Waves Generate Electrons and Both are Quantized into Phosons…
(New Definition of Relativistic Mass and Failure of De Broglie Theory)

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Abstract

This paper is a study of the behavior of light waves from a purely particles' point of view.

I started with showing that waves consist of fundamental units of mass (I called phosons) which are identical in all waves, don't depend on any wave's parameter, have the same mass and carry the same energy.

By interpreting Compton's effect experiment from a different point of view, I educed the mass of the phoson and explained how waves and electrons are quantized into phosons and how the electron's mass and energy are the summation of masses and energies of the phosons comprising its mass.

Since my work contradicts with the theory of relativity, I found it mandatory to find an alternative which works at all speeds and give more logical results.

After finding the nature of the phoson's mass with the new definition of the relativistic mass at the speed of light, everything became ready to propose a model to describe the phosons behavior and propagation as a continuous energy transformation between two forms of kinetic energies and a continuous mass variation between two levels.

The model explains the actual meaning of mc^2 and how even if we believe in mass energy equivalency, both are conserved individually.

At last I proposed how electrons are generated by waves' and how these phosons shape the electron and the effect of the fine structure constant in shaping the electron.

1 The Phoson

1.1 Introduction

This discussion assumes that any beam of light consists of rays where each ray is a stream of particles (I named phosons).

The phoson which will be introduced in this chapter is the fundamental unit of energy carrying mass where it carries always one *h (J.s).*

All waves consist of discrete identical phosons which do not change its energy or mass with frequency or any other wave's parameter.

After defining the phoson, it will be obvious how waves and electrons are quantized into phosons.

The name phosons I gave to the waves' particles stands for (photon son)

1.2 what is the Phoson

I will define the phoson and calculate its mass using the data we have about Compton effect experiment.

Compton's famous equation for the change wave length is (figure 1.1)

$\Delta\lambda = \frac{h}{m.c}\ (1 - \cos\theta)$ where m is the electron's mass.

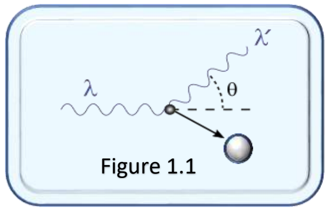


Figure 1.1

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 the wave and eject electrons.

The part ($\Delta\lambda = \frac{h}{m.c}$) in the equation above consists of constants and represents a full value of Δ λ 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.

Accordingly, an 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 interaction being involved and one 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.

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

The interpretation of the latter two cases can have other possibilities than what Compton gave. The first is the possibility to have a newly generated electron and the second is a full interaction when both the wave and electron are composed of the same number of identical particles, a full one to one interaction will give the number of phosons in the electron and consequently the number of phosons involved from the wave.

The increase in wave length represents a decrease of frequency which corresponds to the number of reduced phosons contributed in producing new electrons in a full interaction and Compton frequency denoted by f_c can be defined as:

fc is the number of missing phosons in the scattered wave when the increment in wave length is equal to (h/m.c) which contributed in generating a new electron or involved in a full interaction.

If the interaction is one to one, then the number of phosons in the electron and the number of phosons the wave lost are the same and if the ejected electron is a newly generated one, then the mass of the electron is equal to summation of the masses of the involved phosons.

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

$fc = c / \lambda_c$

$fc = \frac{m.c^2}{h}$

$f_c = 1.235589965 \times 10^{20}$ Hz

$m_{phs} = m / f_c$ 1.1

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

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

$E = h$ 1.3

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

Therefore, the electron is 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 λ_c. Wave length

It should be noted that f_c can be a frequency with units (s^{-1}) or it can be just a figure representing the number of phosons in the electron.

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

In the photoelectric effect experiment, it is our measurement units which are quantized into values per second not the waves and saying that waves are quantized into photons of energy $E = hf$ is just as saying that nature follows our manmade measurement units.

Thus, the photon is just a group of phosons involved in an electron generation (or in an interaction).

2. Particles at the Speed of Light

2.1 Introduction

As we have seen in the previously, waves' particles have mass and can generate electrons which contradicts with theory of relativity, but attention should be paid to 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.

Since experiments proved that waves' particles have momentum which is an exclusive property of mass, it is essential to find what are the characteristics of this mass.

All the coming discussion will be to show that light particles do have invariant mass and a determined mass at the speed of light.

I will use a different approach in this section to describe the behavior of mass particles travelling at the speed of light.

