Compton was Greatly Mistaken Using the Quantum

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Abstract: The alleged existence of quantum with momentum in electromagnetic radiation is disputed, this is within the supposed balance of both Einstein’s mass-energy equivalent with Planck’s radiation energy, we realize this is untrue, except at one energy state represented by a single frequency, from the whole frequency spectrum; this formula is also analyzed and compared with the balance between kinetic energy and the Planck’s radiation energy, the energy as well as the momentum for each is derived and showed to relate to an equivalent radiation energy and momentum equivalent to momentums given by $mV$ and $mc$, which was coined for particle’s mass; a momentum derived from the multiplication of Radiation Magnetic Force ($F_{mr}$) and change in time ($\Delta t$), designated as Magnetic Momentum ($\rho_M$), is related to the Electron Momentum ($\rho_E$) and both are in odd with the Compton Momentum ($\rho_C$), which showed great discrepancies with momentum of both the $\rho_M$ and $\rho_E$, when plotted graphically; the paper established the condition for radiation momentum to remove electron from atom, which is only fulfilled by the Magnetic Momentum ($\rho_M$), rather than Compton Momentum ($\rho_C$); thus a conclusion is reached that, the use of the formula by Compton was not justified, it was misleading, and doesn’t uphold scientific merit, while the Radiation Magnetic Force ($F_{mr}$) embedded in the electromagnetic radiation, is the force gives the proper and logical momentum that ejected photoelectrons and carried different mechanism in Compton Effect and others; this attempt aimed at restoring the common sense to the physical world.

Keywords: Quantum; Photon; Compton Effect; Compton Momentum ($\rho_C$); Electron Momentum ($\rho_E$); Magnetic Momentum ($\rho_M$) secondary electromagnetic radiation;

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I. Introduction

Planck was the first to perceive in 1900, the radiation energy as a discrete quantity, composed of integer number of finite equal parts, he suggested energy $\varepsilon$ is be proportional to the number of frequency $\nu$ [1]. in 1905 Einstein linked electrons “oscillators” with electromagnetic waves, and suggested energy quanta as constituent of incident light, having magnitude $\frac{RB\nu}{N}$ [2], Einstein developed quanta from blurred idea into wave-particle duality in 1909, suggesting that, “the expressions for the mean-square energy and momentum fluctuations split naturally into a wave dominated in the Rayleigh-Jeans low-frequency region of the spectrum and a particle term dominated in the Wien’s law high-frequency region” [3], by this he fills the theoretical gap necessitate photoelectrons removal from the atoms [4], that duality brought the current concept of photon, associating electromagnetic fields of light with singular points, similar to electrostatic fields, and surrounded by fields of force that superposed to give the electromagnetic wave of Maxwell’s classical theory [5]; Einstein’s suggestion was rejected by prominent scientists like Millikan, Lorenz, Planck [6], and Bohr [7]; the rejection persist until Compton claimed solving the scattering of electron by X-rays and $\gamma$-rays in 1923 [8], transforming Einstein’s explanation of photoelectric effect into an acceptable theory [2], by this turning the illogic into logic; Compton interpretation strengthened the shaky status of quanta ( photon), as it stated that “scattering is a quantum phenomenon; and a radiation quantum carries with it momentum as well as energy” [8], Planck rejected the extension of quantum into electromagnetic radiation, stating that “instead of quantized electromagnetic fields, the problem of the quantum theory should be transferred to the area of interaction between matter and radiation energy,” [5]. Planck was correct, as our search in theoretical physics suggested the existence of Radiation Magnetic Force ($F_{mr}$) embedded in electromagnetic radiation, this also interpreted Planck’s energy as embedded in the electromagnetic radiation [9], while the Compton effect was explained as an internal reproduction of secondary electromagnetic radiation [10], the Double Slit Experiment is explained as an interaction between two Polarized Wave (PW), in form of Circular Magnetic Fields (CMF) [11], a comprehensive mechanism reproducing Electromagnetic Radiation is provided [12], including requirements, analysis of energy and Planck’s constant [13], the reason radiation moves with speed of light [10], explanation of Electron Diffraction [14], the Weak force [15], the nature and origin of Planck’s constant ($h$) [11], and “The Faraday Effect Explained” [16], all these based on the Magnetic Interaction [17], which showed the existence of an alternative solutions to different challenges faced physicists since mid-nineteen century, and early twenty century; as formulas 3 and 8 in the Magnetic Interaction [17], were not discovered, and scientists were in hurry
to get any acceptable solutions [18]; such as the inclusion of quanta (photon) and its momentum by Compton, which is reviewed in this paper and found to be extremely odd, controversial and lacking scientific merit, as Compton used two unrelated formulas of energies to derived the momentum of particle with mass, perceived as massless photon! This serious breach reflected Compton’s eagerness to attain success [18], without scientific certainty, contrary to Einstein who spent the remaining fifty years of his life, deliberating without success about photon! Till he ascertained that, no physicist knows what photon is [19]! clearly he has doubted the existence of photon, in addition to the strong indications showed light consist of wave rather than a corpuscular [20], as been suggested [12, 13]; this paper analyzed the formations and balance of both Einstein mass-energy equivalent and Planck’s energy formula and compared Compton Momentum (ρ_c), Electron Momentum (ρ_E) and the magnetic Momentum (ρ_M) derived from the Radiation Magnetic Force (F_{mh}), a relation is found between the graph of Electron Momentum (ρ_E), and any momentum that should remove electron from atoms, thus a discrepancy is found in the graph of ρ_c, indicating it’s not parallel with graph ρ_E, therefore ρ_c is not radiation momentum, thus the postulation made by Compton invalid, and for him to use this formula, as a short cut, was an act of deception, taken into account his denial knowledge of Einstein paper [18], thus the paper is aimed at restoring the common sense into the physical science, diverted by the mathematical description of the natural world!

