



A Unified Mass Theory of Elementary Fermions and Elementary Bosons

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Abstract

Base on photon generation, a unified mass theory of elementary fermions and elementary bosons is postulated.

Photon Generation Charge $Q(\wedge[Q]$

$\Psi)$

Particle Mass Function $\Psi(\gamma)$

Color-Unit Constant Ψ_0

ScalarProduct-Mass Equation

$Q(\wedge[Q]$

$\Psi)$ -Running

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A Unified Mass theory of Elementary Fermions and Elementary Bosons

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Abstract Base on photon generation , a unified mass theory of elementary fermions and elementary bosons is postulated.

Keywords: Table X, Photon Generation Charge $\mathbf{Q}(\gamma^Q, \xi)$, Particle Mass Function $\xi(\omega)$, Color-Unit Constant ξ_0 , ScalarProduct-Mass Equation, $\mathbf{Q}(\gamma^Q, \xi)$ -Running, Double Helix Structure, 4th, 5th of Fermion, Mass Spectrum

Contents

| | |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Introduction | (P.2) |
| Table X | (P.6) |
| Part A Unified mass theory of two Dirac Neutral Mass Bosons $B = H, Z$ | (P.8) |
| Part B Unified mass theory of two Dirac Charged Mass Bosons $B = W^-, W^+$ | (P.10) |
| Part C Unified mass theory of two Dirac Neutral Massless Bosons $B = \gamma, g$ | (P.12) |
| Mass function of Photon $B = \gamma$ | (P.12) |
| Mass function of Gluon $B = g$ | (P.13) |
| Photon Generation Charge $\mathbf{Q}(\gamma^Q, \xi)$ and Particle Mass Function $\xi(\omega)$ of Table X | (P.16) |
| Table Z 4th, 5th of Elementary Fermion | (P.23) |
| Epilogue | (P.26) |
| Mass Spectrum of 1st, 2nd, 3rd of Elementary Fermion | (P.26) |
| References | |

1. Introduction

After obtaining a unified mass theory of twelve elementary fermions [1], extravagant hopes naturally, subsequently what about the other six elementary bosons, $B = H, Z, W^+, W^-$ and γ, g ? ! May these six bosons be merged into the existing unified mass theory of twelve elementary fermions mentioned ?

Ahead of us, light ; Genesis of mass, light .

In this paper, we will use photon generation $\mathbf{Q}(\gamma^Q, \xi)$, instead of zeroth generation Zth of fermion $\mathbf{Q}(\Psi(0), \xi)$ of **Table 0** [1], to make a new larger **Table X** below, in which six elementary bosons B are included. Further, all the masses of both twelve elementary fermions and six elementary bosons of Standard Model SM could be uniformly identified.

IN **Table 0**, column ($\mathbf{Q}(\Psi(0), \xi), \xi(\Psi(0))$) is the zeroth zh of generation of fermion.

$$(\mathbf{Q}(\Psi(0), \xi), \xi(\Psi(0))) \tag{00.1}$$

IN **Table X**, column ($\mathbf{Q}(\gamma^Q, \xi), \xi(\gamma^Q)$) is the generation of photon.

$$(\mathbf{Q}(\gamma^Q, \xi), \xi(\gamma^Q)) \tag{00.2}$$

OR

$$\mathbf{Q}(\Psi(0), \xi) = \begin{array}{|c|} \hline \mathbf{Q}(\delta(0), \xi) \\ \hline \mathbf{Q}(\gamma(0), \xi) \\ \hline \mathbf{Q}(\beta(0), \xi) \\ \hline \mathbf{Q}(\alpha(0), \xi) \\ \hline \end{array}$$

Table 0 fermion zeroth generation
For twelve elementary fermions



$$\mathbf{Q}(\gamma^Q, \xi) = \begin{array}{|c|} \hline \mathbf{Q}(\gamma^{\frac{+2}{3}e}, \xi) \\ \hline \mathbf{Q}(\gamma^{\frac{-1}{3}e}, \xi) \\ \hline \mathbf{Q}(\gamma^{-e}, \xi) \\ \hline \mathbf{Q}(\gamma^{0e}, \xi) \\ \hline \end{array}$$

Table 0 photon generation
For twelve elementary bosons and six elementary bosons

The color representation of particle ω is defined as below. And $\xi(\omega)$ is called as mass function.

$$\mathbf{Q}(\gamma^Q, \xi) + i \xi(\omega) \quad (00.3)$$

Base on ScalarProduct-Mass Equation, the mass value $M(\omega)$ of a particle ω could be obtained below

$$\mathbf{Q}^2(\gamma^Q, \xi) - \xi^2(\omega) = \mathbf{Q}^2(\omega) = \frac{M(\omega)}{M(e^-)} \quad (00.4)$$

Here $\omega = F, B$ fermion, boson. CHARGE of ω rely on photon generation $\mathbf{Q}(\gamma^Q, \xi)$ and MASS of ω relate to mass function $\xi(\omega)$.

AND $\mathbf{Q}^2(\gamma^Q, \xi)$ is the scalar product of $\mathbf{Q}(\gamma^Q, \xi)$ that comprises four members, each one of $\mathbf{Q}(\gamma^Q, \xi)$ with different charge :
 $Q(\gamma^Q, \xi) = (0e, -e, \frac{-1e}{3}, \frac{+2e}{3})$ $\tilde{Q}(\gamma^Q, \xi) = (0e, +e, \frac{+1e}{3}, \frac{-2e}{3})$.

Analogy with what did for the masses of the twelve elementary fermions, NOW, the more detailed discussions for the masses of the six elementary bosons $\omega = H, Z, W^+, W^-$ and γ, g are given in the next three parts **Part A**, **Part B** and **Part C** following

Part A and **Part C** are related to four neutral bosons H, Z and γ, g , that all with same charge, $0e$, So, both H, Z and γ, g belong to the common photon generation members (A.1)(C.1) and (A.2)(C.2); But accompanied by the different mass function $\xi(\omega)$: $\xi(Z), \xi(H)$ by (A.7),(A.8) and photon $\xi(\gamma)$ by (C.4), gluon $\xi(g)$ by (C.24), (C.25), , (C.30), (C.31). Subsequently result in bosons Z, H massive (A.13),(A.12), and γ, g massless (C.9), (C.36). NOTICE: photon γ is just γ^{0e} .

Part B is related to two charged bosons W^-, W^+ that with different particle charge $-e, +e$, So they belong to different photon generation. W^- (B.1), W^+ (B.2); W^- accompanied by mass function $\xi(W^-)$ (B.13), $\xi(W^+)$ by (B.14). BUT at last, the two particles possess the same mass value (B.17) (B.18).

Table X is defined as (more details see Table 2 and Table 3 Table 4 & Table 5) :

$$\underline{\underline{\mathbf{Table X}}} = \underline{\underline{\mathbf{Table 0}}} + \underline{\underline{\mathbf{Part A}}} + \underline{\underline{\mathbf{Part B}}} + \underline{\underline{\mathbf{Part C}}} \quad (00.5)$$

Before discuss **Part A , Part B , Part C** First, glance over Table 1, the archives of elementary fermion and elementary boson below

Table1 Mass M and Color Scalar Products \mathbf{Q}^2 of Twelve elementary fermions q, l and six elementary bosons B

| Fermion | | | | Fermion | | | | Boson | | | | | |
|---------|-------|-------|-----------------------|-----------------|------------|------|-------------------|----------------------|------------------------|----------|-------------------|---|-----------------------|
| q | I_3 | Y | $M(q)$ Mev | l | I_3 | Y | $M(l)$ Kev | B | I_3 | Y | $M(B)$ Mev | | |
| t | +5/2 | -11/3 | 173, 000.0 | ν_τ | +5/2 | -5 | 18, 200.0 | W^+ | +1 | 0 | 80, 400 | | |
| c | +3/2 | -5/3 | 1, 280.0 | ν_μ | +3/2 | -3 | 190.0 | Z, H | 0 | 0 | 91, 200, 125, 000 | | |
| u | +1/2 | +1/3 | 2.3 | ν_e | +1/2 | -1 | 0.002 | W^- | -1 | 0 | 80, 400 | | |
| d | -1/2 | +1/3 | 4.8 | e^- | -1/2 | -1 | 511.0 | γ | 0 | 0 | 0 | | |
| s | -3/2 | +7/3 | 95.0 | μ^- | -3/2 | +1 | 105, 700.0 | g | 0 | 0 | 0 | | |
| b | -5/2 | +13/3 | 4, 700.0 | τ^- | -5/2 | +3 | 1, 777, 000.0 | | | | | | |
| | | | $\mathbf{Q}^2(q)$ | | | | $\mathbf{Q}^2(l)$ | | | | $\mathbf{Q}^2(B)$ | | |
| t | +5/2 | -11/3 | 338, 551.859 099 8043 | $\mathbf{Q}(t)$ | ν_τ | +5/2 | -5 | 35.616 438 3562 | $\mathbf{Q}(\nu_\tau)$ | H | 0 | 0 | 244, 618.395 303 3268 |
| c | +3/2 | -5/3 | 2, 504.892 367 9061 | $\mathbf{Q}(c)$ | ν_μ | +3/2 | -3 | 0.371 819 9609 | $\mathbf{Q}(\nu_\mu)$ | Z | 0 | 0 | 178, 473.581 213 3072 |
| u | +1/2 | +1/3 | 4.500 978 4736 | $\mathbf{Q}(u)$ | ν_e | +1/2 | -1 | 0.000 003 9139 | $\mathbf{Q}(\nu_e)$ | W^\pm | ± 1 | 0 | 157, 338.551 859 0998 |
| d | -1/2 | +1/3 | 9.393 346 3796 | $\mathbf{Q}(d)$ | e^- | -1/2 | -1 | 1.000 000 0000 | $\mathbf{Q}(e^-)$ | | | | |
| s | -3/2 | +7/3 | 185.909 980 4305 | $\mathbf{Q}(s)$ | μ^- | -3/2 | +1 | 206.849 315 0685 | $\mathbf{Q}(\mu^-)$ | γ | 0 | 0 | 0.000 000 0000 |
| b | -5/2 | +13/3 | 9, 197. 651 663 4051 | $\mathbf{Q}(b)$ | τ^- | -5/2 | +3 | 3, 477. 495 107 6321 | $\mathbf{Q}(\tau^-)$ | g | 0 | 0 | 0.000 000 0000 |

