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On the propagation and speed of the fields

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Abstract: The speed of the gravitational field in the angular direction is proved to be 2πC m/s where C is the speed of the field in the radial direction which is $3x10^8$m/s.Then a formula for the speed of the gravitational, electric, and magnetic fields in the angular direction is derived and the same is generalized for all fields of the nature. Finally, the special theory of relativity is modified and rest and dynamic masses of many elementary particles are calculated.

Introduction: The speed of expansion of the space is greater than the speed of the light [1]. As per the special theory of relativity, the maximum speed in the universe is postulated to be the speed of the light in the absolute space [2]. This is because Albert Einstein formulated the special theory of relativity in the absolute space. But in the general theory of relativity, Albert Einstein assumed that the space and the field are one and the same. By making this assumption he was able to use the Riemann's geometry and developed the general theory of relativity.

But it was proved that the the three astronomical events suggested by him to verify the general theory of relativity can be very well be explained by using the Newton's gravitational field theory [3]. The standard big bang theory of cosmology could also be explained by the Newton's gravitational field theory [4]. A new model of cosmology was developed based on the Newton's gravitational field theory which very much includes the standard big bang model of cosmology [5]. The standard model fails to solve the Hubble tension problem. The same standard model also fails to explain the dark matter and dark energy problems. The new model very well solves the Hubble tension problem and explains the dark matter and dark energy problems [6-7]. The new model of cosmology is also validated by the observational evidences [8].

So , in the first section of this article, the speed of the gravitational field is proved to be 2πC m/s where C is the speed of the field in the radial direction which is 3×10^8 m/s. Then in the section 2, a formula for the speed of the gravitational, electric, magnetic and electromagnetic fields is derived.In the third section, the theoretical formula derived is generalized for all the fields of the nature. Finally, special theory of relativity is modified and rest and dynamic masses of many elementary particles are calculated.

Speed of the gravitational field in the radial and angular directions: We all know that the speed of the electromagnetic wave in the free space is the maximum speed in the universe as postulated by the special theory of relativity. As explained in the introduction, if the space and the field are assumed to be different, then the speed of the gravitational field can vary from 0 to 2πC m/s. This is proved in the following lines.

As per the new model of cosmology [4-5], the universe is having a center and the gravitational field lines forces the observers to see only the objects lying on the spherical surface layer which has the earth. If the space and the field are assumed to be one and the same, then we can see only the objects of the spherical space which has the earth. We can't see anything inside the spherical layer or spherical space.

The universe is estimated to be 13.8 billion years old. So, the distance of the earth from the center of the universe is 13.8 billion light years. As per the new theory of the cosmos, energy originates from the center and with the expansion, energy cools down. In the beginning, the universe is at a very high temperature and the frequency of the electromagnetic wave is very high. With the expansion, universe cools and the speed and the frequency are reduced. Then from the cooled photons, matter particles originates. On the two dimensional plane, the spherical surface layer of the universe may be represented by a circle. So, the radial distance traveled by the spherical surface layer which has the earth from the center of the universe is 13.8 billion light years.

Exactly, when the earth travelled over 13.8 billion light years from the center of the universe, the the field on the spherical surface would have travelled to the distance of 2πx13.8 billion light years during the same period of 13.8 billion years. So, the speed of the gravitational field in the radial direction is C m/s. The speed of the gravitational field along the spherical surface or in the angular direction is 2πC m/s [9][10].

Variation of the speed of the gravitational, electric and magnetic fields from the source of radiation: As per the columb's law of electrostatic field, the electric field intensity E is

$E = Q/(4\pi€ r^2)$, where Q is the point electric charge, € is the permittivity of the medium and r is the radial distance from the point of location of the charge. .....(1)

If the Newton's gravitational force law and the Columb's electric force law are compared, a relationship between mass M and the charge Q could be established. The charge Q is equal to

$Q = (4.\pi.€.G)^{.5} M$, where G is gravitational constant. .....(2)

From the Newton's gravitational field law and Coulumb's electric field law, field goes to infinity as the radial distance from the point charge or mass goes to zero. So, a mass or charge particle may be defined as a highly concentrated field. Similarly, a field point or particle may be defined as a charge or mass particle whose charge or mass is directly proportional to the charge or the mass of the source and inversely proportional to the square of the radial distance of the field particle from the source.