II. Mathematics or Mechanism of Energy and Frequency/Wavelength!

Compton [8], started buildup his mathematical formation for the incident X-ray by claiming the change in wavelength is due to the scattering, he stated that: “Imagine, as in Fig. 1 (Fig. 1A), that an X-ray quantum of frequency ν is scattered by an electron of mass m. The momentum of the incident ray will be \( \frac{\hbar \nu}{c} \), where c is the velocity of light and h is the Planck’s constant, and that of the scattered ray is \( \frac{\hbar \nu}{c} \) at an angle \( \theta \) with the initial momentum.”

Compton didn’t make any introduction to illustrate how he got this important momentum formula; and despite the importance of this claim he just made the suggestion without giving any evidence, on how he got this momentum, or even the mathematical derivatives, for such claim, but why he did so? Because everyone will know the truth behind it, and since the whole building block of quantum is based on this statement, we will check the root of the alleged “momentum of the incident ray \( \frac{\hbar \nu}{c} \),” shown in Fig.1, and see if it got any merit?

The energy of charge particle with mass m and Velocity (V_R), is given by [13]

\[
E_R = \frac{mV_R^2}{2}
\]  

(1)

Where, \( V_R \) is electron or proton velocity in \( m.s^{-1} \), \( m \) is the mass in kg. The conclusion reached by Planck that, “energy element \( \varepsilon \) is proportional to the number of vibrations \( v \),” giving his famous equation [1], known as Planck’s Radiation Energy (E_R) formula

\[
E_R = h \nu
\]  

(2)

Einstein mass-energy (E_R) equivalent [21], is given by

\[
E_R = mc^2
\]  

(3)

The equivalent of radiation and mass-energy combining Eq. (2) and Eq. (3) is

Fig.1. The incident radiation is treated by Compton as a quantum carrying “momentum= \( \frac{\hbar \nu}{c} \),” in which the quantum is scattered by the electron at an angle \( \theta \) [8].

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The mass of the charged particle derived from radiation energy given in Eq. (4), is given by
$$m = \frac{hv}{c^2}$$

As Eq. (5) can be changed slightly, as derived from Eq. (4), the momentum of the mass $m$ due to velocity $c$ is given by
$$\rho = mc = \frac{hve}{c}$$

But Eq. (6) is the source of Compton formula [22], where he concluded from the extreme parts of Eq. (6), while neglecting or deleting the central part of $mc$, that the momentum of electromagnetic radiation is
$$\rho_C = \frac{hve}{c}$$

The momentum given by Eq.(7) is what Compton claimed to represent the incident ray, it’s originally derived from Eq.(4), which was perceived as an equivalent of both the Planck’s energy formula given by Eq. (2) with Einstein’s mass-energy formula give by Eq. (3), but both parts in Eq. (4) are not equal, so as to justify this, because when Eq. (4) is claimed to be equal, this means at any variation both parts should be equal, but as given in Table 1, Eq. (4) is only equal in one condition, when both energies $E_R=E_E=8.1985\times10^{-14}$ eV, at that level, the frequency of radiated energy $\nu=1.237\times10^{20}$ Hz, but can such equality be compared with that of the radiation energy and electron’s energy, combining both Eq. (1) and Eq. (2), as given by?
$$E = \frac{mv^2}{2} = \hbar \nu$$

For Eq. (8), and as demonstrated in Table.1, the variation of the frequency $\nu$ is related to an equivalent energy variation reflected on the velocity $V$ of the charge particle, this is why Eq. (8) can be stated categorically, as equal, but can this be the same for Eq. (4)?
In the Compton Effect Revisited [10], the Radiation Magnetic Force ($F_{mR}$) in the incoming electromagnetic radiation forced inter-atomic electron to higher binding energy from point 1 to 2, and the electron carried Flip-Flop ($F-F$) mechanism from point 2 to 3 [12], ended with the produced secondary electromagnetic radiation at 3, pulled towards line-4, and the ejection of the electron at points 6 [10].

