THEORY OF ELECTRON

WU SHENG-PING

Abstract. This article try to unified the three basic forces by Maxwell equations, the only experimental theory. Self-consistent Maxwell equation with the current from electromagnetic field is proposed. and is solved to four kinds of electrons and the structures of particles. The static properties and decay and scattering are reasoned, all meet experimental data. The momentum-energy tensor of the electromagnetic field coming to the equation of general relativity is discussed. In the end that the conformation elementarily between this theory and QED and weak theory is discussed compatible, except some bias in some analysis.

Contents

Date: Jan 14, 2013.
Key words and phrases. Maxwell equations, Decay, Antiparticle.

1. Unit Dimension of *sch*

A rebuilding of units and physical dimensions is needed. Time s is fundamental. The velocity of light is set to 1

$$Velocity : c = 1$$

Hence the dimension of length is

$$L : c(s)$$

The $\hbar$ is set to 1

$$Energy : \hbar(s^{-1})$$

In Maxwell equations the following is set

$$c\epsilon = 1, c\mu = 1$$

One can have

$$\epsilon : \frac{Q^2}{\varepsilon L};$$

$$\mu : \frac{\varepsilon L}{c^2 Q^2}$$

$$UnitiveElectricalCharge : \sigma = \sqrt{\hbar}$$

It's very strange that the charge is analyzed as space and mass. Charge Q is then defined as Q/σ here, without unit.

$$\sigma = 1.03 \times 10^{-17} C = 64e, e_{/\sigma} = e/\sigma = 1/64 = 1.56 \times 10^{-2}$$

$$H : Q/(LT) : \sqrt{\hbar}/c(s^{-2})$$

$$E : \varepsilon/(LQ) : \sqrt{\hbar}/c(s^{-2})$$

If $\hbar, c$ is taken as a number instead of unit, then all physical units is described as the powers of the second: s^n.

The unit of charge can be reset by *linear variation of charge-unit*

$$Q \to CQ, Q : \sigma/C$$

We will use it without detailed explanation.

2. Quantization

All discussion base on a explanation of quantization, or *real* probability explanation for quantum theory, which bases on a Transfer Probability Matrix (TPM)

$$P_i(x)M = P_f(x)$$

As a fact, that a particle appears in a point at rate 1 is independent with appearing at anther point at rate 1. There still another pairs of independent states

$$S_1 = e^{ipx}, S_2 = e^{ip'x}$$

because

$$< s_1, s_2 >_4 = \int dV s_1 s_2^* = N\delta(p - p')$$

$< s_1, s_2 >_4$ means make product integrated in time-space. Similarly the symbol

$$< s_1, s_2 >$$

is the product integrated in space and *always means its branch of zero frequency.* In fact in the TPM formulation, it's been accepted for granted that the Hermitian inner-product is the measure of the dependence of two states, and it is also implied by the formula

$$P_1 M P_2^*$$

Depending on this view point one can constructs a wave

$$e^{ipx}$$

and gifts it with the momentum explanation p, Then all quantum theory is set up.

3. Self-consistent Electrical-magnetic Fields

The Maxwell equations are

$$\frac{\partial H}{\partial t} + \nabla \times E = 0$$

$$\frac{\partial E}{\partial t} - \nabla \times H + \mathbf{j} = 0$$

Try equation for the free E-M field

$$A^{i,j}_{,j} - A^{j,i}_{,j} = \frac{1}{4}(-iA^*_\nu \cdot \partial^i A^\nu + iA^\nu \cdot \partial^i A^*_\nu) = J, Q_e = 1 \tag{3.1}$$

$$(A^i) := (-V, \mathbf{A}), (j^i) = (\rho, J)$$

$$\partial := (\partial_i) := (\partial_t, \partial_{x_1}, \partial_{x_2}, \partial_{x_3})$$

$$\partial' := (\partial^i) := (-\partial_t, \partial_{x_1}, \partial_{x_2}, \partial_{x_3})$$

The equation 3.1 have symmetries

$$CPT, cc.PT$$

If the gauge is

$$\partial_\mu A^\mu = 0$$

the continuous charge current meets

$$\partial_\mu \cdot j^\mu = 0$$

4. Stable Particle

All particles are elementarily E-M fields is presumed. It's trying to find stable solution of the Maxwell equations *in complex domain*. One can write down a function initially and correct it by re-substitution. Here is the initial state

$$V = V_i e^{ikt}, A_i = V$$

Substituting into equation 3.1

$$\partial_\mu \partial^\mu A^\nu = J_x, \partial_\mu \partial^\mu A^\nu_i - \partial^\nu \partial_\mu A^\mu_i = J_i$$

$$J_x = \frac{1}{2}(-iA^*_\nu \cdot \partial^i A^\nu - cc.)$$

$$J_i = -\partial^\nu \partial_\mu A^\mu_i = \partial^\nu \partial_t V$$

It has the properties

$$\partial \cdot J_i = 0$$

J_i causes the initial fields V, so that it is the real seed of recursive algorithm.

The static fields E_0, H_0

$$\nabla \cdot E_0 = (iA^*_{1\nu} \cdot \partial_t A^\nu_1 + cc.)/4 = \rho_0 \tag{4.1}$$

$$\nabla \times H_0 = -(iA^*_{1\nu} \cdot \nabla A^\nu_1 + cc.)/4 = J_0$$

In the first round of substitution

$$4J_1 = -i(A_{0\nu *} \cdot \partial' A_1^\nu) + i(\partial' A_{0\nu} \cdot A_1^{\nu^*}) + cc.$$

We calls the fields' correction with frequency nk the n-th order correction, calls the n-th re-substitution in same order the n-th rank correction.

