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The Zeroth of Generation Zh of Fermion, A Unified Mass Theory of Twelve Elementary Fermions

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Contents

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Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025 27

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

Introduction

The Zeroth Generation Zth of Fermion is presented in the column " Zeroth " of Table 0 in page 12 in this paper.

" Zeroth " is comprised of four particles $\alpha(0), \beta(0), \gamma(0), \delta(0)$, that all with Zero-Mass in vertical direction, BUT with four different electric charges $0e, -e, -\frac{1}{3}e, +\frac{2}{3}e$ in horizontal direction respectively.

Particle mass $M(\omega)$ could be found out by Table 0 and ScalarProduct-Mass Equation, expression (0.26)

Base on particles $\alpha(0), \beta(0), \gamma(0), \delta(0)$, the masses of neutral leptons $\upsilon_e, \upsilon_\mu, \upsilon_\tau$, charged leptons e^-, μ^-, τ^-, charged quarks d, s, b and u, c, t could be understood by A Unified Mass Theory respectively (see **Part A, Part B, Part C, Part D**) respectively.

There are some curious digital correlations among $\alpha(0), \beta(0), \gamma(0), \delta(0)$, due to Charge-Transition in page 11**.**

Following are the outline of searching for**:** From Zero-Mass particle ($\alpha(0)$, $\beta(0)$, $\gamma(0)$, $\delta(0)$) to Non-Zero-Mass particle (Dirac Particle) of Standard Model SM**.**

- **Mass Principle:**

Particle mass M is propertional to Scalar Product $\mathbf{Q}^2$ of Electric Charge $\mathbf{Q}$ of the particle. [1]

Particle Mass $M(\omega)$ results from Color Scalar Product CSP $\mathbf{Q}^2(\omega)$ of Electric Charge Color Operator $\mathbf{Q}(\omega)$ of particle ω

$$M(\omega) = \mathbf{Q}^2(\omega)\, M(e^-) \tag{0.1}$$

Where $\mathbf{Q}^2(\omega)$ is mass ground state of particle ω, or mass vacuum state of particle ω. Scaling Factor, $M(e^-) = 0.511\, Mev$.

• Basing on **Mass Principle** (0.1), we could obtain two equivalent tables, Table 1 and Table 2, of particle mass $M(\omega)$ and color scalar product $\mathbf{Q}^2(\omega)$ of particle ω below

Example of $\omega = up\ quark$

$$M(u) = \mathbf{Q}^2(u)\, M(e^-) \tag{0.2}$$

or

$$\mathbf{Q}^2(u) = \frac{2.3}{0.511} = 4.\ 500\ \ 978\ \ 4736 \tag{0.3}$$

Example of $\omega = Neutrino\ \ \upsilon_e$

$$M(\upsilon_e) = \mathbf{Q}^2(\upsilon_e)\, M(e^-) \tag{0.4}$$

$$\mathbf{Q}^2(\upsilon_e) = \frac{0.000\ \ 003\ \ 9139}{0.511} = 0.\ 000\ \ 002 \tag{0.5}$$

or

-3-

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

Table 1: Mass of particle ω

Ground State	1st	2nd	3rd
Mass *Mev*			
	u	c	t
	2. 3	1280	173000
	d	s	b
	4. 8	95	4700
	e	μ	τ
	0. 511	105. 7	1777
	υ_e	υ_μ	υ_τ
	0. 000 002	0. 190	18. 2

$\Rightarrow$

Table 2: Color Scalar Product $\mathbf{Q}^2(\omega)$ of particle ω

Ground State	1st	2nd	3rd
CSP $\mathbf{Q}^2(\omega)$			
	$\mathbf{Q}^2(u)$	$\mathbf{Q}^2(c)$	$\mathbf{Q}^2(t)$
$+\frac{2}{3}e$	4. 500 978 4736	2504. 892 367 9061	338551. 859 099 8043
	$\mathbf{Q}^2(d)$	$\mathbf{Q}^2(s)$	$\mathbf{Q}^2(b)$
$-\frac{1}{3}e$	9. 393 346 3796	185. 909 980 4305	9197. 651 663 4051
	$\mathbf{Q}^2(e)$	$\mathbf{Q}^2(\mu)$	$\mathbf{Q}^2(\tau)$
$-e$	1. 000 000 0000	206. 849 315 0685	3477. 495 107 6321
	$\mathbf{Q}^2(\upsilon_e)$	$\mathbf{Q}^2(\upsilon_\mu)$	$\mathbf{Q}^2(\upsilon_\tau)$
$0e$	0. 000 003 9139	0. 371 819 9609	35. 616 438 3562
$Q(\omega)$			

In paper [1], we discomposed the Color Scalar Product $\mathbf{Q}^2(\omega)$ of particle ω in Table 2, by color presentation $\mathbf{Q}(\omega)$ of the particle ω, into a three dimensional color vector picture, below

$$\mathbf{Q}^2(\omega) \quad \Rightarrow \quad \mathbf{Q}(\omega) = (\ \mathbf{Q}\omega\mathrm{R},\ \mathbf{Q}\omega\mathrm{G},\ \mathbf{Q}\omega\mathrm{B}\ ) \qquad (00)$$

Examples of (00) shown below:

Elementary Fermion Observed Mass Spectrum (Ground State)

- Color of quarks

$$\mathbf{Q}(t) = (+238.206\ 321\ 5198, \quad +238.206\ 321\ 5198, \quad -474.412\ 643\ 0396) \tag{00.1}$$

$$\mathbf{Q}(c) = (+21.093\ 605\ 7202, \quad +21.093\ 605\ 7202, \quad -40.187\ 211\ 4404) \tag{00.2}$$

$$\mathbf{Q}(u) = (+1.393\ 262\ 0539, \quad +1.393\ 262\ 0539, \quad -0.786\ 524\ 1078) \tag{00.3}$$

$$\mathbf{Q}(d) = (-1.562\ 154\ 7908, \quad -1.562\ 154\ 7908, \quad +2.124\ 309\ 5816) \tag{00.4}$$

$$\mathbf{Q}(s) = (-5.894\ 757\ 7177, \quad -5.894\ 757\ 7177, \quad +10.789\ 515\ 4354) \tag{00.5}$$

$$\mathbf{Q}(b) = (-39.485\ 426\ 3597, \quad -39.485\ 426\ 3597, \quad +77.970\ 852\ 7194) \tag{00.6}$$

- Color of leptons

$$\mathbf{Q}(\upsilon_\tau) = (+2.436\ 405\ 7666, \quad +2.436\ 405\ 7666, \quad -4.872\ 811\ 5332) \tag{00.7}$$

$$\mathbf{Q}(\upsilon_\mu) = (+0.248\ 937\ 7301, \quad +0.248\ 937\ 7301, \quad -0.497\ 875\ 4602) \tag{00.8}$$

$$\mathbf{Q}(\upsilon_e) = (+0.000\ 807\ 6578, \quad +0.000\ 807\ 6578, \quad -0.001\ 615\ 3156) \tag{00.9}$$

$$\mathbf{Q}(e^-) = (-1.000\ 000\ 0000, \quad -1.000\ 000\ 0000, \quad -1.000\ 000\ 0000) + i \left(\frac{\pm 1}{\sqrt{3}}, \frac{\pm 1}{\sqrt{3}}, \frac{\mp 2}{\sqrt{3}} \right) \tag{00.10}$$

$$\mathbf{Q}(\mu^-) = (-6.828\ 797\ 9759, \quad -6.828\ 797\ 9759, \quad +10.657\ 595\ 9518) \tag{00.11}$$

$$\mathbf{Q}(\tau^-) = (-25.064\ 133\ 4342, \quad -25.064\ 133\ 4342, \quad +47.128\ 266\ 8684) \tag{00.12}$$

Calculating the scalar products of the above expressions, then gain following results which are just what listed in Table 2.

-5-

Up to know, we see: Due to Mass Principle, twelve fermions are attached their " math masses " below

$$\mathbf{Q}^2(t) = 338,551.859\ 099\ 9027 = \frac{173{,}000.000\ 000\ 0017}{0.511} \tag{00.13}$$

$$\mathbf{Q}^2(c) = 2,504.892\ 367\ 8975 = \frac{1{,}280.000\ 000\ 0041}{0.511} \tag{00.14}$$

$$\mathbf{Q}^2(u) = 4.500\ 978\ 4756 = \frac{2.300\ 000\ 0001}{0.511} \tag{00.15}$$

$$\mathbf{Q}^2(d) = 9.393\ 346\ 3803 = \frac{4.799\ 999\ 9998}{0.511} \tag{00.16}$$

$$\mathbf{Q}^2(s) = 185.909\ 980\ 4292 = \frac{95.000\ 000\ 0005}{0.511} \tag{00.17}$$

$$\mathbf{Q}^2(b) = 9,197.651\ 663\ 3893 = \frac{4{,}700.000\ 000\ 0000}{0.511} \tag{00.18}$$

$$\mathbf{Q}^2(\upsilon_\tau) = 35.616\ 438\ 3571 = \frac{18.200\ 000\ 0005}{0.511} \tag{00.19}$$

$$\mathbf{Q}^2(\upsilon_\mu) = 0.371\ 819\ 9609 = \frac{0.190}{0.511} \tag{00.20}$$

$$\mathbf{Q}^2(\upsilon_e) = 0.000\ 003\ 9138 = \frac{0..000\ 002}{0.511} \tag{00.21}$$

$$\mathbf{Q}^2(e^-) = 1.000\ 000\ 0000 = \frac{0.511\ 000\ 0000}{0.511} \tag{00.22}$$

$$\mathbf{Q}^2(\mu^-) = 206.849\ 315\ 0632 = \frac{105.699\ 999\ 9973}{0.511} \tag{00.23}$$

$$\mathbf{Q}^2(\tau^-) = 3,477.495\ 107\ 6339 = \frac{1{,}777.000\ 000\ 0009}{0.511} \tag{00.24}$$

• Long time to staring at the odd digital numbers of the twelve mass-particles in table 1, table 2 and the above-mentiond (00.13), (00.14), ..., ..., (00.23), (00.24), we wonder what's the relationship between them ? Who is their ancestor ?