2.2 Relativistic Mass at the Speed of Light.

Referring to figure (2.1.a) if an external force F is applied on a particle travelling at the speed of light to cross a distance S, if the particle changes its mass from m_0 to m (to have a mass at the speed of light is our argument) then the change in kinetic energy is

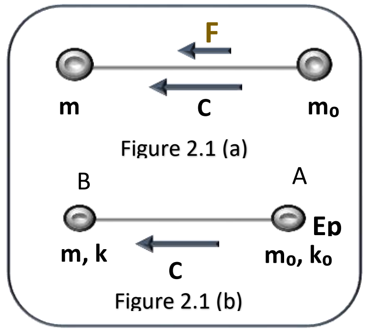


Figure 2.1 (a)
Figure 2.1 (b)

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

Where F is force and W is the work done in the distance S.

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

$$F = m\,\partial v/\partial t + v\,\partial m/\partial t \qquad 2.1$$

But at the speed of light, acceleration is zero i.e. $\partial v=0$, and $\partial s/\partial t = v = c$ then

$\partial k = c\ \partial m/\partial t.\ \partial s$

$\partial k = c\ (\partial s/\partial t).\ \partial m.$

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

$$\Delta k = \Delta m.c^2 \qquad 2.2$$

Referring to figure (2.1.b) if a particle is travelling at the speed of light from point A to point B where its kinetic energy and mass at point A are k_0 and m_0 and its kinetic energy and mass at point B are k and m respectively then, the total energy at points A and B are equal because there is no external source of energy or force

$\frac{1}{2} mc^2 = \frac{1}{2} m_0c^2 + Ep.$

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

$$\tfrac{1}{2} mc^2 - \tfrac{1}{2} m_0c^2 = Ep. = \Delta k \qquad 2.3$$

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_0 or to accelerate the particle from speed c to (c + v) with constant mass m_0 (impossible case), then

$Ep = \frac{1}{2} m_0v^2$

Substituting in equation 2.3 we get

$$\tfrac{1}{2} mc^2 - \tfrac{1}{2} m_0c^2 = \tfrac{1}{2} m_0v^2 \qquad 2.4$$

$$mc^2 - m_0c^2 = m_0v^2 \qquad 2.5$$

$$m = m_0\ (1+\frac{v^2}{c^2}) \qquad 2.6$$

Since the maximum value of v is C, then substituting C for v in equation 2.6 gives

$m = 2m_0$ 2.7

also, equation 2.4 with v equals to its peak value C is

$\Delta k = \frac{1}{2} m_0 c^2$ 2.8

$\frac{\Delta m}{m_0} = \frac{v^2}{c^2}$ 2.9

If $E_p = \frac{1}{2} m_0 c^2$ at point A in its peak, the total carried energy is

$k = k_0 + E_p = \frac{1}{2} m_0 c^2 + \frac{1}{2} m_0 c^2 = m_0 c^2$ 2.10

And at point B with $m = 2m_0$, the total carried energy is

$E = \frac{1}{2} (2m_0) c^2 = m_0 c^2$ 2.11

Where all the energy Ep is converted to translational kinetic energy.

The first case is theoretical because waves' particles do not need an external force to propagate while the second case is a description of the behavior of these waves' particles

If the particle's translational kinetic energy is $\frac{1}{2} m_0 c^2$, then it can carry another $\frac{1}{2} m_0 c^2$ 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 $m_0 c^2$.

Equation 2.1 states that the change in kinetic energy is due to the change in velocity and mass, the question which should be answered is whether both mass and speed can increase together in the same time.

2.3 Relativistic Mass at Speeds less than C.

To discuss what happens to a mass at speeds below the speed of light, I will start with equation 2.1 in full to find the change in kinetic energy

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

$\partial k = \partial s.\ m\, \partial v/\partial t + \partial s.\ v\, \partial m/\partial t$ *(but $\partial s/\partial t = v$ then)*

$\partial k = mv\partial v + v^2 \partial m$ 2.12

Also γ is expressed as

$m = m_0 / \sqrt{1 - \frac{v^2}{c^2}}$ 2.13

$m^2 = m_0^2 / (1 - v^2/c^2)$

$m^2c^2 - m^2v^2 = m_0^2 c^2$ 2.14

$2mc^2\partial m - 2mv^2\partial m - 2m^2 v\partial v = 0$ *(deriving equation 2.14)* 2.15

$c^2\partial m = v^2\partial m + mv\partial v$ *(Dividing equation 2.15 by 2m* 2.16

Comparing equation 2.16 with 2.12 we get

$\partial k = c^2\partial m$ 2.17

If we try to integrate equation 2.16 going back to equation 2.14 we get the following:

Multiply equation 2.16 by 2m we get

$2mc^2\partial m = 2mv^2\partial m + 2m^2v\partial v$ 2.18

Integrate equation 2.18 with m ranges from m_0 to m and v ranges from 0 to v, we get

$$\int_{m_0}^{m} 2mc^2\partial m = \int_{m_0}^{m} 2mv^2\partial m + \int_{0}^{v} 2m^2v\partial v \quad 2.19$$

$m^2c^2 - m_0^2c^2 = m^2v^2 - m_0^2v^2 + m^2v^2$ 2.20

It is obvious that equation 2.14 can't be recovered from equation 2.20 unless we consider m as constant equal to m_0 in the second term of equation 2.14 which leads us to equation 2.6.but with squared masses.

If we integrate equation 2.16 directly we get

$$\int_{m_0}^{m} c^2\partial m = \int_{m_0}^{m} v^2\partial m + \int_{0}^{v} mv\partial v$$

$c^2 (m - m_0) = v^2 (m - m_0) + ½\, m (v^2 - 0)$

$c^2 (m - m_0) = 3/2\, mv^2 - m_0v^2$

$c^2 (m - m_0) = c^2 (m - m_0) + ½\, mc^2$ *(substituting v = c)*

$c^2 (m - m_0)$ appears in both sides which implies that the particle either remained at rest or has a zero-relative mass.

Thus, γ is not suitable to describe the relativistic mass because it compressed two ranges of two separate effects and overlapped it in one range.

From section 2.2 and the above discussion we can conclude that in equation 2.12 which is $\partial k = mv\partial v + v^2\partial m$, the plus sign works as an (OR) rather than an addition.

The kinetic energy and consequently the momentum increases either with increasing velocity for speeds below the speed of light or by increasing mass at the speed of light but not both in the same time.

Thus, if speed can be increased for speeds below the speed of light, the accelerated object will maintain its rest mass without any amplification.

At the constant speed of light, mass increases to maintain the proportionality with the translational kinetic energy.

Accelerated objects should be destructed to molecules or compounds then to atoms then subatomic particles to have the possibility to be accelerated to the speed of light where no longer the original object exists.

2.4 Realistic Relativistic Mass

At speeds below the speed of light the mass is constant and equal to the rest mass m_0

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

$\partial k = F.\partial s$

$$\partial k = m_0.v.\partial v \qquad 2.21$$

And the new relativistic mass equation is

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

$mc^2 = m_0c^2 + m_0v^2$ (deriving this equation)

$$c^2\partial m = 2m_0v\partial v \qquad 2.22$$

comparing equations 2.21 and 2.22 we get

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

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

$c^2(m-m_0) = 2(½\, m_0v^2 - 0)$

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

$½\, mc^2 - ½\, m_0c^2 = ½\, m_0v^2$

This equivalency means that the change in kinetic energy caused by increasing the mass of a particle travelling at the speed of light is equivalent to the change in kinetic energy caused by increasing the velocity of the same particle when accelerated from rest to a specific speed v.

As a conclusion, any object travelling with a speed bellow the speed of light will not experience any change in mass but for particle travelling at the speed of light, mass varies in proportion to the translational kinetic energy.

3. The Phoson's Model

3.1 Introduction to Phoson's Model

The following points are fundamental in this section:

- At the speed of light, the source of mass increase is not the energy involved, mass and energy are conserved separately.
- Phosons mass works as the energy carrier.
- 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.

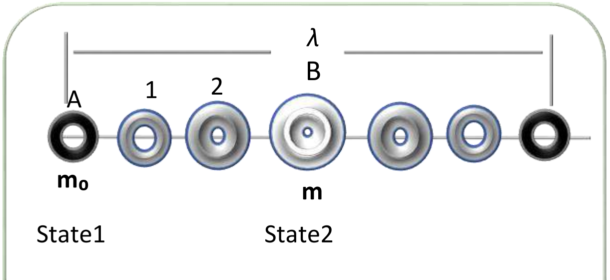


Figure 3.1

Figure 3.1 shows a sketch of the proposed behavior of the phoson while travelling in a wave. It has two peak states, state 1 with mass m_0 at point A and state 2 with mass m at point B.

3.2 Phoson's Model

In figure 3.1, I assumed that the phoson is a ring of mass which collects and releases mass during travelling each wave length and has one of two states as shown in the figure.

In state 1: The phoson has minimum mass, minimum translational kinetic energy and maximum spinning kinetic energy.

In state 2: The phoson has maximum mass, maximum translational kinetic energy and zero spinning kinetic energy.

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

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.

