Title: Phoson's theory (A new theory of quantization, electrons' generation by waves, Electrons' structure, relativistic mass and conflict with De Broglie's theory)

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Abstract

By an alternative interpretation of Compton effect experiment, I concluded that waves can generate electrons and that waves are quantized into units of mass (which I called phosons).
A phoson is a fundamental unit of energy carrying mass and the origin of quantization while Photons are a misconception in interpreting the photoelectric experiment.

I concluded a model to describe the particles' behavior of phosons based on describing its propagation as a continuous interchange of two type of energies (spinning and translational) and a mass variation proportional to the translational kinetic energy.

Also, I concluded a model that explains how electrons are comprised of phosons besides the role of these phosons in giving the electron its mass, energy and shape.

Since my theories state that phosons do have mass and the nature of the concluded electron's structure contradicts with the definition of relativistic mass according to the theory of relativity and with De Broglie's theory in describing the wave behavior of the electron, I discussed both theories showing how both failed to describe the electron's properties and behavior.

The electron- wave interrelation explains how the properties of each is originated by the other, accordingly the calculation of some of the electron's properties like its intrinsic angular velocity from wave parameters and the unquantized intrinsic angular momentum and magnetic moment became much clearer.

Calculating the angular velocity from both wave's parameters and from electron's parameters, proves the assumption that the spinning kinetic energy of the electron is half its rest energy and relating Compton frequency to all the electron's parameters proves my theories about the phoson's behavior, electron's structure and consequently my definition of relativistic mass.

Keywords

Compton Scattering effect, relativistic mass, De Broglie theory, electron structure, wave matter interaction.

PACS

Quantum mechanics 03.65.-w.

1 Definition of phosons

1.1 Phosons and Compton experiment

This section is to show that waves consist of discrete identical mass particles which do not change its energy or mass with frequency or any other wave's parameter

For identification and simplicity, I will call these particles phosons and define it as fundamental units of energy carrying mass particles where each carry a packet of energy equals to planks constant value h (J.s).

This discussion assumes that any beam of light consists of rays of streams of phosons.

Compton's famous equation for the change in wave length $\Delta\lambda = \frac{h}{m.c}\,(1 - cos\theta)$ was the major conclusion of his experiment (where *m* is the electron's mass).

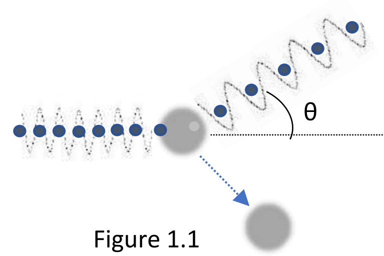


Figure 1.1

This experiment was explained as a collision and scattering physical event using the principle of energy and momentum conservation to prove that light consists of particles which can scatter waves and eject electrons.

The part ($\Delta \lambda = \frac{h}{m.c}$) consists of constants and represents a full value of $\Delta\lambda$ when ignoring the fraction caused by the other part of the equation.

If each phoson occupies one wave length, then the frequency of the wave corresponds to the number of phosons in one second of the wave's ray (figure 1.1). Accordingly, the absence of phosons represents an increase in wave length and a decrease in frequency proportional to the number of missing phosons.

The results of Compton experiment gave two peaks of scattered waves, one for the part of the wave which is scattered without being involved in the interaction and the other is for the part of the wave after losing some of its phosons in the interaction at specific scattering angles.

The second peak at 90° and 180° scattering angles corresponds to a full Compton wave length and consequently a full interaction.

The interactions in this experiment are one of three types, the first is scattering without wave length alteration where phosons are not involved in the interaction, the second is with increased wave length which is a fraction of λ_c where the wave loses part of its phosons in a partial interaction and the third is at scattering angles 90° and 180° which represents a full interaction where the wave length increment equals to λ_c or $2\lambda_c$.

The latter case can have other interpretations than what Compton gave. The first is the possibility to have a newly generated electron by the wave's phosons and the second is when both the wave and the electron are composed of the same identical particles, the wave's phosons replace the electron's phosons while the original electron's phosons being ejected as an electron which can give the number of phosons in the electron and consequently the number of phosons involved from the wave.

Compton frequency *fc* ban be defined as the number of missing phosons in the scattered wave when the increment in wave length is equal to λ_c or $2\lambda_c$ which contributed in generating a new electron or involved in a full interaction (electron replacement and ejection).

The number of phosons in the ejected electron and the number of phosons lost by the wave are the same where we can conclude that the mass of the electron equals to summation of the masses of the wave's phosons involved.

The number of phosons involved equals to the decrease in frequency of the scattered wave

$$f_c = c / \lambda_c$$
$$f_c = (m_e.c^2) / h$$
$$f_c = 1.235589965 \times 10^{20} \text{ Hz}$$

Compton frequency corresponds to number of phosons involved in the interaction and consequently the mass of the phoson is the resultant of dividing the electron mass by this number.

$$m_{phs} = m_e / f_c \quad 1.1$$

$$m_{phs} = 7.372497201 \times 10^{-51} \text{ Kg. s} \quad 1.2$$

where m_{phs} is the phoson's mass and

$$\lambda_c = h / (m_e.c) = (m_{phs.}\ c^2)/(me.c) = c / f_c$$

Using the famous equation ($E = m.c^2$) we can also find the energy and mass of the phoson in an equivalent way where

$$E = h = m_{phs}.c^2 \quad 1.3$$

$$m_{phs} = h/c^2 \quad 1.4$$

Therefore, we can say that the electron is composed (and can be generated) by f_c number of phosons and if this electron is emitted fully as a wave (not ejected as an electron) will produce a wave of f_c frequency and $\lambda_{c.}$ Wave length.

Considering that an electron is composed of f_c phosons (Compton frequency) is applicable to ejected electrons (free electrons), to electrons in a one electron atom or to generated electrons in a ready to leave the atom state i.e. unquantized mass.

Consequently, this implies that waves are quantized into discrete identical phosons.

1.2 Planks Constant unit and frequency

Frequency is defined as the number of regularly occurring events in one second.

