

A possible Solution To Galaxy Rotation Curve And Cosmological Constant Problem

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Abstract

We apply some aspects of Mach's principle to the theory of gravitation. we manage to drive the observed rotation galaxy curve without introduction of dark matters or dark energies. we also propose a solution for cosmological constant problem.

1 Introduction

we know that the density of ordinary matter in the world is approximately 0.2 hydrogen atom or $4.5 \times 10^{-28} (kg/m^3)$ and $G = 6.67 \times 10^{-11} (m^3)/(kgs^2)$. the principle of equivalence relates and expresses the equivalence of an accelerating reference frame with a stationary reference frame in the presence of a gravitational field. in other words the principle of equivalence relates the deformed parameters of space time observed by an accelerated frame (an accelerated frame is a nonlinear the transformation of space time parameters and in addition an accelerated observer must see a distorted trajectories and geometry which inertial frames observe as un distorted one) with the Newtonian gravitational potential, although it does not offer any explanation and justification for the cause and source of the Newtonian gravitational potential and its $\frac{1}{r}$ structure.

$$\Phi = -G \frac{M}{R} \quad (1)$$

$$F = -G \frac{M_1 M_2}{R^2} \quad (2)$$

$$g_{00} = (1 + \frac{2\phi}{c^2}) \quad (3)$$

and finally manifest its shape in Einstein field equation.

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} + \lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \quad (4)$$

suppose that we had in priory no information about the principle of equivalence and general relativity. all our tools for exploring the gravitation was Mach's principles and similarity of Newtonian gravitational law with the Coulomb law of maxwell electromagnetic equation. in order to accelerate a particle with acceleration a_0 we need force $F = ma_0$. now

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suppose another picture that the particle is stationary in space and we accelerate all masses of the universe. the Mach's principles predict that the geodesics of particle in space time change and particle will experience a force $F = ma_0$. now suppose that the world radius is limited in size and consider the fact that we are at the center of the universe.

at this point we want to determine the amount of the gravitational potential that a test particle will experience at the center of the universe. the amount of the potential that a spherical shell with electric charge q create is

$$\phi_E = \frac{q}{4\pi\epsilon_0 r} \quad (5)$$

similarly, for gravitational field it will be

$$\phi_G = G \frac{M}{r} \quad (6)$$

and the potential due to all masses will be

$$\phi_G = G \int \frac{\rho(r)4\pi r^2 dr}{r} = G\rho 2\pi r^2 \quad (7)$$

provided $\rho(r) = \rho_0 = \text{const}$

now for electromagnetic four vector we have the following known formulas

$$A^\mu = \left(\frac{\phi}{c}, A\right) \quad (8)$$

$$E = -\nabla\phi - \frac{\partial A}{\partial t} \quad (9)$$

$$A' = \frac{A - \phi \frac{v}{c^2}}{\sqrt{1 - \beta^2}} \quad (10)$$

$$\phi' = \frac{\phi - Av}{\sqrt{1 - \beta^2}} \quad (11)$$

for a stationary universe we have $A = 0, \beta = 0$ thus we obtain

$$A' = \frac{-\phi \frac{v}{c^2}}{\sqrt{1 - \beta^2}} \approx -\phi \frac{v}{c^2} \quad (12)$$

and for electric field

$$E' = -\frac{\partial A'}{\partial t} = -\frac{\phi}{c} \left[\frac{\frac{a}{c}}{\sqrt{1 - \beta^2}} + \frac{\frac{\beta^2 a}{c^2}}{(1 - \beta^2)^{\frac{3}{2}}} \right] = -\phi \frac{a}{c^2} \quad (13)$$

in other words if all universe suddenly accelerate to the right direction then it creates an electric field that its amount is $\frac{\phi a}{c^2}$ and is proportional to both potential of all masses at our location and the acceleration a_0 and the speed of light c . thus from equation 4 the final gravitational field that the test particle will experience is

$$g = E' = G\rho 2\pi R^2 \frac{a}{c^2} \quad (14)$$

where R is the radius of the world. on the other hand from Mach's principle we have

$$a = G\rho 2\pi R^2 \frac{a}{c^2} \quad (15)$$

which results in

$$\frac{2\pi G\rho R^2}{c^2} = 1 \quad (16)$$

we obtain the radius of the world as $R = 10^{27}m$ which is in good agreement with the radius of the world obtained from cosmological model and general relativity $R = 4.42 \times 10^{26}m$ \square .

