Speculate on the source of basic physical constants

HuangShan

(Wuhu Institute of Technology, China, Wuhu, 241003)

Abstract: By assuming several simple equations, we try to explain the sources of light speed, Vacuum dielectric constant, Permeability of vacuum, Elementary charge, electron rest mass, proton mass, Rydberg constant, Boltzmann constant, Bohr radius, Bohr magneton constant, Gravitational constant and Electrostatic constant.

Key words:Physical constant, universal Gravitational constant formula, Coulomb's law.

As long as two physical equations are assumed, the sources of light speed, Vacuum dielectric constant, Permeability of vacuum, Elementary charge, electron rest mass, proton mass, Rydberg constant, Boltzmann constant, Bohr radius, Bohr magneton constant, Gravitational constant and Electrostatic constantt can be explained.

$$\begin{cases} \dfrac{(m_e)[\alpha_o]^2(c)^2}{(a_0)} = \dfrac{(m_e)(G_N)}{(a_o)^2} * \dfrac{[\alpha_o](c)(R_\infty)}{2\pi} , \\ \dfrac{(m_{atom})(c)^2}{2\pi(R_\infty)} = (m_e)(R_\infty)^2(G_N) * \dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)} , \end{cases}$$

$$\Rightarrow \begin{cases} \dfrac{(e_o)^2}{4\pi(\varepsilon_0)(a_o)^2} = \dfrac{(m_e)[\alpha_o]^2(c)^2}{(a_0)} , \\ \dfrac{(e_o)^2}{4\pi(\varepsilon_0)(a_o)^2} = \dfrac{(m_e)(G_N)}{(a_o)^2} * \dfrac{[\alpha_o](c)(R_\infty)}{2\pi} , \\ \dfrac{1}{2}(m_e)[\alpha_o]^2(c)^2 = \dfrac{(m_{atom})(c)^2}{2\pi(R_\infty)} , \\ \dfrac{1}{2}(m_e)[\alpha_o]^2(c)^2 = (m_e)(R_\infty)^2(G_N) * \dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)} , \end{cases}$$

$$\Rightarrow \begin{cases} (m_e)(R_\infty)^2(G_N) = \dfrac{(m_{atom})(a_o)}{2\pi} * \dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)^2} , \\ \dfrac{1}{2}(m_e)[\alpha_o]^2(c)^2 * \dfrac{(m_e)[\alpha_o]^2(c)^2}{(a_0)} = \dfrac{(m_e)(m_{atom})(G_N)}{(a_o)^2} * \dfrac{(c)^2}{(2\pi)^2} * [\alpha_o](c) , \end{cases}$$

$$\Rightarrow \begin{cases} [\alpha_o] = \dfrac{(e_o)^2}{4\pi(\varepsilon_0)(c)(\hbar)} , \\ (R_\infty)(a_o) = \dfrac{[\alpha_o]}{4\pi} , \\ \dfrac{(a_o)(c)}{(R_\infty)(\mu_0)} = \dfrac{(e_o)(c)^2}{4\pi} , \end{cases} \Rightarrow \begin{cases} (h) = 2\pi(\hbar) = 2\pi(m_e)[\alpha_o](c)(a_o) , \\ (a_o)^2(c)^2 = \dfrac{(e_o)}{4\pi(\varepsilon_0)} * \dfrac{[\alpha_o](c)}{4\pi} , \\ \dfrac{(e_o)(R_\infty)^2}{4\pi(\varepsilon_0)} = \dfrac{[\alpha_o](c)}{4\pi} , \\ (e_o) = (m_e)(R_\infty)(c)[\alpha_o]^2 , \end{cases}$$

$$\Rightarrow \begin{cases} \dfrac{(e_o)(R_\infty)(k)}{(a_o)(c)} = \dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)(c)} , \\ \dfrac{(m_e)(R_\infty)(G_N)}{(h)} = \dfrac{4\pi(\varepsilon_0)(c)2\pi(m_e)[\alpha_o](c)(a_o)}{2\pi(e_o)(c)(m_e)(R_\infty)} , \end{cases} \Rightarrow \begin{cases} (k) = \dfrac{1}{4\pi(\varepsilon_0)} = \dfrac{(c)(a_o)}{(e_o)(R_\infty)} , \\ (G_N) = \dfrac{(h)}{(m_e)(R_\infty)} = \dfrac{(e_o)(c)[\alpha_o]2\pi}{4\pi(\varepsilon_0)(c)} , \end{cases}$$

For Bohr magneton constant,it is,

$$2\pi(\mu_B)(m_e) = (m_e)(R_\infty)^2(G_N) * (m_e)(R_\infty)^2(G_N) ,$$

Or,

$$2\pi(\mu_B)(m_e)*\frac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)}=\frac{1}{2}(m_e)[\alpha_o]^2(c)^2*(m_e)(R_\infty)^2(G_N)\,,$$

This is, $(\mu_B)=\frac{(e_o)(\hbar)}{2(m_e)}=\frac{(h)(\hbar)(R_\infty)^2}{(m_e)}$.

