Orbital radius of the hydrogen atom with strong gravity

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Bohr radius, recommended value CODATA 2018

$$R_0 = \frac{\hbar}{me\ c\ \alpha} = 5{,}29177210903 \text{ x } 10^{-11} \text{ m}$$

<u>Classic approach of strong gravity for the hydrogen atom</u>

I will now try to demonstrate empirically how to solve the orbital stationarity of the electron in the 1s orbital completely eliminating the electromagnetic interactions and making use only of gravitational interactions of strong Gravity.

Calculation for the orbital radius with strong gravity for the hydrogen atom

$$R_0 = \frac{\Gamma\ mp^2 137}{8c^2\ me} = 5{,}2903860245 \text{ x } 10^{-11}\text{m}$$

$$\Gamma\ =\ \text{Strog gravity constant}\ =\ 9{,}0404827196 \text{ x } 10^{28}\ \frac{m^3}{kg\ s^2}$$

mp = proton mass

me = electron mass

137 = number of oscillations of the Compton wavelength of the electron in the hydrogen orbital (1s)

c = electromagnetic wave propagation speed

Applying now the 3rd Kepler's law, calculate the electron's revolution time in the orbital radius R_0 using the strong gravity.

$$t^2 = \frac{4\pi^2 {R_0}^3}{\Gamma\, mp}$$

Once the time value has been calculated we can calculate the orbital velocity of the electron in 1s.

$$t = \sqrt{3{,}86573215337 \text{ x } 10^{-32}\ s^2} = 1{,}96614652388 \text{ x } 10^{-16}\ s$$

$$V_0 = \frac{R_0 2\pi}{t} = 1{,}69063952453 \text{ x } 10^{6}\ \frac{m}{s}$$

The orbital speed thus calculated allows us to calculate the kinetic energy possessed by the electron in the level 1s.

$$Ek = \frac{1}{2}\ me\ {v_o}^2 = 1{,}30185024426 \text{ x } 10^{-18}\ J = 8{,}1255\ eV$$

It is now much clearer why the energy required to ionize the hydrogen atom is 13.6 eV, since the energy used to perform the extraction work must be greater than that possessed by the electron in its orbital stationary state .

In this regard we see how this equilibrium occurs to understand why the electron does not fall into the nucleus, that is we will verify its stationarity.

We calculate the centrifugal and centripetal force (same formulation) for uniform circular motions of the electron in the 1s orbital using the data previously obtained for the orbital velocity of the electron and the orbital radius of the hydrogen atom.

$$Fcf = Fcp = \frac{me\ {v_0}^2}{R_0} = 4{,}9215737267 \text{ x } 10^{-8} N$$

Let us now calculate the value of the gravitational force (it too is a centripetal force) with the strong force gravitational law which, as we shall see, is nothing other than the module of Newton's gravitational force with a strong gravitational force constant (Γ)

$$Fg(Ff) = \frac{\Gamma\ mp\ me}{{R_0}^2} = 4{,}92157372667 \text{ x } 10^{-8}\ N$$

It is clear that only through the gravitational forces of strong force and the centripetal force given by the electron revolution speed can we describe the orbital stationarity in the hydrogen atom, where $Fg = Fc$

Isaac Newton in Philosophiae Naturalis Principia Mathematica of 1687, defines the centripetal force as follows:

"The centripetal force is the force which, due to the effect of which the bodies are attracted or pushed, or in any case they tend towards some point as towards a center. Of this kind is gravity ... and whatever strength it may be, due to which the planets are continually deviated by straight motions and are forced to rotate along curved lines. Everyone tries to get away from the centers of the orbits and if there were not some force contrary to that tendency, as a result of which they are restrained and held in their orbits they would go away with a uniform straight line. "

All this, however, does not affect the admissibility that the electron could be in any point of the "electronic sphere" that surrounds the hydrogen nucleus, since in the instant in which we measure its speed its position has already changed.

In other words, this calculation method allows us to estimate both the effective orbital velocity of the electron in 1s and its distance from the nucleus but not its actual position in the sphere drawn by its rotations around the nucleus (electronic cloud)

We can therefore only conclude, that in a generic framework of strong gravity it is possible to describe how and why the hydrogen atom is stable thanks to the orbital stationarity of the electron in 1s due to the balance between centripetal force and strong gravitational force.

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