The energy of field A is $\varepsilon = \int dV(E^2 + H^2)/2$

$$(A^i_{,j} - A^j_{,i})^*(A^i_{,j} - A^j_{,i})$$

$$= 2A^{i*}_{,j}A^i_{,j} - A^{i*}_{,j}A^j_{,i} - A^{j*}_{,i}A^i_{,j}$$

$$= 2A^{i*}_{,j}A^i_{,j} - (A^{i*}_{,j}A^j)_{,i} + A^{i*}_{,ji}A^j - (A^{j*}A^i_{,j})_{,i} + A^{j*}A^i_{,ij}$$

under integration

$$\int dV(A^i_{,j} - A^j_{,i})^*(A^i_{,j} - A^j_{,i}) = 4\varepsilon = 2 < A^i_{,j}|A^i_{,j} >$$

ε is energy of the field.

5. Radium Function

Firstly

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

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

$$0 = r^2\nabla^2 f + k^2 f = (r^2 f_r)_r + k^2 r^2 f + \frac{1}{\sin\theta}(\sin\theta f_\theta)_\theta + \frac{1}{\sin^2\theta}(f_\phi)_\phi$$

Its solution is

$$f = R\Theta\Phi = R_l Y_{lm}$$

$$\Theta = P_l^m(\cos\theta), \Phi = \cos(\alpha + m\phi)$$

$$R_l = N\eta_l(kr), \eta_l(r) = r^l \int_0^\infty \frac{(1-\lambda)^l}{(1+\lambda)^{l+2}} \cos(\lambda r) d\lambda$$

$$\int_0^\infty dr \cdot r^2 R^2 = 1$$

R is solved like

$$(r^2 R_r)_r = -k^2 r^2 R + l(l+1)R, l \geq 0$$

$$R \to rR'$$

$$(r^2 R')_{rr} = -k^2 r^2 R' + l(l+1)R'$$

$$R' \to r^{l-1}R'$$

$$rR'_{rr} + 2(l+1)R'_r + k^2 rR' = 0$$

$$r \to r/k$$

$$(s^2 F)' + 2(l+1)F + F' = 0, F = F(R')$$

$F()$ is the Fourier transform

$$R' = \int_0^\infty \frac{(1-\lambda)^l}{(1+\lambda)^{l+2}} \cos(\lambda r) d\lambda$$

The function R_1 has zero derivative at $r = 0$ and is zero as $r \to \infty$. R_1 is expanded to be odd function.

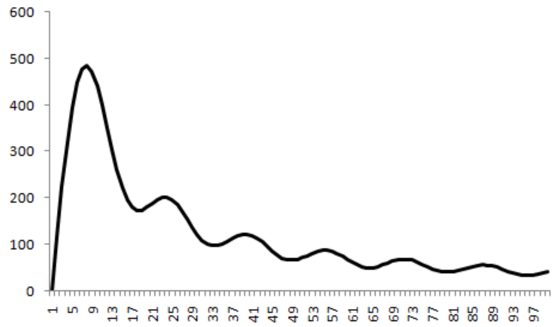

FIGURE 1. the shape of radium function R_1 by DFT

6. Solution

The derivatives of the function of electron has a strange breaking point in coordinate origin hence without normal convenience of Fourier transform. The following are some proximation of the first rank. The solution of $l = 1, m = 1, Q = e_{/\sigma}$ is calculated or tested for electron.

$$A_1 = NR_1(kr)Y_{1,1},$$

The curve of R_1 is like the one in the figure 1.

The magnetic dipole moment μ_z is calculated as the first rank of proximation

$$\mu_z =< A_\nu| - i\partial_\phi|A^\nu > /2$$
$$= 1/2, k_e = 1$$

The power of unit of charge is not equal, but it's valid for unit $Q = e$.

$$\frac{Q}{2k} = \mu_B$$

7. Electrons and Their Symmetries

Some states of electrical field A are defined as the core of the electron, it's the initial function $A_1 = V$ for the re-substitution to get the whole electron function.

$$e_r^+ : NR_1(kr)Y_{1,1}e^{-ikt},$$
$$e_r^- : NR_1(kr)Y_{1,1}e^{ikt}, (CPT)$$
$$e_l^+ = NR_{-z}(e_r^+) : R_1(kr)Y_{1,-1}e^{-ikt}$$
$$e_l^- = NR_{-z}(e_l^-) : R_1(kr)Y_{1,-1}e^{ikt}$$
$$R_{-z} : Rotation : z \to -z, x \to x, y \to -y$$

r, l is the direction of the magnetic dipole moment. We use these symbols e to express the complete potential field A or the abstract particle.

