Logic about forming hydrogen atom from Higgs Bosons

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New theories was introduced in this paper. With these theories, author deduced the forming process of electrons and protons in Higgs field[1], and analyzed many relations, finally got the theoretical values. By comparing, All experimental data [2] are precisely consistent with the theoretical value. It confirms that hydrogen atom is a coordinating whole with strict logic as this paper..

Usage: Quantum physics, field theories, string theory, particle physics.

keywords: Fine Structure constant, Higgs field, Higgs Boson, electron mass, proton mass, Energy Spiral.

Where do electrons and protons come from? There are Higgs fields and Higgs bosons[1] all over the universe, which was verified by experiments at 1912[3]. The relations between Hydrogen atoms and Higgs fields (Higgs bosons) will be the key to solve this problem.

I. PHYSICAL THEORIES

Everything is vibration in the nature. All are based on Mass energy equation and Plank's quantum formula.

$$E = mc^2 \qquad E = h\nu = hc/\lambda$$

The potential energy equation of Coulomb force and Universal Gravitatiion can be explained with two energies.

$$E_P = -\frac{GE_1E_2}{r} = -\frac{G}{r}\frac{hc}{\lambda_1}\frac{hc}{\lambda_2} = -\frac{G'}{\lambda_1\lambda_2 r} \tag{1}$$

A. Unified Energy Spiral

After some research, author found there are same spiral fields around every object. Assume a case as Fig.1:

Micro-particles "A" are at the surface of object "B". When "A" get some energy, they will run on the surface of "B". According to the principle of threshold value, when they get enough energy with $E_0 + E_{P0} = 0$, $E_{P0} = -GE_AE_B/r_0$, they will leave away one by one while moving around "B". With influence of object "B" or external, they usually leave away with the same position $(E_0, 0)$. Set any position of their path (E, θ). The particle "A" will cause resonant energy E/n at the direction of θ. The resonant energy $E/2$ is the largest, if it is absorbed, then there is no energy to form other resonance. To get the resonant energy, "A" always moves towards the first resonance point $(E/2, \theta + 2\pi)$ after one circle of motion, and moves without energy's loss. Finally, many micro-particles "A" are moving along this path which forms a spiral. The energy equation of the spiral with polar coordinate as Fig.1.

$$E = E_0/2^{\theta/2\pi} = E_0 2^{-\theta/2\pi} \tag{2}$$

$$\lambda = hc/E = (hc/E_0)2^{\theta/2\pi} = \lambda_0 2^{\theta/2\pi} \tag{3}$$

All of energy spirals are same in graph. Any energy wave λ can resonate the matter at the point λ of any energy spiral. The resonated matter can transfer the energy to next resonance point one by one along the line of polar radius, finally radiate to any point $2^n\lambda$ (n is an integer). call it Equivalence of 2^n Resonance.

$$\lambda \overset{energy}{\Longleftrightarrow} 2^n\lambda \qquad or \qquad \lambda \overset{energy}{\Longleftrightarrow} \lambda/2^n$$

Energy Spiral theory is an ancient theory. There are only simple records in Chinese history books [4][5].

B. Higgs Boson and Basic particles

There are Higgs field and Higgs bosons in every region of the universe[1]. Set the energy of Higgs boson E_h.