In Planks equation $E = nhf$, n is a positive multiplication factor (integer) and f is the number of repetitions i.e. h is multiplied by two factors to get the energy E and the unit chosen to this constant h is (J.s) which is equal to (kg.m²/s) is the unit of angular momentum.

So, we should understand this equation as the repetitions of a certain angular momentum value multiplied by an integer will give energy, which is not accurate.

If the repetitions of an event produce a new event, then the type and unit of the resulted event should match the type and unit of the repeated one.

This unit was chosen to avoid the time involvement, otherwise we will end up with a unit of power rather than energy.

That's why h is a packet of energy in Joules but with ignoring the time involvement (J. s) was chosen.

We can think of waves as follows:

1- In case of a continuously flowing wave, the energy in one second of the wave flow which is the power is $P = h.\ f$ *(Joule.sec/sec)*
   The energy for the wave flow of a specific time t is $E = h.f.t$ *(Joule.sec)*
   It is obvious that to get proper units i.e. (Joule) for energy and (Joule/sec) for power, h should be measured in (Joules) and we can say:

"The energy of one photon in the wave equals to the power of the wave and both equal to *hf*".

2- In case of a pulse wave for a duration of one second, power and energy are equal, and the time parameter can be ignored.
3- In case of a pulse wave for a period less than one second, power has no significance and time can be ignored.

The black body radiation belongs to the first case with n (in the equation $E = nhf$) is a positive integer tanking values (1,2, 3….) representing wave amplification in forming the standing waves. The photoelectric experiment belongs to the first case also but with n = 1, that's why waves seemed to be quantized into photons of energy ($E = hf$) while, it's our measurement units which are quantized to values/s not the wave.
When the source of the experiment input energy is a contiouasly flowing wave of particles, it is measured in its energy per second of one ray of the wave i.e. its power which was considered as a particle called photon in a misconception in interpreting the experiment.
Accordingly, saying that waves are quantized into photons of energy $E = hf$ is just like saying that nature follows our manmade measurement units).

When we think of the mass of the electron as composed of *f* number of phosons and can be emitted as a wave with frequency equals to *f* then we should pay attention to that *f* in the first case is just a unitless number and in the second case is a frequency with unit (1/s).

Therefore, when using $mc^2 = hf$, f is a unitless figure representing the number of phosons composing the electron mass with h in joules.
However, I will maintain the unit (J.s) because all the history of quantum mechanics was based on this unit, but we should note the following:

$$E\ (J) = E_{phs}\ (J.s).\ f = hf \quad \text{Where } E_{phs}\ (J.s) = h\ (J.s) \qquad 1.5$$

2. Phoson model

2.1 Introduction

The following points are fundamental to this model:

- At the speed of light, the source of mass increase is not the energy involved, mass and energy are conserved individually.
- Phosons as fundamental units of mass work as energy carriers.
- Each Phoson carries h (J.s) energy and have mass m_{phs} (Kg. s) where both are constants and do not vary in normal conditions with frequency or other wave's parameters.

Figure 2.1 shows a sketch of the proposed behavior of phosons while travelling in a wave. It has two peak states, state 1 with mass m_o and state 2 with mass m.

2.2 Phoson's model

Figure 2.1 shows that the phoson is a ring of varying mass where usually each wave length is occupied by one phoson but here different stages of one phoson is shown in one wave length travel for clarity.

The phoson goes from state 1 to state 2 in half wave length and back to state 1 in the other half.

In half wave length, the phoson's translational kinetic energy *K* increases to maximum and its spinning kinetic energy *S* reduces to zero maintaining a total kinetic energy equal to h (J.s) where its mass follows its translational kinetic energy and in the other half the process is reversed.

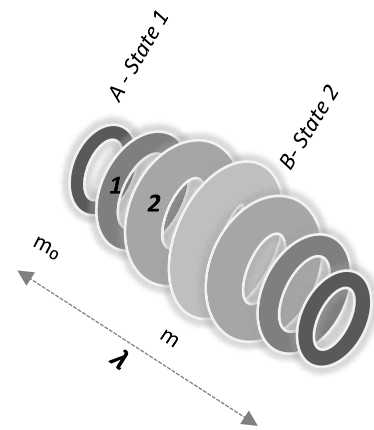


Figure 2.1

<u>state 1:</u> The phoson has minimum mass m_o, minimum translational kinetic energy h/2 and maximum spinning kinetic energy h/2.

The ring shape comes from the high spinning with a moment of inertia **I** = m. r² and mass m_o = 7.372497201x10^{-51} Kg. s

The phoson keeps a total energy h as

$$E_T = h = K + S \qquad 2.1$$

Where $\partial K/\partial t = - \partial S/\partial t$

$$K\ (J.s) = ½\ m_o\ .c^2 \qquad 2.2$$

$$S\ (J.s) = ½\ I.\ \omega^2 = ½\ m_o.\ r^2.\ \omega^2 \qquad 2.3$$

At this state, the two energies are equal because (r.ω = c) which occurs at (0, 2π,4π,6π … in figure 2.2)

$$E_T = h = K + S = ½\ m_o c^2 + ½\ m_o c^2$$

$$E_T = h = m_o\ .c^2 \qquad 2.4$$

<u>In state 2:</u> The phoson has maximum mass m, maximum translational kinetic energy h and zero spinning kinetic energy.

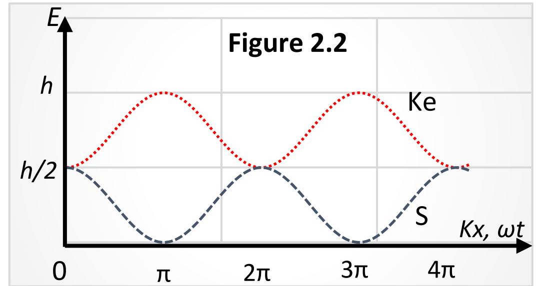
The increase in translational kinetic energy is supplied by the spinning kinetic energy until it is consumed fully where the total energy becomes translational which is an unstable state of the phoson, so it starts to decrease its translational kinetic energy again and reduce its mass to suit this decrease with restoring its spinning energy back in the other half wave length.

$$E_T = K = h = ½\ m.\ c^2$$

$$E_T = ½\ (2m_o).c^2 (m=2.m_o \text{ - see section 4})$$

$$E_T = h = m_o .\ c^{\ 2} \qquad 2.5$$

These points can be seen in figure 2.2 at (π,3π,5π ...)



