# GENERAL THEORY OF FIELDS

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***Abstract:*** Four forces of the nature namely gravitational, electromagnetic, weak nuclear and strong nuclear forces are integrated by six different deterministic theories of the field. Newton and Albert Einstein's gravitational fields are also integrated. First theory is based on radiation and propagation of fields. Second theory is based on electromagnetic radiation of isotropic point source .Third theory is based on force acting on energy and field. Fourth theory is based on the force acting on a matter particle Fifth theory is based on the dipole array theory. Last theory is based on the special theory of relativity. All theories lead to same general expression for fields. This general expression integrates all the known and unknown forces of the nature. Then these theories are applied to the field of astrophysics to explain the history of stars and other massive objects of the sky.

***Key words:*** **Integration, forces of the nature and general expression**

## I. INTRODUCTION

In this article, first the discrete nature of radiation and propagation of the electromagnetic fields is explained and Faraday's lines of forces are integrated with the Huygens's ether particles assumed in building up his theory of light wave propagation. The same theory is also integrated with the general theory of relativity. Based on such an integrated theory developed a general expression for field radiated by any particle known and unknown is derived.

Then in the next section, based on the field radiated by an isotropic point source [1] a much simpler and general expression for field radiated by all particles known and unknown is developed. In the next section of this article, first the force acting on energy and field are examined and expressions relating the space, time and field are derived. The assumption made in the general theory of relativity is proved to be not required and the space of general theory of relativity is proved to be a non linear function of absolute space. The classical electromagnetic field theory and the special theory of relativity are proved to be true only approximately in the far field regions of the source of radiation. Finally, a general formula for field radiated by a mass or equivalent charge is derived which includes all fields radiated by all known and unknown particles of the universe.

In the next section, the field acting on a matter particle is examined first. In this section, field acting on matter particles are analyzed by applying wave and classical mechanical concepts. The analysis shows that the field acting on the matter particle has $4^{th}$ order term in r. The presence of a $4^{th}$ order term proves the existence of an additional near field component. Therefore, it encourages the generalization of the radiated field by a particle. In the next section a general expression for field radiated by a particle is derived based on the radiation by an array of dipoles. In the last section the same expression is derived based on special theory of relativity. Then these theories are applied to the field of astrophysics to explain the history of stars and other massive objects of the sky.

## II. RADIATION AND PROPAGATION OF FIELDS [2 3]

Matter is made up of atoms and other atomic and nuclear particles. Since the matter particles originated from photons and photons are made up of electromagnetic waves, all matter particles are made up of Fourier modes. Charge in a matter particle like in neutron is zero. Therefore, they are made up of full cycles of electromagnetic wavelets. But charge points must have been made up of half rectified cycles of electromagnetic waves. As per the Newton and Coulomb's laws the particle could be defined as a highly concentrated field points. Therefore, all particles are made up of electromagnetic waves. De Broglie's wave equation also confirms these facts. Due to the potential difference between the cycles of field, all cycles will be in vibration at all times and places. Due to these vibrations at very high frequencies, all particles radiates field. Since vibrations are discrete functions of space and time, radiated fields are also in the form of discrete functions of space and time. These discrete fields are geometrically described by the Faraday's lines of forces. Therefore, mathematically, these discrete fields radiated could be represented by train of impulse functions of space and time. Therefore, each point in the space receives an impulse and the impulse leaves the point over a finite and small interval of time. Therefore, each point of the space could be equivalently considered as a receiver of an impulse and radiator of the same. This propagation theory was proposed by Christian Huygens. Therefore, ether particle of Huygens theory is just hypothetical particle just like Faradays lines of forces. Therefore, at a fixed point in the space, the impulse function could be described by $e^{-kt}$ and at a fixed time, the impulse function could be described by $e^{-lr}$ where k, l are scale factors. In the general theory of relativity, the space and the field are assumed to be equivalent. Therefore, mass is assumed to disturb the space. This means the space receives the field and radiates the field at all points. Therefore, assumptions of the general theory of relativity are equivalent to the assumptions made in Huygens wave theory of light propagation. The function $e^{-lr} = \sum(K_n/r^n)$, where n = 1,2,3,… which is proportional to the field radiated by the particle.