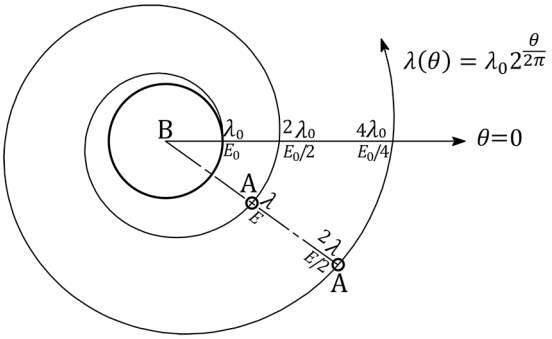

FIG. 1. Energy Spiral

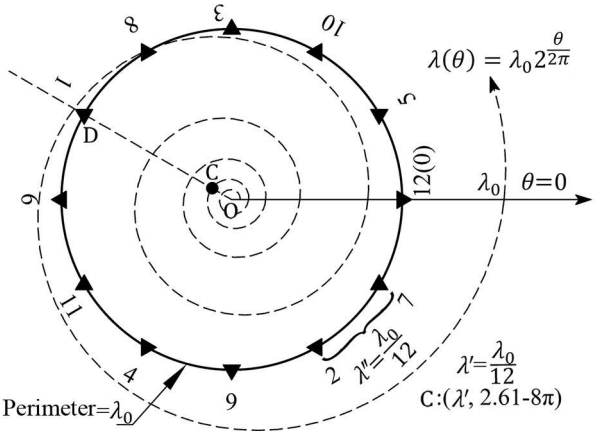

FIG. 2. Resonance diagram of $\lambda/12$

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$$E_h = hc/\lambda_h$$

Several Higgs bosons can gather into a group as a new particle with energy $E' = iE_h = hc/\lambda'$, $\lambda' = \lambda_h/i$. When the wave λ' affects on the original particles, there will happen a series of actions as Fig.2. Fig.2 is of $i = 12$.

In a group of the original particles (Higgs bosons), wave $\lambda_0 = \lambda_h$ cause a circle wave with the perimeter equal to λ_0. And a energy spiral exists with the same center of that circle, on the energy spiral, the position of λ_0 is determined by internal or external influences.

When wave $[\lambda' = \lambda_0/i]$ affects on these original particles, it will resonant the energy point "C", with equation (3), $\theta(C) = 2\pi \log_2(1/i)$. Point "C" will transfer the energy along the line "OC" by dual resonances, this line intersects with the circle wave λ_0, and causes a vibration peak "1" at the point "D" of intersection.

A new energy spiral forms with the peak "1" as the start point $(\lambda_0, 0)$, wave $[\lambda']$ affects the new energy spiral, then causes the second vibration peak "2". One peak by one peak, one loop by one loop, the deviation is eliminated, finally j resonant peaks divide the circle into j equal parts as Fig.2. The arc length of two adjacent peaks causes a new strong wave $\lambda'' = \lambda_0/j$. Table I is the result of above.

From Tables I, only when $i = 12$, $j = i$. This means: if wave $\lambda_0/12$ has formed, then it cannot be absorbed by original particles, the energy of new particles will not disappear and the new particles with energy wave $\lambda_0/12$ is stable. Based on this principle, the new particles gather into next particles one by one, the energy of which is $E_{hk} = hc/\lambda_{hk}$, k are nature numbers.

When k is up to 12, Because $\lambda_{h12} \Rightarrow 2^{43}\lambda_{h12} \lesssim \lambda_h$, the energy wave of λ_{h12} can be absorbed slowly by Higgs field λ_h through 43 times of dual resonances, and particles $h12$ will not gather into next one, therefore there are only 12 kinds of basic particles except Higgs boson.

$$E_{hk} = 12^k E_h = 12^k hc/\lambda_h \quad (k = 1, 2 \cdots 12.) \tag{4}$$

$$\lambda_{hk} = \lambda_h/12^k \quad (k = 1, 2 \cdots 12.) \tag{5}$$

II. FORMATION of ELECTRON and PROTON

When two above particles interact, the small one "e" moves around the large one "p", and is effected by the outside Higgs field.

§1. There is a energy spiral with the particle "e" as FIG.3. The outside Higgs wave λ_h will resonate the energy spiral and transfer the energy to the point "a" $\lambda_a = \lambda_h/2^n$, and make the direction of λ_a consistent with the revolution radius. Point "a" is the nearest point to particle "e". The wave λ_{e1} of the revolution energy E_{e1} have same direction with λ_a, they will be synchronous. The revolution energy is converted from energy of "e".

$$E_{e1} = m_e v^2 = hc/\lambda_{e1} \qquad \lambda_{e1} = \lambda_a = \lambda_h/2^n$$

§2. With the effect by wave λ_h, point "b" at the opposite place of point"a" becomes the point of energy release for particle "e". Point "a" is the end of the energy spiral, and point "b" is the start point, the length of energy spiral between them is the shortest. $\Delta\theta = \theta(a) - \theta(b) = \pi$. The energy spiral is related to the rotation of particle "e", the wave λ_{e2} of rotation energy E_{e2} is synchronous with λ_b. The rotation energy is also converted from the energy of "e".