During motion, the phoson maintains a constant translational kinetic energy equal to (h/2) beside the other (h/2) exchanged with the spinning energy.

In general, the motion of the phoson can be described by

$$\frac{1}{2} m\,.c^2 + \frac{1}{2}\ I.\omega^2 = h \qquad 2.6$$

$$h = \frac{1}{2} m.c^2 (\ 1 + \frac{r^2\omega^2}{c^2}) \qquad 2.7$$

$$\frac{h}{c^2} = \frac{1}{2}.m\ (\ 1 + \frac{r^2\omega^2}{c^2}) \qquad 2.8$$

Knowing that $\frac{h}{c^2}$ = m_o and m in the above equations is the relativistic mass

$$A_m = \frac{m}{m^0} = \frac{2}{1+\frac{r^2\omega^2}{c^2}} \qquad 2.9$$

$$E = A_{m.}\ m_o.c^2 = (\frac{2}{1+\frac{r^2\omega^2}{c^2}}).m_oc^2 \qquad 2.10$$

In trigonometric form, we can express both energies as

$$K = h/4\ \{\cos\ (kx\text{-}\omega t)\text{-}\pi) + 3\} = h/4\{3\text{-}\cos(kx\text{-}\omega t)\} \qquad 2.11$$

$$S = h/4\{\cos(kx\text{-}\omega t) + 1\} \qquad 2.12$$

For waves where $m = m_{phs}$

$$f.\lambda = c = (m.c^2)\ /\ (m.c) = h\ /\ p$$

$$\lambda = h\ /pf = c\ /f \qquad 2.13$$

$$k = 2\pi\ /\ \lambda$$

$$k = \omega.\frac{p}{h} = f.\frac{p}{\hbar} \qquad 2.14$$

where the wave number is the reciprocal of the wave length.

2.3 *Energy and momentum*.

Between any two points like 1 and 2 in figure 2.1, the energy is

$$½\ m.c^2 + ½\ I_1.\omega_1 = ½\ (m + \Delta\ m).c^2 + ½\ I_2.\ \omega_2$$

$$½.\ (\Delta m.\ c^2) = ½\ I_1.\omega_1 - ½\ I_2.\ \omega_2$$

$$\Delta k = ½\, \Delta m.\, c^2 = \Delta S \qquad 2.15$$

If the total change in mass $\Delta m = m_o$ in half wave length, then

$$\Delta K = \Delta S = ½\, m_o\, .c^2 \qquad 2.16$$

Since the change in spinning and translational momentum is generated by the change in mass then similarly we can find that the change in translational momentum P is

$$\Delta P = m_o.\, c \qquad 2.17$$

2.4 *Force*

With the phoson's mass increment to double in one half wave length (figure 2.3), it generates a force which causes the translational momentum to increase in the same rate.

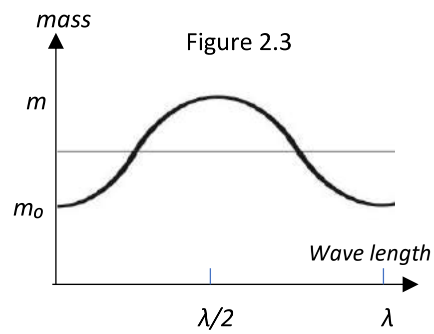


Figure 2.3

Usually external forces make a change in velocity and consequently a change in momentum with constant mass.

In the phoson's case, the variable is the mass with constant speed, this mass variation produces a change in momentum which generates force.

The force produced by one phoson in half wave length is derived as

$$F = c.\partial m/\partial t$$

$$F = c\,(m - m_o)/t$$

$$M = (m - m_o)/t \qquad \text{where } M \text{ is in } (Kg.\ s)/s \qquad 2.18$$

$$M = 2m_o f \qquad \text{where } t = T/2 \text{ and } \Delta m = m_o \qquad 2.19$$

$$F = M.c \qquad 2.20$$

$$F = 2m_o cf$$

$$F = 2P_o.\, f \qquad \text{where } m_o.c = P_o$$

$$F = P.f \qquad \text{where } P = 2P_o \qquad 2.21$$

To find the energy

$$E = F.\lambda/2$$

$$E = P.f.\, \lambda/2$$

$$E = m.c.f.\lambda\, /2$$

$$E = ½\, mc^2$$

$$E = m_o c^2 \qquad (\text{where } m = 2m_o)$$

3. Electron's structure

This section is to show how electrons are composed of phosons and how its motion is a composition of two components, one is rotating around the nucleus with a speed equals to αc and the other is spinning in a perpendicular direction which causes the electron to roll in a perpendicular direction (figure 3.3).

The rotational motion of phosons around the electron's axis generates the circular shape of the electron and when accompanied with the perpendicular rotational motion of the electron caused by the nucleus force produces the helical shape of the electron.

Electrons are comprised of phosons which moves in a helical route where each phoson keeps travelling at the speed of light besides maintaining its intrinsic spinning motion (figure 3.1)

Each phoson has a translational kinetic energy equals to h/2 and a spinning kinetic energy of the same value.

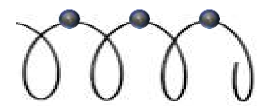


Figure 3.1

To explain, I will start with showing how waves generate electrons.

