4G model of fractional charge strong-weak super symmetry

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Abstract: To understand the mystery of final unification, in our earlier publications, we proposed that, 1) There exist three atomic gravitational constants associated with electroweak, strong and electromagnetic interactions; and 2) There exists a strong interaction elementary charge (e_s) in such a way that, it's squared ratio with normal elementary charge is close to inverse of the strong coupling constant. In this context, starting from lepton rest masses to stellar masses, we have developed many interesting and workable relations. We noticed that, electroweak field seems to be operated by a primordial massive fermion of rest energy 585 GeV. It can be considered as the zygote of all elementary particles and galactic dark matter. Proceeding further, with a characteristic fermion-boson mass ratio of 2.27, quarks can be classified into quark fermions and quark bosons. Considering strong charge conservation and electromagnetic charge conservation, fractional charge quark fermions and quark bosons can be understood. Quark fermions that generate observable massive baryons can be called as Fluons. Quark bosons that generate observable mesons can be called as Bluons. By considering a new hadronic fermion of rest energy 103.4 GeV, rest masses of fluons and bluons can be estimated and there by baryon masses and meson masses can be estimated.

Key words: Four gravitational constants; Super symmetry; strong charge; strong coupling constant; quark fermions, quark bosons, fluons; bluons; baryons; mesons;

Nomenclature	
1) Newtonian gravitational constant = G_N	24) Mean stable mass number = A_m
2) Electromagnetic gravitational constant = G_e	25) Nuclear binding energy = $B_{(A,Z)}$
3) Nuclear gravitational constant = G_s	26) Nuclear binding energy coefficient = B_0
4) Weak gravitational constant = G_w	27) Coefficients connected with nuclear stability and binding energy = (k_1, k_2)
5) Fermi's weak coupling constant = G_F	28) Mass limit of stellar object = M_X
6) New electroweak fermion = M_{wf}	29) Characteristic ratio associated with charged leptons = $\sqrt{\frac{4\pi\varepsilon_0 G_e m_e^2}{e^2}} \cong \gamma$
7) New electroweak boson = M_{wb}	30) Mass of charged baby lepton= $(m_{xl})^{\pm}$
8) Reduced Planck's constant = $\hbar$	31) Neutron life time = t_n
9) Speed of light = c	32) Mass of basic quark = m_q
10) Strong coupling constant = α_s	33) SUSY Fermion-boson mass ratio = Ψ
11) Elementary charge = e	34) Mass of quark fermion = m_{qf}
12) Strong elementary charge = e_s	35) Mass of quark boson = m_{qb}
13) Mass of proton = m_p	36) Baryon mass generator = M_{hf}
14) Mass of neutron = m_n	37) Meson mass generator = M_{hb}
15) Mass of electron = m_e	38) Mass of Fluon = M_{qf}
16) Mass of Up quark = m_u	39) Mass of Bluon = M_{qb}
17) Mass of Down quark = m_d	40) Mass of neutral electroweak boson = M_Z
18) Bohr Radius = a_0	41) Mass of charged electroweak boson = M_W
19) Schwarzschild radius of $m_p = R_p$	42) Mass of neutral Higg's boson = M_H
20) Nuclear charge radius = $R_{(Z,A)}$	
21) Schwarzschild radius of $M_w = R_w$	
22) Schwarzschild radius of $m_e = R_e$	
23) Schwarzschild radius of atom = R_{atom}	

1. Introduction

Even though celestial objects that show gravity are confirmed to be made up of so many atoms, so far scientists could not find any relation in between gravity and the atomic interactions at quantum gravity level [1,2]. Black hole temperature point of view [3], strong interaction point of view [4-7] and electroweak interaction point of view [8], scientists found very interesting similarities in between gravity and quantum phenomena. Quantum cosmology point of view [9] and nuclear quantum gravity point of view [10-20], authors could develop workable ideas, concepts and relations. On a whole, workability is still lagging. It clearly indicates that, there is something wrong in our notion of understanding or there is something missing in developing the unified physical concepts and needs a critical review at fundamental level. In this context, we hope that, electroweak scale [21,22,23] can certainly yield useful stuff.

2. Motivating concepts

To develop new and workable ideas, we wish to highlight the following points.

1) During cosmic evolution, if one is willing to give equal importance to Higgs boson and Planck mass in understanding the massive origin of elementary particles and observed matter [24,25], then it seems quite logical to expect a common relation in between Planck scale and Electroweak scale.
2) Whether particle's massive nature is due to electromagnetism or gravity or weak interaction or strong interaction or cosmic dust or dark matter [26] or something else, is unclear.
3) Without understanding the massive nature, it is not reasonable to classify the field created by any elementary particle.
4) All the four interactions seem to be associated with $(\hbar)$.
5) Nobody knows the mystery of $(\hbar)$ which seems to be a basic measure of angular momentum [27,28,29,30].
6) Nobody knows the mystery of existence, stability and behavior of 'proton' or 'electron'.
7) 'Mass' is a basic property of space-time curvature and basic ingredient of angular momentum.
8) Atoms are mainly characterized by protons and electrons.
9) 'Free neutron' is an unstable particle.

