

Concise Formulas of the Anomalous Magnetic Moment of Electron/Muon/Tauon and the Fine-structure Constant

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Dedicated to Prof. Albert Sun-Chi Chan on the occasion of his 70th birthday

Abstract

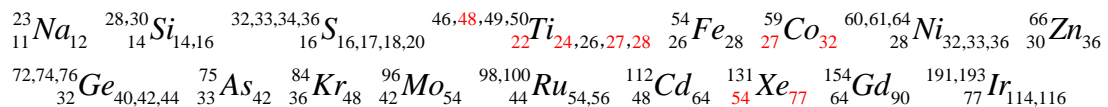
This paper is a subsequent paper to our previous paper “Schrödinger Equation of Hydrogen Atom in Atomic Unites, Theory of Chirality and the Territory of Modern Physics” (viXra:2103.0088v3). In the end of it, we gave some preliminary formulas and values of the anomalous magnetic moment ($a=(g-2)/2$) of electron and muon. In this paper, we test the value of the anomalous magnetic moment of electron (a_e) given in the previous paper by a new method which employs our formulas of the fine-structure constant and 2π -e formula, and hence we have verified the previous value and give a new concise formula of the anomalous magnetic momentum of electron (a_e) and the fine-structure constant (α_2). The same formulas for muon and tauon are also given.

Keywords: formula; value; the anomalous magnetic moment; electron; muon; tauon; the fine-structure constant.

1. Introduction

In our previous paper¹, we gave a new formula of the anomalous magnetic moment of electron (a_e) and supposed it would relate to nuclides.

$$a_e = \frac{g_e - 2}{2} = \frac{1}{2 \cdot (16 \cdot 27 - 1)} - \frac{1}{2 \cdot 7 \cdot 11 \cdot (16 \cdot 3 \cdot (4 \cdot 7 \cdot 11 - 1) + 1)} = 0.00115965218134781$$



CODATA recommended values: $a_e = \frac{g_e - 2}{2} = 0.00115965218128(18)$

With theoretical and experimental values of the anomalous magnetic moment of electron (a_e), physicists can calculate the fine-structure constant (α) by means of Quantum Electrodynamics (QED) and Standard Model (SM). However, the calculation is much complicated. In this paper, we introduce a simply method to connect the anomalous magnetic moment of electron (a_e) and the fine-structure constant (α_2), and give a concise formula of them. This method is also applied to muon and tauon.

2. A Concise Formula of the Anomalous Magnetic Moment of Electron and the Fine-structure Constant

In December 1947, Schwinger gave the first formula between the anomalous magnetic moment of electron and the fine-structure constant as follows based on Quantum Electrodynamics².

$$a_e \approx \frac{\alpha}{2\pi}$$

However, the subsequently developed more precise calculation methods are much complicated and usually demand super-computer³⁻⁷. And if the experiment determined a_e is not enough accurate, the calculated α shouldn't be satisfying precise either.

In our previous papers^{1,8-14}, we gave many formulas of the fine-structure constant, the two most typical formulas along with our 2π -e formula are listed as follows.

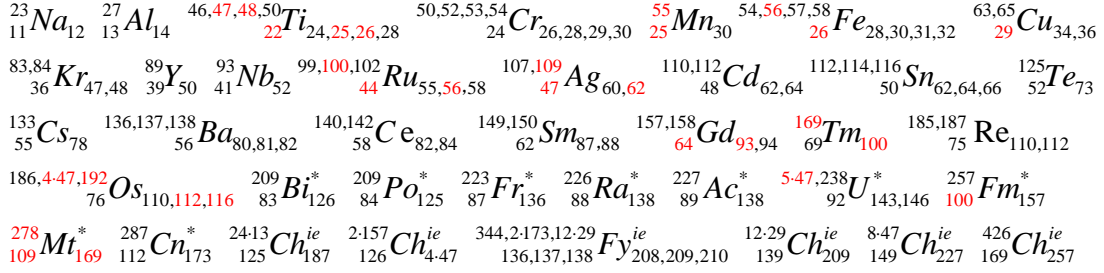
$$\alpha_1 = \frac{36}{7 \cdot (2\pi)_{Chen-112}} \frac{1}{112 + \frac{1}{75^2}} = 1/137.035999037435$$

$$\alpha_2 = \frac{13 \cdot (2\pi)_{Chen-278}}{100} \frac{1}{112 - \frac{1}{64 \cdot 3 \cdot 29}} = 1/137.035999111818$$

$$2\pi - e \text{ formula: } (2\pi)_{Chen-k} = \left(\frac{e}{e^{\gamma_{c-k}}}\right)^2 = e^2 \frac{e^2}{\left(\frac{2}{1}\right)^3} \frac{e^2}{\left(\frac{3}{2}\right)^5} \frac{e^2}{\left(\frac{4}{3}\right)^7} \dots \frac{e^2}{\left(\frac{k+1}{k}\right)^{2k+1}}$$

In these formulas, we developed a methodology that the natural constant 2π was quantized, i. e., 2π -e formula could only adopt definite natural number k rather than infinity. So, with Schwinger formula and our 2π quantization method, we can construct the relationship formula between the anomalous magnetic moment of electron (a_e) and the fine-structure constant (α_2) as follows.

