The General Relativity in the Radius of Particles

Giampaolo Piscedda

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email:giampaolo.piscedda@icloud.com

Abstract

Through Minkowsky's Geometry and the equation on the curvature of a light ray, derived from the Theory of General Relativity, we deduce that in the presence of a mass, a constant volume must always be subtracted from that volume containing that mass, by decreasing the radius of a sphere containing such a mass. So we show that the same phenomenon physic leads also to a reduction in the radius of mass of particles with mass.

keywords: *pseudo-Euclidean, Curvature, Scalar triple product, Aether, Charge radius, Schwarzschild*

1 Introduction

Since $x^2 + y^2 + z^2 = c^2t^2$(with $c = 1$) is the equation of a sphere, multiplying by 4π the $ds^2 = -x^2 - y^2 - z^2 + c^2t^2$, the Pseudo-Euclidean distance allows us to derive the difference between two spherical surfaces S_1,S_2, and by denoting V_1 and V_2 as the volumes of the spheres S_1 and S_2 we can also give to the pseudo-Euclidean distance a volumetric interpretation. We place ourselves in the condition $ds^2 > 0$ (intervals of the timelike). The equation obtained from the curvature of a light ray undergoes in the presence of a gravitational field to the General Relativity is:

$$C = 2a/\Delta = 8\pi GM/2\pi c^2\Delta \tag{1}$$

then we obtain the constant:

$$4\pi c^2 \Delta C = 4\pi c^2 = 8\pi J_G M \tag{2}$$

in which we have eliminated time. Given the Cartesian coordinate system of origin O $(x_1, x_2, x_3, x_4 = ct)$ the volume $4\pi c^2 a$, can be interpreted as the scalar triple product $4\pi \mathbf{c}\times\mathbf{c}\cdot\mathbf{a}$ (topologically equivalent to a spherical surface) in which the vector **a** is perpendicular at each point to the spherical surface $4\pi c^2$ of the sphere S, with the direction parallel to the x_4 axis. Since this volume $4\pi ac^2$ is smaller than the volume $4\pi c^3/3$ of the sphere S, then by the condition $ds^2 > 0$, must be negative; Therefore the volume of the sphere must be:

$$V_f = (4\pi c^3/3) - 4\pi ac^2 < 4\pi c^3/3 \tag{3}$$

(in the space-time cone we are in the region of absolute past).

2 Discussion

Since $8\pi J_G$ has the dimension of a volumetric density, we can ascribe to $8\pi J_G M$ the physical meaning of that volume, which the mass M occupies in a substance with volumetric density $8\pi J_G$; then the theory of general relativity through the equation $4\pi ac^2 = 8\pi J_G M$, should lead us to assume the existence of an aether with volumetric density $8\pi J_G$ that fills all space. We note that the Theory of General Relativity gives a real physical description of an apparent force through the mass M and $8\pi J_G$, so we deduce that there is no aether in space since the described force is apparent. Therefore we can deduce that the physical phenomenon in which an elementary particle such as the muon, penetrates inside the mass of the proton (a phenomenon predicted by quantum mechanics), generates a gravitational field inside the proton that will reduce its volume by a $J_p M_p$ quantity, since the proton has a real volume density J_p. Since we can describe the real force as if it were an apparent force, the equivalence principle remains valid for the proton, and the measure of the ratio α between the charge radius and the mass radius of the proton is always constant. Thus calculated the mass radius of the proton at the instant the muon is inside it, we obtain the charge radius by multiplying its mass radius by α. Since the reduced volume V_p' of the proton, due to the presence of the muon inside it, equals:

$$V_p' = V_p - J_p M_p \tag{4}$$

then its reduced charge radius, must be:

$$r_p' = r_p(1 - M_\mu/M_P)^{\frac{1}{3}} \tag{5}$$

from which we obtain the value of $r_p = 0.875fm$, if we assume as the reduced value $r_p' = 0.8409fm$; which is in good agreement with the recent measurement obtained by the group of researchers at Colorado State University and with the measurement $r_p = 0.877fm$ obtained in 2017 by the group of researchers from the Sorbonne University of France.

3 Conclusion

Because in the space-time cone, the volume $4\pi ac^2$ is in the region of absolute past, we must be subtracted it; this volume no longer belongs to the present time, due to the curvature induced by a mass on space-time. Since this phenomenon also occurs when a particle of radius r penetrates inside a particle of radius r', with $r < r'$, then the volumetric density of the particle decreases. So e e can state that mass not online curves space-time, buy also mass itself; infact a decrease in volumetric density can be obtained either by decreasing the volume and leaving the mass constant, or by increasing the mass and leaving the volume constant, and so to a portion of volume in the region of absolute paste, we can associate it, with a certain amount of mass in the present time, and we also could deduce that, any portion of volume in the present time must be associated with a mass in the region of absolute future. Then, by the principle of equivalence $E = mc^2$, we could deduce that the Volume as a form of Energy. Furthermore in order for this theory, because when the muon is inside the proton, decreases the radius of the proton by the calculated amount; then extending the validity of the Theory of General Relativity to particles, the increase of the Schwarzschild radius ($r_S = a = 2GM/c^2$), with increasing mass, must start from the origin. So the measure of the mass radius of a sphere containing a black hole does not increase with increasing the mass of the black hole. We note that the radius of the black hole, as the mass increases cannot decreas, since inside a black hole, because must be $c = 0$, we have $4\pi \text{ac} = 0$.

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