3. Basic assumptions

1) There exists a characteristic electroweak fermion of rest energy [18], $M_{wf}c^2 \cong 584.725$ GeV.
2) M_{wf} can be considered as the zygote of all elementary particles.
3) Fermi's weak coupling constant (G_F) [29,30,31] can be considered as the basic unified coupling constant.
4) There exists a strong interaction elementary charge (e_s) in such a way that, it's squared ratio with normal elementary charge is close to inverse of the strong coupling constant.
5) Each atomic interaction is associated with a characteristic gravitational coupling constant.

$$
\begin{aligned}
G_e &\cong 2.374335\times10^{37}\ \text{m}^3\text{kg}^{-1}\text{sec}^{-2}\\
G_s &\cong 3.329561\times10^{28}\text{m}^3\text{kg}^{-1}\text{sec}^{-2}\\
G_w &\cong 2.909745\times10^{22}\ \text{m}^3\text{kg}^{-1}\text{sec}^{-2}\\
G_N &\cong 6.679855\times10^{-11}\ \text{m}^3\text{kg}^{-1}\text{sec}^{-2}
\end{aligned}
$$

4. Characteristic unified relations

Based on the above points, we propose the following new and workable relations.

$$
\begin{aligned}
&\hbar c \cong G_w M_{wf}^2 \cong \sqrt{G_F\left(\frac{c^4}{4G_w}\right)}\\
&\Rightarrow \hbar \cong \frac{G_w M_{wf}^2}{c} \cong \sqrt{\frac{G_F c^2}{4G_w}}
\end{aligned}
\tag{1}
$$

where $\left(\frac{c^4}{4G_w}\right) \cong 6.9401\times10^{10}$ N is the characteristic force associated with electroweak interaction.

$$
m_e \cong \left(\frac{G_w}{G_s}\right)M_{wf} \tag{2}
$$

$$
m_p \cong \left(\frac{G_s}{G_w}\right)\left(\frac{G_s}{G_e}\right)M_w \cong \left(\frac{G_s^2}{G_w G_e}\right)M_{wf} \tag{3}
$$

$$\frac{m_p}{m_e} \cong \frac{G_s^3}{G_w^2 G_e} \tag{4}$$

5. Specific unified relations connected with (G_e, G_s, G_w, G_N)

With reference to Newtonian gravitational constant [32-39],

$$\left(\frac{m_p}{m_e}\right)^{10} \cong \left(\frac{G_w}{G_N}\right) \tag{5}$$

$$\exp\left(\frac{1}{\alpha_s^2}\right) \cong \left(\frac{G_w}{G_N}\right) \tag{6}$$

where α_s=Strong coupling constant [29,31]

$$\frac{m_p}{m_e} \cong \left(\frac{G_s}{G_e^{1/3} G_N^{2/3}}\right)^{1/7} \tag{7}$$

$$\frac{M_{wf}}{m_e} \cong \frac{G_w^{5/2} G_e^{5/3}}{G_s^4 G_N^{1/6}} \tag{8}$$

$$\frac{M_{wf}}{m_p} \cong \frac{G_s^{1/2} G_e^{1/6} G_N^{1/12}}{G_w^{3/4}} \tag{9}$$

$$\frac{m_p}{m_e} \cong \frac{G_w^{13/4} G_e^{3/2}}{G_s^{9/2} G_N^{1/4}} \tag{10}$$

Based on these relations,

$$G_N \cong \left(\frac{m_e}{m_p}\right)^4 \frac{G_w^{13} G_e^6}{G_s^{18}} \tag{11}$$

Based on the nuclear experiments and astrophysical observations,

1) (G_w) can be estimated from relation (1).
2) (G_s) can be estimated from relations (12-14).
3) (G_e) can be estimated from relation (30).

6. Specific unified relations connected with nuclear radius and Bohr radius

Characteristic Schwarzschild radius of proton and Schwarzschild radius of atom can be addressed with the following relations.

$$R_p \cong \frac{2G_s m_p}{c^2} \cong 1.2393 \text{ fm} \tag{12}$$

= Characteristic nuclear charge radius [40,41]

$$R_{(Z,A)} \cong \left\{Z^{1/3} + \left(\sqrt{Z(A-Z)}\right)^{1/3}\right\}\left(\frac{G_s m_p}{c^2}\right) \tag{13}$$

= Nuclear charge radius [42]

$$a_0 \cong \left(\frac{4\pi\varepsilon_0 G_e m_e^2}{e^2}\right)\left(\frac{G_s m_p}{c^2}\right) \cong 5.2918\times10^{-11} \text{ m} \tag{14}$$

= Bohr radius of Hydrogen atom [28]

7. Specific unified relations connected with proton-electron mass ratio

With reference to electroweak interaction,

$$R_w \cong \frac{2G_w M_{wf}}{c^2} \cong 6.7494\times10^{-19} \text{ m} \tag{15}$$

= Schwarzschild radius of M_w

$$\frac{R_p}{R_w} \cong \left(\frac{2G_s m_p}{c^2}\right) \div \left(\frac{2G_w M_{wf}}{c^2}\right) \cong \frac{G_s m_p}{G_w M_{wf}} \cong \left(\frac{m_p}{m_e}\right) \tag{16}$$

With reference to $R_w \cong 6.7494\times10^{-19}$ m and cconsidering $\left(\frac{m_p}{m_e}\right)$ as a geometric ratio, nuclear radius and atomic radius can be estimated in the following way.

$$R_1 \cong \left(\frac{m_p}{m_e}\right)\left(\frac{2G_w M_{wf}}{c^2}\right) \cong 1.2393 \text{ fm} \tag{17}$$

$$R_2 \cong \left(\frac{m_p}{m_e}\right)^2 \left(\frac{2G_w M_{wf}}{c^2}\right) \cong 2.275 \text{ pm} \tag{18}$$

With reference to electromagnetic gravitational constant, Schwarzschild radius of electron can be addressed with,

$$R_e \cong \left(\frac{2G_e m_e}{c^2}\right) \cong 0.48 \text{ nm} \tag{19}$$

Based on relations (17) and (18) and identifying R_2 and R_e as characteristic length scales associated with characteristic atomic radius, we noticed that,

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$$\sqrt{R_2 R_e} \cong \left(\frac{2\sqrt{G_e G_s} m_p}{c^2}\right) \cong 33.1 \text{ pm} \tag{20}$$
$$\cong R_{atom} \cong \text{Scwarzschild radius of atom [43]}$$