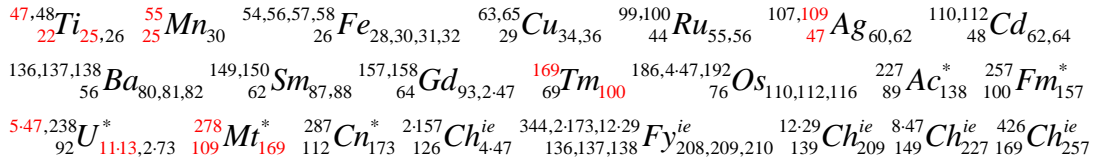
$$\begin{aligned}
a_e &= \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109}} = \frac{\alpha_2 (1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{(2\pi)_{Chen-109}} \\
&= \frac{1 + \frac{1}{11 \cdot 25 \cdot 47 \cdot 109}}{137.035999111818 \cdot 6.29271247440151} = 0.00115965218134971 \\
a_e &= \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109}} = \frac{(\frac{13 \cdot (2\pi)_{Chen-278}}{100} \frac{1}{112 - \frac{1}{64 \cdot 3 \cdot 29}}) (1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{(2\pi)_{Chen-109}} \\
&= \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{112 - \frac{1}{64 \cdot 3 \cdot 29}} \\
&= \frac{13 \cdot e^2 \frac{e^2}{(\frac{2}{1})^3} \frac{e^2}{(\frac{3}{2})^5} \frac{e^2}{(\frac{4}{3})^7} \dots \frac{e^2}{(\frac{9 \cdot 31}{278})^{557}}}{100 \cdot e^2 \frac{e^2}{(\frac{2}{1})^3} \frac{e^2}{(\frac{3}{2})^5} \frac{e^2}{(\frac{4}{3})^7} \dots \frac{e^2}{(\frac{110}{109})^{3.73}}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{112 - \frac{1}{64 \cdot 3 \cdot 29}} = 0.00115965218134971
\end{aligned}$$



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In brief, we gave a concise formula of the anomalous magnetic moment of electron (a_e) and the fine-structure constant (α_2) as follows.

$$a_e = \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{112 - \frac{1}{64 \cdot 3 \cdot 29}} = 0.00115965218134971$$



$$(2\pi)_{Chen-k} = \left(\frac{e}{e^{\gamma_{c-k}}}\right)^2 = e^2 \frac{e^2}{(\frac{2}{1})^3} \frac{e^2}{(\frac{3}{2})^5} \frac{e^2}{(\frac{4}{3})^7} \dots \frac{e^2}{(\frac{k+1}{k})^{2k+1}}$$

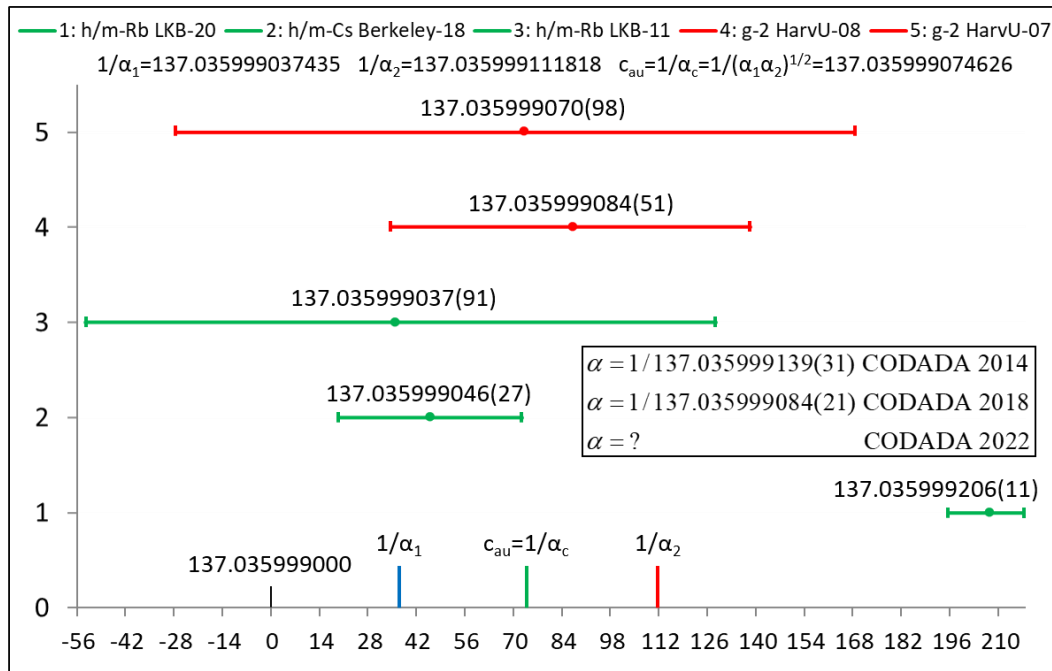
CODATA: $a_e = 0.00115965218128(18)$; Experimental: $a_e = 0.00115965218073(28)^5$

The relationships between the factors in the above formula such as 11, 25, 47, 109 and 278 and nuclides strongly indicate this formula and the value should be correct and precise. It also shows that the quantization of 2π , i.e., 2π -e formula's taking definite k rather than infinity, has the same effect as calculations with Quantum Electrodynamics and Standard Model, this means that in the world of nuclides 2π is quantized to be the form of $(2\pi)_{\text{Chen-k}}$ or some approximate fractional numbers like $4 \times 157/100$.

It is just like taking a clear photo from a moving object to calculate the fine-structure constant from experiment determined values of the anomalous magnetic moment of electron. The method with QED and SM is to calculate the all moving details, our method is to add adjusting coefficients, different paths get to the same goal.

3. Comparison of Calculated and Measured Values of the Fine-structure Constant

In our previous paper¹¹, we gave the following figure to illustrate comparison of calculated and measured values of the fine-structure constant. In it, the lines 4 and 5 were in black. In this paper, we make a correction to change them to red. That means g-2 method corresponds to α_2 (**Fig. 1**). There are color changes with $1/\alpha_1$ and $1/\alpha_c$.



