The Speed of light
A Fundamental Retrospection to Prospection

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Abstract: Speed of light can not be achieved independently by any Body even a Photon, unless it has a source, a thrust of that speed. Further, no amount of radiation or light form can be produced *freely*, unless some amount of (mass) rest energy is converted to dynamic liberated energy. With the investigation of above query and retrospection in mass- energy relation, a paradigm shift in understanding fundamental nature of Energy and Universe is presented. [Narendra Katkar. **The Speed of light - A Fundamental Retrospection to Prospection.** Journal of American Science 2011;7(5):113-127]. (ISSN: 1545-1003). http://www.americanscience.org.

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Introduction

Physics is a natural science and attempts to present general analysis of nature; carried out with the purpose to understand how the universe works. (Feynman, Leighton, Sands (1963), Maxwell (1878), Young, Freedman (2004), Holzner (2006).

Philosophy of physics is the examination of the fundamental aspects of physical world and philosophical questions are primary in modern physics, with it the understanding of matter and energy and their interactions. (Bohr, (1958), Penrose (2004), Butterfield, and Earman, (2007), Craig, and Nick, (2001), Deutsch, (1997), d'Espagnat, (1989, 1995, 2006), Bohm, (1980), , Lawrence, (1992), Stenger, (2000), Weizsäcker, (1980), Rosenberg, (2006), Godfrey-Smith (2003), Godfrey-Smith (2003).

Many physicists, Laplace, Erwin Schrödinger, Roger Penrose, Stephen Hawking, have expressed ideas concerning the philosophical inferences of their work, Hawking calls himself as an "unashamed reductionist" and discusses the subject with Penrose's views. (Laplace, (1951), Schrödinger, (1983, 1995), Hawking and Penrose (1996), Penrose, (2004), Penrose, Shimony, Cartwright, Hawking (1997).

After foundation of Quantum Mechanics, mathematical formulations has been of ever increasing applications in theoretical work and now accepted as Mathematical physics. (Geroch, (1985), Szekeres, (2004), Yndurain, (2006), Aslam, Hussain, (2007). Although, it was much earlier articulated, that mathematics does not thoroughly describe the nature of Reality.

Albert Einstein, *"as far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality."* See note.

The scientific community has responsibility to communicate to citizens of the world and the governments, the exact nature of fundamental features of their work and must enlighten all, of any uncertainty about cognizance of the phenomenon.

The following article of fundamental physics is an attempt to communicate to specialists, students, experts of other fields, governments and the citizens, the basic aspects of Energy and Universe, in an unambiguous language.

The Speed of light

"... *The most accurate standard for the meter is conveniently defined so that there are exactly 299,792,458 of them to the distance travelled by light in a standard second...*" (Penrose, R. 2004, pp 410–1).

This is approximately 186,282 miles or 299792.458 km per second in vacuum.

Speed of light had historical investigations, which are the basis of scientific endeavors of individuals, concerning one of the most influential branches of physics, the light. (Galilei, G (1954) [1638], Rømer, O (1676), Newton, I (1704), Halley, E (1694), Fizeau, HL (1849), Foucault, JL (1862), Michelson, AA (1878), Newcomb, S (1886), Perrotin, J (1900), Michelson, AA; Pease, FG; Pearson, F (1935), Froome, KD (1958), Brillouin, L (1960), Evenson, KM; *et al.* (1972), Jackson, JD (1975).

Finally, the velocity of light in meters was determined by International Bureau of Weights and Measures (2006).

The question, never asked, is, *"How the light achieves such a speed? What is the source of that speed?"*

Einstein illustrated the equivalence of mass and energy. (Einstein, 1923, [1919] 1982). According to Einstein's equation $E = mc^2$, the energy E of a body is quantitatively equal to the product of its mass m and the speed of light c squared, or all mass has energy equal to its energy content. We might simply say all Mass is Energy. Or again, in relativity, rest mass is proportional to a body's rest energy, E=m, meaning the rest mass is the energy in the rest frame. (Flores, F. 2005).

The general illustration of Einstein's equation is in the interaction of sub-atomic particles. When an electron interacts with a positron, both particles are entirely annihilated; in reality, their mass is converted into a pair of gamma ray photons (Dirac, 1928, 1930, 1931).

This conversion of mass of electron e^- and positron e^+ into two photons is emblematically written as:

$$e^- + e^+ \rightarrow \gamma + \gamma$$
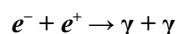
The overall energy of the two photons is equal to the amount of the (theoretical) kinetic energies of the electron and positron in addition the sum of the rest-masses of the two particles, multiplied by c^2. This raises many questions.

c^2 is a quantity, can be calculated in joules. $c^2 = (299,792,458$ m/s$)2 = 89,875,517,873,681,764$ J/kg ($\approx 9.0 \times 1016$ joules per kilogram).

"C" is also a symbol for light speed, which is 299792.458 km per second in vacuum. When this quantity is applied to "mass", it becomes messy.

Historically, many thinkers were involved in conceptualizing the mass – energy relation; S.Tolver Preston in 1875 gave Eα Δ mc2, (Preston, 1875), Poincarè in 1900 said mv = (E/c2)c, Poincaré, H. (1900), **Olinto** De Pretto who speculated E=mc2 in 1903-1904 (Pretto, 1904; Bartocci, 1999), Fritz Hasenőhrl in 1904 m= 4E/3c2 (Hasenöhrl, F. (1904), Einstein in 1905, 1923, Δm=L/c2 (Einstein in 1905, 1923), Planck, M, 1907. m-M = E/c2 in which the mass increased by absorbing heat (Planck, 1907, 1908), finally, the equation E = Mc**2** remained in Einstein's name.