8. Specific unified relations connected with strong coupling constant

There exists a strong elementary charge (e_s) in such a way that,

$$\left.\begin{aligned} \frac{m_p}{m_e} &\cong \left(\frac{G_s m_p^2}{\hbar c}\right)\left(\frac{G_e m_e^2}{\hbar c}\right) \\ &\cong \left(\frac{e_s^2}{4\pi\varepsilon_0 G_s m_p^2}\right)\Big/\left(\frac{e^2}{4\pi\varepsilon_0 G_e m_e^2}\right) \end{aligned}\right\} \tag{21}$$

$$\rightarrow \left\{\begin{aligned} \frac{e_s^2}{e^2} &\cong \left(\frac{G_s m_p^3}{G_e m_e^3}\right) \cong \left(\frac{G_s m_p^2}{\hbar c}\right)^2 \cong \frac{1}{\alpha_s} \\ \frac{e_s}{e} &\cong \sqrt{\frac{G_s m_p^3}{G_e m_e^3}} \cong \left(\frac{G_s m_p^2}{\hbar c}\right) \cong \sqrt{\frac{1}{\alpha_s}} \end{aligned}\right\} \tag{22}$$

where, $\alpha_s \cong$ Strong coupling constant

Based on these relations,

$$\boxed{e_s \cong 2.9463591e,\ \alpha_s \cong 0.1151937 \quad \text{and } \frac{1}{\alpha_s} \cong 8.681032}$$

9. Specific unified relations connected with nuclear stability and binding energy

Nuclear mean stability and binding energy [44,45] can be understood with the following two relations.

Nuclear mean stability can be understood with,

$$\left.\begin{aligned} &(A_s)_{mean} \cong A_m \cong 2Z + k_1 Z^2 \\ &\text{where } \left\{\begin{aligned} &k_1 \cong 4\left(\frac{G_s^2}{G_e G_w}\right) \cong 4\left(\frac{m_p}{M_{wf}}\right) \\ &\cong 0.0064185 \end{aligned}\right. \end{aligned}\right\} \tag{23}$$

Nuclear binding energy can be understood with,

$$B_{(A,Z)} \cong \left\{\begin{aligned} &\left(1 - k_2\sqrt{ZN}\right)A - A^{1/3} \\ &-\left(1 + \frac{(A_m - A)^2}{A_m}\right) \end{aligned}\right\}(B_0 \cong 10.1 \text{ MeV}) \tag{24}$$

$$\left.\begin{aligned} &\text{where, } k_2 \cong 2\sqrt{\frac{G_w}{G_s}} \cong 2\sqrt{\frac{m_e}{M_{wf}}} \cong 0.00189 \\ &B_0 \cong \left(\frac{1}{\alpha_s}\right)\frac{e^2}{4\pi\varepsilon_0 R_0} \cong \frac{e_s^2}{4\pi\varepsilon_0 R_0} \end{aligned}\right\}$$

Note-: The numbers $(k_1 \text{ and } k_2)$ can be considered as the characteristic outcomes of the combined effect of strong and electromagnetic coupling constants. With trial-error method, we noticed that,

$$(k_1,\ k_2) \cong \left(\frac{(1-\alpha_s)^n}{2n-1}\right)\alpha \cong (0.00646, 0.0019043)$$

where $n \cong 1, 2$ and $\alpha_s \cong 0.1152$. It needs further study.

10. Specific unified relations connected with stellar mass limits

With reference to strong nuclear gravitational constant and astro-physics point of view [14, 16], by considering nucleon as a characteristic building block, stellar mass limit [46,47] can be understood with a relation of the form,

$$\frac{G_N M_X}{G_s m_n} \cong \sqrt{\frac{G_s}{G_N}} \tag{25}$$

Thus, characteristic stellar mass limit can be estimated with a very simple relation of the form,

$$M_X \cong \left(\frac{G_s}{G_N}\right)^{\frac{3}{2}} (m_n) \cong 9.37 \text{ solar masses} \tag{26}$$

Another interesting relation is,

$$\frac{G_N M_X}{G_s\sqrt{m_n M_{wf}}} \cong \sqrt{\frac{G_s}{G_N}} \tag{27}$$

$$M_X \cong \left(\frac{G_s}{G_N}\right)^{\frac{3}{2}} \sqrt{m_n M_{wf}} \cong 234 \text{ solar masses} \tag{28}$$

With reference to electromagnetic gravitational constant, mass limits of super massive stellar objects can be understood.

11. Applications of G_e in elementary particle physics and astrophysics

A) Understanding the recently observed 3.5 keV galactic photon

Recent galactic X-ray [48,49] studies strongly confirm the existence of a new photon of energy 3.5 keV. So far, its origin is unknown and unclear. In this context, we propose the following alternative mechanism for understanding the origin of 3.5 keV photon.

1) There exists a characteristic charged baby lepton of rest mass,

$$\left(m_{xl}\right)^{\pm} \cong \sqrt{\frac{e^2}{4\pi\varepsilon_0 G_e}} \cong 1.75\ \text{keV}/c^2 \qquad (29)$$

2) With pair annihilation mechanism, $\left(m_{xl}\right)$ generates a photon of rest energy 3.5keV
3) With current and future particle accelerators, $\left(m_{xl}\right)^{\pm} \cong 1.75\ \text{keV}/c^2$ can be generated.

B) Fitting Muon and Tau rest masses

Experimentally observed [29] Muon and Tau rest masses can be fitted in the following way.

$$m_{(\mu,\tau)}c^2 \cong \left[\gamma^3 + \left(n^2\gamma\right)^n \left(\frac{G_e}{G_N}\right)^{1/4}\right]^{\frac{1}{3}} 1.75\ \text{keV} \qquad (30)$$

where,

$\gamma \cong \sqrt{\frac{4\pi\varepsilon_0 G_e m_e^2}{e^2}} \cong 292.187$ and $n = 1$ and 2

For $n=1$, obtained $m_\mu c^2 \cong 106.5$ MeV

$n=2$, obtained $m_\tau c^2 \cong 1781.5$ MeV.