When a ray of phosons is bent over to form a circular orbit with circumference equals to one wave length λ_c and radius λc/2π where each orbit is occupied by one phoson (figure 3.2.a), the radius and angular velocity are given as

$$t = \lambda_c/c$$
$$f = c / \lambda_c$$
$$\omega_c = 2\pi c / \lambda_c$$
$$\omega_c = 2\pi f_c = 7.763441x10^{20}\ rad/s$$
$$c = r_c\ \omega_c$$
$$r_c = 3.8616\ x\ ^{-13}\ m$$

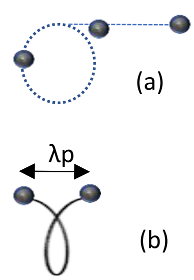


Figure 3.2

If in the same time the phoson starts moving under the influence of the nucleus force with a velocity equals to αc perpendicular to the direction of rotation, it forms a helical orbit (figure 3.2.b) such that the circumference of the orbit is reduced by α and the angular velocity is accelerated by the same factor (α^{-1} = 137.03587 is the fine structure constant reciprocal).

$$2\pi r_e = \lambda c.\ \alpha = 1.770538\ x\ 10^{-14}\ m$$

$$r_e = r_c / \alpha^{-1} = 2.8179\ x\ ^{-15}\ \mathrm{m}$$

$$\omega = \alpha^{-1}.\ \omega_c = 1.06389\ x\ 10^{23}\ rad/s \qquad 3.1$$

This angular velocity of one phoson in a loop of the helical orbit with a certain pitch λ_p is itself the spinning angular velocity of the electron.

This angular velocity of the electron (equation 3.1) is calculated purely from wave parameters, but to confirm this value and the full assumption that electrons are comprised of phosons, I will calculate it using only familiar electron's parameters using the definition of electric force and potential energy.

The electric potential energy U at the electron surface at a distance r from the center of the electron where r is the electron's radius is

$$F = \frac{1}{4\pi\epsilon^0} \cdot \frac{q^2}{r^2}$$

$$U = F.\ r = = \frac{1}{4\pi\epsilon^0} \cdot \frac{q^2}{r}$$

$U = m.a.r$ *where a is the centrifugal acceleration*

$a = c^2/r$ *for the phoson's rotation we get*

$$U = m.c^2$$

$$m.c^2 = \frac{1}{4\pi\epsilon^0} \cdot \frac{q^2}{r}$$

$\frac{1}{2}\, m.c^2 = \frac{1}{2} \left(\frac{1}{4\pi\epsilon^0} \cdot \frac{q^2}{r} \right)$, *But* $\omega.r = c$ *then*

$$\frac{1}{2}\, m.\ r^2\omega^2 = \frac{1}{2} \left(\frac{1}{4\pi\epsilon^0} \cdot \frac{q^2}{r} \right)$$

$$\omega = \sqrt{\frac{1}{4\pi\epsilon^0} \cdot \frac{q^2}{mr^3}} = 1.064015744x10^{23}\ Hz \qquad 3.2.1$$

comparing equations 3.1 and 3.2 we find it approximately equal which proves my calculated angular velocity from wave parameters and my full assumptions about the phosons – electrons behavior is correct.

Also, it confirms my assumption that the angular kinetic energy of the electron is half its rest energy and the relation between angular velocity and intrinsic angular velocity is

$$\omega_i = \alpha^3\omega_a \qquad 3.2.2$$

If the phoson's motion perpendicular to its rotation produces a pitch λ_p then the time required by one phoson to travel across the pitch horizontally in parallel to the axis of rotation is equal to

$$t = \lambda_p / v \qquad 3.3$$

The same time *t* is required to travel one helical orbit and is given by

$$t = \lambda_c / c \qquad 3.4$$

equalizing equitation 4.2 and 4.3 we get

$$\lambda_p / v = \lambda_c / c$$

$\lambda p = \lambda_c\ (\upsilon/c)$ *where* $(v = \alpha.c)$ 3.5

$$\lambda p = \alpha.\ \lambda_c \qquad 3.6$$

The question which arises here is whether α is constant to give a constant λ_p.

Figure 3.3 shows one phoson in its orbit which is inclined by an angle θ from the x-axis because of the its helical motion and running with the speed of light c.

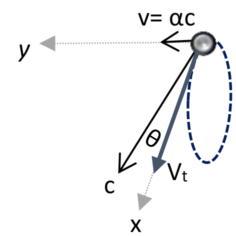


Figure 3.3

$$v_t^2 = c^2 - \alpha^2 c^2$$

$$\alpha^2 c^2 = c^2 - v_t^2$$

$$\alpha^2 = 1 - v_t^2/c^2$$

$$\alpha = \sqrt{1 - \frac{Vt^2}{c^2}}$$

$$v = \alpha c$$

$$v = \sqrt{1 - \frac{Vt^2}{c^2}} \,.\, c \qquad 3.7$$

This shows that α is inversely proportional to the tangential spinning velocity of the electron.

Thus, it is not possible to accelerate the electron to the speed of light where it becomes a string of phosons acting as a wave because the electron elongates and reduces its spinning speed and charge (charge is a function of spinning (equation 3.2)).

The electron can't be accelerated to the speed of light because it loses its charge with increasing its speed not because it increases its mass.

The effective tangential angular velocity is v_t not c used in calculating the angular velocity ω in equation 3.1 (see figure 3.3)

V_t = Ac 3.8

A = A = $\sqrt{1 - \alpha^2}$ = 0.999973374 which came from the vector summation in figure 3.3. 3.9

The effective angular velocity is

ω_e = A ω = (0.999973374) (*1.06389 x 10^{23} rad/s)* = 1.063861673 x 10^{23} rad/s. 3.10

The pitch λ_p calculated previously equals to $\alpha\lambda_c$ (equation 3.6) and the circumference of the helical route is also $\alpha\lambda_c$ (which is the electron's circumference $2\pi r_e$).

Knowing that the actual helical route length is λ_c, the calculated root length is

[Route length] ^{2} = [pitch ($\lambda_p = \alpha\lambda_c$)] ^{2} + [circumference = $\alpha\lambda_c$] ^{2}

Route length = $\sqrt{2}.\alpha.\lambda_c$ 3.11

The above shows that λ_p is a quantized value of the electron elongation and the actual number of turns in each λ_p is (figure 3. 4)

$N = (\alpha\lambda c) / (\sqrt{2}.\alpha.\lambda_c)$

$N = N = 1/(\sqrt{2}.\alpha.)$

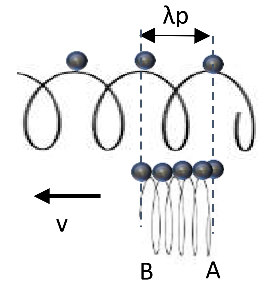


Figure 3.4

Referring to figure 3.1, and to the previous discussions we conclude that the electron's mass and energy are those complying with E=mc² and are the summations of masses and energies of the phosons comprising it.

