Particle Count Reduction in an E_8 Standard Model

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Abstract

By definition in Lie Algebras, all roots can be composed from either all positive or all negative combinations of their "simple roots". Taking a modified A.G. Lisi split real even E_8 model with 240 fundamental physics particles associated with an extended Standard Model, a particle count reduction (from 240 fundamental particles to 8 "elemental" particles) is determined from these 8 simple roots. Interestingly, by taking account of the particle mass assignments, all known fermions {e/ν, u/d, c/s, t/b}, as well as known (plus the Lisi predicted) bosons {W/B, gluons(g), ω, eϕ, xΦ} can be generated with the sum of the simple root masses being less than the resulting composite particle masses (with the exception of the four 2nd and 3rd generation leptons {$e_{\mu,\tau}$ / $\nu_{\mu,\tau}$}).

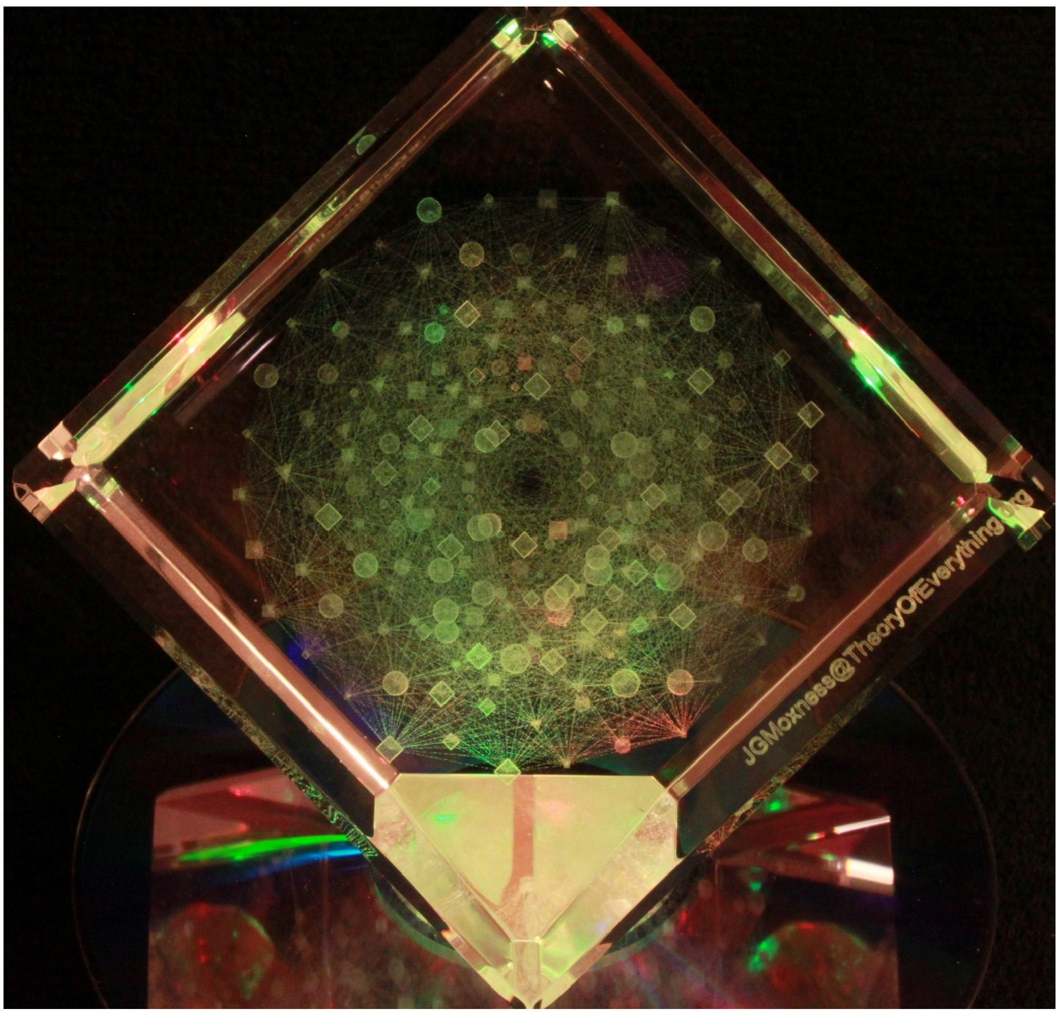


Figure 1: E_8 projection in 3D laser etched into 3"x3"x3" crystal with vertex shape and size assigned based on extended Standard Model particle assignments

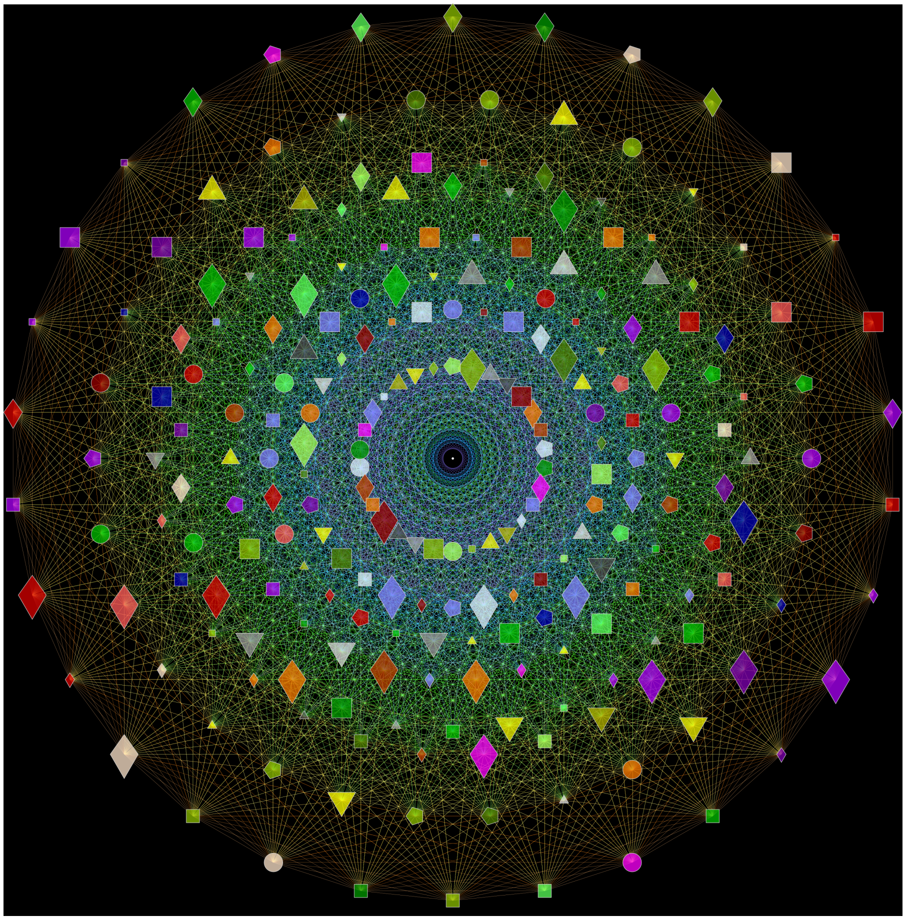


Figure 2: E_8 in 2D Petrie projection with 6720 edges and vertex shape, size, color/shade assigned based on extended Standard Model particle assignments

Introduction

Visualizing the 8 dimensional (8D) E_8 polytope uses 2 (or 3) basis vectors to project it into 2D (or 3D). Figures 1 and 2 are generated using the projection operation (1) applied to the split real even (SRE) E_8 vertices with basis vectors (2), (3) and (4).

$$\text{VertexProjectionLocation}_i = \{H.\text{SRE}_{i=1-256},\ V.\text{SRE}_{i=1-256},\ Z.\text{SRE}_{i=1-256}\} \tag{1}$$

$$H = \left\{0, -\frac{1}{4}\sqrt{5-\sqrt{5}+\sqrt{\frac{2}{3}\left(5+\sqrt{5}\right)}}, \frac{1}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}, -\frac{1}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}, \sqrt{\frac{2}{15+6\sqrt{5}+\sqrt{3\left(85+38\sqrt{5}\right)}}}\,\mathrm{Sin}\left[\frac{2\pi}{15}\right], -\frac{2\,\mathrm{Cos}\left[\frac{\pi}{15}\right]}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}, 0, \frac{2\,\mathrm{Cos}\left[\frac{\pi}{15}\right]}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}\right\} = \tag{2}$$

$\{0., -0.556793440452, 0.19694925177, -0.19694925177, 0.0805477263944, -0.385290876171, 0., 0.385290876171\}$

$$V = \left\{\frac{1}{4}\sqrt{7-3\sqrt{5}+\sqrt{\frac{1}{15}\left(50-22\sqrt{5}\right)}}, 0, \sqrt{\frac{1}{30}\left(15+\sqrt{75-30\sqrt{5}}\right)}\,\mathrm{Sin}\left[\frac{\pi}{15}\right], \sqrt{\frac{1}{30}\left(15+\sqrt{75-30\sqrt{5}}\right)}\,\mathrm{Sin}\left[\frac{\pi}{15}\right], 0, \sqrt{\frac{\left(5-\sqrt{5}\right)\left(15+\sqrt{75-30\sqrt{5}}\right)}{30\left(5+\sqrt{5}\right)}}\,\mathrm{Sin}\left[\frac{\pi}{15}\right], \right.$$
$$\left. \frac{1}{4}\sqrt{3+\sqrt{5}+\sqrt{\frac{2}{15}\left(65+29\sqrt{5}\right)}}, \sqrt{\frac{\left(5-\sqrt{5}\right)\left(15+\sqrt{75-30\sqrt{5}}\right)}{30\left(5+\sqrt{5}\right)}}\,\mathrm{Sin}\left[\frac{\pi}{15}\right]\right\} = \{0.180913155536, 0., 0.160212955043, 0.160212955043, 0., 0.0990170516545, 0.766360424875, 0.0990170516545\} \tag{3}$$

$$Z = \left\{0, -\sqrt{\frac{2}{15+6\sqrt{5}+\sqrt{3\left(85+38\sqrt{5}\right)}}}\,\mathrm{Sin}\left[\frac{2\pi}{15}\right], -\frac{1}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}, \frac{1}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}, \frac{1}{4}\sqrt{5-\sqrt{5}+\sqrt{\frac{2}{3}\left(5+\sqrt{5}\right)}}, \frac{2\,\mathrm{Cos}\left[\frac{\pi}{15}\right]}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}, 0, -\frac{2\,\mathrm{Cos}\left[\frac{\pi}{15}\right]}{\sqrt{\sqrt{30-6\sqrt{5}}+3\left(5+\sqrt{5}\right)}}\right\} = \tag{4}$$

$\{0, -0.0805477263944, -0.19694925177, 0.19694925177, 0.556793440452, 0.385290876171, 0, -0.385290876171\}$

Lisi has proposed an extended Standard Model (SM) based on a SRE E_8 Lie Algebra with a fundamental physics particle associated with each of its 240 roots[1]. In this model, particle assignments are modified slightly in order to create a pattern of roots consistent with its Simple Roots (SRs). This construction of the SRE E_8 is based on the $256 = 2^8$ binary pattern from the 8th row of the Pascal Triangle {1, 8, 28, 56, 70, 56, 28, 8, 1} and its associated Cl(8) Clifford Algebra. The SRE E_8 roots are defined by combining the 112={56, 56} integer roots of Lie group D_8=SO(16) and the 128={1, 28, 70, 28, 1} half integer roots of Lie group C_8=Sp(16). Specifically, C_8 contains all permutations of {±1, ±1, ±1, ±1, ±1, ±1, ±1, ±1}/2 with an even number of plus signs (an 8-Demi-Cube), which are assigned to the 2nd and 3rd generation fermions. D_8 contains all permutations of {±1, ±1, 0, 0, 0, 0, 0, 0}, which are assigned to 48 bosons and the 64 1st generation fermions. In this model, the 16 particles associated with {8, 8} are excluded as dimensional generators from the permutations of {±1, 0, 0, 0, 0, 0, 0, 0}. These excluded particles are associated with the 8 Orthoplex (dual of the 8-Cube with 256 vertices). E_8 has 120 positive roots and 120 negative roots. These construction patterns are shown in Figure 3.

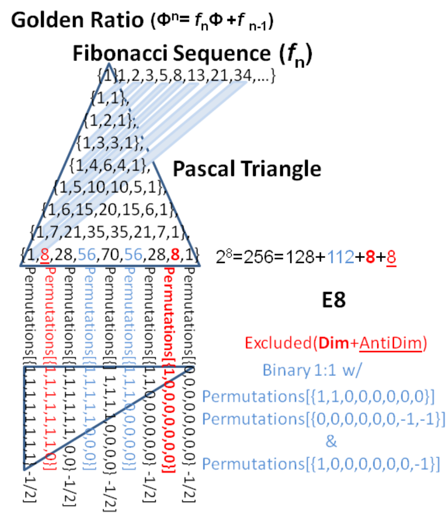


Figure 3: Split real even E_8 construction from Pascal Triangle, Cl(8) Clifford Algebra and binary permutations

The E_8 Dynkin diagram (Figure 4) with canonical node ordering generates the Cartan matrix (CM) in (5), which is used to construct the E_8 Lie Algebra.

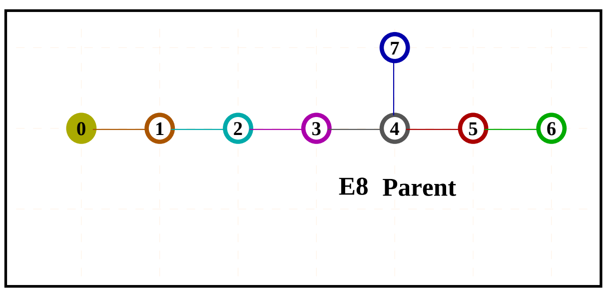


Figure 4: E_8 Dynkin with canonical node ordering

$$\text{CM} = \begin{pmatrix} 2 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ -1 & 2 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 2 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 2 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 2 & -1 & 0 & -1 \\ 0 & 0 & 0 & 0 & -1 & 2 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 2 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & 2 \end{pmatrix}, \ \text{SRM} = \begin{pmatrix} 0 & -1 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & -1 \\ -1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 1 & 0 & 0 \\ -\frac{1}{2} & \frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} & -\frac{1}{2} & \frac{1}{2} & -\frac{1}{2} \end{pmatrix} \quad (5)$$

By definition in Lie Algebras, all roots can be composed from either all positive or all negative combinations of the SRs. The simple root matrix (SRM) in (5) and the 256=240+16 excluded SRE vertices are used to uniquely generate all 240=120 positive+120 negative algebra roots of E_8 using (6), ignoring the excluded 16=8 positive (dimensional)+8 negative (anti-dimensional) SRE generated roots.

$$\text{AlgebraRoot}_i = \left[\text{SRM}^T\right]^{-1}.\text{SRE}_{i=1-256} \quad (6)$$

New Model Construction

In this new model, each E_8 vertex is a Big Endian (left most significant) zero-based 8 dimensional vector that contains the configuration of a particle's spin in positions {7, 6, 5, 4}, the generations in position {3}, and color in positions {2, 1, 0}.

