E8 Integrated with Binary, Octonions, Particles, Wolfram's New Kind of Science (NKS), and the Periodic Table of Elements

243 $s^{-\frac{1}{3}\to\frac{2}{3}}$ $^{0}{}_{d}\,L$ Ref. Symbols: 2D 3D

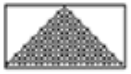
0apccssgg
000010010_2

Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

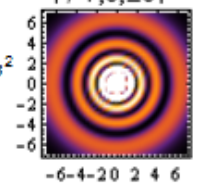
Binary{	0	1	1	1	1	0	1	1 }
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$ }
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$ }

Bit NKS CA Pascal E8

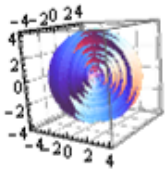


^{88}Ra [Rn] $7s^2$

$|\psi_{7,0,\pm0}|^2$



$|\psi_{7,0,\pm0}|^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

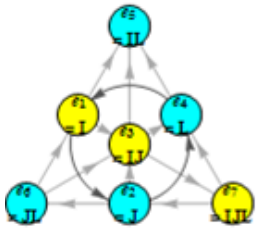
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

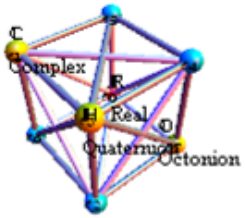
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

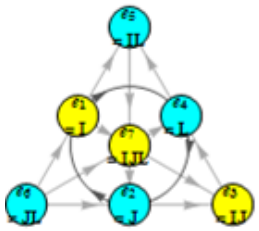
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

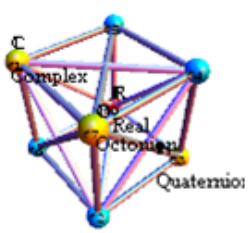
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

E8 Number Indexed by Clifford/Pascal Order

243 $s_{\circ_d L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

Root{ 2 2 3 3 2 1 0 1 }
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Theo. m 98.1056
Exp. τ ? s

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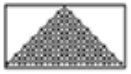
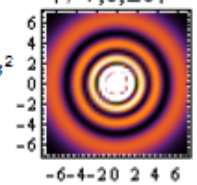
Bit NKS CA Pascal E8

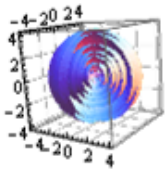


^{88}Ra [Rn] $7s^2$

$|\psi_{7,0,\pm0}|^2$



$|\psi_{7,0,\pm0}|^2$



E8 Number Indexed by Clifford/Pascal Order

Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

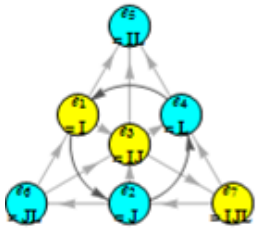
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

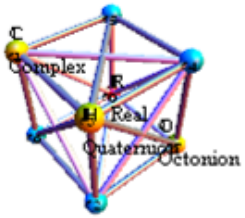
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

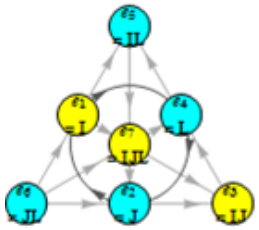
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

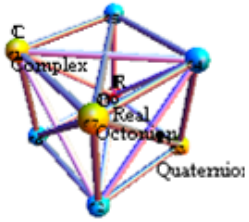
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

243 $s_{d\,L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
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Theo. m 98.1056
Exp. τ ? s

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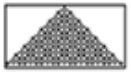
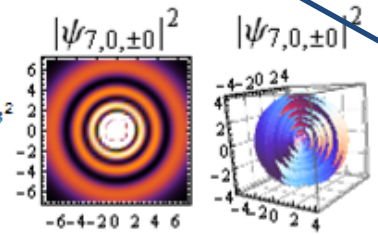
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$ }

Bit NKS CA Pascal E8



^{88}Ra [Rn] $7s^2$



Particle Physics Identifiers

Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

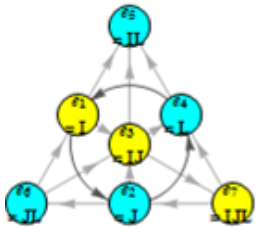
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

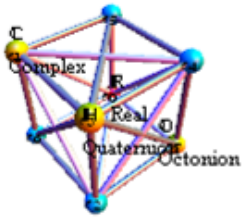
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

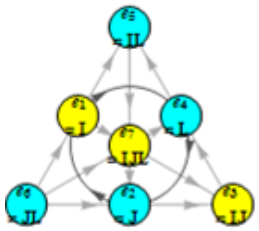
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

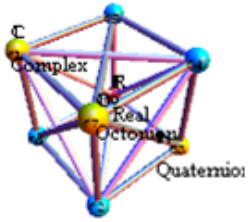
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Particle Physics Identifiers

243 $s_{\circ_d L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

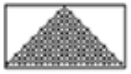
0apccssgg
000010010_2

Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

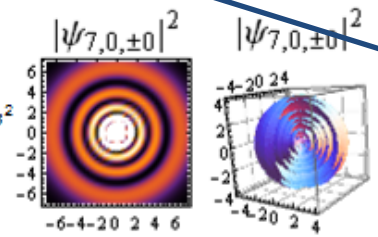
Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1 }
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$ }
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$ }

Bit NKS CA Pascal E8



^{88}Ra [Rn] $7s^2$



Bitwise Quantum Particle Structure

Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

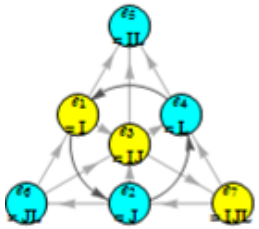
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

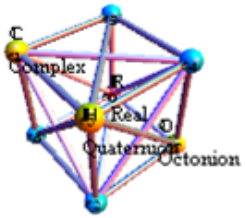
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
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Coxeter (Cyan)

Flattened triad/mask bits
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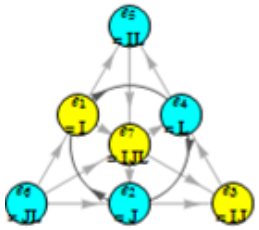
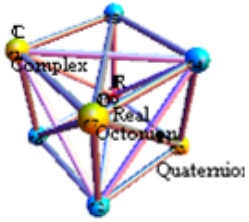
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Bitwise Quantum Particle Structure

E8 Algebra Root/Weight/Height

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0apccssgg
000010010$_2$

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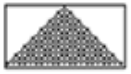
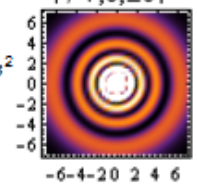
Bit NKS CA Pascal E8

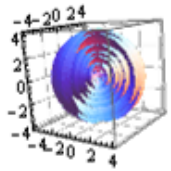


^{88}Ra [Rn] $7s^2$

$|\psi_{7,0,\pm0}|^2$



$|\psi_{7,0,\pm0}|^2$



E8 Algebra Root/Weight/Height

Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

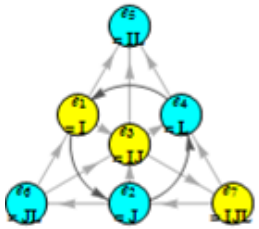
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

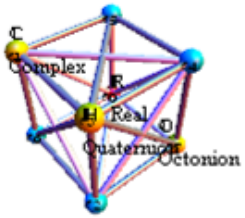
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

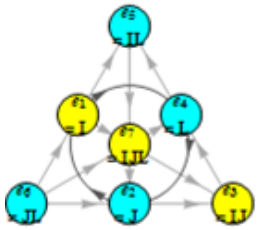
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

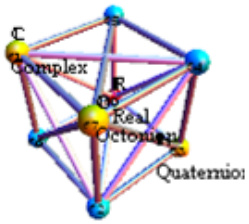
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Binary/E8/Physics 8 Dimensional Vertex Location

243 $s_{d}^{-\frac{1}{3}} L^{+\frac{2}{3}}$ Ref. Symbols: 2D 3D

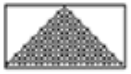
0apccssgg
000010010$_2$

Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

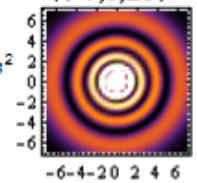
Binary{	0	1	1	1	1	0	1	1 }
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$ }
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$ }