Are there a math formula that could describe their ties of blood ?

We raise question, We need imagination.

• This paper introduces The Zeroth Generation Zh of Fermion, which consists of four particles $\alpha(0), \beta(0), \gamma(0), \delta(0)$ that all with Zero-Mass, AND then combining the Zeroth generation with the first, second, third generations (table1, table2)) of SM Standard Model extend to a new larger picture, *four generations fermion, Table 0.*

Particles of Table 0 are labelled by the two characteristic, Function-**Q**(ω, ξ) and Function-ξ(ω). (see following).
We receive epiphanies from Table 0 on the way to accomplish a unified mass theory with Zero-Mass and Non-Zero-Mass.

Logical rounting constructing Table 0

Beside mass, we take notice of charge $Q(\omega)$. Charge $Q(\omega)$ of particle ω is the other characteritic observational quantity in Table 2. In the horizontal direction, there are four groups of fermion. Each of the four groups comprises three charged fermions all with the same charge $Q(\omega)$, which are two groups of lepton with charge $0e$ & $-e$ and two groups of quark with charge $-\frac{1}{3}e$ & $+\frac{2}{3}e$.

■ Now fermion particles that with the same charege are attributed to *IDENTICAL PARTICLES.*

Example of $\omega = Leptons\ e^-, \mu^-, \tau^-$ are attributed to be the three identical particles that with the same charge $-e$, although their masses are completely different.

Especially of $\omega = Neutrinos\ \upsilon_e, \upsilon_\mu, \upsilon_\tau$ are attributed to be the Three Identical Dirac Particles that with the same charge $0e$, Rather than to be three different Dirac fermion particles, each one possesses its own mass.

-7-

■ Due to **Pauli Exclusion Principle**:

When fermion particles in Table 2 with the same charge state Q, they are positioned in the same row, each of these fermions should be distinguished by different quantum numbers. Function - $\mathbf{Q}(\omega, \xi)$ and Function - $\xi(\omega)$ are selected as the candidates for quantum number below

♦ Further-A, in order to describe the mass behavior of particles ω in Table 2, we construct a complex charge expression (0.6) below

$$\mathbf{Q}(\omega, \xi) + i\ \xi(\omega) \tag{0.6}$$

The charge values of Color Function-$\mathbf{Q}(\omega, \xi)$ and the charge values of Color Function-$\xi(\omega)$ are respectively below

$$Q(\omega, \xi) = 0e, -e, -\frac{1}{3}e, +\frac{2}{3} \tag{0.7}$$

$$\xi(\omega) = 0e \tag{0.8}$$

♦ Further-B, in order to describe the mass behavior of particles ω of four generations of fermion (Table 0), Table 3 is presented below

Table 3: Function-**Q** and Function-ξ of particle ω

		$0th$	$1st$	$2nd$	$3rd$		
Ψ	$\mathbf{Q}(\Psi(0),\xi)$	$\xi(\Psi(0))$	$\xi(\omega_1)$	$\xi(\omega_2)$	$\xi(\omega_3)$		
δ	$\mathbf{Q}(\delta(0),\xi)$	$\xi(\delta(0))$	$\xi(u)$	$\xi(c)$	$\xi(t)$	$\xi(q^+)$	$+\frac{2}{3}e$
γ	$\mathbf{Q}(\gamma(0),\xi)$	$\xi(\gamma(0))$	$\xi(d)$	$\xi(s)$	$\xi(b)$	$\xi(q^-)$	$-\frac{1}{3}e$
β	$\mathbf{Q}(\beta(0),\xi)$	$\xi(\beta(0))$	$\xi(e^-)$	$\xi(\mu^-)$	$\xi(\tau^-)$	$\xi(l^-)$	$-e$
α	$\mathbf{Q}(\alpha(0),\xi)$	$\xi(\alpha(0))$	$\xi(\upsilon_e)$	$\xi(\upsilon_\mu)$	$\xi(\upsilon_\tau)$	$\xi(\upsilon^0)$	$0e$
	Function-$\mathbf{Q}(\Psi(0),\xi)$	Function-$\xi(\omega_0)$ $\omega_0 = \Psi(0)$	Function-$\xi(\omega_1)$	Function-$\xi(\omega_2)$	Function-$\xi(\omega_3)$	Function-$\xi(\omega)$	$Q(\omega)$

Notice： Function-**Q** and Function-ξ of Zero-Mass particles all are labelled by $\Psi(0)$ (0.11)

$$\mathbf{Q}(\Psi(0),\xi) = \mathbf{Q}(\alpha(0),\xi),\ \ \mathbf{Q}(\beta(0),\xi),\ \ \mathbf{Q}(\gamma(0),\xi),\ \ \mathbf{Q}(\delta(0),\xi) \tag{0.9}$$

$$\xi(\Psi(0),\xi) = \xi(\alpha(0)),\quad \xi(\beta(0)),\quad \xi(\gamma(0)),\quad \xi(\delta(0)) \tag{0.10}$$

$$\Psi(0) = \alpha(0),\ \ \beta(0),\ \ \gamma(0),\ \ \delta(0) \tag{0.11}$$

Function-**Q** and Function-ξ of Non-Zero-Mass particles are labelled by $\Psi(0)$ and by $\xi(\omega)$ respectively

-9-

In Table3, particle identity is distinguished by Function -**Q**(ω, ξ) and Function-ξ(ω), which are the color representations in three-dimension color space of quantum number that called *Colorized Quantum Number, CQN.* CQN *is not a C-number* as usual we encounter.

Basing on Table 3 and Functional Array (0.12) below, Table 0 is established.

$$(\mathbf{Q}(\omega, \xi), \ \xi(\omega)) \tag{0.12}$$

Expression (0.12) is Quantum Characteristic of Table 0, which is used to deal with partcile classfication of particle ω, we see： due to Pauli Exclusion Principle, each of sixteen fermions in Table 0 occupies diffirent Functional Array ($\mathbf{Q}(\omega, \xi)$, $\xi(\omega)$).

Carefully notice the pairings of particle and anti-particle following

- **0** $\mathbf{Q}(\alpha(0), \xi) = (+236.539\ 654\ 85315, \ +238.539\ 654\ 85315, \ -475.079\ 309\ 70630)$ (1.1)
- **0** $\mathbf{Q}(\overline{\alpha}(0), \xi) = (+238.539\ 654\ 85315, \ +236.539\ 654\ 85315 \ -475.079\ 309\ 70630)$ (1.2)

- **0** $\mathbf{Q}(\beta(0), \xi) = (+236.539\ 654\ 85315, \ +238.539\ 654\ 85315, \ -478.079\ 309\ 70630)$ (2.1)
- **0** $\mathbf{Q}(\overline{\beta}(0), \xi) = (+238.539\ 654\ 85315, \ +236.539\ 654\ 85315 \ -472.079\ 309\ 70630)$ (2.2)

- **0** $\mathbf{Q}(\gamma(0), \xi) = (+236.539\ 654\ 85315, \ +238.539\ 654\ 85315, \ -476.079\ 309\ 70630)$ (3.1)
- **0** $\mathbf{Q}(\overline{\gamma}(0), \xi) = (+238.539\ 654\ 85315, \ +236.539\ 654\ 85315 \ -474.079\ 309\ 70630)$ (3.2)

- **0** $\mathbf{Q}(\delta(0), \xi) = (+236.539\ 654\ 85315, \ +238.539\ 654\ 85315, \ -473.079\ 309\ 70630)$ (4.1)
- **0** $\mathbf{Q}(\overline{\delta}(0), \xi) = (+238.539\ 654\ 85315, \ +236.539\ 654\ 85315 \ -477.079\ 309\ 70630)$ (4.2)

