Strong nuclear gravity - a very brief report

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Introduction

This paper accepted for publication in the Hadronic journal. The first step in unification is to understand the origin of the rest mass of a charged elementary particle. It can be supposed that elementary particles construction is much more fundamental than the black hole's construction. If one wishes to unify electroweak, strong and gravitational interactions it is a must to implement the classical gravitational constant G in the sub atomic physics. By any reason if one implements the planck scale in elementary particle physics and nuclear physics automatically G comes into subatomic physics. Then a large 'arbitrary number' has to be considered as a proportionality constant. With this large arbitrary number it is be possible to understand the mystery of the strong interaction and strength of gravitation. The basic and important problem is : How to select the 'arbitrary number' ? For this purpose 'mole' concept can be considered as a fundamental tool. The combination of Avogadro number and the classical gravitational constant generates the 'effective' 'strong gravitational constant'.

Abstract

Key conceptual link that connects the gravitational force and non-gravitational forces is - the classical force limit $\left(\frac{c^4}{G}\right)$. For mole number of particles, if strength of gravity is $(N.G)$, any one particle's weak force magnitude is $F_W \cong \frac{1}{N}\cdot\left(\frac{c^4}{N.G}\right) \cong \frac{c^4}{N^2G}$. Ratio of 'classical force limit' and 'weak force magnitude' is N^2. This can be considered as the beginning of 'strong nuclear gravity'. Assumed relation for strong force and weak force magnitudes is $\sqrt{\frac{F_S}{F_W}} \cong 2\pi\ln\left(N^2\right)$. If m_p is the rest mass of proton it is noticed that $\ln\sqrt{\frac{e^2}{4\pi\varepsilon_0 Gm_P^2}} \cong \sqrt{\frac{m_p}{m_e} - \ln\left(N^2\right)}$. From SUSY point of view, 'integral charge quark fermion' and 'integral charge quark boson' mass ratio is $\Psi = 2.262218404$ but not unity. With these advanced concepts starting from nuclear stability to charged leptons, quarks, electroweak bosons and charged Higgs boson's origin can be understood. Finally an "alternative" to the 'standard model' can be developed.

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To fit the gravitational constant

Fitting the gravitational constant with the atomic and nuclear physical constants is a challenging task. It is noticed that

$$\ln\sqrt{\frac{e^2}{4\pi\varepsilon_0 Gm_P^2}} \cong \sqrt{\frac{m_p}{m_e} - \ln\left(N^2\right)} \qquad (1)$$

where m_p is the proton rest mass and m_e is the electron rest mass. From this expression, $G \cong 6.666270179 \times 10^{-11}\ \mathrm{m^3Kg^{-1}sec^{-2}}$.

Strong nuclear gravity concepts

1. For any one elementary particle of mass m_0, magnitude of gravitational constant is G only. As the number of particles increases to Avogadro number (N), magnitude of gravitational constant approaches $N.G$. Mass of the system approaches to $N.m_0$. This idea leads to "nuclear strong gravity".

2. Based on strong gravity, similar to the 'Schwarzschild radius', size of the system can be expressed as $R_N \cong \frac{2(NG)(Nm_0)}{c^2}$. Volume of one particle can be expressed as total volume divided by Avogadro number $= \frac{4\pi}{3N}R_N^3$.

3. If nuclear charge radius or characteristic size of nucleus is$R_0 \approx 1.20$ fm, its volume $V_0 \cong \frac{4\pi}{3} R_0^3$ and total volume of N nucleons is $V_N \cong N \cdot \frac{4\pi}{3} R_0^3$. Thus size of N nucleons is $R_N \cong N^{\frac{1}{3}} R_0 \cong \frac{2(NG)(Nm_0)}{c^2}$. Then rest energy of nucleon comes out to be $\mathrm{m_0 c^2} \approx 105\ MeV$. This is not matching with the rest energy of nucleon but matching with the geometric mean of nucleon rest energy and its pairing energy constant, 12 MeV. If α_s is the strong coupling constant, it is noticed that $\frac{1}{\alpha_s}\mathrm{m_0 c^2} \approx 939\ MeV$ and $\alpha_s \cdot \mathrm{m_0 c^2} \approx 12$ MeV. More over it is noticed that $\mathrm{m_0 c^2} \approx 105\ MeV$ is close to "half of the QCD energy scale" $\approx 217\ MeV$. It is also noticed that $\ln \sqrt{\frac{c^4}{N^2 G} \div \frac{e^2}{4\pi\varepsilon_o R_N^2}} \cong \frac{1}{\sqrt{\alpha}}$.