Bit NKS CA Pascal E8

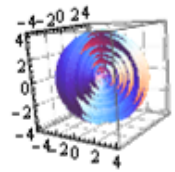


^{88}Ra [Rn] $7s^2$

$|\psi_{7,0,\pm0}|^2$



$|\psi_{7,0,\pm0}|^2$



Binary/E8/Physics 8 Dimensional Vertex Location

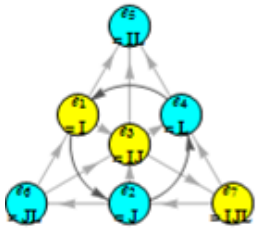
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

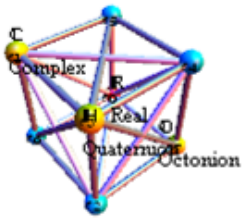
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

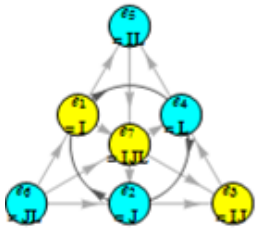
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

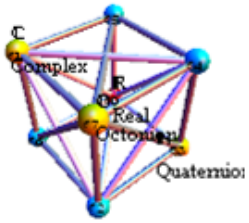
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

243 $s_{d}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

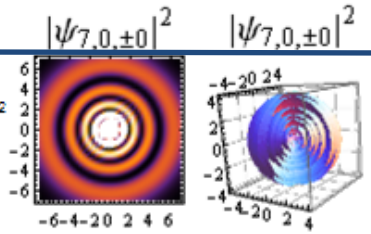
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1 }
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$ }
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$ }

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Wolfram's NKS Cellular Automata (CA)

Wolfram's NKS Cellular Automata (CA)

Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

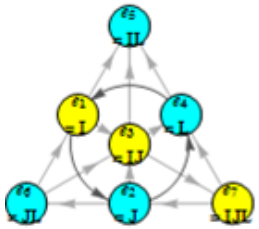
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

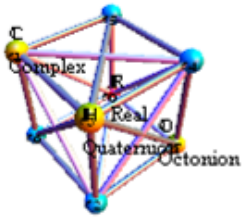
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

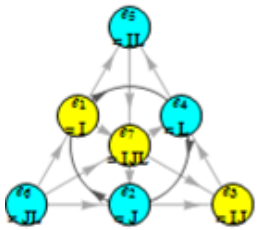
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

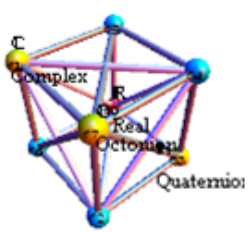
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Periodic Table Element & Structure

243 $s_{\circ_d L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010_2

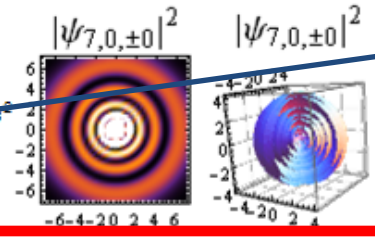
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Periodic Table Element & Structure

Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

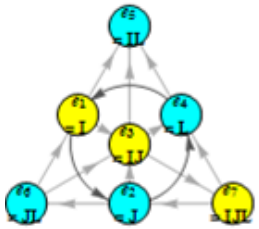
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

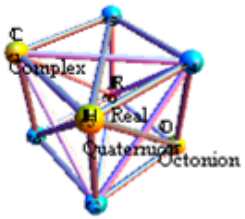
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

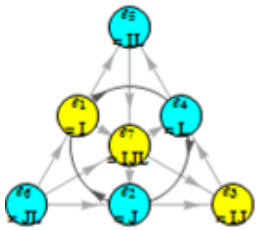
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

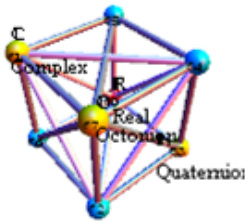
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Octonion Fano Plane, Cubic, & Multiplication Table

243 $s_{d\,L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

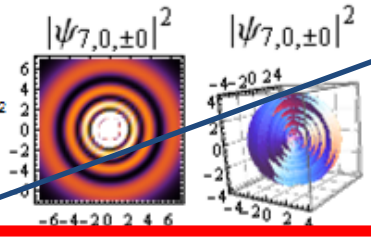
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion Fano Plane, Cubic, & Multiplication Table

Flipped

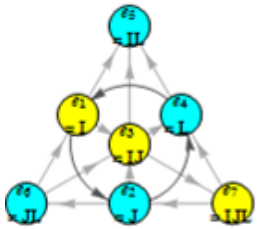
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

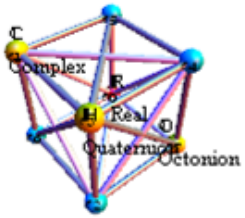
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Not Flipped

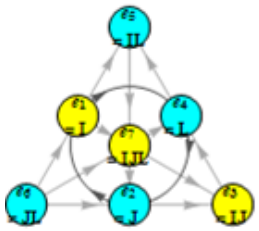
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

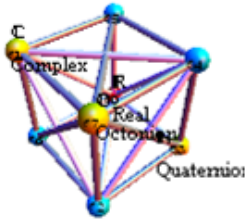
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



