Gravitational field and proton radius

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In this document we wish to show how the formula for the gravitational field expressed by the theory of general Relativity, can be valid also for measuring the atomic gravitational field through the substitution of the universal gravitational constant of Newton (G) with the quantum atomic constant of QHT (Gq) .

Equation of cosmological gravitational field of Albert Einstein

$$R_{\mu\nu} - \frac{1}{2} R\, g_{\mu\nu} + \Lambda\, g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

We simplify the above equation:

$$G\mu\nu = \frac{8\pi\ G}{c^2}\ \rho$$

Quantum atomic gravitational field equation with QHT

$$G\mu\nu = \frac{8\pi\ Gq}{c^2}\ \rho = \frac{6Gq\ m}{c^2\ r^3}$$

Where is it:

Gq = quantum atomic gravitational constant

m = particle mass

r = particle radius

Demonstration:

If our hypothesis of quantum gravity (QHT) is correct we can rewrite the equation of the gravitational field of the RG, replacing as said, with Gq (atomic quantum gravitational constant) the universal gravitational constant of Newton.

$$G\mu\nu = \frac{8\pi\ Gq}{c^2}\ \rho = \frac{6Gq\ m}{c^2\ r^3}$$

Where Gq is the atomic-quantum gravitational constant derived from QHT.

This quantum constant, according to our QHT theory, would be the key to access the sub-atomic world, interpreting and replacing in a gravitational form what we know to be the strong force.

Here we represent some of the ways in which we can describe this quantum atomic gravity constant.

$$Gq = \frac{8\hbar c}{mp^2} = \frac{8LpMpc^2}{mp^2} = \frac{8K_0e^2 137}{mp^2} = 9{,}04047577441\ \mathrm{x}\ 10^{28}\ \frac{m^3}{kg\ s^2}$$

$$\frac{Gq}{G} = 1{,}354\ \mathrm{x}10^{39}\ (\ \mathit{intensit}\grave{a}\ \mathit{della\ forza\ quantistica})$$

That said, let's continue with the demonstration.

To know the curvature of the gravitational field generated by the density of a proton, we need to insert in the equation the datum of this density (ρ^P).

$$\rho^P = \frac{mp}{\frac{4}{3}\pi\ rp^3} = 6{,}708\ \mathrm{x}\ 10^{17}\ \frac{kg}{m^3}$$

Where is it:

mp = proton mass

rp = proton radius with QHT

$$mp = \sqrt{\frac{8\hbar c}{Gq}} = 1{,}672\ \mathrm{x}\ 10^{-27} kg$$

$$rp = \frac{Gq\ mp}{2c^2} = 8{,}412\ \mathrm{x}\ 10^{-16} m$$

Once the necessary calculations have been performed, we finally obtain that the value of the curvature generated by a proton in space time will be equal to:

$$G^P\mu\nu = \frac{8\pi\ Gq}{c^2}\ \rho^P = 1{,}695\ \mathrm{x}\ 10^{31} m^{-2}$$

At this point, we will try to give the Riemann tensor ($G\mu\nu$) a physical and not just mathematical explanation by transforming the curvature value to obtain the value of a hypothetical surface (A), formulating this hypothesis of ours:

"The curvature (Riemann tensor) generated in space time by a particle, can be interpreted as the inverse of a spherical surface of area A"

$$A = \frac{N}{G^P\mu\nu}$$

where N is a constant from the pure numerical value unknown to us.

If A is a flat surface, we will have that:

$$A = r^2\pi$$

If a (r) we give the value of the proton radius, then N will be equal to:

$$N = G^P\mu\nu \times rp^2\pi = 12\pi$$

So we'll have that:

$$G^P\mu\nu = \frac{N}{A} = \frac{12\pi}{rp^2\,\pi} = \frac{12}{rp^2} = 1{,}695 \text{ x } 10^{31}\text{m}^{-2}$$

This solution, seen from a quantum atomic geometric point of view, puts the radius of the proton in close relation with the curvature generated in space time by the density of the proton.

From this hypothetical solution we deduce that the Riemann tensor is equivalent to the inverse of the surface of radius rp for a particle of mass mp, or to the measures estimated with QHT that characterize the proton.

Now, we can simplify the quantum atomic gravitational field equation for the proton derived from the union of two different theories, namely QHT and RG:

$$G^P\mu\nu = \frac{8\pi\ Gq}{c^2}\ \rho^P = \frac{6Gq\ mp}{c^2\ rp^3} = \frac{12}{rp^2} = 1{,}695 \text{ x } 10^{31}\text{m}^{-2}$$

From which we derive again the formula for the proton radius.

$$rp = \sqrt{\frac{12}{G^P\mu\nu}} = \frac{Gq\ mp}{2c^2} = 8{,}412 \text{ x } 10^{-16}\text{m}$$

Not yet completely satisfied with this solution, namely $G\mu\nu = N / A$, let's try to rework the Einstein gravitational field equation by inserting the Schwarzschild radius (quantum atomic) for the proton.

$$r_s = \frac{2Gq\ mp}{c^2} = 4rp$$

from which:

$$2Gq = \frac{r_s\ c^2}{mp}$$

Now let's replace the values in the gravitational field equation:

$$G\mu\nu = \frac{8\pi\ Gq}{c^2}\ \rho = \frac{4\pi\ r_s\ c^2}{mp\ c^2}\ \frac{mp}{\frac{4}{3}\pi\ rp^3} = \frac{3\ r_s}{rp^3} = \frac{12\ rp}{rp^3} = \frac{12}{rp^2} = \frac{N}{A}$$

Also in this case we have obtained the same equivalence.

Conclusions:

The theory of relativity explains gravitational behavior very well at a cosmological level but if we insert the QHT equations in it, the RG can also enter the quantum atomic gravity field.

We therefore believe that this thesis can exhaustively explain the close relationship that exists between the radius of the proton, defined with a quantum atomic theory of QHT and the curvature (Riemann tensor) interpreted by the density of the proton with a gravitational field theory of RG modified through a new value for the gravitational constant.

We hope that this work will be shared by the scientific community.

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