Planck's Dimensionless Constant of Proportionality as a Possible New Dimensional Constant

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The fine structure constant characterizes the strength of the electromagnetic interaction. It is a dimensionless quantity. The following is a common derivation:

$$\alpha = \frac{e^2}{4\pi\varepsilon_0 \hbar c} = 7.2973525376(50)\times 10^{-3} = \frac{1}{137.035990679(94)}. \quad (1)$$

In equation (1), e is the elementary charge, $\hbar = h/(2\pi)$ is the reduced Planck's constant, c is the speed of light in a vacuum, and ε_0 is the permittivity of free space.

Our empirical equation is consistent within the framework of current theoretical and phenomenological constraints such as general relativity and the Pioneer effect, respectively. Acceleration due to energy is expressed as quantized by the following expression:

$$a = [h]\nu c. \quad (2)$$

The dimensionless constant $\langle h \rangle$ acts as the unit of proportionality between the acceleration (or observable) a and the frequency of a photon ν multiplied by c the speed of light in a vacuum. It is equivalent in magnitude to Planck's constant in equation (3).

$$h = 6.62606896(33)\times 10^{-34}\, J\cdot s \quad (3)$$

$$[h] = 6.62606896(33)\times 10^{-34} \quad (4)$$

The only difference being, as we have stated, that it is unit-less. We can also write equation (2) more explicitly as:

$$a = [h]\frac{c^2}{\lambda} \quad (5)$$

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The wavelength of a photon is given by λ, which gives us the proper units for acceleration in m/s^2.

It may be possible to consider the constant (4) as characterizing the strength of the gravity interaction. Following equation (1) as a template, we might derive the following:

$$[h] = \beta = \frac{a\lambda}{c^2} = 6.62606896(33) \times 10^{-34} = \frac{1}{1.50919045 \times 10^{33}} \qquad (6)$$

We believe that such a relationship is not unreasonable, and lies within the realm of theoretical and phenomenological considerations.

References

[1] Link for the original empirical equation, *"Electromagnetic Gravitation"*:
http://adsabs.harvard.edu/abs/2005APS..MAR.R1197M

[2] Link for "*Study of the anomalous acceleration of Pioneer 10 and 11"*:
http://arxiv.org/PS_cache/gr-qc/0104/0104064v5.pdf

[3] Link for the *"Pioneer Effect"*:
http://groupkos.com/eso/tiki-index.php?page=Electromagnetic+Gravitation

[4] Link for the "*Fine structure constant"*:
http://en.wikipedia.org/wiki/Fine-structure_constant