A point source of the field is an isotropic radiator of the field. So, the field particle moves in the radial and spherical angular directions when the field is radiated out from the source. The field in the radial direction moves with speed of the light in the free space C m/s. Since the linear velocity of the particle on the spherical surface is directly proportional to the angular position of the particle and the radial velocity, the speed of the field particle, on the spherical surface in the angular direction is $2\pi C$.

By applying the equation (2), the volume mass density $m = q/(4\pi€G)^{1/2}$ where q is the volume charge density .....(3)

So, force acting on m, as per the Newton's second law of motion = $m.d^2r/dt^2 = F$. .....(4)

By substituting the equation (7) into equation (8) we get, $F = q/(4\pi€G)^{1/2}\ d^2r/dt^2$ .....(5)

So, the force per unit charge = $E = F/q = (1/(4\pi€G)^{1/2})(d^2r/dt^2)$ .....(6)

By equating the equations (1) and (10), we get, $d^2r/dt^2 = (G/(4\pi€))^{1/2}\ Q/r^2 = dV/dt$, where V is the speed of the field intensity. .....(7)

As we know, V = dr/dt and dt = dr/V. .....(8)

By substituting the equation (12) into equation (11), we get, $(G/(4\pi€))^{1/2}(Q/r^2).dr = V.dV$. .....(9)

By integrating the equation (13) we get, $(G/(2\pi€))^{1/2}(Q/r) = -V^2$ .....(10)

So, $\mathbf{V} = j(G/(2\pi€))^{1/4}(Q/r)^{1/2}$ .....(11)

So, the velocity **V** is very much in the direction perpendicular to the radial vector **r**. So , the field propagates as a series of continuous expanding spherical layers from the location of the source. The magnitude of the velocity of the field is $(G/(2\pi€))^{1/4}(Q/r)^{1/2}$.The magnitude is directly proportional to the square root of the charge and inversely proportional to the square root of the radial distance. The speed of the field at the location of the charge is infinitely. The speed vanishes as the radial distance reaches infinity.So, the spherical field decelarates in the radial direction from the source of radiation. The speed of the field close to the source is very high. Then quickly the speed declines to the average speed C m/s over the radius. The speed of the field in the angular direction is $2\pi C$ m/s.

So, Albert Einstein 's assumption of curved field or space concept is very much matches with the physical reality. Newton and Coulumb's assumption of action at a distance concept is a mathematical reality used to derive physical formulae and to make field calculations [11] [12].

Variation of speed of the fields of nature from the source of radiation: For the magnetic field, the theory developed in the above lines is very much applicable. The applicability of the above field theory for strong and weak nuclear fields doesn't look clear because the field theories of electrostatics, magnetostatics, gravity and electromagnetics are classical and deterministic. But the field theories of strong and weak nuclear fields are based on quantum mechanics. Quantum mechanical theories are interpretated using statistics.

But all the fields of the nature were integrated by applying deterministic quantum mechanical theories developed. The general formula which integrates all the fields of the nature is sum of $K_n.M/R^n$ where K_n is proportionality constant, M is the mass or equivalent mass of the point source of radiation, R_n is the radial distance from the point source of radiation and n varies from 0 to infinity except n = 1.

SO, the nth order field = $E_n = K_n.M/R^n$ .....(12)

As per the Newton's field law, $K_n.M/R^n = dV/dt$. and V= dR/dt .....(13)

So, from the equation (11), we get,$(K_n.M/R^n).dR = V.dV.$ .....(14)

By integrating the equation (12), we get,

$-K_n.M/((n-1)R^{n-1}) = V^2/2$, for n greater than 0 and not equal to 1. .....(15)

So, $\mathbf{V} = j.(2.K_n.M/((n-1).R^{n-1}))^{1/2.}$ .....(16)

For n = 1, if we integrate the equation (12), we get,

$K_1.M.\ln^R = V^2/2.$ .....(17)

So , $V = (2.K_1.M.\ln^R)^{.5}$ .....(18)

So, as per the equation (14), all the fields of the nature propagates as a series of continuous spherical layers from the source of the radiation. The speed is very high at points close to the source. The speed approaches zero when the radial distance goes to infinity. So, there is a deceleration of the the field particles from the source point. This is because the surface field intensity decreases with the expansion of the spherical field layers in the radial direction from the source.

