# Novel and Innovative Physics Equations for the Modern Era

## Part A) Photon

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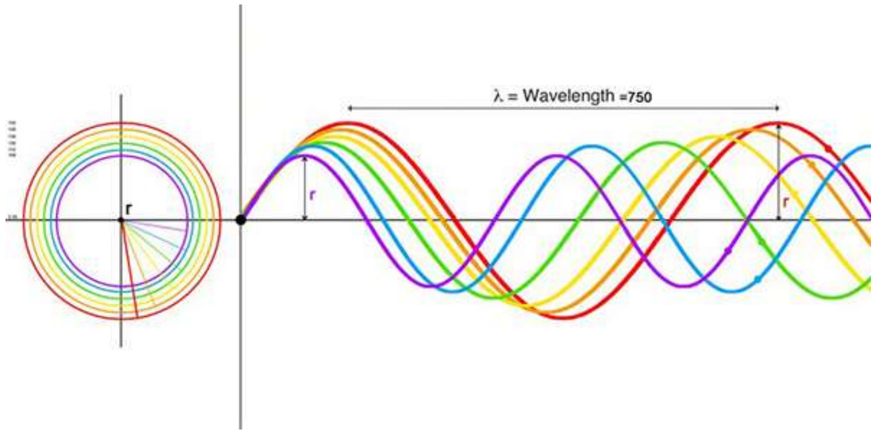
The photon is the lightest, fastest, and most agile particle known in the universe. Although it cannot be seen directly, it is the key factor behind the visibility of all objects. According to the theories proposed by the Saleh theory group, the photon can be considered the cornerstone of the universe—not only because particles such as the electron, proton, and neutron are made from photons, but also because electromagnetic waves are composed of them. Furthermore, even the nature of forces and energies is defined through the photon.

In the following, new equations presented by Saleh Theory on the nature of the photon are introduced.

### 1. Calculating the radius of the photon helical motion

Since the photon has a helical motion, the radius of rotation of the photon can vary depending on the photon's frequency, and this difference in radius causes the eye to see different colors.




To calculate the radius of gyration, we use the following equation:

Translational kinetic energy = Initial energy - Rotational kinetic energy

$$\frac{1}{2}mv^2 - \frac{1}{2}mr^2\omega^2 = h\vartheta$$

$$\Rightarrow r = (\frac{c^2}{\omega^2} - \frac{2hc}{\lambda m\omega^2})^{\frac{1}{2}}$$

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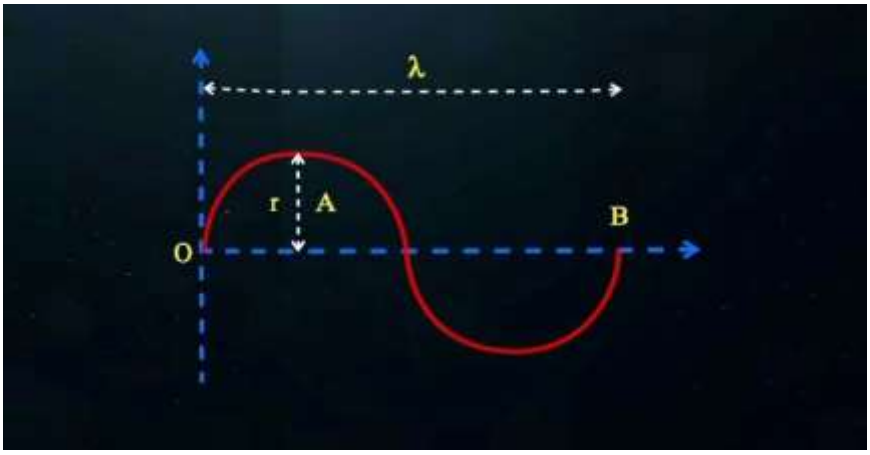
## 2. Calculating different speeds of photon (linear, wave-like and first, second and third helices)

### 2.1. The linear speed of the photon $v_l$:

The linear speed of the photon $v_l$can be calculated using the following equations:

$$v_l = \frac{\lambda}{T} = \lambda f = c$$

$$A = r = \frac{\lambda}{4}$$




### 2.2. Speed in curved path:

To calculate the wave path, or the curved path electromagnetic waves, we proceed as follows:

$$l = 2\pi r = 2\pi \frac{\lambda}{4}$$

$$V_{w1} = \frac{l}{T} = \frac{\pi}{2} C \approx 1.5C$$

Since the photon is emitted from an electron that has a rotational motion around the atomic nucleus, the emitted photon also has a helical motion.