Decompose the color scalar products $\mathbf{Q}^2(B)$ of Six Bosons of the right column of Table1, into three dimensional color space $\mathbf{Q}(B)$ following

- Boson Ground States for massive particles $B = H, Z, W^-, W^+$:

$$\mathbf{Q}(H) = (+201.915\ 161\ 76492, +201.915\ 161\ 76492, -403.830\ 323\ 50984) \quad (0.1)$$

$$\mathbf{Q}^2(H) = 244,618.395\ 303\ 3228 = \frac{124,999.999\ 999\ 9980}{0.511} = \frac{M(H)}{0.511} \quad (0.2)$$

$$\mathbf{Q}(Z) = (+172.469\ 118\ 59486, +172.469\ 118\ 59486, -344.938\ 237\ 18972) \quad (0.3)$$

$$\mathbf{Q}^2(Z) = 178,473.581\ 213\ 3274 = \frac{91,200.000\ 000\ 0103}{0.511} = \frac{M(Z)}{0.511} \quad (0.4)$$

$$\mathbf{Q}(W^-) = (-161.932\ 883\ 14360, -163.932\ 883\ 14360, +322.865\ 766\ 28720) \quad (0.5)$$

$$\mathbf{Q}^2(W^-) = 157,338.551\ 8591929 = \frac{80,400.000\ 000\ 0476}{0.511} = \frac{M(W^-)}{0.511} \quad (0.6)$$

$$\mathbf{Q}(W^+) = (-159.932\ 883\ 14360, -161.932\ 883\ 14360, +324.865\ 766\ 28720) \quad (0.7)$$

$$\mathbf{Q}^2(W^+) = 157,338.551\ 859\ 1929 = \frac{80,400.000\ 000\ 0476}{0.511} = \frac{M(W^+)}{0.511} \quad (0.8)$$

- Boson Ground States for massless photon, gluon, $B = \gamma, g$:

$$\mathbf{Q}(\gamma, g) = (0.000\ 000\ 0000, 0.000\ 000\ 0000, 0.000\ 000\ 0000) \quad (0.9)$$

$$\mathbf{Q}^2(\gamma, g) = 0.000\ 000\ 0000 = \frac{0.000\ 000\ 0000}{0.511} = \frac{M(\gamma, g)}{0.511} \quad (0.10)$$

The above six formulas \mathbf{Q}^2 (0.2) (0.4) (0.6) (0.8) (0.10) will help us to use ScalarProduct-Mass Equation (00.4) (0.11) to calculate the mass $M(B)$ of the above six boson particle $\omega = B$

$$\mathbf{Q}^2(\gamma^Q, \xi) - \xi^2(\omega = B) = \underline{\mathbf{Q}^2(\omega = B)} = \frac{M(\omega = B)}{M(e^-)} \quad (0.11)$$

Later we will see the formulas \mathbf{Q}^2 (0.2) (0.4) (0.6) (0.8) (0.10) are just formulas (A.13) (A.12) (B.17) (B.18) (C.9) (C.36).

Table X Unified Mass Theory of Elementary Fermion and Elementary Boson

| Boson γ^Q | Fermion | Fermion | Fermion | Boson | $Q(\omega)$ |
|------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------|-----------------|
| | 1st | 2nd | 3rd | Force Carriers | Charge |
| $\gamma^{\frac{+2}{3}}$ | u | c | t | | $+\frac{2}{3}e$ |
| $(\mathbf{Q}(\gamma^{\frac{+2}{3}}, \xi), \xi(\delta(0)))$ | $(\mathbf{Q}(\gamma^{\frac{+2}{3}}, \xi), \xi(u))$ | $(\mathbf{Q}(\gamma^{\frac{+2}{3}}, \xi), \xi(c))$ | $(\mathbf{Q}(\gamma^{\frac{+2}{3}}, \xi), \xi(t))$ | | |
| $\gamma^{\frac{-2}{3}}$ | \bar{u} | \bar{c} | \bar{t} | | $-\frac{2}{3}e$ |
| $(\mathbf{Q}(\gamma^{\frac{-2}{3}}, \xi), \xi(\bar{\delta}(0)))$ | $(\mathbf{Q}(\gamma^{\frac{-2}{3}}, \xi), \xi(\bar{u}))$ | $(\mathbf{Q}(\gamma^{\frac{-2}{3}}, \xi), \xi(\bar{c}))$ | $(\mathbf{Q}(\gamma^{\frac{-2}{3}}, \xi), \xi(\bar{t}))$ | | |
| $\gamma^{\frac{-1}{3}}$ | d | s | b | | $-\frac{1}{3}e$ |
| $(\mathbf{Q}(\gamma^{\frac{-1}{3}}, \xi), \xi(\gamma(0)))$ | $(\gamma^{\frac{-1}{3}}, \xi), \xi(d)$ | $(\gamma^{\frac{-1}{3}}, \xi), \xi(s)$ | $(\mathbf{Q}(\gamma^{\frac{-1}{3}}, \xi), \xi(b))$ | | |
| $\gamma^{\frac{+1}{3}}$ | \bar{d} | \bar{s} | \bar{b} | | $+\frac{1}{3}e$ |
| $(\mathbf{Q}(\gamma^{\frac{+1}{3}}, \xi(\bar{\gamma}(0)))$ | $(\mathbf{Q}(\gamma^{\frac{+1}{3}}, \xi), \xi(\bar{d}))$ | $(\mathbf{Q}(\gamma^{\frac{+1}{3}}, \xi), \xi(\bar{s}))$ | $(\mathbf{Q}(\gamma^{\frac{+1}{3}}, \xi), \xi(\bar{b}))$ | | |
| γ^- | e | μ | τ | | $-e$ |
| $(\mathbf{Q}(\gamma^-, \xi), \xi(\gamma^-))$ | $(\mathbf{Q}(\gamma^-, \xi), \xi(e^-))$ | $(\mathbf{Q}(\gamma^-, \xi), \xi(\mu^-))$ | $(\mathbf{Q}(\gamma^-, \xi), \xi(\tau^-))$ | $(\mathbf{Q}(\gamma^-, \xi), \xi(W^-))$ | |
| γ^+ | \bar{e} | $\bar{\mu}$ | $\bar{\tau}$ | | $+e$ |
| $(\mathbf{Q}(\gamma^+, \xi), \xi(\gamma^+))$ | $(\mathbf{Q}(\gamma^+, \xi), \xi(e^+))$ | $(\mathbf{Q}(\gamma^+, \xi), \xi(\mu^+))$ | $(\mathbf{Q}(\gamma^+, \xi), \xi(\tau^+))$ | $(\mathbf{Q}(\gamma^+, \xi), \xi(W^+))$ | |
| γ^0 | ν_e | ν_μ | ν_τ | | $0e$ |
| $(\mathbf{Q}(\gamma^0, \xi), \xi(\gamma^0))$ | $(\mathbf{Q}(\gamma^0, \xi), \xi(\nu_e))$ | $(\mathbf{Q}(\gamma^0, \xi), \xi(\nu_\mu))$ | $(\mathbf{Q}(\gamma^0, \xi), \xi(\nu_\tau))$ | $(\mathbf{Q}(\gamma^0, \xi), \xi(Z, H; \gamma, g))$ | |
| γ^0 | $\bar{\nu}_e$ | $\bar{\nu}_\mu$ | $\bar{\nu}_\tau$ | | $0e$ |
| $(\mathbf{Q}(\bar{\gamma}^0, \xi), \xi(\gamma^0))$ | $(\mathbf{Q}(\bar{\gamma}^0, \xi), \xi(\bar{\nu}_e))$ | $(\mathbf{Q}(\bar{\gamma}^0, \xi), \xi(\bar{\nu}_\mu))$ | $(\mathbf{Q}(\bar{\gamma}^0, \xi), \xi(\bar{\nu}_\tau))$ | $(\mathbf{Q}(\bar{\gamma}^0, \xi), \xi(Z, H; \gamma, g))$ | |
| ZeroMass | Non-Zero-Mass | Non-Zero-Mass | Non-Zero-Mass | | |