Above interaction $e^- + e^+ \rightarrow \gamma + \gamma$ is instantaneous. The interacting particles have no net linear momentum before the interaction. This interaction achieves velocity "c" by self inter-acceleration, equal to c in a Planck time, symbolized as *tp,* which is $10^{-44.}$ Sec. (Plank Time: 2005) and the emitted photons have the speed of light.

Paul Dirac, theorizing electron-positron annihilation said, *"Such process is spontaneous, i.e. it occurs necessarily for any pair of electron and positron independently of their energy. The process does not need any previously existing radiation."* (Dirac, 1930, Heitler, 1954).

If there is no previously existing radiation and no net linear momentum with the pair electron-positron, then what is the real rest energy of electron and positron without association of kinetic energy?

"S*pontaneous*" because of particle's intrinsic attributes which are of opposite nature. Once the particles come in contact, there is nothing to hold back, neither any acceleration required.

In fact, this is an inverse interaction of negation of quantum attributes. Particles negate their charge, magnetic moment and angular momentum devoid of kinetic energy. The canceling of quantum attributes leads to the conversion of rest energy into active liberated Energy.

The Planck time, *tp* is$10^{-44.}$ Sec, where light travels in a vacuum at a distance of 1 Planck Length *lp*, which equal to $1.616252(81) \times 10^{-35}$ meters. Classical electron radius is r_e = .817 940 2894 x 10^{-15} m. The negation interaction of above particles has same radius each, the cancellation of the same occurs in a Plank time, *tp,* in Dirac's expression, "*spontaneous*".

Application of the Plank time was also conceptualized by Stephen Hawking (1974-1975)**,** who hypothesized the Evaporating Black Holes by particle pair annihilation.

c^2 is an imaginary quantity and has nothing to do with velocity in practical term, neither the quantity is exact, when applied with assumptions of mass increase. The real energy liberated from a mass is always equal to its natural energy content at rest.

$E = mc^2$ suppose to give estimation of energy out put. Example one gram of mass will generate energy out put equal to 21kt of TNT. This is based on calculation: **$c^2 = (299,792,458$ m/s$)^2 = 89,875,517,873,681,764$ J/kg ($\approx 9.0 \times 10^{16}$ joules per kilogram).**

Is c^2 a conversion factor? This has gone terribly wrong.

The physicist at the Manhattan Project participant Serber, Robert, (1992) said: *"Somehow the popular notion took hold long ago that Einstein's theory of relativity, in particular his famous equation $E = mc^2$ plays some essential role in the theory of fission… but his theory of relativity is not required in discussing fission. The theory of fission is what physicists call a non-relativistic theory, meaning that relativistic effects are too small to affect the dynamics of the fission process significantly."* (See also Note: Conversions used)

SLAC: *"Look at an example of how this energy unit works. The rest mass of an electron is 9.11 x 10⁻³¹ kg. Using E = mc2 and a calculator we get:*

E = 9.11 x 10⁻³¹kg x (3 x 108 m/s)2 = 8.199 x 10⁻¹4 joules, convert the joules to electron volts. This gives the mass of an electron as 0.511 MeV (about half a million eV). So if you ask a high energy physicist what the mass of an electron is, you'll be told the answer in units of energy. You can blame Einstein for that!" (Special Relativity: SLAC).

This is not science.

Laboratory produced Positron was having only 85 eV kinetic energy and detected electron–positron pairs from a surface on which the low energy positron beam was impacted, confirmed energies of pair particle Ee+ + Ee−, in the range of 30 to 90 eV only. (Van Riessen et al. 2008)

Above induced positron and produced pair are not at rest.

A Laboratory produced Positron can have an energy of just 85 eV and by multiplying with the uncertain factor "c2", the rest energy of same particle, without linear momentum, suppose to be 511 keV. Indeed, this is a clear case of incongruity. Fundamentally, what are we calculating?

We neither have real rest energy of an Electron or Positron, nor do we have the particle at the speed of light to measure its total energy.

Extraordinary conclusion was drawn on the basis of the energy of motion W of an electron by Einstein, with equation:

$$\mathbf{W} = \int \epsilon \mathrm{X}\, dx = m \int_0^v \beta^3 v\, dv$$
$$= mc^2 \left\{ \frac{1}{\sqrt{1 - v^2/c^2}} - 1 \right\}.$$

Einstein said: *"Thus, when v = c, W becomes infinite. Velocities greater than that of light have--as in our previous results--no possibility of existence. This expression for the kinetic energy must also, by virtue of the argument stated above, apply to ponderable masses as well."* (Einstein, 1905).

The fallacy is mass approaches infinity as the velocity v approaches the speed of light c. In other words, it will require infinite energy to move a body at the speed of light c. (Okun, 2009).

We use special relativity with the misconstrued idea of mass increase, which gives numerical value drawn from c2 quantity to measure a particle mass, because it is impossible to evaluate mass of an immobile electron, so the measurements are carried out on electrons in motion or for that matter, all measurements on all particles are carried out with the same method of erroneously conceived relativistic mass.

The values of Planck constant, the fine structure constant and the Rydberg constant are applied to calculate the electron rest mass in kilograms (Mohr, et al. 2008).