Comparison of Calculated and Measured Values of $1/\alpha$
 Gang Chen, Tianman Chen and Tianyi Chen (2020/9/4-5,10-11, 12/7)

Fig. 1.

4. Concise Formulas of the Anomalous Magnetic Moment of Muon and the Fine-structure Constant

In our previous paper¹, we gave the following formula of the anomalous magnetic moment of muon.

$$a_{\mu} = \frac{g_{\mu} - 2}{2} = \frac{1}{2 \cdot 3 \cdot 11 \cdot 13 - \frac{25}{81}} = 0.00116592057346019$$

^{10,11}₅B_{5,6} ^{12,13}₆C_{6,7} ²³₁₁Na₁₂ ^{24,25,26}₁₂Mg_{12,13,14} ²⁷₁₃Al₁₄ ^{47,48,49,50}₂₂Ti_{25,26,27,28} ⁵⁵₂₅Mn₃₀ ^{54,56}₂₆Fe_{28,30}
⁶⁶₃₀Zn₃₆ ⁷⁵₃₃As₄₂ ⁷⁸₃₄Se₄₄ ^{79,81}₃₅Br_{44,46} ⁸⁹₃₉Y₅₀ ¹¹⁶₅₀Sn₆₆ ¹³³₅₅Cs₇₈ ¹³⁷₅₆Ba₈₁ ¹⁴³₆₀Nd₈₃ ¹⁶²₆₆Dy₉₆
^{194,195}₇₈Pt_{116,117} ²³⁵₉₂U₁₄₃^{*} ²⁸⁶₁₁₃Nh₁₇₃^{ie} ^{363,364}₁₄₃Ch_{220,221}^{ie}

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Here, we give another form of formula of the anomalous magnetic moment of muon (a_{μ}) and the fine-structure constant (α_2) as follows.

$$a_{\mu} = \frac{\alpha_2 \gamma_{\mu}}{(2\pi)_{Chen-109}} = \frac{\alpha_2 \gamma_e \gamma_{\mu}'}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})(1 + \frac{1}{5 \cdot 37})}{112 - \frac{1}{64 \cdot 3 \cdot 29}}$$

$$= 0.00116592057151917$$

$$a_{\mu} = \frac{\alpha_2 \gamma_{\mu}}{(2\pi)_{Chen-109}} = \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109} \gamma_{\mu}''} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{(112 - \frac{1}{64 \cdot 3 \cdot 29})(1 - \frac{1}{6 \cdot 31})}$$

$$= 0.00116592057151917$$

²³₁₁Na₁₂ ²⁷₁₃Al₁₄ ³¹₁₅P₁₆ ^{46,47,48,50}₂₂Ti_{24,25,26,28} ^{50,52,53,54}₂₄Cr_{26,28,29,30} ⁵⁵₂₅Mn₃₀ ^{54,56,57,58}₂₆Fe_{28,30,31,32}
^{63,65}₂₉Cu_{34,36} ^{69,71}₃₁Ga_{38,40} ^{83,84}₃₆Kr_{47,48} ^{85,87}₃₇Rb_{48,50} ⁸⁹₃₉Y₅₀ ⁹³₄₁Nb₅₂ ^{96,99,100,102,104}₄₄Ru_{52,55,56,58,60}
^{107,109}₄₇Ag_{60,62} ^{110,112}₄₈Cd_{62,64} ^{112,114,116}₅₀Sn_{62,64,66} ¹²⁵₅₂Te₇₃ ¹³³₅₅Cs₇₈ ^{136,137,138}₅₆Ba_{80,81,82} ^{140,142}₅₈Ce_{82,84}
^{149,150}₆₂Sm_{87,88} ^{157,158}₆₄Gd_{93,94} ¹⁶⁹₆₉Tm₁₀₀ ^{183,184,186}₇₄W_{109,110,112} ^{185,187}₇₅Re_{110,112} ^{186,4-47,192}₇₆Os_{110,112,116}
²⁰⁹₈₃Bi₁₂₆^{*} ²⁰⁹₈₄Po₁₂₅^{*} ²²³₈₇Fr₁₃₆^{*} ²²⁶₈₈Ra₁₃₈^{*} ²²⁷₈₉Ac₁₃₈^{*} ^{5-47,238}₉₂U_{143,146}^{*} ²⁵⁷₁₀₀Fm₁₅₇^{*} ²⁷⁸₁₀₉Mt₁₆₉^{*} ²⁸⁷₁₁₂Cn₁₇₃^{*}
²⁸⁻¹¹₁₂₃Ch₁₈₅^{ie} ³¹⁰₁₂₄Ch₁₈₆^{ie} ²⁴⁻¹³₁₂₅Ch₁₈₇^{ie} ²⁻¹⁵⁷₁₂₆Ch₁₈₇^{ie} ^{344,2-173,12-29}_{136,137,138}Fy_{208,209,210}^{ie} ⁸⁻⁴⁷₁₄₉Ch₂₂₇^{ie} ⁴²⁶₁₆₉Ch₂₅₇^{ie}

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The latest measured value¹⁵:

$$a_{\mu} = \frac{g_{\mu} - 2}{2} = 0.00116592061(41)$$

Calculated value with QED and Standard Model¹⁶:

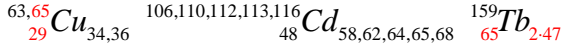
$$a_{\mu} = \frac{g_{\mu} - 2}{2} = 0.00116591810(43)$$

5. Concise Formulas of the Anomalous Magnetic Moment of Tauon and the Fine-structure Constant

In the above formulas of the anomalous magnetic moment of muon and the fine-structure constant, we notice that there are correction coefficient factors 31 and 37 which are adjacent prime numbers with relationship formula of $6 \times 31 = 5 \times 37 + 1$. There is only the other such couple of prime numbers which are 11 and 13 in all prime numbers ($6 \times 11 = 5 \times 13 + 1$). So, by imitating the above formulas of the anomalous magnetic moment of muon and the fine-structure constant, we can construct the following formulas and guess they would be the formula of tauon.

