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RESEARCH ARTICLE

THE LIGHT PHOTON, DARK MATTER AND THE WHIRLING OF DARK MATTER, THE THEORY OF THE BIRTH OF UNIVERSE

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ABSTRACT

Cause and Effect is one of the Basic Laws of Nature. Hence, a Light Photon having mass property, the momentum, does not have 'rest-mass', cannot be a true fact. An exhaustive endeavor is done, in this article, to confirm that, a light photon have the smallest, ultimate mass. As per Relativistic mass energy transformation relation [$E = mc^2$], mass doesn't convert into energy by disappearing as a mass and appearing as an energy; but, outwardly, it gets attached the photon masses increasing its speed suitably and transforms its 'rest mass internal energy', into radiations by braking its own consolidated mass into ultimate mass particles Photons which are Dark Matter Particles possessing the Dark Energy. Due to their mutual gravitational forces, mass cannot concentrate at a point across an mm. because, 'no gravity shells' are created inside a body of radii decreasing from outwards surface towards the centre, as a function of radius/density. Hence, Big-Bang, the cause of the Birth of Universe, seems a remote possibility. Whirling created in Dark Matter gave birth of Universe.

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INTRODUCTION

The light energy packets have a property of mass, the momentum; but, a light photon have no mass, is the consideration prevailing in Modern Science; because, a light photon doesn't stop and hence, it is considered that, a light photon have no rest mass. It looks scientifically illusive. An exhaustive effort is done here to prove the light photon have a mass. So also is condition of energy. Light photons are considered to have relativistic mass due their motion, though they have no rest mass as per the science today. But as per Relativity, relativistic mass doesn't come into existence; is the fact proved in this paper. It very ingeniously puts how a relativistic mass actually appears with a moving mass. It has very basic approach to the definition of energy. When energy is lumped in different stages; though it is scalar, it behaves as a vector quantity because, its each stage has independent momentum. It explains, how, light is condensed at absolute zero and how mass elementary particles are created from light photons. It denies the birth of Universe from a Big-Bang; instead it pleads a new concept of 'Whirling Dark Energy Mass Theory'. It proves that, a mass is not converted into energy but, transformed into energy; the rest mass remaining eternal lastly

as Dark Energy the ultimate mass particles, that are the light photons at almost rest, in universe' inertial frame. It has approached the definition of energy as it follows. Energy without mass; is an illusion. Mass and energy are associated with each other as a single entity. 'A moving mass or its capacity to move, is an energy.' It is defined by Einstein somewhere.

Mass

The mass of an object is fundamental measure of the amount of matter in an object, as per concept from 'hyper physics' of Department of Physics and Astronomy associated to Georgia State University'. A mass in motion has a physical property momentum denoted by letter p and represented mathematically by the relation $p = mv$ where, symbol m denotes the mass in kg of the object and v is its velocity in m/s in free space. In the process of change in velocity of the object mass m, from v_1 to v_2 in m/s, within period of time $(t_2 - t_1)$ s, it develops a force F equal to $[F = m.(v_2 - v_1)/(t_2 - t_1)]$, N. During the change of momentum thus, if the velocity of the object increases in this process, a force is applied on the object and, if the velocity decreases then, force is applied by the object on an obstruction trying to oppose the motion of the object 'm'. As per laws of mechanics, In case if the object is a basic particle mass and the force acting on it is sufficiently large as compared to particle's mass. The time required to accelerate the particle to get its

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velocity changed from v_1 to v_2 ; will be very short say, t s tending to zero. Then, the force 'F' involved will be equal to $[m \cdot (v/t)]$. Such instantaneous force is treated as an Impulse is given in Impulse and Momentum: Physics Hypertextbook © 1998-2017 Glenn Elert, Author, Illustrator, Webmaster that, Impulse $J = F \cdot t = m \cdot v$, m.kg/s. Consider two objects having masses m_1 and m_2 . Let, both be moving with rectilinear motion in the same direction along the same path with, linear speeds u_1 and v_1 respectively, such that, $v_1 > u_1$. Let m_2 be initially lagging behind mass m_1 but, speed v_1 of m_2 being greater than the speed u_1 of mass m_1 ; mass m_2 will dash mass m_1 from behind. Then any one of following conditions occur, depending upon quantities of masses and their respective velocities, maintaining total momentum of m_1, m_2 always constant. It is well explained on web of 'Momentum, Law of Conservation of Momentum, by City Collegiate'.

1. Speed of m_1 will increase to u_2 and the speed of m_2 will decrease to v_2 to maintain total momentum constant as before ($m_1u_2 + m_2v_2 = m_1u_1 + m_2v_1$).
2. Speed of m_1 will increase to u_3 but, the speed of m_2 will become zero.
3. Speed of m_1 will increase to u_4 and the speed of m_2 will decrease to v_3 such that $u_4 = v_3$. In this case the mass m_2 will get attached to the mass m_1 . Here, $u_4 < u_3$.
4. Speed of m_1 will increase to u_5 and the speed of m_2 will be reversed to v_4 , such that $u_5 > u_4$. In this case the mass m_2 will get attached to the mass m_1 . Here, $u_4 < u_3$.

Till now we have seen in collision in the same direction of motion due to speed difference of colliding masses, and how transfer of momentum takes place. Above conditions can be abstracted from, the 'GCSE Physics; What is the Law of Conservation of Momentum, Forces and Motion; Momentum-Law of Conservation'. Now let us see when both the masses are allotted the same speed v and m_2 is expected to transfer its momentum to m_1 ; then, m_2 will have to be released so as to get attached with m_1 , to travels always touching m_1 . In this case both the masses m_1 and m_2 maintain their individual momentums and behave as one mass ($m_1+m_2=m$) with momentum mv . Thus we feel that, mass m_1 has increased to m ; because, its momentum has increased to $mv (= m_1v + m_2v)$, speed remaining constant instead of increasing. It happens at speed of light. Therefore, when a mass is moving at speed of light, and we inject energy packets into that mass; its speed doesn't increase; (why? It is being explained in this paper at suitable place) but, its momentum increases without increase in its speed. It is well explained in the web article, 'Relativistic Mass-University of California, Riverside; Physics FAQ Copyright; Updated by Don Koks, 2012. Original by Philip Gibbs and Jim Carr, late 1990s; What is Relativistic Mass?' It indicates the energy packets the photons moving at speed c have got attached to the mass moving at light speed. Exactly similar event happens with electron moving at speed c in an accelerator say a CRT or Cyclotron. In an accelerator, as an electron at speed c , passes an accelerating electrode; that accelerator imparts energy packets, the photons to the electron. Both, the electron and, the energy photons released from its source which ride upon electrons at accelerating 'grid' have speed c . But, the photon at speed c , cannot increase the speed of the electron beyond c . But, measurement of energy of the electron at accelerator output shows that, the injected or the imparted energy is with the electron, though its speed has not raised. It means energy photon has got attached itself with the electron. It indicates as a photon is associated with momentum,

and it has a mass whatever smallest ultimate may it be. It is not that the energy has transferred into mass; but, energy photon mass is added to the electron mass as explained below under the sub-title energy. All this happens because, nothing can be accelerated to speed greater than ' c ' in the rest frame of accelerating source (explained ahead at suitable place).

Energy

Energy is existed in different forms. In each and every form it is perceived from 'something moving'. This inference can definitely be drawn from 'web, Energy Science; An Introduction to Energy Science and How We...; by Chris Woodford. Last updated: March 26, 2017. Broadly energy is divided in two categories; that are, energy in motion and energy due to position. The energy due to position is perceived when motion of something is affected due to the position with respect to something other. Hence, the most general and the most basic definition of energy is '*Something moving and capable to move is Energy*'. The light is 'radiation energy'. Something moving there in is, a photon of light. Only something moving is not sufficient, to be it an energy. It must do work. It must convert energy from one form to another form. It must have capacity to do work. 'Something moving is energy' inherently includes, work can be done by that something in motion. In case energy due to relative position; there is ability to make move something that can do work; is energy due to position; that is (i.e.) potential energy. Ultimately, 'something moving is energy'. Or more elaborately, '*Something moving or something having capacity to move, is energy*'; is the definition of energy. This definition is well sufficient in itself. Something moving itself represents it is with respect to (w.r.t.) something other. Hence it inherently also includes something moving 'against an obstruction' when it is doing work... It is true as per the article 'What is Energy? Is there Energy in Space? Under the heading Space Environment of web; What is energy? - Northwestern University'. Something moving freely, has storage of energy in its motion and something moving against an obstruction effectively converts the stored energy in motion, into another type of energy.

A motion is associated invariably with a mass. It is detected through another mass by, the changing energy due to the changing relative positions with respect to each other. Radiations are perceived because, its photons have very basic ultimate mass, which is to be perceived. It is one of the aims of this paper; whether it is moving at speed c or not as in BEC explained ahead.. Hence, *everything that is perceived in Physics' world must have a mass*. The definition of gravitation given in 'Gravity Wikipedia', 'gravitation, is a natural phenomenon by which all things with mass are brought toward (or *gravitate* toward) one another, including objects ranging from atoms and particles of light, to planets and stars', clearly indicates that, light particles have mass because, they are attracted by gravitational mass. Till now, mass is defined by its secondary properties, such as its momentum, capacity to develop a force. To define it on the basis of its primary basic property; It is defined here in as, '*Mass is that entity a part of Universe that exhibits energy in its motion or in its position*. Further, *gravity, gravitational force and the acceleration due to gravity, all are associated with each ultimate basic mass-particle. Assume mass of such a particle equal to m_p .*'

Let us think on '**Radiation Energy**'.

Radiation Energy: *No one can deny that, the Universe is basically a cluster of different combinations of mass and energy, in the form a mass having different types of motions and positions w.r.t. each other. "Mass and energy are two very basic elements of the Universe. Without mass energy cannot appear and without energy existence of mass cannot be perceived." By any way, by any manner someone may think; but, he cannot erase this fact. The whole existence of Universe is due to it. It is a very basic fact of Universe.*

Main radiation energy is exhibited by LIGHT. In respect of nature of light we are having concepts that, light is made up of energy quanta or light is made up of bundles of waves. OK; both are the facts supported by 'Concepts-Nature of Light-Astronomy Online'. But, their explanation about these both facts is conman. To understand it we have to see Plank's Electro-Magnetic Theory of Radiation. Let us review how, Maxwell's derived equation for light speed and light waves as oscillations of electro-magnetic waves at right angles to each other. Please refer the Maxwell's equation given below and then Plank's. Maxwell derived below mentioned equations for electrical field (E) and magnetic field (H) intensity or magnetic field density B at a point in free space from 'Chapter 13 Maxwell's Equations and Electromagnetic Waves of web MIT edu. are,

$$\ddot{\mathbf{E}} = \frac{1}{\epsilon_0} \nabla \rho - \mu_0 \nabla \times \dot{\mathbf{H}} \quad (1)$$

$$\ddot{\mathbf{H}} = \nabla \times \dot{\mathbf{E}} - \dot{\mathbf{J}} \quad (2)$$

By comparing it with the mechanical equation for a wave through a medium,

$$\ddot{\mathbf{X}} = (1/v^2) \nabla^2 \mathbf{X} \quad (3)$$

Where, X is a mechanical field as mentioned in the 'Book: Antenna & Wave Propagation by K. D. Prasad, Satya Prakashan New Delhi; third edition 1996'. A force field or a sound, traveling through a medium say, water. In this relation v represents the linear velocity of the wave created in the medium by motions of particles of the medium. They compared equation (1) and (2) with equation (3). There from they derived the correspondence of v the velocity of water wave with the term $1/\sqrt{\epsilon_0 \mu_0}$ as below,

$v = (1/\epsilon_0 \mu_0)^{1/2}$, It is the speed of light radiation denoted by letter 'c'. Hence,

$$c = (1/\epsilon_0 \mu_0)^{1/2} \text{ m/s} \quad (4)$$

Constancy of 'c', The Speed of Light

At the first instant, it is to revise the concept of 'constancy of speed of light, in space, irrespective of relative motion between them, or w.r.t, any inertial frame. In reality, speed of light is constant 'c', only in an inertial frame attached to both the observer and the source. Any other observer attached to any other frame, will not find light speed from that source, constant; but will find reduced relativistic-ally, whatever may be the relative speed in between this external observer's frame and the source's frame. It is well proved in Author's published paper, titled as, 'An Innovative Review of Kennedy-Thorndike Experiment', in issue-5, May 2017.

Second fact is that, a freely moving body in free space transforms energy given to it into increasing its momentum by increase its speed up to c. Then after, speed of any, either a mass or a light photon, cannot be increased. This, phenomena takes place due to reason explained here. When a mass move freely, it has conserved, work done upon it, in the form of momentum by increase in its speed. For the universe to exist, nature observes certain very basic rules. One out of its is that, a matter brakes down into it's, 'the smallest ultimate mass particles photons' because, the photons remain in motions, internal to any respective mass, w.r.t. the first pair of photons which have formed a revolving pair in a space domain said stationary, by an external observer. Mass particles thus formed are elementary particles. When such particles in a mass structure, are speeded up to speeds greater than c in space, the photons will be moving in space at c, by transforming their internal linear motions in angular, curvilinear motions into linear motions in space. In-fact, it is the consciousness of the photons that, obeys its own law. This takes place as it follows here. When energy is given to a mass or a photon at its speed greater than c, the observer, perceiving the speed c will observe that, the energy fed by him is now not increasing the speed of the mass or a light photon, but, appearing as an electrical charge. The given energy-photon-masses appear as charged particles attached to the mass moving at speed c w.r.t. observer in whose inertial frame the mass is accelerated to speed c. Moving electric charge produces changing electric field in space, consequently, it produces proportionate magnetic field around the path of motion of the mass, so as to totally oppose the motion, from it increasing beyond c.

Then as ϵ_0 is the electrical permittivity of free space and μ_0 is the magnetic permeability of free space; and that the term $(1/\epsilon_0 \mu_0)^{1/2}$ have unit of velocity; they have put forth rightly that, speed of electric and magnetic field oscillations is $(1/\epsilon_0 \mu_0)^{1/2}$. Further, magnetic field, have not its self existence. It is generated by the changing electric field. Naturally, Though with a time lag; the magnetic field intensity vary proportionately to that of its cause, the electric field. The direction of magnetic field is at right angle to the direction of electric field, circular to it, the most commonly, or curvilinear around the direction of electric field. Hence, relativistic logically, the light is oscillations of electrical and magnetic field, at right angle to each other, in free space and they travel at speed $(1/\epsilon_0 \mu_0)^{1/2} = c$ in free space. These scientific thinking solved the problem of nature of light up to some extent, as per the author. Much of the light behavior could be explained by this 'wave theory of light'. But, Mechanical wave travels through mass-particles-medium. On the contrary light travels through free space. Mechanical wave propagation is created by high and low pressure domains radially away from the point of event of generation of waves; but, in electro-magnetic (em) wave propagation through free space; there are not any particles in space to propagate electromagnetic field. If at all there are any kind of particles associated with the group of em waves forming dense and rare regions perpendicular to their direction of motion; they ought to be released by the light source or the em wave source. A mechanical wave needs particles invariably to generate wave. Similarly, electric and magnetic wave also need particles having electric and magnetic properties. In mechanical waves, mass particles of small suitable size serve the purpose; whereas, in electro-magnetic waves the ultimate the smallest mass particles photon serve the purpose. In case of motion of the mechanical mass, that can rest in a frame, it can be understood that, electric

charge can be generated on mass, as its mass is an integer times, the mass of an electron. Till now we haven't come across fractional electrical charge. But, it is observed that, elementary particles have fractional charges, each having $1/3$ and other $2/3$ of electrical charge with fundamental particles Quarks. Not only that but, fractional electrical charge up to $(1/5)$ th of an electron are found with quaziparticles as mentioned in research article, 'Condensed Matter: e.5 Particles Discovered, May, 25, 1999' in magazine 'Physics World, a member of IOP, volume 12, Number 6, citation, Valerie Jamieson 1999 Phys. World 12 (6) 7'. Hence the light photons also can bear proportionate electric charge whenever needed. Because the fractional charges found till now are $1/3, 2/3, 1/5$. Hence, further fractioning as per mass must be possible.

Momentum and Rest Mass:- It is the well established concept that, as per Maxwell's em field equations, electric and magnetic fields oscillate in space at right angles to each other forming the propagation of electro-magnetic wave through free space. If at all non-mass em field has to acquire wave form it must meet respective reflectors at its each +ve and -ve peaks successively continuously at each respective wavelength. In this nano-era also, no one could detect, the EM field with light wave in free space; because, it is not there. In such situation to have propagation of light, there should be some particle medium in which they dash with each other to transfer the motion or, the light photon particle should travel due to its momentum allotted by its source, during its release from its source, linearly in free space, like a pebble is released by a sling. Hence, light must have particle nature with a mass. Without mass its momentum, $[p=mv]$, how can it be possible. How one can perceive momentum without a mass. Non perceivable have no place in science; thus declared Einstein, during the search of ether when, it has gone in-vain after, exhaustive experimentation for a decade. Hence, consideration of momentum without mass seems illusive. In the relation $[p=mv]$, m is the rest mass. Now let us see energy with a radiation. It is given by Plank's equation theorem and its derived equation (12) discussed below.

Microscopic perusal of Maxwell's equations w.r.t. atomic model shows that, an excited orbital electron releases extra energy photon; it receives from an external source by electromagnetic action. And those light photon mass particles travel as light in free space.

The Quantum Theory of Light Radiation:- It is defined by Max Plank. According to it, Light is considered consisting of packets of energy named 'Quanta'. The quanta have mass property momentum but, it is considered to have no rest mass; a mass-less particle always in state of motion. It has 'No rest mass' as per the understanding prevailing that time; because, there were not any methods to stop light and bring it to at rest. We will see ahead that, the light is stopped in BEC. Let us refer to energy of a wave as packets or quanta of energy derived by Max Planks. Thus, energy of a wave E is given by,

$$E = h \cdot \nu \quad (5)$$

where h is Plank's constant and ν is the radiation-frequency.

Please note that, as the units of energy in above relation give energy of number of cycles; not that of cycles per second; though we attribute it J/sec. we can measure energy of any number of cycles including a single cycle, irrespective of time

period. Thus, we can find energy of one cycle by substituting ($\nu = 1/\text{cycle}$) in above relation. It gives h the value of Plank's constant as energy pack of a single wave. It will represent smallest possible energy quanta in nature. When we substitute ($\nu = 1$) means 1 cycle of any frequency in above relation; then, we get one Quanta of radiation energy equal to h in Joules. Such numbers of quanta in series, moving at speed c is the smallest basic light ray. To have universality of measurement ν , we refer as frequency. For a single sine wave frequency one cycle, will have energy equal to h Joule. For one modulated cycle of n frequencies, the energy will be $(E=n\cdot h\nu)$. Here 'n' is an integer quantity. It represents n number of different frequencies' waves modulated and that modulated one wave is considered as single quanta which will represent 'nh' joules. In case of energy radiation each wave of any frequency, single or modulated will have energy h or nh respectively. During the study of 'Black Body Radiation', Max Plank observed that, a Black Body radiates energy pulses in integer n, equal to a group of number of waves, each of different frequency. There from, He derived the above equation. $[E=n\cdot h\nu]$ Where, h is proportionality constant named after him as Plank's constant. It is contained as equation-1 of article, 'Max Planck's Derivation of the Blackbody Radiation Law; further contained in THE MAP OF PHYSICS CONTENTS, Book I: Relativity: Section A: The Constitution of Reality; at last standing in EXPLORATIONS OF NEORATIONALISM: Essays in the Nature and Uses of Reason by Dennis Anthony.

