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Article

Understanding Atomic Mass Unit, Avogadro Number, Atomic Radii and Electrochemical Equivalents with 4G Model of Final Unification

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Abstract: Based on three assumptions of our 4G model of final unification, we have developed simple logics for estimating the unified atomic mass unit, atomic electrochemical equivalents, Faraday constant and Avogadro number. We appeal the science community to review the following points. 1) Unified atomic mass or energy unit can be considered as 'average rest energy of nucleons minus average binding energy per nucleon of all atomic nuclides plus electron rest energy'. 2) Electrochemical equivalent of any atomic ion is nothing but the ratio of its mass to its charge. 3) Faraday charge is nothing but the ratio of elementary charge to unified atomic mass unit. 4) Faraday mass can be considered as the inverse of Faraday charge. 5) Avogadro number is nothing but the inverse of unified atomic mass unit. 6) Number of atoms per kg can be called as Kg-mole and number of atoms per gram can be called as gram-mole. Following our 4G model, starting from $A=5$ to 340, for isobars, 'average binding energy per nucleon' having maximum binding energy can be estimated with a simple relation of the form, $BE/A = A^{-1}[1 - (0.5 + 0.000935A^2) - A^{1/3}]10.1\text{MeV}$. It needs a review and fine tuning.

Keywords: 4G model of final unification; nuclear binding energy; electrolysis; electrochemical equivalents; Faraday constant; Faraday Mass; Avogadro number; Newtonian gravitational constant; weak coupling angle

1. Introduction

Following Abdus Salam et al.[1] and Roberto Onofrio [2], in our recent and previous published papers [3–10], we proposed the possible existence of three large gravitational constants assumed to be associated with the electromagnetic, strong and weak interactions. By following this idea, in analogy with Planck scale, as an immediate result, it seems possible to have three different characteristic string amplitudes corresponding to electromagnetic, strong and weak interactions. In this way, String theory [11,12] can be shaped to a model of elementary particle physics associated with 3+1 dimensions. As the subject under consideration deals with 4 different gravitational constants, our model can be called as 4G model of final unification or Microscopic Quantum Gravity. By stressing the existence of nuclear elementary charge and highlighting other applications like understanding elementary magnetic moments, understanding quantum constants and radiation constants, fitting Fermi's weak coupling constant, understanding nuclear binding energy with 4 simple terms and one energy coefficient, understanding quarks' electromagnetic charges and estimation of electron neutrino rest mass, in this paper, we make an attempt to estimate the unified atomic mass unit, Avogadro number, atomic electrochemical equivalents and atomic radii. It may be noted that, starting from sections 1 to 3 are in review as a 'short letter'. Parts of sections 3 and 6 are also in review.

2. Three simple assumptions of 4G model of final unification

Our three assumptions are,

- 1) There exists a characteristic weak fermion of rest energy, $M_{wf}c^2 \cong 584.725 \text{ GeV}$. It can be considered as the zygote of all elementary particles [7].
- 2) There exists a nuclear elementary charge in such a way that, $\left(\frac{e}{e_n}\right)^2 \cong \alpha_s \cong 0.1152 = \text{Strong}$ coupling constant [13] and $e_n \cong 2.9464e$.
- 3) Each atomic interaction is associated with a characteristic large gravitational coupling constant. Their fitted magnitudes are,

$$\left. \begin{aligned} G_e &\cong \text{Electromagnetic gravitational constant} \\ &\cong 2.374335 \times 10^{37} \text{ m}^3 \text{kg}^{-1} \text{sec}^{-2} \\ G_n &\cong \text{Nuclear gravitational constant} \\ &\cong 3.329561 \times 10^{28} \text{ m}^3 \text{kg}^{-1} \text{sec}^{-2} \\ G_w &\cong \text{Electroweak gravitational constant} \\ &\cong 2.909745 \times 10^{22} \text{ m}^3 \text{kg}^{-1} \text{sec}^{-2} \end{aligned} \right\}$$

Unification point of view, most important relation is $\hbar c \cong G_w M_{wf}^2$. Planck length can be addressed with $\sqrt{G_N \hbar / c^3} \cong \sqrt{G_w G_N} M_{wf} / c^2$. In a unified approach, Newtonian gravitational constant [14] can be addressed with $G_N \cong \frac{G_w^2 G_e^{10}}{G_n^{30}} \cong 6.679851 \times 10^{-11} \text{ m}^3 \text{kg}^{-1} \text{sec}^{-2}$. Strange and

interesting ratio associated with Avogadro like number is $\frac{G_w G_n}{G_N G_e} \cong \frac{G_n^{31}}{G_w^{20} G_e^{11}} \cong 6.1085 \times 10^{23}$. Clearly

speaking, ratio of the product of short ranges forces and the product of long range forces somehow seems to be connected with the observed Avogadro like number. Proton-electron mass ratio can be

addressed with $\frac{m_p}{m_e} \cong \frac{G_n^3}{G_w^2 G_e}$. High energy physics point of view, we would like to emphasize the

point that, currently believed strong coupling constant is inherently connected with ordinary electromagnetic charge and the proposed nuclear charge. It needs a very critical review. It can be

addressed with $\alpha_s \cong \left(\frac{e}{e_n}\right)^2 \cong \frac{G_e^4 G_w^6}{G_n^{10}} \cong \frac{G_n^{1/3} G_e^{2/3}}{G_w} \cong 0.1151937$. Considering weak and electromagnetic

gravitational constants, neutron life time [13] can be fitted with a very simple relation of the form,

$t_n \cong \frac{G_e^2 m_n^2}{G_w (m_n - m_p) c^3} \cong 875.0 \text{ sec}$. Based on the proposed assumptions and with reference to the cosmic

force of the form (c^4/G_N) , for the three atomic interactions, at atomic scale, interaction strength can be defined as,

For weak interaction, $\left[(c^4/G_w)/(c^4/G_N)\right] \cong G_N/G_w \cong 2.294 \times 10^{-33}$.

For nuclear or strong interaction, $\left[(c^4/G_n)/(c^4/G_N)\right] \cong G_N/G_n \cong 2.0 \times 10^{-39}$.

For electromagnetic interaction, $\left[(c^4/G_e)/(c^4/G_N)\right] \cong G_N/G_e \cong 2.811 \times 10^{-48}$.

Based on these values, at atomic scale, it seems logical to say that, based on (c^4/G_N) –

- a) Interaction range is inversely proportional to interaction strength.

- b) Effective magnitude of the operating gravitational constant is, $G_x \cong \frac{G_N}{\text{Interaction strength}}$

3. Atomic, nuclear and sub-nuclear applications

Clearly speaking gravity associated with weak interaction seems to play a crucial role in exploring the mystery of quantum phenomena. Fermi's weak coupling constant can be addressed with,

$$G_F \equiv \left(\frac{m_e}{m_p} \right)^2 \hbar c R_0^2 \equiv G_w M_{wf}^2 R_w^2 \cong 1.44021 \times 10^{-62} \text{ J.m}^3$$

$$\text{where } \begin{cases} R_0 \equiv \frac{2G_n m_p}{c^2} \cong 1.24 \times 10^{-15} \text{ m} \\ R_w \equiv \frac{2G_w M_{wf}}{c^2} \cong 6.75 \times 10^{-19} \text{ m} \end{cases}$$