## III. GENERAL RADIATION THEORY OF FIELDS [1]

The field radiated by an isotropic point source is directly proportional to 1/r and the field acting on the energy or photon is directly proportional to $1/r^2$. Close to the radiator static field has $1/r^3$ component also. Therefore, field radiated by a charge or mass as per the charge and mass equivalence principle may be generalized to

$F(r) = K_1/r + K_2/r^2 + K_3/r^3$ where $K_n$, n = 1, 2, 3 are constants (1)

The field radiated by a particle [1] is directly proportional to $e^{-at}$ where a is a constant if the space and field are assumed to be one and the same as per the general theory of relativity. Therefore, the speed of the radiated field is directly proportional to a. Therefore, the deceleration of the field is directly proportional to $a^2$. Since the energy is directly proportional to the square of the field, the deceleration of the energy or photon is directly proportional to $a^4$. Since the speed of a photon or energy radiated by an isotropic source is directly proportional to $1/r^2$, the deceleration of the photon is directly proportional to $1/r^4$. Therefore, a is directly proportional to 1/r. Therefore, the equation (1) could be generalized to

$F(r) = \sum(K/r)^n$ where K is a constant and n = 1,2,3,4 (2)

Since the particle which generates the field is in vibration at a very high speed and frequency, the electric current due to the vibration of a charge is $I = \pm I_0.e^{\pm bt}$ where $I_0$ and b are positive constants and this current is periodic. By definition current is time rate of change of charge and therefore, current is the speed of the charge. Therefore, the charge and the current produce electromagnetic fields. Therefore, the electromagnetic field radiated and then comes back to the source when the current flow is in the opposite direction. Therefore, dI/dt is directly proportional to the time rate of change of the field produced. In other words dI/dt is directly proportional to the speed of electromagnetic field radiated. Therefore, dr/dt is proportional to dI/dt, where r is the distance travelled by the field. Therefore,

$r = \pm Ae^{\pm bt}$, where A is a constant (3)

If we compare the equations (2) and (3) b = 1, 2, 3, 4. Therefore, b is proved to be a positive integer. Therefore, the radiated field is generalized to

$F(r) = \sum(K/r)^n$ where K is a constant and n = 1,2,3,… (4)

The mass and charge equivalence principle as explained in the following lines is used to generalize the field equations.

## IV. FORCE ACTING ON ENERGY AND FIELD [1]

The power flow per unit area on a spherical surface whose center point is at the isotropic radiator = $P_0/4\pi r^2$ where $P_0$ is total radiated power of the isotropic radiator and r is the radial distance from the center. (1)

The power flow per unit area at a point is time rate of change of energy at that point by definition and therefore, equation (1) is the speed of a photon energy. Therefore,

$dE/dt = C^2(r) = P_0/4\pi r^2$ (2)

where C(r) is the phase velocity of the electromagnetic wave which is square root of group velocity $C^2(r)$. Therefore, field acting on a photon =

$d^2E/dt^2 = 2C(r).dC(r)/dt = 2C(r).d^2r/dt^2$ (3)

Therefore, Field acting on a photon = $d^2E/dt^2 = 2C(r).d^2r/dt^2$ = 2C(r) x acceleration of the field. Energy = $E = K.F^2$ where K is proportionality constant and F is field. Therefore, the speed of a photon is

$dE/dt = 2KF.dF/dt$ (4)

The field acting on the photon =

$d^2E/dt^2 = 2KF.d^2F/dt^2 + K.(dF/dt)^2$ (5)

Therefore, by equating the equations (3) and (5) we get,

$2KF.d^2F/dt^2 + K.(dF/dt)^2 = 2C(r).dC(r)/dt$ (6)

The speed of the field = Phase velocity of the electromagnetic wave =

$dF/dt = C(r)$ (7)

By substituting the equation (7) into the equation (6) we get,

$2.(K.F–C(r)).dC/dt+K.C^2(r ) = 0$ (8)

Integration of equation (8) results in

$Kt = 2.\ln C(r) + 2KF/C(r) +A$, where A is a constant (9)

By substituting the expression for C(r) from the equation (2) into the equation (9), we get the following equation (10).