As concluded from Table.1, there is no relation between the formula of mass-energy equivalent given by Eq. (3), with Planck’s energy formula given by Eq. (2), which is equivalent to kinetic energy given by Eq. (1), because it change with frequency, while Einstein mass-energy equivalent formula only give a single amount of energy, when converted, it gives a single velocity $c$, while if variable energies are given, this changed the mass, and since Einstein Eq.(3) originated from the statement that, “if a body gives off the energy $E_E (L)$ in the form of radiation, its mass diminishes by $E_E (L)/c^2$” [21], and such case occurred only in particles such as pion, which decays into two gamma rays [23], so it gives radiation for only one frequency, but Eq. (4) doesn’t give any relation of variation, because the equivalent of Einstein’s mass-energy formula doesn’t change with velocity, its equal only at one frequency $v$=1.237x10^{20} Hz, and only one velocity $c$, as given in Table.1, so what about the other frequencies, does it exists? (This is the odd situation expressed by Compton Momentum ($\rho_C$) slope in Fig.3).

The same can be stated for the momentum given by Eq. (7), where the $mc$ part gives only an equivalent of one momentum as shown in Table.1, in the whole spectrum of the radiation, contrary to sensible Electron Momentum ($\rho_E$) derived from Eq.(8), as given by

$$\rho_E = mV = \frac{2\hbar v}{V}$$  \hspace{1cm} (9)

In the Electron Momentum ($\rho_E$), shown in Table.1, the variation of both parts of Eq. (9) is sequential and related to variation of velocity and frequency, while in Mass-Energy momentum, designated as Compton Momentum ($\rho_C$) such variation doesn’t exist, the equivalence only exist at one frequency when $v$=1.237x10^{20} Hz, then what about other frequencies? And if photon existed, how such photon due to one frequency can be imposed on the whole spectrum?

Since $v=\frac{c}{\lambda}$, thus substituting this with the variable frequency $v$ in Eq. (8), the equivalent of radiation energy to charged particle kinetic energy, with variable wavelength is given by

$$E_k = \frac{mV^2}{2} = \frac{\hbar c}{\lambda}$$  \hspace{1cm} (10)

While substituting $v=\frac{c}{\lambda}$, with the variable frequency $v$ in Eq. (4), hence Einstein’s mass-energy equivalent to radiation is given in variable wavelength by
\[ E = mc^2 = \frac{h \nu}{\lambda} \]  
(11)

Therefore both Eqs. (10&11) are energy formulas, with variable wavelength in the radiation part. From Eq. (10), the Electron Momentum \((\rho_E)\) is obtained by dividing both parts on \(V\), given as

\[ \rho_E = mV = \frac{2 \hbar c}{V \lambda} \]  
(12)

While from Eq. (11), the momentum is obtained by dividing both parts on \(c\), given as

\[ \rho_C = mc = \frac{h}{\lambda} \]  
(13)

Eq. (6) is similar to Eq. (9), except the particle velocity \(V\) is substituted with the velocity of light \(c\), and since in both parts of Eqs. (6&9), it is the velocity of the mass \(m\), which is common and both Eqs. (12) and Eq. (13) are similar, only differ in the particle velocity \(V\) which is substituted with the velocity of light \(c\); and \(c\) in Eq. (13) canceled \(c\) existed in Eq. (12), therefore the Electron Momentum \((\rho_E)\) in Eq. (12) has got two value, the first express by \(mV\) and the equivalent to it derived from radiation \(\frac{2 \hbar c}{V \lambda}\), while the Compton Momentum \((\rho_C)\) in Eq. (13) has got two value, the first is expressed by \(mc\) and the equivalent to it express by the radiation parameters \(\frac{h}{\lambda}\), hence the momentum \(\frac{h}{\lambda}\), in Eq. (6) used by Compton expressed the equivalent magnitude of the momentum using the radiation quantity, if it’s understood as the momentum of the radiation, then why not taken the radiation part \(\frac{2 \hbar c}{V \lambda}\) of Eq. (12) to mean the momentum of the radiation? And what about the mass in Eq. (13)?

<table>
<thead>
<tr>
<th>(V)</th>
<th>(E)</th>
<th>(\lambda)</th>
<th>(E_{\text{cmf}})</th>
<th>(\rho_E)</th>
<th>(\rho_C)</th>
<th>(\rho_M)</th>
<th>(\rho_{\text{mk}})</th>
</tr>
</thead>
<tbody>
<tr>
<td>10^4</td>
<td>6.30875</td>
<td>5x10^-2</td>
<td>3.81415663x4</td>
<td>3x10^-4</td>
<td>3.613670194</td>
<td>3.208969333</td>
<td>4.374464000</td>
</tr>
<tr>
<td>10^5</td>
<td>6.30875</td>
<td>5x10^-2</td>
<td>3.81415663x4</td>
<td>3x10^-4</td>
<td>3.613670194</td>
<td>3.208969333</td>
<td>4.374464000</td>
</tr>
<tr>
<td>10^6</td>
<td>6.30875</td>
<td>5x10^-2</td>
<td>3.81415663x4</td>
<td>3x10^-4</td>
<td>3.613670194</td>
<td>3.208969333</td>
<td>4.374464000</td>
</tr>
<tr>
<td>10^7</td>
<td>6.30875</td>
<td>5x10^-2</td>
<td>3.81415663x4</td>
<td>3x10^-4</td>
<td>3.613670194</td>
<td>3.208969333</td>
<td>4.374464000</td>
</tr>
</tbody>
</table>

