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Alpha Via Two Dimensionless Physical Constants

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Abstract: The fine-structure constant calculated through the proton-to-electron mass ratio and neutron-to-proton mass ratio.

Keywords: Fine-structure constant, proton-to-electron mass ratio, neutron-to-proton mass ratio, dimensionless.

Inverse fine-structure constant

The formula (1) features the sought value of the inverse fine-structure constant on both sides of the equation, therefore, it will be solved by using the iterative method.

$$\alpha' = \sqrt{\left[\left(\frac{3*(e^{2\pi}/2+\log_2 2\pi)}{2} - 1 + \frac{1}{2\mu/\alpha'+4}\right)/\log_2\gamma - 1\right]/\log_2\mu} \quad (1)$$

Where ***e*** and π are well-known mathematical constants, while the physical constants with CODATA values [1] are listed below:

Constants		CODATA 1969	CODATA 2010	CODATA 2014
proton-to-electron mass ratio	**μ**	1836.1090(110)	1836.152 672 45 (75)	1836.152 673 89 (17)
neutron-to-proton mass ratio	**γ**	1.001379(13)	1.001 378 419 17 (45)	1.001 378 418 98 (51)
inverse fine-structure constant	**α'**	137.03602(21)	137.035 999 074 (44)	137.035 999 139 (31)

Using the formula (1), **α'** is obtained through three iterations for:

		CODATA 1969	CODATA 2010	CODATA 2014
	μ	1836.1090	1836.15267245	1836.15267389
	γ	1.001379	1.00137841917	1.00137841898
The initial value:		**136**	**136**	**136**
α'after iteration:	**1**	**137.00734**	**137.0359646**	**137.0359740**
	2	**137.00737**	**137.0360008**	**137.0360102**
	3	**137.00737**	**137.0360008**	**137.0360102**

Let's show the applied Excel notation, for easy check:

α'=sqrt(((3(e^π/2+log(2π;2))/2-1+1/(2μ/α'+4))/log(γ;2)-1)/log$_2$(μ;2))

Even if we started with a value much smaller than 136, we would quickly get the same result.

DISCUSSION:

The difference between the calculated α' value and its CODATA value exists because of the uncertainty in the input data for μ and γ.

Note that there is a little bit better match when the 2010 CODATA values are used than those from 2014, which is why in all my comparisons I use the CODATA reports from the year 2010. Of course, since 1969 there has been a drastic improvement in the determined values for these three constants in the CODATA reports and calculated values.

Note that the first element in (1):

$$\frac{3*(e^{2\pi}/2+\log_2 2\pi)}{2}$$

Is purely mathematical, which leads to conclusion that:

It is possible to solve certain parts of the problem of determining the fine-structure constant by using only mathematical parameters.

This does not mean that there is no purely mathematical solution for α', but it is practically impossible to reach it, as we would have to solve the entire Universe and the formula would have an emormous number of elements.

It can be shown that the result in (1) is far more sensitive to the changes of γ than the changes of μ, or better said, to the knowing of the γ value.

In my article [2] from 2012, I wrote:

Is it possible to express the fine-structure constant only through two dimensionless physical constants?

The formula (1) to an extent represents a solution, since it has to be taken into account that certain values on the right side of the formula are not independent from alpha.

The formula (1) has been obtained by using [3, Table]

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REFERENCES:

[1] *CODATA internationally recommended values of the Fundamental Physical Constants,* values of the constants (2010), http://physics.nist.gov/cuu/Constants/

[2] B. Zivlak, *Fine-Structure Constant in Speculative Relations*, http://vixra.org/abs/1212.0103

[3] B. Zivlak, *Cycle towards Methodology of Everything*, http://gsjournal.net/Science-Journals/%7B$cat_name%7D/View/6731