The sum of the above pairings are given below

$$\mathbf{Q}(\alpha(0),\xi) + \mathbf{Q}(\bar{\alpha}(0),\xi) = \mathbf{Q}(\beta(0),\xi) + \mathbf{Q}(\bar{\beta}(0),\xi) = \mathbf{Q}(\gamma(0),\xi) + \mathbf{Q}(\bar{\gamma}(0),\xi) = \mathbf{Q}(\delta(0),\xi) + \mathbf{Q}(\bar{\delta}(0),\xi) \quad (0.13)$$

$$= (+475.079\ 309\ 70630, \quad +475.079\ 309\ 70630, \quad -950.158\ 619\ 41260) = \mathbf{Q}(\Pi) \quad (0.14)$$

We see: the scalar product of (0.14) is just the mass of Heaven Particle [2]

$$\mathbf{Q}^2(\Pi) = 1354,202.103\ 066\ 0877 = \frac{691997.274\ 666\ 7708}{0.511} = \frac{M(\Pi)}{0.511} \quad (0.15)$$

The relationship between four Function-$\mathbf{Q}(\omega,\xi)$ of $\alpha(0)$, $\beta(0)$, $\gamma(0)$, $\delta(0)$ of Zeroth Generation of Fermion Zth in Table 0 are given by Charge-Transition expressions following

$$\mathbf{Q}(\beta(0),\xi) = \mathbf{Q}(\alpha(0),\xi) + (0, \quad 0, \quad -3) \quad (0.16)$$

$$\mathbf{Q}(\bar{\beta}(0),\xi) = \mathbf{Q}(\bar{\alpha}(0),\xi) + (0, \quad 0, \quad +3) \quad (0.17)$$

$$\mathbf{Q}(\gamma(0),\xi) = \mathbf{Q}(\alpha(0),\xi) + (0, \quad 0, \quad -1) \quad (0.18)$$

$$\mathbf{Q}(\bar{\gamma}(0),\xi) = \mathbf{Q}(\bar{\alpha}(0),\xi) + (0, \quad 0, \quad +1) \quad (0.19)$$

$$\mathbf{Q}(\delta(0),\xi) = \mathbf{Q}(\alpha(0),\xi) + (0, \quad 0, \quad +2) \quad (0.20)$$

$$\mathbf{Q}(\bar{\delta}(0),\xi) = \mathbf{Q}(\bar{\alpha}(0),\xi) + (0, \quad 0, \quad -2) \quad (0.21)$$

-11-

Table 0: Zeroth Generation of Fermion Zth and the Color Representation of Fermions of Standard Model, SM

	Zeroth **0**	||	1st **1**	2nd **2**	3rd **3**	||	Charge
Charged Quark	δ(0)	|	u	c	t	|	$+\frac{2}{3}e$
	($\mathbf{Q}(\delta(0),\xi)$, $\xi(\delta(0))$)	|	($\mathbf{Q}(\delta(0),\xi)$, $\xi(u)$)	($\mathbf{Q}(\delta(0),\xi)$, $\xi(c)$)	($\mathbf{Q}(\delta(0),\xi)$, $\xi(t)$)	|	
Charged Quark	γ(0)	|	d	s	b	|	$-\frac{1}{3}e$
	($\mathbf{Q}(\gamma(0),\xi)$, $\xi(\gamma(0)$)	|	($\mathbf{Q}(\gamma(0),\xi)$, $\xi(d)$)	($\mathbf{Q}(\gamma(0),\xi)$, $\xi(s)$)	($\mathbf{Q}(\gamma(0),\xi)$, $\xi(b)$)	|	
Charged Lepton	β(0)	|	e	μ	τ	|	$-e$
	($\mathbf{Q}(\beta(0),\xi)$, $\xi(\beta(0))$)	|	($\mathbf{Q}(\beta(0),\xi)$, $\xi(e^-)$)	($\mathbf{Q}(\beta(0),\xi)$, $\xi(\mu^-)$)	($\mathbf{Q}(\beta(0),\xi)$, $\xi(\tau^-)$)	|	
Neutral Lepton	α(0)	|	υ_e	υ_μ	υ_τ	|	$0e$
	($\mathbf{Q}(\alpha(0),\xi)$, $\xi(\alpha(0))$)	|	($\mathbf{Q}(\alpha(0),\xi)$, $\xi(\upsilon_e)$)	($\mathbf{Q}(\alpha(0),\xi)$, $\xi(\upsilon_\mu)$)	($\mathbf{Q}(\alpha(0),\xi)$, $\xi(\upsilon_\tau)$)	|	
Mass Type	Zero-Mass	||	Non-Zero-Mass	Non-Zero-Mass	Non-Zero-Mass	||	$Q(\omega)$

-12-

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

- The color scalar product of complex charge expression (0.6) is given by (0.22)

$$\mathbf{Q}(\omega,\xi)\ +i\ \boldsymbol{\xi}(\omega) \tag{0.6}$$

$$\mathbf{Q}^2(\omega,\xi)\ -\ \boldsymbol{\xi}^2(\omega)\ +\ i\ [\ \mathbf{Q}(\omega,\xi),\ \ \boldsymbol{\xi}(\omega)\ ]_+ \tag{0.22}$$

IF

$$[\ \mathbf{Q}(\omega,\xi)\ \ ,\boldsymbol{\xi}(\omega)\ ]_-\ \ =\ 0 \tag{0.23}$$

THEN (0.22) turns to an operator $\mathbb{Q}^2(\omega,\xi)$

$$\mathbb{Q}^2(\omega,\xi)\ \equiv\ \ \mathbf{Q}^2(\omega,\xi)\ -\ \boldsymbol{\xi}^2(\omega)\ +\ 2\,i\,\mathbf{Q}(\omega,\xi)\cdot\boldsymbol{\xi}(\omega) \tag{0.24}$$

(0.25) called as **ScalarProduct-Mass Equation,** that could be used to deal with complex mass $\mathbb{M}(\omega)$ of particle ω.

$$\mathbb{Q}^2(\omega,\xi)\ =\ \frac{\mathbb{M}(\omega)}{M(e^-)} \tag{0.25}$$

The **Real ScalarProduct-Mass Equation** of (0.24) is (0.26), that consists of the real part of (0.24) and Ground State $\mathbf{Q}^2(\omega)$ (0.1) of particle ω

$$\mathbf{Q}^2(\omega,\xi)\ -\ \boldsymbol{\xi}^2(\omega)\ =\ \mathbf{Q}^2(\omega)\ \ =\ \frac{M(\omega)}{M(e^-)} \tag{0.26}$$

- Particle mass $M(\omega)$ could be found out by putting Function-**Q** and Function-**ξ** of particle ω of Table 0 into equation (0.26). Next four parts we will use (0.26) to dedicate and analyse the unified mass theory of four types of charged fermions in Table 0

Part A Unified mass theory of three Dirac Neutrinos $\upsilon_e, \upsilon_\mu, \upsilon_\tau$ ($\overline{\upsilon}_e, \overline{\upsilon}_\mu, \overline{\upsilon}_\tau$).

♦ From Table 1 and Table 2, we extract neutrinos $\omega = \upsilon$ to obtain Table 4 below

Table 4: Mass $M(\upsilon)$ and Color Scalar Product $\mathbf{Q}^2(\upsilon)$ of neutrinos υ

Ground State	1st	2nd	3rd
	υ_e	υ_μ	υ_τ
Mev	0. 000 002	0. 190	18. 2
	$\mathbf{Q}^2(\upsilon_e)$, $\mathbf{Q}^2(\overline{\upsilon}_e)$	$\mathbf{Q}^2(\upsilon_\mu)$, $\mathbf{Q}^2(\overline{\upsilon}_\mu)$	$\mathbf{Q}^2(\upsilon_\tau)$, $\mathbf{Q}^2(\overline{\upsilon}_\tau)$
$\mathbf{Q}^2$	0. 000 003 9139	0. 371 819 9609	35. 616 438 3562

What's the relationship between the above three Dirac Neutrinos $\upsilon_e, \upsilon_\mu, \upsilon_\tau$ ($\overline{\upsilon}_e, \overline{\upsilon}_\mu, \overline{\upsilon}_\tau$) ?

