Mass relations among quarks and/or leptons

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Abstract

The mass relations among respective quark family members are predicted and similar mass relation for the lepton family member are obtained. The volume of the volume element is also calculated which is $\sqrt{3/2}$.

1 Introduction

The theory of strong interactions is named: quantum chromodynamics (QCD) and it is based on massless bi-colored gluons. The study of the properties of the strong interactions in the asymptotic Bjorken limit has proved to be one of the most creative ideas in theoretical physics [1]. Relatively little work has been done in the other high energy limit, i.e. Regge limit [2]. In Regge asymptotics, the number of partons increases rapidly due to QCD bremsstrahlung. The massless eight gluons carry color-anticolor charge [3]. QCD, in particular, is constructed as the unique embodiment of a symmetry group, local SU(3) color gauge symmetry. To use symmetry as our guide, QCD plays an essential tool in devising strategies for experimental exploration. Unfortunately, a group property violation is observed in the color charge structure of gluons [4]. This destroys the whole structure of the QCD. A new model for strong interactions is proposed which favored electroweak and can be extended to the study of Casimir and gravitational forces [4, 5, 6, 7, 8]. This model made predictions with the help of set theory and get constraints from

group theory. A unified picture of all the four forces (i.e. Casimir force, gravitatonal force, electroweak force and strong force) appeard and nature of the forces appeared to be electroweak.

Presently, we study the possible relation among the masses of quarks and/or leptons families.

2 The size of volume element

Quantum Chromodynamics (QCD) has three charges i.e. red, green and blue. QCD developed by giving color charges and fractional charges to quarks while the color charges were arbitrary. No value was given to the color charges. Recently, the value of color charges is predicted in Ref. [5] with the help of cube roots of unity whereas the fractional charges of quarks are discarded. With the help of pictorial representation of cube roots of unity, various mass relations among gluons are also predicted. By keeping in view of the discussion of various figures of Ref. [5], we can exactly estimate the size of the volume element. Let us have a look on Fig. 1, the ratio among the various line elements are:

$$\begin{aligned} oz &: or : \bar{g}\bar{b} = \sqrt{2} : 1 : \sqrt{3} \\ oz &: or : \frac{\bar{g}\bar{b}}{2} = \sqrt{2} : 1 : \frac{\sqrt{3}}{2} \end{aligned} \tag{1}$$

As the point 'o' is the center of the γ (photon) volume element and 'z' is that of Z^0. So, the height of the volume element is oz. Similarly, the length of the volume element is 'or' and width is $\bar{g}\bar{b}/2$. Therefore, the volume of the volume element is

$$V = \sqrt{2} \times 1 \times \frac{\sqrt{3}}{2} = \sqrt{\frac{3}{2}}. \tag{2}$$

3 Mass relations among quark families

Quarks were known by three up-types (up, charm, top) and three down-types (down, strange, beauty). Beside the color charges, quarks were supposed to have electric charges whose magnitudes are fractions (2/3 or 1/3) of what appears to be the basic unit, namely the magnitude of the charge carried by proton or electron. Value to the color charges is given by cube roots of unity [5]. After giving the value to color charges, it is pointed out that the fractional

charges are useless and hence rejected. Among six flavors of quarks, three are light (i.e. down, up, strange) and three are heavy (i.e. charm, beauty, top). Instead of six flavor of quarks, three quark families are proposed (i.e. charm, beauty, top) while the light quarks (i.e. down, up, strange) are accomodated in these families [6]. The triplicity of quarks is discussed in Ref. [8] and suspected that three faces of a cube provide information about quarks and three about leptons. The study of cube roots of unity provide a ratio among the sides of the volume element [see Eq. (1)]. If we depict the same to the masses, as the charm is the lighest among quarks and top the heaviest one. Therefore,

$$m_{t_i} : m_{b_i} : m_{c_i} = \sqrt{2} : 1 : \frac{\sqrt{3}}{2}, \tag{3}$$

where i represent the family member of the respective family. Similar relations can be obtained for leptons

$$m_{\tau_i} : m_{\mu_i} : m_{e_i} = \sqrt{2} : 1 : \frac{\sqrt{3}}{2}. \tag{4}$$

4 Conclusions

The mass relations among respective quark family members are predicted and similar mass relation for the lepton family member are obtained. The volume of the volume element is also calculated.

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5 Figure Captions

1. One of the possible plot of cube roots of unity [5].

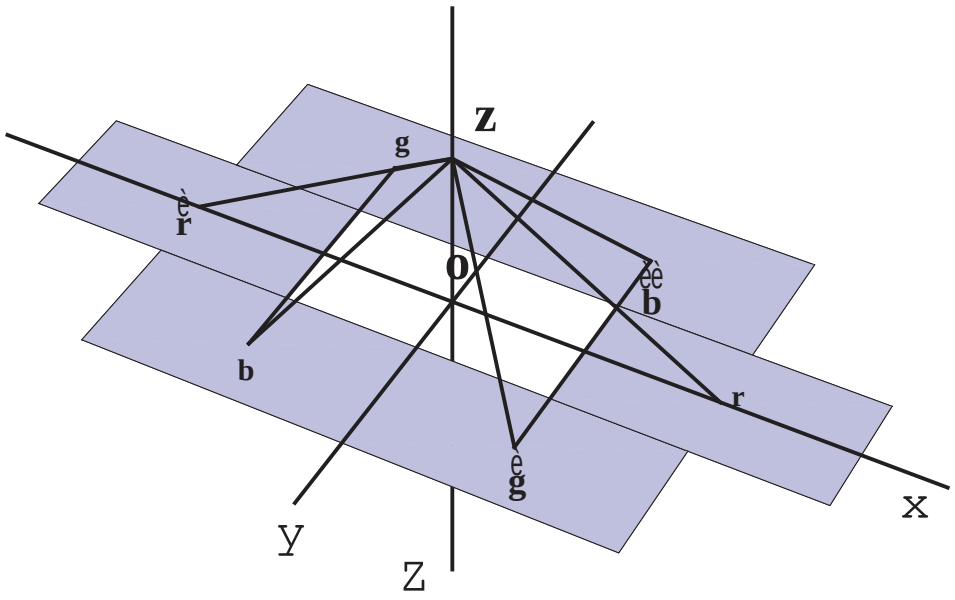

Figure 1