

Gravitational Constant Formula

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Abstract: The formula is obtained due to The Theory of Unity between the Whole and its Parts [1]. It is shown here predictive power of formula (1), for obtaining the Newtonian Constant of Gravitation through CODATA history [2].

Keywords: Gravitational constant, proton, fine-structure constant

Checking the formula:

In the formula have been included physical constants that are easy to determine by measuring.

$$G = \frac{\sqrt{2\pi c^2 \lambda_p}}{m_p} * 2^{3 - e^{2\pi/4-3} / (\alpha^{-3} R_\infty^{-1} \lambda_p^{-1} + 4)} \quad (1)$$

The name and values of physical constants with uncertainties in brackets are given in Table 1.

Table 1. CODATA values [2] (1969-2014 year)

inverse alpha α^{-1}	Rydberg constant $R_\infty * 10^{-7} m^{-1}$	speed of light c (m/sec)	Compton wavelength $\lambda_p * 10^{15} m$	Proton mass $m_p * 10^{27} kg$	Year	[$kg^{-1} m^3 s^{-2}$] G * 10^{11}
137.03602(21)	1.09737312(11)	299792500	1.3214409(90)	1.672614(11)	1969	6.6732 (31)
137.036040(110)	1.097373177(83)	299792458	1.3214099(22)	1.6726485(86)	1973	6.6720(41)
137.0359895(61)	1.0973731534(13)	299792458	1.32141002(12)	1.6726231(10)	1986	6.67259(85)
137.03599976(50)	1.0973731568549(83)	299792458	1.321409847(10)	1.67262158(13)	1998	6.673(10)
137.03599911(46)	1.0973731568525(73)	299792458	1.3214098555(88)	1.67262171(29)	2002	6.6742(10)
137.03599679(94)	1.0973731568527(73)	299792458	1.3214098446(19)	1.672621637(83)	2006	6.67428(67)
137.03599074(45)	1.0973731568539(55)	299792458	1.32140985623(94)	1.672621777(74)	2010	6.67384(80)
137.035999139(31)	1.0973731568508(65)	299792458	1.32140985396(61)	1.672621898(21)	2014	6.67408(31)

In Table 2. are values from the table above without uncertainties in brackets. These data were used in the last column to calculate G with the formula 1.

Table 2. CODATA values (1969-2014 year) for calculation G by formula

inverse alpha $\alpha=1/\alpha$	Rydberg constant $R_{\infty} [m^{-1}]$	speed of light $c [m/sec]$	Proton Compton wavel. $\lambda_p [m]$	Proton mass $m_p [kg]$	Year	G $[kg^{-1}m^3s^{-2}]$	
						CODATA	formula
137.03602	10973731.2	299792500	1.3214409E-15	1.67261E-27	1969	6.6732E-11	6.674016E-11
137.036040	10973731.77	299792458	1.3214099E-15	1.6726485E-27	1973	6.672E-11	6.673729E-11
137.0359895	10973731.534	299792458	1.32141002E-15	1.6726231E-27	1986	6.67259E-11	6.6738316E-11
137.03599976	10973731.568549	299792458	1.321409847E-15	1.67262158E-27	1998	6.673E-11	6.67383675E-11
137.03599911	10973731.568525	299792458	1.3214098555E-15	1.67262171E-27	2002	6.6742E-11	6.6738363E-11
137.035999679	10973731.568527	299792458	1.3214098446E-15	1.672621637E-27	2006	6.67428E-11	6.67383651E-11
137.035999074	10973731.568539	299792458	1.32140985623E-15	1.672621777E-27	2010	6.67384E-11	6.67383601E-11
137.035999139	10973731.568508	299792458	1.32140985396E-15	1.672621898E-27	2014	6.67408E-11	6.67383552E-11

Table 2. shows that the value of G determined by the formula in year 1969. achieved the accuracy from CODATA year 2014. All values determined by the formula have two significant digits more than the CODATA values.

We will compare graphically G from CODATA reports and obtained by the formula, Figure 1.

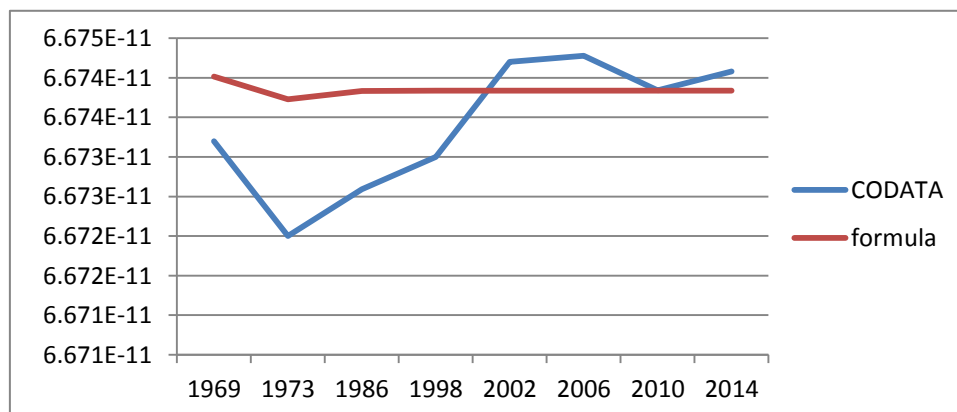


Figure 1. G - CODATA vs formula

It seems that the CODATA value in 2010. is more accurate than all previous and even proposed for 2014. I expect that the next report show lower value for G and closer to the obtained by formula.

Novi Sad, March 2017.

References:

- [1] http://fqxi.org/data/essay-contest-files/Zivlak_Theory2017.pdf
- [2] <http://physics.nist.gov/cuu/Constants/>