As is well known in the Lisi SRE model, there are only 48 assigned D_8 integer bosons and only 128 C_8 half-integer vertices available. Yet, with 192=64x3 generation fermions in SM, the meaning or validity of assigning a generation of fermions to the remaining 64 D_8 integer vertices has been hotly debated[2]. In this model these remaining integer fermions are assigned to the 1st generation. This means that the integer SRE vertices are fully allocated with the "generation 0" bosons and 1st generation fermions. For a complete reference of particle assignments, see Appendix B.

The 1:1 bit-wise correspondence of a particle's quantum number assignments, a Big Endian (left most significant) zero-based 8 dimensional vector {7-0}, are respectively {1 bit=a (Antiparticle- p/$\overline{p}$), 1 bit=p (Type- e/ν or u/d quark), 2 bits=c1, c0 (Color- r/g/b/none), 2 bits=s1, s0 (Spin-$\check{L}$, $\hat{R}$, $\hat{L}$, $\check{R}$), 2 bits=g1, g0 (Generations- $3\tau/2\mu$ half integer fermions, 1e/0 integer bosons)} or simply {**a, p,** s1, s0, c1, c0, g1, **g0**}. The **green bold** type face indicates quantum assignments which are not exclusively allocated to a dimension {7-0} defined in this model, but in the particle assignments based on the inherent structural symmetry of E_8. These construction patterns are shown in Figure 5 and 6.

$2_a * 2_p$	Gen	---------->	0 Boson Generation	<----------	3_g Generations	(1 e, 2 μ, 3 τ)
	Spin	4_s Spin $(\hat{\check{L}}\ \hat{\check{R}})$	3_s Spin $(\check{L}\ \hat{\check{R}})$	1 Spin $(\hat{L})$	----> 4_s Spin	$(\hat{\check{L}}\ \hat{\check{R}})$ <-----
	Color	0 Color (w)	---------->	3_c Color (rgb)	<------------	0 Color (w)
	Row	5	4	3	2	1
	Count	4_s	3_s x3_c	3_c	3_g x3_c x 4_s	3_g x4_s

Figure 5: Particle flavor counts given quantum number assignments

2_a	Gen	---------->	0 Boson Generation	<----------	3_g Generations	(1 e, 2 μ, 3 τ)
	Spin	4_s Spin $(\hat{\check{L}}\ \hat{\check{R}})$	3_s Spin $(\check{L}\ \hat{\check{R}})$	1 Spin $(\hat{L})$	----> 4_s Spin	$(\hat{\check{L}}\ \hat{\check{R}})$ <-----
	Color	0 Color (w)	---------->	3_c Color (rgb)	<------------	0 Color (w)
	Row	5	4	3	2	1
		8 Ortho =				
	p = 1	{Ex_{5-8}	{{{{$e_S\,\phi$, $e_T\,\phi$}, B}	{{{ω_L, ω_R}, W}}	{u, c, t}	{ν_e, ν_μ, ν_τ}
	p = 0	Ex_{1-4}}	{{$x_1\,\Phi$, $x_2\,\Phi$, $x_3\,\Phi$}	{$g^{g\bar{b}}$, $g^{r\bar{b}}$, $g^{r\bar{g}}$}}}	{d, s, b}	{e, e_μ, e_τ}

Figure 6: Particle flavors in row / column groups with boson {group} coloring based on Lie group assignments (**F4**, **F4^S**, **D4 & G2**, **G2^S**)

The anti-particle {**a**} bit is associated with the negation of a particle vertex coordinate. This creates a given particle's anti-particle. It is helpful to note that the entire binary and SRE vertex list is lexicographically ordered from negative to positive with a perfect mirroring about the middle, between the 128th and 129th of 256 vertices, which are the $\hat{R}$ muon neutrinos (ν_μ and $\overline{\nu_\mu}$). Also of interest, the first and last particles in the list are the $\hat{R}$ tau neutrinos (ν_τ and $\overline{\nu_\tau}$). This aligns well with the idea that it is associated with (T)ime reversal in the CPT conservation laws. While the E_8 algebra roots in the SRE ordered list are not lexicographically ordered, it does exhibit the same mirrored pattern of positive (negative) roots as do the binary and SRE particle (anti-particle) assignments.

The {**g0**} bit splits the generation 0 boson family of 128 integer roots (and integer Spins) of D_8 and 8-Orthoplex from the 128 half integer root (and half integer spin) of C_8 fermions.

The {**p**} bit splits the particle families into two types, referenced in the leptons as electron and neutrino types, while the quarks are designated by up and down types. The differences are most easily seen in the 8x8 rotation matrix used for transforming SRE coordinates to physics coordinates (8) and those matrices used in identifying bosonic (9) and fermionic (10) triality transformations. These matrices are divided by an upper left quadrant affecting the SRE {7-4} spin positions and a lower right quadrant affecting the SRE {3-0} generation-color positions.

$$\text{Physics\_Rotation} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} & \frac{1}{\sqrt{3}} \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{6}} & \sqrt{\frac{2}{3}} \end{pmatrix} \quad (7)$$

$$\text{Bosonic\_Triality} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{3} & -\frac{1}{3} & \frac{2}{3} \\ 0 & 0 & 0 & 0 & 0 & \frac{2}{3} & -\frac{1}{3} & -\frac{1}{3} \\ 0 & 0 & 0 & 0 & 0 & -\frac{1}{3} & \frac{2}{3} & -\frac{1}{3} \end{pmatrix} \tag{8}$$

$$\text{Fermionic\_Triality} = \frac{1}{2} \begin{pmatrix} -1 & 1 & 1 & -1 & 0 & 0 & 0 & 0 \\ -1 & 1 & -1 & 1 & 0 & 0 & 0 & 0 \\ -1 & -1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & -1 & -1 & -1 \\ 0 & 0 & 0 & 0 & 1 & 1 & -1 & -1 \\ 0 & 0 & 0 & 0 & 1 & -1 & 1 & -1 \\ 0 & 0 & 0 & 0 & 1 & -1 & -1 & 1 \end{pmatrix} \tag{9}$$

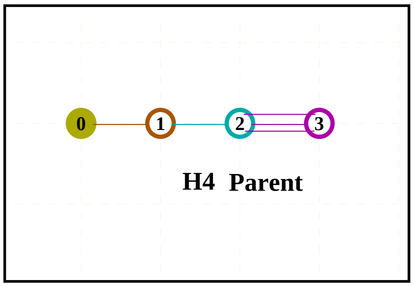


Figure 7: H_4 Dinkin diagram

This left-right splitting of E_8 may be related to the idea that the Dynkin diagrams can be folded, generating related sub-groups. The E_8 Dynkin folds into H_4 (Figure 7). It is associated with the 600-Cell, a 4D polytope (or polychora) of 120 vertices (Figures 8 and 9). It has a dual, the 120-Cell of 600 vertices (Figures 10 and 11). This 4D 600-Cell is constructed from the combination of the 96 vertices of the Snub 24-Cell and the 24 vertices of the 24-Cell (Figure 12 and 13), which is a self-dual polychora D_4, the most symmetrical of Dynkin diagrams (Figure 14). It is interesting to note that the 24-Cell is constructed from the 16 vertices of the Tesseract (or 8-Cell or 4-Cube as shown in Figure 15) and the 8 vertices of the 4-Orthoplex (or 16-Cell), all of which can be found within E_8 and the excluded 8-Orthoplex. On the other hand, the Snub 24-Cell is constructed from even permutations of $\{\phi, 1, 1/\phi, 0\}$, where $\phi = \frac{1}{2}\left(\sqrt{5}+1\right)$ is the golden ratio with numerical value of 1.61803..., which can not be found directly within E_8.

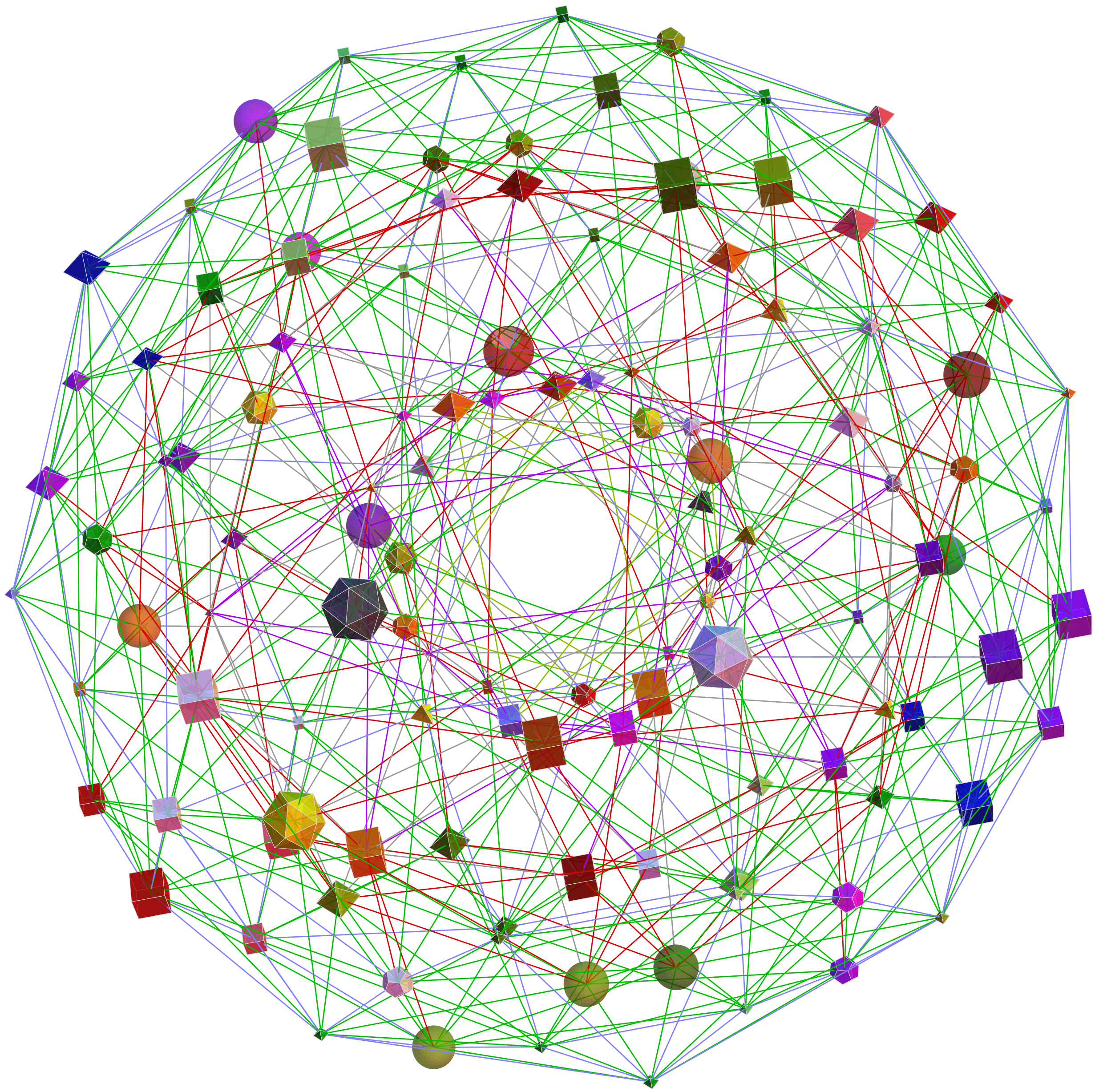


Figure 8: 3D projection of the 4D 600-Cell

Note: If viewing *Mathematica*™ Common Document Format (.CDF), this figure is interactive with zoom, rotate and vertex detail information on mouse-over.

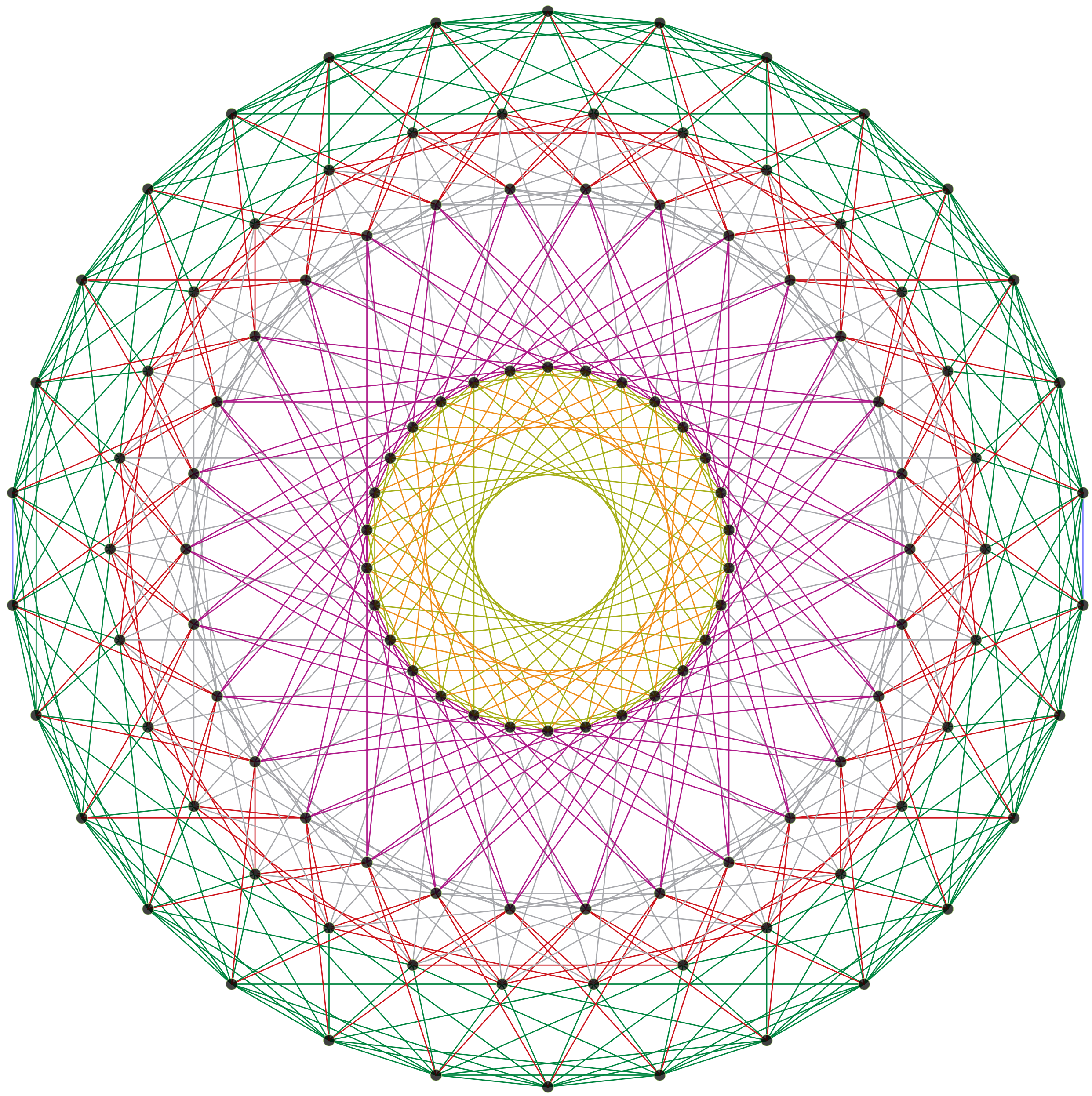


Figure 9: Van Oss projection of the 600-Cell, the shadow of the 3D projection above

Note: If viewing *Mathematica*TM Common Document Format (.CDF), this figure is interactive with zoom and vertex detail information on mouse-over.