♦ From Table 0, We extract $\omega = \alpha(0), \upsilon_e, \upsilon_\mu, \upsilon_\tau$ to obtain Table 5 below, and search for masses of ω following

Table 5: Mass $M(\upsilon)$ and Color Scalar Product $\mathbf{Q}^2(\upsilon)$ of neutrinos υ

Neutral Lepton	0th		1st	2nd	3rd		
	$\alpha(0)$	|	υ_e	υ_μ	υ_τ	|	$0e$
	($\mathbf{Q}(\alpha(0), \xi)$, $\xi(\alpha(0))$)	|	($\mathbf{Q}(\alpha(0), \xi)$, $\xi(\upsilon_e)$)	($\mathbf{Q}(\alpha(0), \xi)$, $\xi(\upsilon_\mu)$)	($\mathbf{Q}(\alpha(0), \xi)$, $\xi(\upsilon_\tau)$)	|	$Q(\omega)$
	0		**1**	**2**	**3**		

- Giving detailed values of Function-**Q** of particle $\alpha(0)$ and anti-particle $\overline{\alpha}(0)$ bwlow

- **0** $\mathbf{Q}(\alpha(0), \xi) = (+236.539\ 654\ 85315, \quad +238.539\ 654\ 85315, \quad -475.079\ 309\ 70630)$ (1.1)
- **0** $\mathbf{Q}(\overline{\alpha}(0), \xi) = (+238.539\ 654\ 85315, \quad +236.539\ 654\ 85315 \quad -475.079\ 309\ 70630)$ (1.2)

The charges of $\alpha(0)$ and $\overline{\alpha}(0)$ are zero

- **0** $Q(\alpha(0), \xi) = \frac{1}{3}(+236.539\ 654\ 85315 + 238.539\ 654\ 85315 - 475.079\ 309\ 70630) = 0e$ (1.3)
- **0** $Q(\overline{\alpha}(0), \xi) = \frac{1}{3}(+238.539\ 654\ 85315 + 236.539\ 654\ 85315 - 475.079\ 309\ 70630) = 0e$ (1.4)

AND below

- Giving detailed values of Function-ξ(ω) of particles $\upsilon_e, \upsilon_\mu, \upsilon_\tau$ ($\overline{\upsilon}_e, \overline{\upsilon}_\mu, \overline{\upsilon}_\tau$) below

$$\xi = (\xi_1, \quad \xi_2 \quad \xi_3) \quad (1.5)$$

- **3** $\xi(\upsilon_\tau) = \xi(\overline{\upsilon}_\tau) = (+237.527\ 861\ 28795, \quad +237.527\ 861\ 28795, \quad -475.055\ 722\ 57590)$ (1.8)
- **2** $\xi(\upsilon_\mu) = \xi(\overline{\upsilon}_\mu) = (+237.540\ 226\ 04833, \quad +237.540\ 226\ 04833, \quad -475.080\ 452\ 09666)$ (1.7)
- **1** $\xi(\upsilon_e) = \xi(\overline{\upsilon}_e) = (+237.540\ 356\ 48798, \quad +237.540\ 356\ 48798, \quad -475.080\ 712\ 97596)$ (1.6)

The charges of Function-ξ(ω) of particles $\upsilon_e\ \overline{\upsilon}_e,\ \upsilon_\mu\ \overline{\upsilon}_\mu,\ \upsilon_\tau\ \overline{\upsilon}_\tau$ are zero

$$\xi = \frac{1}{3}(\xi_1 + \xi_2 + \xi_3) = 0 \quad (1.9)$$

Expressions of the color scalar products of the above **0**, **1**, **2**, **3** are given below

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025 41

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

- **3** $\xi^2(\upsilon_\tau) = \xi^2(\overline{\upsilon}_\tau) = 338,516.909\ 328\ 1656$ (1.13)
- **2** $\xi^2(\upsilon_\mu) = \xi^2(\overline{\upsilon}_\mu) = 338,552.153\ 946\ 5609$ (1.12)
- **1** $\xi^2(\upsilon_e) = \xi^2(\overline{\upsilon}_\tau) = 338,552.525\ 762\ 6079$ (1.11)
- **0** $\mathbf{Q}^2(\alpha(0),\xi) = \mathbf{Q}^2(\overline{\alpha}(0),\xi) = 338,552.525\ 766\ 5218$ (1.10)

Finally making subtraction, using **ScalarProduct-Mass Equation** (0.26): The masses of three neutral Dirac leptons $\upsilon_e,\upsilon_\mu,\upsilon_\tau$ ($\overline{\upsilon}_e,\overline{\upsilon}_\mu,\overline{\upsilon}_\tau$) are obtained by using a common color scalar product $\mathbf{Q}^2(\alpha(0),\xi)$ of Function-**Q** of particle $\alpha(0)$ and color scalar product $\xi^2(\upsilon_e),\xi^2(\upsilon_\mu),\xi^2(\upsilon_\tau)$ ($\xi^2(\overline{\upsilon}_e),\xi^2(\overline{\upsilon}_\mu),\xi^2(\overline{\upsilon}_\tau)$) of Function-ξ of particles $\upsilon_e,\upsilon_\mu,\upsilon_\tau$ ($\overline{\upsilon}_e,\overline{\upsilon}_\mu,\overline{\upsilon}_\tau$), their own. Yieldng

- **3** $\mathbf{Q}^2(\alpha(0),\xi) - \xi^2(\upsilon_\tau) = \mathbf{Q}^2(\overline{\alpha}(0),\xi) - \xi^2(\overline{\upsilon}_\tau)$

$$= 338,552.525\ 766\ 5218 - 338,516.909\ 328\ 1656 = 35.616\ 438\ 3562 = \frac{18.200\ 000\ 0000}{0.511} \quad (1.16)$$

- **2** $\mathbf{Q}^2(\alpha(0),\xi) - \xi^2(\upsilon_\mu) = \mathbf{Q}^2(\overline{\alpha}(0),\xi) - \xi^2(\overline{\upsilon}_\mu)$

$$= 338,552.525\ 766\ 5218 - 338,552.153\ 946\ 5609 = 0.371\ 819\ 9609 = \frac{0.190\ 000\ 0000}{0.511} \quad (1.15)$$

- **1** $\mathbf{Q}^2(\alpha(0),\xi) - \xi^2(\upsilon_e) = \mathbf{Q}^2(\overline{\alpha}(0),\xi) - \xi^2(\overline{\upsilon}_e)$

$$= 338,552.525\ 766\ 5218 - 338,552.525\ 762\ 6079 = 0.000\ 003\ 9139 = \frac{0.000\ 002\ 0000}{0.511} \quad (1.14)$$

Just like each of three Dirac neutrinos $\upsilon_e,\upsilon_\mu,\upsilon_\tau$ ($\overline{\upsilon}_e,\overline{\upsilon}_\mu,\overline{\upsilon}_\tau$) are attached their Function-ξ, $\xi(\upsilon_e),\xi(\upsilon_\mu),\xi(\upsilon_\tau)$ ($\xi(\overline{\upsilon}_e),\xi(\overline{\upsilon}_\mu),\xi(\overline{\upsilon}_\tau)$); particle $\alpha(0)$ or ($\overline{\alpha}(0)$) is attached a Function-ξ of its own, $\xi(\alpha(0))$ and $\xi(\overline{\alpha}(0))$ (1.17) (1.18) too. below

- **0** $$\xi(\alpha(0)) = \xi(\overline{\alpha}(0)) \quad (1.17)$$

- **0** $$= (+237.540\ 356\ 489349, \ +237.540\ 356\ 489349, \ -475.080\ 712\ 978698) \quad (1.18)$$

The color scalar product of (1.17) is given as

- **0** $$\xi^2(\alpha(0)) = \xi^2(\overline{\alpha}(0)) = 338,552.525\ 766\ 5220 \quad (1.19)$$

Again using (1.10)

- **0** $$\mathbf{Q}^2(\alpha(0),\xi) = \mathbf{Q}^2(\overline{\alpha}(0),\xi) = 338,552.525\ 766\ 5218 \quad (1.10)$$

Base on **ScalarProduct-Mass Equation** (0.26), using the above results (1.10) and (1.19), then having the masses of particle $\alpha(0)$ $\overline{\alpha}(0)$ below

- **0** $$\mathbf{Q}^2(\alpha(0),\xi) - \xi^2(\alpha(0)) = 338,552.525\ 766\ 5218 - 338,552.525\ 766\ 5220 = 0.000\ 000\ 0002 = \frac{0.000\,000\ 0001}{0.511} \approx 0 \quad (1.20)$$

- **0** $$\mathbf{Q}^2(\overline{\alpha}(0),\xi) - \xi^2(\overline{\alpha}(0)) = 338,552.525\ 766\ 5218 - 338,552.525\ 766\ 5220 = 0.000\ 000\ 0002 = \frac{0.000\,000\ 0001}{0.511} \approx 0 \quad (1.21)$$

We see particles $\alpha(0)$ $\overline{\alpha}(0)$ are zero-mass particles.

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Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

Part B Unified mass theory of three Dirac Charged Leptons e^-, μ^-, τ^- (e^+, μ^+, τ^+).

♦ From Table 1 and Table 2, we extract charged leptons $\omega = l^-$ to obtain Table 6 below

Table 6: Mass $M(l^-)$ and Color Scalar Product $\mathbf{Q}^2(l^-)$ of charged leptons l^-

Ground State	1st	2nd	3rd
	e^-	μ^-	τ^-
Mev	0. 511 000	105. 700	1777. 000
	$\mathbf{Q}^2(e^-)$, $\mathbf{Q}^2(e^+)$	$\mathbf{Q}^2(\mu^-)$, $\mathbf{Q}^2(\mu^+)$	$\mathbf{Q}^2(\tau^-)$, $\mathbf{Q}^2(\tau^+)$
$\mathbf{Q}^2$	1. 000 000 0000	206. 849 315 0685	3477. 495 107 6321

What's the relationship between the above three Dirac charged leptons e^-, μ^-, τ^- (e^+, μ^+, τ^+) ?