While traveling from point A to point B the phoson 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) always, its mass always follows the rate of change of its translational kinetic energy.

$$K + S = h \qquad 3.1$$

If this equation is derived it gives that the rate of increase of any of these two energies equals to the rate of decrease of the other.

$$\partial K/\partial t = - \partial S/\partial t \qquad 3.2$$

At point A, the phoson tends to work against it translational kinetic energy by increasing its mass with constant velocity C, the increase in translational kinetic energy is supplied by the spinning kinetic energy until it is consumed fully at point B.

At point B, the phoson's energy is fully translational which is an unstable state equivalent to a nonexistence 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.

At point A the phoson is in state 1 and has a ring shape because of its high spinning, its moment of inertia is $\boldsymbol{I} = m.\, r^2$ *and its mass is* mass $m_0 = 7.372497201 \times 10^{-51}$ Kg. s

The translational kinetic energy K and the spinning kinetic energy S are both in (J.s) and equal to

$K = ½\, m_0 .c^2$ 3.3

$S = ½\, I.\, \omega^2 = ½\, m_0.\, r^2.\, \omega^2$ 3.4

At this state, the two energies are equal because (r.ω = c) which occurs at

(0, 2π,4π,6π … in figure 3.2)

$E_T = h = K + S = ½\, m_0c^2 + ½\, m_0c^2$

$E_T = h = m_0 .c^2$ 3.5

At point B the phoson is in state 2 and its energy is a fully translational kinetic energy given by

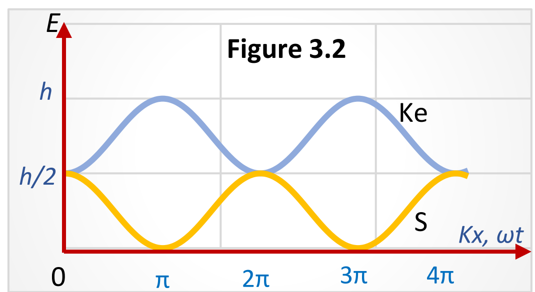
$E_T = K = h = ½\, m.\, c^2$

$E_T = ½\, (2.\, m_0).c^2 \qquad (m=2m_0)$

$E_T = h = m_0.\, c^2$ 3.6

These points can be seen in figure 3.2 at (π,3π,5π ...)

So, while the phoson is moving a full wave length its angular speed ω reduces from its maximum value to zero in one half wave length and back to maximum in the other half.



From point A to Point B

The energy stored as spinning energy is converted to translational kinetic energy during motion and mass increases to suit the new translational kinetic energy with constant speed.

At point B, the phoson's energy is completely translational kinetic energy but it can't keep this situation without spinning, so it starts again to spin and go back to a new point A, then repeat this - process each wave length.

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

The motion of the phoson during its travel from point A to point B can be described by

$\frac{1}{2} m\, .\, c^2 + \frac{1}{2}\, I.\, \omega^2 = h$ 3.7

$h = \frac{1}{2} m.\, c^2 (\, 1 + \frac{r^2 \omega^2}{c^2})$ 3.8

$\frac{h}{c^2} = \frac{1}{2} .\, m\ (\, 1 + \frac{r^2 \omega^2}{c^2})$ 3.9

Knowing that $\frac{h}{c^2} = m_0$ and m in the above equations is the relativistic mass at any time between point A and B

$A_m = \frac{m}{m^0} = \frac{2}{1+\frac{r^2\omega^2}{c^2}}$ 3.10

Where A_m is the mass amplification and here the mass is doubled at point B.

In trigonometric forms, we can express both energies as

$K = h/4 \{\cos((kx-\omega t)-\pi) + 3\} = h/4\{3-\cos(kx-\omega t)\}$ 3.11

$S = h/4\{\cos(kx-\omega t) + 1\}$ 3.12

For waves m = $m_{phs,}$ and thus

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

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

$$\lambda = \frac{\hbar}{pf}$$ 3.13

$k = 2\pi / \lambda$

$$k = \omega.\frac{p}{\hbar} = f.\frac{p}{\hbar}$$ 3.14

3.3 Energy and Momentum.

If we look at point 1 and 2 in figure 3.1, the total energy at both points is

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

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

$\Delta S = ½\, \Delta m.\, c^2$ 3.15

But $\Delta S = -\ \Delta K$ then

$\Delta K = -\ ½\, \Delta m.\, c^2$ 3.16

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

$\Delta S = ½\, m_o\, .c^2$ 3.17

$\Delta K = -\ ½\, m_o.\, c^2$ 3.18

Accordingly, the total rate of change of energy between any two points is equal to zero

$\Delta E_T = 0.0$ 3.19

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

$\Delta P = m_o.\, c$ 3.20

3.4 Force

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

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 force which generates momentum.