Energy of static E-field crossing is discussed. In the zero rank of correction ie. the static field is

$$(e(-i\partial')e + cc.)/4 = J_e, Q_e = 1$$

Because the equation of charge

$$4\rho_0 = (e(i\partial_t)e + cc.), Q_e = 1$$

is used to normalize electron function, The normalization of electron is

$$< e|e >= 2Q_e/(-k_e)$$

The static energy of electric field is

$$\varepsilon_e = -\int dVDV'\rho(\mathbf{r})\rho(\mathbf{r'})/|8\pi(\mathbf{r}-\mathbf{r'})|$$

Using spherical function expansion of $1/|(\mathbf{r}-\mathbf{r'})|$,

$$= -2\int_{r'<r} dVDV'\rho(\mathbf{r})\rho(\mathbf{r'})\sum_n (r'/r)^n P_n(\cos(\theta))/(8\pi)$$

Calculating the first term

$$\approx -\frac{\pi}{4}e_{/\sigma}\int dV\rho(\mathbf{r})/(8\pi r) = -\frac{1}{7.53\times 10^{-16}s}$$

Energy of the static M-field crossing

$$\varepsilon'_m = \varepsilon_e$$

It's easy to prove

$$4\varepsilon_m - 4\varepsilon_e = \int dV(A^*_\mu(\mathbf{r_1})\partial' A^\mu(\mathbf{r_1}) - cc.)^* \cdot (A^*_\mu(\mathbf{r_1}-\mathbf{r_2})\partial A^\mu(\mathbf{r_1}-\mathbf{r_2}) - cc.)/|\mathbf{r_1}-\mathbf{r_2}| = 0$$

Hence the gross energy is $2\varepsilon_e$. The value of crossing term generated by static fields between electrons are

$2\varepsilon_e$	e_r^+	e_r^-	e_l^+	e_l^-
e_r^+	$+$	0	0	$-$
e_r^-	0	$+$	$-$	0
e_l^+	0	$-$	$+$	0
e_l^-	$-$	0	0	$+$

Calculating the crossing part between e_r^+, e_r^-. In a electron e_r^+ has two parts of first rank correction

$$J_1 = -i(-V_0\cdot\partial' V + V_0\cdot\partial' V^*)/4 \to A_1$$

$$J'_1 = -i(-V^*\cdot\partial' V_0 + V\cdot\partial' V_0)/4 \to A'_1$$

Between e_r^+, e_r^- the crossing part is zero in this rank. They coupling with V

$$J_2 = -i((-V_1\cdot\partial' V + V_1\cdot\partial' V^* - V^*\cdot\partial' V_1 + V\cdot\partial' V_1))/4$$

Its electrical part is

$$= -(G(V_0\cdot V_t^*)\cdot V_t + G(V_0 V_t)\cdot V_t^*)/8$$

$G(J)$ is the potential caused by current J.

$$J'_2 = -i(-V'_1\cdot\partial' V + V'_1\cdot\partial' V^* - V^*\cdot\partial' V'_1 + V\cdot\partial' V'_1)/4 = 0$$

As the magnetic part interaction with static fields their crossing part is zero. J_2 interacts with static field (zero rank). By violent computation and sampling the radium function at 10 points with clear shape of it, the results of crossing between e_r^+, e_r^- approaches

$$2\varepsilon_x \approx -\frac{1}{1.6\times 10^{-8}s}$$

The value of this crossing term generated between electrons are

$$\begin{array}{ccccc} 2\varepsilon_x & e_r^+ & e_r^- & e_l^+ & e_l^- \\ e_r^+ & + & - & 0 & 0 \\ e_r^- & - & + & 0 & 0 \\ e_l^+ & 0 & 0 & + & - \\ e_l^- & 0 & 0 & - & + \end{array}$$

The crossing term between J_1 of e_r^+, e_l^- is

$$2\varepsilon_d = \varepsilon_e$$

The full crossing between e_r^+, e_l^- is

$$2\varepsilon_E = 3\varepsilon_e = -\frac{1}{3.2 \times 10^{-16} s}$$

8. Mechanic Feature

If the equation that connects space and E-M fields is written down for cosmos of electrons, it's the following:

$$R_{ij} - \frac{1}{2} R g_{ij} = 8\pi G T_{ij} \tag{8.1}$$

$$e^2_{/\sigma} T_{ij} = F_i^{k*} F_{kj} - g_{ij} F_{\mu\nu} F^{\mu\nu^*}/4$$

F is the electromagnetic tensor. This equation give mass because the space is decided by E-M fields instantly. the factor $e^2_{/\sigma}$ is to balances the physical unit.

Because fields F is additive, the group of electrons are express by:

$$\sum_i f_i * \nabla e_i, < f_i | f_i >= 1$$

The convolution is made only in space:

$$f * g = \int dV f(t, y - x) g(t, x)$$

It's called *propagation*. Each f_i is normalized to 1. We always use

$$\sum_i f_i * e_i, \sum_i f_i * \nabla e_i$$

to express its abstract construction and the field. The reason is that

$$f_i * (\partial e_i - (e_i \partial))$$

is the potential field F Its potential and strength fields is

$$A = \int dx \sum_i f_i * \nabla e_i, , \partial A - A\partial$$

When the mechanical physical is discussed, we presume the field A also describes mechanical wave, then the dense of matter (mass) deduced from harmonic wave of charge current is

$$(\sqrt{|Q_e|/2} A_\nu^* \cdot i\partial_t \sqrt{|Q_e|/2} A^\nu + cc.)/2$$

For electron the sum of the matter's dense in mass-center frame is

$$< \sqrt{|Q_e|/2} e | i\partial_t | \sqrt{|Q_e|/2} e >= 1$$

In general frame it's

$$< \sqrt{|Q_e|/2} e | i\partial_\tau | \sqrt{|Q_e|/2} e >= 1$$

The current of matter (or momentum) is calculated by mechanical wave:

$$p^\mu = -(\sqrt{|Q_e|/2}A^*_\nu \cdot \partial^\mu \partial_\tau \sqrt{|Q_e|/2}A^\nu + cc.)/2 \tag{8.2}$$

The field energy equal to the quantum energy

$$p^0 =< \partial A | \partial A > /2$$

By this equation we can get the natural frequency of the coupling electron system $e_x * \sum e_i$ and natural frequency of electron.