4. The famous Fermi's weak coupling constant, $G_F \cong \frac{1}{3}\left(\frac{e^2}{4\pi\varepsilon_o m_0 c^2}\right)^3 m_0 c^2$. Considering m_0 as a characteristic strong interaction energy constant it is noticed that $\sqrt{e^{\frac{m_0}{m_e}}} \times \frac{G m_e^2}{c} \cong e^{\frac{m_0}{2m_e}} \times \frac{G m_e^2}{c} \cong \hbar$. Here $\mathrm{m_e}$ is the rest mass of electron. If so it can be represented as $\frac{m_0}{m_e} \cong \ln\left(\frac{\hbar c}{G m_e^2}\right)^2 \cong 206.1113643$ and $\mathrm{m_0 c^2} \cong 105.3226825\ MeV$.

5. Similar to the classical force limit $\frac{c^4}{G}$, force required to bind N particles can be expressed as $\frac{c^4}{(NG)}$. Force required to bind one particle is $\frac{1}{N} \cdot \frac{c^4}{NG} \cong \frac{c^4}{N^2 G}$.

6. $E_W \cong \sqrt{\frac{e^2 c^4}{4\pi\epsilon_0 N^2 G}} \cong 0.0017318\ MeV$ can be considered as the basic electromagnetic mass unit. It can be compared with the characteristic mass unit of 'dark matter'.

7. Considering the rest mass of electron, its gravitational mass generator $= X_E \cong m_e c^2 \div \sqrt{\frac{e^2}{4\pi\varepsilon_0}\left(\frac{c^4}{N^2 G}\right)} \cong 295.0606338$. Using this number, tau and muon masses can be fitted accurately as $\left(mc^2\right)_n \cong \left[X_E^3 + \left(n^2 X_E\right)^n \sqrt{N}\right]^{\frac{1}{3}} E_W$ where n = 1 and 2. At n = 1, $\left(mc^2\right) \cong 105.95\ MeV$, n = 2, $\left(mc^2\right) \cong 1777.4\ MeV$. At n = 3 charged lepton rest energy is 42260 MeV.

8. Weak coupling angle is $\sin\theta_W \cong \frac{1}{\alpha X_E} \cong 0.464433353 \cong \frac{\text{Up quark mass}}{\text{Down quark mass}}$.

9. For any black hole if its density approaches the nuclear mass density, its mass $\cong \mathrm{M_F} \cong \left(\frac{\hbar c}{(NG) m_e^2}\right)^3 \cdot \sqrt{\frac{m_e^3}{m_n}} \cong 1.81 \times 10^{31}$ Kg and can be called as the Fermi black hole mass limit. Ratio of Fermi black hole mass limit and Chandrasekhar's mass limit is 2π.

10. Strong interaction range can be expressed as $b \cong \frac{M_F}{M_P} \cdot \frac{2Gm_n}{c^2} \cong 2.06$ fm where m_n is the average rest mass of nucleon and M_P is planck mass.

11. There exists a strongly interacting confined fermion of rest energy $M_{Sf} c^2 \cong m_o c^2 \equiv 105.3226825$ MeV. Its boson rest energy can be expressed as $M_{Sb} c^2 \cong \frac{M_{Sf} c^2}{\Psi} \cong 46.6$ MeV where $\Psi \approx 2.26$ is the fermion and boson mass ratio. In SUSY, $m_e \cong \alpha.\sqrt{M_{Sf}.M_{Sb}} \cong \alpha.\sqrt{M_{Sf}.\left(\frac{M_{Sf}}{\Psi}\right)}$. In this way value of $\Psi \cong 2.262218404$ is fitted.

12. In integral charge quark system, if Q_f and Q_b are the rest masses of quark fermion and quark boson, $Q_b \cong \frac{Q_f}{\Psi}$. Interesting thing is that $\left(1 - \frac{1}{\Psi}\right) Q_f$ acts as the effective quark fermion.

13. And so on ...

References

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