♦ From Table 0, We extract $\omega = \beta(0), e^-, \mu^-, \tau^-$ to obtain Table 7 below, and search for masses of ω following

Table 7: Mass $M(l^-)$ and Color Scalar Product $\mathbf{Q}^2(l^-)$ of charged leptons l^-

Neutral Lepton	0th		1st	2nd	3rd		
	$\beta(0)$	|	e^-	μ^-	τ^-	|	$-e$
	($\mathbf{Q}(\beta(0), \xi)$, $\xi(\beta(0))$)	|	($\mathbf{Q}(\beta(0), \xi)$, $\xi(e^-)$)	($\mathbf{Q}(\beta(0), \xi)$, $\xi(\mu^-)$)	($\mathbf{Q}(\beta(0), \xi)$, $\xi(\tau^-)$)	|	$Q(\omega)$
	0		**1**	**2**	**3**		

- Giving detailed values of Function-**Q** of particle $\beta(0)$ and anti-particle $\overline{\beta}(0)$ bwlow

- **0** $$\mathbf{Q}(\beta(0), \xi) = (+236.539\ 654\ 85315, \quad +238.539\ 654\ 85315, \quad -478.079\ 309\ 70630) \tag{2.1}$$
- **0** $$\mathbf{Q}(\overline{\beta}(0), \xi) = (+238.539\ 654\ 85315, \quad +236.539\ 654\ 85315 \quad -472.079\ 309\ 70630) \tag{2.2}$$

The charges of $\beta(0)$ and $\overline{\beta}(0)$ are $-e$ and $+e$

- **0** $$Q(\beta(0), \xi) = \frac{1}{3}(+236.539\ 654\ 85315 + 238.539\ 654\ 85315 - 478.079\ 309\ 70630) = -e \tag{2.3}$$
- **0** $$Q(\overline{\beta}(0), \xi) = \frac{1}{3}(+238.539\ 654\ 85315 + 236.539\ 654\ 85315 - 472.079\ 309\ 70630) = +e \tag{2.4}$$

AND below

- Giving detailed values of Function-ξ(ω) of particles e^-, μ^-, τ^- (e^+, μ^+, τ^+) below

$$\xi \quad (\quad \xi_1, \quad \xi_2 \quad \xi_3 \quad) \tag{2.5}$$

- **3** $$\xi(\tau^-) = (+237.323\ 445\ 434400, \quad +237.323\ 445\ 434400, \quad -474.646\ 890\ 868800) \tag{2.8}$$
- **3** $$\xi(\tau^+) = (+231.744\ 670\ 848706, \quad +231.744\ 670\ 848706, \quad -463.489\ 341\ 697412) \tag{2.$\widetilde{8}$}$$
- **2** $$\xi(\mu^-) = (+238.469\ 128\ 788085, \quad +238.469\ 128\ 788085, \quad -476.938\ 257\ 576170) \tag{2.7}$$
- **2** $$\xi(\mu^+) = (+236.468\ 532\ 294544, \quad +236.468\ 532\ 294544, \quad -472.937\ 064\ 589088) \tag{2.$\widetilde{7}$}$$
- **1** $$\xi(e^-) = (+238.541\ 052\ 240755, \quad +238.541\ 052\ 240755, \quad -477.082\ 104\ 481510) \tag{2.6}$$
- **1** $$\xi(e^+) = (+236.541\ 064\ 055935, \quad +236.541\ 064\ 055935, \quad -473.082\ 128\ 111870) \tag{2.$\widetilde{6}$}$$

The charges of Function-ξ(ω) of particles e^-, μ^-, τ^- (e^+, μ^+, τ^+) are zero

$$\xi = \frac{1}{3}(\xi_1 + \xi_2 + \xi_3) = 0 \tag{2.9}$$

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

Expressions of the color scalar products of the above **0**, **1**, **2**, **3** are given below

- **3** $$\xi^2(\tau^-) = 337,934.506\ 517\ 1276 \tag{2.13}$$
- **3** $$\xi^2(\tau^+) = 322,233.554\ 800\ 6506 \tag{2.$\widetilde{13}$}$$
- **2** $$\xi^2(\mu^-) = 341,205.152\ 309\ 6898 \tag{2.12}$$
- **2** $$\xi^2(\mu^+) = 335,504.200\ 593\ 2148 \tag{2.$\widetilde{12}$}$$
- **1** $$\xi^2(e^-) = 341,411.001\ 624\ 7596 \tag{2.11}$$
- **1** $$\xi^2(e^+) = 335,710.049\ 908\ 2840 \tag{2.$\widetilde{11}$}$$
- **0** $$\mathbf{Q}^2(\beta(0), \xi) = 341,412.001\ 624\ 7596 \tag{2.10}$$
- **0** $$\mathbf{Q}^2(\overline{\beta}(0), \xi) = 335,711.049\ 908\ 2840 \tag{2.$\widetilde{10}$}$$

-20-

Finally making subtraction, using **ScalarProduct-Mass Equation** (0.26): The masses of three Dirac charged leptons e^-, μ^-, τ^- (e^+, μ^+, τ^+) are obtained by using a common color scalar product $\mathbf{Q}^2(\beta(0), \xi)$ of Function-**Q** of particle $\beta(0)$ and color scalar product $\xi^2(e^-), \xi^2(\mu^-), \xi^2(\tau^-)$ ($\xi^2(e^+), \xi^2(\mu^+), \xi^2(\tau^+)$) of Function-ξ of particles e^-, μ^-, τ^- (e^+, μ^+, τ^+), their own. Yieldng

- **3** $\mathbf{Q}^2(\beta(0), \xi) - \xi^2(\tau^-) = 341,412.001\ 624\ 7596 - 337,934.506\ 517\ 1276 = 3477.495\ 107\ 6320 = \frac{1,777.000\ 000\ 0009}{0.511}$ (2.16)
- **3** $\mathbf{Q}^2(\overline{\beta}(0), \xi) - \xi^2(\tau^+) = 335,711.049\ 908\ 2840 - 322,233.554\ 800\ 6506 = 3477.495\ 107\ 6334 = \frac{1,777.000\ 000\ 0007}{0.511}$ $(2.\widetilde{16})$

- **2** $\mathbf{Q}^2(\beta(0), \xi) - \xi^2(\mu^-) = 341,412.001\ 624\ 7596 - 341,205.152\ 309\ 6898 = 206.849\ 315\ 0698 = \frac{105.700\ 000\ 0007}{0.511}$ (2.15)
- **2** $\mathbf{Q}^2(\overline{\beta}(0), \xi) - \xi^2(\mu^+) = 335,711.049\ 908\ 2840 - 335,504.200\ 593\ 2148 = 206.849\ 315\ 0692 = \frac{105.700\ 000\ 0004}{0.511}$ $(2.\widetilde{15})$

- **1** $\mathbf{Q}^2(\beta(0), \xi) - \xi^2(e^-) = 341,412.001\ 624\ 7596 - 341,411.001\ 624\ 7596 = 1.000\ 000\ 0000 = \frac{0.511\ 000\ 0000}{0.511}$ (2.14)
- **1** $\mathbf{Q}^2(\overline{\beta}(0), \xi) - \xi^2(e^+) = 335,711.049\ 908\ 2840 - 335,710.049\ 908\ 2840 = 1.000\ 000\ 0000 = \frac{0.511\ 000\ 0000}{0.511}$ $(2.\widetilde{14})$

Just like each of three Dirac charged leptons e^-, μ^-, τ^- (e^+, μ^+, τ^+) are attached their Function-ξ, $\xi(e^-), \xi(\mu^-), \xi(\tau^-)$ ($\xi(e^+), \xi(\mu^+), \xi(\tau^+)$); particle $\beta(0)$ or ($\overline{\beta}(0)$) is attached a Function-ξ of its own, (2.17) (2.18) too below

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025 47

• **0** $\xi(\beta(0)) = (+238.541\ 401\ 5863770, \quad +238.541\ 401\ 5863770, \quad -477.082\ 803\ 1727540)$ (2.17)

• **0** $\xi(\overline{\beta}(0)) = (+236.541\ 416\ 3553197, \quad +236.541\ 416\ 3553197, \quad -473.082\ 832\ 7106394)$ (2.18)

The color scalar product of (2.17) and (2.18) are given as

• **0** $\xi^2(\beta(0)) = 341,412.001\ 624\ 7592$ (2.19)

• **0** $\xi^2(\overline{\beta}(0)) = 335,711.049\ 908\ 2842$ $(2.\widetilde{19})$

Again using (2.10) and $(2.\widetilde{10})$

• **0** $\mathbf{Q}^2(\beta(0), \xi) = 341,412.001\ 624\ 7596$ (2.10)

• **0** $\mathbf{Q}^2(\overline{\beta}(0), \xi) = 335,711.049\ 908\ 2840$ $(2.\widetilde{10})$

Base on **ScalarProduct-Mass Equation** (0.26), using the above results (2.19) $(2.\widetilde{19})$ and (2.10) $(1.\widetilde{10})$, then having the masses of particle $\beta(0)$ $\overline{\beta}(0)$ below

• **0** $\mathbf{Q}^2(\beta(0), \xi) - \xi^2(\beta(0)) = 341,412.001\ 624\ 7596 - 341,412.001\ 624\ 7592 = +0.000\ 000\ 0004 = \frac{0.000\ 000\ 0002}{0.511} \approx 0$ (2.20)

• **0** $\mathbf{Q}^2(\overline{\beta}(0), \xi) - \xi^2(\overline{\beta}(0)) = 335,711.049\ 908\ 2840 - 335,711.049\ 908\ 2842 = -0.000\ 000\ 0002 = \frac{0.000\ 000\ 0001}{0.511} \approx 0$ (2.21)

We see particles $\beta(0)$ $\overline{\beta}(0)$ are zero-mass particles.