**III. Variation of Energy Parameters**

The Planck’ energy formula in the *Electromagnetic Radiation Energy and Planck’ Constant* [13] contained the radiation energy \(h\nu\) balanced with Einstein’s mass-energy equivalent in addition to other parameters, but both are balanced, with parameters given in Table 2, as

\[ h\nu = \frac{B_{\text{cmf}}^2 A^4 m c^2}{2 (4)^4 q^3} \]  
(14)

Rearranging Eq. (14), the CMF is obtained as
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\[ B_{CMF}^2 = \frac{2 (4)^4 v \hbar q^2}{m c^2 \lambda^4} \]  \hspace{1cm} (15)

Substituting \( B_{CMF} \) in Eq. (15) with \( B_{CMF} = \frac{q v}{r^4 c^2} \), we get

\[ q^2 V^2 \frac{r^4}{c^2} = \frac{2 (4)^4 v q^2 \hbar}{m c^2 \lambda^4} \]  \hspace{1cm} (16)

Rearrangement of Eq. (16) we get

\[ q^2 V^2 m c^2 \lambda^4 = v \]  \hspace{1cm} (17)

Then the following is obtained

\[ v = \frac{V^2 m \lambda^4}{2 (4)^4 r^4 \hbar} \]  \hspace{1cm} (18)

From Eq. (18) the frequency is

\[ v = \frac{(4)^4 V^2 m \lambda^4}{2 (4)^4 \lambda^4 \hbar} \]  \hspace{1cm} (19)

Cancelling similar elements, the frequency is given by

\[ v = \frac{V^2 m}{2 \hbar} \]  \hspace{1cm} (20)

From Eq. (20), the balanced of both kinetic and radiation energies is given by

\[ mV^2 = \hbar v \]  \hspace{1cm} (21)

From Eq. (21), the momentum is given by

\[ \rho = mV = \frac{2 \hbar v}{V} \]  \hspace{1cm} (22)

Therefore, Eq. (22), is the Electron Momentum (\( \rho_E \)) given by Eq. (9), hence, \( \rho_E \) is given by

\[ \rho_E = mV \]  \hspace{1cm} (23)

Eq. (14) contained Planck’s energy, Einstein’s mass-energy equivalent, and the wavelength, but it ended in Eq. (23) with the Electron Momentum (\( \rho_E \)) given by Eq. (9), therefore the existence of wavelength and frequency in any formula such as given by Eq. (14), doesn’t mean the existence of different element or imaginary phenomenon in the formula, it only give the equivalent amount of radiation parameters and mass-energy equivalent that can be used, this is to show that, the formula used by Compton and given by Eq. (7) and Eq. (13), doesn’t mean it represents an imaginary factor of the so called quanta (photon), rather it’s just an equivalent parameters.

<table>
<thead>
<tr>
<th>Color</th>
<th>Wavelength (( \lambda ))</th>
<th>Frequency (( v ))</th>
<th>( \Delta r = \frac{1}{v} )</th>
<th>Radiation Force (( F_{rad} ))</th>
<th>Magnetic Momentum (( \rho_M ))</th>
<th>Electron Momentum (( \rho_E ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>750nm ( x10^1 )</td>
<td>4. x10^11</td>
<td>2.5 x10^{-6}</td>
<td>3.49291228535603 ( x10^7 )</td>
<td>8.73228071x10^{-15}</td>
<td>6.9489282x10^{-15}</td>
</tr>
<tr>
<td></td>
<td>620 nm</td>
<td>4.83787967419354 ( x10^4 )</td>
<td>2.66666666666667 ( x10^{-11} )</td>
<td>4.64720724499806 ( x10^9 )</td>
<td>9.60422831x10^{-25}</td>
<td>7.642802x10^{-25}</td>
</tr>
<tr>
<td>Orange</td>
<td>590 nm</td>
<td>5.084745762711864 ( x10^4 )</td>
<td>1.96666666666667 ( x10^{-11} )</td>
<td>5.06612347649391 ( x10^9 )</td>
<td>9.84537617x10^{-25}</td>
<td>7.8347014x10^{-25}</td>
</tr>
<tr>
<td>Yellow</td>
<td>570 nm</td>
<td>5.263157894736842 ( x10^4 )</td>
<td>1.9 x10^{-11}</td>
<td>5.27190154796351 ( x10^9 )</td>
<td>1.001661294x10^{-35}</td>
<td>7.9709673x10^{-35}</td>
</tr>
<tr>
<td>Green</td>
<td>495 nm</td>
<td>6.060606060606060 ( x10^4 )</td>
<td>1.65 x10^{-11}</td>
<td>6.51436031915912 ( x10^4 )</td>
<td>1.07489453x10^{-25}</td>
<td>8.535393x10^{-25}</td>
</tr>
<tr>
<td>Blue</td>
<td>450 nm</td>
<td>6.6666666666666666 ( x10^4 )</td>
<td>1.5 x10^{-11}</td>
<td>7.51555061719288 ( x10^4 )</td>
<td>1.127332593x10^{-25}</td>
<td>8.9710277x10^{-25}</td>
</tr>
<tr>
<td>Violet</td>
<td>380 nm</td>
<td>7.894736842105263 ( x10^4 )</td>
<td>1.2666666666666666 ( x10^{-13} )</td>
<td>9.68510157502454 ( x10^4 )</td>
<td>1.226779533x10^{-25}</td>
<td>9.7624013x10^{-25}</td>
</tr>
<tr>
<td>Ultras</td>
<td>360 nm</td>
<td>8.333333333333333</td>
<td>1.2 x10^{-13}</td>
<td>1.05033012927398</td>
<td>1.260396155x10^{-25}</td>
<td>1.00299139x10^{-24}</td>
</tr>
</tbody>
</table>