Important relation pertaining to final unification can be expressed as, $\hbar c \equiv G_w M_{wf}^2$. With reference to the assumed gravity associated with electron, characteristic radius of electron can be addressed with $R_{ele} \equiv \frac{2G_e m_e}{c^2} \cong 4.813 \times 10^{-10} \text{ m} \cong 0.48 \text{ nm}$. We are working on understanding the applications of this length at nano-scale. The most puzzling root mean square radius of proton can

be addressed with $R_p \equiv \sqrt{\left(\frac{4\pi\epsilon_0 \hbar^2}{e_n^2 m_p} \right) \left(\frac{\hbar}{m_p c} \right)} \equiv \sqrt{\frac{\alpha_s}{\alpha} \left(\frac{\hbar}{m_p c} \right)} \cong 0.835 \text{ fm}$. Quantum of magnetic flux can be

addressed [15] with $\frac{h}{e} \equiv \frac{e_n}{e} \sqrt{\frac{\mu_0}{4\pi} (G_e m_e^2)}$. Most fundamental Planck's radiation constant can be

addressed with $h \equiv \sqrt{\left(\frac{e_n^2}{4\pi\epsilon_0 c} \right) \left(\frac{G_e m_e^2}{c} \right)} \equiv \frac{e_n}{e} \sqrt{\left(\frac{e^2}{4\pi\epsilon_0 c} \right) \left(\frac{G_e m_e^2}{c} \right)}$. Reduced Planck's constant can be

addressed with $\hbar \equiv \left(\frac{e}{e_n} \right) \frac{G_n m_p^2}{c}$. Proton magnetic moment can be expressed as $\mu_p \equiv \frac{e G_n m_p}{2c}$. Bohr

magneton can be expressed as $\mu_e \equiv \frac{e\hbar}{2m_e} \equiv \sqrt{\left(\frac{e G_n m_p}{2c} \right) \left(\frac{e G_e m_e}{2c} \right)} \equiv \left[\left(\frac{e}{m_e} \right) \div \left(\frac{e_n}{m_p} \right) \right] \mu_p$. Clearly speaking,

ratio of Bohr magneton to proton magnetic moment is close to the ratio of specific charge ratio of electron having a charge e and proton having a charge $e_n \cong 2.9464e$. Electron's anomalous magnetic

moment can be addressed with a factor $\left[1 + \left(\frac{\alpha}{2\pi} \right) \right] \mu_{Bohr} \equiv \left[1 + \left(\frac{e^2}{4\pi\epsilon_0 \hbar c} \right) \right] \mu_{Bohr}$. Fine structure ratio

can be addressed with $\alpha \equiv \left(\frac{e^2}{4\pi\epsilon_0 \hbar c} \right) \equiv \frac{e e_n}{4\pi\epsilon_0 G_n m_p^2}$. Based on these expressions, it seems possible to

understand the discreteness of elementary angular momentum with the discrete nature of elementary particle rest masses.

With reference to currently believed Semi Empirical Mass Formula (SEMF), we call our formula as 'Strong and Electroweak Mass Formula' (SEWMF). It constitutes 4 simple terms and single binding

energy potential or coefficient addressed with $\frac{e_n^2}{8\pi\epsilon_0 (0.62 \text{ fm})} \cong 10.1 \text{ MeV}$ where

$\frac{G_n m_p}{c^2} \cong 0.62 \text{ fm}$ and $\frac{\alpha}{2\pi} \equiv \frac{e^2}{4\pi\epsilon_0 \hbar c} \equiv \sqrt{\frac{13.6 \text{ eV}}{10.1 \text{ MeV}}}$. This is a very interesting observation.

Fortunately this energy coefficient is very close to the average rest energy of 3 Up quarks and 3 Down quarks. Simplified formula can be expressed as, $BE \equiv (A - A_{free} - A_{rad} - A_{asy}) 10.1 \text{ MeV}$

$$\left\{ \begin{array}{l} A_{free} \equiv \left(2 - \frac{N}{Z} \right) + \left[0.0016 \left(\frac{Z^2 + A^2}{2} \right) \right] \\ A_{rad} \equiv A^{1/3}, \quad A_{asym} \equiv \frac{(A_s - A)^2}{A_s} \end{array} \right\}$$

where

$$\left\{ \begin{array}{l} A_s \equiv 2Z + 0.0016(2Z)^2 \equiv 2Z + 0.0064Z^2 \\ \frac{m_p}{M_{wf}} \equiv \frac{938.272 \text{ MeV}}{584725 \text{ MeV}} \equiv \frac{\sqrt{(m_\pi c^2)^0 (m_\pi c^2)^\pm}}{\sqrt{(m_z c^2)^0 (m_w c^2)^\pm}} \\ \equiv \left(\frac{\sqrt{134.98?} \cdot 39.57 \text{ MeV}}{\sqrt{80379.0?} \cdot 1187.6 \text{ MeV}} \right) \equiv 0.0016 \end{array} \right\}$$

and

First term is a volume term, second term is associated with free nucleons pertaining to electroweak interaction, third term is a radial term and fourth one is an asymmetry term about a light house like stable mass number associated with weak interaction coefficient 0.0016. Here it is very important to note that, 0.0016 is the ratio of proton rest energy of 938.272 MeV and the assumed weak fermion of rest energy 584.725 GeV. It is noticed that, the ratio of mean mass of pions to mean mass of weak bosons is accurately matching with 0.0016. Thus, we have clearly established the combined and independent roles of strong and weak interactions in basic nuclear physics [16]. With this kind of approach, cold nuclear fusion like complicated concepts can be understood independent of Coulombic repulsions [17,18]. We are working on finding alternative expressions for estimating the number of free nucleons. Approximate new expressions are [19],

$$A_{free} \approx 0.0016 \left[\left(Z^2 + N^2 + \left(\frac{Z^2}{N} \right)^2 \right) - \left(\frac{A - 2Z}{2} \right)^2 \right], \quad A_{free} \approx \left[0.0016A \left(\sqrt{NZ} + \sqrt{A} + \sqrt{A_s - 2Z} \right) \right] \quad \text{and}$$

$$A_{free} \approx \left[0.004156(N-1)(Z-1) \right] \quad \text{where} \quad \sqrt{10.1 \text{ MeV} / 584.725 \text{ GeV}} \equiv 0.004156. \quad \text{Based on the proposed nuclear charge, nuclear stability can also be understood with } A_s \equiv \left\{ (Z + 2.9464)^{1.2} \right\} - 1$$

$$\text{and} \left(\frac{e_n}{e} \right)^{1/6} \equiv 1.2. \quad \text{This can be confirmed with Green's beta stability relation [20,21],}$$

$$Z \equiv \frac{A_s}{2} - \frac{0.2 A_s^2}{A_s + 200}. \quad \text{Proceeding further, Myer and Swiatecki's mass formula energy coefficients can be}$$

fixed with a reference potential energy of $\frac{e_n^2}{4\pi\epsilon_0} (0.62 \text{ fm})^{-1} \equiv 20.2 \text{ MeV}$. Volume and surface energy

coefficients can be addressed with $(1 - 2\alpha_s) 20.2 \text{ MeV}$ and $(1 - \alpha_s) 20.2 \text{ MeV}$ respectively.

Interesting point to be noted is that all other minor energy coefficients are interlinked with expressions like $\frac{1}{2}(\alpha_s) 20.2 \text{ MeV}$, $(\alpha_s) 20.2 \text{ MeV}$, $(2\alpha_s) 20.2 \text{ MeV}$ and $(3\alpha_s) 20.2 \text{ MeV}$. Isospin

coefficients of volume and surface energy terms can be fitted with $2 \mp \left[\frac{(1 + \alpha_s)}{(1 - \alpha_s)} \right]^2 \alpha_s$. We have

developed the above relations with reference to the following advanced mass formula [22].

$$BE \equiv \left\{ \left[1 + \left(\frac{4k_v}{A^2} \right) |T_z| (|T_z| + 1) \right] a_v * A \right\} + \left\{ \left[1 + \left(\frac{4k_s}{A^2} \right) |T_z| (|T_z| + 1) \right] a_s * A^{\frac{2}{3}} \right\} + \left\{ a_c * \left(\frac{Z^2}{A^{1/3}} \right) \right\} + \left\{ f_p * \frac{Z^2}{A} \right\} + E_p \Bigg\}$$

$$\text{where,} \quad T_z \equiv \text{3rd component of isospin} = \frac{1}{2}(Z - N)$$

$$\left\{ \begin{array}{l} a_v = -15.4963 \text{ MeV}, a_s = 17.7937 \text{ MeV} \\ k_v = -1.8232, k_s = -2.2593 \\ a_c = 0.7093 \text{ MeV}, f_p = -1.2739 \text{ MeV} \\ d_n = 4.6919 \text{ MeV}, d_p = 4.7230 \text{ MeV} \\ d_{np} = -6.4920 \text{ MeV} \end{array} \right\} \text{ and } \left\{ \begin{array}{l} \text{for } (Z, N) \text{ Odd, } E_p \cong \frac{d_n}{N^{1/3}} + \frac{d_p}{Z^{1/3}} + \frac{d_{np}}{A^{2/3}} \\ \text{for } (\text{Odd } Z, \text{ Even } N), E_p \cong \frac{d_p}{Z^{1/3}} \\ \text{for } (\text{Even } Z, \text{ Odd } N), E_p \cong \frac{d_n}{N^{1/3}} \\ \text{for } (\text{Even } Z, \text{ Even } N), E_p \cong 0 \end{array} \right\}$$

Medium and heavy atomic nuclides' charge radii [23,24] can be addressed with $R(Z, N) \cong \left[Z^{1/3} + (\sqrt{NZ})^{1/3} \right] 0.62 \text{ fm}$. Considering our proposed $e_n \cong 2.9464e$ as a characteristic quark charge, it seems possible to understand the integral nature [25–27] of quarks' electromagnetic charge. A detailed paper is in review on magnetic and radiation constants, quarks' electromagnetic charges and other applications [28].