Table2 Photon Generation $\mathbf{Q}(\gamma^Q, \xi)$ and Mass Function MF $\xi(\omega)$ of Elementary Fermion and Elementary Boson

| Photon Generation $\mathbf{Q}(\gamma^Q, \xi)$ | MF $\xi(\gamma^Q)$ | MF $\xi(F)$ Fermion 1st | MF $\xi(F)$ Fermion 2nd | MF $\xi(F)$ Fermion 3rd | MF $\xi(B)$ Force Carriers | Charge $Q(\omega)$ |
|--------------------------------------------------|------------------------------|---------------------------------|-----------------------------------|------------------------------------|-------------------------------|-----------------------|
| | $\gamma^{\frac{+2}{3}}$ | u | c | t | | $+\frac{2}{3}e$ |
| $\mathbf{Q}(\gamma^{\frac{+2}{3}}, \xi)$ | $\xi(\gamma^{\frac{+2}{3}})$ | $\xi(u)$ | $\xi(c)$ | $\xi(t)$ | | |
| | $\gamma^{\frac{-2}{3}}$ | \bar{u} | \bar{c} | \bar{t} | | $-\frac{2}{3}e$ |
| $\mathbf{Q}(\gamma^{\frac{-2}{3}}, \xi)$ | $\xi(\gamma^{\frac{-2}{3}})$ | $\xi(\bar{u})$ | $\xi(\bar{c})$ | $\xi(\bar{t})$ | | |
| | $\gamma^{\frac{-1}{3}}$ | d | s | b | | $-\frac{1}{3}e$ |
| $\mathbf{Q}(\gamma^{\frac{-1}{3}}, \xi)$ | $\xi(\gamma^{\frac{-1}{3}})$ | $\xi(d)$ | $\xi(s)$ | $\xi(b)$ | | |
| | $\gamma^{\frac{+1}{3}}$ | \bar{d} | \bar{s} | \bar{b} | | $+\frac{1}{3}e$ |
| $\mathbf{Q}(\gamma^{\frac{+1}{3}}, \xi)$ | $\xi(\gamma^{\frac{+1}{3}})$ | $\xi(\bar{d})$ | $\xi(\bar{s})$ | $\xi(\bar{b})$ | | |
| | γ^- | e | μ | τ | | $-e$ |
| $\mathbf{Q}(\gamma^-, \xi)$ | $\xi(\gamma^-)$ | $\xi(e^-)$ | $\xi(\mu^-)$ | $\xi(\tau^-)$ | $\xi(W^-)$ | |
| | γ^+ | \bar{e} | $\bar{\mu}$ | $\bar{\tau}$ | | $+e$ |
| $\mathbf{Q}(\gamma^+, \xi)$ | $\xi(\gamma^+)$ | $\xi(e^+)$ | $\xi(\mu^+)$ | $\xi(\tau^+)$ | $\xi(W^+)$ | |
| | γ^0 | ν_e | ν_μ | ν_τ | | $0e$ |
| $\mathbf{Q}(\gamma^0, \xi)$ | $\xi(\gamma^0)$ | $\xi(\nu_e)$ | $\xi(\nu_\mu)$ | $\xi(\nu_\tau)$ | $\xi(Z, H, \gamma, g)$ | |
| | γ^0 | $\bar{\nu}_e$ | $\bar{\nu}_\mu$ | $\bar{\nu}_\tau$ | | $0e$ |
| $\mathbf{Q}(\bar{\gamma}^0, \xi)$ | $\xi(\bar{\gamma}^0)$ | $\xi(\bar{\nu}_e)$ | $\xi(\bar{\nu}_\mu)$ | $\xi(\bar{\nu}_\tau)$ | $\xi(Z, H, \gamma, g)$ | |
| | ZeroMass | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass | | |

2. Part A: Unified Mass Theory of Two Dirac Neutral Mass Bosons B = H, Z B = H, Z

◆ Detailed values of $\mathbf{Q}(\gamma^0, \xi)$ of particles $B = Z, H$ below

• **0** $\mathbf{Q}(\gamma^0, \xi) = (+236.539\ 654\ 85315, \quad +238.539\ 654\ 85315, \quad -475.079\ 309\ 70630)$ (A.1)

• **0** $\mathbf{Q}(\tilde{\gamma}^0, \xi) = (+238.539\ 654\ 85315, \quad +236.539\ 654\ 85315 \quad -475.079\ 309\ 70630)$ (A.2)

The charges of particles $B = Z, H$ are zero

$$Q = \frac{1}{3} (236.53965485315 + 238.53965485315 - 475.07930970630) = 0 \tag{A.3}$$

$$Q = \frac{1}{3} (238.53965485315 + 236.53965485315 - 475.07930970630) = 0 \tag{A.4}$$

AND below

◆ Detailed values of mass function $\xi(B)$ of particles $B = Z, H$ below

• **1** $\xi(Z) = (+163.339\ 597\ 441044, \quad +163.339\ 597\ 441044, \quad -326.679\ 194\ 882088)$ (A.5)

• **2** $\xi(H) = (+125.122\ 693\ 427295, \quad +125.122\ 693\ 427295, \quad -250.245\ 386\ 854590)$ (A.6)

• **1** $\xi(Z) = 163.339\ 597\ 441044 (+1, \quad +1, \quad -2) = 163.339\ 597\ 441044 \xi_0$ (A.7)

• **2** $\xi(H) = 125.122\ 693\ 427295 (+1, \quad +1, \quad -2) = 125.122\ 693\ 427295 \xi_0$ (A.8)

Where ξ_0 called as Color-Unit Constant that is a three dimensional colore vector, with which $\xi(\omega)$ could be limpid. see following

$$\xi_0 = (+1, \quad +1, \quad -2) \tag{00.6}$$

$$\xi_0^2 = 6 \tag{00.7}$$

3. Part B: Unified Mass Theory of Two Dirac Charged Mass Bosons $B = W^-$, W^+ $B = W^-$, W^+

- Detailed values of photon generation $\mathbf{Q}(\gamma^-, \xi)$ $\mathbf{Q}(\gamma^+, \xi)$ of particle γ^- and anti-particle γ^+

• **0** $\mathbf{Q}(\gamma^-, \xi) = (+236.539\ 654\ 85315, \quad +238.539\ 654\ 85315, \quad -478.079\ 309\ 70630)$ (B.1)

• **0** $\mathbf{Q}(\gamma^+, \xi) = (+238.539\ 654\ 85315, \quad +236.539\ 654\ 85315, \quad -472.079\ 309\ 70630)$ (B.2)

The charges of particles $B = W^-, W^+$

$$Q(W^-) = \frac{1}{3} (236.53965485315 + 238.53965485315 - 478.07930970630) = -e \tag{B.3}$$

$$Q(W^+) = \frac{1}{3} (238.53965485315 + 236.53965485315 - 472.07930970630) = +e \tag{B.4}$$

And the color scalar products of (B.1) (B.2) are below

• **0** $\mathbf{Q}^2(\gamma^-, \xi) = 341,412.001\ 624\ 7596$ (B.5)

• **0** $\mathbf{Q}^2(\gamma^+, \xi) = 335,711.049\ 908\ 2840$ (B.6)

Because of requirement of final results (B.7) (B.8) below, Then having color scalar products (B.9) (B.10)

• **1** $\mathbf{Q}^2(\gamma^-, \xi) - \xi^2(W^-) =$
 $= 341,412.001\ 624\ 7596 \quad - \quad 184,073.449\ 765\ 6598 = 157,338.551\ 859\ 0998 = \frac{80,400.000\ 000\ 0000}{0.511}$ (B.7)

• **1** $\mathbf{Q}^2(\gamma^+, \xi) - \xi^2(W^+) =$
 $= 335,711.049\ 908\ 2840 \quad - \quad 178,372.498\ 049\ 1842 = 157,338.551\ 859\ 0998 = \frac{80,400.000\ 000\ 0000}{0.511}$ (B.8)

4. Part C: Unified Mass Theory of Two Dirac Neutral Massless Bosons $B = \gamma, g$

Both Boson photon γ and Boson gluon g are massless particles. Photon γ is mediating particle in electromagnetic interaction, And gluon g in strong interaction.

◆ Detailed values of photon generation of particles $B = \gamma, g$ below

• **0** $\mathbf{Q}(\gamma^0, \xi) = (+236.539\ 654\ 85315, \quad +238.539\ 654\ 85315, \quad -475.079\ 309\ 70630)$ (C.1) (A.1)

• **0** $\mathbf{Q}(\tilde{\gamma}^0, \xi) = (+238.539\ 654\ 85315, \quad +236.539\ 654\ 85315, \quad -475.079\ 309\ 70630)$ (C.2) (A.2)

◆ Next two paragraphs search for detailed values of mass function of particles $B = \gamma, g$ respectively

FIRST discuss mass function $\xi(\gamma)$ of photon $B = \gamma$ following:

The color representation of mass function of photon is given below

■ γ $\xi(\gamma) = (+237.540\ 356\ 489349, \quad +237.540\ 356\ 489349, \quad -475.080\ 712\ 978698)$ (C.3)

$= \kappa (+1, \quad +1, \quad -2) = \kappa \xi_0$ (C.4)

Where

$\kappa = 237.540\ 356\ 489349$ (C.5)

From (C.4), having

$\xi^2(\gamma) = 338,552.525\ 766\ 5220$ (C.6)

Further the expressions of the color scalar products of photon generation and mass function of photon γ are given below

$$\mathbf{Q}^2(\gamma^0, \xi) = \mathbf{Q}^2(\tilde{\gamma}^0, \xi) = 338,552.525\ 766\ 5218 \quad (\text{C.7})$$

$$\xi^2(\gamma) = 338,552.525\ 766\ 5220 \quad (\text{C.8})$$

Last making subtraction, using ScalarProduct-Mass Equation:

$$\begin{aligned} & | \mathbf{Q}^2(\gamma^0, \xi) - \xi^2(\gamma) | = \\ & = | 338,552.5257665218 - 338,552.5257665220 | = 0.000\ 000\ 0002 = \frac{0.000\ 000\ 0001}{0.511} = \frac{M(\gamma)}{0.511} \approx 0 \quad (\text{C.9}) \end{aligned}$$

(C.9) shows from photon generation (C.1) and mass function (C.4), we could obtain mass of photon γ

o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o o

SECOND discuss mass function $\xi(g)$ of gluons $B = g$ following:

In contrast with photon γ , the pictures of color representation of mass function $\xi(g)$ of gluon is rough to be revealed.