$Kt = \ln (P_0/4\pi r^2) + 2K.F.r(4\pi/P_0)^{1/2} + A$ (10)

Since $F = (E/K)^{1/2} = (P_0/4K\pi r^2)^{1/2}$, $Kt = \ln B.(P_0/4\pi r^2)^{1/2}$, where $B = 2.K + A$ (11)

The equation (11) could be simplified to

$D.e^{-Kt} = r$, where $D = B(P_0/4\pi)^{1/2}$ (12)

Therefore, the equation (12) gives the exact relationship between space r and time t, if the field F is assumed to be same as the space r in dF/dt = dr/dt = C(r). This assumption was made in the general theory of relativity. This assumption is not required since the space is proved to be a non linear function of time t in the regions close to the source of radiation. If the space and the field are assumed to be one and the same, the space becomes a non linear function of absolute space r since $F = (P_0/4\pi Kr^2)^{1/2}$. At the far field, r ≈ D and therefore, the space becomes a linear function of time and the absolute space. The equation (12) could be typed as

$r = D.(1- Kt + (Kt)^2/2! – (Kt)^3/3! + \dots )$ (13)

Therefore, $dr/dt = C(r) \approx D = C_0 = 3 \times 10^8$ m/s (14)

Therefore, the postulate of the special theory of relativity is proved to be incorrect. This assumption is correct only in the regions far away from the source of radiation. All matter and charge particles of the universe radiates field and the universe itself originated from a point of radiation in the absolute space. Therefore, speed of energy and the field were greater than the speed $3 \times 10^8$ m/s. As per the classical electromagnetic field theory and the special theory of relativity,

$C_0 = dr/dt$. Therefore, $r = C_0t + H$, where H is integration constant (15)

As per the equation (13), equation (15) is proved to be true only approximately in the far field regions of the source or radiation. As per the equation (12), each point in the space could be treated as the source radiating the field, if we assume that the original source of radiation disturbs the space as per the general theory of relativity or as per Huygens's wave theory of light. In the Newton and Coulomb's theory, the field is assumed to be stationary and therefore, the field includes both expanding field from the source and the contracting field towards the source. That is why in the Newton and Coulomb's formulas of the field,

$R = r^2 = D^2. e^{-2.K.t}$ (16)

is used instead of r as in the case of general theory of relativity and Huygens's wave theory of light. Therefore, R is the space variable in the general theory of relativity, which is a non linear function of r as in the equation (16). This function $R(r) = r^2$ is a parabolic function of r. Therefore, in the near field regions of the absolute space, curvature is very high and therefore, $R(r) = r^2$ has to be used as used by Newton and Coulomb. In the far field regions of the space $R(r) \alpha r$,as in the general theory of relativity. Therefore, the equation (16) could be approximated to the following equation. $R(r) = r^2$ in the near field region and

R(r) = r in the far field region of the absolute space (17)

Therefore, by combining the near and far field radiations, the gravitational field radiated by a mass

$M = GM/r^2 + K_g.GM/r$ where G is gravitational constant (18)

$K_g$ is a proportionality constant. Therefore, equation (18) is the general field radiated by the Mass M which combines the field components of Newton and Einstein theories on gravitational fields. The Newton's formula corrected to include the field component close to the particle [4] is $K_N.GM/r^3$ where $K_N$ is constant of proportionality. Therefore, the total gravitational field radiated by a particle of mass

$M = GM/r^2 + K_g.GM/r + K_N.GM/r^3$ where G is gravitational constant (19)

Equation (19) proves that closer is the radial distance from the point of location of the matter particle, greater is the order of the field radiated. Moreover, if we approach a particle closer and closer, we approach the nucleus of an atom. Nucleus is made up of so many elementary particles. Therefore, an atomic particle in general is made up of so many elementary particles with or without charges. Therefore, the equation (19) must be expanded to include all the higher order radiation components. If we compare the equations (13), (15), (16), (17) and (20), R(r) = f(r) where f(r) = is a general function of r which includes higher order terms of r. Therefore, by expanding R(r) using Taylor series, we get,

$R(r ) = 1 + r. R'(0 ) + r^2/2! R''(0) +$ (20)

Therefore, general gravitational field formula which includes all the radiated components of the field is

$F = G.M(K_1/r + K_2/r^2 + K_3/r^3 + K_4/r^4 + \dots\dots)$ (21)

where $K_n$, n = 1,2,3,… are proportionality constants. Therefore, equation (21) could be typed in short form as

$F = G.M.\sum.(K_n/r^n)$ (22)

The equation (22) is valid for radiations due to charges as per the mass and charge equivalence principle explained in the following section.

## V. FIELD ACTING ON A MATTER PARTICLE [1]

As per the special theory of relativity energy of a particle $E = mC^2(r)$ if the particle of mass m is close to the electromagnetic radiating source. Close to the source of radiation, the speed of the electromagnetic wave C(r) was proved to be much greater than that of $C_0 = 3 \times 10^8$ m/s.