- Up, Charm and Top quark's electromagnetic charge is $+\frac{2}{3}e_n \cong +2e$.
- Down, Strange and Bottom quark's electromagnetic charge is $-\frac{1}{3}e_n \cong -e$.
- Quarks having an electromagnetic charge of $\pm 2e$ and $\mp e$ can be called as integral charge quarks.
- There exists no repulsion between any two particles having same kind of nuclear charge.

For example, proton can be assumed to have one up quark pair and one anti down quark. Neutron can be assumed to have two anti down quarks and one anti up quark. Positive and negative pions can be assumed to have one Up quark and one down quark or one anti up quark and anti down quark. Neutral pions can be assumed to have one Up quark pair or one down quark pair. Thus, decay of neutrons, protons and pions can be understood very easily. For the case of neutron decay, one anti up quark transforms to one down quark and releases one electron. For the case of proton decay, one up quark transforms to one anti down quark and releases one positron. In case of charged pions, up quark plays a vital role in the decay process. For positive pion, up quark transforms positive electron or positive muon and generates a neutral pion. For negative pion, anti up quark transforms to electron or negative muon and generates a neutral pion. With reference to Up quark pair, neutral pion can decay into 2 positive particles and two negative particles. With reference to down quark pair, neutral pion can decay into one positive particle and one negative particle. In this way, neutron, proton and pions decay can be understood very easily. In all the cases, up quark of charge $(\pm 2e)$ seems to play a crucial role in final decay. In the given Table 1, it may be noted that, in the second column, quark charges expressed in '()' indicate their own internal decay in the third column. This proposal can be applied to all 6 quarks without any difficulty.

Table 1. Internal and external decay modes of neutron, proton and pions.

Particle	Integral Quark charges	Internal Decay mode	Decay Result
Neutron	+e, +e, (-2e)	-2e $\rightarrow$ -e, -e	[+e, +e, (-e)] = Proton and Electron (-e)
Anti neutron	-e, -e, (+2e)	+2e $\rightarrow$ +e, +e	[-e, -e, (+e)] = Anti proton and Positron (+e)
Proton	(+2e), (-2e), +e +e, +e, -e	+2e $\rightarrow$ +e, +e -2e $\rightarrow$ -e, -e	[(+e), -2e, +e] = Neutron and Positron (+e) [+2e, (-e), +e] = (Baryon ^{+2e}) and (electron or muon ⁻) Lepton ⁺ and Gamma or Pion ⁰ Lepton ⁻ and meson ^{+2e}
Anti proton	(-2e), (+2e), -e -e, -e, +e	-2e $\rightarrow$ -e, -e +2e $\rightarrow$ +e, +e	[(-e), +2e, -e] = Anti neutron and Electron (-e) [-2e, (+e), -e] = (Baryon ^{-2e}) and (positron or muon ⁺) Lepton ⁻ and Gamma or Pion ⁰ Lepton ⁺ and meson ^{-2e}

Pion ⁺	(+2e),-e	+2e → +e, +e	Positron or Muon ⁺ and [(+e),-e] = Gamma or Pion ⁰
Pion ⁻	(-2e),+e	-2e → -e,-e	Electron or Muon ⁻ and [(-e),+e] = Gamma or Pion ⁰
Pion ⁰	(+2e),(-2e); -e,+e	(+e,+e),(-e,-e) -e,+e	Two Gamma Electron, Positron and Gamma Two electrons and Two positrons Electron and positron One Gamma

4. Understanding the rest mass of electron neutrino

Based on the above applications, we noticed that, there exists an electron neutrino [29,30] or gravitino like a neutral fermion of rest mass, $m_{xf} \cong (m_e^6/m_p^5) \cong 4.365 \times 10^{-47}$ kg. Similar to the proposed, $m_{xf} \cong (m_e^6/m_p^5)$, current recommended value of electron neutrino mass can be fitted with, $\frac{m_e^3}{m_p^2} \cong 2.7 \times 10^{-37}$ kg $\cong 0.15$ eV/ c^2 . Mass ratio of proposed and believed electron neutrino is $(m_e/m_p)^3$ and needs a review. Considering $M_{wf}c^2 \cong 584.725$ GeV as the weak fermion, electron and electron neutrino rest masses can be addressed with $m_e \cong \left(\frac{G_w}{G_n}\right)M_{wf}$ and $m_{xf} \cong \left(\frac{\sqrt{G_w G_N}}{G_n}\right)M_{wf}$ respectively where G_w , G_n and G_N represent electroweak, nuclear and Newtonian gravitational constants respectively. In a verifiable approach with other relations, our adopted procedure is mainly associated with interpreting the large numbers as $(m_p/m_e)^{10} \cong (m_e/m_{xf})^2$ and $(m_p/m_e)^{12} \cong (m_p/m_{xf})^2$. With reference to strong coupling constant, we noticed that, $\ln(m_e/m_{xf})^2 \cong \ln(G_w/G_N) \cong 1/\alpha_s^2 \cong (0.1152)^{-2}$. With reference to the proposed electron neutrino rest mass, Planck length can be addressed with a very interesting relation of the form, $\sqrt{G_N \hbar/c^3} \cong G_n m_{xf}/c^2$.

Considering nuclear unit charge, unit volume, Fermi's weak coupling constant and based on proton, electron and proposed neutrino rest masses, neutron life time[13] can be fitted with, $t_n \cong \left(\frac{m_p m_e}{m_{xf}(m_n - m_p)}\right) \left(\frac{4\pi}{3} R_0^3\right) \left(\frac{\hbar}{G_F}\right) \cong 884.0$ sec. By considering the relations, $G_F \cong \left(\frac{m_e}{m_p}\right)^2 \hbar c R_0^2$ and $R_0 \cong \frac{2G_n m_p}{c^2}$, neutron life can be fitted with, $t_n \cong \frac{8\pi G_n m_p^4}{3m_{xf} m_e (m_n - m_p) c^3} \cong \frac{4\pi m_p^3}{3m_{xf} m_e (m_n - m_p)} \left(\frac{R_0}{c}\right)$. In

this way, with our 4G model of final unification electron neutrino rest mass can be inferred and can be confirmed by fitting it with the neutron life time. Accuracy point of view, neutron life time seems to depend on the characteristic nuclear radius and nuclear volume. With further research, rest masses of electron neutrino and gravitino can be understood in a unified approach.