Considering that the electron consists of f_c phosons, each phoson has a translational kinetic energy equals to *h/2* and spinning with an energy equals to *h/2*, then the rest mass and rest energy of the electron are

$$m_{rest} = f_c.\ m_{phs} \qquad 3.8$$

$$E_{rest} = f_c.\ (h/2 + h/2) = f_c.\ h \qquad 3.9$$

The total translational kinetic energies of all the phosons comprising the electron equals to the spinning motion energy of the whole electron mass given by

$$S_e = A.f_c.\ h/2 \qquad 3.10$$

$$but\ A = \sqrt{1-\alpha^2} = 0.999973374 \approx 1$$

$$S_e = f_c.\ h/2 = ½.f_c.\ m_{phs.}\ c^2 = ½\ m_e.c^2 \qquad 3.11$$

Where S_e is half the rest energy of the electron.

When the electron's phosons are emitted as a wave, it will have a wave length equals to the electron circumference multiplied by the fine structure constant factor α^{-1}.

$$\lambda c = 2\pi re.\alpha^{-1}$$

If a wave's ray happens to fall on an electron in a proper direction and its frequency is high enough to provide the required phosons in a time equal or shorter than the time required by the electron to escape from the interaction area because of its orbital motion, the wave's phosons will replace the electron's phosons (fully or partially) and the original phosons will be ejected as an electron in case of full interaction or as wave in case of partial interaction.

4. Conflict with the theory of relativity

Since the previous discussion assumes that waves' particles have mass which can generate electrons and contribute in forming its mass, it became essential to find another way to define the relativistic mass to overcome the contradiction with the theory of relativity.

Experiments proved that waves' particles have momentum which is an exclusive property of mass which made it essential to find what is this mass assuming that any existing particle which can carry energy should have a mass regardless of what type of mass it has or our capability to measure or detect it.

I will avoid using Lorentz transformation because the relativity square root γ will be concluded regardless of the mass involvement where usually derivations of this type goes in opposite direction starting from relative frames of reference besides that this transformation of inertial frames violates the energy conservation principle (showing this needs a special discussion) unless we vary mass, time and distance.

I will start this discussion with a familiar derivation of the relativistic mass when an object of mass m is under an external force.

$$\partial k = \partial W = F.\partial s$$

Where F is an external force and W is the work done in a distance s.

$$F= \partial P / \partial t = \partial/\partial t\ (mv)$$

$$F = m\ \partial v/\partial t + v\ \partial m/\partial t$$

$$\partial k =\partial s.\ m\ \partial v/\partial t + \partial s.\ v\ \partial m/\partial t \qquad (\partial s/\partial t = v)$$

$$\partial k = mv\partial v + v^2\partial m \qquad 4.1$$

Also γ *is expressed as*

$$m = m_o / \sqrt{1-\frac{v^2}{c^2}} \qquad 4.2$$

$$m^2 = m_o^2 / (1 - v^2/c^2)$$

$$m^2c^2 - m^2v^2 = m_o^2c^2 \qquad 4.3$$

$$2mc^2\partial m - 2mv^2\partial m - 2m^2v\partial v = 0 \qquad \text{(deriving equation 4.3)} \qquad 4.4$$

$$c^2\partial m = v^2\partial m + mv\partial v \text{ (Dividing equation 4.4 by 2m)} \qquad 4.5$$

Comparing equation 4.1 with 4.5 we get

$$\partial k = c^2\partial m = v^2\partial m + mv\partial v \qquad 4.6$$

Checking equation 4.3, we see a meaningless equation between squared momentums which is tailored to give the equality with ∂k in equation 4.1 and the square root of equation 4.2.

Equation 4.3 without squaring masses is

$$mc^2 - mv^2 = m_oc^2 \qquad 4.7$$

if we derive equation 4.7 we get

$$c^2\partial m = 2mv\partial v + v^2\ \partial m \qquad 4.8$$

Comparing equation 4.8 with equation 4.5 we find the same $c^2\partial m$ equals ∂k in equation 4.5 and to $\partial k + mv\partial v$ in equation 4.8.

This gives an impression that equation 4.2 was a matter of choice, and the target was to get the square root in equation 4.2 which was derived from Lorentz transformation for relative velocities.

From equation 4.8 and 4.1 with exchanging m by m_o for v < c

$$c^2\partial m = \partial k + m_o.v.\partial v \qquad 4.9$$

$$c^2(m-m_o) = (½\, mc^2 - ½\, m_oc^2) + m_ov^2/2 \qquad 4.10$$

where $\partial k = ½\, mc^2 - ½\, m_oc^2$ *at the speed of light, then equation 4.10 gives*

$$½\, mc^2 - ½\, m_oc^2 = ½\, m_ov^2$$

$$mc^2 - m_oc^2 = m_ov^2 \qquad 4.11$$

if we substitute $\partial k = ½\, m_ov - ½\, m_ov_o^2$ in equation 4.9 with $v_o = 0.0$ we get

$$mc^2-m_oc^2 = ½\, m_ov^2 + ½\, m_ov^2$$

$$mc^2 - m_oc^2 = m_ov^2 \qquad 4.12$$

Equation 4.9 cab be written as

$$c^2(m-m_o) - ½\, m_ov^2 = \Delta k \qquad 4.13$$

This equivalency means that accelerating a particle from rest to a speed v to gain a specific kinetic energy by an external force is equivalent to gain the same kinetic energy at the speed of light when mass is increased from m_o to m by an initial energy equal to $½\, m_ov^2$.

It should be noted that equation 4.9 is applicable to all speeds from zero to C.

To explain, I will give the following example:

Figure 4.1 shows a particle traveling at the speed of light from point A to point B where its mass and kinetic energy are m_o and k_o at point A and at point B, its mass and kinetic energy are k and m respectively.