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Part C Unified mass theory of three Dirac Charged Quarks $d, s, b\ (\bar{d}, \bar{s}, \bar{b})$.

♦ From Table 1 and Table 2, we extract charged quarks $\omega = q^-$ to obtain Table 8 below

Table 8: Mass $M(q^-)$ and Color Scalar Product $\mathbf{Q}^2(q^-)$ of charged quarks q^-

Ground State	1st	2nd	3rd
	d	s	b
Mev	4. 8	95. 0	4700. 0
	$\mathbf{Q}^2(d)$, $\mathbf{Q}^2(\bar{d})$	$\mathbf{Q}^2(s)$, $\mathbf{Q}^2(\bar{s})$	$\mathbf{Q}^2(b)$, $\mathbf{Q}^2(\bar{b})$
$\mathbf{Q}^2$	9. 393 346 3796	185. 909 980 4305	9197. 651 663 4051

What's the relationship between the above three Dirac charged quarks $d, s, b\ (\bar{d}, \bar{s}, \bar{b})$?

♦ From Table 0, We extract $\omega = \gamma(0), d, s, b$ to obtain Table 9 below, and search for masses of ω following

Table 9: Mass $M(q^-)$ and Color Scalar Product $\mathbf{Q}^2(q^-)$ of charged quarks q^-

Neutral Lepton	0th		1st	2nd	3rd		
	$\gamma(0)$	|	d	s	b	|	$-\frac{1}{3}e$
	($\mathbf{Q}(\gamma(0), \xi)$, $\xi(\gamma(0))$)	|	($\mathbf{Q}(\gamma(0), \xi)$, $\xi(d)$)	($\mathbf{Q}(\gamma(0), \xi)$, $\xi(s)$)	($\mathbf{Q}(\gamma(0), \xi)$, $\xi(b)$)	|	$Q(\omega)$
	0		**1**	**2**	**3**		

- Giving detailed values of Function-**Q** of particle $\gamma(0)$ and anti-particle $\bar{\gamma}(0)$ bwlow

- **0** $\mathbf{Q}(\gamma(0), \xi) = (+236.539\ 654\ 85315, \quad +238.539\ 654\ 85315, \quad -476.079\ 309\ 70630)$ (3.1)
- **0** $\mathbf{Q}(\overline{\gamma}(0), \xi) = (+238.539\ 654\ 85315, \quad +236.539\ 654\ 85315 \quad -474.079\ 309\ 70630)$ (3.2)

The charges of $\gamma(0)$ and $\overline{\gamma}(0)$ are $-\frac{1}{3}e$ and $+\frac{1}{3}e$

- **0** $Q(\gamma(0), \xi) = \frac{1}{3}(+236.539\ 654\ 85315 + 238.539\ 654\ 85315 - 476.079\ 309\ 70630) = -\frac{1}{3}e$ (3.3)
- **0** $Q(\overline{\gamma}(0), \xi) = \frac{1}{3}(+238.539\ 654\ 85315 + 236.539\ 654\ 85315 - 474.079\ 309\ 70630) = +\frac{1}{3}e$ (3.4)

AND below

- Giving detailed values of Function-ξ(ω) of particles $d, s, b\ (\overline{d}, \overline{s}, \overline{b})$ below

$$\xi \quad (\quad \xi_1, \quad \xi_2 \quad \xi_3 \quad) \tag{3.5}$$

- **3** $\xi(b) = (+234.629\ 506\ 78411, \quad +234.629\ 506\ 78411, \quad -469.259\ 013\ 56822)$ (3.8)
- **3** $\xi(\overline{b}) = (+233.953\ 597\ 77950, \quad +233.953\ 597\ 77950, \quad -467.907\ 195\ 55900)$ (3.$\widetilde{8}$)
- **2** $\xi(s) = (+237.808\ 667\ 63202, \quad +237.808\ 667\ 63202, \quad -475.617\ 335\ 26404)$ (3.7)
- **2** $\xi(\overline{s}) = (+237.141\ 820\ 14380, \quad +237.141\ 820\ 14380, \quad -474.283\ 640\ 28760)$ (3.$\widetilde{7}$)
- **1** $\xi(d) = (+237.870\ 514\ 86035, \quad +237.870\ 514\ 86035, \quad -475.741\ 029\ 72070)$ (3.6)
- **1** $\xi(\overline{d}) = (+237.203\ 841\ 24234, \quad +237.203\ 841\ 24234, \quad -474.407\ 682\ 48468)$ (3.$\widetilde{6}$)

The charges of Function-ξ(ω) of particles $d, s, b\ (\overline{d}, \overline{s}, \overline{b})$ are zero

$$\xi = \frac{1}{3}(\xi_1 + \xi_2 + \xi_3) = 0 \tag{3.9}$$

Expressions of the color scalar products of the above **0**, **1**, **2**, **3** are given below

- **3** $$\xi^2(b) = 330,306.032\ 722\ 5282 \tag{3.13}$$
- **3** $$\xi^2(\bar{b}) = 328,405.715\ 483\ 8326 \tag{3.$\widetilde{13}$}$$
- **2** $$\xi^2(s) = 339,317.774\ 405\ 4996 \tag{3.12}$$
- **2** $$\xi^2(\bar{s}) = 337,417.457\ 166\ 6864 \tag{3.$\widetilde{12}$}$$
- **1** $$\xi^2(d) = 339,494.291\ 039\ 5680 \tag{3.11}$$
- **1** $$\xi^2(\bar{d}) = 337,593.973\ 800\ 7272 \tag{3.$\widetilde{11}$}$$
- **0** $$\mathbf{Q}^2(\gamma(0),\xi) = 339,503.684\ 385\ 9344 \tag{3.10}$$
- **0** $$\mathbf{Q}^2(\bar{\gamma}(0),\xi) = 337,603.367\ 147\ 1092 \tag{3.$\widetilde{10}$}$$

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

Finally making subtraction, using **ScalarProduct-Mass Equation** (0.26): The masses of three Dirac charged quarks d, s, b ($\bar{d}, \bar{s}, \bar{b}$) are obtained by using a common color scalar product $\mathbf{Q}^2(\gamma(0), \xi)$ of Function-**Q** of particle $\gamma(0)$ and color scalar product $\xi^2(d), \xi^2(s), \xi^2(b)$ ($\xi^2(\bar{d}), \xi^2(\bar{s}), \xi^2(\bar{b})$) of Function-ξ of particles d, s, b ($\bar{d}, \bar{s}, \bar{b}$), their own. Yieldng

- **3** $\mathbf{Q}^2(\gamma(0), \xi) - \xi^2(b) = 339,503.684\ 385\ 9344 - 330,306.032\ 722\ 5282 = 9197.651\ 663\ 4062 = \frac{4700.\ 000\ 000\ 0006}{0.511}$ (3.16)
- **3** $\mathbf{Q}^2(\bar{\gamma}(0), \xi) - \xi^2(\bar{b}) = 337,603.367\ 147\ 1092 - 328,405.715\ 483\ 8326 = 9197.651\ 663\ 2766 = \frac{4699.\ 999\ 999\ 9343}{0.511}$ $(3.\widetilde{16})$

- **2** $\mathbf{Q}^2(\gamma(0), \xi) - \xi^2(s) = 339,503.684\ 385\ 9344 - 339,317.774\ 405\ 4996 = 185.909\ 980\ 4348 = \frac{95.000\ 000\ 0022}{0.511}$ (3.15)
- **2** $\mathbf{Q}^2(\bar{\gamma}(0), \xi) - \xi^2(\bar{s}) = 337,603.367\ 147\ 1092 - 337,417.457\ 166\ 6864 = 185.909\ 980\ 4228 = \frac{94.999\ 999\ 9961}{0.511}$ $(3.\widetilde{15})$

- **1** $\mathbf{Q}^2(\gamma(0), \xi) - \xi^2(d) = 339,503.684\ 385\ 9344 - 339,494.291\ 039\ 5680 = 9.393\ 346\ 3664 = \frac{4.799\ 999\ 9932}{0.511}$ (3.14)
- **1** $\mathbf{Q}^2(\bar{\gamma}(0), \xi) - \xi^2(\bar{d}) = 337,603.367\ 147\ 1092 - 337,593.973\ 800\ 7272 = 9.393\ 346\ 3820 = \frac{4.800\ 000\ 0012}{0.511}$ $(3.\widetilde{14})$