5. Understanding and estimating atomic radii

With reference to 4G model of final unification, we emphasize the point that, there exists 3 different large gravitational constants for weak, strong and electromagnetic interactions. In this paper, by considering the effective behavior of strong and electromagnetic interactions, similar to Rutherford's nuclear radii formula [23], we propose a very simple formula for understanding atomic

radii. It can be expressed as, $R_A \cong A^{1/3} \left(\frac{2\sqrt{G_n G_e} M_u}{c^2} \right) \cong A^{1/3} \times 32.86 \text{ pm}$ where A represents atomic mass number, G_n , G_e represent strong and electromagnetic gravitational constants respectively and M_u represents the unified atomic mass unit [14]. Starting from $A = (1 \text{ to } 340)$, obtained range of atomic radii is (32.86 to 229.35) pm. It is in line with the measured range of various atomic radii [31–36] and needs a fine tuning. In this context, for 3 to 7 periods, we have developed an approximate formula, $R_A \cong [4 - (A/Z)] (Z_{fp}/Z)^2 A^{1/3} \times 32.86 \text{ pm}$. Here, Z_{fp} represents first element of any period and Z represents any element in that period. For Helium and the 2nd period, $R_A \cong [4 - (A/Z)] (Z_{fp}/Z) A^{1/3} \times 32.86 \text{ pm}$. We sincerely appeal the field experts to see the possibility of implementing this idea with possible changes for a better understanding at fundamental level. See the following Figure 1.

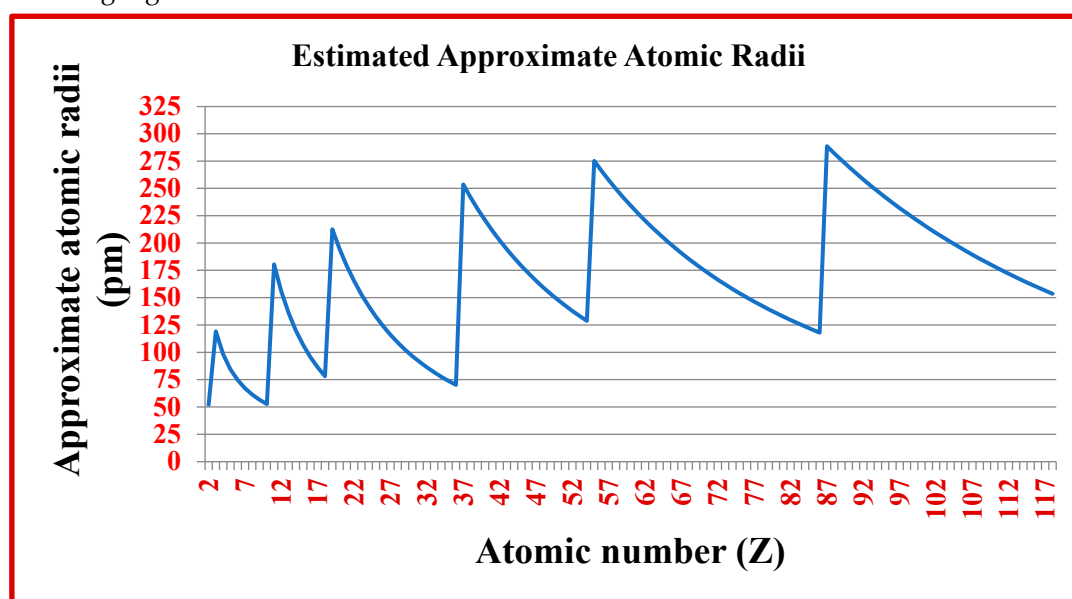


Figure 1. Estimated atomic radii.

6. Understanding Unified atomic mass unit, Avogadro number and Electrochemical equivalents

We have noticed a very simple and accurate relation for understanding and estimating the Unified atomic mass unit M_u . In terms of energy, it can be considered as 'average rest energy of nucleons minus average binding energy per nucleon of all atomic nuclides plus electron rest energy'. By considering the 'binding energy per electron' of all atomic electrons there is a scope for correction to the estimated M_u . It needs a review. It may be noted that, 'average binding energy per nucleon' of all atomic nuclides can be estimated in three ways. One simple way is, to consider the average of experimental 'binding energy per nucleon' values of all observed 2500 atomic nuclides. Second possible way is, starting from $A=4$ to 294, selecting all 291 mass numbers having maximum binding energy, finding their binding energy per nucleon and taking the average of 291 values. Alternatively, based on our 4G model of final unification, starting from $A=5$ to 340, considering isobars, based on our three assumptions and considering maximum binding energy associated with any stable mass number, we have noticed a very simple relation [37]. It can be expressed as,

$$\left. \begin{aligned} (BE)_{A_s} &\equiv \left(A_s - \left(\left(\frac{1}{2} \right) + 0.000935 A_s^2 \right) - A_s^{1/3} \right) 10.1 \text{ MeV} \\ \frac{(BE)_{A_s}}{A_s} &\equiv A_s^{-1} \left(A_s - \left(\left(\frac{1}{2} \right) + 0.000935 A_s^2 \right) - A_s^{1/3} \right) 10.1 \text{ MeV} \end{aligned} \right\}$$

$$\text{where } \sqrt{\frac{G_w}{G_n}} \equiv \sqrt{\frac{m_e c^2}{M_{wf} c^2}} \equiv \sqrt{\frac{0.511 \text{ MeV}}{584725 \text{ MeV}}} \equiv 0.000935$$

With reference to stability against beta decay, proposed coefficient 0.000935 can be addressed with a relation of the form, $\sqrt{\left(\frac{m_p c^2}{M_{wf} c^2}\right)\left(\frac{m_e c^2}{m_p c^2}\right)} \equiv \sqrt{(0.00160464)(0.0054462)} \equiv 0.000935$. It needs a review. See Figures 2 and 3 for the estimated binding energies of $A_s = 4$ to 294 . It may be noted that, with reference to experimental binding energy of isobars having maximum binding energy [38], average error in estimated binding energy seems to be 0.93 MeV for 291 atomic nuclides and corresponding standard deviation is 3.97 MeV. It needs a review with respect to the following relations [20,21], $Z \equiv \frac{A_s}{1 + \sqrt{0.0064 A_s + 1}} \equiv \frac{A_s}{2} - \frac{0.2 A_s^2}{A_s + 200}$ and the proposed asymmetry term, $A_{asy} \equiv \frac{(A_s - A)^2}{A_s}$. Table 2, Figures 2 and 3 clearly demonstrate the existence of our proposed weak fermion of rest energy 584.725 GeV.

Table 2. Assumed stable mass number and its corresponding maximum binding energy.

Assumed stable mass number A_s	Estimated Max. Binding energy of A_s (MeV)	Experimental Max. Binding energy of A_s (MeV)	(Est.- Exp.) Binding energy (MeV)	Estimated Binding energy per nucleon (MeV)	Experimental Binding energy per nucleon (MeV)
4	19.2	28.30	-9.13	4.79	7.07
5	27.94	27.56	0.38	5.59	5.51
6	36.86	31.99	4.86	6.14	5.33
7	45.87	39.25	6.62	6.55	5.61
8	54.95	56.50	-1.55	6.87	7.06
9	64.08	58.16	5.91	7.12	6.46
10	73.25	64.98	8.27	7.32	6.50
11	82.45	76.20	6.24	7.50	6.93
12	91.67	92.16	-0.49	7.64	7.68
13	100.91	97.11	3.80	7.76	7.47
14	110.16	105.28	4.87	7.87	7.52
15	119.42	115.49	3.92	7.96	7.70
16	128.68	127.62	1.06	8.04	7.98
17	137.95	131.76	6.19	8.11	7.75
18	147.22	139.81	7.41	8.18	7.77
19	156.49	147.80	8.69	8.24	7.78
20	165.76	160.64	5.11	8.29	8.03
21	175.02	167.41	7.61	8.33	7.97
22	184.28	177.77	6.51	8.38	8.08
23	193.53	186.56	6.97	8.41	8.11