According to Plank's 'Quantum Theory of Radiation', energy is radiated in the form of 'Quanta'. A Quanta is an energy packet. An energy packet is a group of different frequencies waves. It is assumed to represent wave properties of wave nature of light by its 'group of different frequency waves and, particle properties, by the group of waves behaving like a particle. Something illusive! Because, light particles were not found at rest. In fact, a wave is representation of a particle; the representation of density in space, of its inside contained material. The particles in a light wave are considered to be arranged represented as contained in containers equally displaced such that, their surfaces can be plotted as similar waves around the direction of propagation of the packets of particles. This view is supported by 'The Quantum Theory of Waves and Particles by John D. Norton Department of History and Philosophy of Science University of Pittsburgh'.

There is Einstein's famous relation of conversion of mass into energy and vice vis. It is, (as per routine meanings of terms and as per web portal 'Einstein on line, $E = mc^2$).

$$E = mc^2 \text{ Joules.} \quad (6)$$

It is considered that, all the mass at rest or in motion is converted into energy. But, the generation of light energy and its full transfer into other kind of energy, indicates co-existence of very basic mass particles in a group, arranged in specific manner with energy bonds with each other forming a 'mass' when it is broken by external force, become free and move at speeds very near to light speed. Then after transferring its energy to something other they (the smallest basic mass particles vanish into space around rest frame of that something around or get attached with them or go into free space. Then they acquire energy due to their position in space with respect to other mass particles. When such particles come near to each other, within their effective distance they combine due to their attractive forces, they act with each other and combine in

different ways to form different kinds of quarks. The quarks then form atomic basic particles; and then the nucleus then nucleus catches moving electrons and the electrons get locked around the nucleus forming an atom, so on and so forth. As there exist four different inter-actions within an atom; those interactions must exist in free space between elementary atomic particles when they come near within their zone of action. It can be well understood from web: Hyper Physics-Fundamental Forces.

Thus, the stationary particles with respect to each other in the universe; doesn't manifest the existing Universe. The particles; that's the very basic mass particles moving with respect to each other, give birth to the Universe by generating more and more coarse matter; continue the existence of the Universe. Hence, Einstein's relation $[E=mc^2]$ meant; transformation of kinetic energy and atomic energy of basic mass particles into radiation energy in space around. That are the final very basic ultimate, the smallest mass particles, moving linearly in space at speeds just smaller than or at c in Universal inertial frame to exhibit heat energy light energy and, other higher frequencies radiation waves' energy. Radiation waves are considered electro-magnetic field oscillations; but, no electro-magnetic field is detected in space with light. Hence, light photons must be tiny ultimate mass particles with orbiting electrons ejected by, electro-magnetic field between orbiting excited-electrons and positrons at the centre of an atom on protons in the nucleus as stated above. While describing Origin of light; they consider light as mass-less gauze Bosons as quanta of energy having no mass. No problem. Light works in both the systems same ways. It is like a very orderly kingdom; where in each and every one obeys laws strictly. Therefore, the existence of the king practically seems NOT; but, actually, it is there. By the Quantum theory; the state of Universe before its Birth, can be explained better by applying projective symmetry group (PSG) as explained in his article . 'Origin of Light' by Xiao-Gang Wen, *Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139* (Dated: June 15, 2001). It characterizes quantum orders of no gap quantas as dancing pattern in which particles waltz around each other in a ground state. In quantum as well as in 'ultimate the smallest mass' both the theories this 'dancing pattern can definitely exist; because, in both light particles are Bosons and number of Bosons can exist in the same state.

After all, what is heat? It is nothing but vibrations of mass particles bonded with each other by molecular forces. They vibrate in different patterns such as, linear, to and fro, circular, curvilinear, at heat wave frequencies releasing heat photons particles periodically, That is frequency of radiation. And a bunch of photons released at the same instant of time is its strength represented by amplitude of the frequency. These, internal vibratory motions of material molecules and their atoms are sensed by observer as a heat. Temperature denotes the intensity of heat. It is clear from Temperature Wikipedia, sub-head, Kinetic Theory Approach to Temperature. It denotes the frequency and amplitude of heat radiation. Thus a very basic truth is being revised by the author a bit differently that, "The very basic, ultimate and the most smallest mass particles moving with different velocities, either linear, curvilinear or vibratory motion, either in free space or, inside a material is an energy E ; and, temperature is its measure of intensity. In a fixed volume and fixed pressure of a material, as we transfer heat; its pressure increases. Because, increased temperature of the enclosed mass means increase of molecular vibrations in it,

which makes the material molecules to dash more vigorously on the enclosure; thereby increasing the pressure of it proportionately. When we give heat to, some enclosed mass means we supply photons having speeds ' c ' to increase the vibratory maximum speed each of that enclosed mass particles and, hence the kinetic energy of the mass particles of enclosed mass. Hence, when universe is existed; all particles in universe, in inertial Universal Frame have relative motions within themselves w.r.t. each other. When the motions will be stopped or reduced to dancing around each other in free space as mentioned above**, the particles will have stored energy within themselves w.r.t. each other at ground state level due to their positions. Thus, when there is not the visible, perceiving Universe, there is only the 'Dark Energy' filled in the space all over. When the Birth of Universe took place; a few Dark Energy 5% or so, has converted into material world. It is explained in Dark Energy, Dark Matter | Science Mission Directorate-web.

Thus, as per the relation $E=mc^2$ We are considering the mass as whole to be converted into energy. And that energy has no particles. Therefore we have attached electro-magnetic field oscillations in space creating light waves. But, electro-magnetic field is not detected with light in space. And the possibility of ether is already waved off. Further, the Dark Energy and the Dark matter doesn't act as medium for energy transmission tool; instead energy transfer-particles transfer energy from source to receiver in free space. Hence as per quantum theory, light consists of energy quanta released by light source atoms, so that one revolution of an excited orbital electron will release one or series of photons depending upon excited state of orbital electron. How it happens can be understood from article, 'Why Spontaneous Emission? By P. W. Milonni, Department of Physics, University of Arkansas, Fayetteville, Arkansas; published in Am. J. Phys., Vol.52, No. 4, April 1984. This way the serially released photons can be represented as a wave of light. Thus, I repeat, wave is a mode of representation of particles' density along its path of travel. Secondly, there is not electro-magnetic field in space with light photons. Hence, energy should accompany with mass particles.

Physical Shape of Light Photon:-To satisfy all properties of light and relativistic concepts being discussed in this paper; a photon is considered by the author like an annular part/segment of a circular hollow sphere's surface, very thin, so thin that, photon can exist, that's the ultimate, the smallest thickness; which is cut from both sides, opposite to each other, separated at one of its pair of poles, made straight and twisted through ninety degrees with respect to its both the ends as shown in the figure-1 below. Such physical feature of light photon can explain all light phenomena including polarization concentration like sunlight on earth. When, such two light photons collide with each other, they just slip over each other and pass away without change in their directions of motions and without any attenuation. In fact above figure-1 shows two photons in succession oriented through 90° . Polarization of light as explained in 'Classification of Polarization - HyperPhysics Concepts', is satisfied because of this twist. In this reference electric and magnetic fields are shown forming the above said 90° orientation within photons. But, this author puts the fact that, there is neither electric nor magnetic field with light photons in free space. The orientation can be achieved releasing the photons by orbiting electron around its nucleus in its excited orbit. Thinking microscopically, an orbital electron orbit axis cannot remain stationary due to

repulsive electromagnetic forces inside an atom. An electron describes its orbit as vector sum of two circular orbits having their axes perpendicular to each other. Hence a pair of photons oriented through 90° , w.r.t. each other, could be released by any excited orbital electron.

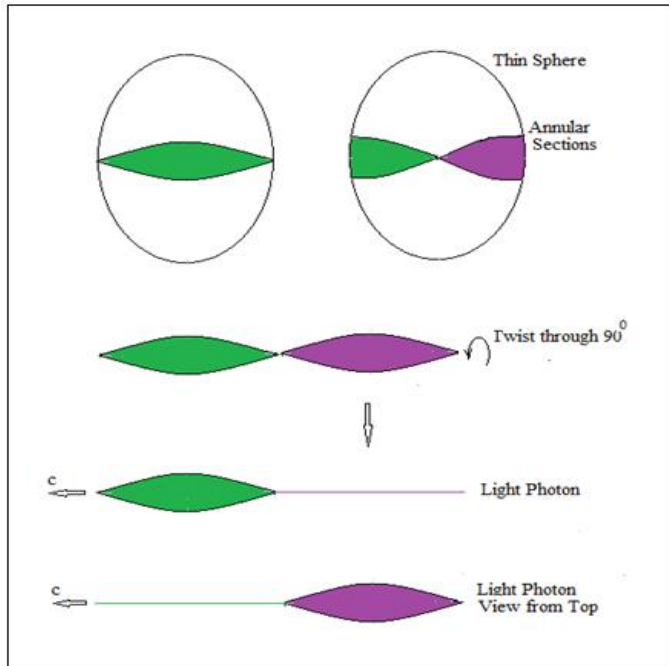


Figure 1. Physical Shape of Light-Photon

We are going to prove after some preparation that, though a light photon is always moving at speed c in free space, it doesn't acquire rest state; it's mass in motion, which is called its relativistic mass; is not that; but it is equal to its rest mass only. At the same time it will also be proved that, relativistic mass increase is that mass which gets attached to original mass in motion, to increase its speed by transferring its respective momentum. Thus if m^0 is a light photon rest mass, moving at speed c , of its own in free space and that is not having any other attached mass added to it to increase its speed; then, a light photon has kinetic energy $[m_0c^2]$.

Rest Mass of Light Photon

Thus, $E=m_0c^2$ represents kinetic energy in free space of the rest mass m_0 of a light photon. The mass of light photon emitted by different sources range from (8×10^{-40}) gram for 'Dispersion of star light (binary stars) to (3×10^{-60}) gram for Analysis of Mechanical Stability of Magnetized gas, as found experimentally in article titled as 'The mass of photon' written by Liang-cheng Tu, at Department of Physics Huazhong University of Science and Technology, Wuhan, 430074, Peoples Republic of China; Jun Luo and Geoge T Gillies, University of Verginia, Charlottes Ville. VA 22904 USA. As per Plank's relation for radiation energy $[E = nh \cdot J.c.]$. Here n represents number of basic ultimate mass particles that's the photon masses in total consolidated mass m . The mass m in relation $[E=mc^2]$ represents the rest mass m_0 plus, the total mass of the photons with their momentum Hence,

$$E = mc^2 = nh \dots\dots\dots(7)$$

Here represents resultant frequency of energy quanta that are serially gapless connected in different numbers of group, are

released from its/their source at speed c . Rearranging above equation mathematically, and putting photon mass m_0 moving at speed c ,

$$m_0 = [nh/ c^2]. \dots\dots\dots(8)$$

$$= [nh/c].[1/(c/)] = [nh/c].[1/] \dots\dots\dots(9)$$

Microscopic perusal through above equation (7), informs the following facts.

1. 'h' is the energy of the basic ultimate mass i.e. a unit mass of single photon in motion at speed c .
2. '' represents frequency of 'h' i.e., number of such energy packets seen crossing a point in period of one second moving at speed c in free space.
3. 'n' represents such number of 'Bosons' sharing same place as its property mentioned in article 'Boson' by By Sean Carroll, California Institute of Technology, in 'Symmetry Magazine' on 1/8/13.
4. The term, $[nh]$. represents total mass of a group of photons defined by above (1, 2, 3) statements. It is homogeneously distributed in space linearly evenly in equal bunches along length c . It represents mass m in equation (7) above. It also represents mass m_0 if it is found stationary that at rest in observer's (ours) frame. But, If it is found moving at speed c linearly w.r.t. observer naturally originally; then it possesses kinetic energy equal to $[m_0c^2]$.
5. If the particle masses $[nh]$. move at linear speeds equal to c in a smallest possible circular space domain attached to observer's frame describing suitable curvilinear paths in the space domain; the group of particle masses still have energy due to motion equal to the same as previous; that's equal to $[m_0c^2]$. Now in this case we find the group of photons stationary as a packed mass equal to m_0 containing all its photon masses $[nh]$. , moving with speed c linearly but describing curvilinear paths in constrained space domain under the influence of their mutual forces. Hence m_0c^2 represents the rest mass energy and $\{[nh] . /c^2\}$ represents rest mass m_0 .
6. When we break this assembly of photons describing m_0 , they are released from mutual pressure zones, maintaining their energies due to their internal curvilinear motions at speed c ; the photons assume linear paths in free space around at speeds c ; imparting their energies in motions to other masses towards which they are directed any manner, i.e. either naturally as in an atom bomb blast or manually as in a nuclear reactor.
7. If this rest mass is imparted motion additional masses glue it in each effort of increasing the speed of m_0 ; and mass go on increasing as speed increases. Naturally it is equating to relativistic mass increase. Hence, we err and state that energy can be converted into mass. The mass m is seen to have increased to m apparently. When we reduce the speed of the mass m by reducing its speed by aiming speedy photons in direction opposite to its direction of motion; the extra added masses loosely bound are released in space along with the aimed photons to decrease speed of mass m as radiation energy. finally the mass comes to rest with no extra photon with it, to the quantity m_0 . Again we err saying that mass can be converted into energy.

8. Thus perusing through above (7) facts, anyone can get satisfied by, perceived with the fact that, mass is an eternal quantity in Universe. Neither it can be created nor, it can be destroyed. Energy to do work is, exhibited by motion of mass. In doing world; the position a mass in Universal rest frame changes and energy is transformed from one form to another. Neither mass nor energy can neither be created nor destroyed in the Universe. It is the forever standing scientific fact in the Universe.

Above equations (7, 8, and 9) and the eight facts mentioned just above perceive us that, a light photon has a rest mass in motion with speed c representing energy. The rest mass of a photon is calculated by using energy transformation formula $[E=m_0c^2]$ and $[E = m_0c^2 = nh]$.

The derived as above relation

$$m_0c^2 = nh \dots\dots\dots(10)$$

In above equation (10) the term $[m_0c^2]$ means that each and every ultimate mass particle in mass m_0 , is moving at linear speed c describing vibrations into the mass domain space. And the mass m_0 remain stationary attached to observer's frame. The above internal motions of the ultimate mass particles, constitute the internal energy of the rest mass m_0 . Observe both sides of the equation. Left side includes mass and speed. The right side also includes mass in h and speed in both inherently. Rearranging above equation for value of rest mass m_0 as below,

$$m_0 = nh / c^2,$$

Substitute, $[n = 1]$ to mean one cycle of the radiation; $[h = 6.626 \times 10^{-34} \text{ Js}]$ to mean only one single light particle-boson; $[c = 3 \times 10^8 \text{ m/s}]$. After these substitutions in above equation, we have rest mass of single light photon,

$$m_{0p} = 0.732 \times 10^{-50} \text{ Kg is}$$

The smallest ultimate mass of light photon.....(11)

The addition of a Yukawa component to the potential of magnetic dipole fields, and all of these has been studied seriously. All these consequences of such an effect open the door to useful approaches for laboratory experiments or astrophysical/cosmological observations aimed at determining the photon mass or, more precisely, setting an upper limit on it. For the photon, the Particle Data Group finds the currently accepted upper limit on the rest mass to be $m \leq 4 \times 10^{-49} \text{ g} = 2 \times 10^{-16} \text{ eV}$ i.e. $= 0.4 \times 10^{-50} \text{ kg}$. It tallies with above equation (11). Because, here the photon mass is approximately (1/2) of that in equation (11). But, equation (11) is for two polar components of light photon as indicated in this paper. Hence, as per equation (11), one light photon will have mass equal to, 0.366×10^{-50} . Please perceive that the light photon rest mass m_{0p} is always in motion with speed c in free space. It cannot be delivered momentum to increase its speed; for, the mass carrying momentum intending to speed it up, should be at speed greater than c . Thus, light photon has mass and it is the smallest ultimate mass particle in the Universe.

If such two light photons will be passing very near to each other within their effective distance; they will assume circular

motion described around their mass centre. When such groups of rotating photons will go on increasing, their circular speeds will be reducing due to their mutual gravitational forces. The spacecraft's onboard atomic clock appeared to be running slow due to accelerating forces as in 'Gaia's atomic clock run slow']. Because of this gravitational interaction. Then after, such groups of masses have interactions due to their mutual gravity acting on each other. Resultant developed due to internal gravity and other internal forces generates resultant vibratory motion of the final group of mass contained in respective body. Its frequency

$$= m_0c^2/nh,$$

where n is number of ultimate total photon masses in m_0 derived from Quantum Theory.

.....(12)

Its natural frequency of oscillations as per Kinetics f_n from web 'Natural Frequencies-Azima DLI for any structure is,

$$f_n = [1/2 \cdot K/m_0]^{1/2} \dots\dots\dots(13)$$

where, K is gravitational force in Newton at the position of the mass and acting on the mass m_0 .

We get one innovative thing here that there are two natural frequencies for each body mass. The first is, as per internal energy-quantum vibrations and the second is, f_n . Due to undamped reaction between inertia of mass m_0 and external force of gravity and others, given by above equations. Here, there is one fact that should be borne in mind while considering mass as a wave. That is as stated below. When we represent a mass as a wave; it is to be represented by frequency (equation 12 above) wave derived from internal quantum energy of the mass concerned. The natural frequency is due to external forces (equation 13 above). The frequency of its rest mass is in free space; whereas the frequency f_n , of its respective mass is under the influence of external forces. Under such condition, frequency is reduced decided by resultant of external forces on internal Quantum masses of the consolidated mass respective mass, here m_0 . In respect of Quantum frequency, as per material wave theory, 'the wavelength of a particle is inversely proportional to its momentum (mass times velocity) and its frequency is proportional to its kinetic energy, which is a 'frame-dependent (relative) value' every object, every matter has motion either linear or curvilinear or oscillatory. Hence each object, each matter particle describes a respective wave as described in 'Wise Greel, What are Matter Waves? It commensurate with the facts derived above in equation (12) for Quantum frequency. But, with natural frequency due to external forces derived above as in equation (13), the relations between wavelength/ momentum and frequency/kinetic energy are inverse w.r.t. the Quantum frequency quantities. It is because, their dependence is also on forces inverse to each other; for quantum frequencies they are internal and for natural kinetic, they are external. Hence, the fact in reference as mentioned above is also true for f_n .