At $n=3$, a new heavy charged lepton of rest energy 42.2 GeV can be predicted.

12. Understanding neutron life time with $\left(G_e, G_w\right)$

One of the key objectives of any unified description is to simplify or eliminate the complicated issues of known physics. Neutron life estimation is one of such complicated issue [29,50,51]. In this context, in our earlier publications [20,52], we proposed the following relations.

$$\left.\begin{aligned} t_n &\cong \left(\frac{G_e}{G_w}\right)\left(\frac{G_e m_n^2}{\left(m_n - m_p\right)c^3}\right) \\ &\cong \left(\frac{G_e^2 m_n^2}{G_w\left(m_n - m_p\right)c^3}\right) \cong 874.94\ \text{sec} \end{aligned}\right\} \qquad (31)$$

Plausible point to be noted is that, relativistic mass of neutron seems to play a crucial role in understanding the increasing neutron life time. It can be understood with,

$$t_n \propto \frac{m_n^2}{\left[1-\left(v^2/c^2\right)\right]} \quad \text{and} \quad t_n \cong \frac{874.94\ \text{sec}}{\left[1-\left(v^2/c^2\right)\right]} \qquad (32)$$

In this way, bottle method [50] and beam method [51] of neutron life time experiments can be correlated with confined and moving neutrons.

13. Quark fermions, quark bosons, fluons and bluons

With reference to our earlier publications on Super Symmetry [53,54,55,56], we propose the following concepts.

A) Quark charge spectrum with respect to Super Symmetry (SUSY)

1) Strong coupling constant plays a vital role in hadron mass generation.
a) There exists a strong interaction elementary charge $\left(e_s\right)$ in such a way that, $e_s/e \cong \sqrt{1/0.1152} \cong 2.9463 \approx 3$ and $e_s \approx 3e$.
b) With reference to the integral nature of e, splitting of e_s can be visualized as

$$\left.\begin{aligned} &\pm e_s \to \left(\pm e \text{ and } \pm 2e\right) \\ &\Rightarrow \pm e = \pm\left(\frac{1}{3}e_s\right) \text{ and } \pm 2e = \pm\left(\frac{2}{3}e_s\right) \end{aligned}\right\}$$

2) Currently believed basic quarks can be represented by the symbol $\left(m_q\right)$ with no second letter in the subscript.
3) Basic quarks can be classified into quark fermions and quark bosons.
4) Mass fraction gained by a quark under super symmetry can be called as 'Quark boson' and can be represented by $\left(m_{qb}\right)$.

5) Effective quark that lost its fraction of mass to its corresponding boson can be called as 'quark fermion' and can be represented by (m_{qf}).
6) Quark fermion - boson mass ratio is very close to $\Psi \cong \ln\left(1+\frac{1}{\alpha_s}\right) \cong 2.27$ where, $\alpha_s \cong 0.1152$.
7) Quark boson mass can be represented by $m_{qb} \cong \frac{m_q}{\Psi} \cong \frac{m_q}{2.27} \cong 0.4405 m_q$.
8) Quark fermion mass can be represented by
$$\left.\begin{array}{l} m_{qf} \cong m_q - m_{qb} \cong m_q - \frac{m_q}{\Psi} \\ \cong \left(1-\frac{1}{2.27}\right)m_q \cong 0.5595 m_q \end{array}\right\}$$
9) At any level and at any state, if any quark splits into quark fermion and quark boson, due to its heavy mass fraction of $0.5595 m_q$, quark fermion carries a strong charge of magnitude $\pm\left(\frac{2}{3}e_s\right) \cong \pm 2e$. Due to its little mass fraction of $0.4405 m_q$, quark boson carries a strong charge of magnitude $\pm\left(\frac{1}{3}e_s\right) \cong \pm e$.
10) Independent of its level, at any *state*, strong charge is conserved. Clearly speaking, sum of quark fermion charge and quark boson charge $= \left[\pm\left(\frac{2}{3}e_s\right)\right]+\left[\pm\left(\frac{1}{3}e_s\right)\right] \cong \pm 3e \cong \pm e_s$.
11) At any level, if lower state is assumed to have quark fermions of charge $\mp\left(\frac{1}{3}e_s\right)$, then corresponding state quark bosons can have a charge of $\mp\left(\frac{2}{3}e_s\right)$.
12) At any level, if upper state is assumed to have quark fermions of charge $\pm\left(\frac{2}{3}e_s\right)$, then corresponding state quark bosons can have a charge of $\pm\left(\frac{1}{3}e_s\right)$.
13) At any *level*, electromagnetic charge is conserved. Clearly speaking, charge sum of the two states should always be $\pm\left(\frac{1}{3}e_s\right) \cong \pm e$.
14) Up and Down quarks can be considered as first level upper and lower states. At first level,
a) Upper state, Up fermion will have a charge of $\pm\left(\frac{2}{3}e_s\right)$ and Up boson will have a charge of $\pm\left(\frac{1}{3}e_s\right)$.
b) Lower state, Down fermion will have a charge of $\mp\left(\frac{1}{3}e_s\right)$ and Down boson will have a charge of $\mp\left(\frac{2}{3}e_s\right)$.
15) Charm and Strange quarks can be considered as second level upper and lower states. At second level,
a) Upper state, Charm fermion will have a charge of $\pm\left(\frac{2}{3}e_s\right)$ and Charm boson will have a charge of $\pm\left(\frac{1}{3}e_s\right)$.
b) Lower state, Strange fermion will have a charge of $\mp\left(\frac{1}{3}e_s\right)$ and Strange boson will have a charge of $\mp\left(\frac{2}{3}e_s\right)$.
16) Top and Bottom quarks can be considered as third level upper and lower states. At third level,
a) Upper state, Top fermion will have a charge of $\pm\left(\frac{2}{3}e_s\right)$ and Top boson will have a charge of $\pm\left(\frac{1}{3}e_s\right)$.
b) Lower state, Bottom fermion will have a charge of $\mp\left(\frac{1}{3}e_s\right)$ and Bottom boson will have a charge of $\mp\left(\frac{2}{3}e_s\right)$.