24	202.78	198.26	4.52	8.45	8.26
25	212.02	205.59	6.43	8.48	8.22
26	221.24	216.68	4.56	8.51	8.33
27	230.47	224.95	5.51	8.54	8.33
28	239.68	236.54	3.14	8.56	8.45
29	248.88	245.01	3.87	8.58	8.45
30	258.07	255.62	2.45	8.60	8.52
31	267.25	262.92	4.33	8.62	8.48
32	276.41	271.78	4.63	8.64	8.49
33	285.57	280.96	4.61	8.65	8.51
34	294.71	291.84	2.87	8.67	8.58
35	303.84	298.82	5.02	8.68	8.54
36	312.96	308.71	4.25	8.69	8.58
37	322.07	317.10	4.97	8.70	8.57
38	331.16	327.34	3.81	8.71	8.61
39	340.24	333.94	6.29	8.72	8.56
40	349.30	343.81	5.49	8.73	8.60
41	358.35	351.62	6.73	8.74	8.58
42	367.38	361.90	5.49	8.75	8.62
43	376.40	369.83	6.58	8.75	8.60
44	385.41	380.96	4.45	8.76	8.66
45	394.40	388.37	6.03	8.76	8.63
46	403.38	398.77	4.61	8.77	8.67
47	412.34	407.26	5.08	8.77	8.67
48	421.29	418.70	2.58	8.78	8.72
49	430.22	426.85	3.37	8.78	8.71
50	439.13	437.78	1.35	8.78	8.76
51	448.03	445.85	2.19	8.78	8.74
52	456.92	456.35	0.57	8.79	8.78
53	465.78	464.29	1.50	8.79	8.76
54	474.64	474.01	0.63	8.79	8.78
55	483.47	482.08	1.40	8.79	8.77
56	492.29	492.26	0.03	8.79	8.79
57	501.10	499.91	1.19	8.79	8.77
58	509.89	509.95	-0.06	8.79	8.79
59	518.66	517.31	1.34	8.79	8.77
60	527.41	526.85	0.57	8.79	8.78
61	536.15	534.67	1.49	8.79	8.77
62	544.87	545.26	-0.39	8.79	8.79
63	553.58	552.10	1.48	8.79	8.76
64	562.27	561.76	0.51	8.79	8.78
65	570.94	569.21	1.73	8.78	8.76
66	579.60	578.14	1.46	8.78	8.76
67	588.24	585.41	2.83	8.78	8.74
68	596.86	595.39	1.47	8.78	8.76
69	605.46	602.00	3.47	8.77	8.72
70	614.05	611.09	2.97	8.77	8.73
71	622.62	618.95	3.67	8.77	8.72
72	631.18	628.69	2.49	8.77	8.73
73	639.71	635.47	4.25	8.76	8.71
74	648.23	645.66	2.57	8.76	8.73

75	656.74	652.57	4.17	8.76	8.70
76	665.22	662.07	3.15	8.75	8.71
77	673.69	669.59	4.10	8.75	8.70
78	682.14	679.99	2.15	8.75	8.72
79	690.58	686.95	3.62	8.74	8.70
80	698.99	696.87	2.13	8.74	8.71
81	707.39	704.37	3.02	8.73	8.70
82	715.77	714.27	1.50	8.73	8.71
83	724.14	721.74	2.39	8.72	8.70
84	732.48	732.27	0.22	8.72	8.72
85	740.81	739.38	1.43	8.72	8.70
86	749.12	749.23	-0.11	8.71	8.71
87	757.42	757.86	-0.44	8.71	8.71
88	765.70	768.47	-2.77	8.70	8.73
89	773.95	775.54	-1.59	8.70	8.71
90	782.20	783.90	-1.70	8.69	8.71
91	790.42	791.09	-0.67	8.69	8.69
92	798.63	799.73	-1.10	8.68	8.69
93	806.81	806.46	0.35	8.68	8.67
94	814.98	814.68	0.30	8.67	8.67
95	823.14	821.63	1.51	8.66	8.65
96	831.27	830.78	0.49	8.66	8.65
97	839.39	837.60	1.79	8.65	8.64
98	847.49	846.25	1.24	8.65	8.64
99	855.57	852.75	2.82	8.64	8.61
100	863.63	861.93	1.70	8.64	8.62
101	871.68	868.73	2.95	8.63	8.60
102	879.71	877.95	1.76	8.62	8.61
103	887.72	884.19	3.53	8.62	8.58
104	895.71	893.09	2.62	8.61	8.59
105	903.69	900.13	3.55	8.61	8.57
106	911.64	909.48	2.16	8.60	8.58
107	919.58	916.02	3.57	8.59	8.56
108	927.50	925.24	2.26	8.59	8.57
109	935.41	931.72	3.68	8.58	8.55
110	943.29	940.64	2.65	8.58	8.55
111	951.16	947.62	3.54	8.57	8.54
112	959.01	957.01	2.00	8.56	8.54
113	966.84	963.55	3.29	8.56	8.53
114	974.65	972.59	2.06	8.55	8.53
115	982.44	979.40	3.04	8.54	8.52
116	990.22	988.68	1.54	8.54	8.52
117	997.98	995.62	2.35	8.53	8.51
118	1005.72	1004.95	0.77	8.52	8.52
119	1013.44	1011.43	2.01	8.52	8.50
120	1021.15	1020.54	0.61	8.51	8.50
121	1028.83	1026.71	2.12	8.50	8.49
122	1036.50	1035.52	0.98	8.50	8.49
123	1044.15	1042.10	2.05	8.49	8.47
124	1051.78	1050.69	1.10	8.48	8.47
125	1059.40	1057.27	2.12	8.48	8.46

126	1066.99	1066.37	0.62	8.47	8.46
127	1074.57	1072.66	1.91	8.46	8.45
128	1082.13	1081.44	0.69	8.45	8.45
129	1089.67	1088.24	1.42	8.45	8.44
130	1097.19	1096.91	0.29	8.44	8.44
131	1104.69	1103.51	1.19	8.43	8.42
132	1112.18	1112.45	-0.27	8.43	8.43
133	1119.65	1118.88	0.77	8.42	8.41
134	1127.10	1127.43	-0.34	8.41	8.41
135	1134.53	1134.18	0.35	8.40	8.40
136	1141.94	1142.77	-0.83	8.40	8.40
137	1149.34	1149.68	-0.34	8.39	8.39
138	1156.71	1158.29	-1.58	8.38	8.39
139	1164.07	1164.55	-0.47	8.37	8.38
140	1171.41	1172.69	-1.27	8.37	8.38
141	1178.74	1178.12	0.62	8.36	8.36
142	1186.04	1185.28	0.75	8.35	8.35
143	1193.32	1191.26	2.06	8.34	8.33
144	1200.59	1199.08	1.51	8.34	8.33
145	1207.84	1204.83	3.01	8.33	8.31
146	1215.07	1212.40	2.67	8.32	8.30
147	1222.28	1217.80	4.48	8.31	8.28
148	1229.47	1225.39	4.09	8.31	8.28
149	1236.65	1231.26	5.39	8.30	8.26
150	1243.81	1239.24	4.56	8.29	8.26
151	1250.95	1244.84	6.11	8.28	8.24
152	1258.07	1253.10	4.97	8.28	8.24
153	1265.17	1258.99	6.18	8.27	8.23
154	1272.25	1266.93	5.32	8.26	8.23
155	1279.32	1273.58	5.73	8.25	8.22
156	1286.36	1281.59	4.77	8.25	8.22
157	1293.39	1287.95	5.44	8.24	8.20
158	1300.40	1295.89	4.51	8.23	8.20
159	1307.39	1302.02	5.37	8.22	8.19
160	1314.37	1309.45	4.92	8.21	8.18
161	1321.32	1316.09	5.23	8.21	8.17
162	1328.26	1324.10	4.16	8.20	8.17
163	1335.17	1330.37	4.80	8.19	8.16
164	1342.07	1338.03	4.05	8.18	8.16
165	1348.95	1344.25	4.71	8.18	8.15
166	1355.82	1351.56	4.25	8.17	8.14
167	1362.66	1358.00	4.66	8.16	8.13
168	1369.49	1365.77	3.71	8.15	8.13
169	1376.29	1371.78	4.52	8.14	8.12
170	1383.08	1379.03	4.05	8.14	8.11
171	1389.85	1385.42	4.43	8.13	8.10
172	1396.60	1392.76	3.85	8.12	8.10
173	1403.34	1399.13	4.21	8.11	8.09
174	1410.05	1406.59	3.46	8.10	8.08
175	1416.75	1412.41	4.34	8.10	8.07
176	1423.43	1419.28	4.15	8.09	8.06