The spin of electron is calculated as

$$S_e = \int dV \frac{1}{4}(\sqrt{|Q_e|/2}A^*_\nu \cdot \partial_\phi \cdot \partial_t \sqrt{|Q_e|/2}A^\nu + \sqrt{|Q_e|/2}A^\nu \cdot \partial_\phi \cdot \partial_t \sqrt{|Q_e|/2}A^*_\nu)/2 = 1/2$$

9. Propagation and Movement

Define symbols

$$e_{xr} := N \cdot R_1(k_x r) Y(1,1) e^{ik_x t},$$

$$e_{xx} := (e_{xl} + e_{xr})/\sqrt{2}$$

The following are also (stable) classical propagations.

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

By mathematic

$$\varsigma_{k,l,m}(x) := R_l(kr) Y_{l,m}, \varsigma_k(x) := \varsigma_{k,1,\pm 1}(x)$$

meets the following results

Theorem 9.1. *C_A is a global area with its center in A and its diameter is r_A*

$$\lim_{r_o = r_y \to 0} \int_{I - \sum C_i} dV \varsigma_k(x) \varsigma^*_k(x-y) = 0, y \neq O$$

Proof. Use the limit

$$\lim_{k' \to k} \lim_{r_o = r_y \to 0} (\int_{I - \sum C_i} dV \varsigma_k(x) \varsigma^*_{k'}(x-y))$$

□

Theorem 9.2. *if $e^{i\mathbf{pr}}, \varsigma_k$ is normalized to 1,*

$$e^{i\mathbf{pr}} * \varsigma_k = \omega e^{i\mathbf{pr}}, |\omega| = 1$$

Proof. because

$$\int dV e^{i\mathbf{pr}} * \varsigma_k \cdot (e^{i\mathbf{pr}} * \varsigma_k)^*$$

$$= \int dV e^{i\mathbf{pr}} (e^{i\mathbf{pr}})^* \cdot \int dV \varsigma_k (\varsigma_k)^* = 1$$

□

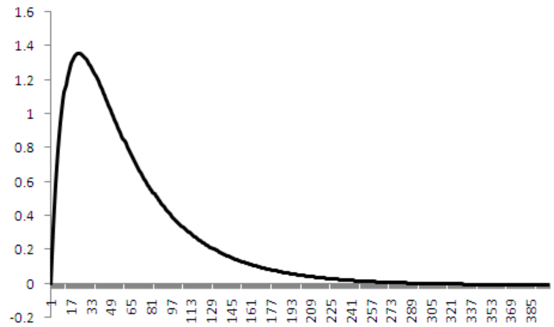

FIGURE 2. the shape of distribution of radioactive momenta of electron fields in one direction: $k/(1+k)^4 - 4k/(1+k)^5$, calculated through spherical Bessel functions

The figure 2 is the shape of distribution of momenta of electron function e_x.

The movement of the propagation is called *Movement*, ie. the third level wave, harmonic wave. For the coupling system x for example

$$e_x * ((e_r^+ + e_l^+ + e_r^-)$$

The harmonic movement in one frame is

$$\nabla A = \frac{1}{\sqrt{2}} e^{ik't+\mathbf{pr}} \frac{M}{1+\omega e^{-i2k_e t}} * e_x * \nabla(e_r^+ + e_l^+ + e_r^-)$$

$$+\frac{1}{\sqrt{2}} e^{ik't+\mathbf{p}''\mathbf{r}} \frac{M}{\omega' e^{i2k_e t}+1} * e_x * \nabla(e_r^+ + e_l^+ + e_r^-)$$

$$M^2 = < e_x * ((e_r^+ + e_l^+ + e_r^-) | e_x * ((e_r^+ + e_l^+ + e_r^-) > /k_e,$$

$$\mathbf{p}^2 = (k' + k_e)^2, \mathbf{p}''^2 = (k' - k_e)^2$$

ω is chosen to render the part of $e^{-ik_e t}$ zero. In general frame the lorentz transform impacts on *cap wave*: $e^{i\mathbf{pr}} e^{i(k'+k_e)t}$ and $e^{i\mathbf{pr}} e^{i(k'-k_e)t}$

$$\nabla A = \frac{1}{\sqrt{2}} e^{ik''t'+\mathbf{p}'\mathbf{r}'} \int dV e^{ik't+\mathbf{pr}} \frac{M}{1+\omega e^{-i2k_e t}} (e_x * \nabla(e_r^+ + e_l^+ + e_r^-))$$

$$+\frac{1}{\sqrt{2}} e^{ik'''t'+\mathbf{p}'''\mathbf{r}'} \int dV e^{ik't+\mathbf{p}''\mathbf{r}} \frac{M}{\omega' e^{i2k_e t}+1} (e_x * \nabla(e_r^+ + e_l^+ + e_r^-))$$

$$\partial_t A = \partial_t \int dx \cdot \nabla A$$

The field of this structure meets wave equation $\partial_\nu \partial^\nu A = 0$. The velocity of this particle x is to transform to the case by Lorentz's:

$$\mathbf{p}^2 = (k_x + k_e)^2, \mathbf{p}''^2 = (k_x - k_e)^2$$

Theorem 9.3.

$$\nabla(\varsigma_k * \varsigma_{k'}) = (\nabla \varsigma_k) * \varsigma_{k'} + \varsigma_k * \nabla(\varsigma_{k'})$$

Calculating

$$\int dV_x dV_y dV_{y'} \delta'(x) \varsigma_k(x-y) \varsigma_{k'}(y) \varsigma_k^*(y') \varsigma_{k'}^*(x-y')$$

and using the theorem 9.1

$$\int dV_x dV_y dV_{y'} \delta'(x) \varsigma_k(x-y) \varsigma_{k'}(x-y') \varsigma_k^*(x-y) \varsigma_{k'}^*(x-y')$$

Theorem 9.4.