Because of: The gluons are considered as the mediating particles in strong interaction, which both carry color charge and anti-color charge simultaneously. So a gluon actually is a mixture of element color and element anti-color. There are six colored gluons $R\tilde{G}, G\tilde{B}, B\tilde{R}$ & $G\tilde{R}, B\tilde{G}, R\tilde{B}$ and two color neutral gluons $R\tilde{R}, G\tilde{G}$ (see following).

In the expedition to explore the color representations of twelve elementary fermions and six elementary bosons, the color representations of photon and gluon are the rather life of hardship, we could even not write down " the real ground states of photon and gluon " But the trivial ground state, $\mathbf{Q}(\gamma) = \mathbf{Q}(g) = (0.0000000000, 0.0000000000, 0.0000000000) !!$ (see : (0.9)).

■ The way to the mass function of gluons $B = g$ following :

THEN six mass function states of colored gluons

■ $R\tilde{G}$ $\xi(gR\tilde{G}) = \sqrt{3} \kappa (+1, -1, 0)$ (C.24)

■ $G\tilde{B}$ $\xi(gG\tilde{B}) = \sqrt{3} \kappa (0, +1, -1)$ (C.25)

■ $B\tilde{R}$ $\xi(gB\tilde{R}) = \sqrt{3} \kappa (-1, 0, +1)$ (C.26)

■ $G\tilde{R}$ $\xi(gG\tilde{R}) = \sqrt{3} \kappa (-1, +1, 0)$ (C.27)

■ $B\tilde{G}$ $\xi(gB\tilde{G}) = \sqrt{3} \kappa (0, -1, +1)$ (C.28)

■ $R\tilde{B}$ $\xi(gR\tilde{B}) = \sqrt{3} \kappa (+1, 0, -1)$ (C.29)

AND three mass function states of color neutral gluons

■ $R\tilde{R}$ $\xi(gR\tilde{R}) = \kappa (+2, -1, -1)$ (C.30)

■ $G\tilde{G}$ $\xi(gG\tilde{G}) = \kappa (-1, +2, -1)$ (C.31)

■ $B\tilde{B}$ $\xi(gB\tilde{B}) = \kappa (-1, -1, +2)$ (C.32)

Due to the color representation of mass function of photon is given by (C.4), and compare it with (C.32)

■ γ $\xi(\gamma) = \kappa (+1, +1, -2) = +\kappa \xi_0$ (C.4)

■ $B\tilde{B}$ $\xi(gB\tilde{B}) = \kappa (-1, -1, +2) = -\kappa \xi_0$ (C.32)

Having

$$\xi(gB\tilde{B}) = - \xi(\gamma) \tag{C.33}$$

Last, (3.30) and (3.31) are chosen as two color neutral candidates of eight color states of boson gluon g

Photon Generation Charge $Q(\gamma^Q, \xi)$ and Particle Mass Function $\xi(\omega)$ of Table X

◆ Photon Generation Charge $Q(\gamma^Q, \xi)$: In Part A & Part C, neutral particles H, Z & γ, g are related to charges $Q(\gamma^{0e}, \xi)$ & $Q(\tilde{\gamma}^{0e}, \xi)$ AND In Part B charged particles W^-, W^+ related to charges $Q(\gamma^{-e}, \xi)$ and $Q(\gamma^{+e}, \xi)$ shown in **Table Y** below

◆ Particle Mass Function $\xi(\omega)$: H, Z & γ, g and W^-, W^+ are listed in **Table3** below

| | | | | | |
|---------------|----------------------|------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| For Particle: | $Q(\gamma^Q, \xi) =$ | $Q(\gamma^{\frac{-2}{3}e}, \xi)$ $Q(\gamma^{\frac{-1}{3}e}, \xi)$ $Q(\gamma^{-e}, \xi)$ $Q(\gamma^{0e}, \xi)$ | = | $(+236.53965485315, +238.53965485315, -473.07930970630)$ $(+236.53965485315, +238.53965485315, -476.07930970630)$ $(+236.53965485315, +238.53965485315, -478.07930970630)$ $(+236.53965485315, +238.53965485315, -475.07930970630)$ | (1.1) |
|---------------|----------------------|------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|

Table 0 photon generation

Table Y1 values of photon generation (**Critical PG**)

| | | | | | |
|--------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| For Anti-Particle: | $Q(\gamma^Q, \xi) =$ | $Q(\gamma^{\frac{-2}{3}e}, \xi)$ $Q(\gamma^{\frac{+1}{3}e}, \xi)$ $Q(\gamma^{+e}, \xi)$ $Q(\tilde{\gamma}^{0e}, \xi)$ | = | $(+238.53965485315, +236.53965485315, -477.07930970630)$ $(+238.53965485315, +236.53965485315, -474.07930970630)$ $(+238.53965485315, +236.53965485315, -472.07930970630)$ $(+238.53965485315, +236.53965485315, -475.07930970630)$ | (1.2) |
|--------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|

Table 0 photon generation

Table Y1 values of photon generation (**Critical PG**)

Table3 Critical PG and Mass Function MF $\xi(\omega)$ values of Elementary Fermion and Elementary Boson (Color-Unit Constant ξ_0)

| $Q(\gamma^Q, \xi)$ | Photon Generation | Fermion 1st | Fermion 2nd | Fermion 3rd | Boson Force Carriers | Boson Force Carriers | Boson Force Carriers |
|---------------------------------|------------------------------|------------------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| $Q(\gamma^{+\frac{2}{3}}, \xi)$ | $\xi(\gamma^{+\frac{2}{3}})$ | $\xi(u)$ | $\xi(c)$ | $\xi(t)$ | | | |
| | 236. 890997571510 | 236. 889414215465 | 236. 008183479106 | 0. 0000000000 | | | |
| $Q(\gamma^{-\frac{2}{3}}, \xi)$ | $\xi(\gamma^{-\frac{2}{3}})$ | $\xi(\bar{u})$ | $\xi(\bar{c})$ | $\xi(\bar{t})$ | | | |
| | 238. 224230106917 | 238. 222655612254 | 237. 346375048611 | 18. 040896875322 | | | |
| $Q(\gamma^{-\frac{1}{3}}, \xi)$ | $\xi(\gamma^{-\frac{1}{3}})$ | $\xi(d)$ | $\xi(s)$ | $\xi(b)$ | | | |
| | 237. 873805614775 | 237. 870514860345 | 237. 808667632002 | 234. 629506784110 | | | |
| $Q(\gamma^{+\frac{1}{3}}, \xi)$ | $\xi(\gamma^{+\frac{1}{3}})$ | $\xi(\bar{d})$ | $\xi(\bar{s})$ | $\xi(\bar{b})$ | | | |
| | 237. 207141245477 | 237. 203841242341 | 237. 141820143797 | 233. 953597779454 | | | |
| $Q(\gamma^-, \xi)$ | $\xi(\gamma^-)$ | $\xi(e^-)$ | $\xi(\mu^-)$ | $\xi(\tau^-)$ | | $\xi(W^-)$ | |
| | 238. 541401586377 | 238. 541052240755 | 238. 469128788085 | 237. 323445434400 | | 175. 15395597667 | |
| $Q(\gamma^+, \xi)$ | $\xi(\gamma^+)$ | $\xi(e^+)$ | $\xi(\mu^+)$ | $\xi(\tau^+)$ | | $\xi(W^+)$ | |
| | 236. 541416355320 | 236. 541064055935 | 236. 468532294544 | 235. 313108715690 | | 172. 42027048716 | |
| $Q(\gamma^0, \xi)$ | $\xi(\gamma^0)$ | $\xi(\nu_e)^*$ | $\xi(\nu_\mu)$ | $\xi(\nu_\tau)$ | $\xi(\gamma)^*$ | $\xi(Z)$ | $\xi(H)$ |
| | 237. 540356489349 | 237. 540356487976 | 237. 540226048334 | 237. 527861287950 | 237. 540356489349 | 163.339 597441044 | 125.122693427295 |
| $Q(\tilde{\gamma}^0, \xi)$ | $\xi(\tilde{\gamma}^0)$ | $\xi(\tilde{\nu}_e)^*$ | $\xi(\tilde{\nu}_\mu)$ | $\xi(\tilde{\nu}_\tau)$ | $\xi(g)^{***}$ | $\xi(Z)$ | $\xi(H)$ |
| | 237. 540356489349 | 237. 540356487976 | 237. 540226048334 | 237. 527861287950 | *** | 163.339 597441044 | 125.122693427295 |
| | ZeroMass | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass | ZeroMass | Non-ZeroMass | Non-ZeroMass |