The force produced by one phoson is

$F = m.\ a\ (Kg.s.\frac{m}{s^2})$ this unit is equivalent to $(\frac{Kg.s}{s}.\frac{m}{s})$ and we can rewrite the equation as

$(F = \frac{\Delta m}{\Delta t}.c)$ where c is constant, and I will call $\frac{\Delta m}{\Delta t}$ as M_m the rate of change of mass in (Kg. s /s).

$F = M_m.c\ (N.s)$ 3.21

We can find this equation also by deriving p = m.υ with ∂v=0.

So, while the phoson travels half wave length the mass increment generates a hammering force given by equation 3.21 and

$M_m = (m - m_0) / t$ 3.22
$m = m_0 + M_m.t$ 3.23

$M_m = \Delta m / t = 2\ m_0.\ f$ (t = T/2 where T is the wave's period) 3.24

$F = 2.m_0.f.c$ (From equation 3.21)

$F = 2.\ P_0.\ f$ 3.25

$F = P.\ f$ (Since $P = 2p_0$) 3.26

To find the energy

$E = F.x$ *with* $x = \lambda/2$ *we get*

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

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

$E = \frac{1}{2} mc^2$

$E = m_0c^2$ $(m = 2m_0)$

4, Electron Generation and Mass Transfer

4.1 Electron Generation

In certain conditions when phosons with proper frequency and direction inter the atom's field, it forms a new electron. The rays of phosons are bent over to orbits such that each orbit circumference is $\alpha\lambda_c$ and each orbit is occupied by one phoson.

Figure 4.1 shows one phoson forming the orbit (α^{-1} = 137.03587 is the fine structure constant reciprocal).

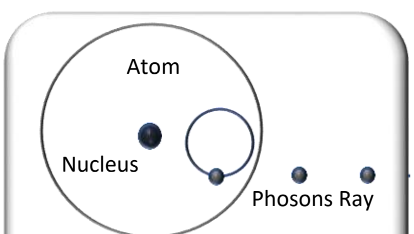


Figure 4.1

Figure 4.2 shows how *f* number of phosons are bent over to circular orbits with maintaining its spinning and translational motion with the speed of light to form a string of phosons spinning around an axis.

Each electron circumference is one wave length of the incident wave reduced by the α factor.

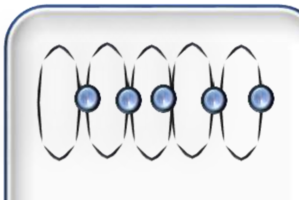


Figure 4.2

$2\alpha r_e = \lambda_c.\alpha$ (r_e is the electron's radius)

Also because of the force applied by the nucleus magnetic field, the orbits are stacked to look like a cylinder of rings.

The electron's mass and energy are those complying with the equation E=mc² and are the summations of masses and energies of the phosons comprising it.

As an example, if an electron of mass *m* consists of f_c phosons, each phoson has a translational kinetic energy equal to h/2 and spinning with an energy equal to h/2, then the rest mass and rest energy of the electron are

$m_{rest} = f.\ m_{phs}$ 4.1

$E_{rest} = f_c.\ (h/2 + h/2) = f.\ h$ 4.2

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

$S = f_c.\ h/2$ 4.3

$S_e = f_c.\ h/2 = ½.f_c.\ m_{phs.}\ c^2 = ½\ m_e.c^2$ 4.4

This S_e is half the rest energy of the electr*on* and after shrinkage the circumference becomes

$2\pi r_e = 1.770538 \times 10^{-14}\ m$

When f_c number of phosons in the wave front inters the atom's energy field, it is supposed to have an angular speed and radius complying with (c = ω. r) such that one wave length λ_c is rounded to a circle with one phoson rotating at the speed of light

$t = \lambda_c/c$
$f = c/\lambda_c$
$\omega = 2\pi c/\lambda_c$
$\omega_c = 2\pi f_c = 7.763441 \times 10^{20}\ rad/s$
$r_c = 3.8616 \times^{-13}\ m$

Turning one wave length to circular shape gives a radius equals to $\lambda_c/2\pi$ and consequently an angular speed ω_c but the shrinkage reduces the radius and accelerates the angular speed to

$r_e = r_c / \alpha^{-1} = 2.8179 \times^{-15}$ m
$\omega = \alpha^{-1}.\ \omega_c = 1.06389 \times 10^{23}\ rad/s$

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

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

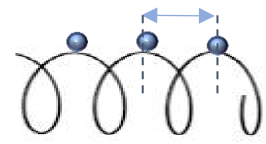


Figure 4.3

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 it orbital motion, the wave's phosons will replace the electron's phosons and the original phosons will be ejected as an electron. The same condition may happen if the intensity of the wave is enough to replace the electron's phosons in the electron's availability time during motion.