thus even a constant potential is not merely a trivial quantity and both the potential difference and the ultimate value of the potential are important.

actually there is no astonishment here. we previously related the Newtonian potential to the geometry by principle of equivalence and only repeated all calculations of cosmological models in two pages.

low surface galaxy

at this point we seek to address directly the problem of rotation galaxy curve. from equation 4 we have

$$\phi = 2 \times 10^{17} \quad (17)$$

or

$$\phi \approx c^2 \approx G \frac{M}{R} \quad (18)$$

for a spiral galaxy such as milky way with diameter

$$1ly = 9.46 \times 10^{15}$$

Low-surface-brightness galaxy

from equation (7) and (16) we can deduce that the speed of light in vacuum is equivalent to gravitational potential of the entire universe on a test mass m_o . this means that the total energy of the specific particle with mass m_o which is $m_o c^2$ is exactly equal to the total potential energy of the particle due to universe gravitational potential. in other words the gravitational potential has created the total energy of the particle. also it seems that the observable radius of universe is approximately equals the schwarzschild radius of the universe (6).

in this case we can make some modification to the theory. in other words if we consider the Hubble constant and assume that the

thus as we obtained from Mach principles the amount of gravitational potential energy of the entire universe is equal second power of speed of light. thus the speed of light is a variable quantity and increase with the gravitational potential energy of the universe. on the other hand in the schwarzschild formula the speed of light is determined from the factor

$$\left(\frac{dr}{dt}\right)^2 = c^2 = c_o^2 \left(1 - \frac{2GM}{c_o^2 r}\right)^2 = \left(c_o - \frac{2GM}{rc_o}\right)^2 \quad (19)$$

in addition from weak field approximation in newtonian limit we have equation (4) which means that

$$c^2 = c_o^2 + 2\phi = -\phi_{universe} + 2\phi_{sun} \quad (20)$$

which is in contradiction with what we expect from Mach principle. in other words we expect that in the existence of gravitational potential the speed of light increase but two above equations indicate that it decrease.

in addition in the discussion of variable speed of light that in a series of papers was introduced by Einstein and others there is not a strong agreement on the issue and several models for a observed red shift or blue shift obtained from gravitational field is presented. in other words although change in the frequency of observed photon can be derived from principle of equivalence but time dilation and variable speed of light are what we infer from redshift which necessarily can not be valid. furthermore as we know the formula of time dilation and Doppler red shift in special relativity are different.

on the other hand we know that the speed of virtual photon among charged particles is the phase velocity of the entangled system. this assumption has the benefit that the total system of charges and virtual photon is invariant under Lorentz transformation. also the only candidate for action at a distance among particles is phase velocity of the entangled system. but in principle of equivalence the assumed principle indicates that the movement of a particle in the gravitational field produced by sun is due to transformation in the space time geometry caused by the existence of sun mass in the specific location. in other words action at a distance in general relativity is ignored.

as another example we must hint to the fact that postulate of special relativity expresses that the the speed of light for all inertial reference frames is constant and further more principle of equivalence says that there is no experiment to distinguish between an inertial reference frame or the reference frame in which is in free fall in a gravitational field. thus it seems that tacitly we can deduce that the speed of light measured in free falling objects or rotating satellites is equal to c which is not what is obtained in standard literatures. in addition it seems that if we suppose that photon have mass and we approach their mass limit to zero we must obtain the same result derived for mass less photon deflection in gravitational field which is half of what obtained in literatures and again there is a contradiction. the justification for this idea can be expressed as follow: suppose that in a photon and a massive neutrino move in a simultaneously in a straight lines from destination A to B in a room. since neutrino is not massless but its speed is close to the speed of light the space time coordinate of B are approximately the same for neutrino and photon. now suppose that the reference frame in which A and B are located at, along with photon and neutrino are in free fall or rotating satellite in gravitational field. logically in order to destination of both neutrino and photon remain the same it is necessary that aberration of both neutrino and photon in gravitational field be similar. on the other hand as derived by Schwartz child formula the aberration of photon is twice that of neutrino which seems in logical.

