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Dynamics Constant Deduced from Relativistic Mass and Distance on Bohr Orbit

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Abstract: *The relativistic mass and distance on Bohr orbit can be explained by Heracletean dynamics with the dynamics constant k=2.29 x 〖10〗^(-47) 〖kg〗^2 m^2 s^(-2) being comparable to some previously estimated values.*

Keywords: *Heracletean dynamics and Einsteinian dynamics, relativistic mass and distance on Bohr orbit, dynamics constant*

1. Introduction

Respecting Heracletean dynamics [1] for mass ($m_{ground} \to m_{relativistic}$):

$$m_{relativistic}^2 c^2 a^2 = e^{\frac{m_{ground}^2 c^2 - k(1-\ln k) + m_{relativistic}^2 c^2 (a^2-1)}{k}} \tag{1}$$

As well as for distance ($s_0 \to s$):

$$s_0^2 c^2 a^2 = e^{\frac{s^2 c^2 - k(1-\ln k) + s_0^2 c^2 (a^2-1)}{k}} \tag{2}$$

At some speed a expressed in the units of speed of light $c = 2.997\,924\,58.10^8 \frac{m}{s}$ the characteristic dynamics constant k can be calculated with the help of known relativistic parameters.

Dividing equation (1) by equation (2) gives:

$$\frac{m_{relativistic}^2}{s_0^2} = \frac{e^{\ln k - 1 + \frac{a^2 m_{relativistic}^2 c^2}{k} + \frac{m_{ground}^2 c^2 - m_{relativistic}^2 c^2}{k}}}{e^{\ln k - 1 + \frac{a^2 s_0^2 c^2}{k} + \frac{s^2 c^2 - s_0^2 c^2}{k}}}. \tag{3}$$

Rearranging gives:

$$\frac{m_{relativistic}^2}{s_0^2} = e^{\frac{a^2(m_{relativistic}^2 c^2 - s_0^2 c^2) + (m_{ground}^2 c^2 - m_{relativistic}^2 c^2) - (s^2 c^2 - s_0^2 c^2)}{k}}. \tag{4}$$

Logarithm gives:

$$\ln \frac{m_{relativistic}^2}{s_0^2} = \frac{a^2(m_{relativistic}^2 c^2 - s_0^2 c^2) + (m_{ground}^2 c^2 - m_{relativistic}^2 c^2) - (s^2 c^2 - s_0^2 c^2)}{k}. \tag{5}$$

Convenient is the explicit form for the unknown a^2:

$$a^2 = \frac{\frac{k}{c^2} \ln \frac{m_{relativistic}^2}{s_0^2} - \left(m_{ground}^2 - m_{relativistic}^2\right) + (s^2 - s_0^2)}{(m_{relativistic}^2 - s_0^2)}. \tag{6}$$

Since for instance inserting a^2(5) in the equation (1) the implicit form for the calculation of dynamics constant k is given:

$$m_{relativistic}^2 c^2 \frac{\frac{k}{c^2} \ln \frac{m_{relativistic}^2}{s_0^2} - \left(m_{ground}^2 - m_{relativistic}^2\right) + (s^2 - s_0^2)}{(m_{relativistic}^2 - s_0^2)}$$

$$= e^{\frac{m_{ground}^2 c^2 - k(1-\ln k) + m_{relativistic}^2 c^2 \left(\frac{\frac{k}{c^2} \ln \frac{m_{relativistic}^2}{s_0^2} - \left(m_{ground}^2 - m_{relativistic}^2\right) + (s^2 - s_0^2)}{(m_{relativistic}^2 - s_0^2)} - 1\right)}{k}}. \tag{7}$$

2. Bohr Orbit

On Bohr Orbit the next mass values are available [2]:

$$m_{ground} = 9.109\,383\,701\,5.10^{-31}kg,$$

$$Ry = 0.000\,242\,543\,510\,48.10^{-31}kg,$$

$$m_{relativistic} = m_{ground} + Ry = 9.109\,626\,245\,0.10^{-31}kg. \quad (8)$$

And the next distance values [2] can be proposed:

$$s_0 = \lambda_e = 2.426\,310\,236\,7.10^{-12}m,$$

$$\alpha^{-1} = 137.035\,999\,084,$$

$$s = \frac{137}{\alpha^{-1}}\lambda_e = 2.425\,672\,849\,8.10^{-12}m. \quad (9)$$

Such a set of data does not obey Einsteinian dynamics since:

$$\frac{9.109\,626\,245\,0.10^{-31}kg}{9.109\,383\,701\,5.10^{-31}kg} = \frac{m_{relativistic}}{m_{ground}} \neq \frac{s_0}{s} = \frac{137.035\,999\,084}{137}. \quad (10)$$

Heracletean dynamics with the non-zero dynamics constant k could be the explanation for the discrepancy. The concerned constant k can be calculated with the help of equation (7) which for the considered set of data (8), (9) takes a little friendlier approximate form:

$$m_{relativistic}^2\, c^2\left(1-\frac{s^2}{s_0^2}\right) \approx e^{\frac{(m_{ground}^2 - m_{relativistic}^2\frac{s^2}{s_0^2})c^2}{k} + lnk - 1}. \quad (11)$$

Or

$$\frac{(m_{ground}^2 - m_{relativistic}^2\frac{s^2}{s_0^2})c^2}{k} + lnk \approx 1 + lnm_{relativistic}^2\, c^2\left(1-\frac{s^2}{s_0^2}\right). \quad (12)$$

Thus, on Bohr orbit (8), (9) the next value of dynamics constant is given:

$$k = 2.292\,014\,x\,10^{-47}\,kg^2m^2s^{-2}. \quad (13)$$

The above result (13) is near the previously estimated values 5.94 x 10^{-46}, 7.44 x 10^{-46} and 6.27 x 10^{-46} $kg^2m^2s^{-2}$ pertaining to the gamma ray delay [3], dual aspect of gravity [3] and discrete communication model [4], respectively.

Interesting is the associated speed a of the electron on Bohr orbit given by the equation (6) which in our case (8), (9) takes Einsteinian form:

$$a^2 \approx 1 - \frac{s^2}{s_0^2}. \quad (14)$$

And (9)

$$a \approx \pi\alpha. \quad (15)$$

This means that the electron only apparently circulates on Bohr orbit with the speed $a = \alpha$ relative to the speed of light. Actually the electron should take about $\pi - times$ longer route applying about $\pi - times$ faster speed around Bohr orbit.

3. Conclusion

It seems that with the help of new tools a classical approach for describing the atomic world is not yet exhausted.

Dedication

This fragment was written on the first school day and is dedicated to the open thinking

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