Just like each of three Dirac charged quarks d, s, b ($\bar{d}, \bar{s}, \bar{b}$) are attached their Function-ξ, $\xi(d), \xi(s), \xi(b)$ ($\xi(\bar{d}), \xi(\bar{s}), \xi(\bar{b})$); particle $\gamma(0)$ or ($\bar{\gamma}(0)$) is attached a Function-ξ of its own, $\xi(\gamma(0))$ and $\xi(\bar{\gamma}(0))$ (3.17) (3.18) too below

• **0** $\xi(\gamma(0)) = (+237.873\ 805\ 614775, \quad +237.873\ 805\ 614775, \quad -475.747\ 611\ 229550\ )$ (3.17)

• **0** $\xi(\overline{\gamma}(0)) = (+237.207\ 141\ 245477, \quad +237.207\ 141\ 245477, \quad -474.414\ 282\ 490954\ )$ (3.18)

The color scalar product of (3.17) and (3.18) are given as

• **0** $\xi^2(\gamma(0)) = 339,503.684\ 385\ 9348$ (2.19)

• **0** $\xi^2(\overline{\gamma}(0)) = 337,603.367\ 147\ 1102$ $(2.\widetilde{19})$

Again using (3.10) and $(3.\widetilde{10})$

• **0** $\mathbf{Q}^2(\gamma(0), \xi) = 339,503.684\ 385\ 9344$ (3.10)

• **0** $\mathbf{Q}^2(\overline{\gamma}(0), \xi) = 337,603.367\ 147\ 1092$ $(3.\widetilde{10})$

Base on **ScalarProduct-Mass Equation** (0.26), using the above results (3.19) $(3.\widetilde{19})$ and (3.10) $(3.\widetilde{10})$, then having the masses of particle $\gamma(0)$ $\overline{\gamma}(0)$ below

• **0** $\mathbf{Q}^2(\gamma(0), \xi) - \xi^2(\gamma(0)) = 339,503.684\ 385\ 9344 - 339,503.684\ 385\ 9348 = -0.000\ 000\ 0004 = \frac{-0.000\ 000\ 0002}{M(e^-)} \approx 0$ (3.20)

• **0** $\mathbf{Q}^2(\overline{\gamma}(0), \xi) - \xi^2(\overline{\gamma}(0)) = 337,603.367\ 147\ 1092 - 337,603.367\ 147\ 1102 = -0.000\ 000\ 0010 = \frac{-0.000\ 000\ 0005}{M(e^-)} \approx 0$ (3.21)

We see particles $\gamma(0)$ $\overline{\gamma}(0)$ are zero-mass particles.

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-27-

Part D Unified mass theory of three Dirac Charged Quarks $u, c, t\ (\bar{u}, \bar{c}, \bar{t}\ )$.

♦ From Table 1 and Table 2, we extract charged quarks $\omega = q^{+}$ to obtain Table 10 below

Table 10: Mass $M(q^{+})$ and Color Scalar Product $\mathbf{Q}^2(q^{+})$ of charged quarks q^{+}

Ground State	1st	2nd	3rd
	u	c	t
Mev	2. 3	1280. 0	173000. 0
	$\mathbf{Q}^2(u),\ \mathbf{Q}^2(\bar{u})$	$\mathbf{Q}^2(c),\ \mathbf{Q}^2(\bar{c})$	$\mathbf{Q}^2(t),\ \mathbf{Q}^2(\bar{t})$
$\mathbf{Q}^2$	4. 500 978 4736	2504. 892 367 9061	338551. 859 099 8043

What's the relationship between the above three Dirac charged quarks $u, c, t\ (\bar{u}, \bar{c}, \bar{t}\ )$?

♦ From Table 0, We extract $\omega = \delta(0), u, c, t$ to obtain Table 11 below, and search for masses of ω following

Table 11: Mass $M(q^{+})$ and Color Scalar Product $\mathbf{Q}^2(q^{+})$ of charged quarks q^{+}

Neutral Lepton	0th		1st	2nd	3rd		
	$\delta(0)$	|	u	c	t	|	$+\frac{2}{3}e$
	$(\mathbf{Q}(\delta(0),\xi),\ \xi(\delta(0)))$	|	$(\mathbf{Q}(\delta(0),\xi),\ \xi(u))$	$(\mathbf{Q}(\delta(0),\xi),\ \xi(c))$	$(\mathbf{Q}(\delta(0),\xi),\ \xi(t))$	|	$Q(\omega)$
	0		**1**	**2**	**3**		

- Giving detailed values of Function-**Q** of particle $\delta(0)$ and anti-particle $\bar{\delta}(0)$ bwlow

• **0** $\mathbf{Q}(\delta(0), \xi) = (+236.539\ 654\ 85315, \quad +238.539\ 654\ 85315, \quad -473.079\ 309\ 70630)$ (4.1)

• **0** $\mathbf{Q}(\overline{\delta}(0), \xi) = (+238.539\ 654\ 85315, \quad +236.539\ 654\ 85315 \quad -477.079\ 309\ 70630)$ (4.2)

The charges of $\delta(0)$ and $\overline{\delta}(0)$ are $+\frac{2}{3}e$ and $-\frac{2}{3}e$

• **0** $Q(\delta(0), \xi) = \frac{1}{3}(+236.539\ 654\ 85315 + 238.539\ 654\ 85315 - 473.079\ 309\ 70630) = +\frac{2}{3}e$ (4.3)

• **0** $Q(\overline{\delta}(0), \xi) = \frac{1}{3}(+238.539\ 654\ 85315 + 236.539\ 654\ 85315 - 477.079\ 309\ 70630) = -\frac{2}{3}e$ (4.4)

AND below

- Giving detailed values of Function-ξ(ω) of particles $u, c, t\ (\bar{u}, \bar{c}, \bar{t}\,)$ below

$$\xi = (\quad \xi_1, \quad \xi_2 \quad \xi_3 \quad) \tag{4.5}$$

• **3** $\xi(t) = (+0.000\ 000\ 0000, \quad +0.000\ 000\ 0000, \quad -0.000\ 000\ 0000)$ (4.8)

• **3** $\xi(\bar{t}) = (+18.040\ 896\ 8753, \quad +18.040\ 896\ 8753, \quad -36.081\ 793\ 7506)$ $(4.\tilde{8})$

• **2** $\xi(c) = (+236.008\ 183\ 4791, \quad +236.008\ 183\ 4791, \quad -472.016\ 366\ 9582)$ (4.7)

• **2** $\xi(\bar{c}) = (+237.346\ 375\ 0486, \quad +237.346\ 375\ 0486, \quad -474.692\ 750\ 0972)$ $(4.\tilde{7})$

• **1** $\xi(u) = (+236.889\ 414\ 2155, \quad +236.889\ 414\ 2155, \quad -473.778\ 828\ 4310)$ (4.6)

• **1** $\xi(\bar{u}) = (+238.222\ 655\ 6123, \quad +238.222\ 655\ 6123, \quad -476.445\ 311\ 2246)$ $(4.\tilde{6})$

The charges of Function-ξ(ω) of particles $u, c, t\ (\bar{u}, \bar{c}, \bar{t}\,)$ are zero

$$\xi = \frac{1}{3}(\xi_1 + \xi_2 + \xi_3) = 0 \tag{4.9}$$

Global Journal of Science Frontier Research (A) XXV Issue VI Version I Year 2025

Expressions of the color scalar products of the above **0**, **1**, **2**, **3** are given below

- **3** $$\xi^2(t) = 0.000\ 000\ 0000 \tag{4.13}$$
- **3** $$\xi^2(\bar{t}) = 1952.843\ 760\ 3962 \tag{4.$\widetilde{13}$}$$

- **2** $$\xi^2(c) = 334199.176\ 014\ 6441 \tag{4.12}$$
- **2** $$\xi^2(\bar{c}) = 337999.810\ 492\ 2944 \tag{4.$\widetilde{12}$}$$

- **1** $$\xi^2(u) = 336699.567\ 404\ 0766 \tag{4.11}$$
- **1** $$\xi^2(\bar{u}) = 340500.201\ 881\ 7269 \tag{4.$\widetilde{11}$}$$

- **0** $$\mathbf{Q}^2(\delta(0), \xi) = 336,704.068\ 382\ 5502 \tag{4.10}$$
- **0** $$\mathbf{Q}^2(\bar{\delta}(0), \xi) = 340,504.702\ 860\ 2005 \tag{4.$\widetilde{10}$}$$

Finally making subtraction, using **ScalarProduct-Mass Equation** (0.26): The masses of three Dirac charged quarks u, c, t ($\bar{u}, \bar{c}, \bar{t}$) are obtained by using a common color scalar product $\mathbf{Q}^2(\delta(0), \xi)$ of Function-**Q** of particle $\delta(0)$ and color scalar product $\xi^2(u), \xi^2(c), \xi^2(t)$ ($\xi^2(\bar{u}), \xi^2(\bar{c}), \xi^2(\bar{t})$) of Function-ξ of particles u, c, t ($\bar{u}, \bar{c}, \bar{t}$), their own. Yieldng