### 2.3. Speed in first helix:

To calculate the speed of the photon in its first helix, we use the following equation:

**Resultant** velocity = **Linear** velocity + **Wave-like** velocity

$$\overrightarrow{C_{new\,1}} = \overrightarrow{V_l} + \overrightarrow{V_{w_1}}$$

$$C_{new\,1} = \sqrt{{V_l}^2 + {V_{w_1}}^2} = \sqrt{C^2 + (1.57\,C)^2} \Rightarrow$$

$$\boxed{C_{new\,1} \simeq 1.86\,C \;\simeq 5.58\; \times 10^8\; m/s}$$

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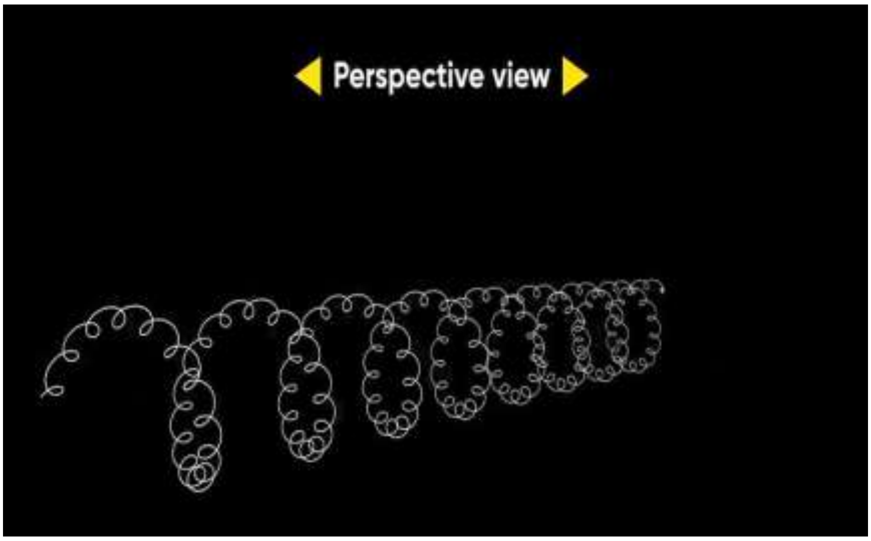
Where the ($C_{new\,1}$ is the speed of the photon in the large helix (First Helix), which is the basic and fundamental speed of photon (electromagnetic waves).

**2.4. Speed in second helix:**

Considering that the electron is rotating around the nucleus of the atom and also rotating around itself, the following figure can be considered for the photon emitted by this electron:




Considering the type of helical motion of the photon in the second helix shown in the figure above, we have:

$$l_2 = n(2\pi r_2)$$

$$n = \frac{2\pi r}{2\pi r_2} = \frac{r}{r_2}$$

$$l_2 = \frac{r}{r_2}(2\pi r_2) = 2\pi r$$

$$V_{w_2} = \frac{l_2}{T} = \frac{2\pi r}{T}$$

$$V_{w_2} = \frac{2\pi}{4}\frac{\lambda}{T} = \frac{\pi}{2}\,C$$

The resultant velocity = The sum of the velocities in the two helical paths + The linear velocity

$$\overrightarrow{C_{new\,2}} = \overrightarrow{V_{w_2}} + \overrightarrow{V_{w_1}} + \overrightarrow{V_l}$$

$$\left|\overrightarrow{V_{w_2}} + \overrightarrow{V_{w_1}}\right| = \sqrt{{V_{w_2}}^2 + {V_{w_1}}^2 + 2V_{w_2}V_{w_1}\cos(0)} = \pi\, C$$

$$\left|\overrightarrow{C_{new\,2}}\right| = \sqrt{\left|\overrightarrow{V_{w_2}} + \overrightarrow{V_{w_1}}\right|^2 + \left|\overrightarrow{V_l}\right|^2 + 2\left|\overrightarrow{V_{w_2}} + \overrightarrow{V_{w_1}}\right|\left|\overrightarrow{V_l}\right|\cos\emptyset}$$

$$C_{new\ 2} = \sqrt{(V_{w_2} + V_{w_1})^2 + V_l^{\ 2} + 2(V_{w_2} + V_{w_1})(V_l)\cos(90)}$$

$$C_{new\ 2} = |\overrightarrow{C_{new\ 2}}| = \sqrt{(\pi C)^2 + C^2} = \sqrt{\pi^2 + 1}\, C$$

$$C_{new\ 2} \simeq 3.3\ C \ \simeq 9.9\ \times 10^8\ \ m/s$$

**2.5. Speed in third helix**

The photon itself also has a rotational motion around itself, which creates a third helix. Using the following equations, this speed can be calculated