- $(\nabla^2 - \partial_t^2) \int dx \cdot e_x * \nabla e_y(x) = 0$
- $(\nabla e_x) * e_y(x) = \dfrac{k_x}{k_y} e_x * \nabla e^y(x)$

To prove the first write the formula in

$$C_1 e_{xx} e^{yx} + C_2 e_{xx} e^{yy} + C_3 e_{xy} e^{yx} + C_4 e_{xy} e^{yy}$$

To prove the second calculating

$$e^{i\mathbf{pr}} * (\nabla e_x) * e_y(x), e^{i\mathbf{pr}} * e_x * \nabla e^y(x)$$

Definition 9.5.

$$< f_1(x_1) + f_2(x_2)) | O(x) | f_1(x_1) + f_2(x_2) >$$

$$= \lim_{V \to I} (\int_V dV_1 \int_V dV_2 \cdot (f_1(x_1) + f_2(x_2))^* (O(x_1) + O(x_2))(f_1(x_1) + f_2(x_2)))/V$$

The static MDM (magnetic dipole moment) for coupling system is

$$\mu =< \sum_i \int dx_i \cdot f * \nabla e_i(x) | -i\mathbf{r} \times \nabla | \sum_i \int dx_i \cdot f * \nabla e_i(x) > /4, Q_e = 1, f = e_x$$

$$=< \sum_i f * e_i(x) | -i\mathbf{r} \times | \sum_i f * \nabla e_i(x) > \frac{k_e}{4k_x}$$

$$\mu_z =< \sum_i f * e_i(x) | \sum_i f * (-i\partial_\phi e_i(x)) > \frac{k_e}{4k_x}$$

The MDM couples between electrons. Its spin (decoupled) is

$$S_z =< \sum_i \int dx \cdot f * \nabla e_i(x_i) | -\partial_\phi \partial_t | \sum_i \int dx \cdot f * \nabla e_i(x_i)) > /4, Q_e = 1, f = e_x$$

$$=< \sum_i f * e_i(x_i) | \sum_i f * (-i\partial_\phi e_i(x_i)) > k_e/4$$

Mechanical spin decouples between electrons.

Calculating the following for coupling system:

$$e_x * \nabla \sum_i e_i$$

we find $e_x * e$ meets the equation 3.1.

10. Antiparticle and Radiation

The radiation of photon is derive from this reaction

$$e^{ip_1x} * e_r^+ + e^{ip_2x} * e_l^- \to e^{ip_3x} * \gamma_r$$

The emission (of E-M fields), that's the reason to react forward but is not the all energy variation related, is

$$3\varepsilon_e = \frac{1}{3.2\times 10^{-16}s}$$

this energy marks the strength of electromagnet effect.

The wave of photon is

$$e^{i\mathbf{pr}+ikt} * (e_r^+ + e_l^-)$$

The equivalent reaction for E-M effect is like

$$e^{ip_1x} * e_r^+ \to e^{-ip_2x} * \overline{e_l^-} + e^{ip_3x} * \gamma_r$$

$\overline{e_l^-}$ is just the equivalent for the equilibrium after the particle e_l^- is shifted to the other side of the reaction. In fact the shift is a transform of conjugation

$$\overline{e_r^-} = (e_r^-)^*$$

The normal matter is called positive matter and this kind above is called antiparticle (this term is different from the one derived by CPT) conventionally.

Antimatter happens by reversing the world's line, with the same map of the event.

The radiation of neutrino depends the reaction

$$e_r^+ + e_r^- \to \nu_r$$

This reaction is with emission of an energy

$$2\varepsilon_x = \frac{1}{1.6\times 10^{-8}s}$$

this energy marks the strength of weak effect (of this kind). As a testifying one can have

$$3\varepsilon_e : 2\varepsilon_x = 0.65\times 10^8$$

This is the difference of the strength between electromagnetic effect and weak effect.

The antiparticle is the particles under the operation PT, comes from the inner-product probabilities. It meets

$$A^{i,j}_{,j} - A^{j,i}_{,j} = -\frac{1}{4}(-iA_\nu^* \cdot \partial^i A^\nu + iA^\nu \cdot \partial^i A_\nu^*), Q_e = 1 \tag{10.1}$$

With the current becomes negative. For example A is antimatter

$$A + P_1 \to P_2$$

The arrow "$\to$" is the time direction.

$$P_1 \to P_2 + A^*$$

This two formula have the same scene of events. If the movement of particles is drawn the anti-operator is to reverse the world line.

11. Conservation Law and Balance Formula

No matter in E-M fields level or in movement (the third) level, the conservation law is *conservation of momentum and conservation of angular momentum.* A *balance formula* for a reaction is the equivalent formula in positive matter, ie. after all anti-matter is shifted to the other side of the reaction formula. Balance formula is suitable for the analysis of the energy transition of E-M fields in the reaction. The *invariance of electron itself* in reaction is also a conservation law.