If the longitudinal motion is quantized into $\alpha\lambda_c$, the phoson will seem to be moving in a helical route but because of the high speed of spinning compared to the speed of motion, each $\alpha\lambda_c$ the phoson makes many revolutions which makes the best description of the phoson's motion as orbital ring moving with a speed αc.

4.2 Electron's Motion.

In figure 4.4 if the generated electron has a pitch λ_p and speed v**,** then the time required by one phoson to travel across the pitch horizontally in parallel to the axis of rotation is equal to

$$t = \lambda_p / v \qquad 4.5$$

The same time t is required to travel one helical orbit following the motion route and is given by

$$t = \lambda_c / c \qquad 4.6$$

equalizing equitation 4.4 and 4.5 we get

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

$$\lambda p = \lambda_c (v/c) \quad \textit{where } (v = \alpha.c) \qquad 4.7$$

$$\lambda p = \alpha.\ \lambda_c \qquad 4.8$$

This means that λ_p is constant if α is constant, that's why we should see what is α.

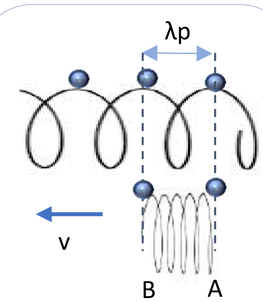


Figure 4.4

According to equation 4.8, the helical route should be $\sqrt{2}.\alpha.\ \lambda_c$ which implies that the phoson spins $N = 1/(\sqrt{2}.\alpha.)$ turns in each $\alpha\lambda_c$ (figure 4.4)

Figure 4.5 shows one phoson in its orbit which is inclined by an angle θ from the x-axis because of the helical route it follows and running with the speed of light c.

Its tangential speed C has two components, one in the direction of motion of the electron (the y-axis in the graph) and equal to α.c and the other is perpendicular to the motion of the electron.

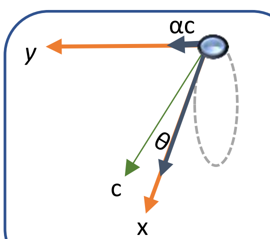


Figure 4.5

If the tangential speed in the x direction is V_x then

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

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

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

$$\alpha = \sqrt{1 - \frac{Vx^2}{c^2}} \qquad 4.9$$

If the speed of the phosons in the y-axis direction which is the electron motion direction is $v = \alpha c$ then substitute for v_x we get

$$\alpha = \sqrt{1 - \frac{(c^2 - v^2)}{c^2}}$$

$\alpha = v/c$

this shows that the inclination which came from the helical shape determines the value of α and that α is proportional to the speed of the electron.

Thus, as the velocity is increased up to the speed of light, the electron will elongate and reduce its spinning speed and charge until it becomes a string of phosons acting as a wave.

It should be noted that the calculated $\omega = 1.06389 \times 10^{23}$ *rad/s* should be multiplied by a factor A where $A = \sqrt{1 - \alpha^2} = 0.999973374$ which came because the effective tangential velocity in the direction of spinning is not c but $v_x = A.c$ which makes $\omega = 1.063861673 \times 10^{23}$ rad/s.

The kinetic energy at ($v = \alpha c$) is

$K = ½\, m. (\alpha.c)^2 \approx 13.6$ eV

which equals to the atom's energy level number 1 or Bohr's hydrogen atom electron's energy level.

5. Failure of De Broglie Theory

5.1 Introduction

After some experiments where electrons shown wave behavior, De Broglie came with a theory that electrons and consequently matter have a wave behavior with wave length λ = 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 a value of v.

5.2 Why it Fails

I will show some examples to figure how De Broglie theory is not accurate and contradicts with other theories.

De Broglie wave length is Compton wave length with the velocity of the electron v replacing the speed of light c is expressed as

$\lambda = h / (m.v)$

$m.v = h / \lambda$

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

$m.c.v = hf$

$E = m.c.v$

Using $E = m.c.v$ instead $E = mc^2$ means one of them should be wrong.