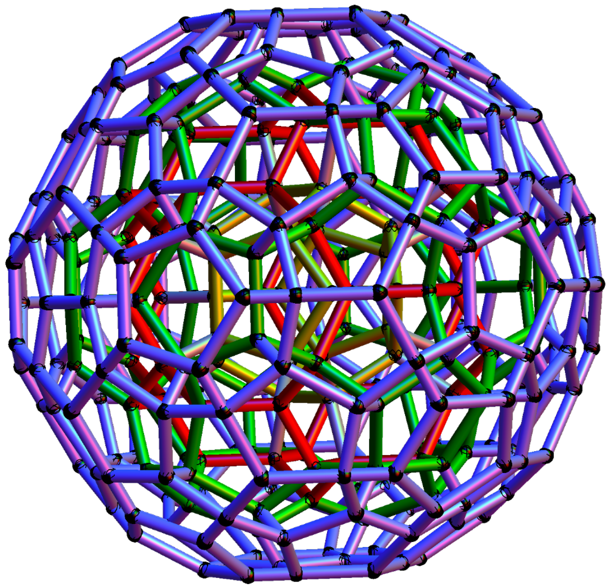


Figure 10: 3D projection of the 4D 120-Cell

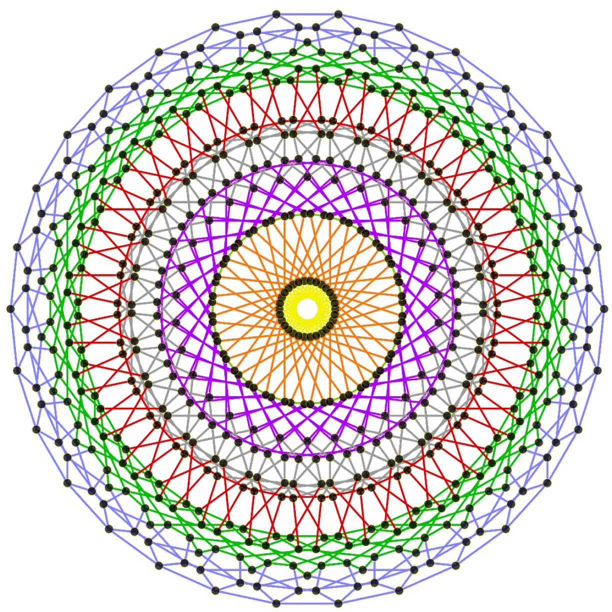


Figure 11: 2D Petrie projection of the 4D 120-Cell

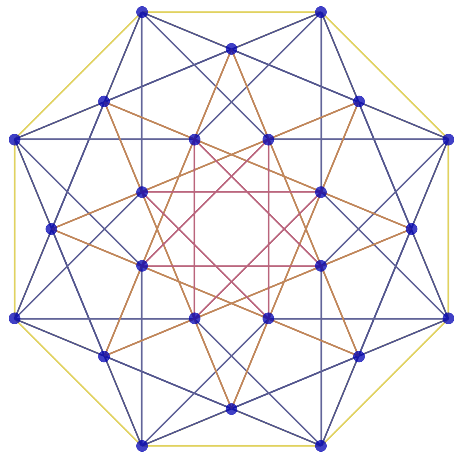


Figure 12: 2D projection of the 24 Cell

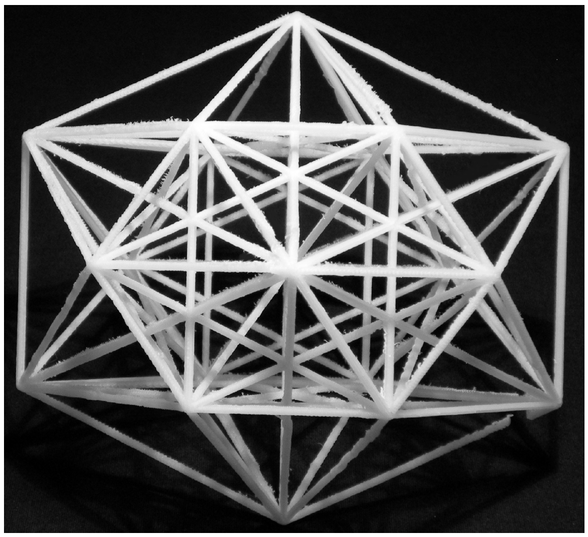


Figure 13: 3D projection of the 24 Cell grown in StereoLithography plastic

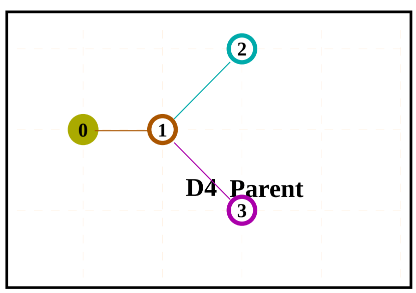


Figure 14: D_4 Dinkin diagram

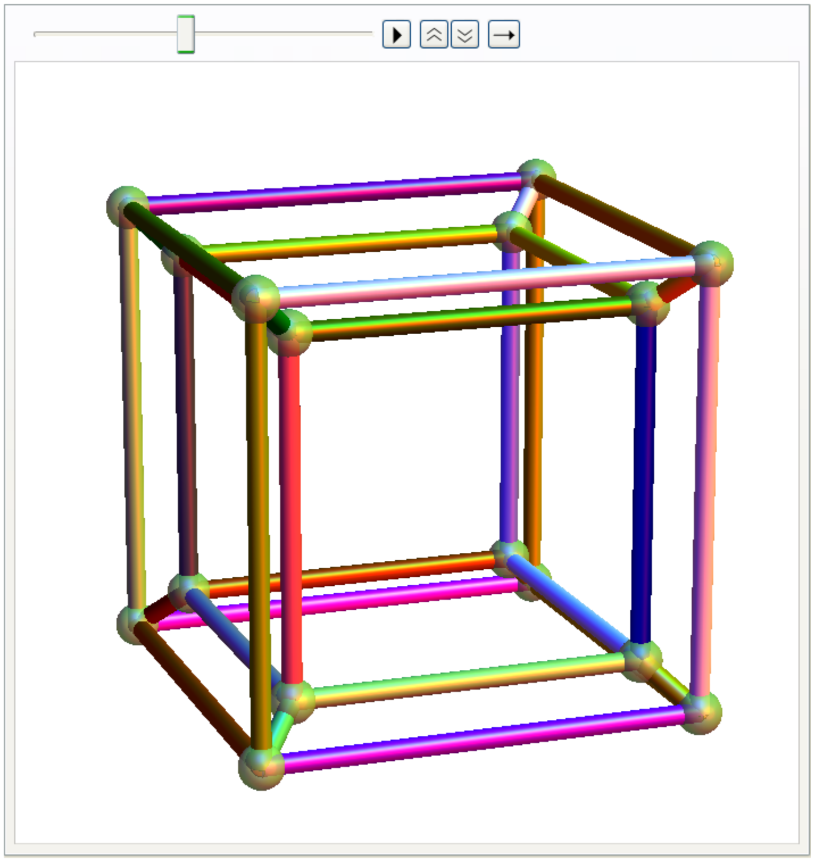


Figure 15: The Tesseract

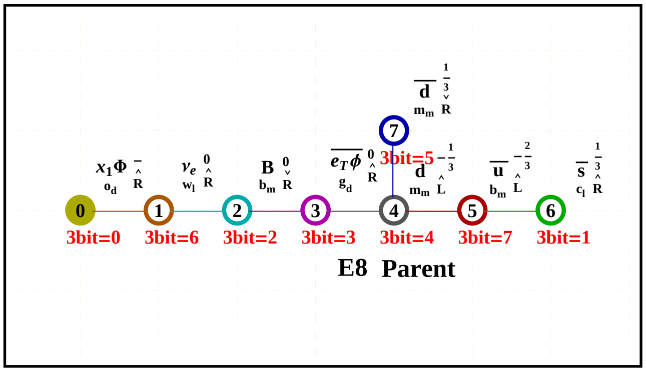
Note: If viewing *Mathematica*TM Common Document Format (.CDF), this figure is interactive with 4D rotation animation, zoom, and rotate.

The 600-Cell in Figure 8 was projected from 4D into 3D with basis vectors (10), which has 720 4D edges of norm'd length $\sqrt{2}\left(-1+\sqrt{5}\right)$. Notice the parallax due to the fact that it is in perspective projection. The shadow of this polytope is the orthographic Van Oss projection (Figure 9). Evidence of the folding is obtained by combining two 600-Cells at the Golden ratio. This results in a structure that is isomorphic to E_8[3]. It has the same Petrie projection as the Figure 1, except with 3360 edges of length $\sqrt{2}\left(-1+\sqrt{5}\right)$, which is half the 6720 E_8 edges of 8D norm'd length $\sqrt{2}$.

$$H=\left\{\frac{1}{4}\left(1+\sqrt{5}\right)\sqrt{\frac{1}{2}-\frac{1}{30}\sqrt{75+30\sqrt{5}}}\ \mathrm{Sin}\left[\frac{\pi}{15}\right],0,\frac{1}{2}\sqrt{\frac{1}{2}-\frac{1}{30}\sqrt{75+30\sqrt{5}}}\ \mathrm{Sin}\left[\frac{2\pi}{15}\right],0\right\}=$$
$$\{0,-0.0801064775214,0,0.236818395103\}$$
$$V=\left\{0,\frac{1}{4}\sqrt{\frac{1}{2}-\frac{1}{30}\sqrt{75+30\sqrt{5}}},0,\frac{1}{4}\left(1+\sqrt{5}\right)\sqrt{\frac{1}{2}-\frac{1}{30}\sqrt{75+30\sqrt{5}}}\ \mathrm{Sin}\left[\frac{\pi}{30}\right]\right\}= \tag{10}$$
$$\{0.159335291712,0,0.192645438086,0\}$$
$$Z=\left\{0,-\frac{1}{4}\left(1+\sqrt{5}\right)\sqrt{\frac{1}{2}-\frac{1}{30}\sqrt{75+30\sqrt{5}}}\ \mathrm{Sin}\left[\frac{\pi}{30}\right],0,\frac{1}{4}\sqrt{\frac{1}{2}-\frac{1}{30}\sqrt{75+30\sqrt{5}}}\right\}=$$
$$\{0,0.236818395103,0,0.0801064775214\}$$

Simple Root Particles

These 3 bits {**a, p, g0**} are used to uniquely identify and generate the $8 = 2^3$ Dynkin diagram nodes as shown in Figure 16 with corresponding 3bit value construction and ordering identified along with the simple root particle assignments.



3 bit =		0	1
$4 = 2^2$	g0	Boson (Gen 0) & 2	Fermion (Gen 1 & 3)
$2 = 2^1$	p	e / d	ν / u
$1 = 2^0$	a	p	$\overline{p}$

Figure 16: E_8 Dynkin diagram with particle labels and 3bit assignments and construction patterns

Note: If viewing *Mathematica*™ Common Document Format (.CDF), this figure is interactive with node detail information on mouse-over.

Please note the seeming anomalous assignment of 3bit=1 to the last SR in the list of SRs (E_8 canonical node #6 in Figure 16, a $\hat{R}$ anti-strange green quark). One might expect it to be a 5 given that it is a fermion, as indicated by the right most column naming for the {**g0**} bit. While {**g0**} does indeed split the generation 0 boson family of integer roots from the 1st and 3rd fermion generations, the naming of the 0 bit as "Boson" is somewhat of a misnomer since the 4 generations given by the combination of "generation bits" {g1, **g0**} have **g0**=0 for generations 0 and 2 (in binary), such that they are associated through their bitwise assignments with bosons. It should also be noted that except for this E_8 canonical node #6, all fermions in the SRs are in the 1st generation and therefore have integer SRE vertex assignments. So all SRs are linked to bosons in some way. For a complete reference of SRs particle assignment detail, see Appendix A.

Triality Relationships

The Lisi model also demonstrates a consistency with the bosons and fermions that is related to the triality relationships within E_8. This is shown in Figure 17 with blue triality lines linking the 3 generations of each fermion using (9). Applying the rotation matrix as a dot product against an SRE vector gives the 2nd generation fermion particle. Applying it again gives the 3rd generation. Applying it a 3rd time returns to the 1st generation fermion. The bosons are also involved in triality relationships as well using (8), rotating through red, green, and blue particle color assignments.

It is interesting to note that the quarks {r/g/b, p/$\overline{p}$} are all located on 6 corresponding dual concentric circles around the center. The leptons are hexagonal "Star of David" patterns in the center, while the bosons are in single or dual hexagonal rings radiating from the center.