$$E_{e2} = hc/\lambda_{e2} \qquad \lambda_{e2} = \lambda_b$$
$$\lambda_a = \lambda_b 2^{\Delta\theta/2\pi} = \lambda_b 2^{\pi/2\pi} = \sqrt{2}\lambda_b$$

§3. At point "b" of energy spiral, particle "e" releases the energy wave λ_b, which is pointing to center of the revolution and becomes the energy radius of Bohr orbit.

$$r_\lambda = \lambda_b$$

The total energy wave λ_e of particle "e" exist an energy circle with the diameter of $d_{\lambda e} = \lambda_e/\pi$, which moves along the energy circle with energy radius r_λ. The diameter $d_{\lambda e}$ expands by particle "e" losing some matter slowly, until $2^{n'}$ times of it meets the perimeter $2\pi r_\lambda$, it will not expand no longer, and particle "e" will not lose matter and becomes stable.

$$\lambda_e/\pi \times 2^{n'} = 2\pi r_\lambda$$

§4. There are two series of dual resonances in the whole, one is 2^n as §1, another is $2^{n'}$ as §3. To ensure coordination of the whole, they will be synchronized. Thus

$$n' = n$$

§5. Because particle "e" with energy E_e is changed from one of basic particles with energy E_{hk} after losing some energy, with equation (4), can get as follow.

$$E_e = m_e c^2 = hc/\lambda_e \lessapprox E_{hk} = 12^k hc/\lambda_h$$

§6. To meet the condition §1,2,3,4,5, with equ (3), get:

$$\begin{aligned} \lambda_e = 2\pi^2 r_\lambda/2^n = 2\pi^2\lambda_{e2}/2^n = \sqrt{2}\pi^2\lambda_{e1}/2^n \\ = \sqrt{2}\pi^2\lambda_h/2^{2n} \gtrapprox \lambda_h/12^k \end{aligned} \tag{6}$$

$$\theta(\sqrt{2}\pi^2/2^{2n}) \gtrapprox \theta(1/12^k) \tag{7}$$

$$\theta(\frac{\sqrt{2}\pi^2}{2^{2n}}) = 2\pi \log_2(\frac{\sqrt{2}\pi^2}{2^{2n}}) = 5.045 + (6 - 4n)\pi \tag{8}$$

$$\theta(1/12^k) = 2\pi \log_2(1/12^k) = 2k\pi \log_2(1/12) \tag{9}$$

TABLE I.

	θ	j		θ	j
λ_0	——	-	$\lambda_0/7$	$(0.385 - 6)\pi$	36
$\lambda_0/2$	——	-	$\lambda_0/8$	——	-
$\lambda_0/3$	$(0.830 - 4)\pi$	12	$\lambda_0/9$	$(1.660 - 8)\pi$	6
$\lambda_0/4$	——	-	$\lambda_0/10$	$(1.356 - 8)\pi$	28
$\lambda_0/5$	$(1.356 - 6)\pi$	28	$\lambda_0/11$	$(1.081 - 8)\pi$	24
$\lambda_0/6$	$(0.830 - 6)\pi$	12	$\lambda_0/12$	$(0.830 - 8)\pi$	12

TABLE II.

Equation(9) $\theta(1/12^k) = 2\pi \log_2(1/12^k)(k = 1,\ 2,\ 3 \cdots 12)$.

	θ		θ		θ
k=1	$2.61 - 8\pi$	k=5	$0.47 - 36\pi$	k=9	$4.62 - 66\pi$
k=2	$5.22 - 16\pi$	k=6	$3.08 - 44\pi$	k=10	$0.94 - 72\pi$
k=3	$1.54 - 22\pi$	k=7	$5.69 - 52\pi$	k=11	$3.55 - 80\pi$
k=4	$4.15 - 33\pi$	k=8	$2.01 - 58\pi$	k=12	$6.16 - 88\pi$