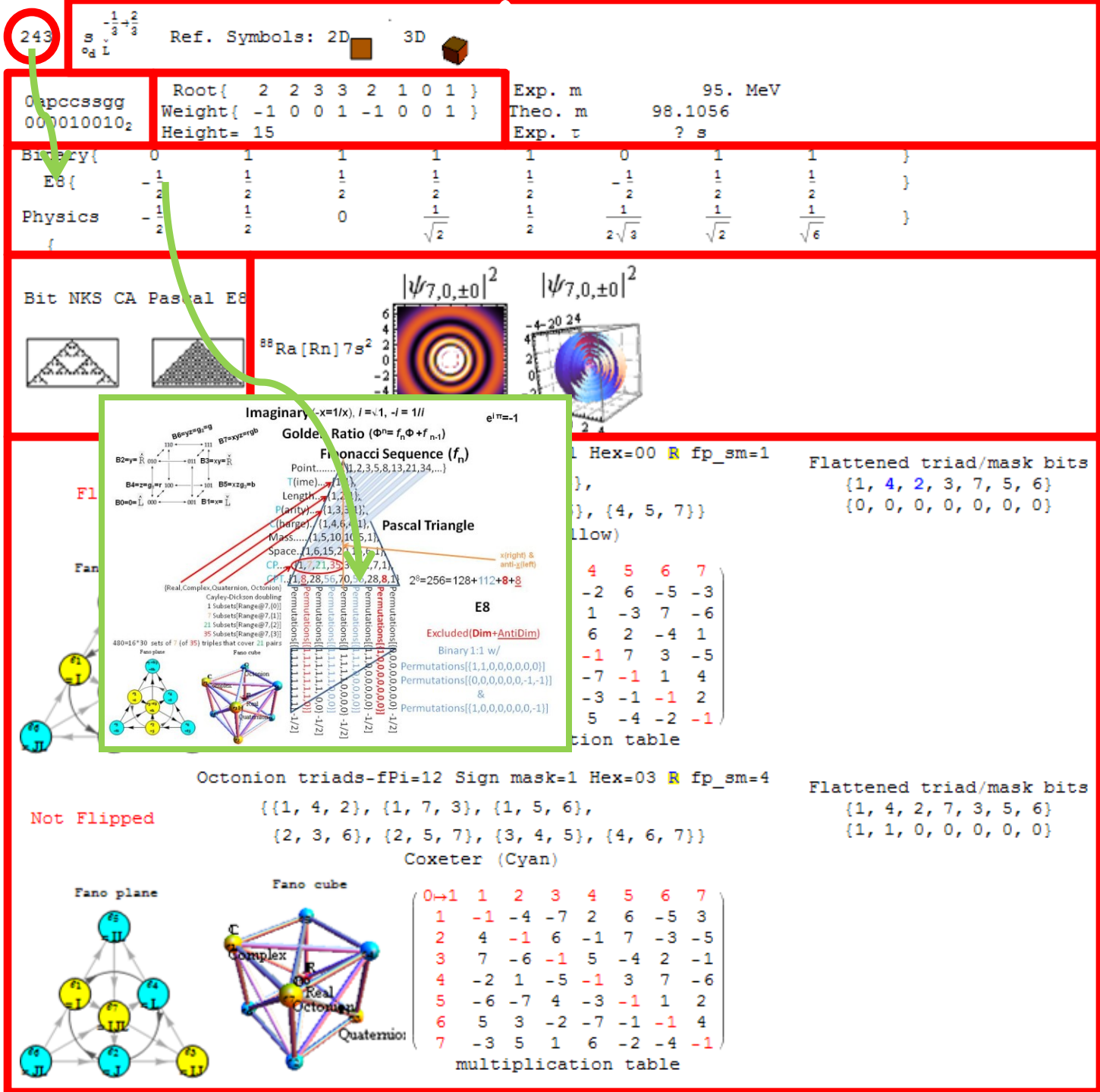
Fano cube



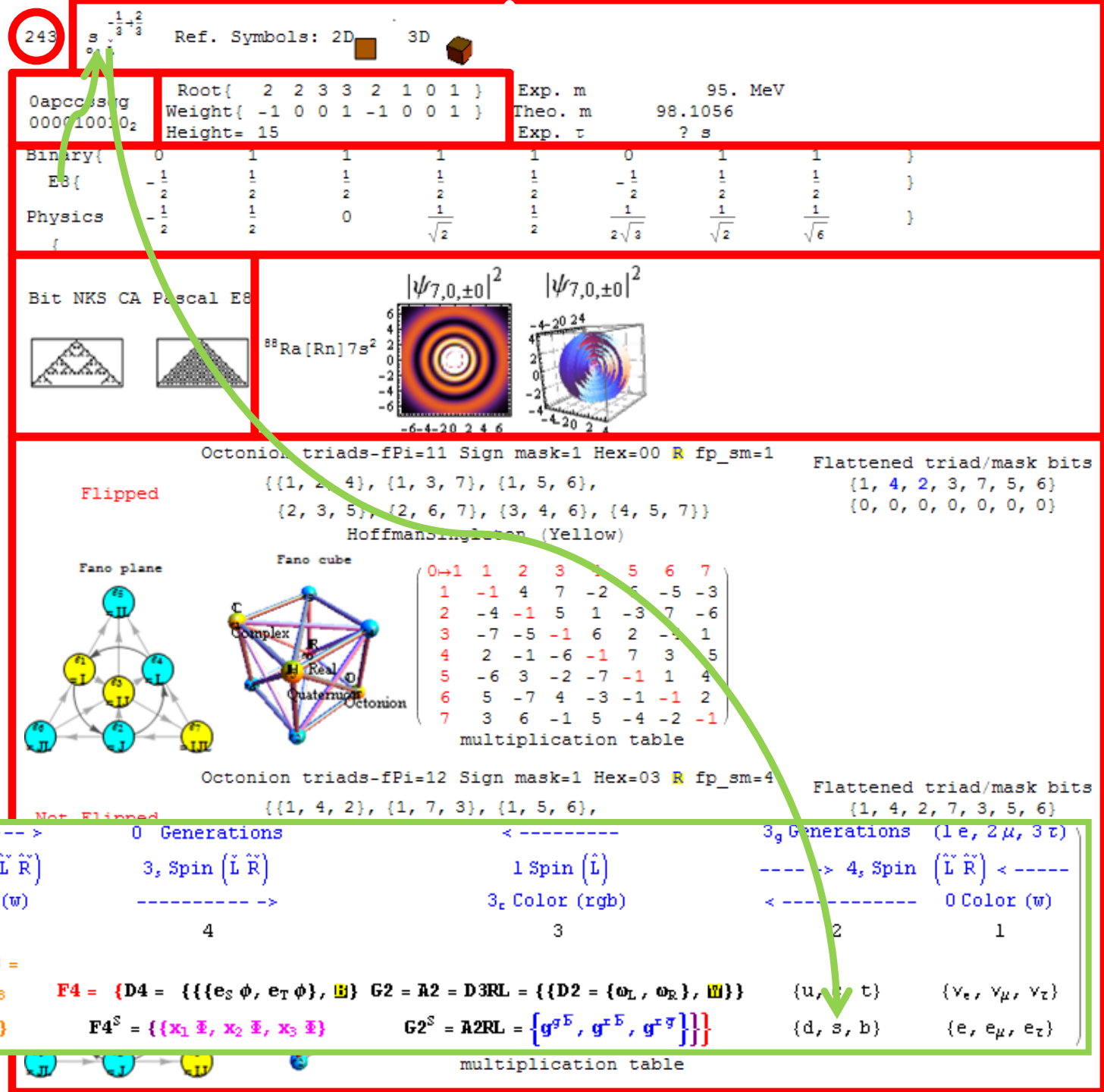
0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