177	1430.09	1425.46	4.62	8.08	8.05
178	1436.73	1432.80	3.92	8.07	8.05
179	1443.35	1438.90	4.45	8.06	8.04
180	1449.95	1446.29	3.66	8.06	8.03
181	1456.54	1452.24	4.30	8.05	8.02
182	1463.11	1459.33	3.77	8.04	8.02
183	1469.65	1465.52	4.13	8.03	8.01
184	1476.18	1472.94	3.25	8.02	8.01
185	1482.70	1478.69	4.01	8.01	7.99
186	1489.19	1485.88	3.31	8.01	7.99
187	1495.66	1491.88	3.78	8.00	7.98
188	1502.12	1499.09	3.03	7.99	7.97
189	1508.56	1505.01	3.55	7.98	7.96
190	1514.98	1512.80	2.17	7.97	7.96
191	1521.38	1518.56	2.82	7.97	7.95
192	1527.76	1526.12	1.64	7.96	7.95
193	1534.12	1532.06	2.06	7.95	7.94
194	1540.47	1539.58	0.89	7.94	7.94
195	1546.79	1545.68	1.11	7.93	7.93
196	1553.10	1553.60	-0.50	7.92	7.93
197	1559.39	1559.45	-0.06	7.92	7.92
198	1565.66	1567.00	-1.34	7.91	7.91
199	1571.91	1573.48	-1.57	7.90	7.91
200	1578.14	1581.18	-3.03	7.89	7.91
201	1584.36	1587.41	-3.05	7.88	7.90
202	1590.56	1595.16	-4.61	7.87	7.90
203	1596.73	1601.16	-4.42	7.87	7.89
204	1602.89	1608.65	-5.76	7.86	7.89
205	1609.03	1615.07	-6.04	7.85	7.88
206	1615.16	1622.32	-7.17	7.84	7.88
207	1621.26	1629.06	-7.80	7.83	7.87
208	1627.34	1636.43	-9.09	7.82	7.87
209	1633.41	1640.37	-6.96	7.82	7.85
210	1639.46	1645.55	-6.09	7.81	7.84
211	1645.49	1649.97	-4.48	7.80	7.82
212	1651.50	1655.77	-4.27	7.79	7.81
213	1657.49	1660.13	-2.64	7.78	7.79
214	1663.46	1666.01	-2.55	7.77	7.79
215	1669.42	1670.16	-0.74	7.76	7.77
216	1675.35	1675.90	-0.55	7.76	7.76
217	1681.27	1680.58	0.69	7.75	7.74
218	1687.17	1687.05	0.12	7.74	7.74
219	1693.05	1691.51	1.55	7.73	7.72
220	1698.91	1697.79	1.12	7.72	7.72
221	1704.76	1702.42	2.34	7.71	7.70
222	1710.58	1708.66	1.92	7.71	7.70
223	1716.39	1713.82	2.56	7.70	7.69
224	1722.17	1720.30	1.87	7.69	7.68
225	1727.94	1725.21	2.74	7.68	7.67
226	1733.69	1731.60	2.09	7.67	7.66
227	1739.42	1736.71	2.72	7.66	7.65

228	1745.14	1743.08	2.06	7.65	7.65
229	1750.83	1748.33	2.50	7.65	7.63
230	1756.51	1755.13	1.38	7.64	7.63
231	1762.16	1760.25	1.92	7.63	7.62
232	1767.80	1766.69	1.12	7.62	7.62
233	1773.42	1771.93	1.49	7.61	7.60
234	1779.02	1778.57	0.46	7.60	7.60
235	1784.61	1783.86	0.74	7.59	7.59
236	1790.17	1790.41	-0.24	7.59	7.59
237	1795.71	1795.53	0.18	7.58	7.58
238	1801.24	1801.69	-0.45	7.57	7.57
239	1806.75	1806.97	-0.23	7.56	7.56
240	1812.24	1813.45	-1.21	7.55	7.56
241	1817.71	1818.69	-0.98	7.54	7.55
242	1823.16	1825.00	-1.84	7.53	7.54
243	1828.59	1830.03	-1.44	7.53	7.53
244	1834.01	1836.05	-2.04	7.52	7.52
245	1839.40	1841.36	-1.96	7.51	7.52
246	1844.78	1847.82	-3.04	7.50	7.51
247	1850.14	1852.98	-2.83	7.49	7.50
248	1855.48	1859.19	-3.71	7.48	7.50
249	1860.80	1864.02	-3.22	7.47	7.49
250	1866.11	1869.99	-3.88	7.46	7.48
251	1871.39	1875.09	-3.70	7.46	7.47
252	1876.65	1881.27	-4.61	7.45	7.47
253	1881.90	1886.07	-4.17	7.44	7.45
254	1887.13	1892.10	-4.97	7.43	7.45
255	1892.34	1896.64	-4.30	7.42	7.44
256	1897.53	1902.54	-5.01	7.41	7.43
257	1902.70	1907.50	-4.80	7.40	7.42
258	1907.86	1911.69	-3.84	7.39	7.41
259	1912.99	1906.33	6.66	7.39	7.36
260	1918.11	1909.07	9.04	7.38	7.34
261	1923.20	1923.93	-0.72	7.37	7.37
262	1928.28	1923.39	4.89	7.36	7.34
263	1933.34	1929.63	3.71	7.35	7.34
264	1938.38	1937.23	1.15	7.34	7.34
265	1943.41	1943.25	0.16	7.33	7.33
266	1948.41	1950.31	-1.90	7.32	7.33
267	1953.40	1956.31	-2.91	7.32	7.33
268	1958.36	1963.37	-5.01	7.31	7.33
269	1963.31	1968.54	-5.23	7.30	7.32
270	1968.24	1974.78	-6.54	7.29	7.31
271	1973.15	1979.66	-6.50	7.28	7.31
272	1978.04	1985.87	-7.83	7.27	7.30
273	1982.92	1990.44	-7.53	7.26	7.29
274	1987.77	1994.17	-6.40	7.25	7.28
275	1992.61	2000.08	-7.47	7.25	7.27
276	1997.42	2004.86	-7.44	7.24	7.26
277	2002.22	2009.64	-7.41	7.23	7.26
278	2007.00	2013.00	-6.00	7.22	7.24

279	2011.76	2019.40	-7.64	7.21	7.24
280	2016.50	2023.56	-7.06	7.20	7.23
281	2021.23	2028.82	-7.59	7.19	7.22
282	2025.93	2031.81	-5.88	7.18	7.21
283	2030.62	2038.45	-7.83	7.18	7.20
284	2035.29	2042.53	-7.24	7.17	7.19
285	2039.94	2047.73	-7.79	7.16	7.19
286	2044.57	2050.33	-5.77	7.15	7.17
287	2049.18	2057.22	-8.04	7.14	7.17
288	2053.77	2060.64	-6.87	7.13	7.16
289	2058.34	2066.06	-7.72	7.12	7.15
290	2062.90	2068.28	-5.38	7.11	7.13
291	2067.44	2075.12	-7.69	7.10	7.13
292	2071.95	2078.16	-6.21	7.10	7.12
293	2076.45	2083.52	-7.07	7.09	7.11
294	2080.93	2085.34	-4.41	7.08	7.09
295	2085.39			7.07	
296	2089.84			7.06	
297	2094.26			7.05	
298	2098.67			7.04	
299	2103.05			7.03	
300	2107.42			7.02	
301	2111.77			7.02	
302	2116.10			7.01	
303	2120.41			7.00	
304	2124.71			6.99	
305	2128.98			6.98	
306	2133.24			6.97	
307	2137.48			6.96	
308	2141.69			6.95	
309	2145.89			6.94	
310	2150.07			6.94	
311	2154.24			6.93	
312	2158.38			6.92	
313	2162.50			6.91	
314	2166.61			6.90	
315	2170.70			6.89	
316	2174.77			6.88	
317	2178.82			6.87	
318	2182.85			6.86	
319	2186.86			6.86	
320	2190.85			6.85	
321	2194.83			6.84	
322	2198.78			6.83	
323	2202.72			6.82	
324	2206.64			6.81	
325	2210.54			6.80	
326	2214.42			6.79	
327	2218.28			6.78	
328	2222.13			6.77	
329	2225.95			6.77	