Compare $5.045+(6-4n)\pi$ to the θ of equation (9) in Tables II, find that: when $k=9$, $\theta=4.62-66\pi$ in TABLE II is the nearest to meet equation (7).Thus

$$5.045+(6-4n)\pi \gtrapprox 4.62-66\pi$$

$\because n$ is an integer $\therefore n=18$, then

$$\lambda_{e1}=\lambda_h/2^{18}\|\lambda_{e2}=\sqrt{2}\lambda_h/2^{17}\|\lambda_e=\sqrt{2}\pi^2\lambda_h/2^{36} \quad (10)$$

$$\alpha=v/c=\sqrt{E_{e1}/E_e}=\sqrt{\lambda_e/\lambda_{e1}}=\sqrt[4]{2}\pi/512 \quad (11)$$

$$a_0=(\lambda_{e1}/c)/(2\pi/v)=\alpha\lambda_{e1}/2\pi=\sqrt[4]{2}\lambda_h/2^{28} \quad (12)$$

§7. Of the basic particles, the particle of $k=9$ becomes an electron. Thus the particle "p" in the center must be the particle of $k=10$ or $k=11$ or $k=12$. Set $z=m_p/m_{eb}$. E_{p1} is the revolution energy. E_{p2} is the rotation energy. Synchronous as Fig.3:

$$z=\frac{a_0}{r_2}=\frac{m_p}{m_e}=\frac{E_p}{E_e}=\frac{E_{e1}}{E_{p1}}=\frac{\lambda_{p1}}{\lambda_{e1}}=\frac{E_{e2}}{E_{p2}}=\frac{\lambda_{p2}}{\lambda_{e2}} \quad (13)$$

As Fig.3, two waves $\lambda_b=\lambda_{e2}$ and $\lambda_b'=\lambda_{p2}$ interact within the distance (a_0+r_2). With equ (1,10,12,13), get:

$$E_P=-\frac{G}{\lambda_{e2}\lambda_{p2}(a_0+r_2)}=-\frac{G}{\lambda_h^3}\times\frac{2^{65}}{(z+1)\sqrt[4]{2}} \quad (14)$$

To fit the interaction energy of Higgs $E_P=-G/\lambda_h^3$ $\therefore$

$$2^{65}/[(z+1)\sqrt[4]{2}]\approx 2^n \Rightarrow 1/(z+1)\approx 2^{n-65}\sqrt[4]{2} \quad (15)$$

$$\theta[1/(z+1)]\approx 2\pi\log_2(2^{n-65}\sqrt[4]{2})=1.57+(n-65)2\pi \quad (16)$$

Check $1.57+(n-65)2\pi$ in Tables II, $\theta(1/12^3)=1.54-22\pi$ near it. $\because n$ is an integer $\therefore$

$$(n-65)=-22\pi/2\pi=-11$$

$$z\approx 2^{11}/\sqrt[4]{2}-1=1721.15$$

With equation (5,10), $m_{h12}/m_e=\lambda_e/\lambda_{h12}=1811.0\approx 1721.15$, so the particle of $k=12$ will become a proton.

Higgs field transfers energy to the electron, then the electron transfers energy to particle "p". Energy of "p" increases until it meets the controls from electron. m_p/m_e want to meet the strong relation of 12^3 as equation (4), the energy of proton can be understood as sum of energy 12^3 and $12^3/2^n$. $12^3/2^n$ is the dual resonace of 12^3. When $n=4$, $12^3+12^3/2^4=1836$ is the nearest number of 1811.0.

$$12^3 \lessapprox 1811.0 \longrightarrow 1836=z=m_p/m_e \quad (17)$$

§8. An electron is changed from a basic particle $h9$ which is combined by 12 of $h8$, so every energy of the electron remains 12 same parts of energy. When the electron causes a resonance wave, its energy just match to 1/12 of total energy E_e.

$$E_{e\to p}=hc/\lambda_{e\to p}=E_e/12=m_ec^2/12 \quad (18)$$

This wave causes a spherical shell (with radius R) of energy matter around the proton. More energy has more energy matter to form more sphere area of the shell.

$$4\pi R^2\propto E_{e\to p}$$

The electron effects the shell at point p_x of intersection with the line of electron-proton, then the energy matter at p_x effects proton. Interact energies as $E_{P(e-p)}\propto E_{P(x-p)}\propto 1/R$. With formula of Coulomb potential energy, $E_{P(e-p)}\propto {Q_e}^2$. Then

$$\begin{cases} {Q_e}^2\propto E_{P(e-p)}\propto 1/R \\ 4\pi R^2\propto E_{e\to p}=m_ec^2/12 \end{cases} \Longrightarrow {Q_e}^4\propto 1/m_e \quad (19)$$

III. DISCUSSION

§9. While electron is at Bohr orbit, set this electron as e_b and this proton as p_b. The rotation energy of electron can remain changeless by the inertia. From the hydrogen atomic spectroscopy, get Rydberg constant R_∞.