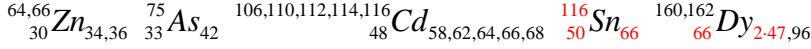
$$a_\tau = \frac{\alpha_2 \gamma_\tau}{(2\pi)_{Chen-109}} = \frac{\alpha_2 \gamma_e \gamma'_\tau}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})(1 + \frac{1}{5 \cdot 13})}{(112 - \frac{1}{64 \cdot 3 \cdot 29})}$$

$$= 0.00117749298413971$$



$$a_\tau = \frac{\alpha_2 \gamma_\tau}{(2\pi)_{Chen-109}} = \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109} \gamma''_\tau} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{(112 - \frac{1}{64 \cdot 3 \cdot 29})(1 - \frac{1}{6 \cdot 11})}$$

$$= 0.00117749298413971$$



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Then we searched literature and found the theoretically calculated value of the anomalous magnetic moment of tauon was $0.00117721(5)^{17}$. It is really amazing.

6. Comparison of Theoretically Calculated and Experimentally Measured

Values of the Anomalous Magnetic Moment of Electron, Muon and Tauon

Table 1. Comparison of Theoretically Calculated and Experimentally Measured a_e , a_μ and a_τ .

Lepton	Calculated a^{SM}	Calculated a^{TC}	Measured a^{EXP}	$(a^{SM} - a^{TC})/a^{TC}$
	By Standard Model	By Theory of Chirality	By Experiment	
e	$0.001159652181606(23)^7$	0.00115965218134971	$0.00115965218073(28)^5$	2.2×10^{-10}
μ	$0.00116591810(43)^{16}$	0.00116592057151917	$0.00116592061(41)^{15}$	-2.1×10^{-6}
τ	$0.00117721(5)^{17}$	0.00117749298413971 0.00117722266894592	$-0.052 - 0.013^{18}$	-2.4×10^{-4} -8.5×10^{-6}

Note: Lifetime of tauon is very short, so it is quite difficult to measure a_τ with ordinary spin precession experiments¹⁷; The second a^{TC} value of tauon is more possible than the first one (refer to **Section 8**).

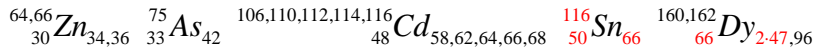
In our previous paper¹, our theory was named to be Theory of Chirality (TC), which is one of the four plates (Theory of Relativity, Quantum Theory, Chaos Theory and Theory of Chirality) of the modern physics. As collision among earth plates makes mountains, interaction among the plates of modern physics makes some anomalies in physics. For example, Standard Model (SM) should be perfect in Quantum Theory plate of modern physics, however, errors in calculation of the anomalous magnetic moment of electron, muon and tauon (a_e , a_μ and a_τ) with Standard Model would become larger and larger (**Table 1**). So, in the calculation of a_e , a_μ and a_τ with Theory of Chirality, we added adjusting coefficient such as γ_e , γ_μ and γ_τ , which could be called Plate Interaction Coefficients (PICs). From electron to muon to tauon, PICs become larger and larger. As for the magnetic moment anomaly of electron, muon and tauon (probably caused by the interaction among the plates of modern physics), electron is like a plain, muon is like a hill and tauon is like a mount.

7. Other Possible Formulas of the Anomalous Magnetic Moment of Tauon and the Fine-structure Constant

There should be possible formulas of the anomalous magnetic moment of tauon and the fine-structure constant as follows.

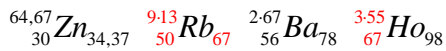
$$a_\tau = \frac{\alpha_2 \gamma_\tau}{(2\pi)_{Chen-109}} = \frac{\alpha_2 \gamma_e \gamma'_\tau}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})(1 + \frac{1}{6 \cdot 11})}{(112 - \frac{1}{64 \cdot 3 \cdot 29})}$$

$$= 0.00117722266894592$$



$$a_\tau = \frac{\alpha_2 \gamma_\tau}{(2\pi)_{Chen-109}} = \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109} \gamma''_\tau} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109})}{(112 - \frac{1}{64 \cdot 3 \cdot 29})(1 - \frac{1}{67})}$$

$$= 0.00117722266894592$$



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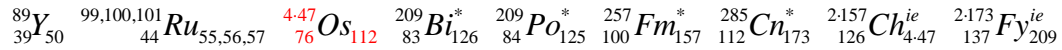
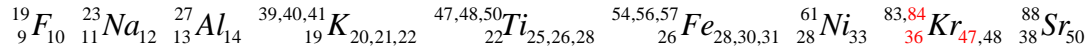
8. Formulas of the Anomalous Magnetic Moment of Electron, Muon and Tauon in Fractional Number Form

In the above formulas of the anomalous magnetic moment of electron, muon and tauon (a_e , a_μ and a_τ) and the fine-structure constant (α_2), there are several kinds of adjusting coefficients which are logically reasonable respectively, however, they could be combined to just one kind of adjusting coefficients (β_1 , β_2 and β_3) and hence formulas of a_e , a_μ and a_τ in fractional number form could be gained as follows.