As early as in 1938, the experiments conducted on electron deflection by magnetic and electric application, confirmed no significant distinction in mass. (Zahn and Spees, 1938)

Mass of Electron does not increase with velocity.

This implies that if mass does not increase as the velocity v approaches the speed of light c, then very fundamental basis of *'kinetic energy'* is also questionable.

Foundations of the concept of kinetic energy established by Gottfried Leibniz and Johann Bernoulli, who described kinetic energy as the living force, vis viva. Willem's Gravesande of the Netherlands provided experimental evidence of this relationship (Zinsser 2007). Gaspard-Gustave Coriolis, in 1829published the paper titled Du Calcul de l'Effet des Machines, resented the mathematics of kinetic energy. William Thomson, later Lord Kelvin, is given the credit for coining the term "kinetic energy" c. 1849 - 1851. (Smith and Wise. 1989, Merz 1912).

According to Newtonian kinetic energy in classical mechanics, the kinetic energy of an object is related to its momentum by the equation:

$$E_k = \frac{p^2}{2m}$$

Relativistic kinetic energy, according to Einstein's theory, when a body's speed is a significant fraction of the speed of light, the calculation of its kinetic energy is given by:

$$p = \frac{mv}{\sqrt{1 - (v/c)^2}}.$$

And the effort exhausted accelerating an object from rest to a relativistic speed is:

$$E_k = \frac{mc^2}{\sqrt{1 - (v/c)^2}} - mc^2.$$

This equation shows that the energy of a body come close to infinity as the velocity *v* approaches the speed of light *c*.

A particle of mass **m** traveling at speed *v* has kinetic energy is: $E_k = \frac{1}{2}mv^2$.

The objects comprising many particles, the kinetic energy is the sum of the kinetic energies of the particles of the compound system.

The pertinent question is, "Is there, in real terms, a quantity called Kinetic energy?" Or is it only a *transfer of velocity* by exhaustion or dispersal of energy in surrounding by the system in momentum?

The measure of a unit of momentum, in high-energy physics, in electron-volt is regularly used. A potential difference of one Volt causes an electron to put on a separate quantity of energy, kinetic, which is one eV.

In other words, the electron volt is a unit of energy equal to roughly $1.602 \times 10^{-}19$ Joule, which is equal to the amount of kinetic energy suppose to gain by a single released electron accelerated through an electric potential difference of one volt.

This misconstrued rise of energy is applied in terms as eV, keV, MeV, GeV, TeV, and some day in future in PeVs, as units of momentum calculated as increase of energy resulting from acceleration of the particle.

It is extremely misleading with misrepresented theory of mass increase by calculating the (mass) unknown rest energy of a particle in momentum, multiplied by imaginary increase of energy (or mass) with the term "kinetic energy" and again multiplied by imaginary quantity c2.

In fact, the body with momentum is releasing energy called "kinetic energy".

An accelerated quantum is radiating, there by dissipating its rest energy.

A body of about 102 grams, moving one meter releases 1 joule of energy.

Even human body at rest releases 1 joule of energy in a hundredth of a second in the form of heat.

A 50 kg mass moving at 720 meters per hour emits 1 joule of energy.

A tennis ball moving at 23 km/h also releases 1 joule of energy. (Ristinen & Kraushaar 2006).

Hence the term: **m = E/c2**

This also means:
Heavier elements become lighter by conversion of partial rest energy to radiation.

Retrospection:

Poincaré observed that the action/reaction theory applies for matter and the electromagnetic field, which has its own momentum. He called this, electromagnetic field energy a fictitious fluid ("fluide fictif") with a mass density of **E / c²** (**m = E/c²**). Einstein's showed that a body losing energy as radiation or heat was losing a mass of the amount **m = E / c².** (Poincaré, 1906, Darrigol, 2005).

In his famous 1905 paper '*DOES THE INERTIA OF A BODY DEPEND UPON ITS ENERGY-CONTENT?*'

Einstein said: **"If a body gives off the energy L in the form of radiation, its mass diminishes by L/c². The fact that the energy withdrawn from the body becomes energy of radiation evidently makes no difference, so that we are led to the more general conclusion that. The mass of a body is a measure of its energy-content…"**

Now known as **m = E/c²**

Hindsight, in above equation, emitted energy E is mass m. Whatever the amount of energy E is, it is, indeed converted form of mass.

The speed of light

Above equation, **m = E/c²,** the emitted energy E is in fact the converted E, can be a photon and photon is having the velocity **c** and has the source, the **mass**. Hence, the energy of photon is equal to energy of converted mass; so also, the velocity of photon is achieved at the source, i.e. **at the moment of conversion of mass into energy.**

Therefore, E = mc, with it m = E/Eo, means without total rest energy Eo at velocity c and velocity c = E/m is the converted state, in first and last expression c is a **conversion factor, not a numerical multiplication factor.**

The quantity of E depends on energy content of transformed rest energy.

The "c2" factor is redundant and must be eradicated from all applications.

E = Mc
M at the speed of light **c** is Energy **E.**
The "c" is not a numerical factor. It is felicitator of conversion.

Consequently, each (mass) energy packet can be converted to electromagnetic energy at the speed of light.

Application of algebraic symbols and numerical values are completely misleading. There are umpteen numbers of possibilities of energy emission of multiple frequencies, correspondingly large number of opposite fractional charge emissions.

This is elucidated in later sections.

