Quantum gravitational force and Coulomb force in the hydrogen atom

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In this paper we want to present how an atomic quantum gravitational force hypothesis can be equivalent to the Coulomb force for the hydrogen atom.

This work is the continuation of the one proposed and published online on Vixra.org (viXra:1904.0196(pdf) of 10 April 2019) for the radius of the hydrogen atom with QHT.

In the published document we proposed a solution for estimating the hydrogen radius, which according to our QHT has this value:

$$\mathrm{r0} = \frac{\mathrm{Gq}\ \hbar\ \mathrm{mp}}{2\mathrm{c}^3\alpha\ \mathrm{me}\ \mathrm{rp}} = \frac{\mathrm{Gq}\ \hbar}{2\mathrm{c}^3\alpha\ \mathrm{re}} = \frac{\mathrm{Gq}\ \mathrm{mp}^2}{8\mathrm{c}^2\alpha\ \mathrm{me}} = \frac{\hbar}{\mathrm{me}\ \mathrm{c}\ \alpha} = 5{,}2903819668 \text{ x } 10^{-11}\mathrm{m}$$

Furthermore, we have indicated the value of the atomic quantum gravitational constant (Gq), the time value of the electron orbital revolution in the hydrogen atom and the electron revolution speed, which according to our QHT assume these values:

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

$$\mathrm{t}^2 = \frac{4\pi^2\ \mathrm{r0}^3}{\mathrm{Gq\ mp}} = 3{,}86573215383 \text{ x } 10^{-32}\mathrm{s}^2$$

$$t = \sqrt{\frac{4\pi^2\ \mathrm{r0}^3}{\mathrm{Gq\ mp}}} = 1{,}96614652399 \text{ x } 10^{-16}\mathrm{s}$$

$$\mathrm{Ve} = \frac{\mathrm{r0}\ 2\pi}{\mathrm{t}} = 1{,}69063952444 \text{ x } 10^6\ \frac{\mathrm{m}}{\mathrm{s}}$$

With these four data (r0, Gq, t^2, Ve) obtained with QHT, we can find the values of the quantum gravitational force, of the centrifugal force and of the centripetal force for the hydrogen atom:

$$FG = Gq\frac{mp\ me}{r0^2} = 4{,}92157372667 \text{ x } 10^{-8} \text{ N}$$

$$Fcf = m\omega^2 r = \frac{m\ 4\pi^2\ r}{t^2} = 4{,}92157372637 \text{ x } 10^{-8}\text{N}$$

$$Fcp = \frac{mv^2}{r0} = 4{,}92157372641 \text{ x } 10^{-8}\text{N}$$

These Forces turn out to be equivalent, which is why the hydrogen atom finds its stability thanks to the gravitational interaction imposed by the masses of the proton and the electron.

We now describe the Coulomb Force:

$$FC = K0\frac{Qp\ Qe}{r0^2} = 8{,}2430536707 \text{ x } 10^{-8} \text{ N}$$

From this first analysis we immediately notice that the Coulomb Force is not equivalent to the other three, namely the gravitational Force, the Centrifugal Force and the Centripetal Force, why?

Here we propose our solution hypothesis.

The Coulomb force is regulated by the Coulomb constant in the vacuum K0.

$$K0 = \frac{1}{4\pi\mathcal{E}0} = 8{,}98755178736 \text{ x } 10^9\ \frac{Nm^2}{C^2}$$

Our hypothesis is that within the atom there is not a state of emptiness but a state of "non-empty emptiness" that alters the value of the electrical and magnetic susceptibility that is worth zero in the vacuum. This variation of electrical and magnetic susceptibility could alter the values of relative electric permittivity and consequently of absolute electrical permittivity.

$$\mathcal{E} = \mathcal{E}0\mathcal{E}r$$

In the formulation of the Coulomb constant the $\mathcal{E}r$ is 1, so $\mathcal{E} = \mathcal{E}0$

Otherwise, if the value of $\mathcal{E}r$ were not 1, but was greater than 1, due to the aforementioned susceptibility, then the Coulomb constant in the atom would have a different value.

Let's try to extract the value of the new Coulomb constant (Kq), assuming a non-empty vacuum condition and therefore an electric and magnetic susceptibility greater than zero, through the value of the quantum gravitational force:

$$Kq = \frac{FG\ \ r0^2}{Q^2} = 5{,}36608161368 \text{ x } 10^9 \text{ N}\frac{m^2}{C^2}$$

$$\mathcal{E}r = \frac{1}{4\pi\ K0\ \mathcal{E}0} = 1{,}6886778043$$

$$Kq = \frac{1}{4\pi\ \mathcal{E}r\mathcal{E}0} = 5{,}36608161368 \text{ x } 10^{9}\ N\frac{m^2}{C^2}$$

This new condition, for what we will call the second Coulomb constant (Kq), would allow the equality between the two attractive forces in the hydrogen atom, or that of the quantum gravitational interaction between the masses and that of the electromagnetic interaction between the charges of Coulomb.

$$FG = Gq\frac{mp\ me}{r0^2} = 4{,}92157372667 \text{ x } 10^{-8}\ N$$

$$FC = K0\frac{Qp\ Qe}{r0^2} = 4{,}92157372667 \text{ x } 10^{-8}\ N$$

This last formulation would put in perfect agreement the quantum gravitational interactions with the electromagnetic ones, allowing in fact to combine the two theories in a unique quantum gravitational theory.

We therefore think that the reason why two electric charges of opposite sign form a hydrogen atom does not depend on the charges themselves, but on the masses associated with them, since the charges do not generate gravitational fields but only electromagnetic fields.

For this reason only an atomic gravitational interaction, dependent on the masses and a quantum gravitational constant, could allow the atom to exist permanently.

The curvature generated in Albert Einstein's time space by the proton mass, according to this hypothesis, is the fundamental reason why the two masses (proton and electron) can by gravitational interaction form a hydrogen atom.

However, we believe that this solution for the "non-empty void" in the atom, however much it puts the accounts in order and can do justice to our QHT, is very risky and should therefore be studied in depth.

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