The masses of the quarks, parameters of the standard model and the non-trivial zeros of the Riemann zeta function

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Contents

1 Introduction **2**

2 The imaginary parts of the non-trivial zeros of the Riemann zeta function used in this work **2**

2.1 Standard model data 2
2.2 Higgs vacuum, quark u mass 3
2.3 quark u mass/ quark d mass 3
2.4 quark u mass/ quark s mass 3
2.5 Higgs vacuum, quark c mass 3
2.6 Higgs vacuum, quark b mass 3
2.7 Higgs vacuum, quark t mass 3
2.8 W boson mass + Z boson mass, quark t mass 4
2.9 The product of the first four non-trivial zeros of the Riemann zeta function and the Higss boson mass/electron mass ratio . . . 4

3 Conclusions **4**

Abstract

This empirical heuristic work on the masses of quarks is a continuation of our previous work on the masses of electrically charged leptons.Once again the first four non-trivial zeros of the Riemann zeta function appear very clearly.Parameters from the standard model are also used

1 Introduction

As we have mentioned in the summary, this work tries to be a continuation of our last work on the masses of leptons with electrical charge. Once again the coincidence of the equations seems to be ruled out, although in this case we must be more cautious. We must pay attention that the parameters used of the standard model are precisely those that appear at the scale of the W and Z bosons, and that precisely at this scale is when these bosons can decay into quarks, except for the top quark.

Note how the mass of the least massive quark or quark u is an extraordinarily simple function that depends only on the values of the Higgs vacuum and the product of the imaginary parts of the first four non-trivial zeros of the Riemann zeta function. For this reason, lastly we return to the equation of the ratio mass of the Higgs boson, mass of the electron to show its non-chance redundancy or repetition.

The previous assessment indicates both its non-randomness and the relationship between the charged leptons and the quarks.

2 The imaginary parts of the non-trivial zeros of the Riemann zeta function used in this work

$z_1 = 14.134725142$, $z_2 = 21.022039639$,$z_3 = 25.01085758$, $z_4 = 30.424876126$

2.1 Standard model data

Inverse Fine structure constant $=137.035999046 = \alpha^{-1}(0)$

Higgs Vacuum $= 246.219650794138\, Gev = V_H$

Fermi Constant$= \dfrac{1}{\left(V_H \cdot \sqrt{\sqrt{2}}\right)^2} = G_F$

Quark masses

$m_{qu} = 2.16\, Mev\, , m_{qd} = 4.67\, Mev\, , m_{qs} = 93.4\, Mev\, , m_{qc} = 1.27\, Gev\, , m_{qb} = 4.18\, Gev\, , m_{qt} = 172.69\, Gev$

weak mixing angle at the Z boson mass scale$=\hat{\theta}\left(M_Z\right)\left(\bar{M}S\right), \sin^2\hat{\theta}\left(M_Z\right)\left(\bar{M}S\right) = 0.23121$

Cabibbo angle $\theta_c = 13.02°$

Weinberg angle$=\arccos\left(\dfrac{m_W}{m_Z}\right) = \theta_W, m_W = 80.377\, Gev\, , m_Z = 9.1876\, Gev$

2.2 Higgs vacuum, quark u mass

$$\frac{2 \cdot V_H}{z_1 \cdot z_2 \cdot z_3 \cdot z_4} = m_{qu} = 0.00217787568\, Gev = 2.17787568\, Mev$$

$$m_e \cdot \ln\left[\alpha^{-1}(0)/2\right] = 3.85062437568E-35\, Kg\,(2.16004\, Mev) \simeq m_{qu}$$

2.3 quark u mass/ quark d mass

$$\frac{m_{qu}}{m_{qd}} = 2 \cdot \sin^2 \hat{\theta}\,(M_Z)\left(\bar{M}S\right)$$

2.4 quark u mass/ quark s mass

$$\frac{m_{qu}}{m_{qs}} = \frac{\sin^2 \hat{\theta}\,(M_Z)\left(\bar{M}S\right)}{10}$$

2.5 Higgs vacuum, quark c mass

$$\frac{V_H}{z_1^2 \cdot \cos(\theta_c)} = 1.2649083\, Gev \simeq 1.27\, Gev$$

2.6 Higgs vacuum, quark b mass

$$\frac{V_H \cdot \left[\sin \hat{\theta}\,(M_Z)\left(\bar{M}S\right) + \cos \hat{\theta}\,(M_Z)\left(\bar{M}S\right) - 1\right]}{z_2} = 4.18895\, Gev$$

2.7 Higgs vacuum, quark t mass

$$\frac{V_H}{2 \cdot \sin(\theta_c) + \cos(\theta_c)} = 172.801\, Gev$$

2.8 W boson mass + Z boson mass, quark t mass

$$(m_W + m_Z) \cdot \left(1 + \frac{\ln^2(\pi)}{z_1^2}\right) = 172.6898\, Gev$$

2.9 The product of the first four non-trivial zeros of the Riemann zeta function and the Higss boson mass/electron mass ratio

$$\left(\frac{2}{e}\right)^2 \cdot 2 \cdot z_1 \cdot z_2 \cdot z_3 \cdot z_4 = 244805.202790003$$

$$\frac{\left(\frac{2}{e}\right)^2 \cdot 2 \cdot z_1 \cdot z_2 \cdot z_3 \cdot z_4 \cdot m_e \cdot c^2}{1,602176634 \times 10^{-19} \cdot 1000000000} = 12.0952\, Gev$$

3 Conclusions

As can be seen, the equations are very simple and depend mainly on the cabbibo angle, and the weak mixing angle at the scale of the Z boson mass. The imaginary parts of the first four non trivial zeros of the Riemann zeta function are also used in several equations.

The accuracy of the equations is also remarkable.

In short: these equations seem to be parts of a puzzle, which would be a unification theory yet to be developed.The empirical heuristic speculation of our previous work is repeated.We hope that these works illuminate, even if in a very humble way, some path that leads to this theory of unification so long awaited by all physicists.

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