Next, the detailed examples ($\xi(\nu_e)^*$ $\xi(\tilde{\nu}_e)^*$ and $\xi(\gamma)^*$ $\xi(g)^{***}$) of characteristic vlues of Function- $\xi(\omega)$ are given

Next $Q(\gamma^Q, \xi)$ –Running: increasing the values of $Q(\gamma^Q, \xi)$ from Critical PG, (1.1) and (1.2) to (2.1) and (2.2) below

For Particle: $Q(\gamma^Q, \xi) =$

| |
|----------------------------------|
| $Q(\gamma^{\frac{-2}{3}e}, \xi)$ |
| $Q(\gamma^{\frac{-1}{3}e}, \xi)$ |
| $Q(\gamma^{-e}, \xi)$ |
| $Q(\gamma^{0e}, \xi)$ |

 $=$

| |
|-------------------------------------------------------------|
| (+475. 07930970630, +475. 07930970630, -948. 15861941260) |
| (+475. 07930970630, +475. 07930970630, -951. 15861941260) |
| (+475. 07930970630, +475. 07930970630, -953. 15861941260) |
| (+475. 07930970630, +475. 07930970630, -950. 15861941260) |

(2.1)

Table 0 photon generation

Table Y2 values of photon generation (**Running PG**)

For Anti-Particle: $Q(\gamma^Q, \xi) =$

| |
|----------------------------------|
| $Q(\gamma^{\frac{-2}{3}e}, \xi)$ |
| $Q(\gamma^{\frac{-1}{3}e}, \xi)$ |
| $Q(\gamma^{+e}, \xi)$ |
| $Q(\tilde{\gamma}^{0e}, \xi)$ |

 $=$

| |
|-------------------------------------------------------------|
| (+475. 07930970630, +475. 07930970630, -952. 15861941260) |
| (+475. 07930970630, +475. 07930970630, -949. 15861941260) |
| (+475. 07930970630, +475. 07930970630, -947. 15861941260) |
| (+475. 07930970630, +475. 07930970630, -950. 15861941260) |

(2.2)

Table 0 photon generation

Table Y2 values of photon generation (**Running PG**)

SUBSEQUENTLY, Table Y2 instead of Table Y1, Table4 instead of Table3. see below

Table4 $Q(\gamma^Q, \xi)$ –Running and Mass Function MF $\xi(\omega)$ values of Elementary Fermion and Elementary Boson (Color-Unit Constant ξ_0)

| $Q(\gamma^Q, \xi)$ | Photon Generation | Fermion 1st | Fermion 2nd | Fermion 3rd | Boson Force Carriers | Boson Force Carriers | Boson Force Carriers |
|---------------------------------|---------------------------------------------------|-------------------------------------------|-------------------------------------------|--------------------------------------------|--------------------------------------|---------------------------------|-------------------------------|
| $Q(\gamma^{\frac{+2}{3}}, \xi)$ | $\xi(\gamma^{\frac{+2}{3}})$ 474. 412877247312 | $\xi(u)$ 474. 412086624059 | $\xi(c)$ 473. 972674356608 | $\xi(t)$ 410. 660770281391 | | | |
| $Q(\gamma^{\frac{-2}{3}}, \xi)$ | $\xi(\gamma^{\frac{-2}{3}})$ 475. 746209924251 | $\xi(\bar{u})$ 475. 745421516814 | $\xi(\bar{c})$ 475. 307241893043 | $\xi(\bar{t})$ 412. 200371672955 | | | |
| $Q(\gamma^{\frac{-1}{3}}, \xi)$ | $\xi(\gamma^{\frac{-1}{3}})$ 475. 412701468404 | $\xi(d)$ 475. 411054940622 | $\xi(s)$ 475. 380112878891 | $\xi(b)$ 473. 797736142317 | | | |
| $Q(\gamma^{\frac{+1}{3}}, \xi)$ | $\xi(\gamma^{\frac{+1}{3}})$ 474. 746034883786 | $\xi(\bar{d})$ 474. 744386043845 | $\xi(\bar{s})$ 474. 713400528296 | $\xi(\bar{b})$ 473. 128793981064 | | | |
| $Q(\gamma^-, \xi)$ | $\xi(\gamma^-)$ 476. 079834828600 | $\xi(e^-)$ 476. 079659787898 | $\xi(\mu^-)$ 476. 043626408948 | $\xi(\tau^-)$ 475. 470742120363 | | $\xi(W^-)$ 447. 692882625925 | |
| $Q(\gamma^+, \xi)$ | $\xi(\gamma^+)$ 474. 079837043933 | $\xi(e^+)$ 474. 079661264787 | $\xi(\mu^+)$ 474. 043475860345 | $\xi(\tau^+)$ 473. 468171447314 | | $\xi(W^+)$ 445. 565483307544 | |
| $Q(\gamma^0, \xi)$ | $\xi(\gamma^0)$ 475. 079309706300 | $\xi(\nu_e)^*$ 475. 079309705614 | $\xi(\nu_\mu)$ 475. 079244485613 | $\xi(\nu_\tau)$ 475. 073062210388 | $\xi(\gamma)^*$ 475. 079309706300 | $\xi(Z)$ 442. 667 768921716 | $\xi(H)$ 430. 035600805864 |
| $Q(\bar{\gamma}^0, \xi)$ | $\xi(\bar{\gamma}^0)$ 475. 079309706300 | $\xi(\bar{\nu}_e)^*$ 475. 079309705614 | $\xi(\bar{\nu}_\mu)$ 475. 079244485613 | $\xi(\bar{\nu}_\tau)$ 475. 073062210388 | $\xi(g)^{***}$ *** | $\xi(Z)$ 442. 667 768921716 | $\xi(H)$ 430. 035600805864 |
| | ZeroMass | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass | ZeroMass | Non-ZeroMass | Non-ZeroMass |

$Q(\gamma^Q, \xi)$ –Running increasing continuously following

$$\text{For Particle: } Q(\gamma^Q, \xi) = \begin{array}{|l} Q(\gamma^{\frac{+2}{3}e}, \xi) \\ Q(\gamma^{\frac{-1}{3}e}, \xi) \\ Q(\gamma^{-e}, \xi) \\ Q(\gamma^{0e}, \xi) \end{array} = \begin{array}{|l} (+950.15861941260, +950.15861941260, -1898.3172388252) \\ (+950.15861941260, +950.15861941260, -1901.3172388252) \\ (+950.15861941260, +950.15861941260, -1903.3172388252) \\ (+950.15861941260, +950.15861941260, -1900.3172388252) \end{array} \quad (3.1)$$

Table 0 photon generation

Table Y3 values of photo generation (**Running PG**)

$$\text{For Anti-Particle: } Q(\gamma^Q, \xi) = \begin{array}{|l} Q(\gamma^{\frac{-2}{3}e}, \xi) \\ Q(\gamma^{\frac{+1}{3}e}, \xi) \\ Q(\gamma^{+e}, \xi) \\ Q(\tilde{\gamma}^{0e}, \xi) \end{array} = \begin{array}{|l} (+950.15861941260, +950.15861941260, -1902.3172388252) \\ (+950.15861941260, +950.15861941260, -1899.3172388252) \\ (+950.15861941260, +950.15861941260, -1897.3172388252) \\ (+950.15861941260, +950.15861941260, -1900.3172388252) \end{array} \quad (3.2)$$

Table 0 photon generation

Table Y3 values of photon generation (**Running PG**)

SUBSEQUENTLY, Table Y3 instead of **Table Y2**, **Table5** instead of **Table4**. **see below**

Table5 $Q(\gamma^Q, \xi)$ –Running and Mass Function MF $\xi(\omega)$ values of Elementary Fermion and Elementary Boson (Color-Unit Constant ξ_0)