If correctly understood, in above described negation interaction, the total mass of e^- and e^+ is converted into energy when the interaction reaches velocity of light. Otherwise the total (mass) energy content should never be converted into gamma ray photons and the photons should never have the velocity **c.**

Hence the equation, for the above convergence must be:

$$(e^- \leftrightarrow e^+) \, c = 2\gamma$$

The symbol "$\leftrightarrow$" here used for interaction and charge attraction.

In electron-positron interaction, their mutual attractive force, created by opposite charges, is so strong that the spin-spin fission of the intrinsic angular momentum of both particles is accelerated to maximum, a ***self-acceleration*** in the point of contact. This is one of the most violent interactions in Universe, where the collective interactive momentum attains, extraordinary as it may sound, instantly, the speed of light.

Photon is a product, hence, like all products; the carried attributes are acquired from the source. In case of energy of gamma ray photon, it is acquired from e- and e+ interaction, the energy acquired is equal to energy of a single particle, which is 0.511 MeV (given by questionable c2 factor), (Mohr, 2008) and total energy of both particles is 1.022 MeV. The spin angular momentum is also converted from spin ½ of electron positron to spin 1of photons. In other words the net angular momentum is conserved.

Accordingly, the Speed of light is also acquired at the point of conversion, which is from sum total of angular and attractive force momentum acceleration of inverse negation.

$$(e^- \leftrightarrow e^+) \, c = 2\gamma$$

Above conversion declares:
At the velocity c, the mass does not increase to infinity. It transforms into radiation.

In retrospection, the photon is not carrying the equal charge and magnetic moment of the (mass) rest energy, which is transformed into radiation Energy. It does have electromagnetic field.

Differing to such event, by total deceleration of canceling intrinsic attribute, the phenomenon collapses in non quantum state, called *"Vacuum State"*.

Ultimate Point of integral deactivation is by total dissolution of intrinsic angular momentum. This is Absolute Conversion of quantum to non quantum state, in other words, finite to infinite state of Energy.

The idea above is extrapolated in last section.

Retrospection continued:

Einstein often had recollections of the implications of special relativity and made statement, "inert mass is simply latent energy." and did not mention relativistic mass. (Einstein, 1956). Einstein derived E=mc2 with some ambiguity that "E is the energy contained in a stationary body." (Einstein, 1976).

The idea of relativistic mass got stuck in text books, with experts, students and public as E=mc2, though the meaning of that equation was messed-up.

Einstein in his May 1921 lectures at Princeton, said that "Eo = mc2 and with c set equal to one, the energy, Eo, of a body at rest equals its mass." (The Collected Papers of Albert Einstein, 2002; Einstein, 1922).

"…many textbooks and articles credit him with the relation E=mc2, where E is the total energy, m is the relativistic mass, and c is the vacuum speed of light. Einstein never derived this relation, at least not with that understanding of the meaning of its terms." (Hecht, 2009).

Many thinkers have tried to clarify the fallacy of E = Mc2. Yet, the misconception is still clinging with experts and public. (Okun, 1989; Rindler, 1990; .Vandyck, 1990; Kolb, 1966; Adler, 1987; Aubrecht II, 2004; Easton, 1988; Hobson, 2005; Carson, 1998; Warren, 1976; Atkin, 2000).

"…modern representations of relativity, it is urged, once again, that the use of the concept at all levels be abandoned." (Oas, 2005).

In physics, the Lorentz force is the force on a point charge due to electromagnetic fields. Maxwell provided the equation for the Lorentz force in relation to electric currents. (Huray 2009)

The modern Maxwell's equations explain how electrically charged particles and objects give rise to electric and magnetic fields and the Lorentz force law summarizes above explanation by describing the force acting on a moving point charge in the presence of electromagnetic fields.

Maxwell's equations, *"together with the Lorentz force law...summarize the entire theoretical content of classical electrodynamics".* (Jackson, 1999 and Griffiths, 1999).

In electrodynamics, the Larmor formula (Larmor 1897, Jackson 1998) calculates the total of radiation by a nonrelativistic point charge as it accelerates. Any charged particle (an electron), accelerating or decelerating radiates away energy in the form of electromagnetic waves.

Bremsstrahlung also refers to radiation due to the acceleration of a charged particle. (Griffiths 1999, Haug & Nakel 2004).

Yet another aspect of motion of electron, conceived by Erwin Schrödinger in 1930, called *"Zitterbewegung"* as a result of interference between positive-negative energy wave constituents. This interference between positive and negative energy states generate a fluctuation, surprisingly at the speed of light, at the location of an electron around the nucleus, giving a circular frequency of 2mc2 / hbar, which is around 1.6×10^{21} Hz.

All above concepts illustrate that all forms of (mass) rest energy radiate, either by acceleration or interaction, even at ground state.

Accelerated charge must radiate, there by losing its rest energy through radiation.

An alpha α hits an atom or other high-speed radiating charged particles knock off electrons out of atoms and release large number of accelerated electrons called δ delta rays. The term was used earlier by J.J. Thomson**.** With these of positive charge δ delta rays are also emitted. Electron and positive charge interact and convert to radiation, that scatters in water and the blue light is seen. The case of Cerenkov radiation, velocity higher than the speed of light is misconstrued and not compelling.

During Radioactive decay process, as in case of internal conversion is defined as α = e / γ where e is the rate of conversion electrons and γ is the rate of gamma-ray emission. Example, the nucleus of 125I, 7% of the decays emits energy as a gamma ray, while 93% release energy as conversion electrons. Therefore, this excited state of 125I has an internal conversion coefficient of α = 13.6.