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**Table 3.** The color part of the light in electromagnetic radiation, giving the wavelength (λ), frequency (v), time (t), Radiation Magnetic Force (\(F_{mR}\)), the Magnetic Momentum (\(p_M\)), and the Electron Momentum (\(p_E\)) of the photoelectron is ejected by the higher magnitudes of \(p_M\) nearer the Ultraviolet.

<table>
<thead>
<tr>
<th>Color</th>
<th>Wavelength (λ)</th>
<th>Frequency (v)</th>
<th>Time (t)</th>
<th>Magnetic Momentum ((p_M))</th>
<th>Electron Momentum ((p_E))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3333333333333333</td>
<td>10^{-14}</td>
<td>310 nm</td>
<td>697266581568397 x10^9</td>
<td>1.358242993 x10^{-23}</td>
</tr>
<tr>
<td></td>
<td>6774193548387097 x10^{-15}</td>
<td>1.03333333 x10^{37}</td>
<td></td>
<td>1.31442870260491 6337866110900507 x10^{-8}</td>
<td>1.08085543 x10^{-24}</td>
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<tr>
<td></td>
<td>1.08085543 x10^{-24}</td>
<td>1.31442870260491 6337866110900507 x10^{-8}</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 3.** The three momentums in Table 2, plotted to form the Magnetic momentum (\(p_M\)) in black color obtained from the Radiation Magnetic Force (\(F_{mR}\)) using Eq. (25), the Electron Momentum (\(p_E = v \cdot m\)) in cyan color using Eq. (23), and the Compton Momentum (\(p_C\)) used by Compton in red color using Eq. (6), the slopes for both \(p_M\) and \(p_E\) varied consistently with constant difference of 12.5664 Kg.m/s, while \(p_C\) started at much lower magnitude with different slope; the threshold frequency of potassium, silver-1, aluminum and silver-2 given in Table 4, are drawn for \(p_M\) and \(p_E\) then extended to \(p_C\), thus the graphic slope \(p_E\), which is parallel with \(p_M\) is not parallel with slope \(p_C\).

**IV. The Magnetic Momentum**

The color part of visible light and the ultraviolet in electromagnetic radiation are given in Table 3, it shows the wavelength (λ), frequency (v), time (t), Radiation Magnetic Force (\(F_{mR}\)) [9], and the Magnetic Momentum (\(p_M\)), derived from \(F_{mR}\) given by Eq. (24), using Eq. (25), the variation of Magnetic Momentum (\(p_M\)) in Table 3, from 8.73228071 x10^{-24} in the red color to 1.22677953 x10^{-23} in the violet is the main factor behind the ejection of electron in the photoelectric effect as assumed by Einstein [2], while the variation of the three momentums given in Table 2, is drawn in graph and given in Fig. 3, it shows the Compton Momentum (\(p_C\)) in red color using Eq. (6), the Electron Momentum (\(p_E = v \cdot m\)) in cyan color using Eq. (23), and the Magnetic momentum (\(p_M\)) in black color using Eq. (25), other four lines representing the momentums of potassium, silver-1, aluminum and silver-2, derived from Table 3, are extended to the three slopes of \(p_M\), \(p_E\) and \(p_C\), with each related momentum, they are characterized by the follows:

1. The slopes for both the Magnetic Momentum (\(p_M\)) and the Electron Momentum (\(p_E\)) are similar, with a constant difference magnitude of 12.566370614359 Kg.m/s.
2. The Compton Momentum (\(p_C\)) is completely different; it started from lower magnitude at lower frequency, then raise sharply to high magnitude at very high frequency.
3. The threshold Frequency of potassium, silver-1, aluminum and silver-2 [24] given in Table 4, are extended from each related frequency at top to the related magnitude of the Magnetic Momentum (\(p_M\)), then to the slope of Compton Momentum (\(p_C\)), across \(p_E\).

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From Fig.3 and Table.4, the threshold frequency of potassium is \(5.5613732 \times 10^{14}\) Hz, giving Magnetic Momentum \((\rho_M)\) equal 1.02964783786 \times 10^{-23}\) Kg.m/s, while the same slope give Compton’s Momentum \((\rho_C)\) with magnitude of \(2.66666666667 \times 10^{-27}\) Kg.m/s, which is great discrepancy.