There can also be another explanation for the Boltzmann constant, that is,

$$\begin{cases}(m_e)(R_\infty)^2(G_N)=\dfrac{(m_{atom})(a_o)}{2\pi}*\dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)^2}\,,\\ \dfrac{(e_o)^2(R_\infty)^2}{4\pi(\varepsilon_0)}*(k_B)=\dfrac{(m_{atom}+m_e)(a_o)}{2\pi(R_\infty)}*\dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)}\,,\end{cases}\Rightarrow\begin{cases}(h)\cong(k_B)(e_o)(c)\,,\\(m_{atom})\cong 2\pi[\alpha_o](c)(k_B)(\varepsilon_0)\,,\end{cases}$$

And for the limit temperature constant, maybe there can be,

$$\begin{cases}\dfrac{(e_o)^2(R_\infty)^2}{4\pi(\varepsilon_0)}*(k_B)=\dfrac{(m_{atom}+m_e)(a_o)}{2\pi(R_\infty)}*\dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)}\,,\\ \dfrac{(m_{Average})(c)^2}{2\pi(R_\infty)}=2\pi\left(k_{Ideal\,gas}\right)(k_B)(R_\infty)*\dfrac{(e_o)^2(R_\infty)^2}{4\pi(\varepsilon_0)}*\dfrac{(e_o)(R_\infty)}{4\pi(\varepsilon_0)(a_o)}\,,\end{cases}$$

$$\Rightarrow\begin{cases}(R_\infty)^2\left(k_{Ideal\,gas}\right)(k_B)[\alpha_o](c)\cong 1\,,\\ (R_\infty)^2\left(k_{Ideal\,gas}\right)(k_B)[\alpha_o](c)\cong\left(\sqrt[4]{1-\dfrac{(c)^2}{(2\pi)^2(c)^2}}\right),\end{cases}$$

I don't know if the part about $\left(\sqrt[4]{1-\frac{(c)^2}{(2\pi)^2(c)^2}}\right)$ is correct, because it involves the source of $\left(\sqrt[2]{1-\frac{(c)^2}{(2\pi)^2(c)^2}}\right)$, and I don't know if the formula involving $\left(\sqrt[2]{1-\frac{(c)^2}{(2\pi)^2(c)^2}}\right)$ is correct.Because this formula is strictly calculated according to the numerical value, the error is between 0.99 and 0.999, and I don't know whether this error is caused by experimental measurement, or by the conversion of theoretical values, or whether it is missing some parameter, or whether this inference is wrong. I'm not sure what caused this for the time being.

This involves the formula of $\left(\sqrt[2]{1-\frac{(c)^2}{(2\pi)^2(c)^2}}\right)$ source, that is,

$$\begin{cases}\dfrac{1}{2}(m_e)[\alpha_o]^2(c)^2*\dfrac{(m_e)[\alpha_o]^2(c)^2}{(a_0)}=\dfrac{(m_e)(m_{atom})(G_N)}{(a_o)^2}*\dfrac{(c)^2}{(2\pi)^2}*[\alpha_o](c)\,,\\ \dfrac{(m_e)(m_{atom})(G_N)}{(a_o)^2}*\dfrac{(c)^4(R_\infty)}{(2\pi)^2}=\dfrac{(m_e)[\alpha_o]^2(c)^2}{(a_0)}*\sqrt[2]{1-\dfrac{(c)^2}{(2\pi)^2(c)^2}}\,,\end{cases}$$

$$\Rightarrow\begin{cases}\dfrac{1}{2}(m_e)[\alpha_o]^2(c)^2*(R_\infty)*(c)^2=\sqrt[2]{1-\dfrac{(c)^2}{(2\pi)^2(c)^2}}\,,\\ (m_{atom})(c)^4=2\pi[\alpha_o](c)*\sqrt[2]{1-\dfrac{(c)^2}{(2\pi)^2(c)^2}}\,,\end{cases}$$

So, why is there this equation, because I want to know if there is an equation on the atomic scale that simply corresponds to the formula of gravity, and another reason is that if this equation holds, it will further tell us what the fine structure constant is.Because if this equation holds, there are not only fine structure constants, $[\alpha_o]=4\pi(R_\infty)(a_o)$, but also $[\alpha_o]*\left(\sqrt[2]{1-\frac{(c)^2}{(2\pi)^2(c)^2}}\right)=\frac{(e_o)(c)^2}{2}$. Of course, whether this equation is correct or not, it does not affect the two hypothetical equations at the beginning of the article, nor does it affect the relationship between the basic physical constants derived from the two hypothetical equations.

Where (ε_0) is the Vacuum dielectric constant, (μ_0) is the Permeability of vacuum, (c) is the Speed of light, (e_o) is the Elementary charge, $[\alpha_o]$ is the Fine structure constant, (R_∞) is the Rydberg constant, (a_o) is the Bohr radius, (m_{atom}) is the Basic atomic mass, (m_e) is the Electron rest mass, $(\hbar)$ is the Reduced Planck constant, (h) is the Planck constant. (k_B) is the Boltzmann constant, (k) is the Electrostatic force constant, (G_N) is the Gravitational constant, $\left(k_{\text{Ideal gas}}\right)$ is the Ideal gas temperature constant, (μ_B) is the Bohr magneton constant, (R) is the molar gas constant.

Reference: https://doi.org/10.5281/zenodo.4456797.