| $Q(\gamma^Q, \xi)$ | Photon Generation | Fermion 1st | Fermion 2nd | Fermion 3rd | Boson Force Carriers | Boson Force Carriers | Boson Force Carriers |
|---------------------------------|---------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------|--------------------------------------|---------------------------------|-------------------------------|
| $Q(\gamma^{\frac{+2}{3}}, \xi)$ | $\xi(\gamma^{\frac{+2}{3}})$ 949. 492069767572 | $\xi(u)$ 949. 491674733607 | $\xi(c)$ 949. 272199366541 | $\xi(t)$ 919. 298580822107 | | | |
| $Q(\gamma^{\frac{-2}{3}}, \xi)$ | $\xi(\gamma^{\frac{-2}{3}})$ 950. 825402936807 | $\xi(\bar{u})$ 950. 825008456794 | $\xi(\bar{c})$ 950. 605840929154 | $\xi(\bar{t})$ 920. 675641591529 | | | |
| $Q(\gamma^{\frac{-1}{3}}, \xi)$ | $\xi(\gamma^{\frac{-1}{3}})$ 950. 491981970565 | $\xi(d)$ 950. 491158418953 | $\xi(s)$ 950. 475682378879 | $\xi(b)$ 949. 685245671655 | | | |
| $Q(\gamma^{\frac{+1}{3}}, \xi)$ | $\xi(\gamma^{\frac{+1}{3}})$ 949. 825315324411 | $\xi(\bar{d})$ 949. 824491194761 | $\xi(\bar{s})$ 949. 809004292115 | $\xi(\bar{b})$ 949. 018012309153 | | | |
| $Q(\gamma^-, \xi)$ | $\xi(\gamma^-)$ 951. 158882249902 | $\xi(e^-)$ 951. 158794637476 | $\xi(\mu^-)$ 951. 140759507781 | $\xi(\tau^-)$ 950. 854161669888 | | $\xi(W^-)$ 937. 272707010274 | |
| $Q(\gamma^+, \xi)$ | $\xi(\gamma^+)$ 949. 158882803734 | $\xi(e^+)$ 949. 158795006698 | $\xi(\mu^+)$ 949. 140721873942 | $\xi(\tau^+)$ 948. 853519931973 | | $\xi(W^+)$ 935. 243012713122 | |
| $Q(\gamma^0, \xi)$ | $\xi(\gamma^0)$ 950. 158619412600 | $\xi(\nu_e)^*$ 950. 158619412257 | $\xi(\nu_\mu)$ 950. 158586802258 | $\xi(\nu_\tau)$ 950. 155495680049 | $\xi(\gamma)^*$ 950. 158619412600 | $\xi(Z)$ 934. 374 552936441 | $\xi(H)$ 928. 456606144576 |
| $Q(\tilde{\gamma}^0, \xi)$ | $\xi(\tilde{\gamma}^0)$ 950. 158619412600 | $\xi(\tilde{\nu}_e)^*$ 950. 158619412257 | $\xi(\tilde{\nu}_\mu)$ 950. 158586802258 | $\xi(\tilde{\nu}_\tau)$ 950. 155495680049 | $\xi(g)^{***}$ *** | $\xi(Z)$ 934. 374 552936441 | $\xi(H)$ 928. 456606144576 |
| | ZeroMass | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass | ZeroMass | Non-ZeroMass | Non-ZeroMass |

Table Z 4th, 5th of Elementary Fermion

If $Q(\gamma^Q, \xi)$ —Running increasing continuously and approaching to **Table Z**, we seem to run out " the despairing plateau " ! Finally the first light of morning, Table 6. below. Further **Table 7**, Ahead of us, light; Genesis of mass, light .

$$\begin{array}{l}
 \text{For Particle:} \\
 \mathbf{Q}(\gamma^Q, \xi) =
 \end{array}
 \begin{array}{l}
 \mathbf{Q}(\gamma^{\frac{-2}{3}e}, \xi) \\
 \mathbf{Q}(\gamma^{\frac{-1}{3}e}, \xi) \\
 \mathbf{Q}(\gamma^{-e}, \xi) \\
 \mathbf{Q}(\gamma^{0e}, \xi)
 \end{array}
 =
 \begin{array}{l}
 (+3800.6344776504, +3800.6344776504, -7599.2689553008) \\
 (+3800.6344776504, +3800.6344776504, -7602.2689553008) \\
 (+3800.6344776504, +3800.6344776504, -7604.2689553008) \\
 (+3800.6344776504, +3800.6344776504, -7601.2689553008)
 \end{array}
 \quad (4.1)$$

$$\begin{array}{l}
 \text{For Anti-Particle:} \\
 \mathbf{Q}(\gamma^Q, \xi) =
 \end{array}
 \begin{array}{l}
 \mathbf{Q}(\gamma^{\frac{-2}{3}e}, \xi) \\
 \mathbf{Q}(\gamma^{\frac{+1}{3}e}, \xi) \\
 \mathbf{Q}(\gamma^{+e}, \xi) \\
 \mathbf{Q}(\tilde{\gamma}^{0e}, \xi)
 \end{array}
 =
 \begin{array}{l}
 (+3800.6344776504, +3800.6344776504, -7603.2689553008) \\
 (+3800.6344776504, +3800.6344776504, -7600.2689553008) \\
 (+3800.6344776504, +3800.6344776504, -7598.2689553008) \\
 (+3800.6344776504, +3800.6344776504, -7601.2689553008)
 \end{array}
 \quad (4.2)$$

Table 0 photon generation

Table Z values of photon generation (**Light PG**)

Table6 Photon Generation $Q(\gamma^Q, \xi)$ and Mass Function MF $\xi(\omega)$ values of Elementary Fermion

| $Q(\gamma^Q, \xi)$ | Photon Generation | Fermion 1st | Fermion 2nd | Fermion 3rd | | Fermion 4th | Fermion 5th |
|---------------------------------|------------------------------|---------------------|----------------------|-----------------------|--|---------------------------|---------------------------|
| $Q(\gamma^{+\frac{2}{3}}, \xi)$ | $\xi(\gamma^{+\frac{2}{3}})$ | $\xi(u)$ | $\xi(c)$ | $\xi(t)$ | | $\xi(q_4^{+\frac{2}{3}})$ | $\xi(q_5^{+\frac{2}{3}})$ |
| | 3799.967 840 223747 | 3799.967 741 517242 | 3799.912 907 511620 | 3792.536 127 301197 | | 3790.040 644 754800 | 3786.324 837 743850 |
| $Q(\gamma^{-\frac{2}{3}}, \xi)$ | $\xi(\gamma^{-\frac{2}{3}})$ | $\xi(\bar{u})$ | $\xi(\bar{c})$ | $\xi(\bar{t})$ | | $\xi(q_4^{-\frac{2}{3}})$ | $\xi(q_5^{-\frac{2}{3}})$ |
| | 3801.301 173 546824 | 3801.301 074 874941 | 3801.246 260 103013 | 3793.872 072 455593 | | 3791.377 466 725300 | 3787.662 965 515700 |
| $Q(\gamma^{-\frac{1}{3}}, \xi)$ | $\xi(\gamma^{-\frac{1}{3}})$ | $\xi(d)$ | $\xi(s)$ | $\xi(b)$ | | $\xi(q_4^{-\frac{1}{3}})$ | $\xi(q_5^{-\frac{1}{3}})$ |
| | 3800.967 818 291814 | 3800.967 612 349822 | 3800.963 742 354470 | 3800.766 161 413529 | | 3800.697 721 102900 | 3800.596 995 634700 |
| $Q(\gamma^{+\frac{1}{3}}, \xi)$ | $\xi(\gamma^{+\frac{1}{3}})$ | $\xi(\bar{d})$ | $\xi(\bar{s})$ | $\xi(\bar{b})$ | | $\xi(q_4^{+\frac{1}{3}})$ | $\xi(q_5^{+\frac{1}{3}})$ |
| | 3800.301 151 626429 | 3800.300 945 648309 | 3800.297 074 974064 | 3800.099 459 370670 | | 3800.031 007 053400 | 3799.930 263 914600 |
| $Q(\gamma^-, \xi)$ | $\xi(\gamma^-)$ | $\xi(e^-)$ | $\xi(\mu^-)$ | $\xi(\tau^-)$ | | $\xi(l_4^-)$ | $\xi(l_5^-)$ |
| | 3801.634 543 411587 | 3801.634 521 491192 | 3801.630 009 190056 | 3801.558 314 578680 | | 3801.531 408 174100 | 3801.493 304 717900 |
| $Q(\gamma^+, \xi)$ | $\xi(\gamma^+)$ | $\xi(e^+)$ | $\xi(\mu^+)$ | $\xi(\tau^+)$ | | $\xi(l_4^+)$ | $\xi(l_5^+)$ |
| | 3799.634 543 446202 | 3799.634 521 514268 | 3799.630 006 838006 | 3799.558 274 488192 | | 3799.531 353 920900 | 3799.493 230 407900 |
| $Q(\gamma^0, \xi)$ | $\xi(\gamma^0)$ | $\xi(\nu_e)$ | $\xi(\nu_\mu)$ | $\xi(\nu_\tau)$ | | $\xi(\nu_4^{0e})$ | $\xi(\nu_5^{0e})$ |
| | 3800.634 477 650400 | 3800.634 477 650314 | 3800.634 469 497815 | 3800.633 696 718466 | | 3800.633 431 690300 | 3800.633 041 224300 |
| $Q(\bar{\gamma}^0, \xi)$ | $\xi(\bar{\gamma}^0)$ | $\xi(\bar{\nu}_e)$ | $\xi(\bar{\nu}_\mu)$ | $\xi(\bar{\nu}_\tau)$ | | $\xi(\bar{\nu}_4)$ | $\xi(\bar{\nu}_5)$ |
| | 3800.634 477 650400 | 3800.634 477 650314 | 3800.634 469 497815 | 3800.633 696 718466 | | 3800.633 431 690300 | 3800.633 041 224300 |
| | ZeroMass | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass | | Non-ZeroMass | Non-ZeroMass |