5. The same discrepancy can be stated for silver-1, aluminum and silver-2.

6. In Fig.3, the magnetic momentum obtained by potassium, which is 1.02964783785810518 \times 10^{-23}\) Kg.m/s at frequency of \(5.561373182361125469 \times 10^{14}\) Hz, can only be obtained by Compton’s Momentum \((\rho_C)\) at higher x-ray frequency of 4.6 \times 10^{19}\) Hz, as shown in Fig.3, an extraordinary difference.

7. The above 4.6x10^{19}\) Hz is a frequency in the range of the 4.237288x10^{18}\) Hz, used by Compton with wavelength of 0.708 Å.

8. The four horizontal slopes from the Magnetic Momentum \((\rho_M)\) to its magnitude are crowded, due to the acute angle of the slope, while the Compton Momentum \((\rho_C)\) slopes are wide due to great angle.

9. The Compton Momentum \((\rho_C)\) slope cross both the Magnetic Momentum \((\rho_M)\) and Electron Momentum \((\rho_E)\), and no any relation can be established except discrepancy of magnitudes.

10. The crossing of Compton Momentum \((\rho_C)\) with the Electron Momentum \((\rho_E)\) occurred at frequency \(v = 1.237 \times 10^{20}\) Hz, this is the only frequency derived by mass-energy equivalent in Table.1.

11. The crossing of Compton Momentum \((\rho_C)\) with the Magnetic Momentum \((\rho_M)\) occurred at frequency \(v = 4.8 \times 10^{18}\) Hz, as shown in Fig.3.

From past discussions and the above observations in Fig.3, the followings are extracted:

1. The \(mc^2\) in Eq. (4) is the mass-energy equivalent formula and it is not equal to the radiation energy \(hv\), except in on state, that is when mass is multiplied on square of speed of light, as shown crossing \(\rho_E\) in Fig.3, at \(v = 1.237 \times 10^{20}\)Hz.

2. Compton gave impression that, both parts of Eq. (4) equal to the radiation energy, which is not true, as shown in Table.1.

3. The mass-energy equivalent formula given by Eq. (3) doesn’t express radiation energy, given by Eq. (2), except in only one condition, therefore it will never be regarded as equal to Planck’ formula.

4. The momentum obtained using Eq.(6) is shown by pink dashed line (2.733 \times 10^{-22}\) Kg.m/s, is due to one of two:
   a. The Multiplication of mass and speed of light or
   b. The division of energy by speed of light.

Thus as given in Table.1, both parts of Eq. (6) can’t give other form of variation; hence the derived momentum is not correct.

5. Therefore, the momentum given by Eq. (13) is similar to the momentum given by Eq. (12), in that they express the momentum of the moving mass, although they are not equal, but both expressed the equivalent of momentum \(mv\) or \(mc\) with equivalent parameters of electromagnetic radiation.

6. Since Eq. (13) and Eq. (12) are similar in all aspect, they must be treated the same, this means either both momentums formulas are applicable to radiation, or both been rejected.

7. The part used by Compton in Eq. (6), \(\frac{h}{\Delta \nu}\), is energy divided by speed of light, similar to Eq. (9), which is energy multiplied by two and divided by velocity of electron.

8. The Electron Momentum \((\rho_E)\) slope shown in Fig.3, is the true representation of the momentum of electrons orbiting atoms.

9. Since the essence of momentum by Einstein is to knock electron from an atom, therefore for any momentum to knock inter-atomic electron, it must be parallel and greater than the Electron Momentum \((\rho_E)\), shown in Fig.3.

10. Therefore, the Magnetic Momentum \((\rho_M)\) slope in Fig.3, is parallel and greater in magnitude than the Electron’s Momentum \((\rho_E)\) slope, and in line with the above condition.

11. The slope obtained using Compton’s Momentum \((\rho_C)\) formula, is acute at both ends, it doesn’t resembles the Electron’s Momentum \((\rho_E)\) slope.

12. The slope of Magnetic Momentum \((\rho_M)\) is greater because it contained the excess momentum removing electron from atom.

13. The success of quantum theory of scattering only in light elements [25], and failed to resolve the heavy atoms, where recoil energy is smaller than the binding energy of scattering electron [26], can be traced to the shape of the \(\rho_C\) in Fig.3, where the slope around 1.237 \times 10^{19}\) Hz is nearly equal to \(\rho_M\).

14. If radiation contained quantum with momentum as described by Compton, the slope of such momentum will be similar to the slope of Electron Momentum \((\rho_E)\).

15. The discrepancy in Compton Secondary Electromagnetic Radiation (S-EM-R) ratio over Prime Electromagnetic Radiation (P-EM-R) at Soft X-rays (SX) which is 99% and 0.13% at end of γ-rays at 3.08 fm [25], are due to the very high forced binding energy \(B_{FEB}\), can be traced to the \(\rho_C\) slope.