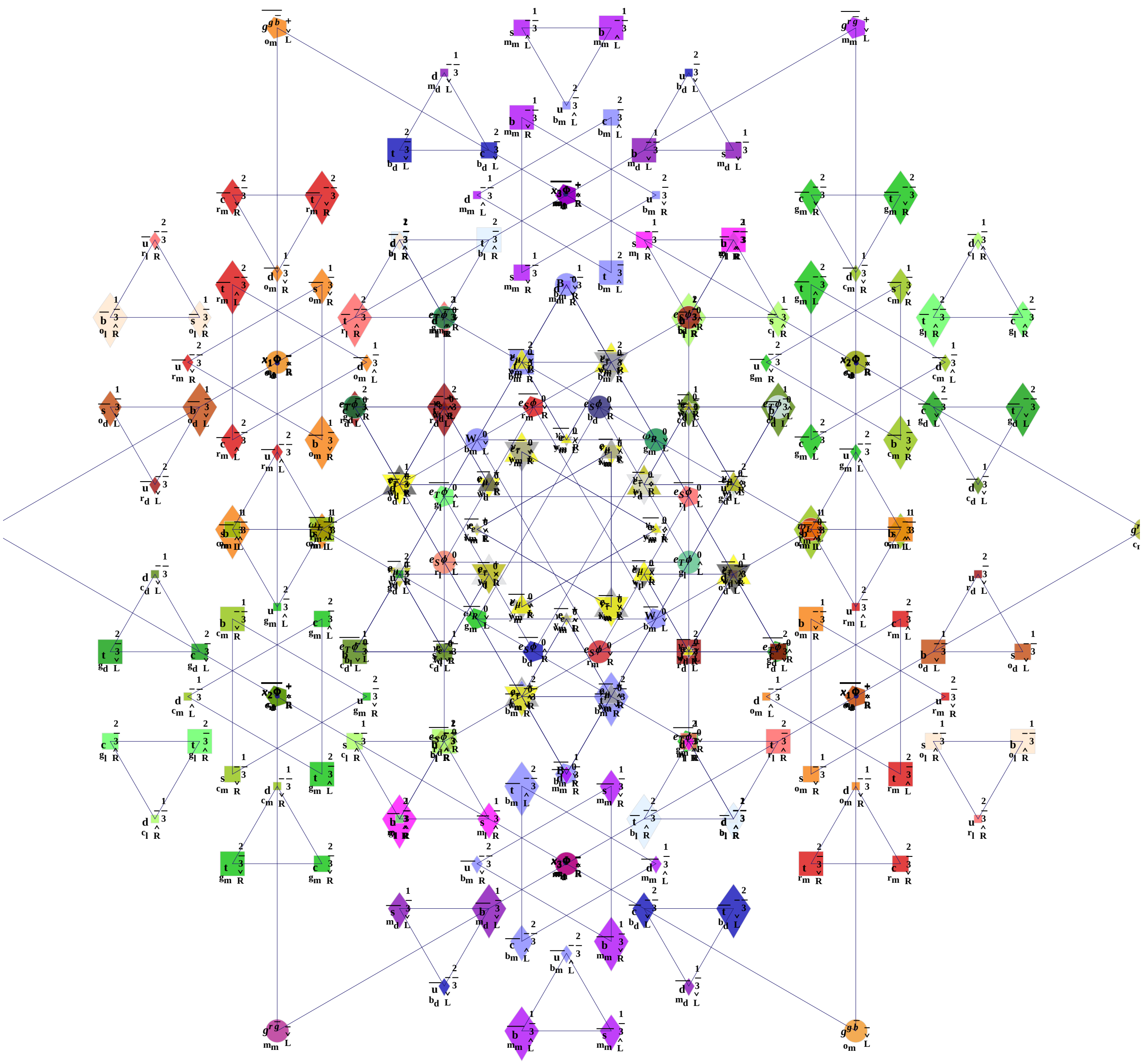


Figure 17: Physics projection with 86=22 bosonic+64 fermionic triality generated equilateral trianges.

Vertex shape, size, color/shade are assigned based on extended Standard Model particle assignments.

Note: If viewing *Mathematica*™ Common Document Format (.CDF), this figure is interactive with vertex detail information on mouse-over.

The projections in Figures 17 and 18 are produced using basis vectors (11).

$$H = \left\{2 - \frac{4}{\sqrt{3}}, 0, 1 - \frac{1}{\sqrt{3}}, 1 - \frac{1}{\sqrt{3}}, 0, -1, 1, 0\right\}$$
$$V = \left\{0, \frac{4}{\sqrt{3}} - 2, \frac{1}{\sqrt{3}} - 1, 1 - \frac{1}{\sqrt{3}}, 0, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, -\frac{2}{\sqrt{3}}\right\} \tag{11}$$

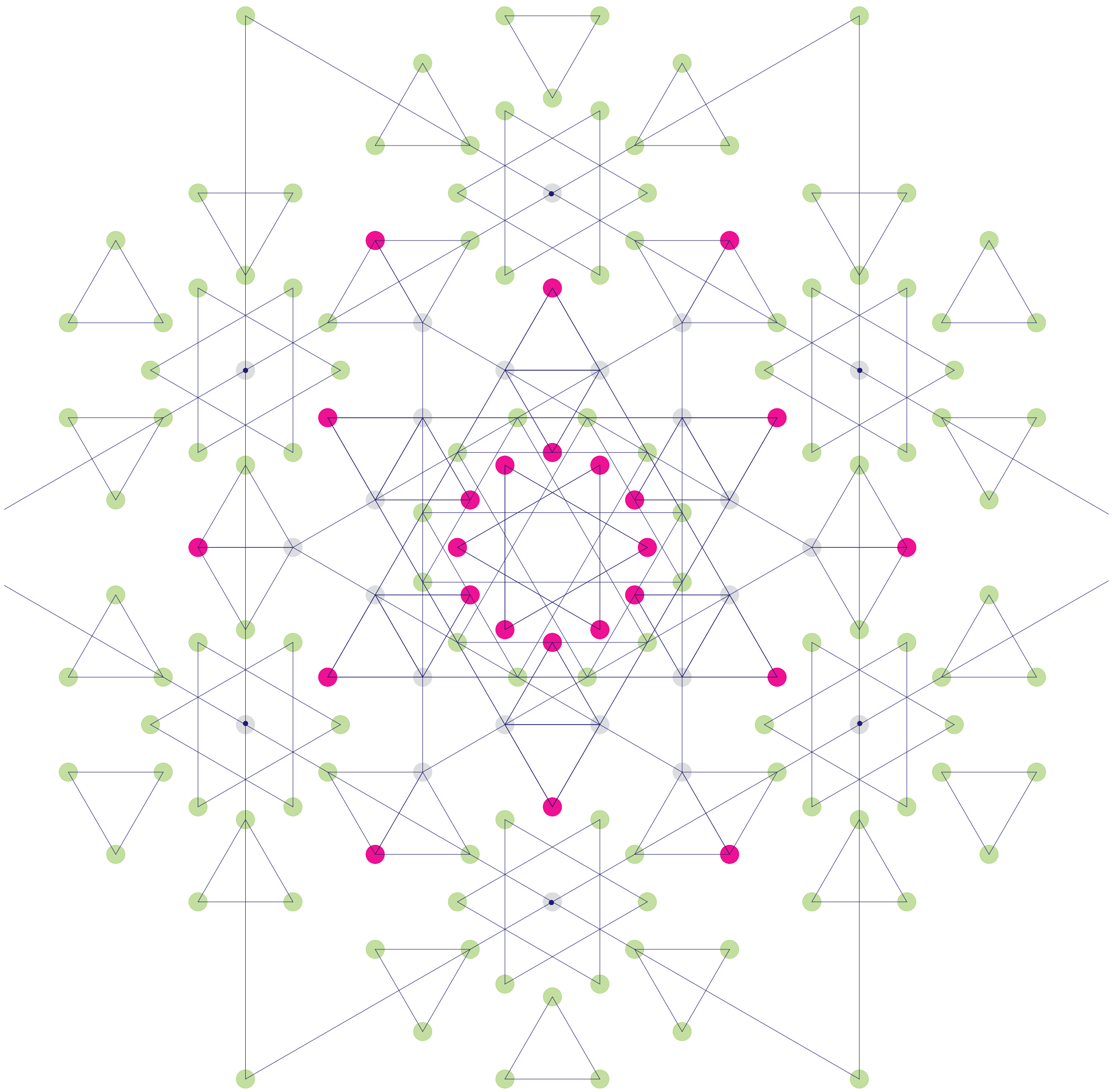


Figure 18: Projection overlap pattern

Note: If viewing *Mathematica*™ Common Document Format (.CDF), this figure is interactive with vertex detail information on mouse-over.

An interesting overlapping of particles (12) in this projection is shown in Figure 17 with:

InView vertices = {{overlap, count}, ...} Total
{Green {1, 120}, Red {2, 24}, Gray {3, 24}} 168
All vertices = {{overlap, count}, ...} Total (12)
{Green {1, 120}, Red {2, 48}, Gray {3, 72}} 240

Looking carefully at the color coding of the trialities, the smaller 1st generation quarks are shaded differently than the 2nd and 3rd generation quarks. This is due to a change in the way the {**p**} bit is used to assign patterns to SRE vertices on 1st generation quarks. This change is needed to align the 3bit numbers in 1:1 correspondence with the Dynkin nodes. It should be noted that this also aligns with the quark mass relationships in the SM, where the 1st generation up/down quark masses are flipped.

Conclusion

This mixture of fermion assignments with bosons is a critical issue in Lisi's model. Therefore, this new binary model may shed some light on the solution, along with the mass determination in extended SM physics. A natural choice would be to assign 2nd generation fermions to the integer SRE vertices as Lisi did originally, but this causes the 3bit calculations to lack a 1:1 relationship with the Dynkin diagram's SRs.

Interestingly, by taking account of the particle mass assignments, all known fermions {e/ν, u/d, c/s, t/b}, as well as known (plus the Lisi predicted) bosons {W/B, gluons(g), ω, eϕ, xΦ} can be generated with the sum of the simple root masses being less than the resulting composite particle masses, with the exception of the four 2nd and 3rd generation leptons {$e_{\mu,\tau}$ / $\nu_{\mu,\tau}$}.

It seems logical to identify the SRs as elemental particles used to construct the known and predicted 240 fundamental particles.

References

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[2] Jacques Distler; Skip Garibaldi (2009). *There is no 'Theory of Everything' inside E8*. URL http://www.citebase.org/abstract?id=oai:arXiv.org:0905.2658.

[3] David A. Richter (2007). *Triacontagonal coordinates for the E(8) root system.* URL http://www.citebase.org/abstract?id=oai:arXiv.org:0704.3091.

Appendix

Appendix A: Simple Roots List

Seq ⌗	Symbol	0apccssgg–Bits	Binary Coordinates	E8 Coordinates	Algebra Root
58	$\underset{b_m}{\overline{u}}\,{}^{-\frac{2}{3}}_{\hat{L}}$	011111001_2	{1, 0, 0, 0, 0, 0, 1, 1}	{0, –1, 0, 0, 0, 0, 0, 1}	{1, 0, 0, 0, 0, 0, 0, 0}
200	$\underset{m_m}{\overline{d}}\,{}^{\frac{1}{3}}_{\check{R}}$	010111101_2	{0, 1, 1, 1, 1, 0, 1, 0}	{0, 1, 0, 0, 0, 0, 0, 1}	{0, 1, 0, 0, 0, 0, 0, 0}
212	$\underset{m_m}{d}\,{}^{-\frac{1}{3}}_{\hat{L}}$	000111001_2	{0, 1, 0, 1, 0, 1, 1, 1}	{1, 0, 0, 0, 0, 0, 0, –1}	{0, 0, 1, 0, 0, 0, 0, 0}
50	$\underset{g_d}{\overline{e_T\phi}}\,{}^{0}_{\hat{R}}$	011100100_2	{1, 0, 0, 1, 0, 1, 0, 0}	{–1, 0, 1, 0, 0, 0, 0, 0}	{0, 0, 0, 1, 0, 0, 0, 0}
73	$\underset{b_m}{B}\,{}^{0}_{\check{R}}$	001111100_2	{0, 1, 0, 0, 0, 0, 1, 1}	{0, 0, –1, 1, 0, 0, 0, 0}	{0, 0, 0, 0, 1, 0, 0, 0}
81	$\underset{w_l}{\nu_e}\,{}^{0}_{\hat{R}}$	001000101_2	{0, 0, 1, 0, 0, 1, 1, 0}	{0, 0, 0, –1, 1, 0, 0, 0}	{0, 0, 0, 0, 0, 1, 0, 0}
87	$\underset{o_d}{x_1\Phi}\,{}^{-}_{\hat{R}}$	000010100_2	{0, 0, 0, 1, 0, 1, 1, 0}	{0, 0, 0, 0, –1, 1, 0, 0}	{0, 0, 0, 0, 0, 0, 1, 0}
21	$\underset{c_l}{\overline{s}}\,{}^{\frac{1}{3}}_{\hat{R}}$	010100110_2	{0, 1, 0, 0, 0, 0, 1, 0}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right\}$	{0, 0, 0, 0, 0, 0, 0, 1}

Appendix B: Complete Particle List

Seq ⌗	Symbol	0apccssgg−Bits	Binary Coordinates	E8 Coordinates	Algebra Root
1	$\underset{w_l}{\nu_{\tau}}\ \overset{0}{\hat{R}}$	001000111_2	{0, 0, 0, 0, 0, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−3, −3, −5, −4, −3, −2, −1, −1}
2	$\underset{\text{" "}}{\overline{\text{Ex1}}}\ \overset{+}{\check{L}}$	010000000_2	{1, 0, 0, 0, 0, 0, 0, 0}	{0, 0, 0, 0, 0, 0, 0, −1}	$\{-\frac{1}{2}, -\frac{1}{2}, 0, 0, 0, 0, 0, 0\}$
3	$\underset{\text{" "}}{\overline{\text{Ex1}}}\ \overset{+}{\hat{R}}$	010000100_2	{0, 1, 0, 0, 0, 0, 0, 0}	{0, 0, 0, 0, 0, 0, −1, 0}	$\{-\frac{7}{2}, -\frac{5}{2}, -5, -4, -3, -2, -1, -2\}$
4	$\underset{\text{" "}}{\overline{\text{Ex1}}}\ \overset{+}{\hat{L}}$	010001000_2	{0, 0, 1, 0, 0, 0, 0, 0}	{0, 0, 0, 0, 0, −1, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -1, -1, -1, -1, -1, 0\}$
5	$\underset{\text{" "}}{\overline{\text{Ex1}}}\ \overset{+}{\check{R}}$	010001100_2	{0, 0, 0, 1, 0, 0, 0, 0}	{0, 0, 0, 0, −1, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -1, -1, -1, -1, 0, 0\}$
6	$\underset{\text{" "}}{\overline{\text{Ex2}}}\ \overset{0}{\check{L}}$	011000000_2	{0, 0, 0, 0, 1, 0, 0, 0}	{0, 0, 0, −1, 0, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -1, -1, -1, 0, 0, 0\}$
7	$\underset{\text{" "}}{\overline{\text{Ex2}}}\ \overset{0}{\hat{R}}$	011000100_2	{0, 0, 0, 0, 0, 1, 0, 0}	{0, 0, −1, 0, 0, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -1, -1, 0, 0, 0, 0\}$
8	$\underset{\text{" "}}{\overline{\text{Ex2}}}\ \overset{0}{\hat{L}}$	011001000_2	{0, 0, 0, 0, 0, 0, 1, 0}	{0, −1, 0, 0, 0, 0, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, 0, 0, 0, 0, 0, 0\}$
9	$\underset{\text{" "}}{\overline{\text{Ex2}}}\ \overset{0}{\check{R}}$	011001100_2	{0, 0, 0, 0, 0, 0, 0, 1}	{−1, 0, 0, 0, 0, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -1, 0, 0, 0, 0, 0\}$
10	$\underset{w_d}{\nu_{\tau}}\ \overset{0}{\check{L}}$	001000011_2	{1, 1, 0, 0, 0, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−3, −2, −4, −4, −3, −2, −1, −1}
11	$\underset{w_m}{\nu_{\tau}}\ \overset{0}{\check{R}}$	001001111_2	{1, 0, 1, 0, 0, 0, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−2, −2, −3, −3, −3, −2, −1, −1}
12	$\underset{y_m}{e_{\tau}}\ \overset{-}{\check{R}}$	000001111_2	{1, 0, 0, 1, 0, 0, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−2, −2, −3, −3, −2, −2, −1, −1}
13	$\underset{y_d}{\overline{e_{\mu}}}\ \overset{+}{\check{L}}$	010000010_2	{1, 0, 0, 0, 1, 0, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−2, −2, −3, −3, −2, −1, −1, −1}
14	$\underset{o_d}{\overline{s}}\ \overset{\frac{1}{3}}{\check{L}}$	010010010_2	{1, 0, 0, 0, 0, 1, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−2, −2, −3, −3, −2, −1, 0, −1}
15	$\underset{c_d}{\overline{s}}\ \overset{\frac{1}{3}}{\check{L}}$	010100010_2	{1, 0, 0, 0, 0, 0, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 0, 1, 0, 0, 0, 0, 1}
16	$\underset{m_d}{\overline{s}}\ \overset{\frac{1}{3}}{\check{L}}$	010110010_2	{1, 0, 0, 0, 0, 0, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−2, −2, −4, −4, −3, −2, −1, −1}
17	$\underset{w_m}{\nu_{\tau}}\ \overset{0}{\hat{L}}$	001001011_2	{0, 1, 1, 0, 0, 0, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−3, −2, −4, −3, −3, −2, −1, −1}