But as per the equation (16), the field propagates in the radial direction when R is greater than 1. The speed increases in the radial direction. Similarly, the field propagates as a series of continuous spherical layers in the radial direction from the source, when R is less than 1. In this region also, the speed increases in the radial direction. Actually, the field decreases with the increasing value of R. So, deceleration of the field particle must happen as per the equation (11). But,as per the equation (16), the speed increases with the increase of the radial distance. So, there is a contradiction in the variation of the speed. Therefore, the formula for speed as expressed in the equation (16) is invalid. Another important fact is that when the speed increases, acceleration increases in this case. For increasing the acceleration, additional source of field is required. Physically, there is no such source of field for increasing the speed and acceleration. So, the equation (16) is physically invalid.[13][14].

Speed of the energy in the radial and angular directions: In general, energy based theories are much simpler as compared with the field based theories. Moreover is energy is common to all the types of fields. So, all the field theories could be easily integrated by the energy based theories. Energy is stored in the electric, magnetic, gravitational, electromagnetic, strong and weak nuclear fields. So, all the fields of the nature could be easily integrated by the energy based theories. So, the speed of the energy points in the radial and angular directions can be found easily as compared with the calculation of the speed of the field.

Energy propagates in a series of continuous spherical layers from the source. The field associated with the energy also propagates in the same manner. This is what was proved in the above lines and a formula was derived for the velocity of the field. The speed of the energy in the radial direction is C m/s. The speed of the energy in the angular direction varies from 0 to 2πC m/s.

In electromagnetic wave propagation, wave theory and ray theory are widely used. Actually the energy propagates like the expansion of a gas in a spherical shaped balloon. This energy propagation from the source could be modelled as propagation along the radial lines of all directions or as a series of continuous propagating spherical layers of energy. This is how ray theory and wave theories were developed.

Modified special theory of relativity and quantum theory: Special theory of relativity was developed based on the postulate that maximum possible speed in the universe is $3x10^8$ m/s which is the speed of light or electromagnetic wave in the free space. Now, the maximum speed possible in the universe is proved to be 2πC m/s. This speed is 2π times greater than C m/s. So, the reference speed C m/s in the special theory of relativity has to be replaced by 2πC m/s. So, the modified Lorentz's factor is

$L_f = 1/(1- (V/2\pi C)^2)^{1/2}$ where V is the speed of the moving object. .....(19)

So, the dynamic mass of a Photon is $m = m_o/(1- (1/2\pi)^2)^{1/2} \sim 1.013m_o$,where m_o is rest mass of the the photon, because V = C. .....(20)

As per the modified special theory of relativity, the energy content of a particle with rest mass $m_o = m_o.(2\pi C)^2 = E_n$ .....(21)

As per the De Broglie's matter wave equation,

$E_n = m_o(2\pi C)^2 = h.f$, where h is Plank's constant and f is matter wave frequency. .....(22)

So, $m_o = h.f/(2\pi C)^2 = (h.f/C^2)(1/2\pi)^2 \sim .0253(hf/C^2)$. .....(23)

By substituting the equation (21) into equation (18), we get,

$m \sim 1.013m_o \sim 1.013x.0253(hf/C^2) \sim .02563(hf/C^2)$ .....(24)

Without modifying the special theory of relativity, the dynamic mass can't be determined. From the equation (20), the quantum energy of one wave cycle of the photon = h .....(25)

From the equation (21), the rest mass of one wave cycle of the photon ~ .0253(h/C^2) .....(26)

Similarly, from the equation (22), the dynamic mass of one wave cycle of a Photon~.02563(h/C^2)

.....(27)

Equations (17), (19) and (20) are valid for any elementary particle of mass or equivalent rest mass m_o and dynamic mass m. The rest mass and dynamic mass of different elementary particles are calculated in the following lines.

Photons and gluons have the same rest mass and the speed. So, the dynamic mass of the photons and gluons are the same. All other elementary particles have finite rest mass and maximum speed less than C m/s. This speed is approximately equal to.99999999C m/s. By applying these values, the rest mass m_o of the particles is calculated to be ~ .0253(hf/C^2). .....(28)

By applying these values in equatios (17), (19) and (20) the dynamic mass of the particles is calculated to be ~ 1.013x.0253.(hf/C^2) ~ .02563.(hf/C^2) = .02563x$(2\pi)^2$xm_o ~ 1.013m_o .....(29)

The maximum dynamic mass of various elementary particles are calculated and tabulated in the following lines.