Before calculating the speed in the third helix, we first calculate the wave velocity in the third helix.

$$l_3 = n'(2\pi r_3)$$

$$n' = \frac{2\pi r}{2\pi r_3} = \frac{r}{r_3}$$

$$l_3 = \frac{r}{r_3}(2\pi r_3) = 2\pi r$$

$$V_{w_3} = \frac{l_3}{T} = \frac{2\pi r}{T}$$

$$V_{w_3} = \frac{2\pi}{4}\frac{\lambda}{T} = \frac{\pi}{2}\ C$$

$$V_{w_3} = V_{w_2} = V_{w_1} = \frac{\pi}{2}\ C$$

$$\overrightarrow{V_{w_3}} = \overrightarrow{V_{w_2}} = \overrightarrow{V_{w_1}}$$

Where “$l_3$” is the traveled distance in third helix, “ n' ” is the number of turns of photon in third helix in one period of big helix (first), “$r_3$” is the radius of third helix and “$V_{w_3}$” is the rotational speed in third helix.

Similarly, the resultant velocity of a photon ($C_{new\ 3}$) is equal to the sum of its speed in helical paths and the linear speed. Therefore, we have:

$$\overrightarrow{C_{new\ 3}} = \overrightarrow{V_{w_3}} + \overrightarrow{V_{w_2}} + \overrightarrow{V_{w_1}} + \overrightarrow{V_l} = 3\overrightarrow{V_{w_1}} + \overrightarrow{V_l}$$

$$|\overrightarrow{C_{new\ 3}}| = \sqrt{|3\overrightarrow{V_{w_1}}|^2 + |\overrightarrow{V_l}|^2 + 2|3\overrightarrow{V_{w_1}}||\overrightarrow{V_l}|\cos(90)}$$

$$C_{new\ 3} = \sqrt{(\frac{3\pi}{2}C)^2 + C^2} = C\sqrt{(\frac{3\pi}{2})^2 + 1}$$

$$C_{new\ 3} \simeq 4.82\ C \ \simeq 1.446\ \times 10^9\ \ m/s$$

In light of the calculation method where rotational speeds are summed, and their result is added to the linear speed, the following relations can be written for the resultant speed of photon ($C_{new\,m}$) in “m” helix:

$$C_{new\,m} = \sqrt{\left(mV_{w_1}\right)^2 + C^2} \simeq m\,C_{new\,1} \Rightarrow$$

$$\boxed{C_{new\,m} \simeq m\,C_{new\,1}}$$

### 3. Photon energy

One of the most important topics of photon is calculating its energy, which we have, according to the previous contents:

$$E_T = E_l + E_R$$

The final energy of the photon is divided into two parts, translational and rotational, and the final energy is equal to the classical kinetic energy of the photon, which is obtained from the following formula:

$$E_T = \frac{1}{2}m_p{V_T}^2 = \frac{1}{2}m_p(3.3C)^2 \approx 5m_p(C)^2 \Rightarrow E_T = 5m_pC^2$$

This energy consists of two parts: rotational energy of photon $E_R$, which depends on the constant angular velocity and the variable rotational radius