The phase velocity of the electron according to De Broglie assumption is

$\omega = f.\ \lambda$

$\omega = (\frac{mc^2}{h})(\frac{h}{mv})$

$\omega = \frac{c^2}{v}$

The phase velocity of the electron ω is greater than the speed of light. The explanation using group velocity and phase velocity is tailored to justify this conclusion.

If we accept that c is a limit speed, how we should accept this result.

Since we know that this theory was basically based on the number of wave lengths the electron makes while rotating around the nucleus, the fact that $v = \alpha.c$ was ignored (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 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 result different from De Broglie's wave length and the second means that the x-ray in Compton experiment was always faster than light.

Knowing the following relations

$\lambda_c = 2\pi r_e.\alpha^{-1}$

$r_e = \alpha^2.\ r_b$

$c = (\alpha^{-1}.\ v)$

The electron orbital angular momentum can be derived as

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

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

$h/p = 2\pi.r_b$

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

$L = h/2\pi$

It is obvious that this derivation does not need to propose a wave length for the electron to be derived, also we should note that

$p = h\ /2\pi r_b$

h / p = 2πr_b ≠ λ (De Broglie wave length).

If for argument $\lambda = (2\pi r_b)$ equals to the wave number, then how to describe the electron as having wave behavior.

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

Setting $k = 1 = (m.\alpha.c)^2 / (m.\alpha.c)^2 = p^2 / (\alpha^2.m.\ E)$, where E is the rest mass of the electron and p is the momentum of the electron, then by Inserting the new k, we get the factor of the second derivative of Ψ as $(-\ \alpha^2.\ E/2)$ instead of $(-\ \hbar^2 /2m)$

And the factor of ψ is simply the energy level of the hydrogen's atom electron (13.6 eV)

5.3 Alternative Analysis

During the intrinsic spin perpendicular to its rotation around the nucleus, the electron acts as a particle with unified mass.

If an electron with radius r_e is rotating in an orbit around the nucleus with radius r_b which is Bohr's radius.

Then starting with

$r_e = r_b.\ \alpha^2$

$\lambda_c = 2\pi r_e \alpha^{-1}$

derive r_b as a function of λ_c

$2\pi r_e = \alpha.\lambda_c$

$2\pi(\alpha^2 r_b) = \alpha\lambda_c$

$r_b = \lambda_c\ /\ 2\pi\alpha$

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

$P = m.v$

$P = m.\alpha.c$

Where p, m, and v are the translational momentum, mass and speed of the electron respectively.

$L = P.\ r_b$

$L = m.\ (\alpha.c).\ (r_b)$ *(using $v = \alpha.c$)*

$L = m.c.\alpha\ (\lambda_c /2\pi\alpha)$

$L = m.c^2.\ (\lambda_c/c)\ (1/2\pi)$ *(multiplying by c/c)*

$L = (E)(1/f_c)\ (1/2\pi)$ *($E=mc^2$)*

$L = h.f_c\ (1/f_c)\ (1/2\pi)$ *($E=hf$)*

$L = h/2\pi$ 5.1

The quantized orbital angular momentum is

$L = n\ (h/2\pi)$ 5.2

Thus, the electron rotates around the nucleus in an orbit equals to $(\alpha^{-1})^2$ of it circumference Its elongation with speed accompanied by a reduction in spinning angular energy and decrease in charge is the proper description we can give for an electron as a unified mass.

The intrinsic spinning angular momentum can be derived as below

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

$h/2\pi\ (2\pi f_c) = mc^2$ *(multiply by $2\pi/2\pi$)*

$h/4\pi\ (2\pi f_c) = mc^2/2$ *(divide both sides by 2)*

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

Where $(2\pi f_c.\ \alpha^{-1} = \omega = \alpha^{-1}.\ \omega_c)$ 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.

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

$L_i = \frac{h\alpha}{2\pi}$ 5.3

$L_i = \alpha L$ 5.4

To derive the intrinsic spinning angular 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

$\mu_i = N.I.\ A = (q.f_c.\ \alpha^{-1})\ x(\pi r_e^2)$ 5.4

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

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

$\mu_i = \alpha.\ \mu_B$ 5.5

We can think of the spin magnetic moment as positive or negative, but laws of nature say that everything revolves counterclockwise, however when the electron is ejected, its spin direction will depend on the direction of its axis of rotation when leaving the atom.

Referring to the well-known equation μ_i

$\mu_i = (-g_s.\ \mu_B)\ S/\hbar \approx \mu_B,$ where the g factor is 2 for the electron, S is the spin which is equal to $\hbar/2$

compare it with equation 5.5 will show a factor α between the them.