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In his justification to electron’s ejection, Einstein assumed the ionization of a gas by ultraviolet light, is carried by individual light energy quantum [2], this was justified mathematically by Compton’s formula, supposing $\rho_c = \frac{h\nu}{c}$ [8], but discrepancy between theoretical candle time requirement and the observed instant electron ejection [6], is comparable to the difference between particle speed and the speed of light, indicating the existence of other factor for photoelectron ejection rather than the billiard-ball of quanta (photon), a theoretical shortage fully understood by Raman who stated that, “the classical wave-principles are not easily reconcilable with Compton effect because they have not been correctly interpreted,” [27]; thus, based on our interpretations and as explained, the Compton Momentum ($\rho_c$) slope in Fig.3, is in great discrepancy with Electron Momentum ($\rho_E$) slope, and as the Compton Momentum ($\rho_c$) slope is obtained from Eq. (6) used by Compton to derive the momentum of electromagnetic radiation, and since the role of momentum in electromagnetic radiation is to remove (knock) electron from atom; hence for any slope of momentum to have such characteristic, it must be parallel and greater in magnitude than the slope of Electron Momentum ($\rho_E$) shown in Fig.3, which includes the inter-atomic momentum of all electrons in periodic table [28], and since slope $\rho_c$ is not parallel with slope $\rho_E$, therefore the slope of Compton Momentum ($\rho_c$) in Fig.3, doesn’t represents the momentum that can remove inter-atomic electron, and since this slope is obtained from Compton formula, therefore the Compton formula is not justified, and doesn’t uphold scientific merit, therefore the formula doesn’t expressed the mechanism ejecting the photoelectron from atom, and the slope $\rho_c$ doesn’t have any relation with the Electron Momentum slope ($\rho_E$), thus whatever built upon it should be reviewed; therefore, and as stated before the Radiation Magnetic Force ($F_{mR}$) is the force embedded in the electromagnetic radiation as given by Eq.(24) [9]

$$F_{mR} = \sqrt{y v_R^3}$$

(24)

Where, $y$ is the constant of force with magnitude equal to $1.9063181614361072009999849625463 \times 10^{-64}$ N², Hz⁻³ (or N².s³.).

Although the mechanism of the Radiation Magnetic Force ($F_{mR}$) doesn’t required momentum to knock electron from the atom, as illustrated in the “Photoelectric Effects-Radiation Based With Atomic Model” [9], and “The Compton Effect Re-Visited” [10], the mechanism of which is shown in Fig.2, and since momentum $\rho = F\Delta t$, therefore from Eq. (24), the Magnetic Momentum ($\rho_M$) is given by

$$\rho_M = \left(\sqrt{y v_R^3}\right) \Delta t$$

(25)

Where, $\rho_M$ is the Magnetic Momentum due to the Radiation Magnetic Force ($F_{mR}$), as given in Tables.2, 3&4, $\Delta t = \frac{1}{\nu}$ the Electron Momentum ($\rho_E$) using Eq. (23), shown in these tables; and a comparison between both $\rho_E$ and $\rho_M$ showed the later is great by 12.566370614359172953850573533118 Kg.m/s.

<table>
<thead>
<tr>
<th>Type</th>
<th>Work Function</th>
<th>Energy</th>
<th>Frequency</th>
<th>$F_{mR}$</th>
<th>$\rho_c$</th>
<th>$\rho_E$</th>
<th>$\rho_M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>2.3 eV</td>
<td>3.68500785</td>
<td>$9 \times 10^{-19}$</td>
<td>5.56137318236111254</td>
<td>5.72625587727401</td>
<td>6.666666666</td>
<td>8.19367722 \times 10^{-22}</td>
</tr>
<tr>
<td>Silver-1</td>
<td>3.6 eV</td>
<td>4.80653199</td>
<td>$\times 10^{-19}$</td>
<td>7.25396502047101636</td>
<td>8.53023269126022</td>
<td>5.40 \times 10^{-24}</td>
<td>9.35788378 \times 10^{-24}</td>
</tr>
<tr>
<td>Aluminium</td>
<td>4.08 eV</td>
<td>6.53688350</td>
<td>$64 \times 10^{-19}$</td>
<td>9.86539242784058225</td>
<td>1.3529110402511</td>
<td>7.66667 \times 10^{-26}</td>
<td>1.09130215 \times 10^{-26}</td>
</tr>
<tr>
<td>Silver-2</td>
<td>4.75 eV</td>
<td>7.61034231</td>
<td>$75 \times 10^{-19}$</td>
<td>1.148544446157457759</td>
<td>1.699493119285</td>
<td>6.5 \times 10^{-28}</td>
<td>1.17702222 \times 10^{-28}</td>
</tr>
</tbody>
</table>

Table 4. The threshold Frequency of potassium, silver-1, aluminium and silver-2 [24], transformed into energy, frequency, the Radiation Magnetic Force ($F_{mR}$) using Eq. (24), the Compton Momentum ($\rho_c$), the Electron Momentum ($\rho_E$) and Magnetic Momentum ($\rho_M$), the table also shows the potential of the work function.

