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The Fine Structure Constant, the Rydberg Constant and the Planck Constant

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Abstract

So let's say that the electron is orbiting the proton in the innermost orbital, and then, according to the equilibrium relationship of forces, there's the following formula:

$F=K \times Qp \times Qe/(Rb \times Rb)=Me \times Ve \times Ve/Rb$ (1)

The K is the electromagnetic constant; Qp is the charge of proton; Qe is the charge of electron; Rb is the Bohr atom radius; Me is the mass of the electron; Ve is the speed of electrons.

Keywords: Protons; Electronic; Mass; Charge; Bohr atom radius; Fine structure constant; The Rydberg constant; Planck constant

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One, the fine structure constant and the Bohr atomic radius.

From the formula (1), we can obtain the formula for calculating the basic radius of the hydrogen atom:

$Rb=K \times Qp \times Qe/(Me \times Ve^2)$ (2)

Based on the international recommendation of the basic physical constants in 2006, we take the numerical constants as follows:

$K=8987551787.3681764$ m/F, $Qp=Qe=1.602176487 \times 10^{-19}$ C, $Me=9.109382145 \times 10^{-31}$ kg, C=299792458 m/s, α=0.0072973525376。

The movement speed of electrons is:

$Ve=\alpha \times C=2187691.25413734$ m/s (3)

It is calculated by the formula (2) that the Bohr atom radius is Rb:

$Rb=K \times Qp \times Qe/(Me \times Ve^2)=5.2917720859 \times 10^{-11}$ m (4)

Two, The basic frequency of the Hydrogen spectrum and the Rydberg constant.

By the speed of the electrons and the basic radius of the hydrogen, we can calculate the basic frequency of the Hydrogen spectrum:

$Fb=Ve/(2 \times \pi \times Rb)/2=3.2898419603609 \times 10^{15}$ 1/s (5)

Hydrogen spectrum basic wavelength:

$\lambda b=C/Fb=9.1126705055191143 \times 10^{-8}$ m (6)

Rydberg constant is: $R=1/\lambda b=10973731.568527$ 1/m (7)

Three, The kinetic energy of the ground state electron and the Planck constant

The kinetic energy of the ground state electron:

$Eb=1/2 \times Me \times Ve^2=2.1798719696853 \times 10^{-18}$ J=13.6056919275362 eV (8)

Planck constant is: $h=Eb/Fb=6.62606896 \times 10^{-34}$ Js (9)

Four, The speed limit of the electron with the limit of the X ray frequency

According to the nature of electricity and magnetism, electrons moving in the same direction at the speed of light interaction force is zero, that is to say, the electronic impossible by electricity and magnetism are accelerated to the speed of light, the speed of light is electronic speed limit [1].

According to Planck quantum mechanics and Einstein's photoelectric effect law, the speed limit of an electron is the same as the limit of the X-ray frequency:

$Em=(1 \div 2) \times Me \times C \times C=h \times Fm=Qe \times Um$ (10)

$Em=(1 \div 2) \times Me \times C \times C=4.093552189 \times 10^{-14}$ J (11)

$Um=Em/Qe=255499.45477$ V (12)

$Fm=Em/h=6.177949873 \times 10^{19}$ Hz (13)

$\lambda e=C/Fm=4.852620435 \times 10^{-12}$ m (14)

Compton wavelength is: $\lambda C=\lambda b/2 \times \alpha^2=\lambda e/2=2.4263102175 \times 10^{-12}$ m (15)

References

1 Kai LS, Yi-Ling G, Huijun S (2008) Fundamental Physical Constants. International recommendations for basic physical constants 3: 183-191.