At last, it should be mentioned that if the electron is split into two parts as in the double slit experiment, it can interfere with itself because each part will act as a wave with partial phosons and if a source of light is applied on the electron part in this state, each can reproduce itself as an individual electron again.

Conclusions

My paper is mostly conclusions, but I will summarize the most important conclusions I made"

Waves and electrons are quantized into discrete identical fundamental energy carrying mass particles (which I called phosons) where each phosons has a mass equal to $7.372497201x10^{-51}$ Kg. s and carry energy equal to h ($6.626x10\text{-}^{34}$ J.s).

Waves can generate electrons where the generated electron's mass and energy are

$m_e = f_c.\ m_{phs}$
$E_e = f_c.h$
$m_{phs} = h / c^2 = m_e / f_c$

where f_c is Compton frequency and m_{phs} is the phoson mass, this number of phosons is applicable to free electrons, electrons in a one electron atom, ready to leave the atom electrons or generated electrons and the value which can be quantized.

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

If a generated electron is emitted fully as a wave it will produce a wave with the same characteristic of the wave which generated it.

Particles travelling at speeds below the speed of light do not experience a change in mass, but this change happen exclusively at the speed of light.

The potential energy carried by particles travelling at the speed of light works as the external force at speeds below the speed of light.

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.

Potential energy in waves is an additional energy to the translational kinetic energy carried in another form of energy like spinning.

Particles at the speed of light can have a maximum translational kinetic energy $k = m_0.c^2$

As a general form, the change in translational kinetic energy at the speed of light is

$½ mc^2 - ½ m_0c^2 = ½ m_0v^2$
The change in mass at the speed of light follows the equation
$m = m_0 (1 + v^2/c^2)$
For light and electromagnetic waves, the equation becomes
$½ mc^2 - ½ m_0c^2 = ½ m_0c^2$
$\Delta k = ½ m_0c^2$
$\Delta m = m_0$
$m = 2m_0$

I proposed a model for phosons based on the following:

- One 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.
- The phoson travels between the two states in half wave length.
- In the second state the energy is purely translational, and the mass is doubled.
- The summation of the translational and angular kinetic energies is equal to h always.
  $E_T = h = m_0c^2 = K + S$ where E_T is the total energy, k and S are the translational and angular kinetic energies respectively.

- The rate of change of each of the energies is the opposite of the other making a total of zero

  $\partial K/\partial t + \partial S/\partial t = 0$

- At the state with minimum mass $c = (\omega.r)$, $k = h/2$ and $S = h/2$
- The mass amplification between the two states is given by

  $A_m = m / m_0 = \frac{2}{1+\frac{r^2\omega^2}{c^2}}$

- S and K energies can be expressed in trigonometric forms as

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

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

In terms of phoson's momentum and wave frequency, the wave length can be expressed by the equation

$$\lambda = \frac{h}{pf}$$

And the wave number is

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

knowing that the mass change is m_0 we get the change in energies as

$\Delta S = \frac{1}{2} m_0 .c^2$
$\Delta K = - \frac{1}{2} m_0. c^2$

During motion, the phoson generates a force expressed as

$F = P. f$ *where p is the phoson's momentum in its maximum mass state and f is the wave frequency.*

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 the orbit radius and angular velocity are given by

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

$\omega = \alpha^{-1}. \omega_c = 1.06389 \times 10^{23}$ *rad/s*

The generated electron will be a sting of phosons moving in ring orbits around a common axis and when the electron moves it takes a helical shape.

The phosons comprising the electron are in a state where each carries a translational kinetic energy *h/2* and an angular kinetic energy *h/2*

The summation of the translational kinetic energies of the phosons comprising the electron acts as the electron's spinning energy.

$S_e = f_c. (h/2) = \frac{1}{2} m_e .c^2$

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

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

A moving electron will elongate in proportion to its velocity *v*, at the speed of light it becomes a string of phosons travelling as a wave, the value of one-unit of elongation is

$\lambda p = \alpha.\lambda_c (v/c)$

where λ_p is the pitch between any two successive phosons quantized into $\alpha\lambda_c$.

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 tangential speed of phoson spinning and given by

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

α = (v/c)

Where v is the electron velocity which is the component of the speed in the direction of the electron and v_x is the component of the tangential speed of the rotating phoson (equals to c) in a direction perpendicular to the electrons motion.

De Broglie theory fails because of the wrong assumption of wave length dealing with the mass of the electron as a sort of wave with wave length not a unified mass.

The intrinsic angular momentum of the electron and its magnetic moment are

$L_i = \alpha.L$

$\mu_i = \alpha. M_B$

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