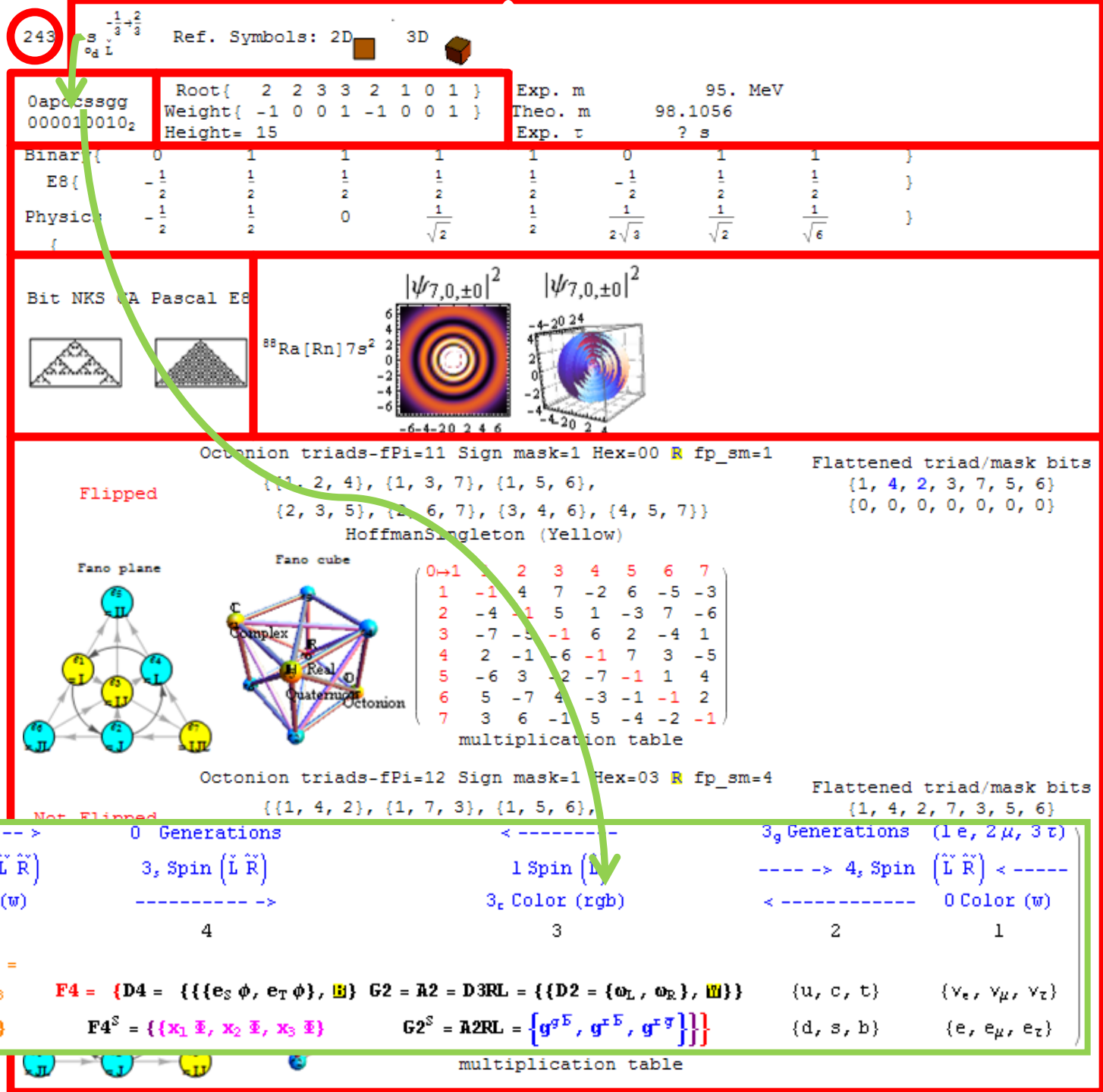
E8, Binary and the Pascal Triangle



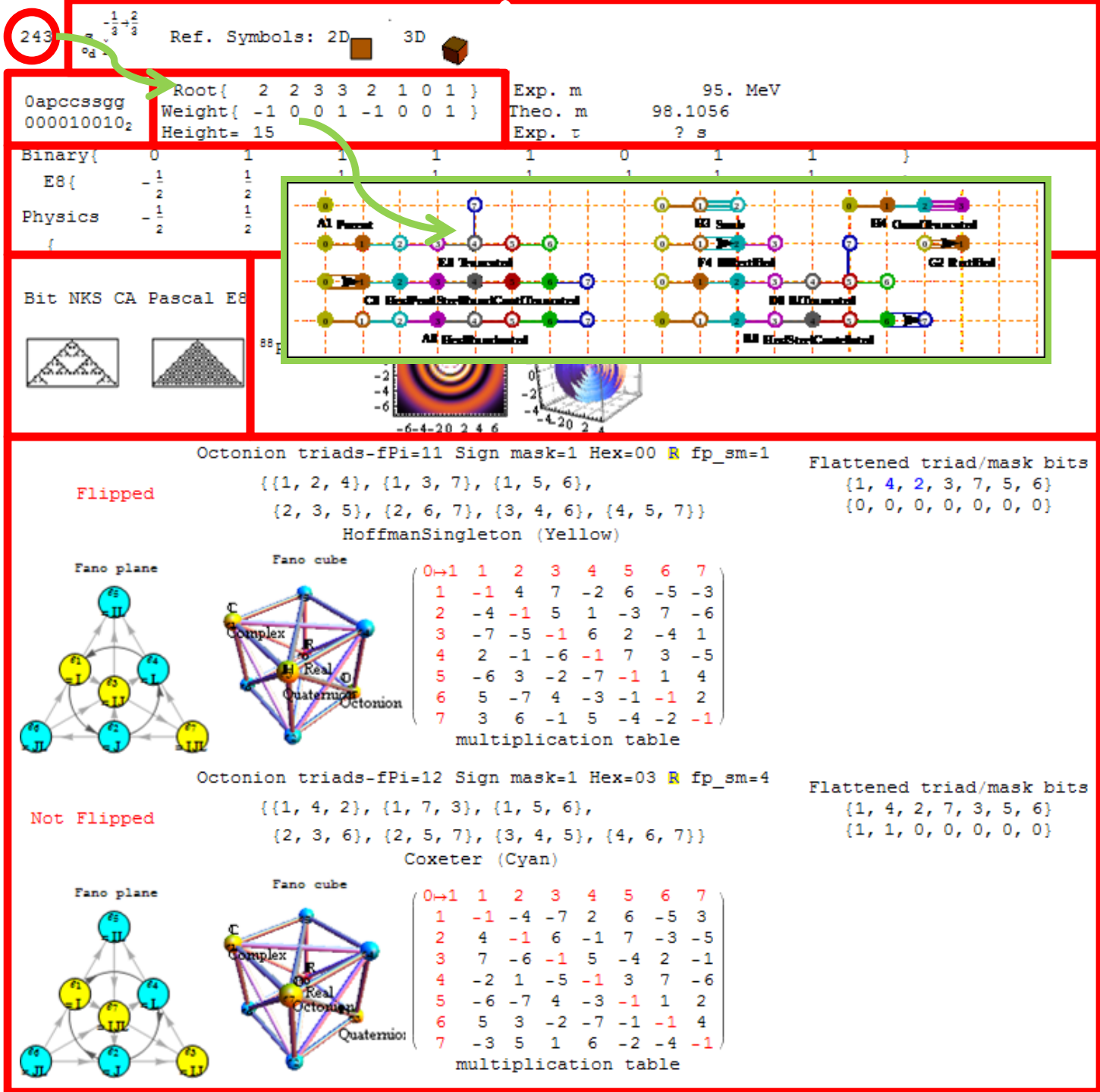
E8 and the Lisi extended Standard Model (eSM) Particle Assignments



Bitwise Quantum Particle Assignments



E8 Algebra Roots (+/- 120)



E8 Roots to Chemical Elements (- are "Anti-Elements")

243 $s_{d}^{-\frac{1}{3}} L^{\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

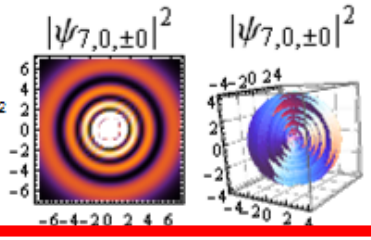
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



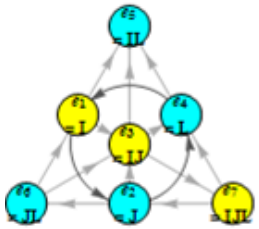
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flipped

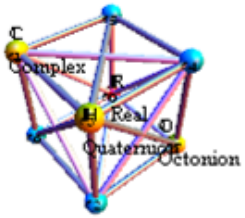
{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

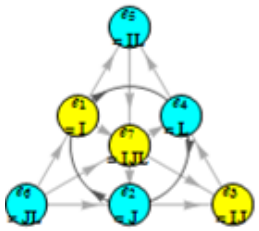
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

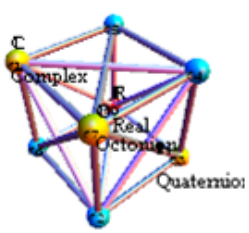
{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



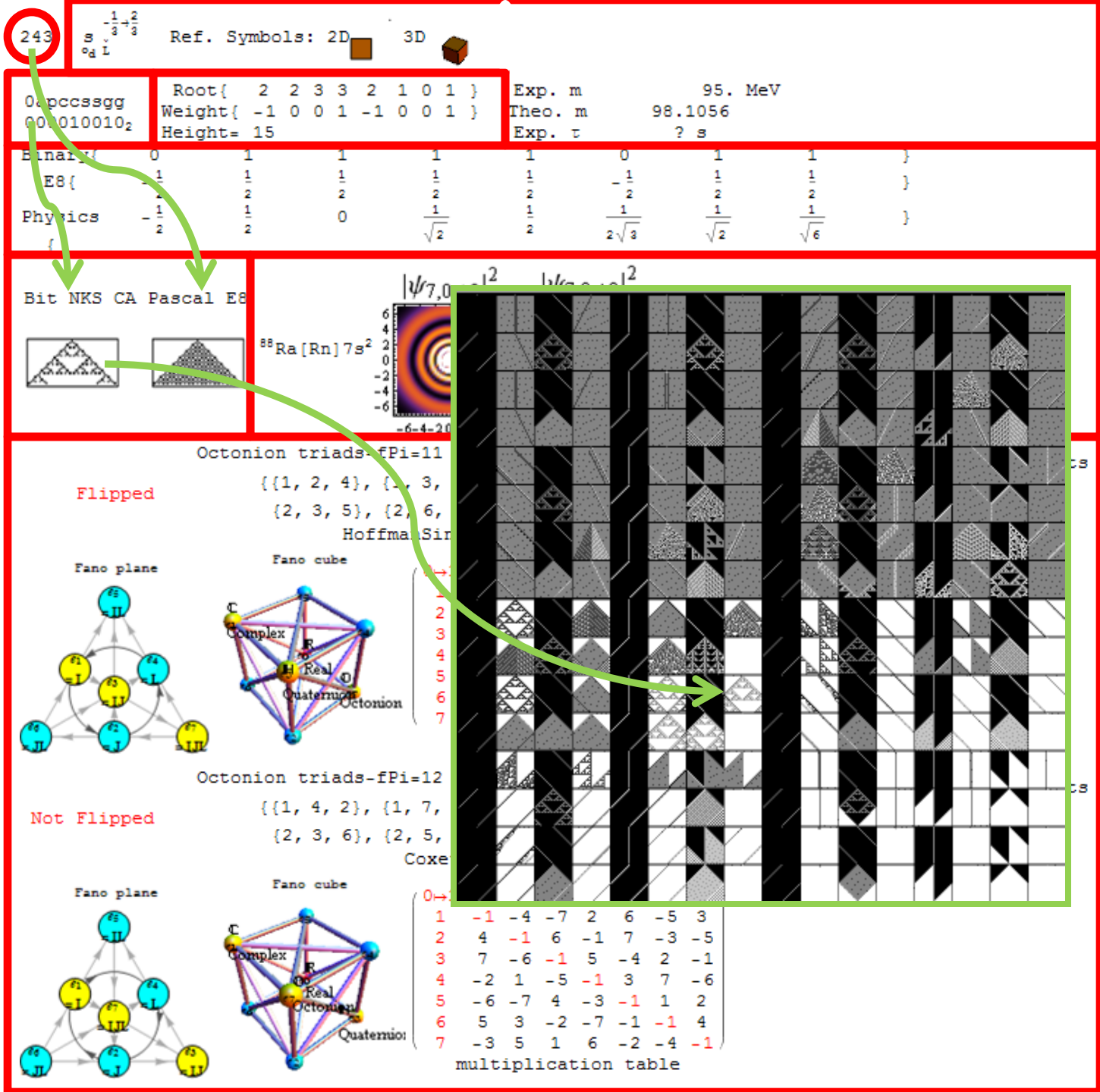
Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Assignment of 256 to NKS CA