B) Quark mass spectrum with respect to SUSY

1) Up, Strange and Bottom quarks are in a geometric series with a geometric ratio,
$$\left.\begin{array}{l} r_{ug} \cong \left(\frac{x(x+1)}{x-1}\right)^2 \cong (5.8836)^2 \cong 34.617 \\ \text{where, } x \cong \ln\left(\frac{1}{\alpha_s}\right) \cong 2.1611 \end{array}\right\}$$

2) Down, Charm and Top quarks are in another geometric series with a geometric ratio, $\left\{ \begin{array}{l} r_{dg} \cong \left(\frac{2x(x+1)}{x-1} \right)^2 \cong 4r_{ug} \\ 4\times(5.8836)^2 \cong 138.468 \end{array} \right\}$
3) Up quark mass can be estimated with $m_u \cong \left(\frac{1}{\alpha_s} \right) \times m_e c^2 \cong 4.436$ MeV.
4) Down quark mass can be estimated with $m_d \cong x \times m_u c^2 \cong 9.586$ MeV.
5) There exists a massive fermion of rest energy $\left(M_{hf}c^2\right)^{\pm} \cong 103.4$ GeV. It can be called as 'baryon mass generator' and needs a formula for its estimation. Roughly, it can be related with the following empirical relation, $\left\{ \begin{array}{l} M_{hf} \cong \left(\frac{e_s}{e}\right)^2 * \left(M_{wf}^2 m_{uf}\right)^{\frac{1}{3}} \\ \cong 9*\left(M_{wf}^2 m_{uf}\right)^{\frac{1}{3}} \cong 103.403 \text{ GeV} \end{array} \right\}$
6) Quark fermions that generate observable massive baryons can be called as 'Fluons'. They can be represented by (M_{qf}).
7) Fluons rest mass can be estimated with a relation of the form, $M_{qf} \cong \frac{1}{2x}\left[m_{qf} \times M_{hf}^2\right]^{\frac{1}{3}}$ where $\frac{1}{2x} \cong \sin^2\theta_W \cong 0.23137$.
8) Obeying the concept of 'fractional quark charge', there exist two kinds of ground state baryons.
9) Type-1 ground state baryons can be addressed with $\left(M_{qf1} \times M_{qf2} \times M_{qf3}\right)^{\frac{1}{3}}$ where $\left(M_{qf1}, M_{qf2} \textit{ and } \mathrm{M}_{qf3}\right)$ represent any three fluons.
10) Type-2 ground state baryons can be addressed with $\left(M_{qf1}^2 \times M_{qf2}\right)^{\frac{1}{3}}$ where $\left(M_{qf1} \text{ and } M_{qf2}\right)$ represent any two fluons.
11) There exist two basic types of excited levels. They can be called as 'fine rotational levels' and 'super fine rotational levels'.
12) Fine rotational levels of ground state baryons can be represented by, $\left[I = n(n+1)\right]^{\frac{1}{4}}$ or $\left[I/2 = n(n+1)/2\right]^{\frac{1}{4}}$ where $n = 1,2,3,..$
13) Super fine rotational levels of ground state baryons can be represented by $\left[I = n(n+1)\right]^{\frac{1}{12}}$ or $\left[I/2 = n(n+1)/2\right]^{\frac{1}{12}}$ where $n = 1,2,3,..$
14) Fine rotational levels seem to be associated with nucleons at low energy scales and super fine rotational levels seem to be associated with fluons and bluons. It needs further study.
15) There exists a massive boson of rest energy $\left(M_{hb}c^2\right)^{\pm} \cong \frac{103.403 \text{ GeV}}{2.27} \simeq 45.552$ GeV. It can be called as 'meson mass generator'.
16) Quark bosons that generate observable mesons can be called as 'Bluons'. They can be represented by (M_{qb}).
17) Bluons rest mass can be estimated with a relation of the form, $M_{qb} \cong \frac{1}{2x}\left[m_{qb} \times M_{hb}^2\right]^{\frac{1}{3}}$.
18) Obeying the concept of 'fractional quark charge', mesons can be understood in three different ways and needs further in depth study.
19) Type-1 ground state mesons can be addressed with $\left(M_{qb1} + M_{qb2}\right)$ or $\sqrt{M_{qb1}M_{qb2}}$ where $\left(M_{qb1} \text{ and } M_{qb2}\right)$ represent any two bluons.
20) Type-2 ground state mesons can be addressed with $\left(M_{qf1} \times M_{qf2} \times M_{qf3}\right)^{\frac{1}{3}} / 2.27$ or $\left(M_{qf1}^2 \times M_{qf2}\right)^{\frac{1}{3}} / 2.27$. It needs a review.
21) Super fine rotational levels of ground state mesons can be represented by $\left[I = n(n+1)\right]^{\frac{1}{12}}$ or $\left[I/2 = n(n+1)/2\right]^{\frac{1}{12}}$ where $n = 1,2,3,..$

C) Quark mass and charge spectrum

See the following tables pertaining to quark masses and charges.