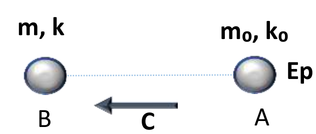


Figure 4.1

With no external source of energy or force, the energy at point A equals to the energy at point B

$$½\, mc^2 = ½\, m_oc^2 + Ep. \qquad 4.14$$

Where Ep. is additional energy carried by the particle at point A in another form of energy which works as a potential energy.

$$½\, mc^2 - ½\, m_oc^2 = \Delta k = Ep \qquad 4.15$$

If we define Ep. in a translational kinetic energy scale to be equivalent to the energy required to accelerate the particle from rest to speed v (maximum value of v = c) with constant mass m_o or to accelerate the particle from speed c to (c + v) with constant mass m_o (impossible case), then

$$Ep = ½\, m_ov^2$$

Substituting in equation 4.15 we get

$$½\, mc^2 - ½\, m_oc^2 = ½\, m_ov^2 \qquad 4.16$$

$$mc^2 - m_0c^2 = m_0v^2 \qquad 4.17$$

$$m = m_0\,(1+\frac{v^2}{c^2}) \qquad 4.18$$

Since the maximum value of v is C, then substituting C for v in equation 4.18 gives $m = 2m_0$. Also, equation 4.15 with v equals to its peak value C is

$$\Delta k = \tfrac{1}{2}\, m_0c^2 \qquad 4.19$$

$$\frac{\Delta m}{m_0} = \frac{v^2}{c^2} \qquad 4.20$$

If Ep = ½ m_0c^2 at point A, the total carried energy is

$$k = k_0 + Ep = \tfrac{1}{2}\, m_0c^2 + \tfrac{1}{2}\, m_0c^2 = m_0c^2 \qquad 4.21$$

And at point B with m = $2m_0$ where all the energy Ep is converted to translational kinetic energy, the total carried energy is

$$E = \tfrac{1}{2}\,(2m_0)\, c^2 = m_0c^2 \qquad 4.22$$

If the particle's translational kinetic energy is ½ m_0c^2, then it can carry another ½ m_0c^2 as a maximum in another form of energy.

While the particle travels at the speed of light, it tends to resist motion by increasing its mass and converting the potential kinetic energy to translational kinetic energy until all this energy is consumed to reach to a translational kinetic energy equal to m_0c^2.

To summarize we can derive the relativistic kinetic energy as

$$F = m_0\,(\partial v/\partial t)$$

$$\partial k = F.\partial s$$

$$\partial k = m_0.v.\partial v \qquad 2.23$$

Using equation 2.18 for relativistic mass

$$m = m_0\,(1 + v^2/c^2)$$

$$mc^2 = m_0c^2 + m_0v^2 \text{ (deriving this equation)}$$

$$c^2\partial m = 2m_0v\partial v \qquad 2.24$$

comparing equations 2.23 and 2.24 we get

$$c^2\partial m = 2\partial k$$

If mass is increased from m_0 to m and speed from rest to v, then integrating will give

$$c^2(m-m_0) = 2(\tfrac{1}{2}\, m_0v^2 - 0)$$

$$mc^2 - m_0c^2 = m_0v^2$$

$$\frac{1}{2} mc^2 - \frac{1}{2} m_0c^2 = \frac{1}{2} m_0v^2$$

This equivalency means that the increase in translational kinetic energy caused by a potential energy carried by the particle accompanied with mass increase at the speed of light is equivalent to the change in translational kinetic energy caused by an external force to accelerate the same particle from rest to a specific speed v when its rest mass is maintained.

As a conclusion, any object travelling with a speed bellow the speed of light will not experience any change in mass.

Thus, equation 4.1 should be understood as working in two domains, the first at speeds below the speed of light where translational kinetic energy increases with velocity under the effect of an external force and the second where translational kinetic energy increases with mass at the speed of light without the need of an external force but by a potential energy.

5. Conflict with De Broglie's theory

5.1 Introduction

After some experiments where electrons shown wave behavior, De Broglie proposed a theory stating that electrons and consequently matter have a wave behavior with a wave length $\lambda = h/p$.

His assumption was simply based on changing the term (m.c) in Compton wave length by (m.v) which led to a phase velocity equals (c^2/v) and this was justified by proposing that the electron has phase velocity greater than the speed of light but keeps it group velocity at v.

My model for the electron structure states that the electron acts as a unified mass not as wave which should be clarified.

5.2 Discussion

I will show some examples to figure how De Broglie's theory contradicts with other theories.

1- De Broglie wave length and Compton wave length are the same except the replacement of the speed of light with the electron velocity v and expressed as

   $\lambda = h / (m.v) \Rightarrow m.v = h / \lambda \Rightarrow m.c.v = (h.\ c / \lambda) \Rightarrow m.c.v = hf \Rightarrow E = m.c.v$

   Using (E = m.c.v) instead of Einstein's equation ($E = mc^2$) means one of them should be wrong.

2- The phase velocity of the electron according to De Broglie's assumption is

$$\omega = f.\ \lambda \Rightarrow \omega = \left(\frac{mc^2}{h}\right)\left(\frac{h}{mv}\right) \Rightarrow \omega = \frac{c^2}{v}$$

ω is greater than the speed of light. The explanation using group and phase velocity accepts a speed greater than c and customized to justify it.

3- Since we know that this theory was basically based on the number of wave lengths the electron makes while rotating around the nucleus, it is not valid for the hydrogen atom where $v = \alpha.c$ (α is the fine structure constant).

Substituting $c = \alpha^{-1}. v$ according to Bohr's model in Compton equation we get

$$\omega = (mc^2/h). (h/m.v.\alpha^{-1})$$

$$\omega = (f_c.) (h.\alpha/p)$$

$$\lambda = (h.\alpha) /p$$

doing the opposite by substituting $v = \alpha\, c$ in De Broglie's wave length we get

$$\omega = (m.c^2 / h). (h / m.\alpha.c)$$

$\omega = f_c. \lambda_c. \alpha^{-1}$ where f_c and λ_c are Compton frequency and wave length

The first assumption gives a different result from De Broglie's wave length and the second means that the x-ray in Compton experiment was always faster than light.

5.3 Major contradiction of the theory

In this section, the two components of the electron's motion will be studied to show how the electron does not have wave behavior.