Quantum Particle Symmetries of Octonions

243 $s_{d\,L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
00001001012

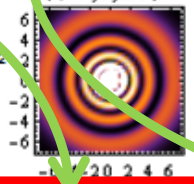
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

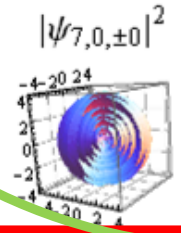
Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1 }
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$ }
Physics	$\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$ }

Bit NKS CA Pascal E8

^{88}Ra [Rn] 7s^{2}





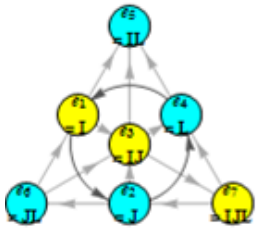
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flipped

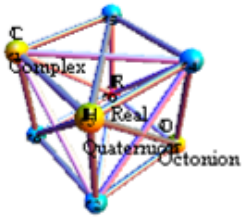
{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

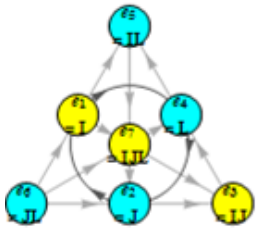
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

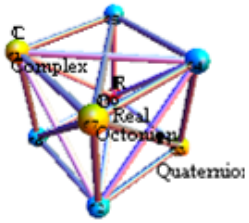
{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



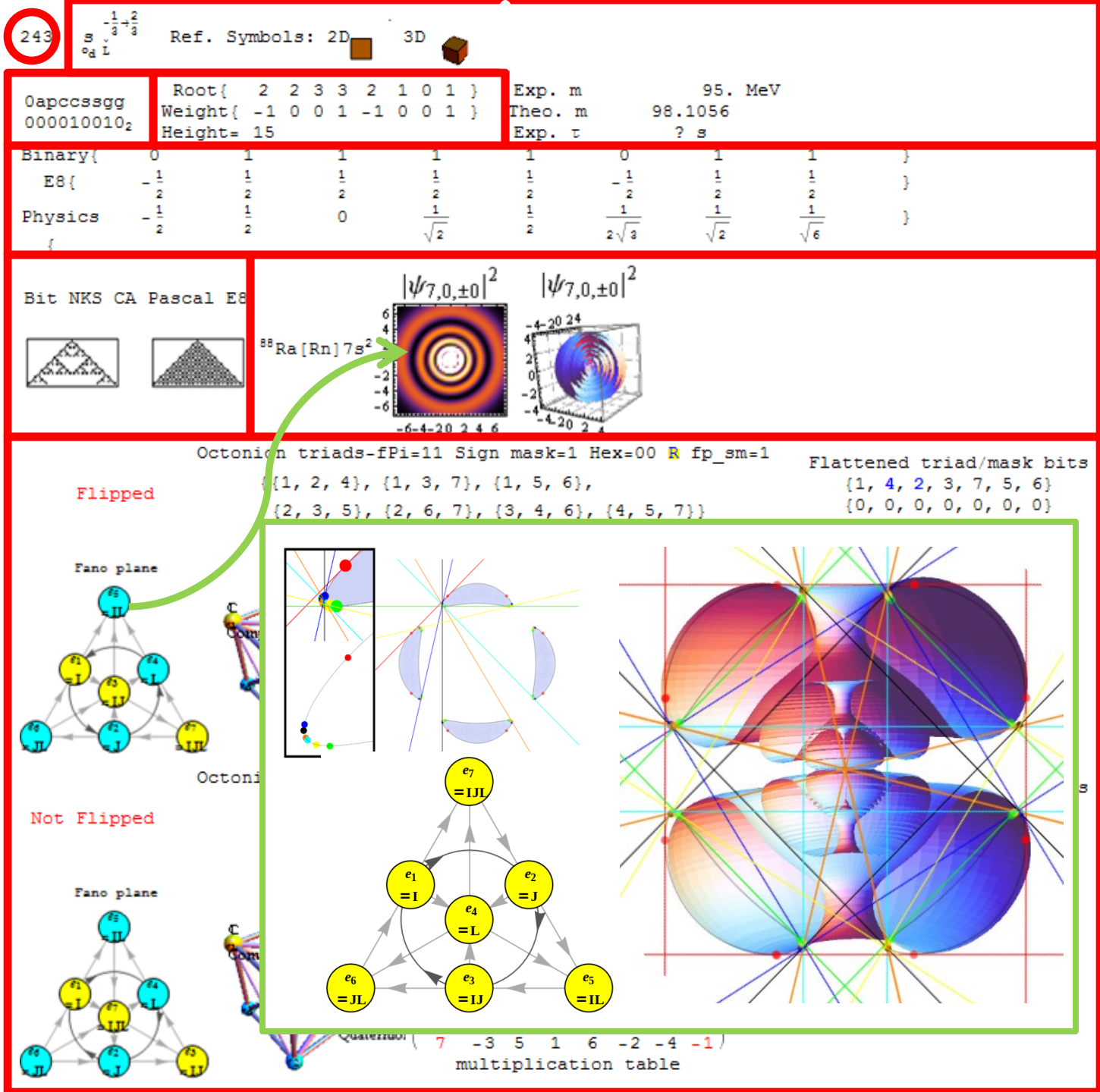
0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

28 Octonion Fano Plane Triangles

28 Trott Quartic and Dual Curve Bitangents

Electron Orbital Probability Density Legendre Functions



Quantum Particle Symmetries (pType and Gen)

243 $\bar{d}_L^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
00001000 02

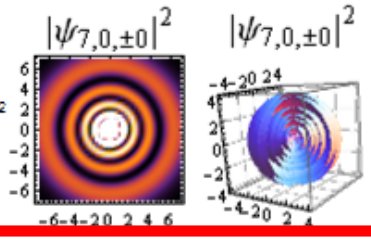
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

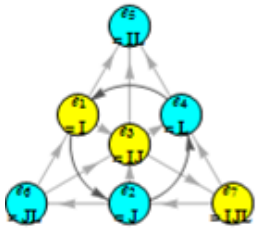
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

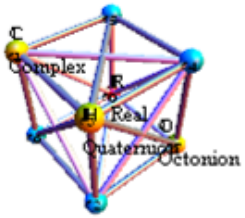
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

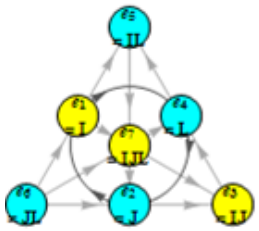
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

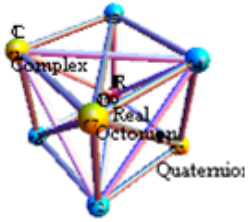
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Quantum Particle Symmetries (Anti)

243 $\overset{-\frac{1}{3}\to\frac{2}{3}}{\underset{d\ L}{\circ}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010_2

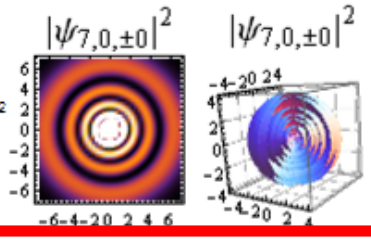
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

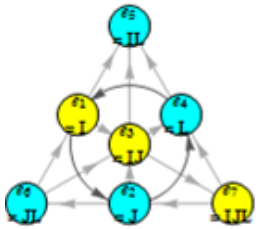
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

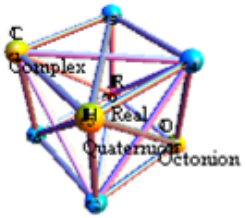
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

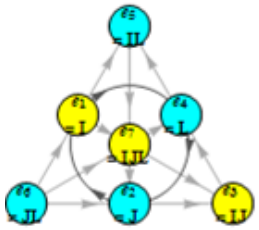
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

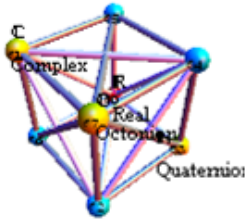
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Quantum Particle Symmetires (Color)

243 $s^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010_2

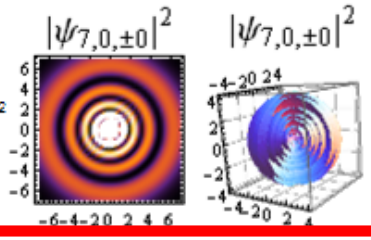
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

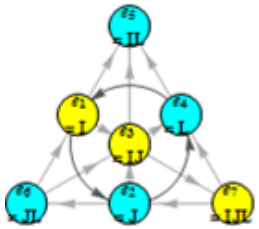
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