- **3** $\mathbf{Q}^2(\delta(0), \xi) - \xi^2(t) = 336,704.068\ 382\ 5502 - 0.000\ 000\ 0000 = 336,704.068\ 382\ 5502 = \frac{172055.778\ 943\ 4832}{0.511}$ (4.16)
- **3** $\mathbf{Q}^2(\bar{\delta}(0), \xi) - \xi^2(\bar{t}) = 340,504.702\ 860\ 2005 - 1,952.843\ 760\ 3962 = 338,551.859\ 099\ 8043 = \frac{173000.000\ 000\ 0000}{0.511}$ $(4.\widetilde{16})$

- **2** $\mathbf{Q}^2(\delta(0), \xi) - \xi^2(c) = 336,704.068\ 382\ 5502 - 334,199.176\ 014\ 6441 = 2,504.892\ 367\ 9061 = \frac{1280.000\ 000\ 0000}{0.511}$ (4.15)
- **2** $\mathbf{Q}^2(\bar{\delta}(0), \xi) - \xi^2(\bar{c}) = 340,504.702\ 860\ 2005 - 337,999.810\ 492\ 2944 = 2,504.892\ 367\ 9061 = \frac{1280.000\ 000\ 0000}{0.511}$ $(4.\widetilde{15})$

- **1** $\mathbf{Q}^2(\delta(0), \xi) - \xi^2(u) = 336,704.068\ 382\ 5502 - 336,699.567\ 404\ 0766 = 4.500\ 978\ 4736 = \frac{2.3\ 000\ 000\ 0000}{0.511}$ (4.14)
- **1** $\mathbf{Q}^2(\bar{\delta}(0), \xi) - \xi^2(\bar{u}) = 340,504.702\ 860\ 2005 - 340,500.201\ 881\ 7269 = 4.500\ 978\ 4736 = \frac{2.3\ 000\ 000\ 0000}{0.511}$ $(4.\widetilde{14})$

Just like each of three Dirac charged quarks u, c, t ($\bar{u}, \bar{c}, \bar{t}$) are attached their Function-ξ, $\xi(u), \xi(c), \xi(t)$ ($\xi(\bar{u}), \xi(\bar{c}), \xi(\bar{t})$); particle $\delta(0)$ or ($\bar{\delta}(0)$) is attached a Function-ξ of its own, $\xi(\delta(0))$ and $\xi(\bar{\delta}(0))$ (4.17) (4.18) too below

- **0** $\xi(\delta(0)) = (+237.873\ 805\ 614775, \quad +237.873\ 805\ 614775, \quad -475.747\ 611\ 229550)$ (4.17)
- **0** $\xi(\bar{\delta}(0)) = (+237.207\ 141\ 245477, \quad +237.207\ 141\ 245477, \quad -474.414\ 282\ 490954)$ (4.18)

The color scalar product of (4.17) and (4.18) are given as

- **0** $\xi^2(\delta(0)) = 336,704.068\ 382\ 5512$ (4.19)
- **0** $\xi^2(\bar{\delta}(0)) = 340,504.702\ 860\ 1998$ $(4.\widetilde{19})$

Again using (3.10) and $(3.\widetilde{10})$

- **0** $\mathbf{Q}^2(\gamma(0), \xi) = 336,704.068\ 382\ 5502$ (4.10)
- **0** $\mathbf{Q}^2(\bar{\gamma}(0), \xi) = 340,504.702\ 860\ 2005$ $(4.\widetilde{10})$

Base on **ScalarProduct-Mass Equation** (0.26), using the above results (4.19) $(4.\widetilde{19})$ and (4.10) $(4.\widetilde{10})$, then having the masses of particle $\delta(0)$ $\bar{\delta}(0)$ below

- **0** $\mathbf{Q}^2(\delta(0), \xi) - \xi^2(\delta(0)) = 336,704.068\ 382\ 5502 - 336,704.068\ 382\ 5512 = -\ 0.000\ 000\ 0010 = \frac{-0.000\ 000\ 0002}{M(e^-)} \approx 0$ (4.20)
- **0** $\mathbf{Q}^2(\bar{\delta}(0), \xi) - \xi^2(\bar{\delta}(0)) = 340,504.702\ 860\ 2005 - 340,504.702\ 860\ 1998 = +\ 0.000\ 000\ 0007 = \frac{-0.000\ 000\ 0014}{M(e^-)} \approx 0$ (4.21)

We see particles $\delta(0)$ $\bar{\delta}(0)$ are zero-mass particles.

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Discussion and Forum [3], [4], [5], [6], [7], [8], [9]

■ The essential of Mass Principle in fact is the charge interaction, the process of origin of particle's mass, the process of from " Non-Mass State " to " Mass State ".

Mass Principle carries Mass Genes and results in Non-Zero-Mass particle, Dirac Particles of Standard Model.

In Standard Model of Gauge Field, all the fermions are massless particles. The masses of fermions are given by Higgs mechanism:

We could use Higgs doublet Φ and Higgs field $h(x)$, which are related to the excitations of vacuum associated with the Higgs boson, to discuss the mass origin of particles in SM.

Then we rely on the "single mass term " of Higgs particle to attach " mass effect " to create mass terms for the massless fermions in SM supported by Gauge Theory. Actually, all what people have done is a process of from a mass term to many mass terms, that is, From Something to Everything. We can't stop thinking how the mass of Higgs particle came from **?**

Higgs particle is something, an experimental value collided at CERN (LHC; ATLAS, CMS), it is a great victory in particle physics. By the way, the expression (0.15) may imply the origin of the mass of boson Higgs particle H, strictly speaking [2], boson heaven particle Π **?**

■ Base on Part A, B, C, D, the familly members $\alpha(0)$, $\beta(0)$, $\gamma(0)$, $\delta(0)$ of The Zeroth Generation Zth of Fermion could explain the ties of blood of Dirac Particles: NOT ONLY could attach mass to the twelve fermions as Mass Principle does in paragraph **Introduction**, BUT ALSO, at the same time, could offer a unified mass description of fermion that with the same charge Q.

Particles $\alpha(0)$, $\beta(0)$, $\gamma(0)$, $\delta(0)$ are zero-mass particles, zero-mass means nothing like all empties, they are nothing at all, to our surprise, they could offer " mass effect ". This phenomena impacts our knowledge of physical world: To our surprise, we could from empty masses of Zero-Mass particles $\alpha(0)$, $\beta(0)$, $\gamma(0)$, $\delta(0)$, From Nothing to Everything to construct a real object world.

Are the Zero-Mass particles ($\alpha(0)$, $\beta(0)$, $\gamma(0)$, $\delta(0)$), physical particles, or Math particles ?

They are massless particles, they motion at light speed, we have never observed charged fermion particles that motion at light speed, *As for* neutral fermion, a little bit of difference : Majorara Neutrino Particle at light speed, so $\alpha(0)$ may be Majorana Particle, may be a physical particle.

If Majorana Particle, or neutral lepton $\alpha(0)$ existed objectively, the symmetrial patterns of Zh generation in Table 0, would by means of Charge-Transition (0.16) (0.17), (0.18) (0.19), (0.20) (0.21) to lead the charged leptons $\beta(0)$, $\gamma(0)$, $\delta(0)$ to be existed objectively too ! ?

■ Fermion particles that with the same charege are attributed to *IDENTICAL PARTICLES.* **??**

" Especially of $\omega = Neutrinos\ \upsilon_e, \upsilon_\mu, \upsilon_\tau$ are attributed to be the Three Identical Dirac Particles that with the same charge $0e$, Rather than to be three different Dirac fermion particles, each one possesses its own mass. " ?

Base on Pauli Exclusion Principle, elementary fermions are catalogued under Table 0 by using two functions, Function-**Q**(ω, ξ) and Function-ξ(ω), Which seems to be two more beautiful colorful quantum numbers, rather than by using one lonely mass variate $m(\omega)$.

Of Course, " IDENTICAL PARTICLES " is not the Prerequisite Condition for Table 0

The observational phenomena of neutrinos possessing mass, of Non-Zero-Mass particles, are expained by Neutrino Flavor Oscillations. Unlucky, this oscillation theory could not give the absolute values of neutrinos, less than a unified mass theory of the three neutrino massess.

BUT, In contrast with the expressions (1.14),(1.15),(1.16) (**Part A**), the masses of $\upsilon_e, \upsilon_\mu, \upsilon_\tau$ ($\bar{\upsilon}_e, \bar{\upsilon}_\mu, \bar{\upsilon}_\tau$) could " by means of <u>From Nothing to Everything</u> ", be obtained directly, by a viod Zero-Mass particle $\alpha(0)$! of The Zeroth of Generation Zh of Fermion, this paper titled.

A graceful theory always is founded on an unacceptable, utterly absurd presupposition.

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