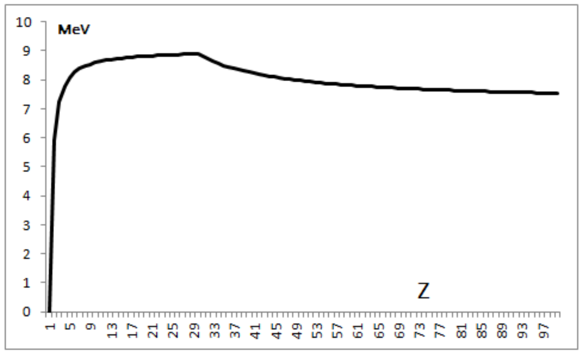

FIGURE 3. Average Binding Mass: $\overline{M}(0) - \overline{M}(Z)$

The EM energy is the same of the static gravitational mass. For a proton,

$$m_p =< \Phi_\nu * p|\frac{1}{2}\partial_\mu \partial^\mu|\Phi_\nu * p >\approx k_p$$

The wave's motive mass is found the flag energy. Mass is detected by energy change in movement.

$$M_\nu = -E$$

13. Basic Results for Interaction

For decay

$$W(t) = \Gamma e^{-\Gamma t} \tag{13.1}$$

$$\Gamma =< A_\nu|\mu \hat{J}_0|A^\nu > |_\infty^{t=0}/4 + cc. \tag{13.2}$$

$$\int_0^\infty W(t)dt = 1 \qquad \Gamma = 1$$

$$\int_0^\infty W(t)dt/\Gamma = 1 \qquad \Gamma = 1$$

J_0 is referenced to 6.3. Γ is interactive potential. The interactive by magnetic field makes no work.

The distribution shape of decay can be explain as

$$A_0 e^{-\Gamma t/2 - ik_x t}, 0 < t < \Delta$$

It's the real wave of the particle x near the initial time and is expanded in that time span

$$\approx \sum_k \frac{Ce^{ikt}}{k - k_x - i\Gamma/2}$$

Variation principle of classical mechanics. Potential change (energy output) makes a force on the object, kinetic energy change (energy input) also makes a force, The two forces are the same. To check the object's mechanical, potential subtracting kinetic energy is the argument of action.

Define $B \cdot B^*$ is the field of $A \cdot A^*$ without cross oscillation. B_μ is a good wave function, a representation of velocity:

$$B_\mu := \exp(i(A_\mu^* \partial^\nu \partial_\nu A_\mu/4 + cc.)) = \exp(imu_\mu u_\mu)$$

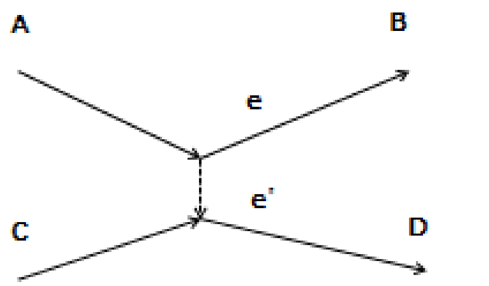

FIGURE 4. scattering e-e

The variation gives the same of the previously related A,

$$0 = \delta < B^{\nu}|B_{\nu} >= \delta(B^{\nu *}(-) * B_{\nu})|_0 = (B^{\nu *}(-) * \delta B_{\nu})|_0 =< B^{\nu}|\delta B_{\nu} >$$

Then

$$< A'^{\nu}|A'_{\nu} >=< B^{\nu}(A') * u|B_{\nu}(A') * u > \quad \beta = 1 \tag{13.3}$$

A' is a Fourier branch of A,

$$< B * u|B * u >, \quad B(x) = e^{-\beta^{+}l} e^{iae^{ipx}\partial^{\nu}\partial_{\nu}ae^{ip'x}/4-cc.}, \quad l := \sum_i |x^i|$$

Including the normalization,

$$=< B' * u|B' * u >, \quad B'(x) = e^{-\beta^{+}l} e^{ie^{ipx}\partial^{\nu}\partial_{\nu}e^{ip'x}/4-cc.} \quad m = 1$$

The scattering of e-e

$$A := h(-t)e^{ip_A x}, \quad B := h(t)e^{ip_B x}, \quad C, D...$$

$$U^{\nu} := (P_A^{\nu}A + P_B^{\nu}B) * e^{l} + (P_C^{\nu}C + P_D^{\nu}D) * e^{\prime l}$$

$$P((A,C) \to (B,D)) =< U^{\nu}U^{\nu *} * u + cc.|U_{\nu}U_{\nu}^{*} * u + cc. > /16$$