It is assumed that a core electron is detached; creating a vacancy, an electron from a higher energy level falling into the vacancy, releases energy. This energy is released in the form of a photon, at the same time many photons knock-off other electrons, from the atoms. All radio active process is stochastic. This

second evicted electron is called an Auger electron (IUPAC, 2006)**.** Auger electrons also emitted when an electric field is produced within an atom's electron cloud on account of loss of another electron, which further creates acceleration and eject yet other electrons of the atoms orbital electrons.

In fact, there large electrons or negative charges emitted by radio activity and positive charges are also accompanied, released in opposite directions.

In particle accelerators electrons or other accelerated particles will lose their energy rapidly than other particles through Bremsstrahlung or simply, by radiating, which takes place not only during particles in flight but also in measuring devices like bubble chamber and other detection device materials like lead plates or walls, Freon gas or argon gas.

Has "Quantum electrodynamics" really solved the problem raised by Maxwell equation, i.e. accelerated charge must radiate? (Nahin, and Heaviside, [1861] 2002).

An experiment stimulated by using microwave techniques of radio-frequency transitions between 2S1 / 2 and 2P1 / 2 levels of hydrogen, in 1947 by Willis Lamb and Robert Retherford was performed to measure the interaction between the electron and the vacuum. The result showed the small shift in energy level is known as Lamb shift. This gave foundation for the contemporary QED theorized by Julian Schwinger, Richard Feynman, and Freeman Dyson. (Lamb et al. 1947)

The "Zitterbewegung" caused by interference between positive- and negative-energy waves components, also seen in stochastic electrodynamics that the Zitterbewegung is an interaction of a classical particle with the zero-point field. (Henning Genz 2002).

Zitterbewegung by another viewpoint also describes the Lamb shift, where the "Zitterbewegung" term disappears and the anticipated values for wave-packets which are of totally positive or negative energy waves, by applying a Foldy Wouthuysen transformation. (Foldy-Wouthuysen: website)

The fundamental aspect of QED is the description of light and matter interactions. QED is a mathematical theory which tries to describe all experience concerning electrically charged particle interactions by exchange of photons. (Feynman, 1985).

Richard P. Feynman, in his series of lectures on QED for public (Feynman, 1985) presented a classic non-mathematical exposition of QED.

The three basic actions relating central mechanisms of Feynman's presentation of QED are:

1: "A photon goes from one place and time to another place and time".
Yes, it does.

2: "An electron goes from one place and time to another place and time".
It may but under some conditions. .

3: "An electron emits or absorbs a photon at a certain place and time."
No, absolutely not.

The extraordinary effort to mathematically formalize the theory does not satisfy the required understanding of physical nature of phenomenon.

The mathematicians Henri Poincaré argued that the laws of science did not relate to the real world at all, but signify random conventions intended to support a supplementary suitable and "functional" depiction of the analogous phenomenon.

The unrelenting critic of QED was Dirac. Recently in 1975, he said,

"I must say that I am very dissatisfied with the situation, because this so-called 'good theory' does involve neglecting infinities which appear in its equations, neglecting them in an arbitrary way. This is just not sensible mathematics. Sensible mathematics involves neglecting a quantity when it is small – not neglecting it just because it is infinitely great and you do not want it!" (Kragh, 1990 p 184).

Feynman, even though had played significant role in the development of quantum electrodynamics, said in 1985:

"The shell game that we play ... is technically called 'renormalization'. But no matter how clever the word, it is still what I would call a dippy process! Having to resort to such hocus-pocus has prevented us from proving that the theory of quantum electrodynamics is mathematically self-consistent. It's surprising that the theory still hasn't been proved self-consistent one way or the other by now; I suspect that renormalization is not mathematically legitimate". (Feynman, 1990).

Close observation shows that:
There is no Electron around the Nucleus; therefore there is no possibility of some 'thing' called electron absorbing and emitting photon.

How does an atom emit radiation?

Vacuum-Zero Point Energy

Using Max Planck's formula (Planck, M. 1900), Albert Einstein and Otto Stern published a paper in 1913 (Einstein (1913), suggesting that an atomic system, an oscillator subsists a residual energy or vibrational energy at absolute zero equal to energy of ½hv. They named this lingering energy as ***"Nullpunktenergie"*** in German, meaning zero-point energy. (Laidler, 2001).

This absolute zero is not a temperature less state; rather it was considered for ground state or the lowest energy state, also called *zero-point field*, (Gribbin,1998).

Since then, many attempts and interpretation of Zero point Energy (ZEP) have been reported. (Nernst, (1916).Marshall, (1963), Sakharov, (1968), Boyer, (1975), Boyer, (1980). Boyer, (1985), Haisch, et al. (1994), de la Pena, and Cetto, (1996). Rueda and Haisch (1998), Sciama, 1991), Haisch et al. (2001), Rueda and Haisch, (2005). de la Pena, and Cetto, (2005)**.**

The lowest possible energy, the energy at ground state of a quantum mechanical system is called Zero-point energy. All quantum mechanical systems go through fluctuations in ground state, which have associated zero-point energy, based on the Heisenberg uncertainty principle.

The uncertainty principle of all physical systems expects, even at absolute zero temperature, a zero-point energy that is greater than zero. Liquid helium-4 (4He) remains unstable liquid and does not freeze, at lowest laboratory temperature, because of its zero-point energy.

A molecule in atmosphere has energy of around 0.03 eV which corresponds to room temperature.