12. Muon

μ^+ is composed of

$$\mu_r^+ : e_{\mu x} * (e_r^+) + e_{\mu y} * \overline{\gamma_r})$$

μ is with mass $3k_e/e_{/\sigma} = 3 \times 64k_e$, spin 1/2, MDM $\mu_B k_e/k_\mu$.

The main channel of decay

$$\mu_r^+ \to \overline{e_l^-} + \overline{\nu_r} + \nu_r$$

$$e_{\mu x} * e_r^+ + e^{-ip_1 x} * e_l^- + e^{-ip_2 x} * \nu_r \to e_{\mu t}^* * \gamma_r + e^{-ip_3 x} * \nu_r$$

It balances approximately unless

$$e_{\mu x} * e_r^+ + e^{-ip_1 x} * e_l^- \to e_{\mu y}^* * \gamma_r$$

This interaction is between $E = J_1', J_1$ The energy gap is

$$-< \frac{1}{\sqrt{2}} e^{i\mathbf{pr}+ik_\mu t+ik_e t} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+ + \frac{1}{\sqrt{2}} e^{i\mathbf{p}''\mathbf{r}+ik_x t-ik_e t} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+$$

$$|\partial^2(\frac{1}{\sqrt{2}} e^{i\mathbf{p_1}\mathbf{r}+ik_\mu t+ik_e t} \int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_l^- + \frac{1}{\sqrt{2}} e^{i\mathbf{p}_1''\mathbf{r}+ik_\mu t-ik_e t} \int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_l^-) > /2$$

$$+ < (\frac{1}{\sqrt{2}} \overline{e^{i\mathbf{pr}+ik_\mu t+ik_e t}} \int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_r^+ + \frac{1}{\sqrt{2}} \overline{e^{i\mathbf{p}''\mathbf{r}+ik_\mu t-ik_e t}} \int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_r^+)$$

$$|\partial^2(\frac{1}{\sqrt{2}} \overline{e^{i\mathbf{pr}+ik_\mu t+ik_e t}} \int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_l^- + \frac{1}{\sqrt{2}} \overline{e^{i\mathbf{p}''\mathbf{r}+ik_\mu t-ik_e t}} \int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_l^-) > /2$$

$$\mathbf{p}^2 = (k_\mu + k_e)^2, \mathbf{p}''^2 = (k_\mu - k_e)^2$$

The attributes come from the derivatives w.r.t t. Summing up in spectrum of p'

$$= -\frac{4k_e \varepsilon_x}{k_\mu}$$

The emission of decay is

$$= \frac{1}{2.4 \times 10^{-6} s} \quad [2.1970 \times 10^{-6} s][1]$$

The data in square bracket is experimental data of the full width.

13. Pion Positive

Pion positive is

$$\pi_r^- : e_{\pi x} * \overline{e_r^+} + e_{\pi y} * \overline{\gamma_r}$$

It's with mass $3 \times 64 k_e$, spin 1/2 and MDM $\mu_B k_e / k_{\pi^+}$.

Decay Channels:

$$\pi^- \to \mu_r^- + \overline{\nu_r}$$

It's with balance formula

$$e^{-ip_1 x} * e_{\mu y} * \gamma_r + e^{-ip_3 x} * \nu_r \to e_{\pi x}^* * e_r^+ + e^{ip_1 x} * e_{\mu x} * e_r^- + e_{\pi y}^* * \gamma_r$$

The emission of energy is weak interaction

$$2\varepsilon_x = \frac{1}{1.6 \times 10^{-8} s} \quad [(2.603 \times 10^{-8} s)[1]$$

The referenced data is the full width.

14. Pion Neutral

Pion neutral is atom-like particle

$$\pi^0 : e_{\pi^0 x} + \nu_r + e_{\pi^0 y} * \nu_l$$

It has mass $4 \times 64 k_e$, zero spin and zero MDM. Its decay modes are

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

The loss of energy is from static field

$$12\varepsilon_e = \frac{1}{8 \times 10^{-17} s} \quad [8.4 \times 10^{-17} s][1]$$

Half of it is the gap of energy, half is the cross interaction. (see the section 18.)

15. tau

τ maybe that

$$\tau^+ : e_{\tau x} * (5 e_r^+ + 4\overline{e_r^+}) + e_{\tau y}(* e_l^- + \overline{e_l^-})$$

Its mass $43 \times 64 k_e$, spin 1/2, MDM $9\mu_B / k_\mu$. It has decay mode

$$\tau^+ \to \overline{\mu_l^-} + \nu_l + \overline{\nu_l}$$

$$e_{\tau x} * 5 e_r^+ + e_{\tau y} * e_l^- + e^{-ip_1 x} * e_{\mu x}^* * e_l^- + e^{-ip_2 x} * \nu_l \to e_{\tau x}^* * 4 e_r^+ + e_{\tau y}^* * e_l^- + e^{ip_1 x} * e_{\mu x}^* * \gamma_r + e^{ip_3 x} * \nu_l$$

The energy gap is from

$$4 e_{\tau x} * e_r^+ + e_{\tau x} * e_r^+ \to 4 e_{\tau x}^* * e_r^+ + e^{ip_1 x} * e_r^+$$