Table7 Mass values of Photon and Mass values of Elementary Fermion Mev

| Photon | Charge | Fermion 1st | Fermion 2nd | Fermion 3rd | Fermion 4th | Fermion 5th |
|-------------------------|----------------|-----------------------|-------------------|----------------------|-------------------------------|----------------------|
| $\gamma^{\frac{+2}{3}}$ | | u | c | t | $q_4^{\frac{+2}{3}}$ | $q_5^{\frac{+2}{3}}$ |
| 0 | $\frac{+2}{3}$ | 2. 300 000 0084 1279. | 999 999 9969 | 173000. 000 000 0008 | 231015. 428 381 58422 317330. | 416 904 2517 |
| $\gamma^{\frac{-2}{3}}$ | | \tilde{u} | \tilde{c} | \tilde{t} | $q_4^{\frac{-2}{3}}$ | $q_5^{\frac{-2}{3}}$ |
| 0 | $\frac{-2}{3}$ | 2. 999 999 9982 1280. | 000 000 0002 | 172999. 999 999 9978 | 231015. 486 558 1882 317330. | 606 538 0023 |
| $\gamma^{\frac{-1}{3}}$ | | d | s | b | $q_4^{\frac{-1}{3}}$ | $q_5^{\frac{-1}{3}}$ |
| 0 | $\frac{-1}{3}$ | 4. 799 999 9986 94. | 999 999 9844 | 4699. 999 999 9872 | 6295. 075 920 3249 | 8642. 540 330 1016 |
| $\gamma^{\frac{+1}{3}}$ | | \tilde{d} | \tilde{s} | \tilde{b} | $q_4^{\frac{+1}{3}}$ | $q_5^{\frac{+1}{3}}$ |
| 0 | $\frac{+1}{3}$ | 4. 799 999 9981 94. | 999 999 9997 | 4700. 000 000 0127 | 6295. 075 897 7285 | 8642. 540 258 2346 |
| γ^- | | e^- | μ^- | τ^- | l_4^- | l_5^- |
| 0 | -1 | 0. 510 999 9898 | 105. 699 999 9957 | 1776. 999 999 9938 | 2404. 217 163 7408 | 3292. 442 021 4139 |
| γ^+ | | e^+ | μ^+ | τ^+ | l_4^+ | l_5^+ |
| 0 | +1 | 0. 510 999 9969 | 105. 699 999 9906 | 1776. 999 999 9969 | 2404. 217 150 1534 | 3292. 441 987 5652 |
| γ^0 | | ν_e | ν_μ | ν_τ | ν_4 | ν_5 |
| 0 | 0 | 0. 000 002 0287 | 0. 189 999 9996 | 18. 200 000 0020 | 24. 376 609 9545 | 33. 476 608 6728 |
| $\tilde{\gamma}^0$ | | $\tilde{\nu}_e$ | $\tilde{\nu}_\mu$ | $\tilde{\nu}_\tau$ | $\tilde{\nu}_4$ | $\tilde{\nu}_5$ |
| 0 | 0 | 0. 000 002 0287 | 0. 189 999 9996 | 18. 200 000 0020 | 24. 376 609 9545 | 33. 476 608 6728 |
| ZeroMass | | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass | Non-ZeroMass |

3. Epilogue

" Double Helix Structure " of elementary particle : Two so-called " Double Helix Structure ", Photon Generation PG $\mathbf{Q}(\gamma^Q, \xi)$ and Mass Function MF $\xi(\omega)$, of a unified mass theory of elementary fermions and elementary bosons, with which the mass-values of particles of Standard Model SM could be uniformly identified. We are amazed to see a wide variety of particle masses of SM, go so far as to be trace back to a regular digital arrangement of **Table Y1, Y2, Y3** and **Table3, 4, 5 !!**

STUNNING ! Due to **Table Z** and **Table 6**, 4th, 5th generations, **Table 7**, of elementary fermion are wondering hazily from the far horizon.

Mass Spectrum of 1st, 2nd, 3rd of Elementary Fermion

We arrange 1st, 2nd, 3rd of Elementary Fermion by THE ORDER of PARTICLE CHARGE ARITHMETIC PROGRESSION, Instead of by CURRENT PARTICLE FLAVOR.

$$\frac{M(\omega, n)}{0.511} = \mathbf{Q}^2(\omega) = \mathbf{Q}^2(\gamma^Q, \xi) - \xi^2(\omega) = \mathbf{Q}^2(\gamma^Q, \xi) - \xi^2(\omega, n, R) \tag{5.1}$$

$$n = 1, 2, 3 \tag{5.2}$$

AND $\xi^2(\omega, n, R) = \xi^2(v_n) \pm m R_n \tag{5.3}$

Where $\xi^2(v_n) \pm m R_n$ is Arithmetic Progression

When $v_n = v_1, v_2, v_3 = v_e, v_\mu, v_\tau$ yield $\xi^2(v_n) + m R_n \tag{5.4}$

$\tilde{v}_n = \tilde{v}_1, \tilde{v}_2, \tilde{v}_3 = \tilde{v}_e, \tilde{v}_\mu, \tilde{v}_\tau$ yield $\xi^2(\tilde{v}_n) - m R_n \tag{5.5}$

$m = 1, 2, 3, 4, 5, 6, 7 \tag{5.6}$

AND R_n

When $n = 1,$ $R_1 = 15, 190 \sim 15, 211 \tag{5.7}$

When $n = 2,$ $R_2 = 12, 880 \sim 17, 551 \tag{5.8}$

When $n = 3,$ $R_3 = ? ? \tag{5.9}$

Table R1 Mass Spectrum of 1st of Elementary Fermion for Charge $Q \leq 0$ and $Q \geq 0$

| Charge $Q \leq 0$ | $Q^2(\gamma^Q, \xi)$ | $\xi^2(\omega^Q)$ 1st | Mass $M(\omega)$ | | Mass $M(\omega)$ | $\xi^2(\omega^Q)$ 1st | $Q^2(\gamma^Q, \xi)$ | Charge $Q \geq 0$ |
|-------------------|---------------------------|------------------------------|--------------------------|--|------------------------------------|------------------------------|---------------------------|-------------------|
| -7/3 | $Q^2(\gamma^{-7/3}, \xi)$ | $\xi^2(q^{-7/3})$ | 86775, 369. 678 830 4600 | | 16.189 897 1767 16.189 860 5023 | $\xi^2(q^{+7/3})$ | $Q^2(\gamma^{+7/3}, \xi)$ | +7/3 |
| -2 | $Q^2(\gamma^{-2e}, \xi)$ | $\xi^2(q^{-2})$ | 86760, 163. 951 681 8800 | | 11.176 597 7794 11.176 567 7735 | $\xi^2(q^{+2})$ | $Q^2(\gamma^{+2e}, \xi)$ | +2 |
| -5/3 | $Q^2(\gamma^{-5/3}, \xi)$ | $\xi^2(q^{-5/3})$ | 86744, 958. 224 533 3000 | | 7.185 298 3872 7.185 275 0498 | $\xi^2(q^{+5/3})$ | $Q^2(\gamma^{+5/3}, \xi)$ | +5/3 |
| -4/3 | $Q^2(\gamma^{-4/3}, \xi)$ | $\xi^2(q^{-4/3})$ | 86729, 752. 497 383 8200 | | 4.215 999 4498 4.215 982 3159 | $\xi^2(q^{+4/3})$ | $Q^2(\gamma^{+4/3}, \xi)$ | +4/3 |
| -1 | $Q^2(\gamma^{-e}, \xi)$ | $\xi^2(e^-)$ | 86714, 550. 209 961 3800 | | 0.511 000 0000 0.511 000 0000 | $\xi^2(e^+)$ | $Q^2(\gamma^{+e}, \xi)$ | +1 |
| -2/3 | $Q^2(\gamma^{-2/3}, \xi)$ | $\xi^2(\tilde{u})$ | 86699, 339. 171 072 2964 | | 2.300 000 0000 2.300 000 0000 | $\xi^2(u)$ | $Q^2(\gamma^{+2/3}, \xi)$ | +2/3 |
| -1/3 | $Q^2(\gamma^{-1/3}, \xi)$ | $\xi^2(d)$ | 86684, 128. 740 793 8004 | | 4.800 000 0000 4.800 000 0000 | $\xi^2(\tilde{d})$ | $Q^2(\gamma^{+1/3}, \xi)$ | +1/3 |
| 0 | $Q^2(\gamma^0, \xi)$ | $\xi^2(\nu_e)$ | 86668, 934. 596 225 6861 | | 0.000 002 0000 0.000 002 0000 | $\xi^2(\tilde{\nu}_e)$ | $Q^2(\gamma^0, \xi)$ | 0 |
| 0 | $Q^2(\gamma^0, \xi)$ | $\xi^2(\gamma^0)$ | 86668, 934. 596 229 6000 | | 0.000 000 0000 0.000 000 0000 | $\xi^2(\gamma^0)$ | $Q^2(\gamma^0, \xi)$ | 0 |
| | | $R_1 = 15, 190 \sim 15, 211$ | | | | $R_1 = 15, 190 \sim 15, 211$ | | |