$$a = \frac{\alpha_2 \gamma_{e/\mu/\tau}}{(2\pi)_{Chen-109}} = \frac{13(2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{\gamma_{e/\mu/\tau}}{(112 - \frac{1}{64 \cdot 3 \cdot 29})} = \frac{13\beta_{e/\mu/\tau}}{100 \cdot 112}$$

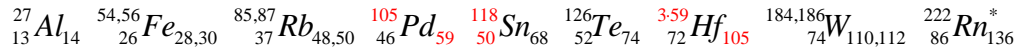
$$a_e = \frac{13\beta_e}{100 \cdot 112} = \frac{13(1 - \frac{1}{4 \cdot 3 \cdot 7 \cdot 13} + \frac{1}{4 \cdot 9 \cdot 11(4 \cdot 19 \cdot 47 - 1) + \frac{1}{8}})}{100 \cdot 112}$$

$$= 0.00115965218134971$$

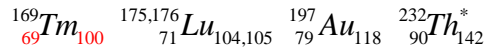
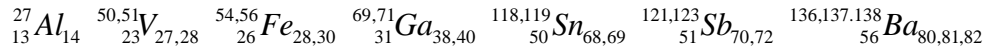


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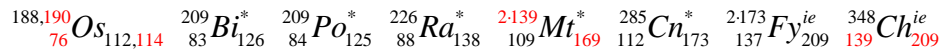
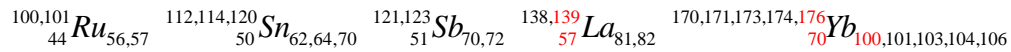
$$a_\mu = \frac{13\beta_\mu}{100 \cdot 112} = \frac{13(1 + \frac{1}{6 \cdot 37} - \frac{1}{6(4 \cdot 37 \cdot 59 - 1) + \frac{8}{105}})}{100 \cdot 112} = 0.001159652057151917$$



$$a_\tau = \frac{13\beta_\tau}{100 \cdot 112} = \frac{13(1 + \frac{1}{3 \cdot 23} - \frac{1}{2 \cdot 27 \cdot 7 \cdot 71 + \frac{197}{16 \cdot 17}})}{100 \cdot 112} = 0.00117749298413971$$



$$a_\tau = \frac{13\beta_\tau}{100 \cdot 112} = \frac{13(1 + \frac{1}{2 \cdot 5 \cdot 7} + \frac{1}{2 \cdot 3 \cdot 19 \cdot 139 + \frac{19}{32 \cdot 11}})}{100 \cdot 112} = 0.00117722266894592$$



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In above, the second formula of a_τ is more meaningful than the first one, so $a_\tau = 0.00117722266894592$ is more possible.

9. The Meanings of k in 2π-e formula in the Formulas of the Fine-structure

Constant and the Anomalous Magnetic Moment of Electron

With k=112, 2π-e formula exists in the formula of the fine-structure constant α₁, the marvelous coincidence of the two 112 numbers is a perfect proof to our assumption that the natural end of elements is the 112th element Cn⁸. However, k=278 appears in the formula of α₂, it seems quite strange. But k=278 and k=109 appear in the formulas of the anomalous magnetic moment of electron with another marvelous coincidence of ¹⁰⁹Mt₁₆₉ (109+169=278), showing this formula should be reasonable or correct. Here we try to dig more meanings of 2π-e formula with the k values of 112, 109 and 278 by approximation to fractional numbers and relating to elements and nuclides as follows.

$$2\pi - e \text{ formula: } (2\pi)_{Chen-k} = \left(\frac{e}{e^{\gamma_{c-k}}}\right)^2 = e^2 \frac{e^2}{\left(\frac{2}{1}\right)^3} \frac{e^2}{\left(\frac{3}{2}\right)^5} \frac{e^2}{\left(\frac{4}{3}\right)^7} \dots \frac{e^2}{\left(\frac{k+1}{k}\right)^{2k+1}}$$

$$\alpha_1 = \frac{36}{7 \cdot (2\pi)_{Chen-112}} \frac{1}{112 + \frac{1}{75^2}} = 1/137.035999037435$$

Mavelous coincidence of the two 112 numbers: ¹¹²₄₈Cd₆₄ ^{185,187}₇₅Re_{110,112} ²⁸⁵₁₁₂Cn₁₇₃*

$$\alpha_2 = \frac{13 \cdot (2\pi)_{Chen-278}}{100} \frac{1}{112 - \frac{1}{64 \cdot 3 \cdot 29}} = 1/137.035999111818$$

$$a_e = \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{\left(1 + \frac{1}{25 \cdot 11 \cdot 47 \cdot 109}\right)}{112 - \frac{1}{64 \cdot 3 \cdot 29}} = 0.00115965218134971$$

Mavelous coincidence of 109 and 278: ²⁷⁸₁₀₉Mt₁₆₉*

$$\frac{1}{(2\pi)_{Chen-112}} = \frac{1}{6.292459356} = 0.15892037 \approx \frac{2 \cdot 53}{23 \cdot 29}$$

⁵³₂₄Cr₂₉ ^{80,82,83,84}₃₆Kr_{44,46,47,48} ^{104,106}₄₆Pd_{58,60} ^{136,138,140,142}₅₈Ce_{78,80,82,84} ⁹⁻²³₈₂Pt₁₂₅ ^{269,271}₁₀₆Mt_{163,165}*

$$\frac{1}{(2\pi)_{Chen-278}} = \frac{1}{6.286939823} = 0.15905990 \approx \frac{5 \cdot 23}{3 \cdot (2 \cdot 11^2 - 1)}$$