18	$\underset{y_m}{e_{\tau}}\,{}^{-}_{\hat{L}}$	000001011_2	{0, 1, 0, 1, 0, 0, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-3, -2, -4, -3, -2, -2, -1, -1}
19	$\underset{y_l}{\overline{e_{\mu}}}\,{}^{+}_{\hat{R}}$	010000110_2	{0, 1, 0, 0, 1, 0, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-3, -2, -4, -3, -2, -1, -1, -1}
20	$\underset{o_l}{\overline{s}}\,{}^{\frac{1}{3}}_{\hat{R}}$	010010110_2	{0, 1, 0, 0, 0, 1, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-3, -2, -4, -3, -2, -1, 0, -1}
21	$\underset{c_l}{\overline{s}}\,{}^{\frac{1}{3}}_{\hat{R}}$	010100110_2	{0, 1, 0, 0, 0, 0, 1, 0}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{0, 0, 0, 0, 0, 0, 0, 1}
22	$\underset{m_l}{\overline{s}}\,{}^{\frac{1}{3}}_{\hat{R}}$	010110110_2	{0, 1, 0, 0, 0, 0, 0, 1}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-3, -2, -5, -4, -3, -2, -1, -1}
23	$\underset{y_l}{e_{\tau}}\,{}^{-}_{\hat{R}}$	000000111_2	{0, 0, 1, 1, 0, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -2, -3, -2, -2, -2, -1, -1}
24	$\underset{y_m}{\overline{e_{\mu}}}\,{}^{+}_{\hat{L}}$	010001010_2	{0, 0, 1, 0, 1, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -2, -3, -2, -2, -1, -1, -1}
25	$\underset{o_m}{\overline{s}}\,{}^{\frac{1}{3}}_{\hat{L}}$	010011010_2	{0, 0, 1, 0, 0, 1, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -2, -3, -2, -2, -1, 0, -1}
26	$\underset{c_m}{\overline{s}}\,{}^{\frac{1}{3}}_{\hat{L}}$	010101010_2	{0, 0, 1, 0, 0, 0, 1, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 0, 1, 1, 0, 0, 0, 1}
27	$\underset{m_m}{\overline{s}}\,{}^{\frac{1}{3}}_{\hat{L}}$	010111010_2	{0, 0, 1, 0, 0, 0, 0, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-2, -2, -4, -3, -3, -2, -1, -1}
28	$\underset{y_m}{\overline{e_{\mu}}}\,{}^{+}_{\check{R}}$	010001110_2	{0, 0, 0, 1, 1, 0, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -2, -3, -2, -1, -1, -1, -1}
29	$\underset{o_m}{\overline{s}}\,{}^{\frac{1}{3}}_{\check{R}}$	010011110_2	{0, 0, 0, 1, 0, 1, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -2, -3, -2, -1, -1, 0, -1}
30	$\underset{c_m}{\overline{s}}\,{}^{\frac{1}{3}}_{\check{R}}$	010101110_2	{0, 0, 0, 1, 0, 0, 1, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 0, 1, 1, 1, 0, 0, 1}
31	$\underset{m_m}{\overline{s}}\,{}^{\frac{1}{3}}_{\check{R}}$	010111110_2	{0, 0, 0, 1, 0, 0, 0, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-2, -2, -4, -3, -2, -2, -1, -1}
32	$\underset{o_d}{\overline{b}}\,{}^{\frac{1}{3}}_{\check{L}}$	010010011_2	{0, 0, 0, 0, 1, 1, 0, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -2, -3, -2, -1, 0, 0, -1}
33	$\underset{c_d}{\overline{b}}\,{}^{\frac{1}{3}}_{\check{L}}$	010100011_2	{0, 0, 0, 0, 1, 0, 1, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 0, 1, 1, 1, 1, 0, 1}

34	$\overline{b}_{m_d}\,{}^{\frac{1}{3}}_{\check{L}}$	010110011_2	{0, 0, 0, 0, 1, 0, 0, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−2, −2, −4, −3, −2, −1, −1, −1}
35	$t_{b_l}\,{}^{\frac{2}{3}}_{\hat{R}}$	001110111_2	{0, 0, 0, 0, 0, 1, 1, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 0, 1, 1, 1, 1, 1, 1}
36	$t_{g_l}\,{}^{\frac{2}{3}}_{\hat{R}}$	001100111_2	{0, 0, 0, 0, 0, 1, 0, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−2, −2, −4, −3, −2, −1, 0, −1}
37	$t_{r_l}\,{}^{\frac{2}{3}}_{\hat{R}}$	001010111_2	{0, 0, 0, 0, 0, 0, 1, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{1, 0, 0, 0, 0, 0, 0, 1}
38	$\overline{W}_{b_m}\,{}^{0}_{\check{L}}$	011110000_2	{1, 1, 1, 0, 0, 0, 0, 0}	{−1, −1, 0, 0, 0, 0, 0, 0}	{0, −1, −1, 0, 0, 0, 0, 0}
39	$\overline{e_S\phi}_{r_m}\,{}^{0}_{\check{R}}$	011011100_2	{1, 1, 0, 1, 0, 0, 0, 0}	{−1, 0, −1, 0, 0, 0, 0, 0}	{−1, −1, −2, −1, 0, 0, 0, 0}
40	$\overline{e_S\phi}_{b_d}\,{}^{0}_{\hat{R}}$	011110100_2	{1, 1, 0, 0, 1, 0, 0, 0}	{−1, 0, 0, −1, 0, 0, 0, 0}	{−1, −1, −2, −1, −1, 0, 0, 0}
41	$\overline{\nu_e}_{w_m}\,{}^{0}_{\hat{L}}$	011001001_2	{1, 1, 0, 0, 0, 1, 0, 0}	{−1, 0, 0, 0, −1, 0, 0, 0}	{−1, −1, −2, −1, −1, −1, 0, 0}
42	$u_{r_m}\,{}^{\frac{2}{3}}_{\check{R}}$	001011101_2	{1, 1, 0, 0, 0, 0, 1, 0}	{−1, 0, 0, 0, 0, −1, 0, 0}	{−1, −1, −2, −1, −1, −1, −1, 0}
43	$u_{g_m}\,{}^{\frac{2}{3}}_{\check{R}}$	001101101_2	{1, 1, 0, 0, 0, 0, 0, 1}	{−1, 0, 0, 0, 0, 0, −1, 0}	{−4, −3, −6, −4, −3, −2, −1, −2}
44	$u_{b_m}\,{}^{\frac{2}{3}}_{\check{R}}$	001111101_2	{1, 0, 1, 1, 0, 0, 0, 0}	{−1, 0, 0, 0, 0, 0, 0, −1}	{−1, −1, −1, 0, 0, 0, 0, 0}
45	$\overline{d}_{m_m}\,{}^{\frac{1}{3}}_{\hat{L}}$	010111001_2	{1, 0, 1, 0, 1, 0, 0, 0}	{−1, 0, 0, 0, 0, 0, 0, 1}	{0, 0, −1, 0, 0, 0, 0, 0}
46	$\overline{d}_{c_m}\,{}^{\frac{1}{3}}_{\hat{L}}$	010101001_2	{1, 0, 1, 0, 0, 1, 0, 0}	{−1, 0, 0, 0, 0, 0, 1, 0}	{3, 2, 4, 4, 3, 2, 1, 2}
47	$\overline{d}_{o_m}\,{}^{\frac{1}{3}}_{\hat{L}}$	010011001_2	{1, 0, 1, 0, 0, 0, 1, 0}	{−1, 0, 0, 0, 0, 1, 0, 0}	{0, 0, 0, 1, 1, 1, 1, 0}
48	$e_{y_m}\,{}^{-}_{\check{R}}$	000001101_2	{1, 0, 1, 0, 0, 0, 0, 1}	{−1, 0, 0, 0, 1, 0, 0, 0}	{0, 0, 0, 1, 1, 1, 0, 0}
49	$e_T\phi_{b_l}\,{}^{0}_{\hat{L}}$	001111000_2	{1, 0, 0, 1, 1, 0, 0, 0}	{−1, 0, 0, 1, 0, 0, 0, 0}	{0, 0, 0, 1, 1, 0, 0, 0}
50	$\overline{e_T\phi}_{g_d}\,{}^{0}_{\hat{R}}$	011100100_2	{1, 0, 0, 1, 0, 1, 0, 0}	{−1, 0, 1, 0, 0, 0, 0, 0}	{0, 0, 0, 1, 0, 0, 0, 0}
51	$\omega_{R\,g_m}\,{}^{0}_{\check{L}}$	001100000_2	{1, 0, 0, 1, 0, 0, 1, 0}	{−1, 1, 0, 0, 0, 0, 0, 0}	{−1, 0, −1, 0, 0, 0, 0, 0}
52	$\overline{e_T\phi}_{g_l}\,{}^{0}_{\hat{L}}$	011101000_2	{1, 0, 0, 1, 0, 0, 0, 1}	{0, −1, −1, 0, 0, 0, 0, 0}	{0, −1, −1, −1, 0, 0, 0, 0}
53	$\overline{e_S\phi}_{r_d}\,{}^{0}_{\hat{R}}$	011010100_2	{1, 0, 0, 0, 1, 1, 0, 0}	{0, −1, 0, −1, 0, 0, 0, 0}	{0, −1, −1, −1, −1, 0, 0, 0}
54	$\overline{e}_{y_m}\,{}^{+}_{\hat{L}}$	010001001_2	{1, 0, 0, 0, 1, 0, 1, 0}	{0, −1, 0, 0, −1, 0, 0, 0}	{0, −1, −1, −1, −1, −1, 0, 0}

55	$d_{o_m\,\check{R}}^{-\frac{1}{3}}$	000011101_2	{1, 0, 0, 0, 1, 0, 0, 1}	{0, -1, 0, 0, 0, -1, 0, 0}	{0, -1, -1, -1, -1, -1, -1, 0}
56	$d_{c_m\,\check{R}}^{-\frac{1}{3}}$	000101101_2	{1, 0, 0, 0, 0, 1, 1, 0}	{0, -1, 0, 0, 0, 0, -1, 0}	{-3, -3, -5, -4, -3, -2, -1, -2}
57	$d_{m_m\,\check{R}}^{-\frac{1}{3}}$	000111101_2	{1, 0, 0, 0, 0, 1, 0, 1}	{0, -1, 0, 0, 0, 0, 0, -1}	{0, -1, 0, 0, 0, 0, 0, 0}
58	$\overline{u}_{b_m\,\hat{L}}^{-\frac{2}{3}}$	011111001_2	{1, 0, 0, 0, 0, 0, 1, 1}	{0, -1, 0, 0, 0, 0, 0, 1}	{1, 0, 0, 0, 0, 0, 0, 0}
59	$\overline{u}_{g_m\,\hat{L}}^{-\frac{2}{3}}$	011101001_2	{0, 1, 1, 1, 0, 0, 0, 0}	{0, -1, 0, 0, 0, 0, 1, 0}	{4, 2, 5, 4, 3, 2, 1, 2}
60	$\overline{u}_{r_m\,\hat{L}}^{-\frac{2}{3}}$	011011001_2	{0, 1, 1, 0, 1, 0, 0, 0}	{0, -1, 0, 0, 0, 1, 0, 0}	{1, 0, 1, 1, 1, 1, 1, 0}
61	$\nu_{e\,w_m\,\check{R}}^{0}$	001001101_2	{0, 1, 1, 0, 0, 1, 0, 0}	{0, -1, 0, 0, 1, 0, 0, 0}	{1, 0, 1, 1, 1, 1, 0, 0}
62	$\overline{e_S\phi}_{r_l\,\hat{L}}^{0}$	011011000_2	{0, 1, 1, 0, 0, 0, 1, 0}	{0, -1, 0, 1, 0, 0, 0, 0}	{1, 0, 1, 1, 1, 0, 0, 0}
63	$\overline{e_T\phi}_{g_m\,\check{R}}^{0}$	011101100_2	{0, 1, 1, 0, 0, 0, 0, 1}	{0, -1, 1, 0, 0, 0, 0, 0}	{1, 0, 1, 1, 0, 0, 0, 0}
64	$\overline{\omega_L}_{r_m\,\check{L}}^{0}$	011010000_2	{0, 1, 0, 1, 1, 0, 0, 0}	{0, 0, -1, -1, 0, 0, 0, 0}	{-1, -1, -2, -2, -1, 0, 0, 0}
65	$\overline{e}_{y_l\,\hat{R}}^{+}$	010000101_2	{0, 1, 0, 1, 0, 1, 0, 0}	{0, 0, -1, 0, -1, 0, 0, 0}	{-1, -1, -2, -2, -1, -1, 0, 0}
66	$d_{o_d\,\check{L}}^{-\frac{1}{3}}$	000010001_2	{0, 1, 0, 1, 0, 0, 1, 0}	{0, 0, -1, 0, 0, -1, 0, 0}	{-1, -1, -2, -2, -1, -1, -1, 0}
67	$d_{c_d\,\check{L}}^{-\frac{1}{3}}$	000100001_2	{0, 1, 0, 1, 0, 0, 0, 1}	{0, 0, -1, 0, 0, 0, -1, 0}	{-4, -3, -6, -5, -3, -2, -1, -2}
68	$d_{m_d\,\check{L}}^{-\frac{1}{3}}$	000110001_2	{0, 1, 0, 0, 1, 1, 0, 0}	{0, 0, -1, 0, 0, 0, 0, -1}	{-1, -1, -1, -1, 0, 0, 0, 0}
69	$\overline{u}_{b_l\,\hat{R}}^{-\frac{2}{3}}$	011110101_2	{0, 1, 0, 0, 1, 0, 1, 0}	{0, 0, -1, 0, 0, 0, 0, 1}	{0, 0, -1, -1, 0, 0, 0, 0}
70	$\overline{u}_{g_l\,\hat{R}}^{-\frac{2}{3}}$	011100101_2	{0, 1, 0, 0, 1, 0, 0, 1}	{0, 0, -1, 0, 0, 0, 1, 0}	{3, 2, 4, 3, 3, 2, 1, 2}
71	$\overline{u}_{r_l\,\hat{R}}^{-\frac{2}{3}}$	011010101_2	{0, 1, 0, 0, 0, 1, 1, 0}	{0, 0, -1, 0, 0, 1, 0, 0}	{0, 0, 0, 0, 1, 1, 1, 0}
72	$\nu_{e\,w_d\,\check{L}}^{0}$	001000001_2	{0, 1, 0, 0, 0, 1, 0, 1}	{0, 0, -1, 0, 1, 0, 0, 0}	{0, 0, 0, 0, 1, 1, 0, 0}
73	$B_{b_m\,\check{R}}^{0}$	001111100_2	{0, 1, 0, 0, 0, 0, 1, 1}	{0, 0, -1, 1, 0, 0, 0, 0}	{0, 0, 0, 0, 1, 0, 0, 0}
74	$\overline{e}_{y_d\,\check{L}}^{+}$	010000001_2	{0, 0, 1, 1, 1, 0, 0, 0}	{0, 0, 0, -1, -1, 0, 0, 0}	{-1, -1, -2, -2, -2, -1, 0, 0}
75	$d_{o_l\,\hat{R}}^{-\frac{1}{3}}$	000010101_2	{0, 0, 1, 1, 0, 1, 0, 0}	{0, 0, 0, -1, 0, -1, 0, 0}	{-1, -1, -2, -2, -2, -1, -1, 0}
76	$d_{c_l\,\hat{R}}^{-\frac{1}{3}}$	000100101_2	{0, 0, 1, 1, 0, 0, 1, 0}	{0, 0, 0, -1, 0, 0, -1, 0}	{-4, -3, -6, -5, -4, -2, -1, -2}