Therefore, fundamentally, there is no absolute inertia in physical world. All physical phenomenons are active and radiating.

To exist (physically) is to be active and thereby radiate.
Again, this means:
Heavier elements become lighter

At what moment, the becoming of lighter side is not known, yet it does.

We describe Energy with attributes and properties, hence finite aspects of Energy. We do not know, *what Energy is?*

A paradigm shift?

In reality, c is a finite speed; hence a mass requires same finite speed to travel at that velocity. Only difference is, at the speed of light, the mass, which is in fact a packaged energy, is transformed into dynamic liberated energy. "Packaged Energy" term is not to be confused with older term used by Plank for radiation quantum. In 1900, Max Planck working on radiation suggested that the energy in electromagnetic waves could be released in "packets" of energy; he called these packets "energy elements" (Planck, M. (1901).

More proper term would be "Quantized Energy" for each particle.

We can totally cancel the misnomer "***mass***" and also the imaginary quantity "***c^2***". All particles are ***Quantized Energy*** and atoms are composite packets. All dynamic energy, i.e. radiation, light, photons are released energy from these packets. Hence:

"Everything essentially is Energy"

Hence, the equation is:

$$E = E_0 c$$
Or
$$E_{rel} = E_0 c$$

Where, E_{rel} is, released converted energy, equal to the amount of rest energy, E_0 is quantized rest energy and c is speed of light. Again "c" here is a conversion factor, not quantitative multiplication factor. For the partial release of energy **E** would be:

$$E = E_{rel} / E_0$$
The actual rest energy E_0 is never known.

In fact, this is applicable as the second law of thermodynamics which describes the Entropy. That is a measure of the energy not accessible for practical work in a thermodynamic progression (Haddad, Chellaboina, VijaySekhar; Nersesov, 2005). In other words, as stated above, the released energy is lost and never returns to its original state, which was the quantized state.

The Planck constant was first described as the proportionality constant between the energy (E) of a photon and the frequency of its associated electromagnetic wave (ν)

The Planck constant E = hν has the value $4.13566733(10) \times 10^{-15}$ eV.s.

In case of light quantum, Photon, supposed to be of zero mass, a calculation was made by testing Coulomb's law to very high precision. (Plimpton, Lawton, 1936), then unacceptable result of an experiment has given a maximum value of photon mass, $m \lesssim 10^{-14}$ eV/c2, (Williams et al.1971), now accepted value, based on galactic vector potential to measure the torque wielded on a magnetized ring (Lakes, 1998), gave an upper limit, reported by the Particle Data Group, is 1×10^{-18} eV/c2, (Amsler, 2008).

Considering this mass of photon as 10^{-18} eV to be real, then with the conversion factor c, this energy is the *released energy* of an electron and positron, each having rest energy equal to 10^{-18} eV or of $4.13566733(10) \times 10^{-15}$ eV These have to be the fractional charge particles, called quasielectron and quasipositron.

The quasiparticles based on a theory formulated by Robert Laughlin (Laughlin (1983) to explain the fractional quantum Hall Effect. Their charge can be of lesser amount than the electron charge e. Observed results are, as fractions of electron charges of e/3, e/4, e/5, and e/7 or one-third, one-fifth, one-seventh - or indeed, two-thirds, two-fifths or three-fifths etc. (Fractional charge, 1997), Stormer, 1999).

Consequently, these fractional charge quasiparticles must also have associated fractional mass of electron, a "*Nanomass*", nothing to do with the units of measure 10^{-9}. We should expect numerous odd denominators of these fractional masses (Lou, 2003), which in turn have fractional rest energy associated.

According to quantum mechanics, the wave equation, as developed by Schrödinger in 1926, allows us to determine a probability that an electron will be located at certain point when a measurement is made. The electron exists in a probability distribution or probability density, which appears to be rather fuzzy. This fuzziness is termed as "electron cloud." (Web: science.)

Atomic orbital is a mathematical function that describes the wave-like behavior of either one electron or a pair of electrons in an atom, (Milton et al. 2005) some times called "atmosphere" around nucleus of an

atom. If an extra electron is added to a single atom, the additional electron has a propensity to uniformly fill up a volume of space around the nucleus so that the resulting collection, termed as the atom's "*electron cloud* " (Feynman, 2006) likely to be in a general spherical region of probability relating where the atom's electrons will be found.

In fact, each point in the *"electron cloud"* contains the possibility, not only of an electron, but also of varied *"Quasielectrons"* each with fractional charge. It depends on what and how much induced impact is created, either atomic interaction or external injection, on the *"cloud",* whereby the separation of an electron or a quasielectron takes place.

The implication of quantum mechanics, as seen above is that the structure of atom is a nucleus with a "cloud" around. There is no way to determine the electron as a particle, its rest position and mass.

In fact there is "no electron" around the nucleus and an atom being a neutral phenomenon, consequently there "no charge" with the cloud and the nucleus.
The observed charge is a change of state, a transformation, including a positron.
A photon of any energy does not create on its own a positron; it is the atomic neutral phenomenon ejects the electron and positron or polarized emission.
Positron is not a freely created particle, even out of vacuum state.

Matter has property of Polarizabilities, which establishes the dynamical reaction of a bound arrangement to exterior fields, which gives insight of the interior organization. (Zhou; et. al. 2002)
In physics, polarity is a description of a binary attribute or a direction,
An electrical charge has a polarity, a voltage has a polarity, a magnet has a polarity, the spin in quantum mechanics has a polarity and quantum mechanics describes photon polarization as the sinusoidal *(having a magnitude that diverges as a sine curve)* plane of electromagnetic wave.