In respect of light photon its rest mass representation in its speed c , is innovatively drawn and shown in the figure below. The rest mass at rest and relativistic mass in speed are same in respect of photon. It always moves at speed c as per nature's basic rule to maintain the energy eternal constant in motion of

ultimate mass particles (Authors Say). Let such one photon be p. To impart speed to photon p which is moving at speed c w.r.t. its source, the source cannot release photons at speed greater than c w.r.t. it to impart momentum to the moving photon. But some external another source coming from behind the light photon at some relative speed can release a photon whose speed w.r.t. it (w.r.t. external source) is c, but that w.r.t. photon p is $(c^2 - v^2)^{1/2}$ (as per article 'An innovative review of Kennedy-Thorndike Experiment' published in scirj, volume V, May, 2017, by the Author); can deliver the momentum to photon p. but the momentum delivered will not be $m_p \cdot c$ but it will be $(1 - v^2/c^2)^{1/2} \cdot m_p$. When this external photon will have an elastic impact with photon m_p and will get attached with it, the speed of photon m_p will decrease instead of increasing it beyond c in order to maintain the law of conservation law of momentum. This happens because of peculiar mode of release of photons from their sources.

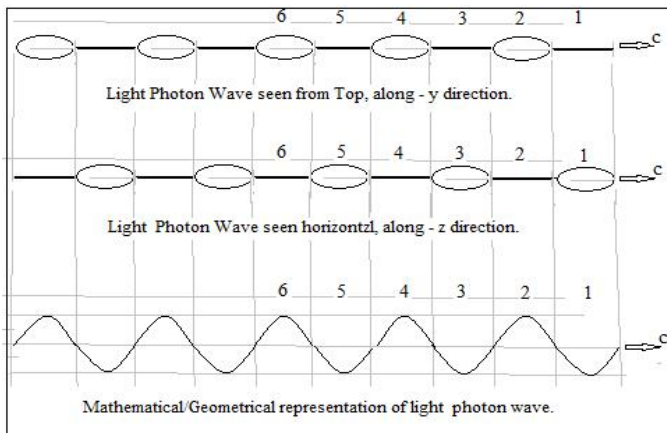


Figure 2. Light Photon Particles as a wave

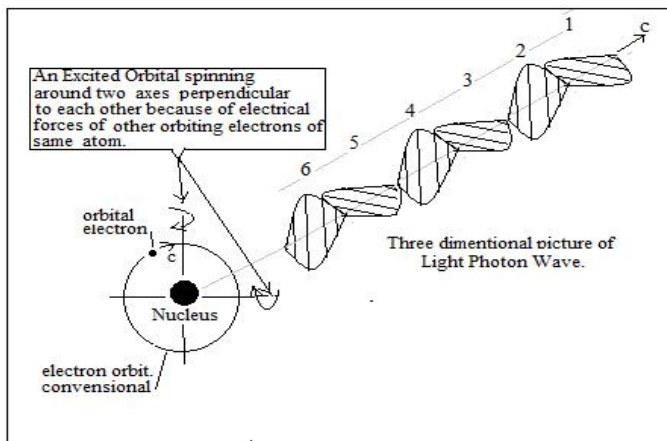


Figure 3. Generation of Light Photon Wave

As per material wave theory, 'the wavelength of a particle is inversely proportional to its momentum (mass times velocity) and its frequency is proportional to its kinetic energy, which is a 'frame-dependent (relative) value'. It commensurate with the facts derived above from equations (8) and (9). Above equation indicates that, as the light photon travels across a point in space; it experiences a contour of it as a sign wave. Hence a light ray is defined as a sine wave. As it is not having thickness; it passes through mating surface lines of transparent crystals which is parallel and coinciding to a photon plane. It causes polarization of light. The photon length is its wave length and amplitude 2A peak to peak of its width as shown in figure-4 below

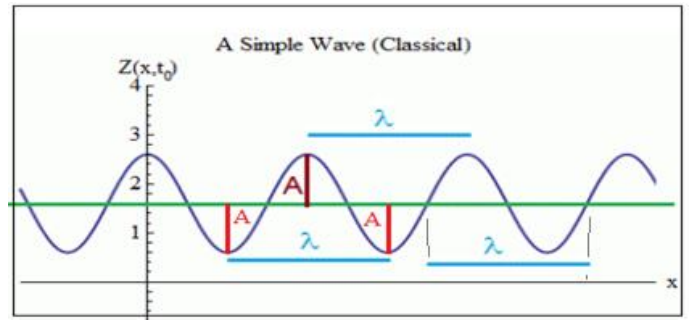


Figure 4. Wave Quantities

Let us find out the physical size of light photon. Draw a Photon physically as shown in the diagram- below.

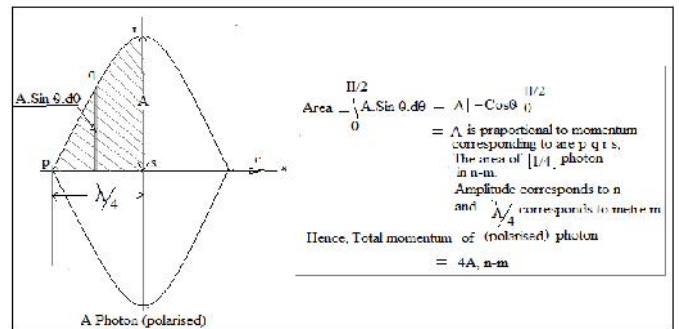


Figure 5. Physical dimensions of photon

The wave length of any radiation can be found from its frequency as c/f . Its half length ($\lambda/2$) will be the length of one polarized light photon. As seen above, there are two light photons in one light wave. $[h/c^2]$ the [Plank's constant/ c^2] represents mass of one normal light photon or a single wave; which contains two normal un-polarized light photons. Hence one photon will contain mass equal to

$$m_{opp} = 0.366 \times 10^{-50} \text{ Kg. received from equation (11) above.} \dots\dots\dots(14)$$

That's the mass of a polarized or simply a polar photon and it is proportional to

$$\text{Area} = 4A = [0.366 \times 10^{-50}] \text{ m}^2 \text{ Hence, its width, twice the amplitude } A$$

$$2A = [0.183 \times 10^{-50}] \text{ m}^2 = \text{length} \times \text{breadth} = [\lambda/2] \times \text{breadth.}$$

$$\text{Hence, breadth} = [0.183 \times 10^{-50}] / [\lambda/2] = [0.366 \times 10^{-50}] \cdot [] \text{ m.}$$

because $[\lambda/2] \text{ m}$ is length $\dots\dots\dots(15)$
of the photon.

Because, one polarized light photon have mass equal to half the mass of photon contained in a single wave; for two normal light photons are in a normal un-polarized light wave.

Thus the

Physical dimensions of a polar single photon are as below.

$$\text{Length} = [\lambda/2] \text{ m} \dots\dots\dots(16)$$

$$\text{Breadth} = [0.366 \times 10^{-50}] \cdot [] \text{ m. as per (15) above.}$$

Thickness = infinitesimally small to enable existence of the photon(17)

There is nothing zero in the Universe and also in mathematics. If there were anything zero in the Universe, the Universe would have not come into existence. Further, if we have assumed zero in mathematics; the mathematics and the science would have not progressed to the extent as at it is at present. Things tend to zero but they never become zero.

The mass of light photon 'm' calculated above from above equation-7, is not relativistic mass; but, it is its rest mass only. Because, in its source's frame; it is released at speed c . And an observer attached to its source's frame, cannot release other photons at speed greater than c , to impart momentum to the said light photon moving at speed c having mass m . This mass m is not received by some 'no-mass speculative photon'. Hence, it is not relativistic mass. It is the rest mass of light photon which is moving at speed c in free space. A light-photon have a rest mass m_0 equal to m , the mass in motion. Being a Boson, It may accompany more photons in their unification with it since their release. If 'n' photons are unified, the mass of such photon will be 'nm'. When 'n' number of photons get attached to a moving mass, in the process of 'increasing its speed; the mass of that moving object increases to 'nm'. When we obstruct that mass to stop it from moving; the attached photon masses are released from it because of mechanical shocks to the mass, as the attached from external source photons are so loosely bound with the moving mass. its mass will reduce proportionately. When the speed of a mass is being increased, photons at speed c impart the mass in motion, transfer its energy to the moving mass to increase its speed effectively, decreasing its (photon's) speed, till both (the moving mass and the photon) attain the same speed so that, their total momentum is conserved. Thus, the attached photon masses to the moving mass, increase the mass of the moving mass relativistic-ally; when photons at speed 'c' are bombarded on the moving mass when the photon is at point of the external source doing this. Out of them some get attached to the moving mass increasing its momentum by accelerating the mass; and, others get reflected, scattered in space around as light photons. When the moving mass is decelerated; the attached photons are released from the moving mass as light photons. Hence, it is observed that, *accelerating mass emits light*. Please refer the article 'Accelerated mass as the source of electromagnetic radiation'. To the concept of, a mass radiate during its accelerated motion, Author has added in this paper the basic cause of that type of radiation. The mode of either linear wave polarization or circular polarization are explained in detail in web 'polarization (wave) Wikipedia and circular polarization Wikipedia. But, no where is explain how the particular shaped photons are generated. That endeavor is done by the Author here in this article. Now is the turn to see how, all energy E of consolidated mass m , is transformed to the n particles of the consolidated mass m and those particles then behave as photons.

Photon Field: It is the well established fact that the light, travelling in space is actually, the oscillations of electric and magnetic field perpendicular to each other and perpendicular to the direction of motion of the light. Emission of light from excited atoms of mass or from excited electrons are explained in detail clearly in web: Electron Excitation and Emission - Microscope. But, Neither such an electric field nor magnetic field is detected with light in free space, even in this nano-

technology era. In Maxwell's electro-magnetic equations the electromagnetic fields are confined to respective orbital electrons. They do not emanate in space outside. Their force throws out the extra photon, received from outside source, to relieve extra outwards centrifugal force due to it, against internal atomic forces on an orbital electron.

Eternality of Mass

In below figure-6, in nuclear reaction, one molecule of deuterium [^2H] unites with one molecule of tritium [^3H] and, creates one molecule of helium [^4H]. This reaction is well explained on web of 'Nuclear Fusion - Georgia State University' In this physical reaction, one hydrogen atom is broken creating one neutron and one electron positron pair. The total internal energy of [^2H] deuterium molecule and the [^3H] tritium molecule is greater than the total internal energy of helium molecule [^4H] by 3.5 MeV. Thus, during fusion of deuterium and tritium to produce helium, this 3.5 MeV energy is released in space around as radiation energy, mainly heat photons-energy. These photons were associated with internal energies of [^2H], [^3H] there in. As seen above, in this reaction one number of hydrogen atom is lost; in the sense, it is dis-integrated into the smallest ultimate mass particles, neutron and positron-electron pair. When orbiting electron of hydrogen atom gets excited during union of [^2H] and [^3H], the orbiting electron is released at speed c . It pulls out its dual, the positron out of the hydrogen atom. Thus the respective proton at nucleus become neutron and it is now free. The freed electron is driven towards its counter-part positron at speed c , generating very heavy magnetic field restraining its own speed rise beyond c . It develops a very heavy electro-magnetic field force, causing the break-down of the electron-positron pair into neutral small ultimate basic particles acquiring the relative speed c .

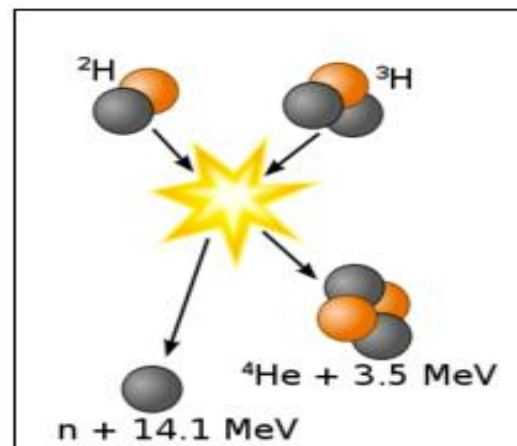


Figure 6. Fusion of deuterium with tritium creating helium-4, freeing a neutron, and releasing 17.59 MeV of energy

Billions of photons moving at speed c are thus created as heat, visible light and other possible radiations' photons. Here lies the perception of the mass-energy conversion transformation relation. The internal atomic energy associated with electron in the hydrogen atom; is thus delivered in space around the hydrogen atom, in the form of ultimate smallest mass particles moving at speeds c , as light photons, heat photons, and other possible radiations' photons. The energy delivered thus, is equal to 14.1 MeV. It is in the form of energy in motion of millions of ultimate, the smallest mass particles. Thus, rest

mass of any body, does not vanish in mass energy transformation, instead of, it is broken into ultimate possible small mass particles basic the smallest ultimate mass particles photons moving at speed c w.r.t its rest position of its host atom. Hence, a light photon has a definite rest mass value equal to 0.732×10^{-50} Kg. as calculated above, which is in motion at light speed always in free space. And its speed is light speed w.r.t. an observer that's its respective host nucleus. We have seen how these photons are generated and released in space. They then travel in space and when, they meet an obstruction in their path; they deliver their energy in motion to the obstruction and either mount on obstruction or get reflected. Hence we see that an accelerating mass radiates. When no energy transfer from photon to the obstruction occurs; the photon is reflected into space by orbital electron of the obstruction like a cricket ball is hit by the bat. There is much space to consider actually a light photon is the smallest ultimate mass particle in Universe. They are restless always in the nature. They have linear motion as light photons and dancing motion within a small domain of space due to their position in space w.r.t. Dark Energy particles in space. FIONA MACDONALD on 16 MAY 2016 'Physicists Just Discovered a New Form of Light' that doesn't follow our existing rules of angular momentum, and it could shake up our understanding of the electromagnetic radiation, results published in Science Advances. It tallys with the Author's consideration that, Planks constant contain two light photons. After their stoppage of linear motion due to some obstruction and their non-absorption by the obstruction, the photons will remain dancing in space as a Dark Energy particles. Two photons in one (unit) h , support half angular momentum. Hence, there should not be any difficulty in accepting photon as mass particles; when they have mass property, the momentum, they exhibit energy by keeping themselves in motion as other all mass particles do. Only difference is other particles being massive, when in group due to their mutual attraction collide each other maintaining boundary, due to their gravities; they vibrate in mass of an object maintaining their energies as internal mass energy; but, light photons doesn't collide with each other in free space, hence they move at their ultimate speed ' c ' w.r.t. their respective nucleus of source-atom'. It may look something like flake; because, most of all believe that, light travels in space at speed c irrespective of any frame. But, in my review paper titled 'An Innovative Review of Kennedy-Thorndike Experiment' in fifth volume, May 2017' it is proved that, the speed c of light is only w.r.t. its source's inertial frame. With so much discussion above, there should not be any difficulty in accepting the fact that, light photons are the smallest ultimate eternal mass particles in the Universe.

In modern era, photons have been cached in crystals and brought to rest with respect to space surrounding the crystal. It is by Abigail Frymann. Published: 11:39 EDT, 27 July 2013 | Updated: 11:39 EDT, 27 July 2013 e-mail; 196. ... RSS Text-based site Reader Prints Our Papers Top of page Daily Mail Mail on Sunday. They explain, the photons trapped in the crystal have offered their mass and energy to orbiting electrons joining their motion. But, it cannot be a real fact. Because if it were so, we would have not able to see those photons trapped in the crystal. Light is reflected from stationary trapped light photons and hence, we can see them. In BEC experiment light photon speed is reduced to 17 m per second or to a standstill position for a milli-second from c . inside the BEC of micro-length by reducing the condensate pressure of a gas to density one thousandth of that of atmosphere and absolute temperature

to a few micro-kelvin by laser cooling; light photons are stopped. It is interesting to refer, the web, ' Bose-Einstein condensate of photons - Physics Forums; and there in, Bose-Einstein condensate of photons Jan 23, 2012.

Please go through the below recipe taken from Slow Light, Physics Central, of American Society Site. ...It's possible to slow light down by making it interact with matter and, in a sense, converting photons to something with mass. ... Lene Hau and colleagues at the Rowland Institute of Science did in 1999 when they slowed light to 17 miles per hour in a Bose Einstein Condensate (BEC) made of ultracold sodium atoms. The laser light photons form with the BEC atoms 'polaritons'. Author explains these polaritons as below. The laser photons impart their momentum to BEC super atom. The velocity-part of momentum of the light photon is distributed among millions of electrons of BEC super atom. slowing down its speed to almost zero. The complex thus formed is 'polariton' as called in science. Then, the article says that, ... By turning the lasers back up, the researchers converted the polaritons back into photons, which then resumed their speed-of-light travel. Thus, the impinged laser shot in particular direction, slows down the electrons to about zero speed by driving out with it at speed c , the injected laser photons in BEC moving at speed about zero, reducing the BEC super polariton to BEC super atom. As mentioned in the referred article under discussion here, it is mentioned that, the light photons make BEC super atom much heavier. It is clear indication of that light photons have mass.

In a collection of millions of atoms like a single super atom known as Bose-Einstein Condensate Light photons are almost stopped from moving. The detailed experimental facts can be seen in 'Bose-Einstein Condensation of Light - Freie Universität; by Martin Witz; Institut für Anjewandte Physik der Universität Bonn'. All these observations indicate that light photon has mass, it attains rest position. Its velocity is indication of temperature. Visible light has more velocity than heat photons. Hence most of the light is reflected not transferring its temperature that its motion to the obstruction. Its two dimensional property tells that its thickness is beyond measurable quantity. It is not zero. There is nothing zero. Zero means beyond capacity to express it in definite number of any kind. Thus, a light photon is having the smallest ultimate rest mass as computed above. Otherwise, they would have disappeared if they were not having rest mass. The rest mass and Relativistic mass of light photon is equal. Because in its source's rest frame, there can not be given a motion greater than c to other particle mass to impart additional momentum to the light photon and therefore, its mass cannot increase in its motion equal to c . Hence its properties that, having no thickness, remaining always in motion can not be proof for photon to be a non-mass particle. Microscopically and PURE-LOGICALLY, a property is existed with the existence of its host/cause. When light photons have mass-properties like momentum; then, it should have a mass. Hence a light photon has a mass as discussed above. Yes, it is accepted by the science; but very relatively. It is stated that, light photons have relativistic mass. That is its energy equivalent as per the relation $[E=mc^2]$. But, I claim, when some particle is moving at a velocity c and we try to impart it additional momentum to increase its speed beyond c the particle who is to give the momentum to the leading particle moving at speed c , cannot make impact to transfer its momentum; because, the trailing particle cannot move at speed greater than c . Hence, the trailing particle A, which is necessarily released exactly at the

point of leading particle B, exactly at its point of its existence in path of motion in space; so that, it also unites with the leading one showing increase in mass of the leading particle B, equal to mass of the particle A and increasing combined speed so as to keep total momentum constant. And it is the real mass increase to which we call relativistic mass obtained from energy to mass conversion. Further, by comparing the properties of light photons assuming them mass-less and with a mass; the comparison leads to the fact that light photons have a mass. Secondly, as per 'Experimental checks on photon mass, sub article of Photon Wikipedia, a light photon have to mass. Hence a photon has a mass. Again the effect and cause phenomena work. According to it, a light photon has a materialistic mass as it has property of mass, the momentum. The main cause that denies mass to a light photon is; it does not rest. It never stop in free space. Why light photon only? Nothing existence in material form can stop; mostly all are vibrating. Because they are in groups, because of mutual gravitational forces in between each other them. They impart their motions to each other inside their group. Therefore the smaller and smaller mass particles in a bulk mass (here greater than a photon mass). Vibrate due to elastic collisions in between them due to their linear speeds. Their resultant appears on the Object they have formed. It is the natural frequency of the Object in free space. (Remember please, there is another natural frequency f_n , of the Object due to forces surrounding it.) Light photons are very tiny particles in un-assembled state. Hence, they are found always moving at speed 'c'. They have energy due to their motion.