$hcR_\infty=m_{eb}v^2/2\Longrightarrow E_{e1}=hc/\lambda_{e1}=m_{eb}v^2=2hcR_\infty$

Check the following physics values in CODATA:2014[2]

Light speed in vacuum c: 299 792 458 m/s

Planck constant h: $6.626\ 070\ 040(81)\times10^{-34}$Js

$4.135\ 667\ 662(25)\times10^{-15}$eVs

Rydberg constant R_∞: $10\ 973\ 731.568\ 508(65)m^{-1}$

Avogadro constant NA: $6.022\ 140\ 857(74)\times10^{23}mol^{-1}$

§10. and with equation (10), Higgs Boson

$$\lambda_h=2^{18}\lambda_{e1}=2^{17}/R_\infty=1.194\ 415\ 9485\times10^{-2}m \quad (20)$$

$$E_h=hc/\lambda_h=hcR_\infty/2^{17}=1.038\times10^{-4}eV \quad (21)$$

§11. electron at Bohr orbit with equ (10,11,12,20,21)

$$\alpha=v/c=\sqrt[4]{2}\pi/512=7.296\ 883\ 4689\times10^{-3}=1/137.044\ 808\ 8227 \quad (22)$$

$$E_{e1}=m_{eb}v^2=hc/\lambda_{e1}=2hcR_\infty=2^{18}E_h \quad (23)$$

$$E_{e2}=\sqrt{2}E_{e1}=hc/\lambda_{e2}=2\sqrt{2}hcR_\infty=2^{18}\sqrt{2}E_h \quad (24)$$

$$E_{eb}=m_{eb}c^2=\frac{2hcR_\infty}{\alpha^2}=\frac{2^{19}hcR_\infty}{\sqrt{2}\pi^2}=\frac{2^{36}E_h}{\sqrt{2}\pi^2} \quad (25)$$

$$m_{eb}=2hR_\infty/\alpha^2c=9.1105548322\times10^{-31}kg \quad (26)$$

$$m_{e0}=\frac{2hR_\infty}{c}(\frac{1}{\alpha^2}-1-\sqrt{2})=\frac{2hR_\infty}{c}\times(\frac{2^{18}}{\sqrt{2}\pi^2}-1-\sqrt{2})=9.109\ 383\ 7285\times10^{-31}kg \quad (27)$$

$$a_0=\alpha\lambda_{e1}/2\pi=\sqrt[4]{2}\lambda_h/2^{28}=\sqrt[4]{2}/2^{11}R_\infty \quad (28)$$

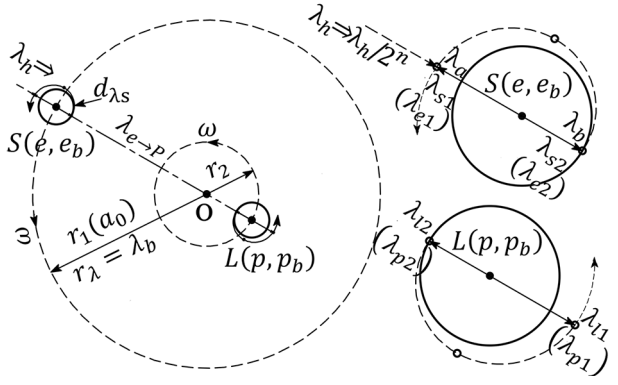

FIG. 3. Energy model of hydrogen atom

§12. proton [of Bohr orbit] with equ (13,17,23,24,25,18)

$$E_{pb} = E_{p0} + E_{p1} + E_{p2} + E_{eb\to p} = 1836E_{eb}$$
$$m_{p0} = \frac{2hR_\infty}{c}\left(\frac{1836 - 1/12}{\alpha^2} - \frac{1+\sqrt{2}}{1836}\right) \quad (29)$$
$$= 1.672\ 621\ 9458 \times 10^{-27} kg$$
$$m_{p0}/m_{e0} = 1836.152\ 692\ 29995 \quad (30)$$