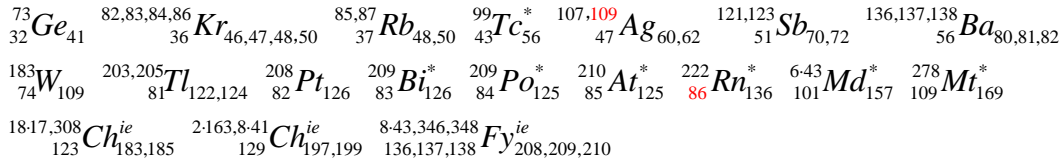
²³₁₁Na₁₂ ^{46,47,48,49,50}₂₂Ti_{24,25,26,27,28} ⁵⁵₂₅Mn₃₀ ^{50,51}₂₃V_{27,28} ^{66,67}₃₀Zn_{36,37} ⁷⁵₃₃As₄₂ ^{85,87}₃₇Rb_{48,50} ⁹⁹₄₄Ru₅₅

^{107,109}₄₇Ag_{60,62} ^{113,115}₄₉In_{64,66} ^{116,117,119,120,122}₅₀Sn_{66,67,69,70,72} ^{121,123}₅₁Sb_{70,72} ^{136,137,138}₅₆Ba_{80,81,82}

^{158,160-164}₆₆Dy_{92,94-98} ⁵⁻³³₆₇Ho₉₈ ¹⁶⁹₆₉Tm₁₀₀ ^{185,187}₇₅Re_{110,112} ^{191,192}₇₇Ir_{114,116} ^{200,201}₈₀Hg_{120,121} ²²⁶₈₈Ra₁₃₈*

²⁷⁸₁₀₉Mt₁₆₉* ²⁸⁹₁₁₅Mc₁₇₄^{ie} ³⁰²₁₂₁Ch₁₈₁^{ie} ^{344,346,348}_{136,137,138}Fy_{208,209,210}^{ie}

$$\frac{1}{(2\pi)_{Chen-109}} = \frac{1}{6.292712474} = 0.15891398 \approx \frac{41}{2 \cdot 3 \cdot 43}$$



Note: $136 = 8 \cdot 17$, $138 = 6 \cdot 23$

2021/8/14-15

It seems that the approximate fractional numbers of $(2\pi)_{112}$ and $(2\pi)_{278}$ do have some meanings referring to elements and nuclides, but $(2\pi)_{109}$ should have much less meanings, so $(2\pi)_{109}$ should be an affiliated part of $(2\pi)_{278}$ corresponding to ${}_{109}Mt_{169}$.

10. Another formulas of the Anomalous Magnetic Moments of Electron, Muon and Tauon

The general formulas of the anomalous magnetic moments of electron, muon and tauon should be as follows.

$$a = \frac{\alpha_2 \gamma}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{\gamma}{(112 - \frac{1}{64 \cdot 3 \cdot 29})}$$

$$a = \frac{13\beta}{100 \cdot 112}$$

$$a = \frac{1}{A} + \frac{1}{B} + \frac{1}{C} + \dots$$

Based on different correction coefficients such as γ , β and $A/B/C$, we can give a little bit different formulas and calculations of the anomalous magnetic moments of electron, muon and tauon. The following are some examples.

$$a_e = \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{1 + \frac{1}{3 \cdot 31 \cdot 59 \cdot 257}}{112 - \frac{1}{64 \cdot 3 \cdot 29}} = 0.00115965218057103$$

${}^{27}_{13}Al_{14}$ ${}^{59}_{27}Co_{32}$ ${}^{63,65}_{29}Cu_{34,36}$ ${}^{69,71}_{31}Ga_{38,40}$ ${}^{85,87}_{37}Rb_{48,50}$ ${}^{100}_{44}Ru_{56}$ ${}^{105}_{46}Pd_{59}$ ${}^{107,109}_{47}Ag_{60,62}$ ${}^{112}_{48}Cd_{64}$
 ${}^{116,118,119}_{50}Sn_{66,68,69}$ ${}^{136,137,138}_{56}Ba_{80,81,82}$ ${}^{141}_{59}Pr_{82}$ ${}^{149}_{62}Sm_{87}$ ${}^{157,160}_{64}Gd_{93,96}$ ${}^{168}_{68}Er_{100}$ ${}^{169}_{69}Tm_{100}$
 ${}^{177}_{72}Hf_{105}$ ${}^{188,192}_{76}Os_{112,116}$ ${}^{223,224}_{87}Fr_{136,137}^*$ ${}^{237}_{93}Np_{144}^*$ ${}^{257}_{100}Fm_{157}^*$ ${}^{278}_{109}Mt_{169}^*$ ${}^{285}_{112}Cn_{173}^*$ ${}^{295}_{118}Og_{177}^{ie}$
 ${}^{2-173,12-29}_{137,138}Fy_{209,210}^{ie}$ ${}^{426}_{169}Ch_{257}^{ie}$

$$a_e = \frac{1}{2(16 \cdot 27 - 1)} - \frac{1}{2 \cdot 9 \cdot 59(8 \cdot 3 \cdot (90 - 1) + 1)} = 0.00115965218057121$$