Definition of Energy

Let us device a theorem on the existed facts discussed above.. Something moving with respect to other one (i.e. an observer) is, energy. Momentum is the relativistic measure of energy. Momentum is perceived by an observer when a mass is moving. Momentum involves motion and mass. Temperature is indicative measure of motion. Hence, higher the temperature of an object greater is its internal vibrations between its basic particles due to their collisions rebounds with each other. But, there is nothing stationary ahead and behind of a photon in free space; therefore, it is moving straight. When a material obstructs it; it is either absorbed by the material or reflected back depending on energy storage condition of the material. The principle behind BEC is which Einstein proposed that cooling bosonic atoms to a very low temperature would cause them to fall (or "condense") into the lowest accessible quantum state, resulting in a new form of matter.

Light Photon Condensate

In BEC experiment light photons are brought to rest for a while. To form BEC, extremely low density gas of rubidium, which is at one thousandth of normal air pressure is taken. It is cooled to ultra low temperature of very near to absolute zero Kelvin that is very near to -273.15^0 K. The gas is cooled by Laser cooling and magnetic trapping. Temperature means respective motion of respective particle/particles. In such a low pressure gas atomic linear path motions and orbital electrons revolving motions are, reduced by directing laser pulses in head on direction and from behind, in the opposite direction, slightly desynchronized to the frequencies of the gas atoms and the orbitals. When a laser photon goes through an atom, it comes out with additional photons from the atom thus reducing

motions and vibrations internal to the atom, and thus cool down the atom, reduce its internal speeds. An opposite double beam of laser, counter acts 'Doppler Shift' and increases the cooling efficiency. The gas in BEC is BOSON gas. In BOSON gas particles do occupy same energy state. So, during their mean path and active zone around atoms they happen to come near each other and unite to the same common quantum stage. Such millions of atoms overlap each other and form a super atom, an atom like structure at absolute zero temperature; that's the atomic structure where in motions of particles are reduced to almost zero. It is held in magnetic field trap so that, not any higher temperature atom, molecule can enter the BEC and disturb it. The magnetic trap, removes out the higher temperature molecules from the gas. The collection of millions of atoms forming super atom in longitudinal 0.2 mm long cigar shape, passes a pulse of light within 0.6 p-secs. Giving a cycling speed 17 miles/s. Before its entrance to the BEC and after its release from BEC, the speed of light is 'c'. It means the millions of condensed atoms of BEC, within active distances of each other, share the speed c of light photons while passing through BEC. In a normal general case, when an atom, receives a light photon and touches to an atom, it absorbs that photon and immediately reflects it in space around it when the atom is in its stable or excited stage dragging with it, some of photons of the atom. So, in the experiment of slowing light; the laser-irradiated photons are injected in extremely low pressure gas contained in extremely cold to some micro K cavity, to increase their internal energy state/quantum state, to the level, where, the extremely cold atoms, cannot absorb the injected photons permanently in this state. Instead of absorbing the photons, the laser-excited atoms' cluster of BEC slow speed orbital electrons surrounds the light-photons and traps them. The energy in speed 'c' of these photons is shared by orbital electrons of the BEC cold atoms, which also do orbit at cycling speed. But, as the quantum level/energy level of the electron is increased by laser to make the cold atoms stable at this state; as usual so that they pass the light photons at cycling speed by absorbing and releasing in succession. At the BEC other end, when a light photon is reached the last cold atom at the edge of BEC, the cooled light photons, drag their energy from BEC creeping orbital-electrons, thereby, flying out of BEC at speed c. By controlling laser irradiation frequency, the photons are also stopped in BEC still quite. The fields of BEC millions of atoms hold the light photon. Thus the temperature of the photon is reduced very near to absolute zero temperature by storing its energy in orbiting electrons of BEC.

As per web: Another New Explanation For Dark Matter TrendinTech; in Home Science by Samuel Bavor - June 27, 2017. It is indicated that, black matter has been fluctuating form the whole time. When it is given linear speed c by excited electron in an excited atom, it moves with speed c till it is obstructed in inelastic collision, transferring its momentum due to velocity to the obstructing body and getting attached to it or getting released as radiation particle or just getting slip down in space around the body as Dark Matter Particle. By observing above behavior, *it is the fact that, each very basic particle 'photon' has its ultimate the smallest mass as indicated above and always moving at speed 'c' and vibrating in every matter at speed at its mean position so as to manifest its internal energy m_0c^2 . Hence the mass of a light photon cannot be denied. In BEC formation, the laser photons drive away, additional photons from the less density gas contained in cavity, thus transferring the internal energy of the atoms to outer space to cool down the atoms to form BEC*

While going through different sites of speed of light and photons; it seems that, the "Birth of Universe can better be explained by experimenting on BEC along with the experimentation on Particle Physics, particularly on BEC. Methods can be worked out to create quarks, and further elementary particle, the 'light photons' trapped inside BEC by creating different conditions (to be innovated).

Above information regarding reducing speed of light to zero require absolute zero values of both pressure and temperature. At absolute zero temperature light condensate is formed by distrusting its energy in motion between the BEC atoms and drags it while it releases itself from the condensate. Laser cooling photons hit head on to moving gas atoms and orbital electrons of BEC-gas and, drive some photons from the gas to reduce its temperature. Thus the temperature is measure of internal energy content of a mass. It proves that h , the energy in joules, represented by Plank's constant is universal constant. It supports the definition of energy that, 'Something moving is Energy'. Then the motion may be of any kind, in any direction. Hence the word 'motion' or 'speed' are used instead of velocity. The constant h also indicates rest mass of ultimate mass particle, the light photon. Hence forth we shall call it fundamental mass particle also as in Physics. Because, up to 1% of electrical charge quantity of an electron's charge can be induced in it. An electron has, Charge $(-e = 1.6021766208(98) \times 10^{-19}$ coulombs. It is detected by Millican's experiment in 1909, as per 'Elementary Charge Wikipedia'.

In an atom, electrons' resultant shell can be drawn in the form of a circle 'ABC' as shown in Figure-7 above. At the centre of the circle positive electrical total charge equal to total orbital electrons-charge is shown as a centre of the spherical shell. The electrons' charge spread uniformly in the shell of the sphere, can be represented further in the form of periphery of $(2/3)$ dia. of equatorial plane circle of the sphere representing atom. Finally, the electrons=charge is distributed homogeneously along the periphery of the circle. Above discussion further leads to the result that, Light speed and orbital electrons linear speed in their respective orbits in their excited state are c at the absolute temperature in free space equal to 2.725 K onwards constant. 'Constant' because, an electron moving at speed ' c ' if acted upon to increase its speed beyond ' c ' its rate of change of electric field instantaneously become so high that, its self induced magnetic field around its path of motion does not allow any more to increase in its speed. About electric field and acquiring charge by a light photon; I repeat necessarily here.

Visualization of events by a source is by nano-electricity. It is also due to the motions of electrical charge with observer. When electric charge motion tries to exceed magnitude c it is restrained by self induced magnetic field by the charge. When an object causing an event moves at speed, better to say, tries it, then the respective energy fed to the event-charge cannot increase its speed beyond c , then it exhibits the extra energy in the form of electric charge. The same thing happens with the light photon also. It is observed that, movement of matter is stopped in BEC at $(- 273.15^0$ C) that's the absolute zero temperature. When light photon passes through an atom; it interacts with orbital electrons transferring its energy in motion to orbitals. Thus orbitals in path of light photons share their energy by increasing their speed negligibly small.

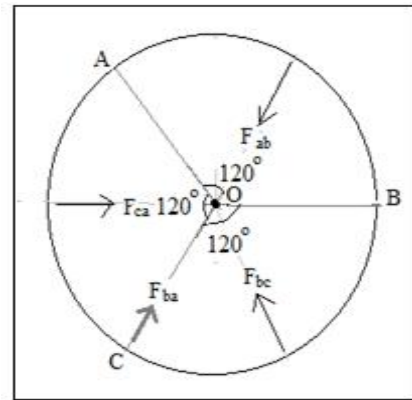


Figure 7. Forces Acting ON Sphere Shell

Because an electron mass (9.1×10^{-31} kg.) that can be had from web: 'Mass of electron-Mass of proton-Mass of neutron-Mass of electron ...', City Collegiate, characteristics of electron', is billions of billions time than a photon. Photon mass in this article is derived and is of the order of 10^{-50} kg. The light photons are just trapped in BEC atoms. When the light photons get released from BEC, coming crawling through BEC; the light photons fly out the BEC at speed c , by removing the energy delivered by them-selves to BEC. And at the same time, they drag away with them, the energy in BEC as pr their capability. A laser pulse in specific direction works as catalyst work in chemical reaction. In quarks, each of the photons maintains its energy, assuming curvilinear motions in bondage with other similar photons. But, in free space, a light photon mass can only maintain its energy in motion c w.r.t. its source atom. Thus electrical charge is a sensation of an observer about the motion of an object or a mass at speed nearing c . Because, as, a speed of a mass increases towards c , Observer perceives, orbiting electrons tending towards linear speed in speed w.r.t. the observer. Hence, he perceives orbiting electron charge, like an external charge attached to the mass. Extending further the logic, it seems that, at zero degree K i.e. absolute zero pressure, the BEC has existed. Because, at these absolute conditions when, the orbital electrons of BEC atoms almost stop orbiting; thereby vanishing their centrifugal forces maintaining balance with internal atomic forces; they would have assimilated by positrons at nucleus of the BEC cluster; hence, BEC atoms would have exploded in result of electron-positron union. But, it doesn't happen. Because, in an atom positive charge is at centre of atom and, orbital electrons of atoms in BEC; are almost stopped their orbital motions. Hence, the orbital electrons form a sphere around nucleus. Because, the internal structure of an electron is like a dense fog of the charge-material. When any electron will try to collapse in centre of the atom in a positron at the centre of the atom, under the influence of attractive force between positron and electron; it acts as if the negative charge sphere is contracting against the repelling forces of similar charges, the electrons present in the electrons' sphere around the nucleus of the BEC-atom. The quantity of electrical charge in an electron is a fixed quantity due its spinning motion at linear speed c as mentioned above. Hence, it doesn't happen. The negatively charged sphere exists. Such an atom is cold atom. Due to laser irradiance the cold atoms collect and overlap each other; thus, producing cold BEC-Super-atom. When a light photon passes through BEC, it is absorbed by electron of the BEC super atom. That super atom is excited negligibly. Because, there are millions of orbital electrons in the super-atom of BEC. Therefore, the

photon passes through BEC at its slow speed of a few meters per second. Resultantly, the light photon crawls through BEC. At the end of BEC the photon is released with its speed 'c'.

The rest mass of an electron is 1.24×10^{20} times the rest mass of a light photon ($9.11 \times 10^{-31} / 0.732 \times 10^{-50} = 1.24 \times 10^{20}$)**. Hence momentum of a light single photon moving at speed of light i.e. 3×10^8 m/s; is distributed amongst the ten thousandth times billions of billions photons contained into electron. Hence, when such millions of light photons in a ray pulse pass through BEC cold super atom; their energy is absorbed by orbital electrons of cold atom at rest in BEC. Therefore, the photon itself becomes cold acquiring absolute zero temperature and creeps through BEC condensate, at cycling speed of its orbital electrons. When the photon comes out from BEC, it recovers its original velocity 'c'; as a heavy mass moving at low velocity strikes very smaller mass at rest (w.r.t. the heavy mass) like a heavy striker in carom strikes a *carrom menat* rest, gives it higher than self speed, lowering its self-speed proportionately to maintain law of conservation of momentum. When a photon is in BEC atomic orbit; it is influenced by the atomic internal forces associated with an orbital electron, which is moving with linear velocity of a few meters/sec. in its orbit of the super atom. The photon gets attached to the electron. the electron in its state of cold atom gets excited very little. Because, the momentum of the photon, gets added to that of the cold electron of the BEC, can not affect its orbital speed noticeably. Because, the mass of electron is too greater than, that of an ultimate the smallest light photon. The respective electron get excited and delivers it to nearing another electron during its crawling speed under the influence of the voltage gradient across the BEC super atom.. In this fashion the light photon crawls inside BEC and moves along the field-voltage-gradient at slow- cycling speed as mentioned above from Lene Hau's findings. At the edge of BEC, the light photon when, move forward beyond the influence length of the BEC cold electron; the light photon energy, stored in BEC internal super atomic fields, is released and the photon therefore, gets ejected out from the BEC at its original speed 'c' in the free space as is explained above with the example of carom.

Please notice that, in a normal atom, the orbiting electrons are moving near linear speed 'c' and their centrifugal forces balance their internal atomic forces. Therefore, it means that, in BEC as linear speed of electron is reduced to a few m/sec. to keep them in super atom held; the orbital electron charges' repulsive forces maintain the atomic structure of the super cool BEC super atom as mentioned above. Further see that, the very rare density gas in cavity (vacuum), is cooled by laser light pulses to collide head on with the gas atoms and its electrons to reduce their speed. During Laser cooling, a light photon drives with it other photons contained in the rare/low pressure gas atoms and its orbiting electrons. Those, thus driven away photons are also similar to light photons. Hence, light photons are the basic mass particles of the Universe and to add it, a light photon has the smallest possible ultimate rest mass as discussed above. Further it is requested to think very microscopically. Then, one will find, the photons are packed in a quark within active zone of each other and there they are vibrating w.r.t. each other at maximum speed 'c' during their vibratory simple harmonic motions. The quarks then get their natural frequency of vibrations inside the elementary particles, electrons neutrons etc. Their resultant appears as natural frequency of an atom. When we consider matter as wave, it is this natural frequency wave of the matter. Please remember

that, the distribution of material mass in an object also greatly affects its natural frequency like multi-degree Freedom of Normal Oscillation given in', web. This all discussion with its references, also leads to the fact that a photon has a mass. Matter is created from light beams smashing against each other as per 'Science Daily' News dated May, 18, 2014, source 'Imperial College London'. The news is, 'Scientists discover how to turn light into matter after 80-year quest'. The matter has mass. Hence, Light Photons have their rest mass. Atom lasers, their coherence and interference like light photons indicate mass to light photons. In 'Experimental studies of Bose-Einstein condensation in a gas', Laser cooling and laser dispersing of BEC is possible because of light photons has mass. Due to mass of laser photons, they can act on BEC. 'Energy without mass', is only principally true. But, in this materialistic Universe, act of energy without a mass in impossible. Hence, light photons have their own rest mass same in their motion at speed c and in condensed state at absolute zero degree K temperature.

Photon is denied from it to be a mass particle. Because, a light photon has only two geometrical dimensions, longitude and transverse dimension the width; but, no thickness. That's it have zero thickness. But, very purely, fundamentally logically, there cannot be anything of absolute zero value in the existing Universe. There is nothing zero. Something zero means its infinitesimally very small value, whatever the smallest it may be. With this fact only, the science could progress. In mathematics, too small values, we omit. To continue mathematics during solving some basic problem, we assume values of respective very small quantities as *tending to zero*; and hence, then assume them *equal to zero* to enable the respective equation to progress forward to obtain the solution of the basic problem. And thereby only we could proceed further and reveal very astonishing, glamorous scientific facts. Actually a zero is meant by an infinitesimally the smallest value. In this sense, the light photon zero-thickness ought to be considered and as per it, zero means infinitesimally smallest value possible, that prove the existence of photon. Hence, a light photon has rest mass. The photon shape Author has innovatively given as 'annular section of a hollow sphere cut from its one pole to other and return to the first pole, in one rotation of the sphere around its axis. Then, as if held in two fingers of our hand, opposite-opposite ends and twisted through right angle to each other the two annular shaped pieces to form a light-photon wave. It is as shown in self explanatory figure-1 above. It proves all properties of light. We have seen above that, how, a light photon is slowed down to cycling speed when entered in BEC and again boosted up from BEC to its linear speed c. See that, the active domain of light photon is very small. The conversion of Kinetic energy into potential energy and its reverse conversion does not destroy any energy. See microscopically that, energy does work; but, neither any energy is consumed nor any of it is destroyed. The total energy utilized to do work gets transformed from one form to another. It is the fact. Hence a work can be defined as transformation of energy from one form to another. It is beautifully explained in open text book: 'Energy Transformation-Boundless' from 'Lumen Bondless Physics'. It is well accepted fact that energy is not destroyed but it is converted from one form to another during work done. But, the Author of this article strides one step ahead, saying that, energy is transformed, not converted. Because, conversion includes energy to mass conversion. But, it is not true. Mass in eternal and moving mass or mass capable to move is energy. Thus Mass is not converted into energy. Its

internal and external relave enrgy is transformed into other form of energy; the mass being disrupted completely in that case to ultimate the smallest mass particles of Dark-Energy, the Black Matter. Similarly in $[E=m_0c^2]$; it is not the conversion of mass into energy or vise vis. but, it is the transformation of internal energy of mass into energy exhibited externally in space and vise vis. Hence, when light photon enters in the BEC, the photon enters in active zone of condensed atoms of BEC. The kinetic energy of photon is converted to atomic internal energy of condensed atoms of BEC, slows down the photon (or even stops it). Therefore photon crawls at a speed of a few meters/sec. that's the speed of cold orbital electrons in BEC super atom. When it reaches to the other end of the condensate super-atom; at the next instant, the photon is out of active zone of BEC and the photon gets converted its stored energy in BEC atomic internal field, to photon's kinetic energy and the photon is ejected from BEC at speed c in space as mentioned above. In case, the photon is stopped to standstill, a slight increase in temperature of condensate, say a millionth of Kelvin; drives out the photon from BEC. See that, speed is measure of temperature. Then the speed may be of any type. Increasing temperature of something means increasing it any type of speed. Alternatively, more correctly the temperature is measure of kinetic energy. When speed decreases without doing any work, it is converted into potential energy at low speeds and into electrical charge at high speeds, both in comparison of light speed. The potential energy is due to position with respect to some source or an observer. The potential energy is stored in the respective field. When some part of K. E. is converted to potential energy w.r.t. some body, then the object assumes orbital motion at suitable radii of the body. When total K.E is converted to P.E. w.r.t. some body, then the object is attached to the body at a fixed position in the rest frame of the body. And it happens by generation of photon-photon pair. In Atlas experiment at CERN LHC, on

ATLAS spots light-by-light scattering, Nov 11, 2016, It is observed that, pair of photon attached to photon had formed. It is indication of Matter formation in whirling of dark energy particles which are dancing photon particles of light after delivering their kinetic enrgy to other something; that are other Dark Matter particles whirling in space before Birth of Universe.(as mentioned ahead in whirling theory of birth of Universe. Still further, Photons with high photon energy can transform in quantum mechanics to lepton and quark pairs who have mass. Thus it is expected light photons will take position in Standard Model of elementary particles. Therefore, and as discussed at place to place above; a light photon have a definite rest mass. In free space a light photon moves at speed c w.r.t. its source, having kinetic energy $[m_0c^2]$ w.r.t. its source. But, when such number of photons are stopped moving linearly by some natural phenomena, the photons form groups and have curvilinear motions within a micro-space domain. The change of linear to curvilinear motions generates virtual gluons. They hold the quarks moving in different curvilinear motion like spherical, elliptical and other, maintaining energy of each photon as previous i.e. m_0c^2 . These bound structures are the quarks at the first stage. By coupling different quarks; electrons positrons neutrons etc. the elementary particles of an atom are formed As mentioned in 'Photon Structure Function Wikipedia', The photon structure function, in quantum field theory, describes the quark content of the photon. While the photon is a mass-less boson, through certain processes its energy can be converted into the mass of massive fermions.