Therefore, the speed of the energy E or photon in the mass =

$dE/dt = dm/dt.C^2(r) + 2.C(r).m.dC(r)/dr.dr/dt = C^2(r).(dm/dt + 2m.dC(r)/dr)$, since $dr/dt = C(r)$ (1)

The speed of the energy or photon in the mass=

$dE/dt = C^2(r) = C^2(r).(dm/dt + 2m.dC(r)/dr)$ (2)

Therefore, $dm/dt + 2m.dC(r)/dr = 1$ (3)

The $C^2(r) = P_0/4\pi r^2$ = Power density at r from the electromagnetic radiator or the speed of the photon radiated.

Therefore, $dC(r)/dr = -(1/r^2).(P_0/4\pi)$ (4)

By substituting the equation (4) into the equation (3) we get,

$dm/dt - m.(P_0/2\pi r^2) = 1$ (5)

In the equation (5)

$dm/dt = dm/dr.\ dr/dt = C(r).\ dm/dr = C(r).V(r)$ where $V(r) = dm/dr$ and $m = m_0/(1 - V^2(r))^{1/2}$ (6)

By dropping (r) for the sake of simplicity in the equations of (6) and substituting the equations (6) into the equation (5), we get,

$V^2(V^2 + C^{-2} - 1) + (2V/C).(1 - V^2) + (2Cm_0)^2 - C^{-2} = 0$ (7)

The equation (7) is a fourth order equation in V and therefore, there will be four different solutions for V. The field acting on the mass is

$dV/dt = dV/dr.\ dr/dt = C(r).dV/dr$ (8)

As per the general field equations derived in the article [4], field generated by a mass

$M = F(r) = K_1/r + K_2/r^2 + K_3/r^3$ where $K_1$, $K_2$ and $K_3$ are proportionality constants (9)

Therefore, the field acting on the mass could be typed as

$F(r) = \sum K_n/r^n$ (10)

where n is an integer varies from 1 to 4. From the equation (10) we could conclude that closer is the distance to the particle radiating the field, greater is the order of the field component produced. Therefore, the integer n may be extended to go up to infinity in the equation (10). This generalization of the field produced is done by in the last two sections of this article.

## VI. GENERAL QUALITATIVE THEORY OF FIELDS

The formulae derived for the fields radiated by a mass or charge particle leads to the conclusion that radiated field consist of field components which vary as per 1/r, $1/r^2$ and $1/r^3$ terms. Closure the distance from the source of radiation, the greater is the order of the field component radiated. Therefore, the term 1/r is far field radiated component or general theory of relativity field component, $1/r^2$ term is static field component or Newton or Coulomb's field component and $1/r^3$ term is the static and dipole radiated field component. Therefore, the model of a particle assumed in the gravitational field theories of Newton and Einstein are just the radiators of 1/r and $1/r^2$ field components. The near field component $1/r^3$ is nuclear field component and therefore, it was not significant in the gravitational field theories. But a nucleus and an atom in general consist of so many charged or uncharged matter or energy particles. Therefore, as per the charge and mass equivalence principle established in the following section, a general model of a particle is an array of dipoles connected together by bonds of different strengths depending upon the mass and charge of the particles. Therefore, the field radiated by a particle may be considered as a radiator of infinite number of higher order field components. Therefore, the field

radiated by a charge or mass particles = $\sum (K_n/r^n)$, where $K_n$ are proportionality constants and n is an integer varies from 1 to infinity. This expression is derived from the radiation theory of the particles in the following section.

## VII. GENERAL QUANTITATIVE THEORY OF FIELDS

As per the special theory of relativity, energy of a matter particle of mass M is $E = M.C_0^2$ and therefore, $dE/dt = dM/dt.C_0^2$ is the speed of the energy = $C_0^2$ .Therefore, dM/dt = 1 and dM = dt. Therefore, change of mass at a point is equal to the change of time. This means the origin of mass in the space at a point and the time at the same point are one and the same. This means if the mass at a point in the space changes from zero to dM ( or dm to zero), time changes from zero to dt (or dt to zero) at that point. This change could be represented by $e^{\pm t}$ since change of mass or equivalent energy at a point is smooth and continuous in continuum mechanics. The dynamics of the mass dM at the point could be equivalently represented by dr, the distance travelled by the mass dM during dt. Therefore,