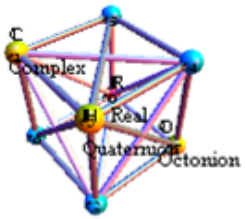
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

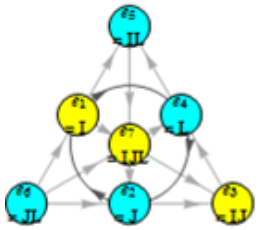
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

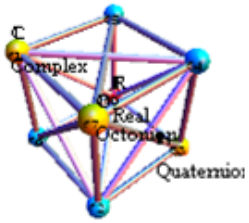
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Quantum Particle Symmetries (Spin)

243 $s^{-\frac{1}{3}\to\frac{2}{3}}$ ^{0}d Ref. Symbols: 2D 3D

0apccssgg
000010010_2

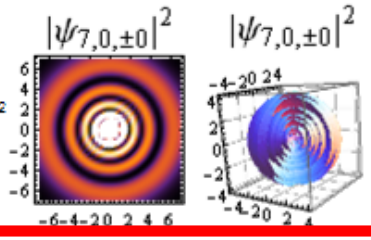
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



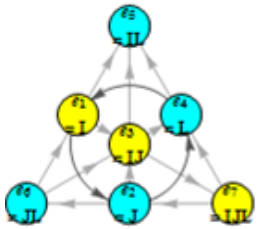
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flipped

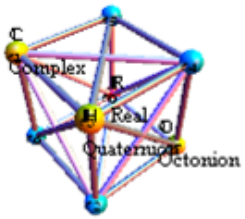
{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

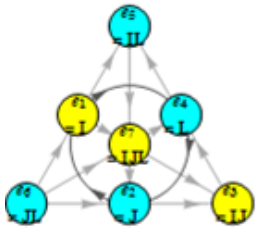
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

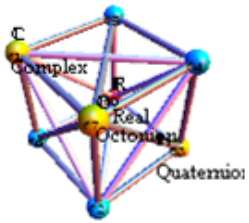
{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



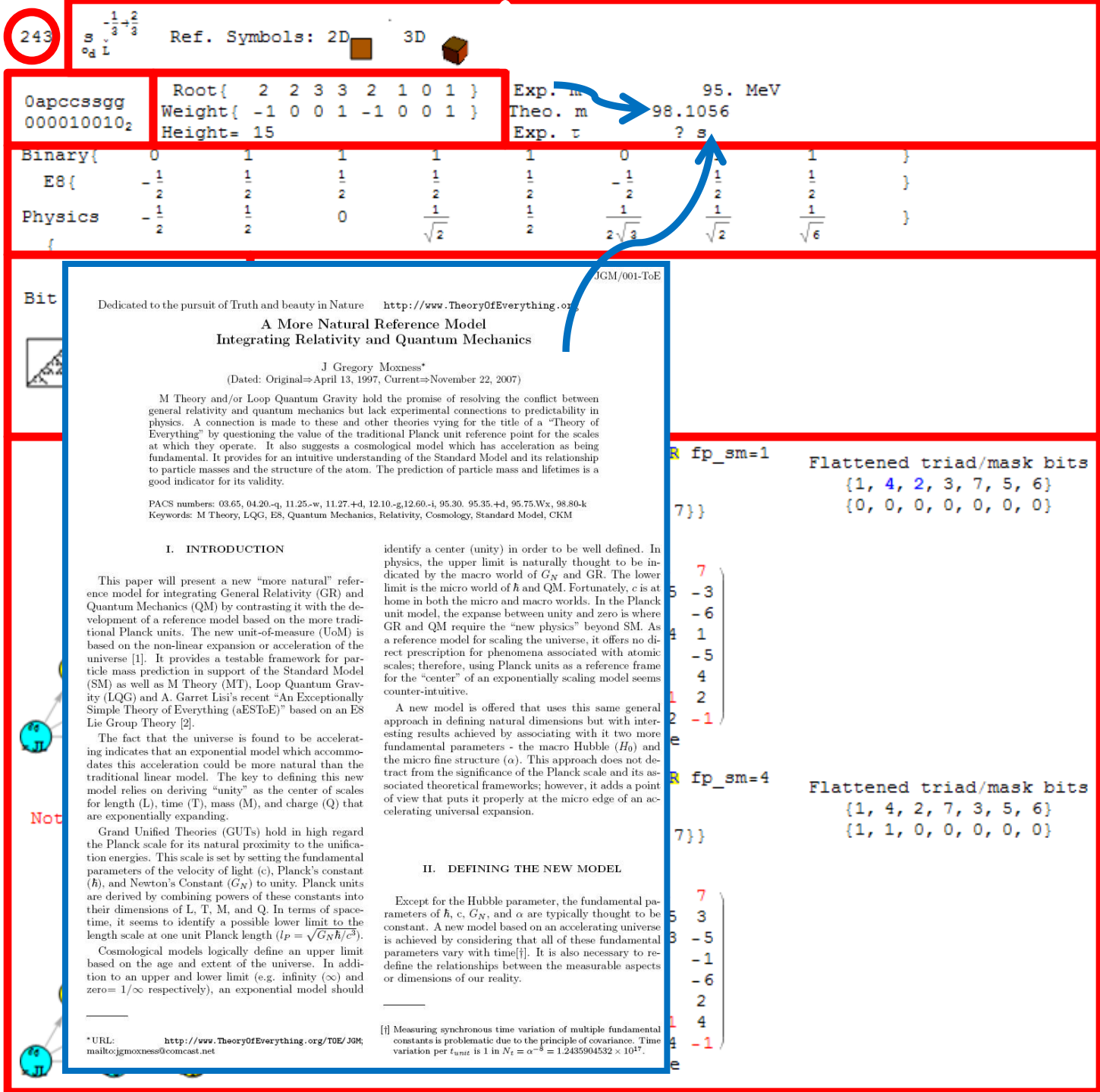
Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

MyToE model Theoretical and Experimental Mass/ Lifetime



Binary, E8 and Physics Coordinates

243 $s_{d}^{-\frac{1}{3}} L^{\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

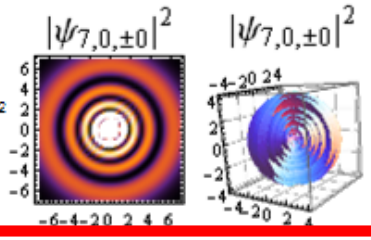
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



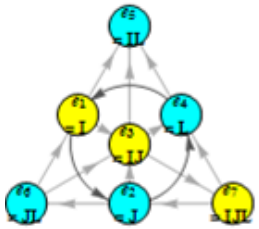
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flipped

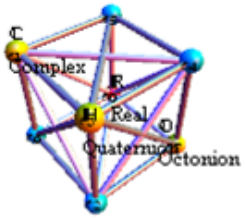
{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

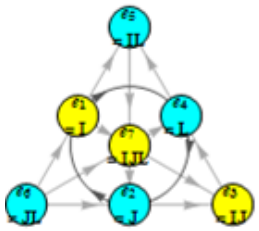
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

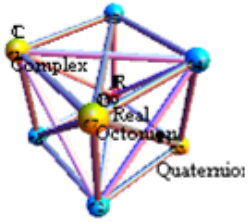
{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