The rotational energy of a photon, according to the articles of Saleh Theory, is obtained from the following equation:

$$E_R = \frac{1}{2}m_pr^2\omega^2$$

To calculate the photon translational energy:

$$E_l = \frac{1}{2}m_p{v_l}^2 = h\vartheta$$

### 4. Planck-Saleh equation

$$E_T = E_l + E_R = constant$$

$$\frac{1}{2}m_pr^2\omega^2 + h\vartheta = \frac{1}{2}m_p(3.3C)^2$$

$$5m_p(C)^2 - \frac{1}{2}m_pr^2\omega^2 = h\vartheta$$

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Now, we divide the first equation by the constant ET

$$\frac{E_T}{E_T} = \frac{E_R}{E_T} + \frac{E_L}{E_T}$$

We define the two variable parameters as follows:

$$i_R = \frac{E_R}{E_T}$$

$$i_L = \frac{E_l}{E_T}$$

The following result can be derived from the above equations:

$$i_R + i_L = 1$$

$$E_R = \frac{1}{2} m_p r^2 \text{w}^2 = i_R E_T$$

$$E_L = \frac{1}{2} m_p {v_l}^2 = h\vartheta = i_L E_T$$

$$E_T = \frac{1}{2} m_p r^2 \text{w}^2 + h\vartheta = i_R E_T + i_L E_T$$

Considering the frequency range of visible light, it can be said that in the frequency range of 300 THz to 900 THz, the range of $i_R$ *and* $i_L$ will be as follows:

$$300THZ \leq f \leq 900THZ$$

$$\frac{1}{4} \leq i_L \leq \frac{3}{4}$$

$$\frac{3}{4} \geq i_R \geq \frac{1}{4}$$

In fact

$$i_L = \frac{f(THZ)}{1200}$$

$$E_l = i_L E_T = i_L (8 \times 10^{-19}) = h\vartheta$$

$$S = \frac{1}{2} m_p (3.3C)^2 = 8 \times 10^{-19} j$$

We call the constant value the Saleh constant "S" and rewrite the above equation as follows:

$$Si = h\vartheta$$

This equation is called the Planck-Saleh equation, where S is the Saleh energy constant and i is a variable coefficient equal to i of L and indicates the variations in translational energy

## 5. External and Internal Energy of Photon

According to the final speed of photon which is about 4.8 C, the external energy of photon is obtained from the following equation:

$$E_k = \frac{1}{2}m_p V^2 = \frac{1}{2}m_p(4.82\ C)^2 \simeq \frac{1}{2}m_p(5\ C)^2 = 12.5M_p\ C^2 = 2 \times 10^{-18}J$$

According to the articles from Saleh Research Group, the photon is composed of smaller particles called Cidtonium, and when a photon decays, the speed of these particles is equal to the final speed of the photon.

So, the internal energy equals:

$$E_{in} = \sum_{i=1}^{n} \frac{1}{2}M_{cid}(V_{cid})^2 = \sum_{i=1}^{10^9} \frac{1}{2} \times 10^{-9}M_p(4.82\ C)^2 = \frac{23.6}{2} \times M_p\ C^2 \simeq 2 \times 10^{-18}J$$

Just as a photon has various types of velocity (linear, wave-like, rotational, etc.), Cidtonium can also assume different velocities, and according to the internal structure of photons, different energies can be considered for it.

## 6. Introducing Photon as the Basis and foundation of Quantum

We can define a basic unit for energy. We can consider photons, because, as shown and proven in the previous articles, photons have a constant speed, a specific mass, and unique properties.

Properties of the Photon:

* Constant mass ($m_p = 1.64 \times 10^{-36}kg$)

* Constant total speed ($V_T = 3.3\ C$)

If we consider the energy of a photon as the smallest unit of energy, we have:

$$E_q = E_p = \frac{1}{2}m_p {V_T}^2 = \frac{1}{2}m_p(3.3\ C)^2$$

$$E_q = S = 8 \times 10^{-19}J$$

Given the constancy of this obtained value, it can be considered as the basic and fundamental energy for quantum.

## 7. Experiments of Michigan university and MIT on electromagnetic waves energy at short distances

According to the experiments conducted by the University of Michigan and MIT on the energy of electromagnetic waves at short distances and observing that the amount of energy calculated by Planck's law is not equal to the amount of energy obtained via their experiments, Sale Research Group has presented the following formula to solve this problem.

According to the Saleh equation, we have:

$$\frac{1}{2}mv^2 - \frac{1}{2}mr^2\omega^2 = h\vartheta$$

But at time close to zero (t=Ɛ):

$$E_R = \frac{1}{2}m_p r^2\omega^2 = 0$$

Given that the final speed of the photon is 4.8 C, by putting this speed in the photon kinetic energy equation, we have:

$$\xrightarrow{t=\varepsilon} \quad E_0 = \frac{1}{2}mv^2 = \frac{1}{2}m\,(C_{new\,3})^2$$

$$E_0 = \frac{1}{2}(2.6 \times 10^{-36})(4.82\;C)^2$$

$$E_0 \simeq 2.72 \times 10^{-18}\,j$$

The calculated energy amount is consistent with the results of the laboratories at MIT and Michigan Universities, and the reason for the difference with Planck's equation is that at short distances, energy has not yet been consumed in the photon's rotation, and the energy obtained is greater than Planck's energy.