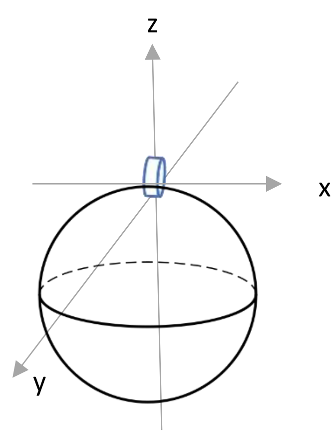


Figure 5.1

Figure 5.1 shows an instantaneous position of the electron in its orbit, the electron has an instantaneous velocity component $v = \alpha c$ in the x direction caused by the nucleus force, and spins in x-z direction which makes it roll around the nucleus perpendicularly with a speed equal to half the effective tangential speed of the phosons rotating around the electron axis.

Where $v_t = A.c.$ and $A = 0.999973374$ (equations 3.8 and 3.9).

1- Starting with the first component where the electron orbits the nucleus with a velocity $v = \alpha c$ and considering a one electron atom. Knowing the following relations

$$(\lambda_c = 2\pi r_e.\alpha^{-1}),\ (r_e = \alpha^2.\ r_b),\ (c = \alpha^{-1}.\ v)$$

The electron's orbital angular momentum can be derived as

$$\lambda_c = h/(m.c) = 2\pi r_e.\alpha^{-1}$$

$$\lambda_c = (h.\alpha)/(m.v) = 2\pi(\alpha^2 r_b).\ \alpha^{-1} \text{ where } r_b \text{ is Bohr's radius}$$

$$h/p = 2\pi.r_b \qquad 5.1$$

$P = h / (2\pi r_b)$ 5.2

$L = h/2\pi$ 5.3

This derivation does not need to propose a wave behavior for the electron motion to be derived.

Equation 5.1 shows that h/p = $2\pi r_b$ (i.e. the full orbit circumference is a wave length) with this condition it clear that we are dealing with rotational motion not wave behavior and with constant speed, mass and energy, the electron motion can't have a wave behavior.

Based on that ($\lambda = 2\pi r_b$) motion can be described as

$$\lambda = 2\pi r_b$$

$$v = f.\lambda$$

$$\alpha c = (2\pi r_b).\ f$$

$$f = \alpha c/2\pi r_b$$

$$\omega = 2\pi f = \alpha c/\ r_b \qquad 5.4$$

Even when describe motion as a wave the resultant is the angular velocity for a mass rotating around an axis. This confirms a purely rotational motion and has nothing to do with wave behavior.

2- The second component is rolling caused by the rotation of the of the phosons around the electron circumference without any external force which appears as spinning of the electron and make the electron rotate (Roll) in a perpendicular direction to the other motion component.

In this direction

The electron circumference = $2\pi r_e = \alpha\lambda_c$

The orbit circumference = $2\pi r_b = \alpha^{-1}\lambda_c$

The ratio of the orbit circumference to the electron circumference is $(\alpha^{-1})^2$ = 18778.86505 which is the number of rotations the electron rotates around its own axes in one rotation around the nucleus.

This component of motion is also just rolling and has nothing to do with wave behavior.

The resultant motion of the electron is the resultant of the aforementioned two components and the electron has its wave behavior because it is composed of phosons not because its mass behaves like a wave.

6. Related derivations

6.1 Intrinsic angular momentum of the electron

Since we found the relation between the number of phosons composing an electron and its intrinsic angular velocity, the unquantized intrinsic spinning angular momentum of the electron can be derived as below

$$h.\,f_c = m.\,c^2$$

$$h/2\pi\ (2\pi f_c) = mc^2 \qquad \textit{(multiply by } 2\pi/2\pi)$$

$$h/4\pi\ (2\pi f_c) = mc^2/2 \qquad \textit{(divide both sides by 2)}$$

$$(h.\alpha/4\pi)\ (2\pi f_c/\alpha) = E_{rest}/2 \qquad \text{(multiply } \alpha/\alpha)$$

Where $(\omega = 2\pi f_c\, \alpha^{-1} = \alpha^{-1}\, \omega_c)$ and $(\frac{E\ rest}{2}) = (\frac{m.c^2}{2})$ is half the rest energy and equal to the spinning energy of the electron S.

$$S = \frac{\omega}{2}\,.\,L_i$$

$$L_i = \frac{h\alpha}{2\pi} \qquad 6.1$$

$$L_i = \alpha L \qquad 6.2$$

6.2 Intrinsic magnetic moment

To derive the intrinsic magnetic moment of the electron, I will consider the charge q as one unit moving in a ring circle around the electron circumference (i.e.one loop), Then, the time for one rotation of the charge around the orbit (the electron's circumference) is

$$t = 2\pi/\omega = 2\pi/(2\pi f_c \alpha^{-1}) = 1/(f_c \alpha^{-1})$$

The current $I = q/t = q.f_c.\ \alpha^{-1}$

The intrinsic magnetic moment is

$$\mu_i = N.I.\ A = (q.f_c.\ \alpha^{-1})\ x\ (\pi r_e^2) \qquad 6.3$$

$$\mu_i = 6.767572x10^{-26}\ J/T$$

comparing this result with Bohr's magneton which is $9.274x10^{-24}$ J/T we find

$$\mu_i = \alpha.\ \mu_B \qquad 6.4$$

Referring to the well-known equation $\mu_i = (-g_s.\ \mu_B)\ S/\hbar \approx \mu_{B,}$ where g factor is 2 for the electron, S is the spin which equals to $\hbar/2$, it shows a difference of α factor Compared equation 5.9.

6.3 Time independent Schrodinger equation of the electron as a rotating mass

De Broglie wave length is equal to the full orbit circumference as seen earlier. Accordingly, each 2π occupies one wave length indication a unity wave number.