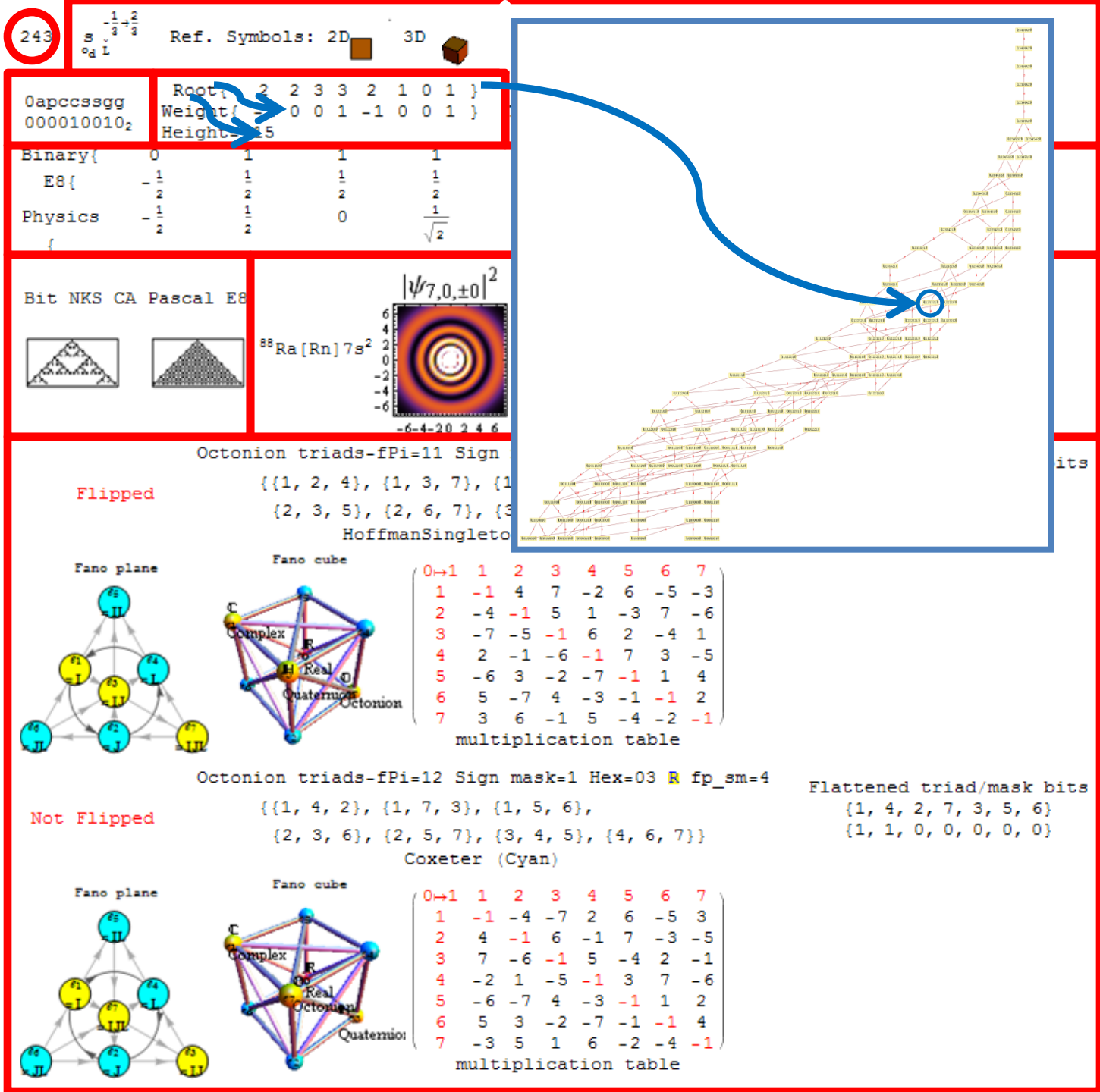
Fano cube



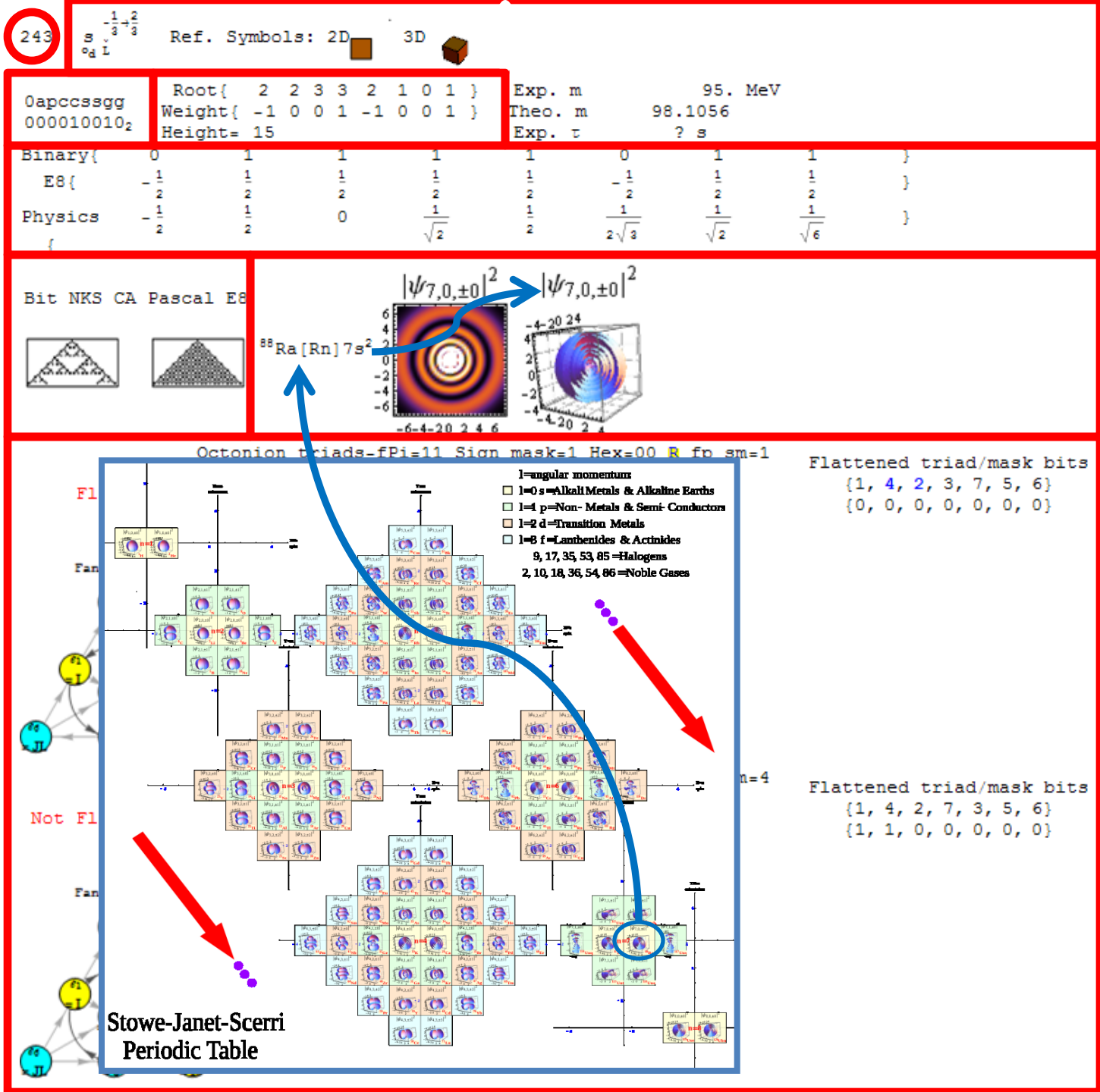
0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

E8 Lie Algebra Root/Weight/ Height and the Hasse Diagram



Chemical Element Quantum Numbers and the Stowe-Janet-Scerri Periodic Table with 3D Spherical Harmonic Electron Density Probability Contours



Octonion Triads and the Fano Plane

243 $s_{\circ_d L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

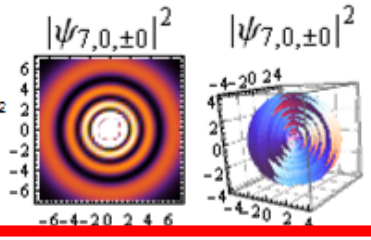
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

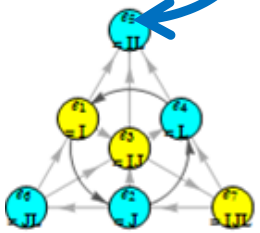
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

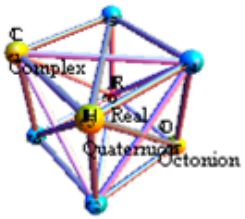
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

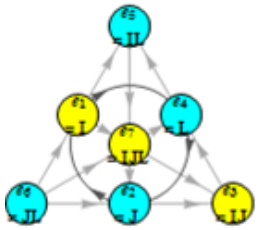
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

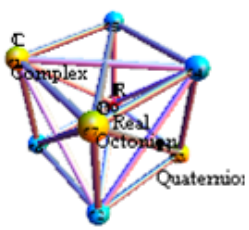
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Fano Plane and Fano Cubic

243 $s_{d}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

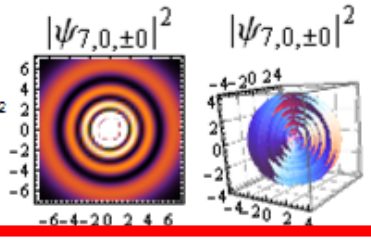
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

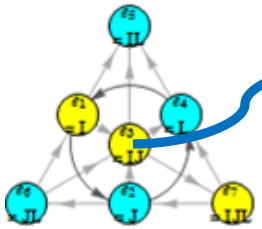
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

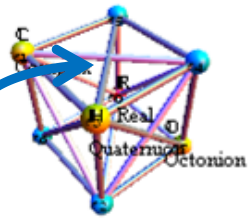
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