77	$d_{m_l\,\hat{R}}^{-\frac{1}{3}}$	000110101_2	{0, 0, 1, 1, 0, 0, 0, 1}	{0, 0, 0, -1, 0, 0, 0, -1}	{-1, -1, -1, -1, -1, 0, 0, 0}
78	$\overline{u}_{b_d\,\check{L}}^{-\frac{2}{3}}$	011110001_2	{0, 0, 1, 0, 1, 1, 0, 0}	{0, 0, 0, -1, 0, 0, 0, 1}	{0, 0, -1, -1, -1, 0, 0, 0}
79	$\overline{u}_{g_d\,\check{L}}^{-\frac{2}{3}}$	011100001_2	{0, 0, 1, 0, 1, 0, 1, 0}	{0, 0, 0, -1, 0, 0, 1, 0}	{3, 2, 4, 3, 2, 2, 1, 2}
80	$\overline{u}_{r_d\,\check{L}}^{-\frac{2}{3}}$	011010001_2	{0, 0, 1, 0, 1, 0, 0, 1}	{0, 0, 0, -1, 0, 1, 0, 0}	{0, 0, 0, 0, 0, 1, 1, 0}
81	$\nu_{e\,w_l\,\hat{R}}^{0}$	001000101_2	{0, 0, 1, 0, 0, 1, 1, 0}	{0, 0, 0, -1, 1, 0, 0, 0}	{0, 0, 0, 0, 0, 1, 0, 0}
82	$\overline{x_1\Phi}_{o_m\,\check{R}}^{+}$	010011100_2	{0, 0, 1, 0, 0, 1, 0, 1}	{0, 0, 0, 0, -1, -1, 0, 0}	{-1, -1, -2, -2, -2, -2, -1, 0}
83	$\overline{x_2\Phi}_{c_m\,\check{R}}^{+}$	010101100_2	{0, 0, 1, 0, 0, 0, 1, 1}	{0, 0, 0, 0, -1, 0, -1, 0}	{-4, -3, -6, -5, -4, -3, -1, -2}
84	$\overline{x_3\Phi}_{m_m\,\check{R}}^{+}$	010111100_2	{0, 0, 0, 1, 1, 1, 0, 0}	{0, 0, 0, 0, -1, 0, 0, -1}	{-1, -1, -1, -1, -1, -1, 0, 0}
85	$x_3\Phi_{m_d\,\hat{R}}^{-}$	000110100_2	{0, 0, 0, 1, 1, 0, 1, 0}	{0, 0, 0, 0, -1, 0, 0, 1}	{0, 0, -1, -1, -1, -1, 0, 0}
86	$x_2\Phi_{c_d\,\hat{R}}^{-}$	000100100_2	{0, 0, 0, 1, 1, 0, 0, 1}	{0, 0, 0, 0, -1, 0, 1, 0}	{3, 2, 4, 3, 2, 1, 1, 2}
87	$x_1\Phi_{o_d\,\hat{R}}^{-}$	000010100_2	{0, 0, 0, 1, 0, 1, 1, 0}	{0, 0, 0, 0, -1, 1, 0, 0}	{0, 0, 0, 0, 0, 0, 1, 0}
88	$x_3\Phi_{m_l\,\hat{L}}^{-}$	000111000_2	{0, 0, 0, 1, 0, 1, 0, 1}	{0, 0, 0, 0, 0, -1, -1, 0}	{-4, -3, -6, -5, -4, -3, -2, -2}
89	$x_2\Phi_{c_l\,\hat{L}}^{-}$	000101000_2	{0, 0, 0, 1, 0, 0, 1, 1}	{0, 0, 0, 0, 0, -1, 0, -1}	{-1, -1, -1, -1, -1, -1, -1, 0}
90	$g^{g\bar{b}}{}_{o_m\,\check{L}}^{-}$	000010000_2	{0, 0, 0, 0, 1, 1, 1, 0}	{0, 0, 0, 0, 0, -1, 0, 1}	{0, 0, -1, -1, -1, -1, -1, 0}
91	$g^{r\bar{b}}{}_{c_m\,\check{L}}^{-}$	000100000_2	{0, 0, 0, 0, 1, 1, 0, 1}	{0, 0, 0, 0, 0, -1, 1, 0}	{3, 2, 4, 3, 2, 1, 0, 2}
92	$x_1\Phi_{o_l\,\hat{L}}^{-}$	000011000_2	{0, 0, 0, 0, 1, 0, 1, 1}	{0, 0, 0, 0, 0, 0, -1, -1}	{-4, -3, -5, -4, -3, -2, -1, -2}
93	$g^{r\bar{g}}{}_{m_m\,\check{L}}^{-}$	000110000_2	{0, 0, 0, 0, 0, 1, 1, 1}	{0, 0, 0, 0, 0, 0, -1, 1}	{-3, -2, -5, -4, -3, -2, -1, -2}
94	$e_{\tau\,y_d\,\check{L}}^{-}$	000000011_2	{1, 1, 1, 1, 0, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -1, -2, -2, -2, -2, -1, -1}
95	$\overline{\nu_\mu}_{w_m\,\hat{L}}^{0}$	011001010_2	{1, 1, 1, 0, 1, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -1, -2, -2, -2, -1, -1, -1}
96	$\overline{c}_{r_m\,\hat{L}}^{-\frac{2}{3}}$	011011010_2	{1, 1, 1, 0, 0, 1, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -1, -2, -2, -2, -1, 0, -1}

97	$\overline{c}_{g_m\,\hat{L}}^{-\frac{2}{3}}$	011101010_2	{1, 1, 1, 0, 0, 0, 1, 0}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 1, 0, 0, 0, 1}
98	$\overline{c}_{b_m\,\hat{L}}^{-\frac{2}{3}}$	011111010_2	{1, 1, 1, 0, 0, 0, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−2, −1, −3, −3, −3, −2, −1, −1}
99	$\overline{\nu_\mu}_{w_m\,\check{R}}^{0}$	011001110_2	{1, 1, 0, 1, 1, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−2, −1, −2, −2, −1, −1, −1, −1}
100	$\overline{c}_{r_m\,\check{R}}^{-\frac{2}{3}}$	011011110_2	{1, 1, 0, 1, 0, 1, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−2, −1, −2, −2, −1, −1, 0, −1}
101	$\overline{c}_{g_m\,\check{R}}^{-\frac{2}{3}}$	011101110_2	{1, 1, 0, 1, 0, 0, 1, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 1, 1, 0, 0, 1}
102	$\overline{c}_{b_m\,\check{R}}^{-\frac{2}{3}}$	011111110_2	{1, 1, 0, 1, 0, 0, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−2, −1, −3, −3, −2, −2, −1, −1}
103	$\overline{b}_{o_l\,\hat{R}}^{\frac{1}{3}}$	010010111_2	{1, 1, 0, 0, 1, 1, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−2, −1, −2, −2, −1, 0, 0, −1}
104	$\overline{b}_{c_l\,\hat{R}}^{\frac{1}{3}}$	010100111_2	{1, 1, 0, 0, 1, 0, 1, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 1, 1, 1, 0, 1}
105	$\overline{b}_{m_l\,\hat{R}}^{\frac{1}{3}}$	010110111_2	{1, 1, 0, 0, 1, 0, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−2, −1, −3, −3, −2, −1, −1, −1}
106	$t_{b_d\,\check{L}}^{\frac{2}{3}}$	001110011_2	{1, 1, 0, 0, 0, 1, 1, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 1, 1, 1, 1, 1}
107	$t_{g_d\,\check{L}}^{\frac{2}{3}}$	001100011_2	{1, 1, 0, 0, 0, 1, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−2, −1, −3, −3, −2, −1, 0, −1}
108	$t_{r_d\,\check{L}}^{\frac{2}{3}}$	001010011_2	{1, 1, 0, 0, 0, 0, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{1, 1, 1, 0, 0, 0, 0, 1}
109	$\overline{\nu_\mu}_{w_d\,\check{L}}^{0}$	011000010_2	{1, 0, 1, 1, 1, 0, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−1, −1, −1, −1, −1, −1, −1, −1}
110	$\overline{c}_{r_d\,\check{L}}^{-\frac{2}{3}}$	011010010_2	{1, 0, 1, 1, 0, 1, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−1, −1, −1, −1, −1, −1, 0, −1}
111	$\overline{c}_{g_d\,\check{L}}^{-\frac{2}{3}}$	011100010_2	{1, 0, 1, 1, 0, 0, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 1, 3, 2, 1, 0, 0, 1}

112	$\overline{c}_{b_d\,\check{L}}^{-\frac{2}{3}}$	011110010_2	{1, 0, 1, 1, 0, 0, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−1, −1, −2, −2, −2, −2, −1, −1}
113	$\overline{b}_{o_m\,\hat{L}}^{\frac{1}{3}}$	010011011_2	{1, 0, 1, 0, 1, 1, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−1, −1, −1, −1, −1, 0, 0, −1}
114	$\overline{b}_{c_m\,\hat{L}}^{\frac{1}{3}}$	010101011_2	{1, 0, 1, 0, 1, 0, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 1, 3, 2, 1, 1, 0, 1}
115	$\overline{b}_{m_m\,\hat{L}}^{\frac{1}{3}}$	010111011_2	{1, 0, 1, 0, 1, 0, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−1, −1, −2, −2, −2, −1, −1, −1}
116	$t_{b_m\,\check{R}}^{\frac{2}{3}}$	001111111_2	{1, 0, 1, 0, 0, 1, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 1, 3, 2, 1, 1, 1, 1}
117	$t_{g_m\,\check{R}}^{\frac{2}{3}}$	001101111_2	{1, 0, 1, 0, 0, 1, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−1, −1, −2, −2, −2, −1, 0, −1}
118	$t_{r_m\,\check{R}}^{\frac{2}{3}}$	001011111_2	{1, 0, 1, 0, 0, 0, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 1, 0, 0, 0, 1}
119	$\overline{t}_{r_m\,\hat{L}}^{-\frac{2}{3}}$	011011011_2	{1, 0, 0, 1, 1, 1, 0, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{−1, −1, −1, −1, 0, 0, 0, −1}
120	$\overline{t}_{g_m\,\hat{L}}^{-\frac{2}{3}}$	011101011_2	{1, 0, 0, 1, 1, 0, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 1, 3, 2, 2, 1, 0, 1}
121	$\overline{t}_{b_m\,\hat{L}}^{-\frac{2}{3}}$	011111011_2	{1, 0, 0, 1, 1, 0, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−1, −1, −2, −2, −1, −1, −1, −1}
122	$b_{m_m\,\check{R}}^{-\frac{1}{3}}$	000111111_2	{1, 0, 0, 1, 0, 1, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 1, 3, 2, 2, 1, 1, 1}
123	$b_{c_m\,\check{R}}^{-\frac{1}{3}}$	000101111_2	{1, 0, 0, 1, 0, 1, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−1, −1, −2, −2, −1, −1, 0, −1}
124	$b_{o_m\,\check{R}}^{-\frac{1}{3}}$	000011111_2	{1, 0, 0, 1, 0, 0, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 1, 1, 0, 0, 1}
125	$c_{b_l\,\hat{R}}^{\frac{2}{3}}$	001110110_2	{1, 0, 0, 0, 1, 1, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 1, 3, 2, 2, 2, 1, 1}
126	$c_{g_l\,\hat{R}}^{\frac{2}{3}}$	001100110_2	{1, 0, 0, 0, 1, 1, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{−1, −1, −2, −2, −1, 0, 0, −1}

127	$c_{r_l\,\hat{R}}^{\frac{2}{3}}$	001010110_2	{1, 0, 0, 0, 1, 0, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 1, 1, 1, 0, 1}
128	$\nu_{\mu}{}_{w_l\,\hat{R}}^{0}$	001000110_2	{1, 0, 0, 0, 0, 1, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 1, 1, 1, 1, 1}
129	$\overline{\nu_{\mu}}{}_{w_l\,\hat{R}}^{0}$	011000110_2	{0, 1, 1, 1, 1, 0, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -1, -2, -1, -1, -1, -1, -1}
130	$\overline{c}_{r_l\,\hat{R}}^{-\frac{2}{3}}$	011010110_2	{0, 1, 1, 1, 0, 1, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -1, -2, -1, -1, -1, 0, -1}
131	$\overline{c}_{g_l\,\hat{R}}^{-\frac{2}{3}}$	011100110_2	{0, 1, 1, 1, 0, 0, 1, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 2, 1, 0, 0, 1}
132	$\overline{c}_{b_l\,\hat{R}}^{-\frac{2}{3}}$	011110110_2	{0, 1, 1, 1, 0, 0, 0, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-2, -1, -3, -2, -2, -2, -1, -1}
133	$\overline{b}_{o_m\,\check{R}}^{\frac{1}{3}}$	010011111_2	{0, 1, 1, 0, 1, 1, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -1, -2, -1, -1, 0, 0, -1}
134	$\overline{b}_{c_m\,\check{R}}^{\frac{1}{3}}$	010101111_2	{0, 1, 1, 0, 1, 0, 1, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 2, 1, 1, 0, 1}
135	$\overline{b}_{m_m\,\check{R}}^{\frac{1}{3}}$	010111111_2	{0, 1, 1, 0, 1, 0, 0, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-2, -1, -3, -2, -2, -1, -1, -1}
136	$t_{b_m\,\hat{L}}^{\frac{2}{3}}$	001111011_2	{0, 1, 1, 0, 0, 1, 1, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 2, 1, 1, 1, 1}
137	$t_{g_m\,\hat{L}}^{\frac{2}{3}}$	001101011_2	{0, 1, 1, 0, 0, 1, 0, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-2, -1, -3, -2, -2, -1, 0, -1}
138	$t_{r_m\,\hat{L}}^{\frac{2}{3}}$	001011011_2	{0, 1, 1, 0, 0, 0, 1, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{1, 1, 1, 1, 0, 0, 0, 1}
139	$\overline{t}_{r_m\,\check{R}}^{-\frac{2}{3}}$	011011111_2	{0, 1, 0, 1, 1, 1, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\}$	{-2, -1, -2, -1, 0, 0, 0, -1}
140	$\overline{t}_{g_m\,\check{R}}^{-\frac{2}{3}}$	011101111_2	{0, 1, 0, 1, 1, 0, 1, 0}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{1, 1, 2, 2, 2, 1, 0, 1}
141	$\overline{t}_{b_m\,\check{R}}^{-\frac{2}{3}}$	011111111_2	{0, 1, 0, 1, 1, 0, 0, 1}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-2, -1, -3, -2, -1, -1, -1, -1}