Table R2 Mass Spectrum of 1st 2nd 3rd of Elementary Fermion for Charge $Q \leq 0$

| Charge | $Q^2(\gamma^Q, \xi)$ | $\xi^2(\omega^Q)$ | $\xi^2(\omega^Q)$ | $Q^2(\gamma^Q, \xi)$ |
|------------|---------------------------|----------------------------------|----------------------------------|-----------------------------------|
| $Q \leq 0$ | | 1st | 2nd | 3rd |
| -7/3 | $Q^2(\gamma^{-7/3}, \xi)$ | $\xi^2(q^{-7/3})$ | $\xi^2(q^{+7/3})$ | |
| | | 86775, 369. 678 830 4600 | 86562, 534. 148 153 8000 | |
| -2 | $Q^2(\gamma^{-2e}, \xi)$ | $\xi^2(q^{-2})$ | $\xi^2(q^{+2})$ | |
| | | 86760, 163. 951 681 8800 | 86577, 733. 496 813 3900 | |
| -5/3 | $Q^2(\gamma^{-5/3}, \xi)$ | $\xi^2(q^{-5/3})$ | $\xi^2(q^{+5/3})$ | |
| | | 86744, 958. 224 533 3000 | 86592, 932. 845 472 9600 | |
| -4/3 | $Q^2(\gamma^{-4/3}, \xi)$ | $\xi^2(q^{-4/3})$ | $\xi^2(q^{+4/3})$ | |
| | | 86729, 752. 497 383 8200 | 86608, 132. 194 132 5400 | |
| -1 | $Q^2(\gamma^{-e}, \xi)$ | $\xi^2(e^-)$ | $\xi^2(\mu^-)$ | $\xi^2(\tau^-)$ |
| | | 86714, <u>550</u> . 209 961 3800 | 86714, <u>344</u> . 360 646 3115 | 86711, <u>073</u> . 714 853 7479 |
| -2/3 | $Q^2(\gamma^{-2/3}, \xi)$ | $\xi^2(\bar{u})$ | $\xi^2(\bar{c})$ | $\xi^2(\bar{t})$ |
| | | 86699, <u>339</u> . 171 072 2964 | 86696, <u>838</u> . 779 682 8639 | 86360*, <u>791</u> . 812 950 9657 |
| -1/3 | $Q^2(\gamma^{-1/3}, \xi)$ | $\xi^2(d)$ | $\xi^2(s)$ | $\xi^2(b)$ |
| | | 86684, <u>128</u> . 740 793 8004 | 86683, <u>952</u> . 224 159 7495 | 86674, 940. 482 476 7749 |
| 0 | $Q^2(\gamma^0, \xi)$ | $\xi^2(\nu_e)$ | $\xi^2(\nu_\mu)$ | $\xi^2(\nu_\tau)$ |
| | | 86668, <u>934</u> . 596 225 6861 | 86668, <u>934</u> . 224 409 6391 | 86668, <u>898</u> . 979 791 2438 |
| 0 | $Q^2(\gamma^0, \xi)$ | $\xi^2(\gamma^0)$ | $\xi^2(\gamma^0)$ | $\xi^2(\gamma^0)$ |
| | | 86668, 934. 596 229 6000 | 86668, 934. 596 229 6000 | 86668, 934. 596 229 6000 |
| | | $R_1 = 15, 190 \sim 15, 211$ | $R_2 = 12, 880 \sim 17, 551$ | $R_3 = ? ?$ |

Table R3 Mass Spectrum of 1st 2nd 3rd of Elementary Fermion for Charge $Q \leq 0$ Mev

| Charge | $Q^2(\gamma^Q, \xi)$ | $\xi^2(\omega^Q)$ | $\xi^2(\omega^Q)$ | $Q^2(\gamma^Q, \xi)$ |
|------------|---------------------------|------------------------------|------------------------------|----------------------|
| $Q \leq 0$ | | 1st | 2nd | 3rd |
| -7/3 | $Q^2(\gamma^{-7/3}, \xi)$ | $\xi^2(q^{-7/3})$ | $\xi^2(q^{+7/3})$ | |
| | | 16.189 897 1767 | 1210.883 000 0610 | |
| -2 | $Q^2(\gamma^{-2e}, \xi)$ | $\xi^2(q^{-2})$ | $\xi^2(q^{+2})$ | |
| | | 11.176 597 7794 | 1055.620 000 0456 | |
| -5/3 | $Q^2(\gamma^{-5/3}, \xi)$ | $\xi^2(q^{-5/3})$ | $\xi^2(q^{+5/3})$ | |
| | | 7.185 298 3872 | 901.379 000 0353 | |
| -4/3 | $Q^2(\gamma^{-4/3}, \xi)$ | $\xi^2(q^{-4/3})$ | $\xi^2(q^{+4/3})$ | |
| | | 4.215 999 4498 | 748.160 000 0199 | |
| -1 | $Q^2(\gamma^{-e}, \xi)$ | $\xi^2(e^-)$ | $\xi^2(\mu^-)$ | $\xi^2(\tau^-)$ |
| | | 0.511 000 0000 | 105.700 000 0000 | 1777.000 000 0000 |
| -2/3 | $Q^2(\gamma^{-2/3}, \xi)$ | $\xi^2(\bar{u})$ | $\xi^2(\bar{c})$ | $\xi^2(\bar{t})$ |
| | | 2.300 000 0000 | 1280.000 000 0000 | 173000.000 000 0000 |
| -1/3 | $Q^2(\gamma^{-1/3}, \xi)$ | $\xi^2(d)$ | $\xi^2(s)$ | $\xi^2(b)$ |
| | | 4.800 000 0000 | 95.000 000 0000 | 4700.000 000 0000 |
| 0 | $Q^2(\gamma^0, \xi)$ | $\xi^2(\nu_e)$ | $\xi^2(\nu_\mu)$ | $\xi^2(\nu_\tau)$ |
| | | 0.000 002 0000 | 0.190 000 0000 | 18.200 000 0000 |
| 0 | $Q^2(\gamma^0, \xi)$ | $\xi^2(\gamma^0)$ | $\xi^2(\gamma^0)$ | $\xi^2(\gamma^0)$ |
| | | 0.000 000 0000 | 0.000 000 0000 | 0.000 000 0000 |
| | | $R_1 = 15, 190 \sim 15, 211$ | $R_2 = 12, 880 \sim 17, 551$ | $R_3 = ? ?$ |

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■ REFERENCES

- [1] Shao-Xu Ren. The Zeroth of Generation Zh of Fermion, A Unified Mass Theory of Twelve Elementary Fermions. *GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE* Volume 25 ISSUE 6 Version 1.0 Year 2025 27-61. Online ISSN: 2249-4626 & Print ISSN: 0975-5896
- [2] Shao-Xu Ren. Production and Decay of Higgs Boson, From God Particle H to Heaven Particle Π . *GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE* Volume 25 ISSUE 5 Version 1.0 Year 2025 36-58. Online ISSN: 2249-4626 & Print ISSN: 0975-5896 ,
- [3] Shao-Xu Ren. Colorization of Gell-mann-Nishijima Relation and Mass Principle, Origins of Mass; Fermions and Charges, Bosons and Color-Pairs. *GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: A PHYSICS AND SPACE SCIENCE* Volume 25 ISSUE 3 Version 1.0 Year 2025 93-128. Online ISSN: 2249-4626 & Print ISSN: 0975-5896
- [4] Ian J.R.Aitchison, Anthony J.G.Hey.(2013). Gauge Theories in Particle Physics A Practical Introduction 4th Edition Volume2. ISBN 978-7-5192-8371-1
- [5] Antonio Ereditato. (2017). Ever Smaller. ISBN: 978-0-262-04386-1
- [6] Paul Langacker. (2017). The Standard Model and Beyond Second Edition ISBN: 978-7-5192-9614-8.
- [7] Richard A Dunlap (2018). Particle Physics. **IOP** Concise Physics. Morgan & Claypoo Publishers
- [8] Daniel Denegri. Claude Guyot. Andreas Hoecker. Lydia Roos (2021). The Adventure of the LARGE HADRON COLLIDER From the Big Bang to the Higgs Boson. World Scientific. ISBN: 978-981-3236-08-0
- [9] Ikaros I Bigi. Giulia Ricciardi. Marco Pallavicini (2021), New Era for CP Asymmetries, Axions and Rare Decays of Hadrons and Leptons. World Scientific. ISBN: 978-981-3233-07-2
- [10] André Rubbia (2022), PHENOMENOLOGY OF PARTICLE PHYSICS, CAMBRIDGE UNIVERSITY PRESS ISBN 978-1-316-51934-9
- [11] Pierre Baldi, Peter Sadowski and Daniel Whiteson. Deep Learning from Four Vectors, ARTIFICIAL INTELLIGENCE for HIGH ENERGY PHYSICS 59-83, © 2022 World Scientific Publishing Company, https://10.1142/978-981-123-402-6_0003. ISBN 978-981-123-402-6

- [12] Andrea Banfi. Hadron Jets an introduction. *University of Sussex, Brighton, UK*. © 2022 IOP Publishing Bristol, UK. ISBN 978-0-7503-4735-8
- [13] Dong-Sheng Du, Mao-Zhi Yang. (2023). Introduction to Particle Physics. ISBN: 978-981-125-945-6.
- [14] Regina Demina. Aran Garcia-Bellido (2023). Electroweak Symmetry and its Breaking. *University of Rochester, USA*. World Scientific. ISBN: 978-981-122-224-5
- [15] PASCAL PAGANINI (2023), FUNDAMENTALS OF PARTICLE PHYSICS. CAMBRIDGE UNIVERSITY PRESS ISBN 978-1-009-17158-8
- [16] W.N. Cottingham and D.A. Greenwood. (2023) *University of Bristol, UK*. An Introduction to the Standard Model of Particle Physics. CAMBRIDGE UNIVERSITY PRESS ISBN 978-1-009-40170-8
- [17] ALESSANDRO BETTINI (2024), INTRODUCTION TO ELEMENTARY PARTICLE PHYSICS. CAMBRIDGE UNIVERSITY PRESS ISBN 978-1-009-44073-8
- [18] Guido Tonelli (2025), Matter The Magnificent Illusion. SEPS Segretariato Europeo per le Pubblicazioni Scientifiche ISBN 978-1-509-56414-9