The other way to approximate the real rest mass quantity is by the observed electromagnetic quantity. As already understood above, all radiation has to be transformed form of some mass quantity or quantized energy.

Therefore, when we observe electromagnetic frequency of an amount of 1.24 eV, which is the visible light or about 1.6 eV to 3.27 eV(Molinaro, 2006), it is certain that an energy packet (mass) of 1.24 eV is converted to radiation. This is the partial quantity of "Electron Cloud" or of two opposite charge "cloud" parts in waves, quasielectron and quasipositron waves, which had energy content equal to 1.24 eV.

A photon with a wavelength of 532 nm (green light) would be the converted form of about 2.33 eV rest energy. Likewise, 1 eV rest energy would be equal to an infrared photon of wavelength 1240 nm.

This is given in:

$$E(\text{eV}) \approx \frac{1240\,\text{eV}\,\text{nm}}{\lambda\,(\text{nm})}$$

Consequently, all observed electromagnetic quantities, from Gamma rays of 1.24 MeV or above energy to extremely low frequency as low as 12.4 feV **(Femto or Quadrillionth of 1 eV)** are effectively converted energy contents of varied "electron - positron cloud" waves, partially or entirely.

Instead of creating panic of atomic structure may collapse, by conversion of electron, quasielectron or negative-positive charge transformation to energy, it would be extremely crucial to understand the nature of Vacuum Infinite Energy, also called Zero Point Energy and its relation with observed phenomenon.

Out of Vacuum

In quantum field, the vacuum condition is the quantum state with the lowest possible energy which has no material particles. The vacuum state of a quantized field is also called Zero-point field.

The vacuum state or the quantum vacuum is considered as "by no means a simple empty space" (Lambrecht 2002). The vacuum state holds ephemeral electromagnetic waves and particles burst into and out of existence. (Dittrich & Gies 2000).

A hypothetical massive scalar elementary particle, called Higgs boson, predicted by three groups of physicists: François Englert and Robert Brout; by Peter Higgs, and by Gerald Guralnik, C. R. Hagen, and Tom Kibble, which is the part of the Standard Model and is a result of the professed Higgs mechanism, proposed in 1964. This supposes to elucidate how most of the known elementary particles acquire mass.

There are no identified elementary scalar bosons of spin-0 in nature. Although statistically, there are many composite spin-0 particles.

Theory of Higgs field also implies that quantum vacuum generates mass, in the form of virtual Higgs bosons, with which particles acquire their mass through interactions with a ubiquitous field carried by the Higgs.

In fact the standard model, the "Higgs mechanism" calculates the creation of masses for the W±, and Z weak gauge bosons in the course of electroweak symmetry breaking. (**Bernardi et al 2007**)

"Physicists have now confirmed that the apparently substantial stuff is actually no more than fluctuations in the quantum vacuum". **(Battersby 2008)**

The Large Hadron Collider (LHC) experiments at CERN are for confirmation of this Higgs field, which in turn will mean that the observed Universe is a virtual reality.

Prospection

To estimate probabilities of effects between elementary particles,

Feynman diagrams are employed, which involves perturbation theory, where the amount corresponds to an infinite series, i. e. an estimation of ever decreasing terms. In this series, a Feynman diagram is suppose to be an instinctive graphical depiction of a term.

A quantum mechanical or statistical field theory is represented in graphics by Feynman diagram, corresponds a perturbative input to the shift amplitude or association function.

In fact, Feynman diagram has no physical implication. It thrives to provide merely the infinite sum over all probable Feynman diagrams which present physical results. This infinite sum is usually only asymptotically convergent, which is a formula, appropriating progressively, more exactly, as a changeable approaches limit, often infinity. (Gribbin, 1997)

"In many cases, the particle number operator does not commute with the Hamiltonian for the system. This implies the number of particles in an area of space is not a well-defined quantity but like other quantum observables is represented by a probability distribution. Since these particles do not have a permanent existence, they are called virtual particles or vacuum fluctuations of vacuum energy." (Kaivarainen and Lehnert 2005)

It is too simplistic to conceive ideas like pair particle annihilation and creation through Vacuum or a virtual particle, as Feynman diagram thrives to establish (Kragh, 1999). There has to be list minimum

information of one intrinsic attribute in Vacuum state or with the Energy in vacuum state.

The most intrinsic to every quantum mechanical occurrence is the Spin value of the angular momentum and this has to be the fundamental comparative characteristic of observed phenomenon and Vacuum-Zero point energy. As the Zero Point Energy or Vacuum Energy is non-measurable and non-observable, consequently it is non-quantum mechanical. Ultimately, it is "*Spinless"* state of Energy or Absolute Inertia.

Though it is Absolute Inertia, it is an ephemeral state of Energy.

As earlier stated, in a certain condition, there is an ultimate Point of integral deactivation, which is by total dissolution of intrinsic angular momentum, the Absolute Conversion of quantum to non quantum state, in other words, finite to infinite state of Energy.

Is the information of physical system lost by the "**Spinless**" condition of Vacuum Energy, which is a consequence of dissolution, *"loss of spin"* of a quantum phenomenon in Vacuum State?

No. it does not.