142	$b_{m_m\,\hat{L}}^{-\frac{1}{3}}$	000111011_2	{0, 1, 0, 1, 0, 1, 1, 0}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right\}$	{1, 1, 2, 2, 2, 1, 1, 1}
143	$b_{c_m\,\hat{L}}^{-\frac{1}{3}}$	000101011_2	{0, 1, 0, 1, 0, 1, 0, 1}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right\}$	{-2, -1, -3, -2, -1, -1, 0, -1}
144	$b_{o_m\,\hat{L}}^{-\frac{1}{3}}$	000011011_2	{0, 1, 0, 1, 0, 0, 1, 1}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right\}$	{1, 1, 1, 1, 1, 0, 0, 1}
145	$c_{b_d\,\check{L}}^{\frac{2}{3}}$	001110010_2	{0, 1, 0, 0, 1, 1, 1, 0}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right\}$	{1, 1, 2, 2, 2, 2, 1, 1}
146	$c_{g_d\,\check{L}}^{\frac{2}{3}}$	001100010_2	{0, 1, 0, 0, 1, 1, 0, 1}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right\}$	{-2, -1, -3, -2, -1, 0, 0, -1}
147	$c_{r_d\,\check{L}}^{\frac{2}{3}}$	001010010_2	{0, 1, 0, 0, 1, 0, 1, 1}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right\}$	{1, 1, 1, 1, 1, 1, 0, 1}
148	$\nu_{\mu\,w_d\,\check{L}}^{0}$	001000010_2	{0, 1, 0, 0, 0, 1, 1, 1}	$\left\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right\}$	{1, 1, 1, 1, 1, 1, 1, 1}
149	$\overline{t}_{r_d\,\check{L}}^{-\frac{2}{3}}$	011010011_2	{0, 0, 1, 1, 1, 1, 0, 0}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\right\}$	{-1, -1, -1, 0, 0, 0, 0, -1}
150	$\overline{t}_{g_d\,\check{L}}^{-\frac{2}{3}}$	011100011_2	{0, 0, 1, 1, 1, 0, 1, 0}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right\}$	{2, 1, 3, 3, 2, 1, 0, 1}
151	$\overline{t}_{b_d\,\check{L}}^{-\frac{2}{3}}$	011110011_2	{0, 0, 1, 1, 1, 0, 0, 1}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right\}$	{-1, -1, -2, -1, -1, -1, -1, -1}
152	$b_{m_l\,\hat{R}}^{-\frac{1}{3}}$	000110111_2	{0, 0, 1, 1, 0, 1, 1, 0}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right\}$	{2, 1, 3, 3, 2, 1, 1, 1}
153	$b_{c_l\,\hat{R}}^{-\frac{1}{3}}$	000100111_2	{0, 0, 1, 1, 0, 1, 0, 1}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right\}$	{-1, -1, -2, -1, -1, -1, 0, -1}
154	$b_{o_l\,\hat{R}}^{-\frac{1}{3}}$	000010111_2	{0, 0, 1, 1, 0, 0, 1, 1}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right\}$	{2, 1, 2, 2, 1, 0, 0, 1}
155	$c_{b_m\,\check{R}}^{\frac{2}{3}}$	001111110_2	{0, 0, 1, 0, 1, 1, 1, 0}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right\}$	{2, 1, 3, 3, 2, 2, 1, 1}
156	$c_{g_m\,\check{R}}^{\frac{2}{3}}$	001101110_2	{0, 0, 1, 0, 1, 1, 0, 1}	$\left\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right\}$	{-1, -1, -2, -1, -1, 0, 0, -1}

157	$c_{r_m}{}^{\frac{2}{3}}_{\vee R}$	001011110_2	{0, 0, 1, 0, 1, 0, 1, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 2, 1, 1, 0, 1}
158	$\nu_{\mu\, w_m}{}^{0}_{\vee R}$	001001110_2	{0, 0, 1, 0, 0, 1, 1, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 2, 1, 1, 1, 1}
159	$c_{b_m}{}^{\frac{2}{3}}_{\wedge L}$	001111010_2	{0, 0, 0, 1, 1, 1, 1, 0}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 1, 3, 3, 3, 2, 1, 1}
160	$c_{g_m}{}^{\frac{2}{3}}_{\wedge L}$	001101010_2	{0, 0, 0, 1, 1, 1, 0, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-1, -1, -2, -1, 0, 0, 0, -1}
161	$c_{r_m}{}^{\frac{2}{3}}_{\wedge L}$	001011010_2	{0, 0, 0, 1, 1, 0, 1, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 2, 2, 1, 0, 1}
162	$\nu_{\mu\, w_m}{}^{0}_{\wedge L}$	001001010_2	{0, 0, 0, 1, 0, 1, 1, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 2, 2, 1, 1, 1}
163	$\overline{e_\tau}_{y_d}{}^{+}_{\vee L}$	010000011_2	{0, 0, 0, 0, 1, 1, 1, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 1, 2, 2, 2, 2, 1, 1}
164	$\overline{g^{r\,\bar{g}}}_{m_m}{}^{+}_{\vee L}$	010110000_2	{1, 1, 1, 1, 1, 0, 0, 0}	{0, 0, 0, 0, 0, 0, 1, -1}	{3, 2, 5, 4, 3, 2, 1, 2}
165	$\overline{x_1\Phi}_{o_l}{}^{+}_{\wedge L}$	010011000_2	{1, 1, 1, 1, 0, 1, 0, 0}	{0, 0, 0, 0, 0, 0, 1, 1}	{4, 3, 5, 4, 3, 2, 1, 2}
166	$\overline{g^{r\,\bar{b}}}_{c_m}{}^{+}_{\vee L}$	010100000_2	{1, 1, 1, 1, 0, 0, 1, 0}	{0, 0, 0, 0, 0, 1, -1, 0}	{-3, -2, -4, -3, -2, -1, 0, -2}
167	$\overline{g^{g\,\bar{b}}}_{o_m}{}^{+}_{\vee L}$	010010000_2	{1, 1, 1, 1, 0, 0, 0, 1}	{0, 0, 0, 0, 0, 1, 0, -1}	{0, 0, 1, 1, 1, 1, 1, 0}
168	$\overline{x_2\Phi}_{c_l}{}^{+}_{\wedge L}$	010101000_2	{1, 1, 1, 0, 1, 1, 0, 0}	{0, 0, 0, 0, 0, 1, 0, 1}	{1, 1, 1, 1, 1, 1, 1, 0}
169	$\overline{x_3\Phi}_{m_l}{}^{+}_{\wedge L}$	010111000_2	{1, 1, 1, 0, 1, 0, 1, 0}	{0, 0, 0, 0, 0, 1, 1, 0}	{4, 3, 6, 5, 4, 3, 2, 2}
170	$\overline{x_1\Phi}_{o_d}{}^{+}_{\wedge R}$	010010100_2	{1, 1, 1, 0, 1, 0, 0, 1}	{0, 0, 0, 0, 1, -1, 0, 0}	{0, 0, 0, 0, 0, 0, -1, 0}
171	$\overline{x_2\Phi}_{c_d}{}^{+}_{\wedge R}$	010100100_2	{1, 1, 1, 0, 0, 1, 1, 0}	{0, 0, 0, 0, 1, 0, -1, 0}	{-3, -2, -4, -3, -2, -1, -1, -2}
172	$\overline{x_3\Phi}_{m_d}{}^{+}_{\wedge R}$	010110100_2	{1, 1, 1, 0, 0, 1, 0, 1}	{0, 0, 0, 0, 1, 0, 0, -1}	{0, 0, 1, 1, 1, 1, 0, 0}
173	$x_3\Phi_{m_m}{}^{-}_{\vee R}$	000111100_2	{1, 1, 1, 0, 0, 0, 1, 1}	{0, 0, 0, 0, 1, 0, 0, 1}	{1, 1, 1, 1, 1, 1, 0, 0}
174	$x_2\Phi_{c_m}{}^{-}_{\vee R}$	000101100_2	{1, 1, 0, 1, 1, 1, 0, 0}	{0, 0, 0, 0, 1, 0, 1, 0}	{4, 3, 6, 5, 4, 3, 1, 2}
175	$x_1\Phi_{o_m}{}^{-}_{\vee R}$	000011100_2	{1, 1, 0, 1, 1, 0, 1, 0}	{0, 0, 0, 0, 1, 1, 0, 0}	{1, 1, 2, 2, 2, 2, 1, 0}
176	$\overline{\nu_e}_{w_l}{}^{0}_{\wedge R}$	011000101_2	{1, 1, 0, 1, 1, 0, 0, 1}	{0, 0, 0, 1, -1, 0, 0, 0}	{0, 0, 0, 0, 0, -1, 0, 0}
177	$u_{r_d}{}^{\frac{2}{3}}_{\vee L}$	001010001_2	{1, 1, 0, 1, 0, 1, 1, 0}	{0, 0, 0, 1, 0, -1, 0, 0}	{0, 0, 0, 0, 0, -1, -1, 0}

178	$u_{g_d}{}^{\frac{2}{3}}_{\check{L}}$	001100001_2	{1, 1, 0, 1, 0, 1, 0, 1}	{0, 0, 0, 1, 0, 0, −1, 0}	{−3, −2, −4, −3, −2, −2, −1, −2}
179	$u_{b_d}{}^{\frac{2}{3}}_{\check{L}}$	001110001_2	{1, 1, 0, 1, 0, 0, 1, 1}	{0, 0, 0, 1, 0, 0, 0, −1}	{0, 0, 1, 1, 1, 0, 0, 0}
180	$\overline{d}_{m_l}{}^{\frac{1}{3}}_{\hat{R}}$	010110101_2	{1, 1, 0, 0, 1, 1, 1, 0}	{0, 0, 0, 1, 0, 0, 0, 1}	{1, 1, 1, 1, 1, 0, 0, 0}
181	$\overline{d}_{c_l}{}^{\frac{1}{3}}_{\hat{R}}$	010100101_2	{1, 1, 0, 0, 1, 1, 0, 1}	{0, 0, 0, 1, 0, 0, 1, 0}	{4, 3, 6, 5, 4, 2, 1, 2}
182	$\overline{d}_{o_l}{}^{\frac{1}{3}}_{\hat{R}}$	010010101_2	{1, 1, 0, 0, 1, 0, 1, 1}	{0, 0, 0, 1, 0, 1, 0, 0}	{1, 1, 2, 2, 2, 1, 1, 0}
183	$e_{y_d}{}^{-}_{\check{L}}$	000000001_2	{1, 1, 0, 0, 0, 1, 1, 1}	{0, 0, 0, 1, 1, 0, 0, 0}	{1, 1, 2, 2, 2, 1, 0, 0}
184	$\overline{B}_{b_m}{}^{0}_{\check{R}}$	011111100_2	{1, 0, 1, 1, 1, 1, 0, 0}	{0, 0, 1, −1, 0, 0, 0, 0}	{0, 0, 0, 0, −1, 0, 0, 0}
185	$\overline{\nu_e}_{w_d}{}^{0}_{\check{L}}$	011000001_2	{1, 0, 1, 1, 1, 0, 1, 0}	{0, 0, 1, 0, −1, 0, 0, 0}	{0, 0, 0, 0, −1, −1, 0, 0}
186	$u_{r_l}{}^{\frac{2}{3}}_{\hat{R}}$	001010101_2	{1, 0, 1, 1, 1, 0, 0, 1}	{0, 0, 1, 0, 0, −1, 0, 0}	{0, 0, 0, 0, −1, −1, −1, 0}
187	$u_{g_l}{}^{\frac{2}{3}}_{\hat{R}}$	001100101_2	{1, 0, 1, 1, 0, 1, 1, 0}	{0, 0, 1, 0, 0, 0, −1, 0}	{−3, −2, −4, −3, −3, −2, −1, −2}
188	$u_{b_l}{}^{\frac{2}{3}}_{\hat{R}}$	001110101_2	{1, 0, 1, 1, 0, 1, 0, 1}	{0, 0, 1, 0, 0, 0, 0, −1}	{0, 0, 1, 1, 0, 0, 0, 0}
189	$\overline{d}_{m_d}{}^{\frac{1}{3}}_{\check{L}}$	010110001_2	{1, 0, 1, 1, 0, 0, 1, 1}	{0, 0, 1, 0, 0, 0, 0, 1}	{1, 1, 1, 1, 0, 0, 0, 0}
190	$\overline{d}_{c_d}{}^{\frac{1}{3}}_{\check{L}}$	010100001_2	{1, 0, 1, 0, 1, 1, 1, 0}	{0, 0, 1, 0, 0, 0, 1, 0}	{4, 3, 6, 5, 3, 2, 1, 2}
191	$\overline{d}_{o_d}{}^{\frac{1}{3}}_{\check{L}}$	010010001_2	{1, 0, 1, 0, 1, 1, 0, 1}	{0, 0, 1, 0, 0, 1, 0, 0}	{1, 1, 2, 2, 1, 1, 1, 0}
192	$e_{y_l}{}^{-}_{\hat{R}}$	000000101_2	{1, 0, 1, 0, 1, 0, 1, 1}	{0, 0, 1, 0, 1, 0, 0, 0}	{1, 1, 2, 2, 1, 1, 0, 0}
193	$\omega_{L}{}_{r_m}{}^{0}_{\check{L}}$	001010000_2	{1, 0, 1, 0, 0, 1, 1, 1}	{0, 0, 1, 1, 0, 0, 0, 0}	{1, 1, 2, 2, 1, 0, 0, 0}
194	$e_T\phi_{g_m}{}^{0}_{\check{R}}$	001101100_2	{1, 0, 0, 1, 1, 1, 1, 0}	{0, 1, −1, 0, 0, 0, 0, 0}	{−1, 0, −1, −1, 0, 0, 0, 0}
195	$e_S\phi_{r_l}{}^{0}_{\hat{L}}$	001011000_2	{1, 0, 0, 1, 1, 1, 0, 1}	{0, 1, 0, −1, 0, 0, 0, 0}	{−1, 0, −1, −1, −1, 0, 0, 0}
196	$\overline{\nu_e}_{w_m}{}^{0}_{\check{R}}$	011001101_2	{1, 0, 0, 1, 1, 0, 1, 1}	{0, 1, 0, 0, −1, 0, 0, 0}	{−1, 0, −1, −1, −1, −1, 0, 0}
197	$u_{r_m}{}^{\frac{2}{3}}_{\hat{L}}$	001011001_2	{1, 0, 0, 1, 0, 1, 1, 1}	{0, 1, 0, 0, 0, −1, 0, 0}	{−1, 0, −1, −1, −1, −1, −1, 0}
198	$u_{g_m}{}^{\frac{2}{3}}_{\hat{L}}$	001101001_2	{1, 0, 0, 0, 1, 1, 1, 1}	{0, 1, 0, 0, 0, 0, −1, 0}	{−4, −2, −5, −4, −3, −2, −1, −2}
199	$u_{b_m}{}^{\frac{2}{3}}_{\hat{L}}$	001111001_2	{0, 1, 1, 1, 1, 1, 0, 0}	{0, 1, 0, 0, 0, 0, 0, −1}	{−1, 0, 0, 0, 0, 0, 0, 0}