Table-1: Basic quark masses and strong charge

Basic quark	(m_q) Mass (MeV)	Strong Charge
Up	4.44	$\pm e_s = \pm 3e$
Down	9.59	$\pm e_s = \pm 3e$
Strange	153.55	$\pm e_s = \pm 3e$
Charm	1327.36	$\pm e_s = \pm 3e$
Bottom	5315.50	$\pm e_s = \pm 3e$
Top	183796.1	$\pm e_s = \pm 3e$

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Table-2: Quark fermion masses and strong charges

Quark fermion	(m_{qf}) Mass (MeV)	Strong Charge
Up	2.48	$\left(\pm\frac{2e_s}{3}\right)$
Down	5.37	$\left(\mp\frac{e_s}{3}\right)$
Charm	742.66	$\left(\pm\frac{2e_s}{3}\right)$
Strange	85.91	$\left(\mp\frac{e_s}{3}\right)$
Bottom	2974.02	$\left(\mp\frac{e_s}{3}\right)$
Top	102833.92	$\left(\pm\frac{2e_s}{3}\right)$

Table-3: Quark boson masses and strong charges

Quark boson	(m_{qb}) Mass (MeV)	Strong Charge
Up	1.96	$\left(\pm\frac{e_s}{3}\right)$
Down	4.22	$\left(\mp\frac{2e_s}{3}\right)$
Charm	584.70	$\left(\pm\frac{e_s}{3}\right)$
Strange	67.64	$\left(\mp\frac{2e_s}{3}\right)$
Top	80962.18	$\left(\pm\frac{e_s}{3}\right)$
Bottom	2341.48	$\left(\mp\frac{2e_s}{3}\right)$

Table-4: Fluon masses and strong charges

Fluons	(M_{qf}) Mass (MeV)	Strong Charge
Up	690.32	$\left(\pm\frac{2e_s}{3}\right)$
Down	892.34	$\left(\mp\frac{e_s}{3}\right)$
Charm	4615.82	$\left(\pm\frac{2e_s}{3}\right)$
Strange	2249.10	$\left(\mp\frac{e_s}{3}\right)$
Top	23880.18	$\left(\pm\frac{2e_s}{3}\right)$
Bottom	7330.05	$\left(\mp\frac{e_s}{3}\right)$

Table-5: Bluon masses and strong charges

Bluons	(M_{qb}) Mass (MeV)	Strong Charge
Up	369.04	$\left(\pm\frac{e_s}{3}\right)$
Down	477.04	$\left(\mp\frac{2e_s}{3}\right)$
Charm	2467.58	$\left(\pm\frac{e_s}{3}\right)$
Strange	1202.35	$\left(\mp\frac{2e_s}{3}\right)$
Top	12766.16	$\left(\pm\frac{e_s}{3}\right)$
Bottom	3918.59	$\left(\mp\frac{2e_s}{3}\right)$

14. Discussion on baryon masses

From Table-4, the following baryon ground state masses can be estimated. See Table-6.

Table-6: Ground state mass of baryons

Combination of fluons	Ground state mass of baryon (MeV)	Electromagnetic Charge of baryon
$\left(M_{uf}^2 M_{df}\right)^{\frac{1}{3}}$	751.99	$(+e)$
$\left(M_{df}^2 M_{uf}\right)^{\frac{1}{3}}$	819.63	(0)
$\left(M_{uf}^2 M_{sf}\right)^{\frac{1}{3}}$	1023.38	$(+e)$
$\left(M_{uf} M_{df} M_{sf}\right)^{\frac{1}{3}}$	1114.80	(0)
$\left(M_{df}^2 M_{sf}\right)^{\frac{1}{3}}$	1214.38	$(-e)$

$\left(M_{sf}^2 M_{uf}\right)^{\frac{1}{3}}$	1517.13	(0)
$\left(M_{sf}^2 M_{df}\right)^{\frac{1}{3}}$	1652.66	$(-e)$
$\left(M_{uf}^2 M_{cf}\right)^{\frac{1}{3}}$	1300.52	$(+2e)$
$\left(M_{df}^2 M_{cf}\right)^{\frac{1}{3}}$	1543.25	(0)
$\left(M_{sf}^2 M_{cf}\right)^{\frac{1}{3}}$	2858.17	(0)
$\left(M_{cf}^2 M_{uf}\right)^{\frac{1}{3}}$	2450.1	$(+2e)$
$\left(M_{cf}^2 M_{df}\right)^{\frac{1}{3}}$	2668.96	$(+e)$
$\left(M_{cf}^2 M_{sf}\right)^{\frac{1}{3}}$	3632.19	$(+e)$
$\left(M_{uf} M_{df} M_{cf}\right)^{\frac{1}{3}}$	1416.70	$(+e)$
$\left(M_{uf} M_{sf} M_{cf}\right)^{\frac{1}{3}}$	1927.98	$(+e)$
$\left(M_{df} M_{sf} M_{cf}\right)^{\frac{1}{3}}$	2100.21	(0)
$\left(M_{uf}^2 M_{bf}\right)^{\frac{1}{3}}$	1517.29	$(+e)$
$\left(M_{df}^2 M_{bf}\right)^{\frac{1}{3}}$	1800.48	$(-e)$
$\left(M_{sf}^2 M_{bf}\right)^{\frac{1}{3}}$	3334.58	$(-e)$
$\left(M_{cf}^2 M_{bf}\right)^{\frac{1}{3}}$	5385.20	$(-e)$
$\left(M_{bf}^2 M_{uf}\right)^{\frac{1}{3}}$	3334.94	(0)
$\left(M_{bf}^2 M_{df}\right)^{\frac{1}{3}}$	3632.85	$(-e)$
$\left(M_{bf}^2 M_{sf}\right)^{\frac{1}{3}}$	4943.95	$(-e)$
$\left(M_{bf}^2 M_{cf}\right)^{\frac{1}{3}}$	6282.82	(0)
$\left(M_{uf} M_{df} M_{bf}\right)^{\frac{1}{3}}$	1652.83	(0)
$\left(M_{uf} M_{sf} M_{bf}\right)^{\frac{1}{3}}$	2249.34	(0)
$\left(M_{uf} M_{cf} M_{bf}\right)^{\frac{1}{3}}$	2858.48	$(+e)$
$\left(M_{df} M_{sf} M_{bf}\right)^{\frac{1}{3}}$	2450.28	$(-e)$
$\left(M_{df} M_{cf} M_{bf}\right)^{\frac{1}{3}}$	3113.83	(0)
$\left(M_{sf} M_{cf} M_{bf}\right)^{\frac{1}{3}}$	4237.62	(0)
$\left(M_{tf}^2 M_{uf}\right)^{\frac{1}{3}}$	7328.95	$(+2e)$
$\left(M_{tf}^2 M_{df}\right)^{\frac{1}{3}}$	7983.66	$(+e)$
$\left(M_{tf}^2 M_{sf}\right)^{\frac{1}{3}}$	10864.96	$(+e)$

