Novel Arithmetic Equations for Mass Energy Equivalence, Newton's Rings Radius, Wavelength and Speed of Light, Fine Structure Constant and Ideal Gas Law Correlated with eπ Based on Sayed's Theorem

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Abstract

Many proved scientific facts are mentioned in the generous Quran. This article introduces revisiting, revising and rewriting of well-established equations and laws of different applied fields of science and engineering. The eπ has been correlated with the mass energy equation of special relativity, fine structure constant, Newton`s rings radius, light wavelength, speed of light and ideal gas law. The correlated formulas were achieved based on the published Sayed`s equations and theorem. The fine structure constant was calculated and compared with a published value with 8.6435×10^{-5} discrepancy percentage. The novel deduced equations/formulas can be considered as confident mathematical expressions to be parallel used in the abovementioned and other scientific fields.

Keywords: Novel derivations and formulas, Sayed`s theorem, eπ correlation.

I.   Introduction

The fundamental and well-established equations and laws have been used and applied long time ago (1,2,3,4). Revisiting of these formulas should be carried out taking into consideration their probable correlation with the other universal constants and theorems (5,6,7,8,9). Modern physics began in 1900 with max planck`s discovery of the role of energy quantization in black body followed by relativity and quantum theory of light (2).

This article introduces revised novel formulas for well-established laws and theories in correlation with the eπ using Sayed El mongy's theorem.

II.   Rephrasing and Derivation of Novel Formulas

II.1. Special Relativity Formula

Einstein special relativity; 1905, with its famous mass energy mutuality/equivalency equation; $E = mc^2$, was proved and elucidated in different applications (1,2). Recent work carried out by the author merged classic mechanics; special relativity and quantum field theory found and deduced a new reading to this formula (5). Our work concluded and proved an outstanding expression and formula expecting higher speed of light to keep mass-energy equivalence as seen from the following equation (5):

$E = 1/8 \ mc^2$ **(1)**

This formula shows and necessitates considering higher speed of light value to keep the correctness of mass-energy mutuality of Einstein`s theory. Taking into consideration Sayed`s theorem (6), equation 1 can also be correlated with eπ as follows:

$E = (1.0688/e\pi) \ mc^2$ **(2)**

This is unusual reading to mutual transformation of mass-energy expression. The Einstein`s famous equation; $E = mc^2$, can also be expressed in term of eπ as,

$E = (8.53973/ \ e\pi) \ mc^2$ **(3)**

Where, the eπ equals 8.53973 and of course the ratio $(8.53973/ e\pi)$ equals unity.

II.2. Fine Structure Constant

Relativistic effects lead to small splitting of the atomic energy levels called fine structure. The fine structure; by Sommerfeld 1916, is produced when an atom emits light in making the transition from one energy state to another. The split lines arise from the interaction of the orbital motion of an electron with the quantum

mechanical "spin" of that electron. The concept of fine structure constant (**α**) that led to explanation of relativistic orbital splitting can be simply given as (1,10)

$$\alpha = (1/4\pi\varepsilon_0 . e^2 / \hbar c) \tag{4}$$

Where, the numerical dimensionless α is (1/137.035999) and equals to (0.0072973525668), e is the electron charge, ε_0 is the electric constant (vacuum permittivity), $\hbar$ is the reduced plank constant and c is the speed of light in vacuum (Einstein equation). This value can also be correlated with eπ as follows:

$$\alpha = (e\pi/1170.25) = 0.0072973588743 \tag{5}$$

The % discrepancy between our correlated value and the published one is 8.643×10^{-5} (Table 1).

Table 1: Comparison of the published fine structure constant with Sayed`s theorem value

Item	Published	Sayed`s theorem	% uncertainty
Fine structure constant	0.0072973525668	0.007297358874	8.643×10^{-5}

The fine structure constant is also expressed as; $\alpha = 2\pi k e^2 / hc$, where k is the Coulomb`s constant and h is the Planck`s constant. The diagram of hydrogen atom splitting is shown in Fig.1. (11)
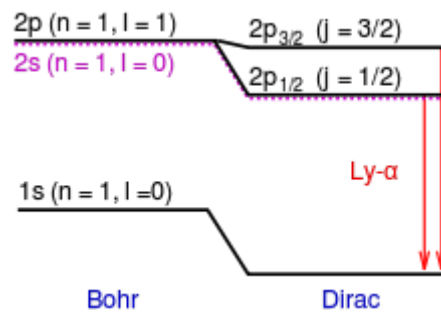

Fig.1: Fine structure – Splitting of orbital (11)

Relativistic corrections (Dirac) to the energy levels of a hydrogen atom from Bohr's model. The fine structure correction predicts that the Lyman-alpha line (emitted in a transition from n=2 to n=1) must split into a doublet (11).