2023/3/3

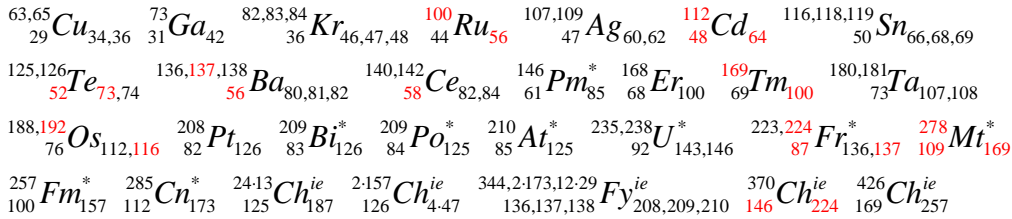
$$a_e = \frac{13\beta_e}{100 \cdot 112} = \frac{13(1 - \frac{1}{4 \cdot 3 \cdot 7 \cdot 13} + \frac{1}{2 \cdot 11^2(8 \cdot 17 \cdot 43 + 1) + \frac{17}{18}})}{100 \cdot 112}$$

$$= \frac{13(1 - \frac{1}{4 \cdot 3 \cdot 7 \cdot 13} + \frac{1}{1415459 - \frac{1}{18}})}{100 \cdot 112} = 0.00115965218057103$$

2023/3/9

The above formulas are not consistent with each other, so they shouldn't be correct.

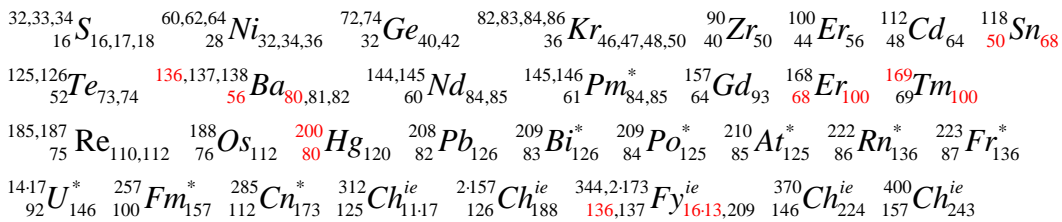
$$a_e = \frac{\alpha_2 \gamma_e}{(2\pi)_{Chen-109}} = \frac{13(2\pi)_{Chen-278}}{100(2\pi)_{Chen-109}} \frac{1 + \frac{1}{3 \cdot 47 \cdot 73 \cdot 137}}{112 - \frac{1}{64 \cdot 3 \cdot 29}} = 0.00115965218058153$$



2023/3/7

$$a_e = \frac{13\beta_e}{100 \cdot 112} = \frac{13 \cdot (1 - \frac{1}{4 \cdot 3 \cdot 7 \cdot 13} + \frac{1}{16 \cdot 5 \cdot 13(16 \cdot 5 \cdot 17 + 1) + \frac{39}{48}})}{100 \cdot 112}$$

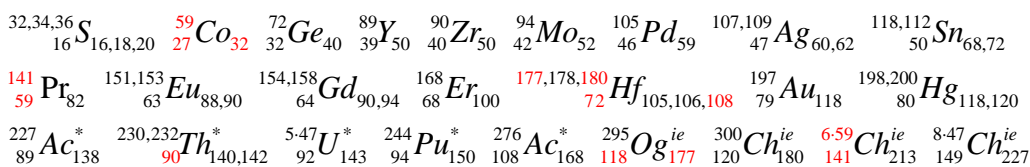
$$= \frac{13 - \frac{1}{4 \cdot 3 \cdot 7} + \frac{1}{16 \cdot 5(16 \cdot 5 \cdot 17 + 1) + \frac{1}{16}}}{100 \cdot 112} = 0.00115965218058153$$



2023/3/9

$$a_e = \frac{g_e - 2}{2} = \frac{1}{2(16 \cdot 27 - 1)} - \frac{1}{2 \cdot 9 \cdot 59(8 \cdot 3 \cdot (90 - 1) + 1) + \frac{5}{2 \cdot 47}}$$

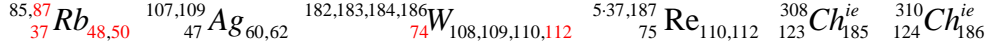
$$= 0.00115965218058153$$



2023/3/7

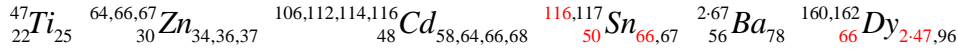
$$a_{\mu} = \frac{\alpha_2 \gamma_{\mu}}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{3 \cdot 47 \cdot 73 \cdot 137})(1 + \frac{1}{5 \cdot 37})}{112 - \frac{1}{64 \cdot 3 \cdot 29}}$$

$$= 0.00116592057074684$$



$$a_{\tau} = \frac{\alpha_2 \gamma_{\tau}}{(2\pi)_{Chen-109}} = \frac{13 \cdot (2\pi)_{Chen-278}}{100 \cdot (2\pi)_{Chen-109}} \frac{(1 + \frac{1}{3 \cdot 47 \cdot 73 \cdot 137})(1 + \frac{1}{6 \cdot 11})}{112 - \frac{1}{64 \cdot 3 \cdot 29}}$$