The h function will disappear after an integral. In the end the second term is

$$P_2((A,C) \to (B,D))$$

$$= k(\frac{(P_A + P_B)^{\nu}(P_C + P_D)_{\nu}}{(p_A - p_B)^{\mu}(p_A - p_B)_{\mu}})^2 \cdot \delta(p_A - p_B + p_C - p_D)$$

$$+k(\frac{(P_A + P_D)^{\nu}(P_C + P_B)_{\nu}}{(p_A - p_D)^{\mu}(p_A - p_D)_{\mu}})^2 \cdot \delta(p_A - p_D + p_C - p_B)$$

for orthogonal coupling. The sum of self-crosses is zero.

14. Grand Unification

The General Theory of Relativity is

$$R_{ij} - \frac{1}{2}Rg_{ij} = -kT_{ij} \tag{14.1}$$

by making the variation of *gross even static mass that's conservative* [2]

$$\delta < R/k - T >= 0, \quad k = k(x,t)$$

Then

$$R_{ij} = k(-T_{ij} + \frac{1}{2}Tg_{ij})$$

$$T_{ij} = -\frac{1}{\mu}(F^*_{i\nu}F_j^{\ \nu} - g_{ij}F^*_{\mu\nu}F^{\mu\nu}/4)$$

Varying unit s to S to set $k = 1$.

15. Algebra of Tensor

Tensor units ∂_t and dt are reciprocal linear transformations

$$\partial_{x(t)} = \partial_t \cdot \partial_x t, \quad dx(t) = dt \cdot \partial_t x$$

and logically

$$\partial = d, \quad \partial_t := \frac{1}{\partial t}$$

and traditionally it's written as below, inconsistently to the definitions herewith

$$\partial_t f := \partial f/\partial t$$

This equation is transferred to the definition in Euclidean space

$$\partial_{x^i} \cdot dx^j = 1$$

In Rieman space they are suitable to Lorentz transform,

$$\partial^*_j \cdot dx^i = 1$$

$$(t', ir') = (t, ir)\begin{bmatrix} \cos(i\rho) & -\sin(i\rho) \\ \sin(i\rho) & \cos(i\rho) \end{bmatrix}.$$

Space rotation causes no variance. Rieman measurement can be expressed in Euclidean space

$$dx^i = g^{ij}\partial^*_j$$

$$dx^i \cdot dx^j =: g^{ij}$$

It's noticed that g^{ij} itself is a differential of Euclidean measure. *There is an imaginary unit in the space coordinates.* Hence

$$p^j\partial^*_{x^j} \cdot P_i dx^i = p^i P_i$$

and

$$dx^i \cdot \partial_{x^i}$$

are co-variant (or invariant).

Harmonic wave phase and front are described by

$$F(x^i(s^0)), \quad \partial_{s^0} := \sum_i \partial_{x^i}, \quad (x^i) = (t, il)$$

$$\partial s^0 \frac{\partial F}{\partial s^0} = \partial x^i \frac{\partial F}{\partial x^i}$$

The co-variance of the vectors are checked, for the movement of the wave front

$$p^i = \partial x^i / \partial s^0 = \partial_{s^0} / \partial_{x^i}$$

and for the wave vector

$$P_i = \partial s^0 / \partial x^i$$

then

$$p = \partial_i \cdot \partial x^i / \partial s^0,$$
$$P = dx^i \cdot \partial s^0 / \partial x^i$$

One is co-variant, the other is contra-variant, in one dimension

$$P = p, \quad m ds^0 = dF$$

This result leads to the operators of momentum.

16. Conclusion

Fortunately, this model explained all the effects in the known world: strong, weak and electromagnetic effects, and even subclassify them further if not being to add new ones. In this model the only field is electromagnetic field, and this stands for the philosophical that the unified world is from an unique source, all that depend on the hypothesis: A-potential is itself a quantum process of charge.

My description of particles is compatible with QED elementarily, and only contributes to it with theory of consonance state in fact. In some way, the electron function is a good promotion for the experimental models of proton and electron that went up very early.

As a result, the static mass conserves, but the energy doesn't, for our world.

References

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