An abstract model of quantum mechanics which is not current in classical physics postulated as total information about a system is prearranged in its wave function. A unitary operator determines the progression of the wave function. Unitarity means, the information is preserved in the quantum sense.

Since the beginning of all endeavors to understand universe, more than a century back or later, a simple common sense question should have been put by the scientific thinkers:

If we wish to know the origin of Universe, the question is:

What is the origin of first particle?

The answer is: ***The origin of first particle is a no-particle state, where there was no quantum.***

That is, a non quantum state, which also means, "*attributeless*" condition.

The cosmic microwave background Radiation (Penzias and Wilson1965).of 2.725K is the evidence that lot of radiation has been already gone down to 0K, hence, we find the Emptiness behind the background radiation. 0K is a least laboratory measure of heat, around − 273ºC. It is not Absolute Zero, in the sense, there is no possibility of any degree of temperature measurement at all. There are also some anisotropies

observed in the cosmic background radiation. (White 1999, Wright 2004).

If infinite lifetime attributed to finite phenomenon, example, to a photon, then it should carry same energy frequency from its source till infinity. The skies and space all over Universe must be luminous, filled with clear observable radiation.

The observed microwave background radiation and observed red shift, a correlation between distance and recession velocity which is known as Hubble's law, (Hubble, 1929, Christianson, 1995) tells us that light is indeed reducing its intensity.

In other words, as it is known, *"attenuation"*, a decrease in property or gradual loss in intensity as energy wave flux or a beam of particles, as the distance from the source increases, due to interaction with medium, scattering, spreading in three dimensions, even without interaction.

The true meaning of Entropy is gradual loss of usability of energy.

Hence, the radiation reaching its intensity to Zero, the Energy reaches the Vacuum state. This is observed in the Intergalactic space between galaxy clusters, also called voids. (Freedman & Kaufmann 2008, Lindner, et al.1995).

The causal connection of Vacuum non-observable with observable and measurable quantum mechanical phenomenon is: Spin angular momentum.

Ehv (T=0) = So.
Loss of Spin of Radiation Quantum at Absolute Zero

Here **So** is Loss of Spin of radiation quantum at Absolute Zero (not laboratory measure), in fact, in nature, this transition is gradual. Energy in radiant form is fainting or weakening. Without Loss of Spin of Radiation Quantum, there should not be "night" and there will not be Voids or Emptiness between galaxies. This is the ultimate conversion of Energy, from observable to non observable state; and it is only a *"Change of State"*.

In fact, Energy in Emptiness condition is all permeating.

A photon is not an independent phenomenon also finite, it has a source. Hence, it carries the information of that Quantum source, which is transformed into radiation quantum.

By the *Loss of Spin* of radiation quantum at absolute zero, the final stage of dissolution of radiating Energy in Vacuum carries the Quantum Information of the source of photon in Vacuum Spinless State.

In other words, Energy in Vacuum state has Quantum Information, which is a Cosmic Quantum Code (CQC).

This is in fact the origin, the Cosmic Primal Energy (CPE) with CQC.

Consequently, it is an ephemeral condition, in the sense that it is variable and regains spin angular momentum as a consequence of CQC.

Experimental laboratory and observed model of quantum information is extrinsic property. The Intrinsic property, "the Quantum Code" of Nature is Cosmic.

Energy devoid of CQC is Infinite Absolute inertia and that is purest form of Energy, non-finite, non-quantized and non-radiant.

The fundamental basis of Universe is a Law of Absolute Transformation.

We should not be surprised, if we find whole universe is spinning inside the non spinning Vacuum Energy. Energy content of observable phenomenon is sustained by all permeating infinite and non-dimensional Energy of Vacuum state, the Cosmic Primal Energy. We can not measure the lifetime of an atom or of a quantum either by measuring the (mass) rest energy content or by calculation of radiation emission by that quantum. The lifetime is related to its origin from Cosmic Primal Energy in Vacuum state, at the same time quantized state does not have infinite lifetime because it goes back to Vacuum Cosmic Primal Energy State by radiating.

The law of conservation of energy states that energy can neither be created nor destroyed: it can only be transformed from one state to another. This conversion still retains mass in non-matter energy form. (Taylor & Wheeler, 1992).

The extension of law of mass-energy conservation is the **Law of Absolute Transformation** with the examination presented here. Vacuum Energy, *VE*, is Spinless Non-quantum State of Cosmic Primal Energy with Cosmic Quantum Code, CQC, which means this condition is evanescent. The observed particles are quantized Energy, *QE*, as a result of CQC with angular momentum, and all electromagnetic radiation of all frequencies is released energy, RE, of quantized energy, which is, in fact, as already mentioned, transformed condition of energy content of *QE*.

The Universe is a process of Absolute transformation, from Cosmic Primal Energy, CPE ***to Quantum to Radiation and back to CPE Vacuum State.***

$$CPE \rightarrow QE \rightarrow RE \rightarrow CPE$$

Energy is never created neither lost.

"Everything essentially is Energy"

What is Energy? ...!!!

Conclusion

Speed of light can not be achieved independently by any Body even a photon, unless it has a source, a thrust of that speed. Further, no amount of radiation or light form can be produced freely, unless some amount of (mass) quantized energy is converted to dynamic liberated energy.

It is also most fundamental to investigate and experiment on the basis of "Loss of Spin" theory given here, the nature of Vacuum Infinite Energy, also called Zero Point Energy, which will establish its relation with observed Universe, with the understanding that observed Universe ***is*** Vacuum Energy with ***spin.***

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1/31/2011