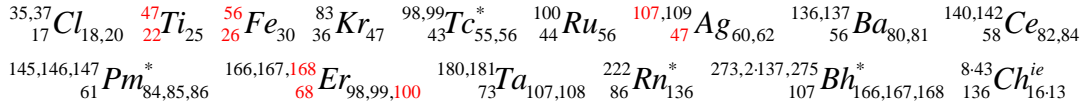
$$= 0.00117722266816610$$



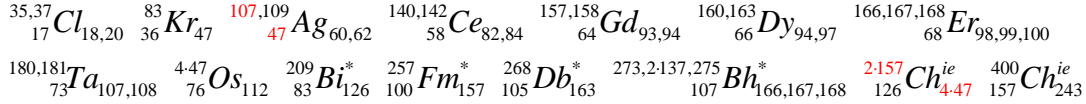
2023/3/10

$$a_{\mu} = \frac{13\beta_{\mu}}{100 \cdot 112} = \frac{13 + \frac{1}{17} - \frac{1}{4(8 \cdot 61 - 1)} + \frac{1}{47 \cdot 107(2 \cdot 11 \cdot 43 + 1)}}{100 \cdot 112}$$

$$= 0.00116592057074684$$

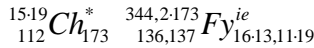
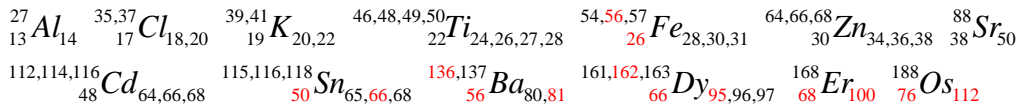


$$a_{\mu} = \frac{1}{8 \cdot 107} - \frac{1}{2 \cdot 17^2(16 \cdot 47 - 1) + \frac{157}{163}} = 0.00116592057074684$$

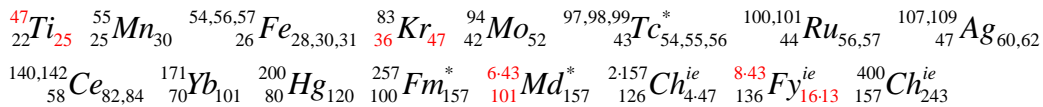


2023/3/19

$$a_{\tau} = \frac{13\beta_{\tau}}{100 \cdot 112} = \frac{13 + \frac{1}{5} - \frac{1}{6 \cdot 11} + \frac{1}{4(4 \cdot 81 \cdot 17 - 1) - \frac{17}{19}}}{100 \cdot 112} = 0.00117722266816609$$



$$a_{\tau} = \frac{1}{3(2 \cdot 3 \cdot 47 + 1)} - \frac{1}{8 \cdot 25 \cdot 13(6 \cdot 101 + 1) - \frac{12}{43}} = 0.00117722266816610$$



2023/3/20

11. Comparison of Theoretically Calculated and Experiment Measured Values of the Anomalous Magnetic Moment of Electron, Muon and Tauon

Based on the results in Section 10, we give the following new table for comparison of theoretically calculated and experimentally measured values of the anomalous magnetic moment of electron, muon and tauon. The values calculated by Theory of Chirality is much more precise.

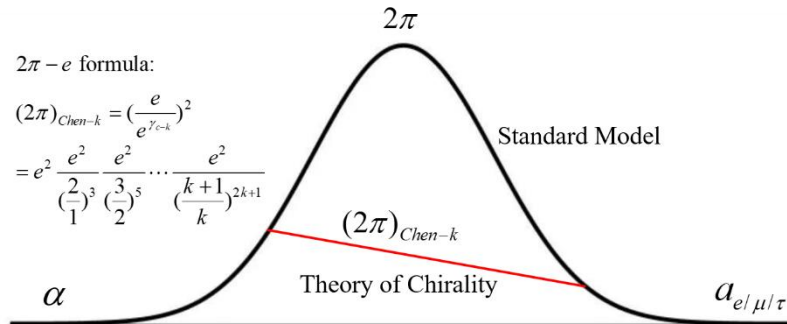
Table 2. Comparison of Theoretically Calculated and Experimentally Measured a_e , a_μ and a_τ .

Lepton	Calculated a^{SM}	Calculated a^{TC}	Measured a^{EXP}	$(a^{\text{SM}}-a^{\text{TC}})/a^{\text{TC}}$
	By Standard Model	By Theory of Chirality	By Experiment	
e	$0.001159652181606(23)^7$	0.00115965218058153	$0.00115965218059(13)^{19}$	8.8×10^{-10}
μ	$0.00116591810(43)^{16}$	0.00116592057074684	$0.00116592061(41)^{15}$	-2.1×10^{-6}
τ	$0.00117721(5)^{17}$	0.00117722266816610	$-0.052-0.013^{18}$	-1.0×10^{-5}

Note: Lifetime of tauon is very short, so it is quite difficult to measure a_τ with ordinary spin precession experiments¹⁷.

12. Comparison of the Two Methods of Standard Model and Theory of Chirality in Calculation of the Anomalous Magnetic Moment of Electron, Muon and Tauon

In calculation of the anomalous magnetic moment of electron, muon and tauon, the method of Standard Model (SM) assumes 2π to be an irrational number as usual but the calculation which employs supercomputer and many physicists' collaboration is very complicated, however, our method of Theory of Chirality (TC) which employs 2π -e formula is quite simple. The comparison of these two methods is shown in Fig. 2. The method of SM is like climbing a mount, the method of TC is like going through a tunnel.



Two Ways to Explain the Anomalous Magnetic Moments of $e/\mu/\tau$

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Fig. 2

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Appendix I: Research History

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7	7	2021/6/20	
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9	9-10	2021/8/14	Chengdu
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Preparing this paper (v2)	7	2021/6/7-13	Shanghai
Preparing this paper (v3)	10	2021/6/7-21	Shanghai
Preparing this paper (v4)	11	2021/6/7-21	Shanghai
		2021/8/14-15	Chengdu
Preparing this paper (v5)	15	2023/3/3-23	Sichuan

Note: Date was recorded according to Beijing Time.