If we take the time independent portion of Schrodinger equation corresponding to the kinetic energy portion of the equation $E = p^2/2m + U$

Substituting $k = 1 = (m.\alpha.c)^2 / (m.\alpha.c)^2 = p^2 / (\alpha^2.m. E)$, where E is the rest mass of the electron and p is its momentum, then by Inserting the new k, we get the coefficient of the second derivative of Ψ as $(- \alpha^2. E/2)$ instead of $(- \hbar^2 /2m)$ which is simply Rydberg energy (13.6 eV)

This shows that the electron does not have wave behavior but simply rotating around the nucleus.

7. Conclusions

Phosons and quantization

Waves are quantized into discrete identical fundamental energy carrying mass particles (which I called phosons) where each phosons has a mass equal to ($m_{phs} = 7.372497201 \times 10^{-51}$ Kg. s) and carries an energy unit equals to h (6.626×10^{-34} J.s).

The ejected electrons in Compton experiment can be newly generated electrons by the wave's phosons or replaced by the wave's phosons when ejected.

Phoson, h or mc^2 have the same meaning, any object which complies with $E = mc^2$ should be comprised of phosons.

If an electron is emitted as a wave, it will produce a wave with frequency equals to the number of phosons comprising it with a wave length fulfilling the relation $c = f.\lambda$

Plank's constant

Plank's constant is a packet of energy repeated each wave length of the wave, the unit given to this constant is (J.s) which is the unit of angular momentum was chosen to avoid the time involvement.

When describing mass with ($E = hf = mc^2$), f is a unitless number indicating the number of phosons in the subject mass where h is in joules.

keeping h in (J.s) and f in (1/s) works because we don't want time to be involved but the energy of the phosons and any derived parameter will haves s like (J.s), examples are (Kg. s) , (N.s).. etc.

Phoson Model

The phosons' model to describe the particles' behavior of the waves is based on the following:

Phoson is a ring of mass which propagates by a continuous energy interchange between its translational and angular kinetic energies accompanied with a continuous mass variation which follows the translational kinetic energy.

Each phoson occupies one wave length and has two peak states, one with minimum translational kinetic energy, maximum angular kinetic energy and minimum mass and the other is with maximum translational kinetic energy, zero angular kinetic energy and maximum mass and travels between the two states in half wave length.

The phoson keeps h/2 translational kinetic energy all the time beside another h/2 interchangeable with the angular kinetic energy

The phoson's mass varies between its original mass m_0 and double the original mass.

Since waves' phosons have $m = m_{phs,}$ the wave length and number can be expressed as

$$\lambda = h / pf = c / f$$

$$k = \omega . \frac{p}{h} = f . \frac{p}{\hbar}$$

The force produced by one phoson in half wave length

$$F = P.f \text{ where } P \text{ is the momentum of maximum mass}$$

Electron Composition, generation and Shape

When an electron is generated by a wave, the phoson rays of the wave are bent over to form circular orbits with one phoson per orbit and under the effect of the nucleus force it starts to move perpendicular to the direction of rotation which gives the electron its helical shape.

The calculation of the angular velocity of the electron from the generating wave parameters and from the generated electron parameters proves all my assumptions about the phoson's model and electron structure.

In the generated helical electron shape , each phoson keeps h/2 spinning energy and h/2 translational kinetic energy where the summation of the translational kinetic energies of the phosons comprising the electron acts as the electron's spinning energy.

$$S_e = f_c. (h/2) = ½ m_e .c^2$$

The summation of the translational and angular kinetic energies of the phosons comprising the electron is equal to its rest energy

$$E_{rest} = f_c.\ (h/2 + h/2) = f_c.h = mc^2$$

The mass of the electron is the summation of masses of the phosons comprising it.

At the speed of light, the electron becomes a string of phosons travelling as a wave but practically it can't be accelerated to the speed of light because with speed it elongates and reduces its spinning velocity and charge.

The inclination which came from the helical shape is determined by the value of α such that α is proportional to the speed of the electron and inversely proportional to the effective tangential speed of the phosons rotation around the electron axis which is the electron's spinning speed.

Conflict with the theory of relativity

Any object with a certain mass will not experience any increase in mass when travelling at speeds below the speed of light.

When a particle of mass m_o travels at the speed of light, its mass varies following its translational kinetic energy and can be expressed as

$$m = m_o\ (1+\frac{v^2}{c^2}) \text{ where the mass doubles when } v = c.$$

The external force at speeds below the speed of light has the same effect of a potential energy carried by the particle at the speed of light $c^2(m-m_o) - ½\ m_o v^2 = \Delta k$ where this equation is applicable for all speeds including the speed of light.
The equivalency means that accelerating a particle from rest to a speed v to gain a specific kinetic energy by an external force is equivalent to gain the same kinetic energy at the speed of light when mass is increased from m_o to m by an initial energy equal to $½\ m_o v^2$.

At the speed of light, the potential energy increases the translational kinetic energy by increasing the mass while at speeds below the speed of light the translational kinetic energy is increased by increasing the velocity only.

Particles at the speed of light can have a maximum translational kinetic energy $k = m_o.c^2$.

The potential energy $E_p = ½\ m_o v^2$ is a general expression of the carried potential energy at the speed of light, usually this value is at its maximum for particles to propagate as part of a wave where $E_p = ½\ mc^2$

Conflict with De Broglie's theory

Even the electron is composed of a wave of phosons, it travels in its orbit around the nucleus without any wave behavior of its aggregated mass.

The wave length of the electron motion (h/p) in a hydrogen atom proposed by De Broglie is the full circumference length of the orbit ($h/p = 2\pi r_b$).

The motion of the electron in its orbit is rotational and has no wave behavior.

The wave properties of the electron motion are proportional to its speed, when it is accelerated to speeds near to the speed of light, it shows more wave properties.

The electron can't be accelerated to the speed of light because its spinning velocity and charge reduces in an inverse proportionality with its speed.

The helical electron elongates with speed till the pitch between any two successive phosons becomes equal to the wave length $\lambda = c$ / (number of phosons) [a condition which can't achieved] because it can't be accelerated to c.

Intrinsic angular momentum and magnetic moment.

Since the relation between the angular motion of the electron and the wave length of the wave generated it became clear, the unquantized intrinsic angular momentum of the electron and its magnetic moment can be derived as

$$L_i = \alpha . L_o$$

$$\mu_i = \alpha . M_B$$

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