Derivation of the Newtonian Gravitational Constant (G) from other Physical Constants.

By: Matthias Asare-Darko

Abstract

It is only logical that all natural physical constants connect, correlate, and are all coherently consistent with each other in dimensionally and numerically precise details. And certainly, this should be central to synthesizing all the four known fundamental forces of nature. Pertinently, the details in this paper primarily seeks to present the gravitational coupling constant, (G) as defined and expressed in tandem with some other physical constants in a harmonious manner. An obvious consequence is helping bring a paradigm shift, if not some solutions to the current stalemate surrounding Common Force (Theory of Everything) dynamics.

Keywords: Derivation, Gravitational Constant, Physical Constants, Momentum, Conservation.

Background

The Committee on Data for Science and Technology (CODATA) responsible for promoting global collaboration to advance Open Science and to improve the availability and usability of data for all areas of research. Therefore all the constants employed in this paper were obtained from current updates of CODATA.

The current CODATA constants [1] used are as follows:

$c\ is\ speed\ of\ light\ in\ vacuum : 299792458\ m/s$

$h\ \ is\ Planck's\ constant : 6.62607015\ \times 10^{-34}\ JHz^{-1}$

$G\ \ is\ 6.67430\ \times\ 10^{-11}\ m^3kg^{-1}s^{-2})$

$\alpha\ \ is\ Fine\ strucure\ constant : 7.297352569\ \times 10^{-3}$

$e\ \ is\ elementary\ charge : 1.602176634\ \times 10^{-19}$ C

$\mu_0\ \ is\ vacuum\ permeability\ constant :\ 1.25663706212\ \times\ 10^{-6}\ NA^{-2}$

Momentum is conserved in any Space-time.

According to the principles of conservation, the momentum of the fabric of a given space-time constantly equals unity in every direction of the space-time medium. Therefore if m is the mass of a unit mass of space-time fabric or ether, [2] and $c,$ is the speed permissible by the space-time then its momentum, $p,$ is given as:

$$p = mc \tag{1}$$

If $mc = 1 \quad kgm/s$ (2)

Also the time $t,$ required for any displacement $l,$ within the space-time fabric will be given as:

$$t = \frac{ml}{p} \tag{3}$$

But because $p = \ 1 \ \ kgm/s$
(4)

$$t = \frac{ml}{(1)} \times \sqrt{1 - \frac{V^2}{C^2}} \qquad \text{to reflect relativistic effects}$$

(5)

Where m is the inverse [3] of c.

$$m = 3.335640952 \times \ 10^{-9} \, kg \tag{6}$$

The time required for any displacement, l will be exactly the same as in the formula,

$$t = {}^{l}/_{c} \times \sqrt{1 - \frac{V^2}{C^2}} \tag{7}$$

Then in any direction of the space-time;

$$\frac{e^2 \mu_0 m}{2\alpha} \ = \frac{2(mc)^2}{\alpha a_o} \tag{8}$$

Where a_o *is acceleration in space − time*

$$ma_o = \frac{4(mc)^2}{e^2 \mu_0} = \text{F (force in any direction)} \tag{9}$$

But from (2), $mc = 1$

$$F = \frac{4(1)^2}{e^2\mu_0} \tag{10}$$

$$F = 1.24002083 \times 10^{44} \ N \tag{11}$$

Comparing the value of the force in (11) to the Planck force, [4] F_p, they are of the same order of magnitude.

$$F_p = \frac{c^4}{G} \tag{12}$$

Using the current CODATA value of G, $(6.67430 \times 10^{-11} \ m^3kg^{-1}s^{-2})$,

$$F_p = 1.210255564 \times 10^{44} \ N. \tag{12}$$

From $$\frac{c^4}{G} = \frac{4(1)^2}{e^2\mu_0} \tag{13}$$

$$G = \frac{c^4e^2\mu_0}{4(1)^2} \tag{14}$$

$$G = 6.514085763 \times 10^{-11} \ m^3kg^{-1}s^{-2} \tag{15}$$

Expressing the Gravitational constant in terms involving the Planck constant,

$$G = \frac{h\alpha c^3}{2(mc)} = \frac{h\alpha c^3}{2(1)} \tag{16}$$

$$G = 6.514085763 \times 10^{-11} \ m^3kg^{-1}s^{-2} \tag{17}$$

Conclusion

CODATA's quest for providing and maintaining a catalogue of self-consistent physical constants also needs a global collaborative efforts. And this is an attempt at making some strides in that direction.

References

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