The function is defined by the process $e + e + \text{hadrons}$. But, still the old theory of 'photons are mass-less boson' is pleaded. Light photons have ultimate minimum mass as proved in this article being written. Leptons and quarks are the basic building blocks of matter. Photons can be considered attached to each other by force-string-like virtual gluons between themselves forming photon cloud of a quark. Further these quarks with other gluons form a soup-like structure to form atoms etc. other bigger particles as described in article, 'Hadron production from a boiling quark soup A thermodynamical quark ...' by Authors: Bohr, Henrik; Nielsen, H. B. in Nuclear Physics, Section B, Volume 128, Issue 2, p. 275-293. The light photons alternately work as guons. Because, in an experiment at lhc CERN, gluon-gluon under high thermal state combined to give (light) photon-photon. Hence, Prior to Quark-Gluon soup, (light) photon-Gluon soup must have been generated there during whirling of photons.(whirling Theory of Birth of Universe, given ahead in this article.)

Nothing is stationary absolutely in universe. When both source and observer are moving in the same direction at the same suitable speed w.r.t. any other inertial frame; they are stationary w.r.t. each other. There the object thought seems stationary to the Observer. Both the object and the observer both are in motion in the same frame in the unique universal inertial frame. We have to realize the total cosmos, the Universe, an inertial frame which may be moving or not w.r.t. it's BEYOND; and then, consider all infinite number of all types of frame Nuclear Physics, Section B, Volume 128, Issue 2, p. 275-293. S in different types of motions relative to each other in the total cosmos or in the Universe. When a light photon is released from an atom, its speed in free space is c w.r.t. its source atom. Its rest mass as discussed above is h/c^2 . It is not given speed c from zero speed in observer's frame. It is already moving at linear speed ' c ' in its atomic orbit since the generation of the atom in the universe during the birth of Universe. Only its direction of motion is changed from circular to constant linear w.r.t. its source atom or the observer attached to its source atom, without change in its basic energy. This light photon came from another source; excited the atom's orbital electron so that its centrifugal force exceeded its internal atomic forces. Hence, it is rejected and ejected out in space by the orbital electron. It has maintained its energy mc^2 constant. If such a photon happens to meet collision with another photon coming from opposite direction, and if gluons are available there at the place and at the instant of collision, both the photons get attached to each other transforming their constant directional linear motions into circular motion maintaining their energies constant. such photons move in free space like Brownian motion. Number of such groups collect together and form quarks, electrons and other elementary particles having mass as mentioned above. Hence, the basic smallest ultimate mass particles are the light photons.

Author has stated that, light photons move always linear at speed c , the ultimate speed of light in its source's frame. When in space, they happen to couple with each other in numbers, initially moving in different directions to each other and also in the same direction, instead of moving linearly, they take other speeds like circular defining different axes or vibrating. We have seen proton, neutron decays in their free state. In an atom, in its nucleus, we assume, there is no such decay. If it were so, regarding orbital electron positions, uncertainty principle would not arise. Therefore, proton to neutron and neutron to proton decay must be going on continuously due to interaction

between orbital revolving electrons, protons and neutrons. And such decays take very short time periods of the order of 10^{-10} s for weak interactions and 10^{-23} s for strong interactions as in their free state. In an atom a proton is not bounded to an electron. its field coupling with that of orbital electrons changes very fast. And pure logically it is as if free state of proton and neutron. It will give an atom its natural frequency. On the same lines, each constituent bigger and bigger mass, contained in an object or a body up to itself, gets its natural frequency. This happening is derived from, study of Quarks-Georgia State University-web and Other webs. As said above, the birth of Universe, has taken due to whirling motion, that's formation of vortex in Dark Energy Particle Vortex; there can be good number of vortices. They expanded and those having directions opposite to each other: created conditions like Big-Bang. Forming dark energy particles the photons gluon soup instantly transforming it into quark-gluon soup (Heavy ions and quark-gluon plasma CERN physicists collide heavy ions to free quarks - recreating conditions that existed in the universe just after the Big Bang) immediately. Further, as expressed in 'Science Daily; Your source for the latest research news; Strange World of Quarks, Gluons, Described by Physicists. Date: February 23, 2008' that, 'One of the great theoretical challenges facing physicists is understanding how the tiniest elementary particles give rise to most of the mass in the visible universe', can better be understood from whirling theory of Dark Energy Particles Described latter in this article ahead. Because, Much more collisions of initial matter can happen in whirlings or vortices meeting each other. And for production of heavier masses in progression of the process; much more collisions are required.

There are still very smaller particles than photons named 'gluons' As seen above there are gluons bigger than light photons also. Further please also visit, CERN's blog, 'Heavy-ion collisions, the quark-gluon plasma, and QCD'. Their mass property can not be measured yet with the help of existing means. Another difficulty is they are not found independent in nature. Please see, Science News, Strange World Of Quarks, Gluons, Described By Physicist, ' Date: February 23, 2008; from Source: Massachusetts Institute of Technology. As seen by Scientists, they are not found solely. They remain glued with quarks always. There is much space, to consider that, a single gluon must be very small having mass $<1\text{eV}$. But being bosonic in nature, millions and billions of even occupy same state and due to their property of gluing, a single gluon separation could not be found yet. Hence, as mentioned above, when a super high energy source for Hadrons collisions will be constructed; then it may be possible to get gluons solely and individual. But As the gluons are in abundance in protons, neutrons, quarks; they exhibit much more energy in an atom compared to energy of protons and neutrons. Mainly gluons are invariably found with quarks in quark-gluon plasma. Quarks are mutually held together by gluons such that, as quarks are pulled from each other to separate them, the mutual force between them increases more and more like a spring force. And as per definition of energy accepted in this paper, that's the something moving is energy; and that something is mass; gluons have mass and they work as energy exchange particles. Hence, they also represent energy. Moving mass is energy. Different type of gluons have different masses. However, as per 'Limits on the mass of gluon' by Ynduráin, F. J., Physics Letters B, Volume 345, Issue 4, p. 524-526., Upper bounds on the gluon mass, m_g , are discussed based on high energy experiments, lack of decay proton-free

quarks, and scarcity of isolated quarks in matter. One gets bounds of the order of 1 MeV, 20 MeV or 10^{-10} MeV, respectively. The minimum mass of gluon 10^{-10} MeV equal to 10^{-40} kg. Gluons are, as we know, energy exchange particles. In this existing Universe, energy without mass is not there. Hence, 'Energy is the moving mass or its capacity to move'. This definition is very correct. The smallest gluon mass is also greater than the mass of a light photon. Hence, light photons are the smallest ultimate eternal mass particles as Dark-Energy particles in the Universe. It is described by the Author, at else places of this article. These are gluons in quark soup. From overall observation of gluons; there seems every possibility to exist still smaller sized mass-gluons and prior to quark-gluon soup, "Dark-Energy particles Photons-gluon soup have been formed in the process of Birth of Universe. Then, from there within an instant Quark-gluon soup is formed. Hence, Super high energy source need to be developed to discover it. Also the article at SciTech Connect Journal Article: Diffraction and the gluon mass by Ducati, M. B. Gay; Halzen, F.; Natale, A. A., published on 1993.09.01, in journal named Physical Review, D (Particle's Physics), (U.S.), Volume-48:5, it is found experimentally from diffraction of gluon, its mass is found. And it commensurate with Laws of Diffraction. Thus gluons also have real mass. The mass of photon and also that of gluon cannot increase relativistically. Because, their speed beyond c cannot be increased due to electromagnetic phenomena at speed c when tried to increase it as is explained in this article in case of light photons.

As Gluons are not found solely; they are in quark gluon plasma; their mass cannot be detected solely. It is rather postulated differently. Hence, the mass figures are varied, from 'milli-eV' to, some mega eV. All elementary mass-particles are generated from quark gluon plasma, more right to say it would have been photon gluon plasma; which must be present before Quark-Gluon plasma at the instant of $0+$ of the Big-Bang and have converted to quarks-gluon plasma then after. Because, at the zeroth instant of the Big-Bang, or the most suitably as per Author, two vortices of Dark Energy Matter meet each other. Spiral motion has appeared expanding along lengths of the space. And motion describes/exhibits mass. It involves momentum. Momentum has inherently a force in itself. Different motions are controlled by force. Motion exists because of force. Hence, originally, perceive please that, each and every ultimate the smallest photon, that's light radiation photon, is mass in motion and therefore, it is having an inherent force. Therefore, all photons at the zero^{th+} instant of the Big-Bang, must be in linear motion with each other w.r.t. each other. When a gluon and photon come within their effective zone; they get attached due to each other because their cohesion must be strong enough. It further causes assembling of number of photons forming/constructing elementary mass particles quarks etc. This possibility is maximum at the instant of Big-Bang. Gluons must have generated from the light photons. Realize, two photons moving in two different directions and passing very nearly by very nearly from each other; attach with each other by gluon and start moving around each other. Thus, such photons can be seen to be stationary in groups. But, they are whirling around each other. Thus, gluons work as spring attached in between photon-photon, Quark-Quark, nucleus-electrons, proton-proton, neutron-neutron, proton-neutron, atom-atom, molecule-molecule; between elementary particle and its decayed particle, radio-active element atom to its decayed version; thus counting to eight. The last two Gluons correspond to neutral Gluons.

Thus as per author, eight types of Gluons discovered, correspond to these eight transformations.

Light photons move at ultimate speed 'c' in its rest frame of its source. What's the rest frame of photons? The rest frame of all photons is Universe; the very basic inertial frame to which the point of Big-Bang is attached; in which, infinite number of inertial and accelerating frames moving w.r.t. each other at different kinds of velocities.

Light Photon's gravitational force is experimentally proved. Please see 'The effect of gravity on light - Physics Forums dt. 22-06-2003 · Light photons are influenced by gravity. Though very small; their mass is also that very small. Hence, the Gravitational force must be the very basic force in the Universe. Duality is the eternal property of Universe. Any existence is associated with corresponding effective non-existence; as any particle have its field existed, there must be anti particle to corresponding to it. In fact, the gravitational field is present everywhere, in the Universe. Author wishes to discuss on antigravity a bit latter in this article. So in bulk, a mass of anybody have gravity. From a heavy neutron star to Dark Matter particle, all have gravity. The empty places in universe, also posses gravity. Hence, it is the particular dark matter filled in the universe; who's each ultimate small particle have mass according to cause and effect basic rule of Universe. The gravitational field is Higg's Field. Any basic particle in space gets mass due to Higg's field and gravitational forces between particles are due to the mass. Gravity is an inherent property of mass. As per 'Definition quantum theory', Posted by: Margaret Rouse; In 1927, contributor: Wigmore; Werner Heisenberg proposed that precise, simultaneous measurement of two complementary values - such as the position and momentum of a subatomic particle - is impossible; which further became, the uncertainty principle. The position here corresponds to mass and momentum corresponds to motion of mass. Momentum is in relation of quantum of energy. Thus, 'A mass is moving is energy' is the definition of energy, inherent in Quantum Theory. Going through the article, 'Hunting season at the LHC', by Matthew Chalmers, Stefania Pandolfi; Posted by Harriet Kim Jarlett on 10 Aug 2017. Last updated 10 Aug 2017, 11.45., *Voir en français, Author opines as follows here. The ultimate smallest mass particles Dark Energy mass particles have, original gravitational force in Universe, either existing or not-existing. The light particles photons at rest in Universe, are a part of Dark Energy forming Dark Matter. Its mass is the ultimately very small mass in comparison to Higgs Bosons. Higgs Bosons are not mass material particles; it is considered. It is stated in this article that, ' On 8 October 2013 the Nobel prize in physics(link is external) was awarded jointly to François Englert and Peter Higgs "for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider." The discovered fundamental particle, referred in this statement is 'Higgs Boson'. But, as per the Author, the Higgs Boson Works out, 10^{23} times heavier than ultimate mass particle. Further it is to keep in remembrance that, light photons or the dark energy particles/Dark matter, have gravity originally. Hence, the Higgs Field is due to Dark energy particles/Dark Matter. And the Higgs Boson found as above, is a big bunch of Dark Energy particles i.e. the Dark Matter formed during proton-*

proton collision in LHC at their speeds c, opposite to each other.

finally, the Higg's field is the force field of Dark energy particles, in space forming matter. The particles, which are found restless, are always moving like light-photons which are released by excited atoms and found dancing in space originally to exhibit energy. We consider them mass-less. The light-particles though have momentum and always are in motion non-stop; we consider their effective mass in their momentum to be relativistic mass due to their speeds; and therefore, we consider them mass-less, meaning by that, they have not rest mass. But, microscopically viewing the Universe; the Dark Energy in the Universe is, due to motion of the Dark matter particles; dancing in a small space-domain. It is the fact that, very basically, at their root, energy is associated with particles' motion. Therefore, the very perceiving and basic definition of energy is that, I repeat, 'something moving is energy'; that according to quantum theory a quanta of energy represented by a group wave function. But, wave nature appears due to particles. Particles in a bunch arrange themselves in groups [Please see, Wave Nature of Electron - Georgia State University] of differing densities by interactions within themselves; so that, they can be represented as a group of waves travelling in space. This is in respect of particles in linear motion. The wave length of mass is given by DeBroglie wavelength. Regarding particles in a body or an object which is stationary w.r.t. us, the particles in it have either vibratory or angular motions. The total net effect on the body appears as its characteristic wave/frequency. these waves follow Scrodinger's wave equation. These waves satisfy the different behaviors of waves. Waves have energy; but, energy basically is with motion of mass-particles. In-fact, the very basic mass particles photons of negligible mass in a group, arranged in varying densities, represented by respective group of waves are groups of photons. Photons are Bosons. Hence in a wave, in the same state from a single boson to infinite number of bosons may be existed. Hence, from an elementary single light photon of energy equal to Plank's constant h to the Big-Bang; each event is a photon. Therefore, one have to be always alert with referred photon during its discussion as to about which photon we are talking. As any happening from a point to the Big-Bang is an event; So also any existence is a photon. Thus the smallest mass-particle in a described wave is a pair of light photons representing one light wave of any frequency. Please see figure-8and 9 below.

After going through above reference, it perceives that, as the Higg's Bosons decay into Leptons, Fermions; which are formed from basic ultimate light photons as Dark Energy Particles as seen in above discussion. Hence, the Higgs Boson is also made up from photon particles. Hence the photon particles have originally the field of gravity. The Dark Matter Boson particles in the same state existing at the same place in space at an intensive density show concentrated density; hence, they are seen apparently dense gravity. And field of gravity examines gravity of a mass. Hence, Author states that, it seems mass property to mass is given by Higgs Boson. Higgs Boson is heavy mass particle made up of Dark Matter photons directly. It is not made up of other elementary particles. This is also another reason due to which, Higgs Bosons are assumed basic particles which give mass-property to a mass.

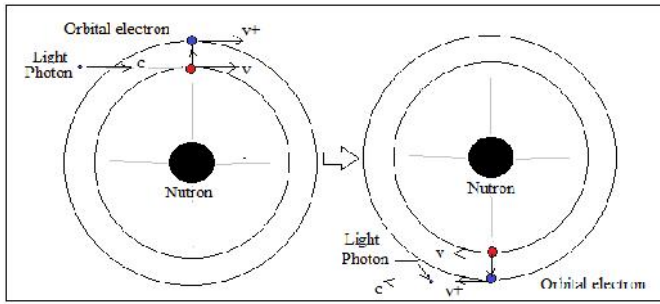


Figure 8. A Photon Changes Quantum Level of Orbiting Electron of an Atom

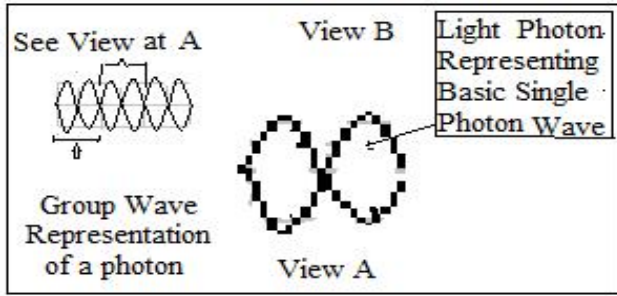


Figure 9. Light photon

An orbital electron moving in above figure-3, represents how a photon changes energy level of an orbital electron in its orbit and passes through an atom. The light photons being Bosons, their number of varied wave functions can occupy the same state in space forming a propagating group wave. As shown in Figure-9 above, from ' Quantum Theory (Margaret Rouse, 2006) According to the author, ... Posted by Samuel ...', An energy photon from an external source, increases energy of orbiting electron of an atom, exciting it and bringing it to higher energy level; soon releasing the photon as light photon. Similarly, A photon increases mass of a particle. In CRT experiment photons supplied from cathode particle's accelerator grid increase the mass of cathode ray particles instead increasing the velocity of the cathode ray particles, the electrons; and it is detected from input-output energy measurements. But the explanation of increase in mass; how it takes place; is illusive. It is explained that energy is converted to mass. Pure logically thinking, energy and mass are co-existed. Moving mass exhibits energy. A photon moving at speed of light, imparts a particle its momentum along with its mass; hence, the mass of photon rides and gets attached the moving particle increasing its total mass and momentum. These photon masses are released as the speed of moving particle decreases due to some opposition. Hence accelerated particles emit light. Because, photons having inelastic collision with the moving particles, get attached to it and, those having elastic collision impart suitable momentum to the moving particle and are suitably reflected. In case the speed of moving particle is the speed of light 'c'; then, the photons get attached to the moving particle when it passes through accelerator grid; the photons ride upon the moving particles when they are passing just under it. Thus, light photons have mass. Increased mass as above of the cathode ray particles impart their increased momentum to moving electrons in the CRT tube increasing their momentum; and then they are absorbed by the CRT screen increasing the CRT screen output current. It will be very interesting mathematics to perceive that, in relation

$E=[mc^2]$, mass is not converted to energy but, all energy of mass is transformed into another form.