The gap of energy is from $E = A_i, J_1'$

$$-4 < \frac{1}{2} e^{i\mathbf{pr} + ik_{\tau x} t + ik_e t} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+ + \frac{1}{2} e^{i\mathbf{p}''\mathbf{r} + ik_{\tau x} t - ik_e t} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+$$

$$|\partial^2 \frac{1}{\sqrt{2}} e^{i\mathbf{pr} + ik_{\tau x} t + ik_e t} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+ + \frac{1}{\sqrt{2}} e^{i\mathbf{p}''\mathbf{r} + ik_{\tau x} t - ik_e t} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+ > /2$$

$$+4 < \frac{1}{\sqrt{2}} \overline{e^{i\mathbf{pr} + ik_{\tau x} t + ik_e t}} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+ + \frac{1}{\sqrt{2}} \overline{e^{i\mathbf{p}''\mathbf{r} + ik_{\tau x} t - ik_e t}} \int dV' e^{-i\mathbf{p}'\mathbf{r}'} * E_r^+$$

$$|\partial^2(\frac{1}{\sqrt{2}}e^{i\mathbf{p_1}\mathbf{r}+ik_e t}\int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_r^+ + \frac{1}{\sqrt{2}}e^{i\mathbf{p_1}\mathbf{r}-ik_e t}\int dV' e^{i\mathbf{p}'\mathbf{r}'} * E_r^+) > /2$$

$$\mathbf{p}^2 = (k_\tau + k_e)^2,$$

Summing up in spectrum of p'

$$= -\frac{4\varepsilon_e}{k_\tau/k_e}$$

$$= \frac{1}{4.4\times 10^{-13}s} \quad [2.9\times 10^{-13}s, BR.0.17][1]$$

From the shape of momentum distribution I can find many experimental data has a shift of initial velocity of mass center, I judge many resonance states is evaluated with larger mass than the real. With zero initial velocity of mass center the momentum distribution is like the figure 2, with the steep edge crosses grid origin directly.

16. Proton

Proton may be like

$$p^+ : e_{px} * (4\overline{e_l^-} + 3e_l^- + e_l^+ + \overline{e_l^+})$$

The mass is $27\times 64k_e$ that's very close to the real mass. The MDM is calculated as $3\mu_N$, spin is 1/2. The proton thus designed is eternal because even if decay to the finest small parts the emission is negative.

17. Magic Numbers

We define an unit: Mass-number Unite

$$m := m_e\sigma/e \approx 64k_e$$

And we presume the Mass-number (in fact relates theoretical electron number) in a particle for the four kinds of electrons are

$$e_r^+ : i, e_r^- : j, e_l^+ : k, e_l^- : l$$

The the designation of a particle is an equation

$$\begin{cases} i^2+j^2+k^2+l^2 = M_{/m} \\ i-j+k-l = Q \\ \pm i \pm j \pm k \pm l = 2S \end{cases}$$

According to Lagrange's four Square theorem, Any integer can be sum of some four square of integers. But after adding the constraints of charge number or spin number the conditions are not so simple as the Lagrange's theorem.

If consider more complicated design like

$$i'e_r^+, \bar{i}\overline{e_l^-}, i'+\bar{i} = i$$

The equations for mass, charge and spin are

$$\begin{cases} i^2+j^2+k^2+l^2 = M_{/m} \\ i-j+k-l = Q \\ i+j-k-l = 2S \end{cases}$$

18. Scattering and decay life

The reaction is like

$$\sum_i f_i * e_i \to \sum_i f_i' * e_i$$

e_i are positive matter all. Studying the interaction between electrons

$$\Delta_{t=0} I(, e_i,) = \Delta_{t=0} I(, J(e_i),)$$

$$e = \sum_p C_p e^{ipx}|_{t>0} + \sum_p C_p' e^{ipx}|_{t<0} = A^+ + A^-$$

A^+, A^- are the initial and the final fields.

$$\Delta_{t=0} I(, e_i,) = I(, e_i|_{t<0},) - I(, e_i|_{t>0},) - I(, J_x(e_i),)$$

$I(, J(e_i),)$ is the *cross interaction*. Because $A^* = A^{PT}$ its interacting current is

$$J_x(e) = (-iA_\nu^{-*} \partial' A^{\nu+} + iA^{\nu+} \partial' A_\nu^{-*})/2$$

$I(, e_i|_{t<0},) - I(, e_i|_{t>0},)$ is *gap of energy*, its interacting current is

$$J_i(e) = (-iA_\nu^{+*} \partial' A^{\nu+} + cc.)/2, J_f(e) = (-iA_\nu^{-*} \partial' A^{\nu-} + cc.)/2$$

For example the scattering

$$e^{ip_1 x} * e_r^+ + e^{ip_2 x} * e_r^- \to e^{ip_3 x} * e_r^+ + e^{ip_4 x} * e_r^-$$

$$I(, J_x(e_i),) = \frac{2\varepsilon_x (p_1' + p_3')^\nu (p_2' + p_4')^\nu}{4 \cdot (2\pi)^4 (p_1' - p_3')^2} \delta(p_1' + p_2' - p_3' - p_4')$$

p_i' is the cap momentum of the i-th electron. The interaction is between J_0, J_2. For electromagnetic interaction between e_r^+, e_l^-

$$I(, J_x(e_i),) = \frac{2\varepsilon_e (p_1' + p_3')^\nu (p_2' + p_4')^\nu}{4 \cdot (2\pi)^4 (p_1' - p_3')^2} \delta(p_1' + p_2' - p_3' - p_4')$$

The interaction is between A_0. Its property of covariance conforms to that of energy. For photon etc.of zero mass , the normalization of matter is operated through the gravitational mass of photon

$$e^{ipx} * \gamma, p_0 = 2m$$

It's taken as in static frame of mass-center.