330	2229.76			6.76	
331	2233.54			6.75	
332	2237.31			6.74	
333	2241.06			6.73	
334	2244.79			6.72	
335	2248.51			6.71	
336	2252.20			6.70	
337	2255.88			6.69	
338	2259.53			6.69	
339	2263.17			6.68	
340	2266.79			6.67	

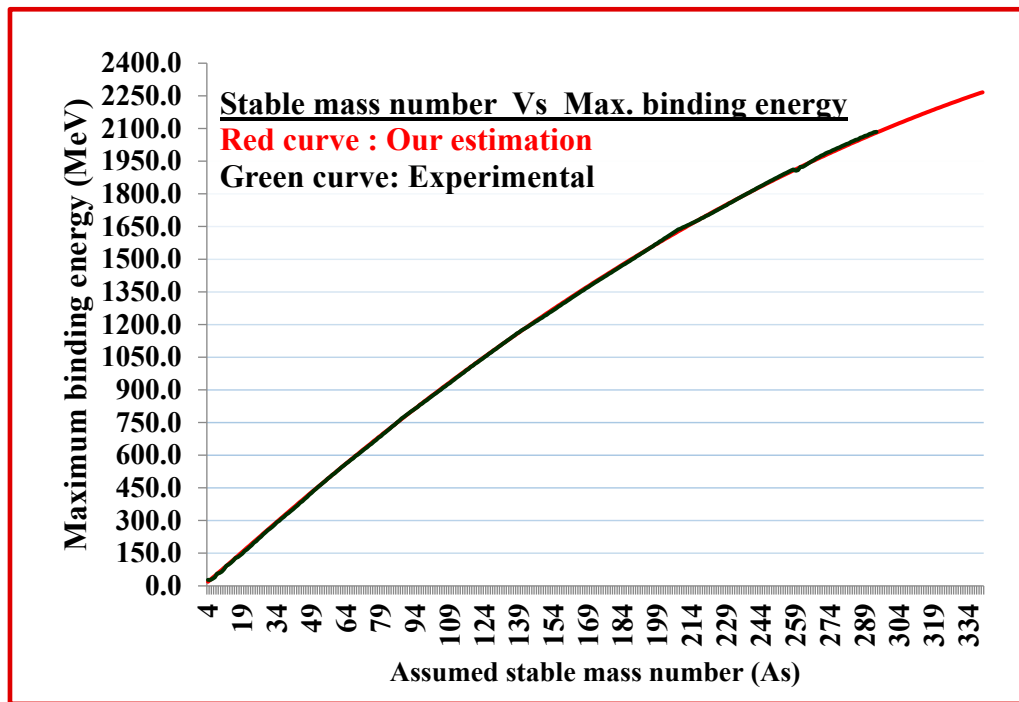


Figure 2. Assumed stable mass number Vs Maximum Binding Energy.

Even though our estimation is on lower side for $A=4$ and some other atomic nuclides, considering $A=5$ to 340, average of 'average binding energy per nucleon' is around 7.93 MeV. Thus, currently believed unified atomic mass unit [14] can be addressed with,

$$M_u c^2 \cong \left(\frac{m_n c^2 + m_p c^2}{2} \right) - \left\langle \frac{BE_{Max}}{A} \right\rangle_{Ave} + m_e c^2 \cong 931.51 \text{ MeV} \cong 1.6605494 \times 10^{-27} \text{ kg} \cdot c^2$$

$$\text{where, } \begin{cases} m_n c^2 = \text{Rest energy of neutron, } m_p c^2 = \text{Rest energy of proton} \\ m_e c^2 = \text{Rest energy of electron} \end{cases}$$

Avogadro number [14,39] can be addressed with 'inverse of the unified atomic mass unit' as,

$$N_A \cong (M_u)^{-1} \cong 6.0221034 \times 10^{26} \text{ atoms/kg} \cong 6.0221034 \times 10^{23} \text{ atoms/gram}$$

Thus, number of atoms per kg can be called as Kg-mole and number of atoms per gram can be called as gram-mole.

Atomic electrochemical equivalents (ECE) [40] can be expressed as,

$$ECE_{(A,v)} \cong \frac{AM_u}{ve} \text{ kg/C} \cong \left(\frac{A}{v} \right) \left(\frac{M_u}{e} \right) \text{ kg/C}$$

where A, v represent Atomic mass number and valency number respectively. It may be noted that,

$\left(\frac{M_u}{e}\right)$ can be called as 'Faraday mass'.

$$M_F \cong \frac{M_u}{e} \cong 1.0364334 \times 10^{-8} \text{ kg/C} \cong 1.0364334 \times 10^{-5} \text{ gram/C}.$$

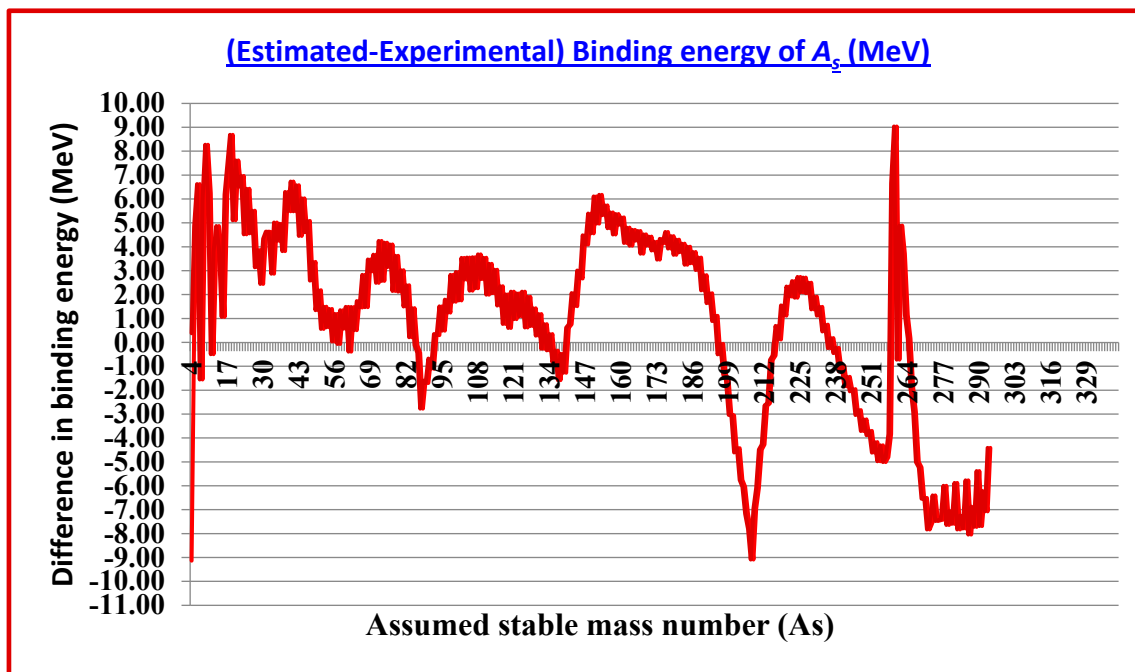


Figure 3. Difference in estimated and experimental binding Energy of As.

In a very simple view, ECE can be defined as the ratio of mass (AM_u) of the ion to the charge (ve) carried by the ion. See Table 3 for the estimated electrochemical equivalents. Readers are encouraged to refer and cross check at '<https://environmentalchemistry.com/yogi/periodic/>'.