200	$\overline{d}_{m_m\,\check{R}}^{\frac{1}{3}}$	010111101_2	{0, 1, 1, 1, 1, 0, 1, 0}	{0, 1, 0, 0, 0, 0, 0, 1}	{0, 1, 0, 0, 0, 0, 0, 0}
201	$\overline{d}_{c_m\,\check{R}}^{\frac{1}{3}}$	010101101_2	{0, 1, 1, 1, 1, 0, 0, 1}	{0, 1, 0, 0, 0, 0, 1, 0}	{3, 3, 5, 4, 3, 2, 1, 2}
202	$\overline{d}_{o_m\,\check{R}}^{\frac{1}{3}}$	010011101_2	{0, 1, 1, 1, 0, 1, 1, 0}	{0, 1, 0, 0, 0, 1, 0, 0}	{0, 1, 1, 1, 1, 1, 1, 0}
203	$e_{y_m\,\hat{L}}^{-}$	000001001_2	{0, 1, 1, 1, 0, 1, 0, 1}	{0, 1, 0, 0, 1, 0, 0, 0}	{0, 1, 1, 1, 1, 1, 0, 0}
204	$e_S\phi_{r_d\,\hat{R}}^{0}$	001010100_2	{0, 1, 1, 1, 0, 0, 1, 1}	{0, 1, 0, 1, 0, 0, 0, 0}	{0, 1, 1, 1, 1, 0, 0, 0}
205	$e_T\phi_{g_l\,\hat{L}}^{0}$	001101000_2	{0, 1, 1, 0, 1, 1, 1, 0}	{0, 1, 1, 0, 0, 0, 0, 0}	{0, 1, 1, 1, 0, 0, 0, 0}
206	$\overline{\omega_R}_{g_m\,\check{L}}^{0}$	011100000_2	{0, 1, 1, 0, 1, 1, 0, 1}	{1, -1, 0, 0, 0, 0, 0, 0}	{1, 0, 1, 0, 0, 0, 0, 0}
207	$e_T\phi_{g_d\,\hat{R}}^{0}$	001100100_2	{0, 1, 1, 0, 1, 0, 1, 1}	{1, 0, -1, 0, 0, 0, 0, 0}	{0, 0, 0, -1, 0, 0, 0, 0}
208	$\overline{e_T\phi}_{b_l\,\hat{L}}^{0}$	011111000_2	{0, 1, 1, 0, 0, 1, 1, 1}	{1, 0, 0, -1, 0, 0, 0, 0}	{0, 0, 0, -1, -1, 0, 0, 0}
209	$\overline{e}_{y_m\,\check{R}}^{+}$	010001101_2	{0, 1, 0, 1, 1, 1, 1, 0}	{1, 0, 0, 0, -1, 0, 0, 0}	{0, 0, 0, -1, -1, -1, 0, 0}
210	$d_{o_m\,\hat{L}}^{-\frac{1}{3}}$	000011001_2	{0, 1, 0, 1, 1, 1, 0, 1}	{1, 0, 0, 0, 0, -1, 0, 0}	{0, 0, 0, -1, -1, -1, -1, 0}
211	$d_{c_m\,\hat{L}}^{-\frac{1}{3}}$	000101001_2	{0, 1, 0, 1, 1, 0, 1, 1}	{1, 0, 0, 0, 0, 0, -1, 0}	{-3, -2, -4, -4, -3, -2, -1, -2}
212	$d_{m_m\,\hat{L}}^{-\frac{1}{3}}$	000111001_2	{0, 1, 0, 1, 0, 1, 1, 1}	{1, 0, 0, 0, 0, 0, 0, -1}	{0, 0, 1, 0, 0, 0, 0, 0}
213	$\overline{u}_{b_m\,\check{R}}^{-\frac{2}{3}}$	011111101_2	{0, 1, 0, 0, 1, 1, 1, 1}	{1, 0, 0, 0, 0, 0, 0, 1}	{1, 1, 1, 0, 0, 0, 0, 0}
214	$\overline{u}_{g_m\,\check{R}}^{-\frac{2}{3}}$	011101101_2	{0, 0, 1, 1, 1, 1, 1, 0}	{1, 0, 0, 0, 0, 0, 1, 0}	{4, 3, 6, 4, 3, 2, 1, 2}
215	$\overline{u}_{r_m\,\check{R}}^{-\frac{2}{3}}$	011011101_2	{0, 0, 1, 1, 1, 1, 0, 1}	{1, 0, 0, 0, 0, 1, 0, 0}	{1, 1, 2, 1, 1, 1, 1, 0}
216	$\nu_{e\,w_m\,\hat{L}}^{0}$	001001001_2	{0, 0, 1, 1, 1, 0, 1, 1}	{1, 0, 0, 0, 1, 0, 0, 0}	{1, 1, 2, 1, 1, 1, 0, 0}
217	$e_S\phi_{b_d\,\hat{R}}^{0}$	001110100_2	{0, 0, 1, 1, 0, 1, 1, 1}	{1, 0, 0, 1, 0, 0, 0, 0}	{1, 1, 2, 1, 1, 0, 0, 0}
218	$e_S\phi_{r_m\,\check{R}}^{0}$	001011100_2	{0, 0, 1, 0, 1, 1, 1, 1}	{1, 0, 1, 0, 0, 0, 0, 0}	{1, 1, 2, 1, 0, 0, 0, 0}
219	$W_{b_m\,\check{L}}^{0}$	001110000_2	{0, 0, 0, 1, 1, 1, 1, 1}	{1, 1, 0, 0, 0, 0, 0, 0}	{0, 1, 1, 0, 0, 0, 0, 0}
220	$\overline{t}_{r_l\,\hat{R}}^{-\frac{2}{3}}$	011010111_2	{1, 1, 1, 1, 1, 1, 0, 0}	$\left\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}\right\}$	{-1, 0, 0, 0, 0, 0, 0, -1}
221	$\overline{t}_{g_l\,\hat{R}}^{-\frac{2}{3}}$	011100111_2	{1, 1, 1, 1, 1, 0, 1, 0}	$\left\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\right\}$	{2, 2, 4, 3, 2, 1, 0, 1}

222	$\overline{t}_{b_l\,\hat{R}}^{-\frac{2}{3}}$	011110111_2	{1, 1, 1, 1, 1, 0, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-1, 0, -1, -1, -1, -1, -1, -1}
223	$b_{m_d\,\check{L}}^{-\frac{1}{3}}$	000110011_2	{1, 1, 1, 1, 0, 1, 1, 0}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 2, 4, 3, 2, 1, 1, 1}
224	$b_{c_d\,\check{L}}^{-\frac{1}{3}}$	000100011_2	{1, 1, 1, 1, 0, 1, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-1, 0, -1, -1, -1, -1, 0, -1}
225	$b_{o_d\,\check{L}}^{-\frac{1}{3}}$	000010011_2	{1, 1, 1, 1, 0, 0, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 2, 1, 0, 0, 1}
226	$s_{m_m\,\check{R}}^{-\frac{1}{3}}$	000111110_2	{1, 1, 1, 0, 1, 1, 1, 0}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 2, 4, 3, 2, 2, 1, 1}
227	$s_{c_m\,\check{R}}^{-\frac{1}{3}}$	000101110_2	{1, 1, 1, 0, 1, 1, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-1, 0, -1, -1, -1, 0, 0, -1}
228	$s_{o_m\,\check{R}}^{-\frac{1}{3}}$	000011110_2	{1, 1, 1, 0, 1, 0, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 2, 1, 1, 0, 1}
229	$e_{\mu\,y_m\,\check{R}}^{-}$	000001110_2	{1, 1, 1, 0, 0, 1, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 2, 1, 1, 1, 1}
230	$s_{m_m\,\hat{L}}^{-\frac{1}{3}}$	000111010_2	{1, 1, 0, 1, 1, 1, 1, 0}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 2, 4, 3, 3, 2, 1, 1}
231	$s_{c_m\,\hat{L}}^{-\frac{1}{3}}$	000101010_2	{1, 1, 0, 1, 1, 1, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-1, 0, -1, -1, 0, 0, 0, -1}
232	$s_{o_m\,\hat{L}}^{-\frac{1}{3}}$	000011010_2	{1, 1, 0, 1, 1, 0, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 2, 2, 1, 0, 1}
233	$e_{\mu\,y_m\,\hat{L}}^{-}$	000001010_2	{1, 1, 0, 1, 0, 1, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 2, 2, 1, 1, 1}
234	$\overline{e_{\tau}}_{y_l\,\hat{R}}^{+}$	010000111_2	{1, 1, 0, 0, 1, 1, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 2, 2, 2, 1, 1}
235	$s_{m_l\,\hat{R}}^{-\frac{1}{3}}$	000110110_2	{1, 0, 1, 1, 1, 1, 1, 0}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{3, 2, 5, 4, 3, 2, 1, 1}
236	$s_{c_l\,\hat{R}}^{-\frac{1}{3}}$	000100110_2	{1, 0, 1, 1, 1, 1, 0, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{0, 0, 0, 0, 0, 0, 0, -1}

237	$\underset{o_l}{s}{}^{-\frac{1}{3}}_{\hat{R}}$	000010110_2	{1, 0, 1, 1, 1, 0, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{3, 2, 4, 3, 2, 1, 0, 1}
238	$\underset{y_l}{e_\mu}{}^{-}_{\hat{R}}$	000000110_2	{1, 0, 1, 1, 0, 1, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{3, 2, 4, 3, 2, 1, 1, 1}
239	$\underset{y_m}{\overline{e_\tau}}{}^{+}_{\hat{L}}$	010001011_2	{1, 0, 1, 0, 1, 1, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{3, 2, 4, 3, 2, 2, 1, 1}
240	$\underset{w_m}{\overline{\nu_\tau}}{}^{0}_{\hat{L}}$	011001011_2	{1, 0, 0, 1, 1, 1, 1, 1}	$\{\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{3, 2, 4, 3, 3, 2, 1, 1}
241	$\underset{m_d}{s}{}^{-\frac{1}{3}}_{\check{L}}$	000110010_2	{0, 1, 1, 1, 1, 1, 1, 0}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}\}$	{2, 2, 4, 4, 3, 2, 1, 1}
242	$\underset{c_d}{s}{}^{-\frac{1}{3}}_{\check{L}}$	000100010_2	{0, 1, 1, 1, 1, 1, 0, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\}$	{-1, 0, -1, 0, 0, 0, 0, -1}
243	$\underset{o_d}{s}{}^{-\frac{1}{3}}_{\check{L}}$	000010010_2	{0, 1, 1, 1, 1, 0, 1, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 3, 2, 1, 0, 1}
244	$\underset{y_d}{e_\mu}{}^{-}_{\check{L}}$	000000010_2	{0, 1, 1, 1, 0, 1, 1, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 3, 2, 1, 1, 1}
245	$\underset{y_m}{\overline{e_\tau}}{}^{+}_{\check{R}}$	010001111_2	{0, 1, 1, 0, 1, 1, 1, 1}	$\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 3, 2, 2, 1, 1}
246	$\underset{w_m}{\overline{\nu_\tau}}{}^{0}_{\check{R}}$	011001111_2	{0, 1, 0, 1, 1, 1, 1, 1}	$\{-\frac{1}{2}, \frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{2, 2, 3, 3, 3, 2, 1, 1}
247	$\underset{w_d}{\overline{\nu_\tau}}{}^{0}_{\check{L}}$	011000011_2	{0, 0, 1, 1, 1, 1, 1, 1}	$\{-\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{3, 2, 4, 4, 3, 2, 1, 1}
248	$\underset{\text{" "}}{\text{Ex2}}{}^{0}_{\check{R}}$	001001100_2	{1, 1, 1, 1, 1, 1, 1, 0}	{1, 0, 0, 0, 0, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, 1, 0, 0, 0, 0, 0\}$
249	$\underset{\text{" "}}{\text{Ex2}}{}^{0}_{\hat{L}}$	001001000_2	{1, 1, 1, 1, 1, 1, 0, 1}	{0, 1, 0, 0, 0, 0, 0, 0}	$\{-\frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0, 0, 0\}$
250	$\underset{\text{" "}}{\text{Ex2}}{}^{0}_{\hat{R}}$	001000100_2	{1, 1, 1, 1, 1, 0, 1, 1}	{0, 0, 1, 0, 0, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, 1, 1, 0, 0, 0, 0\}$
251	$\underset{\text{" "}}{\text{Ex2}}{}^{0}_{\check{L}}$	001000000_2	{1, 1, 1, 1, 0, 1, 1, 1}	{0, 0, 0, 1, 0, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, 1, 1, 1, 0, 0, 0\}$
252	$\underset{\text{" "}}{\text{Ex1}}{}^{-}_{\check{R}}$	000001100_2	{1, 1, 1, 0, 1, 1, 1, 1}	{0, 0, 0, 0, 1, 0, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, 1, 1, 1, 1, 0, 0\}$
253	$\underset{\text{" "}}{\text{Ex1}}{}^{-}_{\hat{L}}$	000001000_2	{1, 1, 0, 1, 1, 1, 1, 1}	{0, 0, 0, 0, 0, 1, 0, 0}	$\{\frac{1}{2}, \frac{1}{2}, 1, 1, 1, 1, 1, 0\}$
254	$\underset{\text{" "}}{\text{Ex1}}{}^{-}_{\hat{R}}$	000000100_2	{1, 0, 1, 1, 1, 1, 1, 1}	{0, 0, 0, 0, 0, 0, 1, 0}	$\{\frac{7}{2}, \frac{5}{2}, 5, 4, 3, 2, 1, 2\}$
255	$\underset{\text{" "}}{\text{Ex1}}{}^{-}_{\check{L}}$	000000000_2	{0, 1, 1, 1, 1, 1, 1, 1}	{0, 0, 0, 0, 0, 0, 0, 1}	$\{\frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0, 0, 0\}$
256	$\underset{w_l}{\overline{\nu_\tau}}{}^{0}_{\hat{R}}$	011000111_2	{1, 1, 1, 1, 1, 1, 1, 1}	$\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}\}$	{3, 3, 5, 4, 3, 2, 1, 1}