As stated by Richard P. Feynman1985 (12), there is a most profound and beautiful question associated with the observed coupling constant, *e* – the amplitude for a real electron to emit or absorb a real photon. It is a simple number that has been experimentally determined to be close to 0.08542455. (My physicist friends won't recognize this number, because they like to remember it as the inverse of its square: about 137.03597 with about an uncertainty of about 2 in the last decimal place. It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it. Immediately you would like to know where this number for a coupling comes from: is it related to pi or perhaps to the base of natural logarithms? Nobody knows. It's one of the greatest damn mysteries of physics: a magic number that comes to us with no understanding by man. You might say the "**hand of God**" wrote that number, and "we don't know how He pushed his pencil." (12).This constant can also be expressed as given in Feynman`s text;

$$e = 1/\sqrt{137.03599} = 0.08542455 \tag{6}$$

In this frame and in comparison with R. Feynman statement, the coupling constant (e) can also be given using Sayed`s theorem as follow:

$$e = e\pi/100 = 0.08539734 \tag{7}$$

The difference between the value given in the previous text (12) and the value given by equation **7** of Sayed`s correlation is in the order of 0.067% only (Table 2).

Table 2: Comparison of coupling constant calculated by Sayed`s theorem and a published value

Item	Published(12)	Sayed`s theorem	% uncertainty
Coupling constant	0.08542455	0.08539734	0.067

II.3. Newton Ring Formula

Newton`s ring, introduced in1666, is a phenomena in which an interference pattern is created by the reflection of light between two surfaces; a spherical surface and an adjacent touching flat surface. They are formed as a result of interference which is between the light waves that are reflected from top and bottom surfaces of air film formed between the lenses and glass sheet. The thickness of the film is constant over a circle (or concentric circles) having center at the center of the lens. This phenomenon became a source of dispute between Newton, who favored a corpuscular nature of light, and Robert Hooke, who favored a wave-like nature of light (4). Figure 2 shows the Newton`s rings interference pattern
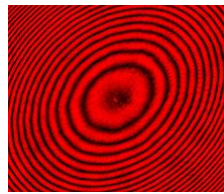

Fig.2: Newton`s Rings interference pattern (4).

For illumination from above, with a dark center, the radius (r_N) of the Nth bright ring is given as (4).

$$r_N = [R\lambda (N-1/2)]^{1/2} \tag{8}$$

Where N is the bright-ring number, R is the radius of curvature of the glass lens the light is passing through, and λ is the wavelength of the light. The above formula is also applicable for dark rings for the ring pattern obtained by transmitted light.

Based on correlation of $e\pi$ as a function in circle radius using Sayed`s theorem published in reference (6);

$$L_A = e\pi\, r\, (\Theta /10\phi) \tag{9}$$

By substituting equation 9 in 8, supposing that the curvature R equals the arc length L_A, one gets;

$$r_N = [\lambda\, e\pi\, (\Theta /10\phi)\, (N-1/2)]^{1/2} \tag{10}$$

The light wavelength λ can also be deduced by rearrangement of equation 10 to be:

$$\lambda = \{10\, \phi\, (r_N)^2 / e\pi\, r\, \Theta\, (N-1/2)\} \tag{11}$$

$$\lambda = \{10\, \phi\, r_N / e\pi\, \Theta\, (N-1/2)\} \tag{12}$$

The energy of photon (quanta) as given by Planck with frequency and wavelength relation (1, 2) is;

$$E = h\nu = h\, c/\lambda \tag{13}$$

So, the energy of light can also be deduced by substituting equation 12 in equation 13:

$$E = hc\, \{e\pi\, \Theta\, (N-1/2)/ 10\, \phi\, r_N \} \tag{14}$$

By rearrangement of equation 14, the following equation will be obtained to calculate speed of light (c) taking into consideration;

$$C = E/h\, [10\, \phi\, r_N / e\pi\, \Theta\, (N-1/2)] \tag{15}$$

Using equation number 15, the speed of light can be verified and calculated based on Newton`s rings experiment and Sayed`s theorem.

II.4. Ideal Gas Law

The ideal gas law, by Benoit in1834 as combination of empirical laws, is one of the wonderful scientific law correlating pressure (P) and absolute temperature (T) with volume (V) and amount of substance of gas in moles (n) as follows (3):

PV = nRT   **(16)**

Where, R is the universal or ideal gas constant (J mole/k). This law can be expressed using eπ for spherical volume based on Sayed`s theorem applications (7) to determine pressure and temperature as follows:

P = (nRT/ V) = nRT/ 0.49 eπ r^3   **(17)**

T = (PV/nR) = 0.49 Peπr^3 / nR   **(18)**

These two equations are also outstanding expression for pressure and temperature of gas correlated with eπ term.

Conclusion

By revisiting of the well-established scientific equations and law, it can be stated that the correlation of eπ with Einstein `s mass-energy, Newton's rings radius, wavelength of light, speed of light, fine structure constant and ideal gas law were found , derived and formulated based on Sayed`s theorem. These innovative formulas are considered as non-traditional and outstanding novel expressions.

Conflict of interest

There is no any conflict of interest with any one.

Acknowledgment

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Biography

Prof. Sayed Ali El-Mongy is currently working as a nuclear affairs consultant and scientific supervisor. He worked in the United Arab Emirates (UAE) – Armed forces for more than 8 years. He participated in meetings with the national, regional and international community (e.g. IAEA, USA. EU and Arab states league) in the field of nuclear safeguards and security. Revolutionary theories and formulas have also been published by him. Antineutrino detection system was proposed by him based on fission probability of ^{210}Po.