there is a point in postulate of special relativity and it seems that on the base of symmetry and no preferred reference frame, the speed of light for all moving reference frame in constant gravitational potential is equal to c . actually we can not exactly determine the effect of gravitational potential on the postulate of constancy of the speed of light. the main problem is that in the case of any increase in gravitational potential the gradient of this potential creates an acceleration which ruin any measurement. in other words we can not find a location such as inside a sphere with an increased constant potential in comparison to inter stellar potential. in other words on earth surface there is a force and for a free moving satellite there is a accelerating inward motion.

we also has not enough information to deduce what happen exactly for clock rate or other variables in an accelerated reference frame in twin paradox.

as another example we must hint to contradiction between general relativity and principle

of equivalence and the concept of action at a distance. suppose there is a vertical electric field in the z direction. in addition suppose a tachyonic charged particle with speed of infinity moves in horizontal direction from location A to B. it is clear that because it take zero time for tachyonic particle to move from A to B the electric force that is acting on particle can not create any distortion in the trajectory of particle. now suppose that the observer move to left with speed $-v$. as a result the speed of charged tachyon will calculated as

$$v' = \frac{v + \infty}{1 + \frac{v\infty}{c^2}} = \frac{c^2}{v} \quad (21)$$

on the other hand the new electric field will be

$$E' = \frac{E}{\sqrt{1 - \beta^2}} \quad (22)$$

$$B' = \frac{\frac{Ev}{c^2}}{\sqrt{1 - \beta^2}} \quad (23)$$

the Lorentz force is zero. which means that the charged particle moves with no distortion.

now suppose that two charge electron positron particles are separated by a large distance above a massive planet. they send virtual photon from electron to positron but by symmetry we expect the proper time of sending virtual photon in reference frame of stationary electron is exactly equal to the proper time of received virtual photon to positron. the necessary condition is that the speed of virtual photon is ∞ . which agree with the phase velocity of entangled system with total zero momentum. on the other hand from schwarzschild metric we have:

$$B' = \frac{\frac{Ev}{c^2}}{\sqrt{1 - \beta^2}} \quad (24)$$

but since because the factor in front of radial distance is not 1 but

$$\left(1 - \frac{GM}{rc^2}\right)^{-1} \quad (25)$$

we conclude that the trajectory of particle first moves inward to the center of mass and later outward to reach to positron position like Hyperbolic motion contrary to elliptical for tardyonic particles which first moves outward to the center of mass and later inward. in other words gravitation has repel force on tachyons. but the main paradox is that moving tachyon means its radial distance from center of mass will vary which means vary in the potential energy of the tachyon which manifest itself in the energy of the tachyon. on the other hand change in the energy of the tachyon means that the speed of particle is no longer ∞ because infinite speed is only possible at zero energy. any reduction in the speed of particle on its journey means proper time of sending virtual photon from electron differ with the proper time of receiving virtual photon in positron reference frame which contradicts symmetry. the route of problem is that in electrodynamics we deal with forces and fields but in general relativity potential appears in metric. both force and potential have similar behaviors in subluminal speeds but at superluminal speeds their difference appears. on the other hand electrodynamics deal with the electric and magnetic force but in gravitation change in gravitation has direct effect on the energy of virtual photon. if in above example

instead of massive object at the center we consider a heavily charged object with no mass; since the electric field of charge at the center has no effect on the energy of virtual photon, no change in its energy is observed because electromagnetic quanta do not interact with each others and maxwell equations are linear but all entities interact with gravitational field. put it other words gauge invariance of electric field is the entangled property and virtual photons transfer energy momentum. but in the case of gravitation entangled property is related to energy and momentum of entangled particles and again virtual photon transfer energy and momentum. both entangled specification and exchanged specifications share the same identity. in the above example if instead of massive particle an electric charged one be in the middle and instead of virtual particle a charged tachyon such as quark moves at superluminal velocity, as we know the charged particle must confine which means that the wavelength of exchanged virtual particle must be at the order of large distance between point A and B and its mass energy and momentum must be very small. also the distance of virtual particle in gravitational field from the center of mass is not a function of central mass if it want to preserve potential energy on its trajectory in other words the equipotential trajectories are circles around center of mass and if the mass be very small it should have no effect on changing the trajectories from circle to others thus even very small masses must deflect virtual particle as much as great masses, which seems un reasonable if the mass approaches zero. even if the mass of virtual particle changes and unlike tachyon do not be constant any small change in energy from zero with any arbitrary mass leads to speed less than infinity. thus generally speaking the trajectory of virtual particle in gravitational field contradict general relativity which is created on the base of potential.

