A Primer of Important Natural Numbers and Revisited Fundamental Physical Constants

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Abstract

Some fundamental physical constants such as the gyromagnetic factor of the electron or its charge need to be marginally revisited considering the altered relativistic correction determined by the Information Relativity theory (*IRT*) of *Suleiman*. As a new important natural number the fifth power of the golden mean is introduced. Also a conjecture is given connecting *Sommerfeld*'s structure constant α with the galactic velocity $ß_g$. This primer will be constantly renewed and extended as the acceptance by the physical community progresses.

Introduction

The intention of this primer is to fasten the process of the revision of physical 'constants' due to a changed relativistic mass correction, which is suggested by the new *Information Relativity* theory (*IRT*) of *Suleiman* [1]. In contrast to the as yet applied relativistic mass correction based on the *Lorentz-Einstein* theory [2]

$$m_r = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}},$$

where m_0 is the rest mass of a moving body, v is its velocity, and c is the speed of light, the new *IRT* approach for the relativistic mass correction resulted in [1]

$$m_r = m_0 \frac{1-\beta}{1+\beta},$$

where $\beta = \frac{v}{c}$ is the recession velocity of a moving body.
A first relativistic mass correction of the experimental determined gyromagnetic factor g_e of the electron was recently proposed [3] and should be confirmed or marginally corrected by the researchers of the original work [4] [5] [6]. Then the *Sommerfeld* fine-structure constant α [7] should be adequately corrected, and also the elementary charge of the electron as not independently defined quantity. The α constant is given by

$$\alpha = \frac{\mu_0 c e^2}{2h},$$

where *e* is the elementary charge of the electron, *h* is *Planck*'s constant, *c* is the speed of light, and μ_0 is the vacuum magnetic permeability. The most precise value of α resulted from comparison of the experimentally measured and calculated value of the gyromagnetic factor of the electron [4] [5] [6], and the most precise value of the *Planck* constant comes from *Kibble* watt balance experiments [15].
Recently, a new seminal approach of structure and matter was given by *Guynn* [16] [17], considering *Thomas* precession of rotating entities from elementary particles to galaxies. He has verified the gyromagnetic factor of the electron almost up to its exorbitantly precise experimental value. He impressively lead back *QED* to what it actually is, hardly more than a construct.

Fundamental Physical Constants and Important Natural Numbers

In Table 1 important physical and chemical constants as well as important natural numbers were selected. The red colored quantities were fixed by definition, whereas the blue colored constants should be revisited. Recently, the *Rydberg* 'constant' was derived for relativistic conditions [19], but should be further adapted using the *IRT* theory [1]. Additional references [20] to [23] are recommended to the reader. As a new important natural number that govern phase transitions from microscopic to cosmic scale and beyond the fifth power of the golden mean respectively its inverse is recommended [24] [25]. Surprisingly, this number multiplied with the circle constant yields the ratio between the in-sphere volume and the pyramid volume of the Great Pyramid of *Giza* [25] [26].
We may point to other approximate relations recently found by the present author, when he studied the seminal results of *Preston Guynn* [16] [17] [18]

$$\alpha \approx \pi^2 |\beta_g| = 0.00729760191$$
$$\pi \cdot |\beta_g| \approx \frac{1}{\pi \cdot \alpha^{-1}}$$

Indeed, these relations can have important consequences, if one could confirm the conjecture $\alpha = \pi^2 |\beta_g|$ [17] [18]. *Guynn*'s approach is a cornucopia of overflowing ideas inspiring metrologists to confirm or measure anew fundamental physical constants. The galactic velocity $|\beta_g|$ can also be approximated as scaled product of electromagnetic and strong coupling constants [16] [17]

$$|\beta_g| \approx \frac{\sqrt{3}}{2} \cdot \alpha \cdot \alpha_s = \beta_0 \cdot \alpha \cdot \alpha_s = 0.000739403$$