Please refer the Figure- 10 below, with reference to following equation.

$$d^2Z/dt^2 - c^2 d^2Z/dx^2 = - (2 c^2/h^2) m^2 (Z-Z_0) \dots\dots\dots(18)$$

derived in 'How the Higgs Field Works (with math) | Of Particular. The Basic Idea; © Matt Strassler [September 22, 2012; revised October 10, 2012]' reference. There in the figure, Z represents an oscillating quantity up and down following simple harmonic motion; for orbiting electron in an atom. It is Z_t , a time fume dependent function. When plotted w.r.t. time progressing along x-axis, it gives sine wave (1) in the referred figure. The oscillations coincide, that of a spring with a ball on its top. A number of light-photon bosons are release by an excited orbital electron. They travel in free space at speed c. They are in pulses at regular interval of time shown at (2) in the referred figure. It is as per Figure-2 and 3 above. A photon pulse contains n number of light ultimate the smallest photon of mass m_0 each. Consider such a single photon. At (3) in the figure its wave function is drawn. Thus, a moving mass with its periodically varying density progressing in free space, with alternately twisted through ninety degrees can be represented as (3) in below figure-10 as mentioned just above. The Light-Photon mass travels as a wave in free space, Hence, In author's words, 'the light-photons behave as material (mass) particles as well as a field wave'.

In above equation-18, the left side terms, $[d^2Z/dt^2 - c^2 d^2Z/dx^2]$ represent, the wave function in space. In addition; it describes the mass density crossing at a point on x-axis, the path of motion of light photons' pulse or a single ultimate light photon. The mass is not seen in these terms. But, it is inherently present there in the function Z_t . The right hand side, $[- (2 c^2/h^2) m^2 (Z-Z_0)]$ represents, the oscillatory function of a spring attached with a ball of mass m (rest mass). It also represents photon density passing across a point on the path of travel of the photon or a pulse of photon. Let us peruse through the sense of this equation (18). Because, It is derived well from freely oscillating spring, which do not release in space travelling, any material particles bearing, any property of mass; then, it is bound to give the timely distribution of 'no-mass', 'not-existing', very basic, virtual particle indicating, a graphical wave form. And then, the results are applied to 'light-photon/light-photons', declaring that, light photons, though have mass-property, have not rest mass; hence they are virtual particles, generated by its source mass which is oscillating. See the Relativity. There in a relativistic mass or effective mass cannot be without its corresponding rest mass. Further, The meaning of mass-energy conversion relation, $[E = m_0c^2]$, doesn't at all mean that the mass is vanished when it is converted into energy. But, the perceived fact is that, the internal atomic/ internal particle energy is transformed into another form of energy. Mass present in universe is eternal. Energy is associated quantity with mass. A moving mass is energy. A mass stationary in universe has energy w.r.t. other masses; due to its position within the total universal mass. Hence, any disturbance in even a point mass in the Universe can disturb the stability of the Universe, in changing its internal state. So for defining light-photon properties, at the place of oscillating spring we have to put an oscillating vector representing, orbiting motion of an excited orbital electron

which emits radiations at frequencies in space. Thus the wave at (2) in the below figure under discussion will correspond to light-photons contained wave. To start working on mathematics to prove anything; the concept in starting mathematical expressions should be perceived very truly, with the help of pure logic. While deriving mass-energy conversion relation, in the construction of initial mathematical statement, the mass to energy and reverse conversion is included. Similarly in proving photon to have no mass, in spring oscillations it is already pre-assumed. And in case of the mathematical results of it, we do not compare them well with results obtained in the same subject. Then illusions creep in science; in which facts are accepted on the basis of countable figures. Such are these two facts discussed here above. One is mass can be converted into energy and vice vis. And the other is light photon is mass-less. Instead as discussed in this paper above; in different manners, the respective facts are mass is eternal it doesn't destroyed. It is existed in the Universe in the form of the smallest ultimate computable/measurable two dimensional particles with negligible thickness just enable its physical existence. It forms all mass bodies from a quark to a galaxy. Its existence either moving or stationary defines energy. As magnetic field has not its self existence; but, changing electric field is its source. Electric field is self generated and is relative since its birth. Secondly, light-photon even the smallest single one have definite rest mass. We deny its rest mass because it does not stop. Its reason is it has energy. And its Motion or ability to develop motion is energy of /in the Universe. Still in last decade, Scientists have succeeded in stopping light-photons in BEC at absolute zero temperature, reduced by laser cooling. As moving mass is energy, temperature is its indicator. In formation of BEC, as the BEC gas atoms are cooled, and orbital electron motions are reduced by Doppler cooling; the motions of the atoms and orbiting electrons are reduced and reduced to zero also. In above equation (9), the mass represented is, the mass of vibrating ball attached to spring top, to derive wave function described by oscillating ball or spring. There substituting its value equal to zero to get progressive virtual wave, we have no concern with photon. So also replacing the spring-ball system with orbiting electron around its nucleus in an atom wave and substituting mass equal to zero means there is not orbital electron but a point is assumed to revolve the nucleus to generate a mass-less wave. Hence, saying that, light photon have no mass, does not hold good.

The Right hand side term of above equation (18) is $[-(2c^2/h)^2 m^2 (Z-Z_0)]$. When it is equated to zero; it indicates either m is zero or $(Z-Z_0)$ is zero. $[(Z-Z_0)=0]$, represents the values of functions given by equation then, represent, the quantity (the value) of the function at points one wave-length distance one after another in succession along the horizontal axis. It cannot be presumed so. Because, to be so, $(Z - Z_0)$ equal to zero; give the magnitude 'A' the amplitude of rotating vector generating the wave function. Therefore, $(Z - Z_0)$ is only at a particular instant of coincidence of position of Z and Z_0 during the spring-ball oscillations or, orbiting electron taking ground position of Z_0 during its orbital motion. Next, substitution of $[m=0]$, represents denial of an excited orbital electron emitting light radiations. Further reviewing further deeply the above equation by transferring the term $(Z-Z_0)$ present on right side to left side the equation takes the form as,

$$[d^2Z/dt^2 - c^2 d^2Z/dx^2]/(Z-Z_0) = - (2c^2/h)^2 m^2 \dots\dots\dots(19)$$

Left sided wave function represents the magnitude of left sided wave function at a point in its path in space; and the right sided wave function represents wave being generated by an orbital electron. The mathematical perusal through it informs that, mass M is the mass of ball in spring-ball system used in deriving the equation. In application of this oscillatory mechanical system to a light radiating atomic system the ball mass is to be transformed logically to light photon mass travelling in space describing a travelling mass-wave. As per the inclusion of equivalence between Plank's relation and Einstien's relation $[mc^2 = h]$. Though wave functions on both sides of the equation are numerical equal they have quiet different sense w.r.t. each other. Hence, while quoting the result, special care have to be taken, that is the mass M in spring-ball system is oscillating in simple harmonic motion representing its kinetic energy in a stationary space-domain; whereas, the mass m in its Plank's equation represents internal atomic energy of mass m which is transformed into light radiations or photons moving at speed c . Thus mass is converted transformed into the smallest ultimate mass moving particles to exhibit the internal energy of mass m . Finally proving that, the light photons have rest mass.

The mass of Light Photon which is always moving at speed 'c' is rest mass. If another photon or light boson gets attached to it then, the assembly also will be moving with speed of light and we find increase in mass of the original photon in this case. It contributes to relativistic mass. Mass and Energy are eternal quantities in Universe. They are co-existing entities. A moving mass is energy exhibited and a stationary mass is energy due to its position. A moving photon or any mass cannot stop without transferring its momentum to other mass suitably. Relativistic mass is very clearly innovatively defined above and it doesn't violate Relativity principle. Hence, we cannot deny rest mass of a photon. The very basic ultimate light photons constitute matter and therein they remain vibrating within whatever small domain they vibrate to have expression of their energy m_0c^2 . When a body is at rest and we find its mass ' m_0 '; we say, the mass ' m_0 ', as the rest mass of the body. But, all ultimate mass particles inside the body are vibrating maintaining their natural energy $[m_0c^2]$. But, their energy is bound between each other by gluons and they all combined show the resultant motion as the 'natural frequency of the body' jointly due to internal energy of basic particles-photons and elementary particles quarks, neutrons, protons etc. It is said that, "Cases with $m=0$ include photons and gluons and gravitons, which are the quanta of the electric, thermo-electric (or "gluon") and gravitational fields; they are all mass-less quanta ("particles") traveling at the universal speed limit c " [58]. But, after viewing the information of light photons, virtual photons, non-virtual photons, neutrinos, gluons, electric charge, gravity etc., the author's conscious, as per his above innovative perceiving study tells that, light-photons have rest mass, very definitely and its relativistic mass is also the same.

Thus, there are three eternal things in vacuum space. That are, (i) Vacuum space, (ii) gluons and (3) 'ultimate mass particles photons'. Before, the Birth of the Universe; all these basic eternal particles were packed and quite stationary in vacuum space. It was then 'Photon-Gluon continuum'. There is one more thing in the Universe; which is ignored yet. It is very virtual thing; that's 'consciousness'. The inherent original norms of some definite behavior are consciousness. The very first its behavior is beyond cause and effect. Cause and effect is started from the very first behave or a motion.

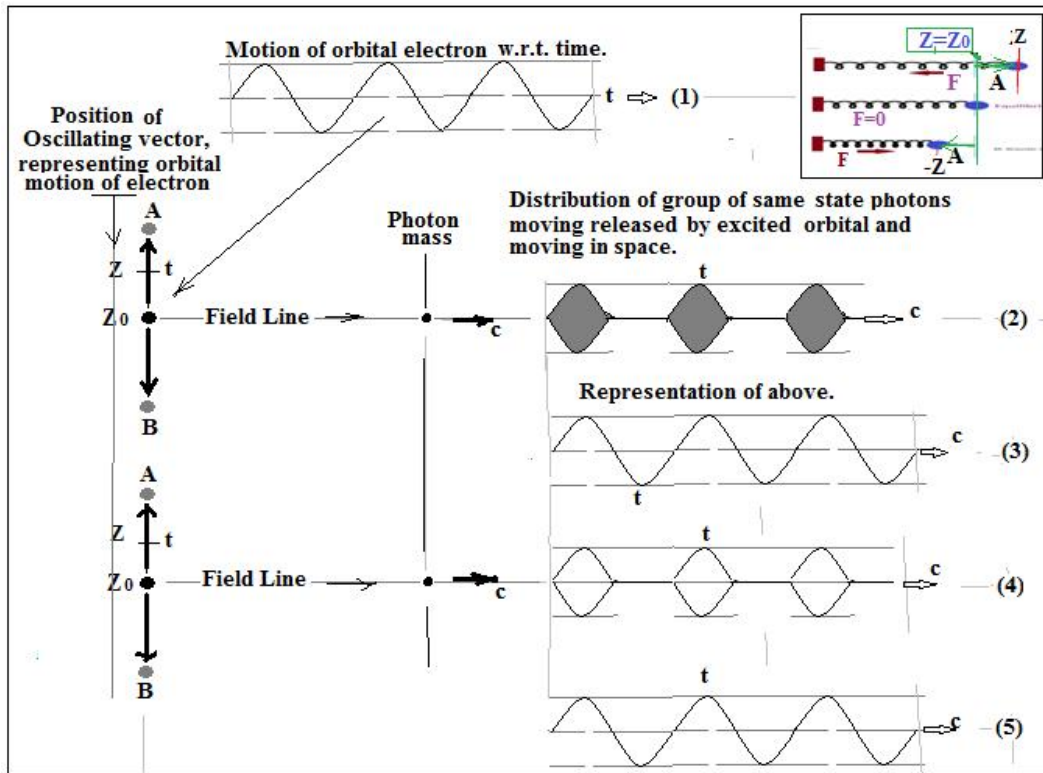


Figure 10. Field and Motion of the Light Photon

It is consciousness of Universe. In physical science there is no probable any reason to create a physical rule to become a cause for the Big-Bang or any other. After all, the world obeys the physical principles of cause and effect. The consciousness with the 'photon-gluon' say an Universal cake-like or foam-like structure ; physically got disturbed 'photon-gluon continuum' without no reason, then it started vibrating; thereby, it became 'photon-gluon soup' or a 'gravy' from cake. Gravity is the most original ever eternal property. In the photon-gluon cake, there was no motions w.r.t. each other within photons and gluons. But, each one possessed energy due to its own position w.r.t. all others. When, the stationary stuff was disturbed, the energy due to position i.e. physical potential energy; much of its portion was converted to energy because of motion i.e. the kinetic energy. The first oscillations from potential to kinetic to potential energy started and continued. The first motion of a particle photon gave birth to time. Motion describes time. Motion indicates respective temperature. Probably higher temperatures in some domains got developed forming quarks, electrons, protons, neutrinos etc., there from star bodies, galaxies and so on. Please peruse the reference, Breit and Wheeler's theory to create matter directly from light using, photon-photon collider explaining how matter can be produced from light photons. The steps involve as follows. First, speed up electrons to just below the speed of light, by using powerful high-intensity laser. Next, fire these electrons into a slab of gold to create a beam of photons a billion times more energetic than visible light. Next fire these electrons into a slab of gold to create a beam of photons a billion times more energetic than visible light of a tiny gold can called a hohlraum to create a thermal radiation field, generating light similar to the light emitted by stars. Then, then direct the photon beam from the first stage of the experiment through the center of the can, causing the photons from the two sources to collide and form electrons and positrons; thus creating the matter from light photons. But, as described above by the Author, the Higgs Boson discovered at LHC CERN, is nothing but an elementary

particle generated from light photons only; from the light that was produced during the particles' collisions in the experiment conducted by ATLAS and CMS on 04 July 2012. It clearly shows, mass is produced from light photons. And it is explained above that, by the ultimate mass particles, energy is exhibited itself. For moving mass, is energy in vibrating, existing material Universe containing all types of stellar bodies. And energy only due to position is associated with non-vibrating Universe where not any motion internal to Universe was existed. And we know that, inside any elementary particle, there is a dense fog of particles having motions similar to Brownian motion due to dancing photons. It is shown above; mass of an electron is billion of billionth of times, mass of the ultimate light photon. Therefore, the most ultimate particles, the basic photons in the elementary mass particles of the fog also must have mass according to cause and effect, which is the basic law of nature. Mass and Energy are two different entities. Mass is the effect of mass field (Higgs Field) on particles. And Energy is the motion of a mass; as is advocated in above discussions. The energy with the particles forming the fog inside an elementary or very basic particle-mass; is its internal energy of that particle. It leads to state that, "the free space is a field"; the Higgs field or that like. It ought to be Gravitational field only associated with the ultimate light photons stationed in micro domain of space dancing as Dark Energy particles which is Dark Matter; and, due to all these in space, there is their effective field, which we call Higgs Field. When these Dark Energy particles construct an elementary mass; the resultant of these indivissual fields work as gravitational field.

After going through, Higgs Boson, false vacuum, true vacuum, Scalar Bosons, Vector Bosons; It seems that, the vacuum-space is a continuum of a scalar boson. Let me talk parallel to an analogy. Assume we are sitting in perfectly clear air. The true vacuum is like that. Let there be dust particles in the air. Dark Energy particles, the Dark Matter particles are like that dust

particles. The dust particles have Brownian motions. The dancing of dark.. Particles in true vacuum; is like that. The dust particles have attractive forces with each other; yet they cannot come together and assemble. Or, they cannot settle down on floor, the great particle Earth; because of air holding them. The Dark...particles in vacuum cannot collect together due to true vacuum. It holds those Dark...particles. Hence, The true space, is a particular scalar boson that interacts with dark...particles and keep them Dancing due to energy with them. Please microscopically; one will realize that, every event, everything what so ever it may be, have is dual existence having opposite properties. Hence, corresponding to true vacuum, there must be true non-vacuum continuum. And see that, any dual existence is from something unique existence. E.g., when an electron appears its positron is generated with it as per matter-antimatter rule. So, there must be an unique entity from which true vacuum space and true non-vacuum space have appeared. For the time being call it 'vacuunon'. Pure logically, its property will be; an infinitely dense particle can pass through it and feel as if passing through vacuum (of-course falls vacuum) and, a less dense particle or a vacuum cannot even enter through it feeling it infinitely dense. Here feeling means a reaction to the action of a purely dense or infinitely dense particle and a void. In-fact our Universe rests in pure vacuum space. The false vacuum space is apart from it. Again let me talk about natures one basic original law that, In order that the both the entities of dual exist; they should be at points in space separated by sufficient space. Hence, Most of the antimatter of Universe must be beyond the skirts of the Universe where the non-vacuum space, is existing. Particle and antiparticle, vacuum space and non-vacuum space, these pairs of opposite entities, have opposite properties. Therefore, they attract each other. Therefore, our Universe might be continuously expanding and that too at accelerated speed, vanishing its terrestrial bodies due to speed higher than c in the Universal frame; converted into dark matter; thereby making more vacuum space and transforming its huge mass into Dark Material. It is said above that, antimatter is filled in non-vacuum space beyond the skirts of the Universe; it does

like a liquid in a vortex returns back. During this process, heavy collisions with other dark particles in Universe result in production of mass, and further terrestrial bodies. Again Author like to put one more Nature's basic law that, It is said above that, in any new generation; a dual of opposite properties is produced; in addition a by-product of each such dual is also generated. Thus, any new original generation will be triplicate in nature. So, during generation of vacuum and non-vacuum space from the vacuunon existence, dark matter and its dual is produced as a bi-product. These are the facts for, further experimental verification. Now returning to the topic:

Please have kind perusal through reference, ' What is the difference between photon **and** gluon? Answer Wiki. 3 Answers. Hossein Javadi, studied Science at Shahid Beheshti University (1975) ... '

There from it can well be deduced that, A photon mass have the form of electrically weak dipole as shown in the figure below. In the science world there is dual of each and everything. Hence, each and every thing is produced with its dual. Each member of dual having properties opposite to each other, from 'nothing'. Therefore for each generation of something, there appear its dual, invariantly; so that the Universe' stability is maintained. Therefore for each particle there is an anti-particle. Hence each light photon is made of $k \triangleright$ and $k \triangleleft$ opposite weak charges of photon are existing as shown in above figure. Formation of two photons rotating around each other is explained as below. Before the birth of elementary particles, all photons are in motion with speed c in universal frame. Each photon is tempted to move at speed greater than c , by other (nearest) one w.r.t. it due to their gravitational and electric forces. When such two photons move towards each other, they experience their electric charges as opposite to each other. When they come near within their effective zones passing by each other; they get locked with each other. Due to their equal linear motions w.r.t. each other; they do not unite with each other; but start rotating around

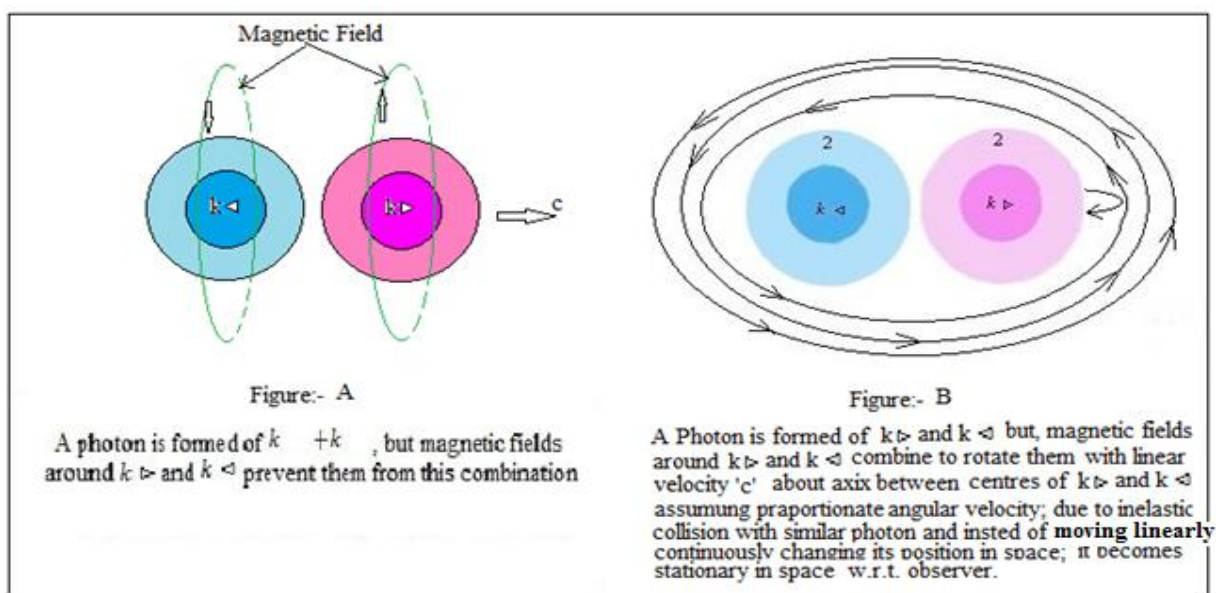


Figure 6. Photons rotating around each other

not allow union of dark matter and its antimatter by the vacuum space bosons. All these Dark Energy photons then come towards the centre of the Universe from all directions

each other; thus, transforming their couplet's linear speed in angular speed. Due to their electric fields and the directions of their rotations w.r.t. each other a common magnetic field is

established enclosing the two photons. The magnetic field holds these photons together revolving around each other.