$$dM = dr = dt \quad (1)$$

Therefore, r = t, the space and the time are one and the same as per the equation (1). Therefore, the change of mass at a point changes the time and the space at that point. This change is represented mathematically by $e^{\pm t}$ in the time domain or $e^{\pm r}$ in the space domain. As per the Newton and Coulomb's field theories, a point mass or a charge could be defined as a highly concentrated field at that point. Therefore, the change of mass or it's equivalent energy or field or time and space are one and the same at that point. The mass or charge also radiates fields. Therefore, concentrated field could radiate the field. Therefore, the radiated field could be described by the factor, $e^{\pm t}$ or $e^{\pm r}$ . By Taylor series expansion,

$$e^r = 1 + r + r^2 + r^3 + \ldots \quad (2)$$

Therefore, the field radiated by any particle could be generalized to

$$F(r) = \sum K_n/r^n \quad (3)$$

## VIII. MASS AND THE CHARGE EQUIVALENCE [4 5]

In electromagnetic field theory, Euclid or linear space is used to formulate all problems. Only in gravitational field theory space is assumed to be curved. But Newton's law of gravitational field is comparable to Coulomb's electric field laws. Therefore, if the space is really curved, the space of electromagnetic fields should be proved to be curved. But no such evidences are available in the literature. Mass and Charges are proved to be equivalent sources of fields, if we compare the Newton's Law of gravitation [4] with the Coulomb's law of electricity [5]. Electric Charge is equal to $\sqrt{G4\pi\varepsilon}$ X Mass. This relationship establishes the link between fundamental units of electric and gravitational fields. This is another evidence to prove that space is not curved.

## IX. APPLICATION TO ASTROPHYSICS [3, 4, 5]

The material universe originated from a 4-dimensional space and time structure, when the energy originated at the origin of the 4-d coordinate system since special theory of relativity and quantum physics were developed within Cartesian space. Therefore, all the sub systems like galaxies, stars, solar systems, earth system, etc. were originated in the 4-d space-time structure. Since each sub system originated from lower order sub system, each sub system could be geometrically described in the 4-d frame work as per the first law of thermodynamics. Therefore, the history of the universe contains histories within histories in the 4-d space-time structures. All structures of the world are made up of particles within particles or all complex higher order systems originated and developed from lower order systems. Since the universe is a second order feedback control system (Universe originated from the energy and it is a cyclical system to satisfy the first law of thermodynamics. Fundamental equations like Electromagnetic wave equation and Schrodinger's wave equation are second order equations. Natural systems like solar and biological systems are feedback control systems.) the origin and development of all the sub systems of the universe also must be governed by second order feedback system's principle, as per the equivalence of energy principle. Therefore, the birth, growth and the death of a star is a cyclical and eternal phenomenon. Therefore, formation of black holes and singularities are not possible in the physical world.

All particles and the universe itself could be described by a multi periodic Fourier series since universe is made up of particles within the particles and all particles could be mathematically described by a Fourier series as explained in the first section (Radiation and propagation of fields). Sine and cosine waves have positive and negative cycles. Therefore, these positive and negative cycles are positive and negative electromagnetic fields. So, the dipole theory of particle explained is a much simplified version of electromagnetic field theory of particles. As per the Newton, Coulomb and the general field theoretical formulae, all particles radiate fields as per the field and distance relationship. Therefore, a particle could be described as a highly concentrated field. Therefore, field theory is the most fundamental theory of all physics. Convergence of the Fourier series is very well known. Moreover, the compression of particles under heavy gravitational pressure of a dead star may lead to the formation of neutron stars since neurons are the maximum possible particles exists in the universe with peak densities of matter. If the gravitational force tends to increase beyond this level of density, electric sparks will be generated between positive and negative charges and pressure opposite to the gravitational pressure will be developed in the dead star. Therefore, there will be a internal vibration of the particles due to the act of opposing forces on the particles within the dead star. These internal vibrations of particles generate heat and radiations. When the heat and radiations are absorbed by the external cooler mass of the dead star, the internal heat is reduced and once again the external mass

comes back closure to the internal mass due to the gravitational force and once again the cycle continues. Therefore, a star or other massive body also expands and contracts eternally like the universe itself as per the second order feedback system's principle. Therefore, the origin of singularity and black hole in the physical universe is impossible.

## X. CONCLUSION

General expressions for field radiated by any known and unknown particles are derived based on six different methods. Then the applicability of these expressions to analyze the birth, growth and death of a star and other massive body is checked. Origin of singularities and black holes are proved to be impossible in the physical world and history of stars and other massive bodies are proved to be cyclical and eternal like the dynamics of the universe and any second order feedback control system.

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