S.N.	Particle name	Rest mass m_o	Max.Dynamic mass m
1.	Photon (γ)	.0253(hf/C^2) kg.	.02563(hf/C^2) kg.
2.	Gluon (g)	.0253(hf/C^2) kg.	.02563(hf/C^2) kg.
3.	Electron(e^-)	0.510999MeV/c^2	.5176MeV/c^2
4.	Muon (μ^-)	105.658 MeV/c^2	107.032MeV/c^2
5.	Tau (τ^-)	1776.86 MeV/c^2	1799.95918MeV/c^2
6.	Electron neutrino(ν_e)	< 1 eV/c^2	<1.013eV/c^2
7.	Muon neutrino($\nu\mu$)	< 0.19 MeV/c^2	<.19247MeV/c^2
8.	Tau neutrino ($\nu\tau$)	< 18.2 MeV/c^2	<18.4366MeV/c^2
9.	Up quark (u)	≈ 2.16 MeV/c^2	≈2.18808MeV/c^2
10.	Down quark (d)	≈ 4.67 MeV/c^2	≈4.73071MeV/c^2
11.	Strange quark(s)	≈ 93 MeV/c^2	≈94.208MeV/c^2
12.	Charm quark (c)	≈ 1.27 GeV/c^2	≈1.28651GeV/c^2
13.	Bottom quark(b)	≈ 4.18 GeV/c^2	≈4.23434GeV/c^2
14.	Top quark (t)	≈ 172.5 GeV/c^2	≈174.7425GeV/c^2
15.	W boson (W±)	≈ 80.37 GeV/c^2	≈81.41481GeV/c^2
16.	Z boson (Z^0)	≈ 91.19 GeV/c^2	≈92.37547GeV/c^2
17.	Higgs boson(H^0)	≈ 125.25 GeV/c^2	≈126.87825GeV/c^2

So, from the equation (21) & (22) and (26) & (27), we may say that m_o and m of all the elementary particles are approximately proportional to the frequency of the particle.

Only at high frequencies, electromagnetic waves behaves like the particles. So, the energy of the particle is directly proportional to the frequency of the wave.

So, the energy of one cycle of the wave is h. .....(30)

As per the wave theory, energy flow in one cycle of the wave per unit area is equal to E^2T/Z, where T is the period of the wave and Z is EM characteristic impedance of the free space. .....(31)

So, at high frequencies, $E^2T/Z = h$. .....(32)

So, energy content of f cycles of the wave = $hf = E^2/Z$ .....(33)

So, at high frequencies, a Photon energy is equal to $hf = E^2/Z$ .....(34)

At low frequencies, a Photon energy is equal to E^2/Z = Power flow per unit area. .....(35)

Similarly, Photon energy of acoustic wave = P^2/Z_a = Power flow per unit area, where P is the acoustic pressure, Z_a is acoustic characteristics impedance of the medium. .....(36)

The energy density of the electrostatic field = $(€/2).E^2 = m_o(2\pi C)^2 = hf$ .....(37)

So, $m_o = (€/2).(E/(2\pi C))^2$ .....(38)

By substituting the equation (1) into equation (38) we get, $m_o = (€/2).(Q/(8\pi^2 C€r^2))^2$ .....(39)

From the equation(37) and (39) we get, $f = (m_o/h)(2\pi C)^2 = (2\pi C)^2(.5€/h).(Q/(8\pi^2 C€r^2))^2$ .....(40)

From the equation (20), the dynamic mass of the static field photon = 1.013mo. .....(41)

By substituting and calculating the values of the constants in SI units in the equations (39),(40) and (41), we get the following equations

$m_o \sim 1.007x10^{-10}(Q/r^2)^2$ .....(42)

$f \sim 4.81858x10^5(Q/r^2)^2$ .....(43)

$m \sim 1.012x10^{-10}(Q/r^2)^2$ .....(44)

Similarly, for any field of the nature, the charge Q may be treated as equivalent charge and the equivalent charge may be found by applying the equation (2).

[15] [16].

Conclusion: The main finding in this article is that all the fields of the nature propagates as a series of continuous spherical layers of the field from the source of radiation. This is contrary to the belief that the field propagates in all the directions from the source in radial lines. This reality was proved by deriving an expression for the velocity of the field and also by using the propagation of energy stored in the field. So, the moving field from the source has radial velocity which is the speed of the light in the absolute space C m/s and the velocity in the angular direction is $2\pi C$ m/s. So, maximum speed in the universe is $2\pi C$ m/s. So, in the special theory of relativity, the reference speed C m/s was replaced by $2\pi C$ m/s. Using the modified special theory of relativity, rest and dynamic mass of many elementary particles were calculated.

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