Inverse of Faraday mass can be called as 'Faraday charge',

$$F_C \cong \frac{e}{M_u} \cong 96484731.7 \text{ C/kg} \cong 96484.732 \text{ C/gram}$$

With reference to Faraday mass, Planck mass $M_p \cong \sqrt{\hbar c / G_N}$ and weak coupling angle [13,14] $\text{Sin}^2 \theta_w$, we noticed a very strange relation,

$$\frac{G_N M_F^2}{\hbar c} \cong \text{Sin}^2 \theta_w \quad \text{and} \quad \frac{M_F^2}{M_p^2} \cong \text{Sin}^2 \theta_w$$

$$\frac{M_F}{M_p} \cong \text{Sin} \theta_w \quad \text{and} \quad M_F \cong \text{Sin} \theta_w M_p$$

This is a very simple relation and seems to connect gravity, weak interaction, electromagnetic interaction and quantum mechanics. It may be an accidental coincidence also. With reference to the recommended value of the Newtonian gravitational constant, obtained value of the weak coupling angle is $\text{Sin}^2 \theta_w \cong 0.2267732$. Even though its recommended value is 0.23122, based on the rest masses of neutral and charged weak bosons, its defined value is 0.22339. To a very good approximation, Newtonian gravitational constant can be expressed as,

$$G_N \cong \text{Sin}^2 \theta_w \left(\frac{\hbar c}{M_F^2} \right) \cong (6.574728 \text{ to } 6.8051776) \times 10^{-11} \text{ m}^3 \text{kg}^{-1} \text{sec}^{-2}$$

Table 3. Estimated atomic electrochemical equivalents.

Atomic No	Symbol	Element	Atomic Mass	Valence	Estimated ECE (kg/C)	Estimated ECE (gram/amp-hr)
1	H	Hydrogen	1.00797	1	1.04469E-08	0.03761
3	Li	Lithium	6.941	1	7.19388E-08	0.25898
4	Be	Beryllium	9.01218	2	4.67026E-08	0.16813
5	B	Boron	10.81	1	1.12038E-07	0.40334
6	C	Carbon	12.011	2	6.22430E-08	0.22407
7	N	Nitrogen	14.0067	3	4.83900E-08	0.17420
8	O	Oxygen	15.9994	2	8.29116E-08	0.29848
9	F	Fluorine	18.998403	1	1.96906E-07	0.70886
11	Na	Sodium	22.98977	1	2.38274E-07	0.85779
12	Mg	Magnesium	24.305	2	1.25953E-07	0.45343
13	Al	Aluminum	26.98154	3	9.32152E-08	0.33557
14	Si	Silicon	28.0855	4	7.27719E-08	0.26198
15	P	Phosphorus	30.97376	5	6.42045E-08	0.23114
16	S	Sulfur	32.06	4	8.30701E-08	0.29905
17	Cl	Chlorine	35.453	1	3.67447E-07	1.32281
19	K	Potassium	39.0983	1	4.05228E-07	1.45882
20	Ca	Calcium	40.08	2	2.07701E-07	0.74772
21	Sc	Scandium	44.9559	3	1.55313E-07	0.55913
22	Ti	Titanium	47.9	4	1.24113E-07	0.44681
23	V	Vanadium	50.9415	5	1.05595E-07	0.38014
24	Cr	Chromium	51.996	6	8.98173E-08	0.32334
25	Mn	Manganese	54.938	7	8.13423E-08	0.29283
26	Fe	Iron	55.847	2	2.89408E-07	1.04187
27	Co	Cobalt	58.7	2	3.04193E-07	1.09510
28	Ni	Nickel	58.6934	2	3.04159E-07	1.09497
29	Cu	Copper	63.546	2	3.29306E-07	1.18550
30	Zn	Zinc	65.38	2	3.38810E-07	1.21972
31	Ga	Gallium	69.72	3	2.40867E-07	0.86712
32	Ge	Germanium	72.59	4	1.88087E-07	0.67711
33	As	Arsenic	74.9216	3	2.58837E-07	0.93181
34	Se	Selenium	78.96	4	2.04592E-07	0.73653
35	Br	Bromine	79.904	1	8.28152E-07	2.98135
37	Rb	Rubidium	85.4678	1	8.85817E-07	3.18894
38	Sr	Strontium	87.62	2	4.54061E-07	1.63462
39	Y	Yttrium	88.9059	3	3.07150E-07	1.10574
40	Zr	Zirconium	91.22	4	2.36359E-07	0.85089
41	Nb	Niobium	92.9064	5	1.92583E-07	0.69330
42	Mo	Molybdenum	95.94	4	2.48589E-07	0.89492
43	Tc	Technetium	98	7	1.45101E-07	0.52236
44	Ru	Ruthenium	101.07	3	3.49174E-07	1.25703
45	Rh	Rhodium	102.9055	3	3.55516E-07	1.27986
46	Pd	Palladium	106.4	2	5.51383E-07	1.98498
47	Ag	Silver	107.868	1	1.11798E-06	4.02473
48	Cd	Cadmium	112.41	2	5.82527E-07	2.09710
49	In	Indium	114.82	3	3.96678E-07	1.42804
50	Sn	Tin	118.69	4	3.07536E-07	1.10713
51	Sb	Antimony	121.75	3	4.20619E-07	1.51423
52	Te	Tellurium	126.9045	4	3.28820E-07	1.18375

53	I	Iodine	127.6	1	1.32249E-06	4.76096
55	Cs	Cesium	132.9054	1	1.37748E-06	4.95891
56	Ba	Barium	137.33	2	7.11667E-07	2.56200
57	La	Lanthanum	138.9055	3	4.79888E-07	1.72760
58	Ce	Cerium	140.12	3	4.84083E-07	1.74270
59	Pr	Praseodymium	140.9077	3	4.86805E-07	1.75250
60	Nd	Neodymium	144.24	3	4.98317E-07	1.79394
61	Pm	Promethium	145	3	5.00943E-07	1.80339
62	Sm	Samarium	150.4	3	5.19599E-07	1.87056
63	Eu	Europium	151.96	3	5.24988E-07	1.88996
64	Gd	Gadolinium	157.25	3	5.43264E-07	1.95575
65	Tb	Terbium	158.9254	3	5.49052E-07	1.97659
66	Dy	Dysprosium	162.5	3	5.61401E-07	2.02105
67	Ho	Holmium	164.9304	3	5.69798E-07	2.05127
68	Er	Erbium	167.26	3	5.77846E-07	2.08025
69	Tm	Thulium	168.9342	3	5.83630E-07	2.10107
70	Yb	Ytterbium	173.04	3	5.97815E-07	2.15213
71	Lu	Lutetium	174.967	3	6.04472E-07	2.17610
72	Hf	Hafnium	178.49	4	4.62482E-07	1.66494
73	Ta	Tantalum	180.9479	5	3.75081E-07	1.35029
74	W	Tungsten	183.85	6	3.17580E-07	1.14329
75	Re	Rhenium	186.207	7	2.75702E-07	0.99253
76	Os	Osmium	190.2	4	4.92824E-07	1.77417
77	Ir	Iridium	192.22	4	4.98058E-07	1.79301
78	Pt	Platinum	195.09	4	5.05494E-07	1.81978
79	Au	Gold	196.9665	3	6.80476E-07	2.44971
80	Hg	Mercury	200.59	2	1.03949E-06	3.74217
81	Tl	Thallium	204.37	1	2.11816E-06	7.62537
82	Pb	Lead	207.2	2	1.07375E-06	3.86548
83	Bi	Bismuth	208.9804	3	7.21981E-07	2.59913
84	Po	Polonium	208.9824	2	1.08298E-06	3.89873
85	At	Astatine	209.9871	1	2.17638E-06	7.83496
87	Fr	Francium	223	1	2.31125E-06	8.32049
88	Ra	Radium	226.0254	2	1.17130E-06	4.21668
89	Ac	Actinium	227.0278	3	7.84331E-07	2.82359
90	Th	Thorium	232.0381	4	6.01230E-07	2.16443
91	Pa	Protactinium	231.0359	5	4.78907E-07	1.72406
92	U	Uranium	238.0289	6	4.11169E-07	1.48021
93	Np	Neptunium	237.0482	5	4.91369E-07	1.76893

7. Conclusion

By following our 4G model of final unification, there is a scope for understanding and estimating the values of Unified atomic mass unit, Avogadro number and Electrochemical equivalents. We humbly appeal the science community to recommend our views for further research.

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