What Might The Fine Structure Constant $1/\alpha = hC/(2\pi e^2) = 137.036$ Mean ?

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【Abstract】。Through making the analogous comparisons of Dirac's large number $1/L_n$ to the fine structure constant $1/\alpha$, and of **gravitational force F_g to F_b, the better reasonable conclusion might be that,** $1/\alpha$ **could be 137.036 times or proportion of the strong force Fn to** the electromagnetic force **F_e in the atomic nucleus.**

[Dongsheng Z. **What Might The Fine Structure Constant $1/\alpha = hC/(2\pi e^2) = 137.036$ Mean ?]** Report and Opinion, 2010;2(1).

Keywords: analogous comparison; Dirac's large number $1/L_n$; constant $1/\alpha$; gravitational force; atomic nucleus.

【1】. The fine structure constant $1/\alpha$ is defined to, $\mathbf{1/\alpha = hC/(2\pi e^2) = 137.036}$ **(1a)**

In formula **(1a), $h=6.626\times10^{-27}g{*}cm^2/s$ =Planck constant; $C = 2.998\times10^{10}cm/s$ = light speed; e** = 4.80325×10^{-10}esu =1.6022×10^{-19}**C; then,** $1/\alpha$== **$hC/(2\pi e^2) = 6.626\times10^{-27}\times2.998\times10^{10}$ /[2π** ($4.80325\times10^{-10})^2$**]** = 137,0368 ≈ **137.036.**

Let's explore the physical property of the fine structure constant $1/\alpha$ **below.**

【2】。Firstly, let's look back the origin of Dirac's large number L_n, According to the idea of Pual Dirac's "large number hypothesis", comparing the electromagnetic force F_e to the universal gravitational force F_g, taking the hydrogen atom as an example, the mass of proton $m_p=1.6727\times10^{-24}$g, the mass of electron $m_e = 9.1096\times10^{-28}$g, the capacity of electron e = - e = 1.602×10^{-19} C, r is the distance between two electrons, G = gravitational constant=6.6726×10^{-8} $cm^3/s^2{*}g$, $k=9.0\times10^9$ $N{\bullet}m^2/C^2$

$\mathbf{F_g}=Gm_pm_e/r^2 = 6.6726\times10^{-8}\times1.6727\times10^{-24}\times9.1096\times10^{-28}/r^2=101.67\times10^{-60}/r^2$ [1] (2a)

$\mathbf{F_e} = ke^2/r^2 = 9.0\times10^9\ N{\bullet}m^2/C^2\times(1.6022\times10^{-19}C)^2/r^2 = 9.0\times10^9\times10^5\times10^4\times(1.6022\times10^{-19}C)^2/r^2 = 23.10\times10^{-20}/r^2$ [1] (2b)

$\mathbf{F_e/F_g} = L_n = 23.10\times10^{-20}/101.67\times10^{-60} = 2.35\times10^{39}$ [1] (2c)

(2c) shows, that under the same distance r, the non-dimension constant $L_n = ke^2/Gm_pm_e = 2.35\times10^{39}$ is the times of the electromagnetic force F_e to the universal gravitational force F_g.

【3】。Since $L_n = F_e/F_g = ke^2/Gm_pm_e$ is equal to a constant 2.35×10^{39}, two patterns of Gm_pm_e/e^2 and **$hC/(2\pi e^2)$ are analogous, and** $1/L_n$ and $1/\alpha$ **are all** non-dimension constants, $1/\alpha$ **= $hC/(2\pi e^2)$** might **be guessed** as a proportion of two different forces. Let's apply some formulas of black holes (BH) as analogous comparison. M_b is mass of any black hole, m_{ss} is a Hawking quantum radiation emitted from the radius of the Event Horizon $\mathbf{R_b}$ of BH M_b, so,

$\underline{\mathbf{m_{ss}M_b = hC/8\pi G}}$[2] **(3a)**

Let $\mathbf{4Gm_{ss}M_b = hC/2\pi}$ **(3b)**

$\mathbf{4Gm_{ss}M_b/e^2 = hC/2\pi e^2}$ **(3c)**

$Gm_{ss}M_b/R_b^2=F_b$, which is the gravitational force of M_b to m_{ss}, and $F_e = e^2/r_n^2$, **if** r_n**= $2R_b$,** then,

$\mathbf{Fn/F_e = hC/2\pi e^2 = 1/\alpha = 137.036}$ **(3d)**

Correspondingly, Fn might be strong force, i.e. acting forces between quarks in the atomic nucleus. Therefore, under $r_n = R_b$,

$\mathbf{Fn = hC/2\pi r_n^2} = F_b$ **(3e)**

How strong is the **strong force Fn? 1*.** Let $r_n \approx 10^{-13}$cm, $Fn = hC/2\pi r_n^2 = 6.626\times10^{-27}\times2.998\times10^{10}/2\pi\times10^{-26} = 0.316\times10^{10}$ dyne. And $F_e = e^2/r_n^2 = (4.80325\times10^{-10})^2/10^{-26} = 23.07\times10^6$dyne. Then, $\mathbf{Fn/F_e = 0.316\times10^{10}/23.07\times10^6 = 136.97 \approx 137.036 = 1/\alpha}$. 2*. Let= $R_b = 10^{-13}$cm, thus, $M_b = 10^{15}$ g, $m_{ss} = 1.76\times10^{-24}$g ≈ mass of a proton. It shows, in case of $r_n = 2R_b = 10^{-13}$cm, **the strong force F_n** = F_b, i.e. **F_n is about equal to the gravitational force of a BH of $M_b = 10^{15}$g to a** m_{ss} ≈ 1 **proton. The reason why F_n is analogous to** F_b, is both might accord with quantum mechanics.

【4】。Conclusion: Just as F_e/F_g $=10^{-39} = 1/L_n$, **Fn/F_e = 137** =$1/\alpha$**.** Therefore, **L_n and α may be considered as the coupling coefficients**. Since L_n= F_e/F_g is the coupling coefficient of the electromagnetic force F_e to the universal gravitational force F_g, and **$1/\alpha = Fn/F_e$** might be the coupling coefficient of the strong force **Fn to F_e. Owing to that Fn has not been clearly recognized and calculated out right now,** some formulas of black holes are applied by author as analogous comparison. **I think, $Fn = hC/2\pi r_n^2$ as**

the strong force in atomic nucleus and $1/\alpha = Fn / F_e$ as a coupling coefficient is better reasonable.

====The End====

【references】:

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