As per antimatter webs, blogs; antimatter has opposite properties and most of the antimatter is missing. Most of the antimatter is not found. It is because, most of it must be at beyond the Universe as seen above. And as gravitation doesn't have attraction-repulsion; it has only attraction, the photon have gravity as force of attraction only. Gravity is such a field; it only attracts masses towards each other; doesn't repel. If unequal gravity act on both the opposite sides of a mass; then, the resultant looks like a repulsive force on smaller side of the gravity. As seen in photon describing a wave, two photons are twisted w.r.t. each other through ninety degrees. Observations in nature show that two similar entities are opposite to each other proving to be duals of each other and residing with each other possessing a suitable another quantity restricting them from uniting with each other. Again I repeat with reference to this contest that, a property cannot exist without its cause agency. Hence above explanation also pleads in support of the fact that, a light-photon has its basic mass the rest mass. Without existence of something physically, its properties cannot exist. Hence considering a light photon which exhibit mass property, but have no mass; won't work. It has a definite rest mass. It is also its relativistic mass. Because, in its motion, another light photon cannot stick it, effectively increasing its mass. It accompanies it apparently showing its mass increase. Thus mass increase in its speed is due to addition of photons attached to it from an external source to increase its momentum. We err in considering, energy given to increase speed of a mass increases its mass. *Mass is mass. Motion is motion.* Moving mass has energy. A mass have energy due to its position in space w.r.t. all other mass in space. This increased mass coincide the relativistic mass increase; because, the common basic thing between these two facts is energy. Hence, Conversion of physical rest mass into energy is also a miss-leading imagination. It is the internal and external energy of a particle having the mass, that's released in space in the form of ultimate mass particles photons and the Mass is ultimately broken into its last existence state, the ultimate mass particles photons moving at linear straight line speed; And, stopping in the Universal frame after delivering its momentum to some other mass; thus stopping and dancing in a small domain of space, attached to Universal frame transforming into Dark Energy Particles. Please refer figure-10 ahead.

Modifying Relativity concepts; doesn't mean Einstein was wrong. The Human in this Universe is, understanding the Universe. Understanding requires perceiving the facts. Before perceiving, they should first be observed by different reliable means and ways there from results are drawn logically and relativistic-ally; it is a process, a step by step process. When the Human is reached say to n^{th} step, he observes in his sight of vision whatever comes or appears ahead. Studies, perceives, puts up the original, innovated new facts and thus advances a step further and postulates the things beyond this step. The things repeat w.r.t. this progressive $(n+1)^{\text{th}}$ step. This process is unlimited never ending. All above learning leads Author to accept that a photon has a rest mass as given above. It is said that light photon never stops. Hence it has no rest mass m_0 . A rest mass attached to its rest frame, when imparted linear speed v in the frame have a kinetic energy mv^2 , and the effective mass 'm' equal to the rest mass m_0 plus the masses of momentums added to increase its speed to 'v'. Added masses are loosely bound to the mass; hence they are radiated during

stopping, decelerating process and obtain its rest mass as before at its zero speed. Thus decelerating mass radiated light photons. During acceleration some photons impart their momentum to moving mass and get reflected. Hence accelerating mass also radiates.

But, the reason a light photon does not stop is; other than, the problem whether the photon have mass or not. First we see that, not only a photon; but, all masses move in a motion non-stop; only difference in motion of light photon and other photon is that, light photon has linear ultimate motion and other masses have vibratory motions, some have angular motions or some have mixed both motions. Therefore, bodies other than light photons seem to us stationary due to their small motions about their mass centre. Small molecular or atomic masses of bodies collide with each other elastically, give and take their momentum in a group bonded by their gravity without losing it; hence they remain vibrating inside a body, as an internal energy of the body. But, photon to photon collisions do not occur easily. A concentrated light photon beams are generated and allowed to collide head on forming material mass pairs of electron-positron as shown in web: A photon-photon collider in a vacuum hohlraum : Nature Photonics A photon here is a heavy photon 'nh', its mass being comparable to electron mass. where n is of the order of 10^{18} or so and 'h' is the plank's constant. Then we can get electron positron pair mass particle produced from photon-photon collisions as per the web: www.theverge.com/.../photon-collider-could-turn-light-into-matter; 18-05-2014.

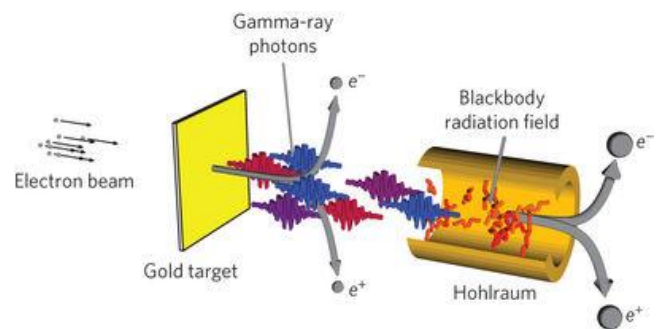


Figure 7. Schematic of the photon-photon collider

Light photon is a boson and a light photon is a two dimensional particle; because, its third dimension thickness is beyond perception as explained above. Hence, number of photons can assemble together in the same state. The term photon is a very general term. Any energy packet is a photon. The smallest ultimate, energy packet is 'h', the Plank's constant. And the energy packet of the Big-Bang is also a Photon. Hence, one have to be always aware about what photon we are talking of, hearing about or, reading, writing like about. Please look at references article by E. Fischbach et al., Physical Review Letters 73, 514-517 25 July 1994. Chibisov et al., ... web: Univ. of California: What is the mass of a photon? and similar ones. They are under impression of zero mass of photon at rest. But, 'Newton defined the "momentum" p of this particle (also a vector), such that p behaves in a simple way when the particle is accelerated, or when it's involved in a collision. For this simple behavior to hold, it turns out that p must be proportional to \mathbf{v} . The proportionality constant is called the particle's "mass" m, so that $p = mv$... Here m, the mass of photon is constant. Hence, it is its relativistic as well as rest mass. Hence,

1. If the particle is at rest, then $p = 0$, and $E = m_{\text{rest}}c^2 \dots (20)$

2. If we set the rest mass equal to zero (regardless of whether or not that's a reasonable thing to do), then $E = pc$.
(21)

The Relativistic mass of a particle which travels with a velocity v is given by the following equation:

$$m = m_0 / [1 - (v^2/c^2)]^{1/2} \dots (22)$$

where m_0 is the rest mass of the particle, v its velocity and c the speed of light. It may appear that because it is considered that, photons have zero rest mass ($m_0=0$), m the relativistic mass in motion is zero too. A closer look at the equation will show that this is not the case because photons travel with the velocity c and the equation collapses to an undefined form ($m=0/0$). Hence, the conclusion is that this equation applies only to sub-light speed particles and NOT to photons. Because, $[v=c]$ give moving mass to be infinite and infinite mass of a rest mass achieving speed c is not observed infinite. And it won't be observed. As it is explained in this paper about the concept of zero that zero doesn't mean 'nothing' but, it means, an infinitesimally small value; in the same fashion an infinity doesn't mean a largest quantity as large as universe and even beyond it; but, infinity means, the quantity which is infinite, it is so big that, the quantity under our consideration is too small to be accounted for. The meaning of sub-light speed here is, 'the speeds nearing but less than speed of light'. But relativity also tells us that every particle with mass m is equal to an energy E given by equation $E=mc^2$. Therefore, rest mass m_0 has energy $E=m_0c^2$. Hence, energy has equivalent relativistic mass m_0 the rest mass in its rest frame. Hence, though the rest mass of respective light-photon particle is considered zero in equation (22) above, the rest mass zero doesn't give relativistic mass m in motion as per relativistic equation (22) above. Hence, the concept of energy conversion to mass is not a valid concept; instead Mass increase with speed increase is due to attachment of photon masses to moving mass during transfer of their momentum to the moving mass as explained in this paper. Thus, the famous relation between mass and energy given below as equation (23), usually being called relation of mass transformation into energy and vice vis, In reality, it is not conversion relation; instead it is transformation relation between mass and energy. In the equation (23) below, the moving mass $m = [m_0 + n(h/c^2)]$, where n is number of ultimate mass (h/c^2) photons moving at c in direction of mass which attached their masses to the rest mass to make it moving at speed c and also to increase the speed beyond c . h is the Plank's constant, here the Plank's mass, representing the mass of photons forming one wave as is explained here in.

$$E=mc^2 \dots (23)$$

Where, $m = [m_0 + n(h/c^2)]$ as mentioned above.

Thus, $E=m_0c^2$ means, the energy associated with n number of particles constituting mass m_0 each such constituent particle of mass m_0 having mass (h/c^2) due to their varied motion at speeds c inside the space domain of mass m_0 and that is the internal energy of mass m_0 . Let such mass particles be n_0 in the mass m_0 . Then above equation, $m = [m_0 + n(h/c^2)]$ becomes,

$$m = [n_0(h/c^2) + n(h/c^2)] \\ = (n_0 + n)(h/c^2)$$

Substituting this value of m in equation (23) i.e. $E=mc^2$, we get

$$E = (n_0 + n)(h/c^2)c^2,$$

where, n_0 is number of ultimate the smallest mass particles in mass m_0 and n is number of the smallest ultimate mass particles attached to rest mass m_0 to impart it momentum to increase its speed up to c and even to in case, it is beyond c . The ultimate the smallest particle mass is (h/c^2) kg.

When mass move at speed c , the internal ultimate mass particles of mass m_0 , also move with resultant linear speed c . All mass has now transformed to Plank's mass particles moving in space at speed c . Therefore, all mass particles have became now energy photons forming energy radiation. Here the mass particles have changed their state. Instead of moving in small space domain described by volume of mass m_0 they are moving at linear constant speed c in infinite space. This is the meaning of mass becomes infinite when it travel at speed c . Basically, we are erring in understanding energy, very basically. Let me define Energy, at its very basic level. Consider, the Universe empty of all bodies and therefore full of very basic particles having the smallest ultimate mass forming the very basic building blocks of the Universe, and consequently all bodies, from quarks up to the stellar bodies and galaxies. The very basic particles are all stationed w.r.t. each other in the Universal frame. Any existence, 'affects' its similar existence in its surroundings. Hence, each of these particles has an effect on surrounding mass particles. In the infinite space the effects of all particles, which is evenly distributed, are quite balanced. These effects are the basic forces in between the particles. Now at this step of birth of Universe, there is space full of light photons IN Dark Energy particles and gluons forming a plasma (new concept by author;). Then if due to some reason or other the mutual forces between some particles get disturbed; (prolong tension in all direction on a group of mass particles damages the structure of the group inside of it. resultant forces acting on these particles will be developed causing a drag on respective particles. It will cause movement of particles w.r.t. each other. It involves, traversing of space by a disturbed particle. Traversal of space by a particle give birth to one more very basic quantity 'time' in the inertial frame of the Universe. Thus, space, particle-matter mass, time and force between particles or the motion of particles; these four factors are the very basic, eternal, elements of the Universe.

Though energy is due to position; it is not exhibited energy. It exhibits itself when something move. That something to exhibit energy must have momentum. Momentum invariably involves mass. Hence, those very basic ultimate particles in Universe ought to have a mass what so ever the smallest it may be. These smallest ultimate mass particles constitute the DARK-MATTER of the UNIVERSE. So, energy basically cannot be defined very clearly than, "the very basic the smallest possible ultimate mass particles, moving (in space) is energy; that we perceive as light. And energy of such assumed stationary particles is the DARK-ENERGY." Not only the light photons but, each and every mass in existing universe is in motion. The bodies carry resultant motion of their elementary, then secondary mass particles, as their natural frequencies. Hence light photons are always in motion at and above Universal normal absolute temperature about 2 to 3 degrees K. Temperature is indicator of motion. In BEC at about absolute

zero degree K temperature, light photons are stopped. All this leads to that the mass of light photon 'm' in equation $E=mc^2$ is its rest mass m_0 , with internal energy due to dark energy particles in curvilinear motions in micro space domains inside the elementary particles of it. 'mc²' is its effective mass' energy in motion. which include internal as well as external energy of the mass as discussed above. Hence,

$E=mc^2$ include energy of Dark Matter particle energy internal of the rest mass, confined to the mass and transformed to another form mainly radiation when the mass is speeded up to the ultimate speed c in the rest frame of the rest mass m_0 . In addition the mass m carry external photons attached to m_0 to increase its speed to c by delivering their momentum to m_0 (25)

Thus, in speed, mass of a particle or an object doesn't increase due to speed, converting energy due to motion into mass; but increases due to photon masses coming from an external source, those get attached to the moving mass to impart their momentum to the moving mass, increasing momentum of the moving mass. Up to speed c, the speed of the external particle will be added, the particle remaining isolated. At speed c, the particles will get attached to the object. Up to c we feel mass increase. But it is not that. It is the increase in inertia of moving body. In the sense that, for increasing speed from a higher one to further higher; the external particle it to have speed higher to reach the object to impart it speed by the same previous step amount. Hence, we feel increase in mass due to increase in inertia of the object or the body.

The most original field since before, the birth of the Universe, is the field of gravity. Inside an atom, internal atomic forces keep the elementary particles bounded; but, atoms are bounded by their self force the self gravity. (Please refer the California Institute of Technology; 1-2; 'Matter is made of Atoms', "Chapter-1st Atom in Motion, by the Pheynman Lectures on Physics; Chamberlin, T. C. The Planetesimal Hypothesis. Journal of the Royal Astronomical Society of Canada, Vol. 10, p.473-497. November, 1916". Self-Gravity is not cause for Big-Bang as per webs: independent.co.uk/life-style/what-happened-before-the-big-bang and, guardianlv.com/2014/03/what-caused-the-big-bang.). These references deny mass concentration across a point or a mm. It supports Authors simple explanation for mass concentration at a point with reference to figure-9 ahead. Also refer the web: www.physicsoftheuniverse.com/topics_bigbang_superstrings.html, 31-07-2008 · The Physics of the Universe - The Big Bang and the Big Crunch - Superstrings and Quantum Gravity

For String/super string Theory. As per the theory the photon particles have mass and energy and even a geometrical shape. It supports Author's definition of energy; that's the moving mass is energy. It also supports the Author's calculation of dimensions of light photon.

Thus, Gravity won't allow mass to concentrate to an extent to cause a rupture of the said concentrated mass as Big-Bang. Before the birth of the universe, all 'dark energy particles' were positioned still and tense, like 'foam' due to their balanced gravitational forces; But, vibrating or dancing in a micro-space domain in a pairs in whole Universe to exhibit energy in very basic form; something moving is an energy as a quanta of energy. Energy cannot vanish. Also, mass is eternal.

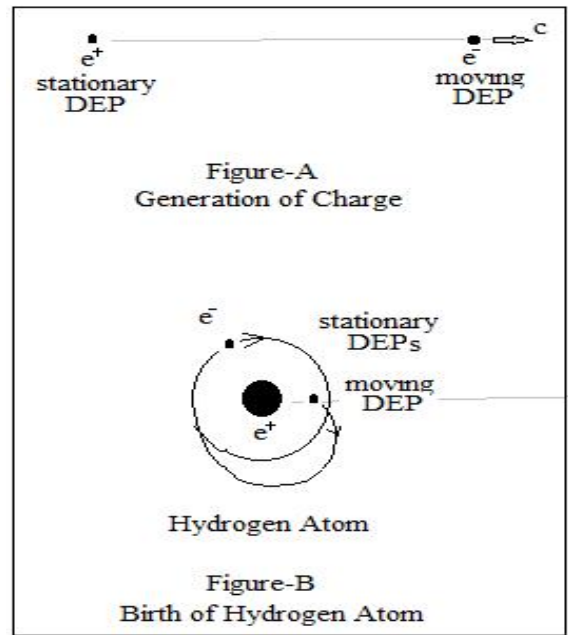


Figure 8. The Birth of Hydrogen Atom

There are number of electrons, each having electrical negative charge, orbiting around the nucleus of an atom [Atomic Structure | Structure of an Atom | ...]. Its equal number positive charges are in the nucleus distributed in the nucleus homogeneously. The Each of these electron assume circular path called orbit, describing almost circular path around two axes perpendicular to each other. Due to interacting forces of orbital electrons with nucleus and mutual in between them, the respective atoms experience vibrations, hence, when they get near to each other, in their effective zone, they get bonded with each other, interacting between themselves. This causes atoms in a material, to have repeated elastic no-loss collisions indicated by the temperature of the material. An Object mass is made up of generally of different atoms and they have gravity. But, While discussing above, about Big-Bang; a mention is made that, Mass cannot contract to a point mass of size estimated to about a mm across; as is pleaded by Big-Bang Theorists. So let us see, why? It cannot be. So, please see the Figure-9 below.