## 8. Calculating the angular and tangential speed of photon

To calculate the constant angular velocity (ω) by equating the translational and rotational energy at a frequency of 600 THz. Subsequently, considering the constancy of the angular velocity across all frequencies, we derive a formula to calculate the radius of the rotation of photons (r) in terms of the variable coefficient of rotational energy ($i_R$). Finally, we calculate the rotational radius for several frequencies within the range of visible light.

$$if\ \ f = 600THz \Rightarrow\ E_R = E_L \Rightarrow$$
$$\frac{1}{2}m_p {v_R}^2 = \frac{1}{2}m_p {v_L}^2 \Rightarrow {v_R}^2 = {v_L}^2 \Rightarrow$$
$$v_R = v_L \Rightarrow \frac{a_R}{T} = \frac{a_L}{T} \Rightarrow$$
$$a_R = a_L = a$$

Where $a_R$ is the amplitude of rotational motion and $a_L$ is the amplitude in linear motion. The rotational radius is the vector sum of these two perpendicular quantities. Therefore, we have:

$$r = \sqrt{{a_R}^2 + {a_L}^2} = \sqrt{a^2 + a^2} = \sqrt{2}\,a$$

At a frequency of 600 THz, the linear amplitude is one-quarter of the wavelength, so we have:

$$\lambda_G = 5 \times 10^{-7}\ m$$
$$a = \frac{\lambda}{4} = \frac{5 \times 10^{-7}}{4} \Rightarrow a = 1.25 \times 10^{-7}\ m$$
$$r_G = \sqrt{2}\,a = 1.76 \times 10^{-7}\ m$$

Now, with the rotational radius for green light at a frequency of 600 THz, we calculate the constant angular velocity of photons:

$$if\ \ f = 600THz \Rightarrow\ E_R = E_L \Rightarrow$$
$$\frac{1}{2}m_p r^2 \omega^2 = h\,f \Rightarrow \omega = \sqrt{\frac{hf_G}{\frac{1}{2}m_p {r_G}^2}} \Rightarrow$$
$$\omega = \sqrt{\frac{6.62 \times 10^{-34} \times 6 \times 10^{14}}{\frac{1}{2} \times 1.64 \times 10^{-36} \times (1.76 \times 10^{-7})^2}} \Rightarrow$$

$$\omega \simeq 4 \times 10^{15}\ {}^{rad}/_{s}$$

Using the obtained angular velocity, for the rotational radius of photons, we have:

$$E_R = \frac{1}{2}m_p r^2 \omega^2 = Si_R \Rightarrow r^2 = \frac{2Si_R}{m_p \omega^2} \Rightarrow r = \frac{3.3C\sqrt{i_R}}{\omega} \Rightarrow$$

$$r = 2.475 \times 10^{-7}\sqrt{i_R}\ \ m$$

Finally, we calculate the linear and rotational velocity for the frequency f = 600 THz, where $E_R = E_L$ .

$$if\ \ \mathrm{f}\ =\ 600\ \mathrm{THz} \Rightarrow$$

$$E_L = \frac{1}{2} m_p {v_L}^2 = h\,f \Rightarrow v_L = \sqrt{\frac{2h\,f}{m_p}}$$

$$v_L = 6.97 \times 10^8 \; {}^{m}/_{s}$$

On the other hand, for the rotational speed, considering the rotational radius $r_G = 1.76 \times 10^{-7}$ and $\omega = 4 \times 10^{15}$ so:

$$v_R = r\omega = 1.76 \times 10^{-7} \times 4 \times 10^{15} = 7 \times 10^8 \quad {}^{m}/_{s}$$

**Conclusion**

Equations proposed by the Saleh group present a new and more complex picture of the photon's structure—one in which helical motion, internal energies, and rotational dynamics play a central role. This innovative perspective provides a foundation for re-evaluating fundamental equations and redefining the interactions between quantum and relativistic theories, opening new horizons in theoretical physics.

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