The scattering cause by energy gap is discussed. For example

$$\pi^+ \to \mu_r^- + \overline{\nu_r}$$

It's with balance formula

$$e^{-ip_1 x} * e_{\mu y} * \gamma_r + e^{-ip_3 x} * \nu_r \to e_{\pi x}^* * e_r^+ + e^{ip_1 x} * e_{\mu x} * e_r^- + e_{\pi y}^* * \gamma_r$$

When $e_{\pi x}^* * e_r^+$ and $e^{ip_1 x} * e_{\mu x} * e_r^-$ couples the transfer of particles acts. Hence the gross wave of $e_{\mu x} * e_r^-$ is

$$e_{\pi x}^* * e_r^- : e_{\pi x}^* * A_2, e_{\pi x}^* * A_0$$

The branches of radiation are

$$< j_1(kr) Y_{1,\pm 1}(\theta, \phi) e^{ik' t} | e_{\pi x}^* >$$

j_1 is spherical Bessel function. Its distribution of momentum is like the figure 2. The momenta of the rest particles can be solved by conservation law. This is the data in static grid, the case for the moving grid can be obtained easily from this.

The scattering mixed with gap of energy and crossing interaction has the example of the reaction of decay of π^0

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

The crossing interaction between e_r^+, e_l^- and between e_r^-, e_l^+ acts because of their coupled values of cap waves.

The gross matter of the initial particles must be normalized to value 1. For example a coupling system C

$$< \sqrt{|Q_e|/2}C|i\partial_t|\sqrt{|Q_e|/2}C >= \frac{-k_C}{|k_C|}, C = e_{Cx} * \sum_i e_i$$

This formula means many symmetries.

The tension of effects is ε, the transferred matter is $\varepsilon\Delta t$ in time of Δt (refrence to the equation 8.2 and the chapter 8) as the initial gross matter is 1, so that the life of particles is reciprocal of field's energy loss ε.

19. η

Eta is in fact different particles that have mass number $10m$. Their decay or scattering modes are

- 2γ (mass $8m$)

$$(\nu_r + \nu_l) + (\nu_l + \overline{\nu_l}) \to \gamma_r + \gamma_l$$

- $3\pi^0$

$$(\overline{\gamma_r + \gamma_l} + e + \overline{e}) \to 2\overline{\pi^0} + \pi^0$$

- $\pi^+ + \pi^- + \pi^0$

$$(\overline{\gamma_r + \gamma_l} + e + \overline{e}) \to \pi^+ + \overline{\pi^+} + \overline{\pi^0}$$

- $\pi^+ + \pi^- + \gamma$ (mass $8m$)

$$(\overline{\gamma_r + \gamma_l}) + (\gamma_l + \overline{\gamma_r})$$

$$\to \pi_r^+ + \pi_l^- + \gamma_l$$

All have decay width at the range of times of ε_e. The decay channel of leptons with width of range ε_x is like

$$(2e + 2\overline{e} + \overline{e_r^+ + e_r^-}) \to \overline{e_r^+} + \overline{e_r^-}$$

Its mass is $14m$. This is a weak particle participating weak interaction. Another example is

$$(\overline{2\gamma_r + \nu_r}) \to \overline{\mu_r^+} + \overline{\mu_r^-}$$

Its mass $10m$.

20. Conclusion

The relative theory is applied to electromagnetic wave to give the looking mass of the fields which does expresses mass, for example the solved electron function in this article. In my view point the sum-up of the grains (as electrons) of electromagnetic field is a mechanic movement with diverse effect. Fortunately this model will explain all the effects in the known world: strong, weak and electromagnetic effects, and even subclassify them further if not add new ones. In this model the only field is electromagnetic field except space, this stands for the philosophical with the point of that unified world from unique source. All depend on a simple fact: the current of matter in a system is time-invariant zero in mass-center frame, and we can devise current of matter to analysis the E-M current. So that all effects is explained with diffusion process.

The inertial mass is deduced by mechanical operator $i\partial_t$. But the gravitational mass (by the equation of 8.1) of the naked electron is 64 time of the inertial and mechanical mass, the photon and neutrino has zero mechanical mass but their gravitational mass is not zero obviously. this is hard problem unsettled by this article. For atom the inertial mass less then gravitational mass by 1/50 approximately.

The energy of matter would happen in this process, the hot matter distilled to protons as got cold with their wave functions dependent each others. the harmony between bent space and electromagnetic fields explain them all.

Except electron function my description of particles in fact has the same form with Quantum Electromagnetic Mechanics, and they two should reach the same result except for precision. But my theory isn't compatible to the theory of quarks, the upper part of standard model, if not it is calculated in the style of Quantum Electromagnetic Mechanics. In fact, The electron function is a good promotion for the experimental model of proton that went up very early.

I found these presumptions on some days of 1994-1995 and soon I grossly testify this theory the year. At that time a few people studied in HUST China knew of it. But in the following teen years I nearly forgot of it except now and several years ago a round of submission of it.

References

[1] K. Nakamura et al. (Particle Data Group), JPG 37, 075021 (2010) (URL: http://pdg.lbl.gov)

E-mail address: hiyaho@126.com

Wuhan University, Wuhan, Hubei Province,The People's Republic of China. Postcode: 430074