maybe vary in potential energy of tachyon is in such a way it has no effect on the total energy of tachyon?

does the total energy of a subluminal particle change when it falls in a gravitational field or only its momentum and mass change? dirac equation.

is the total system of moving of a tachyon from point A to B is invariant under lorentz transformations? with a little move of far observer the speed of $-\infty$ change to $+\infty$ but will the speed of particle in middle of route change from c^2/v to $-c^2/v$?

if the principle of equivalence be valid it means that there must exist a geometrical model of gravitation because the mass of test charge has no effect on the trajectory. but the question is that is there a geometrical model that be compatible with superluminal speed? does the principle of equivalence apply for tachyonic particles?

maybe mass change. uncertainty principle. superluminal gravity. virtual particles interact with gravitational field. superposition principle in gravitation fails. hierarchy problem. definition of space time and its relation with mass of universe. is gravity entanglement behave in such a way that it creates behaviour of particles seems in curved spacetime? what is space time and its relation with entanglement. an space time independent theory .entangled force must behave in such a way that mimic space time curvature? superposition principle and gravity. superposition principle in quantum is different from usual math. de broglie waves devides for mass addition .background independent theory. entanglement must mimic exactly the equivalence principle. phase velocity of entangled system is compatible with mach principle. general relativity is incompatible with mach principle. unification of quantum mechanics and geometry. is quantum matched with my paradox? why same sign quarks confine too?

if the acceleration of tachyon be toward center of mass that means that its speed must increase its energy decrease as it approaches to the center of mass in gravitational field. on the other hand the geodesic derivation of schwarzschild metrics predicts an inward acceleration

for radial motion.

$$\frac{d^2r}{d\tau^2} = -G\frac{M}{r^2} \quad (26)$$

where $d\tau$ is the proper time. M is the mass of object at the center not tachyon mass. if this picture be correct this means that the tachyon loss its energy as it fall toward the center. if we consider the force energy relation, we deduce that the gravitational force must be repulsive for tachyons but it attract them toward the center. the question is that will the relation

$$ma = mg \quad (27)$$

still valid which means that the acceleration must be equal to gravitational field g . as we know for tachyons the proper time must be imaginary that means that the appropriate equation must be

$$\frac{d^2r}{d\sigma^2} = +G\frac{M}{r^2} \quad (28)$$

where σ is a positive quantity and so particle must reduce its speed but increase its energy as it approaches to the center of gravitational field. this means tachyon tends to escape gravitational fields and as they move away they increase their speed. but again by this interpretation a is not equal to g because g is inward but a is outward and in addition the definition of a must be revised to proper distance σ not proper time τ . the sign and quantity of m the mass of virtual particle in the above equation does not matter because it eliminates from the equation. even if we consider proper time then still we obtain wrong sign. thus geometrical analysis of gravitation means principle of equivalence is invalid and so the geometrical analysis has invalid basis. any solution to the metric again must leads to above equations thus even if the solution of the metrics was invalid the conclusion we obtained must still remains in contradiction as a paradox. on the other hand in superluminal quantum electrodynamics using wilson sommer field rule and quantum mechanics tachyon will confine for both opposite and same charges which in contradiction from what we obtained from a geometrical model of gravitation. will quantum gravity determine which route electron choose in double slit experiment? i have an idea route determined by phase velocity go and come. tunneling is performed at phase velocity in double well. when collapse we must look when the head of phase string is located? superposition of my brain wave with objects must create collapse. what type of superposition creates collapse? collapse of wave function is not a metaphysical subjects. spontaneous symmetry breaking and wave function collapse. momentum position commute and uncertainty for tachyon.

unified field theory anti gravity=tachyon force . is tachyon gravitational analysis the analysis of final theory?

References

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