Vice versa one can determine accurately α_s using this relation, because the *Milky Way* maximum galactic velocity is accurate to eight decimal places [16] [18]

$$\alpha_s = \frac{|\beta_g|}{\beta_0} \cdot \frac{1}{\alpha} = 0.117005223$$

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Table 1. Fundamental Physical Constants and Important Natural Numbers

Numbers in parentheses are the one-sigma uncertainty in the last two digits of the given value [9]. The red colored constants have been fixed. The blue colored values must be revised by means of the information relativity theory (*IRT*) [1]

Constants	Symbol	Numerical value	Unit	Reference
Speed of light	c	$2.99792458 \cdot 10^{8}$	m s^{-1}	[9]
Planck constant	h	$6.62607015 \cdot 10^{-34}$	J Hz^{-1}	
Vacuum permittivity	ε_0	$8.8541878128(13) \cdot 10^{-12}$	F m^{-1}	
Vacuum permeability	μ_0	$1.25663706212(19) \cdot 10^{-6}$	NA^{-2}	
Electron mass	m_e	$9.1093837015(28) \cdot 10^{-31}$	kg	
Electron charge	e_0	$1.602176634(83) \cdot 10^{-19}$	C	
Gyromagnetic factor	g_e	2.00231909…	-	[3]
		2.00231930436182(52)	-	[5], CODATA
Sommerfeld constant	α	0.0072973525693(11)	-	[9]
Inverse α constant	α^{-1}	137.035999084(21)	-	
Klitzing resistance	R_K	25812.80745…	Ω	
Klitzing speed	v_K	$4.37538252727 \cdot 10^{6}$	m s^{-1}	
Gravitation constant	G	$6.674484(78) \cdot 10^{-11}$	$m^3 kg^{-1} s^{-2}$	[12]
Gravity acceleration	g_0	9.80665 *)	m s^{-2}	[10]
		9.809280196(13)	m s^{-2}	[11]
Boltzmann constant	k	$1.38064903(51) \cdot 10^{-23}$	JK^{-1}	[9]
Bohr radius	a_0	$5.29177210903(80) \cdot 10^{-11}$	m	
Bohr magneton	μ_H	$9.2740100783(28) \cdot 10^{-24}$	JT^{-1}	
Rydberg ‘constant’	R_∞	$1.0973731568160(21) \cdot 10^{7}$	m^{-1}	[9] [10] [19]
Galactic velocity	$ß_g$	- 0.000739437964740	-	[16]
Strong coupling constant	$\alpha_s(m_z)$	0.1170(19)	-	[18] [27] [28]
		0.11700522	-	[16] [18]
Calibration constants				
$\sqrt{\varepsilon_0 \cdot h \cdot c}$		$1.32621132174 \cdot 10^{-18}$	C	
Isotopic mass	^{133}Cs	132.905451933(24)	g·mol^{-1}	
$\Delta\nu_{\text{Cs-hfs}}$ **)		9192631770	Hz	[9]
$h \cdot \Delta\nu_{Cs}/c^2$ ***)		$6.777265111839 \cdot 10^{-41}$	kg	
Avogadro number	N_A	$6.02214076 \cdot 10^{23}$	mol^{-1}	[9] [23]
Numbers	**Symbol**	**Numerical Value**		
Circle constant	π	3.14159265358079…	-	[13] [14] [25]
Golden mean	φ	0.61803398874989…	-	[13] [14] [25]
	φ^5	0.090169943749…	-	[24] [25] [26]
	φ^{-5}	11.090169943749…	-	
α/π		0.002322819466	-	
Euler number	e	2.7182818284…	-	[13] [14]
FCT numbers ****)	δ_1	4.6692016091…	-	[14]
	δ_2	2.502907875095…	-	
	δ_3	8.7210972…	-	

*) defined by standard **) hyperfine structure transition frequency ***) adopt new kilogram definition ****) *FCT = Feigenbaum-Coullet-Tresser*