§13. mass of hydrogen atom with equation (17,18)

$$m_{1H} = (1837 - 1/12)m_{eb} = 1.673\ 533\ 001\ 37789 \times 10^{-27} kg = 1.007\ 825\ 146\ 31357\ amu \quad (31)$$

§14. Charge of electron

$k = 1/4\pi\epsilon_0 = \mu_0 c^2/4\pi = c^2 \times 10^{-7} Nm^2/C^2$[2]

Charge of electron at Bohr orbit with equ (23,28,22):

$$m_{eb}v^2 = k{Q_{eb}}^2/a_0 = c^2 \times 10^{-7}{Q_{eb}}^2/a_0$$
$$Q_{eb} = \sqrt{m_{eb}v^2 a_0/c^2 \times 10^7} = \sqrt{10^7 \sqrt[4]{2}h/2^{10}c}$$
$$= \sqrt{10^7 h\alpha/2\pi c} = 1.602\ 125\ 12344 \times 10^{-19} C \quad (32)$$

Charge of rest electron with equation (19,26,27)

$$Q_{e0} = Q_{eb}\sqrt[4]{m_{eb}/m_{e0}} = 1.602\ 176\ 6133 \times 10^{-19} C \quad (33)$$

§15. Amend experience data of Fine Structure constant. At present, there are two methods to measure Fine Structure constant. a. Precision atomic recoil measurements of Rb or Cs[6][7], based on equation (34). b. Precision measurement of the electron magnetic moment anomaly combined with QED theory[8], based on equation (35).

$$\alpha^2 = \frac{2R_\infty}{c}\frac{m_A t}{m_e}\frac{h}{m_A t} \Longrightarrow \alpha^2 = \frac{2hR_\infty}{m_e c} \propto \frac{1}{m_e} \quad (34)$$
$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c} \propto e^2 \quad (35)$$

Fine Structure constant is related to the velocity of electron at Bohr orbit. To these parameters in equation (36, 37), only m_e and e belong to electron, which must be the values of the electron at Bohr orbit to calculate Fine Structure constant. With equation (34, 35), can get $\alpha^2 \propto e^4 \propto 1/m_e$, which is same with equation (19). The correlation of m_e and e tells us these two methods will cause coincident error when using the rest mass or the rest charge instead of the values of electron at Bohr orbit. With equation(34, 26, 27), the experience data of Fine Structure constant should be amended as follow. ($\alpha = 7.297\ 352\ 5664(17) \times 10^{-3}$ [2] in CODATA:2014).

$$\alpha' = \alpha(codata)\sqrt{\frac{m_{e0}}{m_{eb}}} = 7.296\ 883\ 53729 \times 10^{-3} \quad (36)$$

For hydrogen atom, there are six measurable data except R_∞. Comparing their theoretical values with the experimental data as Tables III, the relative difference of them are small to the grade of 10^{-8}, which is almost the current limit of experiment.

IV. CONCLUSION

All experimental data are precisely consistent with the theoretical value. It confirms that hydrogen atom is a coordinating whole with strict logic as this paper.

TABLE III.
Compare the experimental data to Experimental Data.

	Experimental Data	Logic/experence
m_{e0}	$9.109\ 383\ 56(11)\times10^{-31}$kg[2]	$1+1.85\times10^{-8}$
m_{p0}	$1.672\ 621\ 898(21)\times10^{-27}$kg[2]	$1+2.86\times10^{-8}$
m_{p0}/m_{e0}	1836.152 673 89(17)[2]	$1+1.00\times10^{-8}$
m_{1H}	1.007 825 064 98488 amu[9]	$1+8.07\times10^{-8}$
Q_{e0}	$1.602\ 176\ 6208(98)\times10^{-19}$C[2]	$1-4.67\times10^{-9}$
α	$7.296\ 883\ 53729\times10^{-3}$ [a]	$1-9.37\times10^{-9}$

[a] Amended with equation (36)

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