$\left(M_{tf}^2 M_{cf}\right)^{\frac{1}{3}}$	13807.28	$(+2e)$
$\left(M_{tf}^2 M_{bf}\right)^{\frac{1}{3}}$	16108.71	$(+e)$
$\left(M_{uf} M_{df} M_{tf}\right)^{\frac{1}{3}}$	2450.23	$(+e)$
$\left(M_{uf} M_{sf} M_{tf}\right)^{\frac{1}{3}}$	3334.51	$(+e)$
$\left(M_{uf} M_{cf} M_{tf}\right)^{\frac{1}{3}}$	4237.52	$(+2e)$
$\left(M_{uf} M_{bf} M_{tf}\right)^{\frac{1}{3}}$	4943.85	$(+e)$
$\left(M_{df} M_{sf} M_{tf}\right)^{\frac{1}{3}}$	3632.39	(0)
$\left(M_{df} M_{cf} M_{tf}\right)^{\frac{1}{3}}$	4616.07	$(+e)$
$\left(M_{df} M_{bf} M_{tf}\right)^{\frac{1}{3}}$	5385.49	(0)
$\left(M_{sf} M_{bf} M_{tf}\right)^{\frac{1}{3}}$	7329.11	$(+e)$
$\left(M_{sf} M_{cf} M_{tf}\right)^{\frac{1}{3}}$	6282.00	$(+e)$
$\left(M_{bf}^2 M_{tf}\right)^{\frac{1}{3}}$	10866.35	(0)
$\left(M_{bf} M_{cf} M_{tf}\right)^{\frac{1}{3}}$	9313.89	$(+e)$
$\left(M_{cf}^2 M_{tf}\right)^{\frac{1}{3}}$	7983.23	$(+2e)$

We assure the readers that, with these ground state baryon masses and considering their super fine rotational levels, most of the observed baryons can be fitted and many new states can also be predicted for future experimental verification/observation. There may be some minor differences in the current classification scheme and proposed scheme of baryon super symmetry.

15. Discussion on meson masses

From Table-5, the following ground state meson masses can be estimated. See Table-7.

Table-7: Ground state mass of mesons

Combination of bluons	Ground state mass of meson (MeV)	Electromagnetic Charge of meson
$M_{ub} + \overline{M}_{ub}$	738.08	(0)
$M_{db} + \overline{M}_{ub}$	846.08	$(-e)$
$M_{db} + \overline{M}_{db}$	954.08	(0)
$M_{sb} + \overline{M}_{ub}$	1571.39	$(-e)$
$M_{sb} + \overline{M}_{db}$	1679.39	(0)
$M_{sb} + \overline{M}_{sb}$	2404.7	(0)

$M_{cb}+\overline{M}_{ub}$	2836.62	(0)
$M_{cb}+\overline{M}_{db}$	2944.62	$(+e)$
$M_{cb}+\overline{M}_{sb}$	3669.93	$(+e)$
$M_{bb}+\overline{M}_{ub}$	4287.63	$(+e)$
$M_{bb}+\overline{M}_{db}$	4395.63	(0)
$M_{bb}+\overline{M}_{sb}$	5120.94	(0)
$M_{bb}+\overline{M}_{cb}$	6386.17	$(-e)$
$M_{bb}+\overline{M}_{bb}$	7837.18	(0)
$M_{tb}+\overline{M}_{ub}$	13135.2	(0)
$M_{tb}+\overline{M}_{db}$	13243.2	$(+e)$
$M_{tb}+\overline{M}_{sb}$	13968.51	$(+e)$
$M_{tb}+\overline{M}_{bb}$	16684.75	$(+e)$
$M_{tb}+\overline{M}_{tb}$	25532.32	(0)

Apart from these ground states, by considering $\sqrt{M_{qb1}M_{qb2}}$, other ground states can also predicted. See the following Table-8 for the charged ground states.

Table-8: Ground state mass of mesons

Combination of bluons	Ground state mass of meson (MeV)	Electromagnetic Charge of meson
$\sqrt{M_{db}\times\overline{M}_{ub}}$	419.58	$(-e)$
$\sqrt{M_{sb}\times\overline{M}_{ub}}$	666.12	$(-e)$
$\sqrt{M_{cb}\times\overline{M}_{db}}$	1084.96	$(+e)$
$\sqrt{M_{cb}\times\overline{M}_{sb}}$	1722.47	$(+e)$
$\sqrt{M_{bb}\times\overline{M}_{ub}}$	1202.55	$(+e)$
$\sqrt{M_{bb}\times\overline{M}_{cb}}$	3109.57	$(-e)$
$\sqrt{M_{tb}\times\overline{M}_{db}}$	2467.78	$(+e)$
$\sqrt{M_{tb}\times\overline{M}_{sb}}$	3917.83	$(+e)$
$\sqrt{M_{tb}\times\overline{M}_{bb}}$	7072.86	$(+e)$

16. General discussion

We appeal that,

(1) Success of any unified model depends on its ability to involve gravity in microscopic models.

(2) Full-fledged implementation of gravity in microscopic physics must be able to:

a) Estimate the ground state elementary particle rest masses of the three atomic interactions.

b) Estimate the coupling constants of the three atomic interactions.

c) Estimate the range of all interactions.

d) Estimate the Newtonian gravitational constant.

(3) As the root/path is unclear and unknown, to make it success or to have a full-fledged implementation, one may be forced to consider a new path that may be out-of-scope of the currently believed string theory models [57] or super symmetric models [58-61].