Above Figure-9, describes the how gravitational forces of masses act. It is known that gravitational force of a body on a mass in space, acts from its 'mass-center' resultantly. Hence, when an observer is stationed on surface of a spherical body; he will experience its gravitational force or the gravity from its centre (Figure-9a above). But, when the observer travels inside the body, towards its centre, along its radius; he will observe, reducing the gravity (Figure-9b). Because, as the observer goes inside; gravity of the body-material atop him, acting upwards, in opposite direction away from centre. When he reaches at about (2/3)of the radius of the body; he doesn't experience any resultant gravitational pull. Thus a spherical annular sphere of small thickness exists; where resultant gravitational forces have vanished. Then further also at the radius of the body (4/9)r, (8/27)r such more and more thinned shell-spheres will be found up to centre. At centre no gravity resultant acts. It is about uniform density of the Body sphere. Practically density vary tropical layer to layer. Generally inside layers of stellar bodies are dense. Hence, the no-gravity shells inside the body will shift towards the center proportionately. At the centre, of a stellar body thus no pressure act on mass at centre. Hence

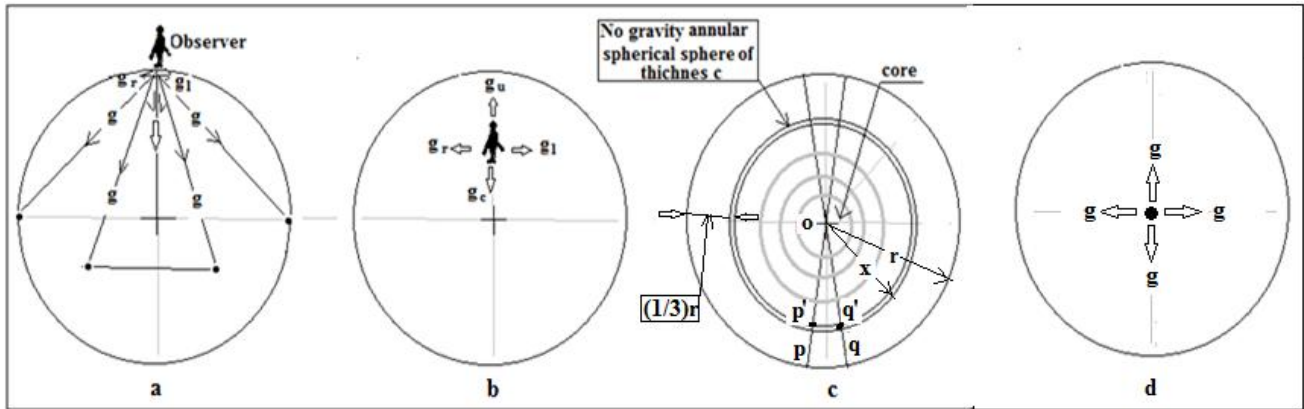


Figure 9. Effect of Self Mass Distribution within itself, on its Own Gravity of a Stellar Body

obviously, mass at centre can remain molten at lower temperatures also; because of no resultant pressure. The no-gravity shells can be found more accurately by equating the masses across the no-gravity shell. Thus the first shell below the ground will be at $(0.67)r$. Not yet have been thought on this fact of internal gravitational structure of stellar bodies. As shown in figure-(9c), an elementary triangle is taken with its apex as the centre of the body-mass. The two sides are the radii of the body and base is the small elementary periphery. Simple trigonometry gives that the areas across the elementary periphery of circle of radius $(2/3)r$, one on body centre side and other on body surface side are equal. The triangle be given an elementary thickness; then it gives equal masses on both sides of the elementary length of the periphery having radius $(2/3)r$. Such similar triangles be constructed in a plane similar to equatorial plane; Then, by rotating the plane around the diameter of the body; we get the body showing shells inside the body, where No resultant gravity is existed. When we say that, before the earth was born, a massive body passed near by the Sun; get ruptured due to the Sun's gravity; and from those ruminants the Planets of the Solar System have got born; it could happen, due to no gravity shell inside a stellar body. Thus, concentration of matter all matter of the Universe is not possible because, of above reason as is assumed for the Big-Bang to happen. There is one more serious matter in science. It assumes energy as virtual waves without actual mass. But, if any Physicist undergoes above reasoning and definition of energy explained in this paper, and will peer through the fact that the mass in Universe is eternal very persistently; definitely, he will perceive the above mentioned fact.

Thus, when a mass is concentrated, its gravitational force cannot increase unbounded. Because, when we go deep and deep; upper mass gravity works against the gravity towards centre. Hence, when mathematically, worked out, there is no-gravity annular sphere of a small thickness at $1/3$ radius measured from surface towards centre, considering the density of the matter homogeneous constant throughout its mass of the body. The same phenomena repeat in case of remaining $2/3$ radius sphere and so on. Hence, the possibility of a mass-blast as a Big-Bang due to gravity is waved off. Hence, there is only above mentioned spinning motion, whirling motion of the ultimate light photons cause of the birth of the Universe as is described above. Two vortices whirling in opposite angular direction whose whirling linear speeds are c crash each other; the photons therein glue with each other producing elementary and then atomic masses. The formation of galaxies at the birth of Universe and stars there in at present also is the indication of the above whirling mass theory.

Now, Let us see, how the equation $[E=mc^2]$ stands for conversion of internal energy of a mass, with the mass remaining eternal. Please see the figure-8 below. In nuclear fusion In the Sun, deuterium ^2H , react with tritium ^3H under super high temperature and, produce helium ^4H and one neutron. As a total quantity of basic particles, one electron is missing in this reaction. It is converted into energy 14.1 MeV. Please refer, "Nuclear Fission and Fusion of U-235 | Tutorvista.com;www.tutorvista.com/.../fission-and-fusion/nuclear-fission.php"; and, 'Marion Brünglinghaus. "Nuclear fission". European Nuclear Society. Retrieved 2013-01-04'.

In nuclear fission a neutron targeted on ^{235}U , converts it into ^{236}U making it unstable first; then, disintegrates it into ^{92}Kr and ^{141}Ba releasing three neutrons and their associated three electrons are converted to energy. See duality is the basic property of nature. When an electron is being released from its orbit; its respective positron with proton in nucleus of an atom follows it. Inside an atom, electron-positron couple was spinning around the axis located at nucleus because of heavier mass of proton to which the positron is attached. But, when this pair is ejected out of the atom the balance of force in between them which was inside the atom due to total atomic forces; get disturbed when the electron-positron pair is outside the atom. There the electron positron acts under the influence of their mutual electrical force mainly in between them. The electron is ejected at speed ' c ' and it drags its positron. Outside the atom the positron works as Schrödinger's energy sink and the electron jump in the well at speed ' c ' the concentrated electric field of positron with a very high permittivity in the sink tries to attract electron with stronger electric force. Hence, alternately a very high magnetic field is produced around the path between electron-positron. The electromagnetic field thus created is so strong that the electron- positron pair gets blasted into ultimate the smallest mass particles and are ejected in space/volume around at the speed of light ' c ' mainly as heat photons. These photons yield their energies due to motion to the heating medium and these ultimate mass particles as broken pieces of mass as photons merge into space around their; becoming DARK ENERGY particles. An explanation in reference, 'Another New Explanation For Dark Matter; Trendin Teck trendin tech.com/2017/06/27/Another New-Explanation For Dark Matter 27-06-2017' Which is based on consideration of waves in water, that in air; where in the mass particles interact with each other for energy transmission. The particles of these masses collide with each other for that cause. But, in respect of light photons, their masses are so tiny and shaped very peculiarly, so that, practically with a great endeavor also their

collision with each other at their velocity c , seems very remote. The dark energy particles are nothing but same like photon masses but, at rest when considered microscopically in a small space domain, where in, they are revolving around each other at linear speeds c where in, light photons travelling in the same line opposite to each other just pass by each other very smoothly without any attenuation of their energies. The particles of air, water and light photons, Dark Energy particles which are called as a type of Dark Matter also; are quasi-particles; though they have mass, but they differ in other behaviors of particles very much. The properties of someone can apply to similar ones.

$$[m_0c^2], \dots \dots \dots (15)$$

Please refer the part of above figure-10 marked, m to E. In the figure-10 it is shown that, an excited electron mass released with its associated positron; is moving with an ultimate speed 'c' to unite with its counterpart positron induced into the target plate. Positive charge doesn't exist independently bearing its own photon mass particles. When the electron was in atom, the positive electric charge was on proton in the nucleus of the host atom of the electron. And when the electron is out of orbit, travelling towards target, its respective +ve charge gets induced the target of the electron. Above equation (14) gives

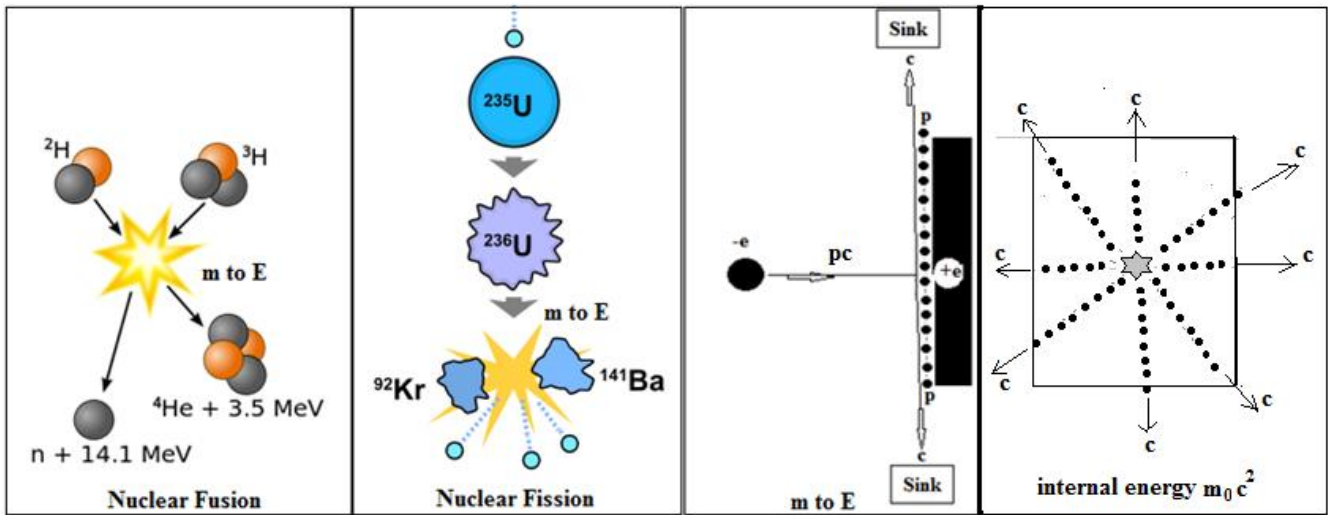


Figure 10. Explaining conversion of mass into energy

The net total relativistic energy of a mass is given by the formula as explained in 'Relativistic Energy - Georgia State University hyperphysics.phy-astr.gsu.edu/hbase/Relativ/releng.html; Relativistic Momentum'.

$$E = (p^2c^2 + m_0^2c^4)^{1/2} \dots \dots \dots (13)$$

In above relativistic mass-energy equation, the basic first term, [pc] represents/gives, the kinetic energy of the total mass containing the rest mass and the added photon masses attached with the rest mass during its speed increase. Thus,

$$pc = mc^2 = (m_0 + m_p)c^2 \dots \dots \dots (14)$$

where, m is the relativistic mass. It contains m_0 , the rest mass, and m_p , the photons' mass added from an external source to the mass m_0 , to increase momentum of the moving mass m_0 . Thus, the term 'pc' represents the kinetic energy that's the energy in motion of the mass m , in above equation (13). Now, the second term [m_0c^2] of the equation (13) above is the internal energy of the rest mass m_0 . It is discussed above that, rest mass is made up of ultimately the light photons vibrating in elementary particles of the mass m_0 at speed corresponding to c . They have circular motions whirling around each other at linear speed c . When the mass m_0 , given sped up to c and it is tried further to speed it up, its internal photon particles get added this linear motion relativistic-ally by changing rotational motions of photons inside of mass m_0 , to their linear motion c , in space. Thus the internal energy of photons which have constructed mass m_0 , is transformed into kinetic energy. Hence, Internal energy of the mass, m_0 is equal to,

its kinetic energy with it. With this tremendous momentum it sinks in its opposite charge, the +ve charge; generating a largest intensity magnetic field causing the electronic mass to stop very shockingly and abruptly within an instant from its velocity c to zero. . It ruptures the electron positron pair into its ultimate, the smallest masses' energy particles; called the quanta, that's the light photons, mainly heat-photons. They are released at right angles to the path of motion of the electron in space due to the collision. The total energy of these billions of billions light photons is given by above expression (15). These photons deliver their momentum to other mass atoms or, particles obstructing their motion, either with elastic or inelastic collisions as per the case. In inelastic collision the moving photon masses get attached to the energy-receiver, adding to its momentum as well as mass. In elastic collision the moving photons impart their momentum to the receiver and their masses either merge in space around them or, get rebounded as per the case depended on mass and speed of energy-receiver mass, getting transformed into a DARK ENERGY-particle dancing in space with speed c under the influence of gravitational forces of other particles around itself in the Universe, representing its energy due to its position in the Universe' inertial frame. The energy transformed to radiation energy from a moving mass m ; given by above expressions (14) and (15) doesn't get added arithmetically; instead it follows vector addition. The events happen as mentioned below. A body moving freely in space, doesn't exhibit its energy; instead, it exhibits its momentum. When another body standing free, stationary in space, in line of motion of the moving body; the moving body transforms its suitable momentum into force, give respective proportionate motion to the standing in path, body; such that, law of

conservation of momentum is obeyed. When a moving body stops dead exhibiting a change in structure either the moving body or the stopping source of moving body; then, the moving body exhibits its energy, by releasing its attached photon masses which were attached to it to increase its speed and the moving body experiencing self breakdown. In the second stage, due to the breakdown of the moving mass which is now stopped; its ultimate mass particles, which have motions inside the elementary particles are released into space around, at speeds c . Each particle bears momentum ' hc '. Thus the total momentum of all particle-masses of mass m_0 equals to m_0c^2 . Thus, energy appears when a momentum recedes from its free speed to standstill. If the speed change is from c to zero of a momentum [$p = mc$] and its speed is reversed to $[-c]$, then, momentum transforms into energy E . thus,

$$[p(-c) = [mc(-c)] = \\ E = mc^2$$

Thus, kinetic energy due to motion and internal energy has their individual momentums. They naturally are perpendicular to each other as discussed above. Therefore, the total energy output of a mass for an observer will be vector sum of both of these above mentioned momentums. Hence, the net total energy offered by a mass is given by the above mentioned formula (13), which is, derived as below,

External mass momentum of mass $m = mc$.

After the braking of mass m into its basic ultimate mass particle photons, the total momentum due to internal energy of original mass, that' the rest mass m_0 is, $= m_0c$. A momentum is a vector quantity. Hence, they are added as vectors. Hence, total momentum of a mass is $= [(mc)^2 + (m_0c)^2]^{1/2}$. Energy is obtained by multiplying the speed of mass bearing the said speed.

Hence, energy $E = [(mc)^2 + (m_0c)^2]^{1/2} \cdot c = [(mc)^2 \cdot c^2 + (m_0c)^2 \cdot c^2]^{1/2}$.

$$= [(mc \cdot c)^2 + (m_0c \cdot c)^2]^{1/2} \\ = [(mc^2)^2 + (m_0c^2)^2]^{1/2} \text{ or, i.e. } = [(m^2c^4) + (m_0^2c^4)]^{1/2} \text{ or i.e.} \\ E = [p^2c^2 + (m_0^2c^4)]^{1/2}$$

The respective vector diagram of momentum is drawn below

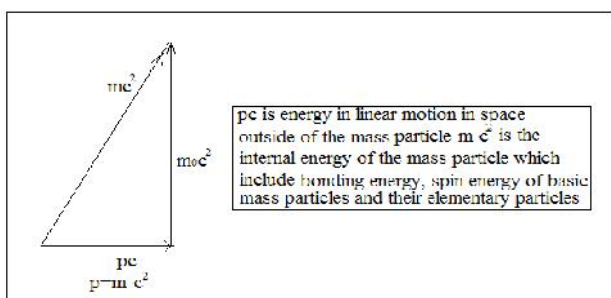


Figure 11. Mass Momentum Diagram

And that is the equation (13) above, derived through perceiving concepts. Thus, above energy transformation equation also includes rest mass of a photon leading to it as a Dark Energy ultimate mass particle having energy due to position in Dark Matter converted it to energy due to motion in a radiation.

Conclusions

Mass and Energy, both are eternal quantities. Any particle having energy; has respective quantity of mass. The various particles are generated from the very basic, the smallest of the smallest, ultimate mass particles, photons having mass equal to ' h ' (Plank's constant), called Photons. They possess energy due to, their varied motions and, positions in Universal Inertial Frame w.r.t. other all matter particles. 'A mass particle moving or capable to move is, energy'. It is the perceiving definition of energy. Each and every mass in the universe exhibit motion either a linear motion or revolving or vibrating motion in the existing Universe. When the massive Universe does not exist; all mass in the form of the smallest ultimate mass particles Photons dancing in small groups. When a mass moves, time is born. Moving mass describes and also defines 'time.' The mass of a moving body, increases due to attachment of photons colliding the moving body from its behind, having speeds greater than the moving body and, getting attached to it adding their momentum to the moving mass. Therefore, mass of a body increases in its motion. It is not that, the energy is converted into mass. Thus, energy in motion of a body includes; kinetic energy of rest mass plus kinetic energy of attached photon masses. And that, the internal energy is the kinetic energy of vibrating or/and oscillating or/and revolving; elementary particles, and ultimate photon particles. Thus, energy is transformed from its one form to another; the mass being left as an eternal entity as a DARK ENERGY particles. The mass in motion of a light photon given by (h/c^2) for one cycle representation of energy; is itself its 'rest mass'. Gravitational forces cannot increase infinitely, as the mass increases; but, in a mass body inside appear shells after shells as a function of radius of mass, enclosed by that concerned shell inside it up to the centre of the whole body. Hence concentration of all mass in Universe in a small domain of space across a mm or smaller; is very remote possibility. Hence, Big-Bang theory of the 'Birth of Universe', though it is an outstanding work; cannot be an ultimate truth. The whirling motion of 'Dark Matter' Photons, can lead to ultimate truth of 'Birth and Future of the Universe'. Each and everything in nature, obeys the laws of Nature, established by the nature itself. Sometimes we see violation of nature's law; but, it is also as per complexity of varied laws. This behavior of the Nature is its consciousness. In human beings, their consciousness works on in each person, relatively, depending upon, cause and effect phenomena. For the same cause, two different persons exhibit effects, totally different effects, due to their different concepts. Similar phenomena occurs in respect of different particles e.g. atom, light photon. An atomic mass has rest mass and relativistic mass different; but, a light photon has the same mass as its rest mass in motion and also at rest in BEC. Author perceives that, to find out basic particle, which is the cause of Universe came into existence, experimentation should be performed on light photon condensate trapped in BEC to produce elementary particles, observing through what stages the condensed light photons pass. There is every possibility of Birth of Universe, through whirling of super cool light photons.

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