V. Results and Discussion

- In science, it is normal to postulate an idea or formula, then to build strong argument around it backed by strong evidence.
- Such as the suggestion by Planck that energy is produced in discrete quantity, composed of integer number of finite equal parts, varied with frequency $\nu = \frac{h}{c}$ [1].
- Compton used such argument to claim that electromagnetic radiation consist of quantum having momentum given by $\frac{h\nu}{c}$.
Compton was Greatly Mistaken Using the Quantum

- Compton didn’t showed in his work neither the origin of the claimed momentum of the quantum, nor how he got it [8].
- This relation is shown to emerged from Einstein mass-energy equivalent [21] as $E = mc^2 = \hbar \nu$ [22].
- The relation between both parts of this formula is shown not to be equal except at an imaginary state when the particle moves with the speed of light $c$, giving energy $E= 8.199 \times 10^{-14}$ eV and frequency $\nu= 1.237 \times 10^{20}$ Hz.
- The two parts in the formula of the momentum $\rho = mc = \frac{h\nu}{c}$ is illustrated as not equal.
- An example given by Eq. (14) contain the radiation energy $\nu \hbar$ balanced with Einstein’s mass-energy equivalent $mc^2$ in addition to other parameters, all of which resulted in Electron Momentum ($\rho_E$) given by Eq. (23).
- The three slopes in Fig.3, for the Magnetic Momentum ($\rho_M$), Electron Momentum ($\rho_E$) and the Compton Momentum ($\rho_C$), are derived, it showed great relation between $\rho_M$ and $\rho_E$, while $\rho_C$ is shown to be in odd with itself and the other two, and it can’t be relate to any momentum.
- Momentum in electromagnetic radiation must be parallel and greater in magnitude than the slope of Electron Momentum ($\rho_E$), to remove electron from atoms.
- Since the slope represented by $\rho_C$ in Fig.3, is not parallel with $\rho_E$, therefore $\rho_C$ is not momentum slope.
- The Electron binding energies for the K 1s, for Hydrogen (H 1) is 13.6 eV = 2.178961688x10$^{10}$ J and for Uranium (U 92) is 115.606 eV = 1.8522131241198x10$^{11}$ J [29], therefore the Ionization Frequency ($f_i$) which is equivalent to the binding energy [9] is 3.288464142613527419058234935068x10$^{14}$ Hz and 2.7953396005219077265268106287047x10$^{19}$ respectively, they are in line with the Electron Momentum ($\rho_E$) given in Fig.3.
- Thus, the momentum formula $\frac{h\nu}{c}$ given by Compton, upon which quantum is based, is not correct.
- Therefore, neither the scattering is a quantum phenomenon, nor the radiation quantum exists and quantum was a big mathematical flawed.
- The Radiation Magnetic Force ($F_{mR}$) is the force embedded in the electromagnetic radiation as given by Eq. (24) [9], while the Magnetic Momentum ($\rho_M$) given by Eq. (25) is the correct theoretical expression of the momentum that removed electron from atom.

VI. Conclusion

The mathematical formula of momentum in the quantum of the incident ray $\frac{d\nu}{c}$ used by Compton, to explain the Compton effect based on the quantum nature of electromagnetic radiation is disputed from its energy formula, which supposed to give the equilibrium between Einstein’s mass-energy equivalent and Planck’s radiation energy; contrary to this, both equations are found not to be equal, except at one energy state related to the value of $mc^2$, and the momentum is not equal except at $mc$ value, a formula contained mass-energy equivalent, Planck’s energy formula and other parameters is analyzed and an Electron Momentum ($\rho_E$) is derived from it, a graph is established contained three slopes of the Magnetic Momentum ($\rho_M$), Electron Momentum ($\rho_E$) and the Compton Momentum ($\rho_C$), they are compared, and great discrepancies found to exist in the Compton Momentum ($\rho_C$) slope, and a condition is established that, a momentum in electromagnetic radiation must be parallel and greater in magnitude than the slope of Electron Momentum ($\rho_E$), to remove electron from atoms, and since the slope represented by $\rho_C$ is not parallel with $\rho_E$, therefore $\rho_C$ can’t represents momentum slope, and it can’t support the idea of the existence of quantum in electromagnetic radiation, operating like billiard-ball to knock electron from atom, therefore the formula by Compton is not justified, therefore the Radiation Magnetic Force ($F_{mR}$) is embedded in the electromagnetic radiation the manner energy is [9], and a related Magnetic Momentum ($\rho_M$) is what existed, the paper is aimed at restoring the common sense to science, as its in the Universe, not as kidnapped by the mathematical description of the natural world!

Finally, although Einstein introduced quanta (photon) to solve the photoelectric effect, but this imaginary particle cost scientists a lot of mental efforts, where Einstein alone as a thinker with great consciousness spent 50 years thinking about photon in vain, he wrote before his death in 1955 that; "All the fifty years of conscious brooding have brought me no closer to the answer to the question: What are light quanta? Of course today every rascal thinks he knows the answer, but he is deluding himself." [19]

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