(4) In our approach,

a) We assign a different gravitational constant for each basic interaction.

b) Considering 585 GeV fermion as the characteristic building block of all elementary particles, an attempt is made to fit proton and electron masses.

c) During this journey, without considering arbitrary numbers or coefficients, we come across many strange and interesting relations for estimating other atomic and nuclear coupling constants.

d) Based on relations (5) and (6), magnitudes of (G_w, α_s) can be estimated in a verifiable approach.

e) Based on super symmetry, in sections (13 to 15), we have presented a brief report on baryons and mesons. It needs further study. In this context, we are working and trying to seek field experts' opinion and guidelines.

(5) Based on the proposed concept of SUSY, corresponding to the proposed electroweak fermion of rest energy $(M_{wf}c^2)^{\pm} \cong 584.725$ GeV, there exists a possibility of finding a characteristic electroweak boson of rest energy,

$$(M_{wb}c^2)^{\pm} \cong \frac{(M_{wf}c^2)^{\pm}}{\Psi} \cong 257.59 \text{ GeV}.$$

(6) In our earlier publications [53,54], we expressed our view that,

a) Charged electroweak boson $(M_W)^{\pm}$ is a super symmetric boson of "integral" charge top quark. In this paper, we have reviewed our earlier paper with respect to 'strong' charge and fractional charge quark bosons. By assuming the combination of Top quark boson

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and anti Strange boson or anti Down boson, there is a possibility of observing $(M_w)^{\pm}$. If so, there is also a possibility of observing neutral boson of rest energy close to $(M_w)^{\pm}$ boson. Hence, it needs further study with respect to the fractional charge quark boson of rest energy of 80.9 GeV.

b) Neutral electroweak boson constitutes two charged bosons of rest energy $(45.5\ \text{GeV})^{\pm}$. It can be expressed as,

$$M_Z \cong \left(\frac{M_{hf}}{\Psi}\right)^{\pm} + \left(\frac{M_{hf}}{\Psi}\right)^{\mp}$$

$$\cong (M_{hb})^{\pm} + (M_{hb})^{\mp} \cong \frac{2M_{hf}}{\Psi} \cong 91.104\ \text{GeV}/c^2$$

c) Neutral Higg's boson constitutes [23,62] a charged electroweak boson $(M_W)^{\pm}$ and a charged $(M_{hb})^{\mp}$. It can be expressed as,

$$(M_H)^0 \cong (M_W)^{\pm} + (M_{hb})^{\mp}$$
$$\cong (80.379 + 45.552)\ \text{GeV}/c^2$$
$$\cong 125.93\ \text{GeV}/c^2$$

d) With reference to the data presented in Table-3, neutral pion seems to constitute Strange bluon and anti Strange bluon. It's rest energy seems to be 2*67.64=135.3 MeV.

e) Currently believed Charm and anti Charm mesons can be understood with super fine rotational levels of Charm bluon and anti Up bluon. See Table -9.

Table-9: Super fine rotational levels of Charm bluon and anti Up bluon.(Neutral charge)

n	$n(n+1)$	$[n(n+1)]^{\frac{1}{12}}$ (MeV)	$[n(n+1)/2]^{\frac{1}{12}}$ (MeV)
1	2	3005.3	**2836.6**
2	6	3293.4	3108.6
3	12	3489.3	3293.4
4	20	3641.0	3436.6
5	30	3766.1	3554.7
6	42	3873.2	3655.8
7	56	3967.2	3744.5
8	72	4051.2	3823.8
9	90	4127.2	3895.6
10	110	4196.8	3961.2
11	132	4261.0	4021.9
12	156	4320.8	4078.3
13	182	4376.6	4131.0
14	210	4429.1	4180.6
15	240	4478.7	4227.3
16	272	4525.7	4271.7
17	306	4570.3	4313.8
18	342	4612.9	4354.0
19	380	4653.5	4392.4
20	420	4692.5	4429.1

f) Similarly currently believed charged Strange and Charm mesons can be understood with super fine rotational levels of Charm bluon and anti Strange bluon. See Table-10.

Table-10: Super fine rotational levels of Charm bluon and anti Strange bluon. $(\pm e)$

n	$n(n+1)$	$[n(n+1)]^{\frac{1}{12}}$ (MeV)	$[n(n+1)/2]^{\frac{1}{12}}$ (MeV)
1	2	1824.9	**1722.5**
2	6	1999.9	1887.6
3	12	2118.8	1999.9
4	20	2210.9	2086.8
5	30	2286.9	2158.5
6	42	2351.9	2219.9
7	56	2409.0	2273.8
8	72	2460.0	2321.9
9	90	2506.1	2365.5
10	110	2548.4	2405.4
11	132	2587.4	2442.2
12	156	2623.7	2476.4
13	182	2657.6	2508.4
14	210	2689.5	2538.5
15	240	2719.6	2566.9
16	272	2748.1	2593.9
17	306	2775.2	2619.4
18	342	2801.0	2643.8
19	380	2825.7	2667.2
20	420	2849.4	2689.5

g) Considering 'nuclear space' as a sea of –

i. Six fractional charge quark bosons of rest energy 2 MeV to 81 GeV,
ii. Six fractional charge quark fermions of rest energy 2.5 MeV to 103 GeV,
iii. Six fractional charge fluons of rest energy 692 MeV to 24 GeV and
iv. Six fractional charge bluons of rest energy 369 MeV to 13 GeV

Many interesting things can be expected.

17. Conclusion

With further study, research and confirming the existence of the proposed $(M_{wf}c^2)^{\pm} \cong 584.725$ GeV,

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or confirming the existence of its corresponding SUSY boson, $\left(M_{wb}c^2\right)^{\pm} \cong \frac{\left(M_{wf}c^2\right)^{\pm}}{\Psi} \cong 257.59\text{ GeV}$, actual essence of final unification can be understood. Proceeding further, by correlating the currently believed baryons and mesons with the proposed scheme of hadronic super symmetry, further research can be carried out.

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