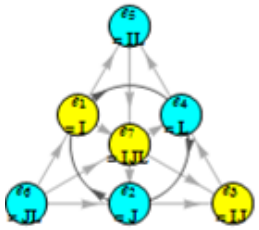
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

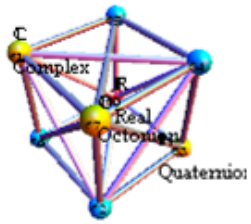
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Fano Plane and Multiplication Table

243 $s_{\circ_d L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

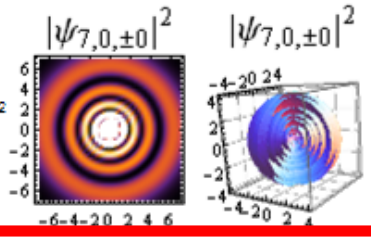
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

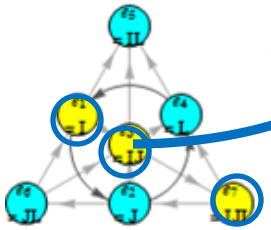
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

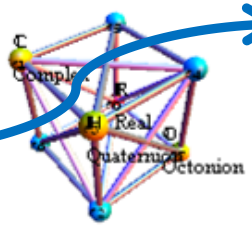
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

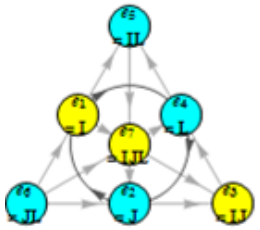
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

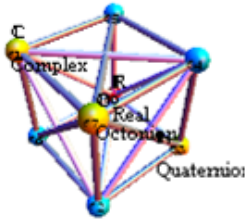
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Assigning flattened triads to the Fano Plane Mnemonic

243 $s_{d}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010$_2$

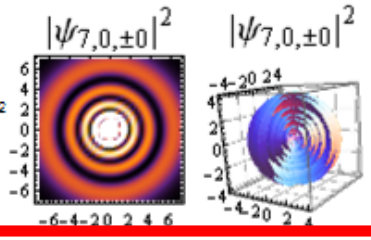
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

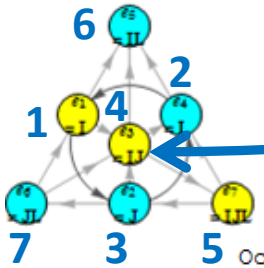
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

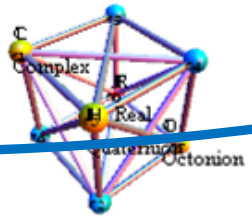
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

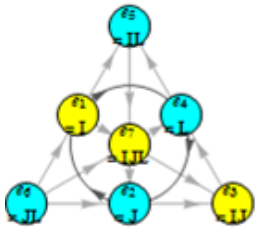
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

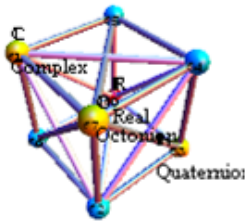
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Flattened Triad Procedure

243 $s_{d}^{-\frac{1}{3}} L^{\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

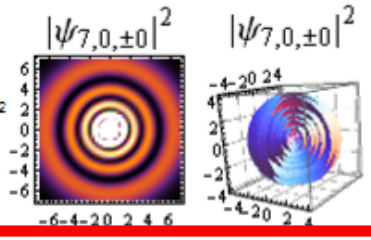
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



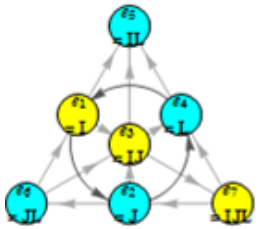
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flipped

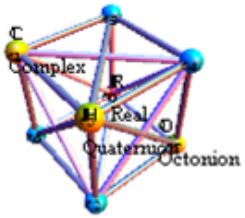
{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

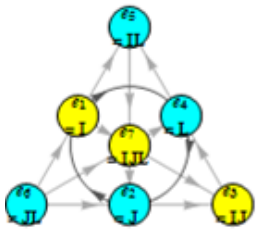
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

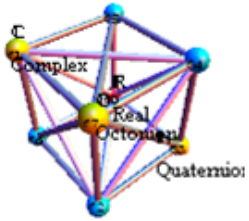
{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

“Flipped” Fano Plane nodes give 2 to 1 cover of E8

243 $s_{d}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

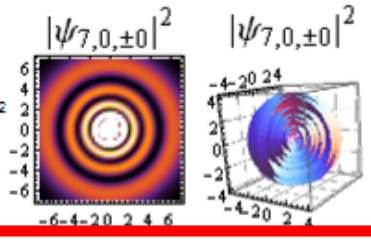
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

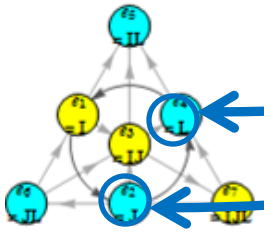
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

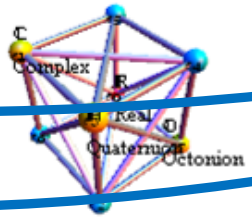
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	1	1	4
6	5	7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

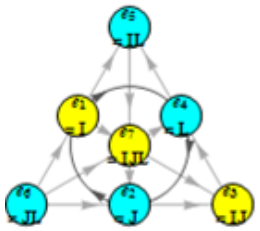
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

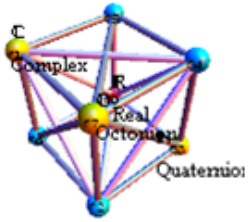
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

“Not Flipped” has the same Bitwise Quantum Particle assignment

243 $s_{\circ_d L}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010₂

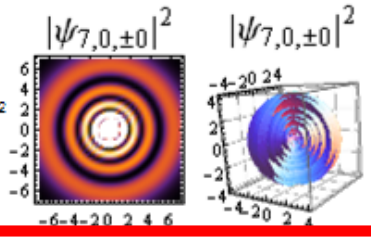
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



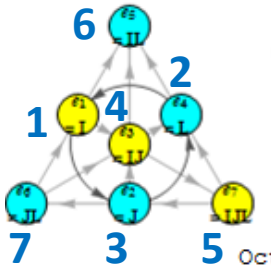
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flipped

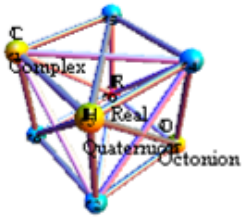
{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

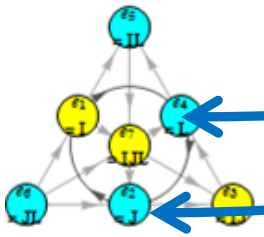
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

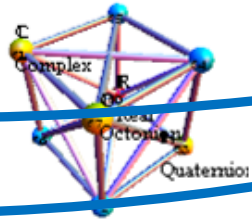
{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	[illegible]	-5
3	7	-6	[illegible]	[illegible]	-4	2	-1
[illegible]	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	[illegible]	1	2
6	5	3	-2	-7	-1	-1	4
[illegible]	-3	5	1	6	-2	-4	-1

multiplication table

Sign Mask Triad Element Reversal

243 $s_{d}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010_2

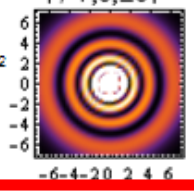
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

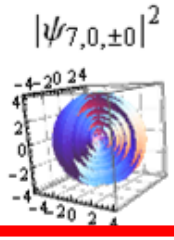
Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$





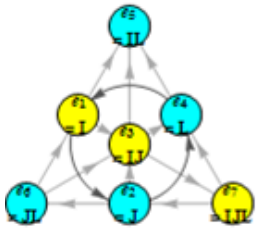
Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

Flipped

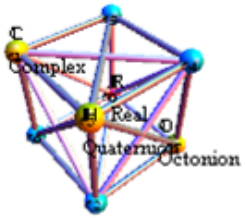
{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

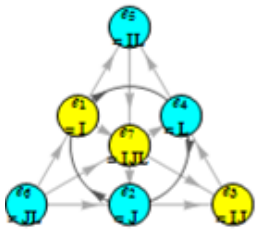
Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

Not Flipped

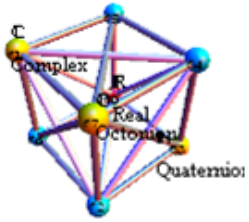
{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

multiplication table

Sign Mask Triad Element Reversal

243 $s_{d}^{-\frac{1}{3}\to\frac{2}{3}}$ Ref. Symbols: 2D 3D

0apccssgg
000010010_2

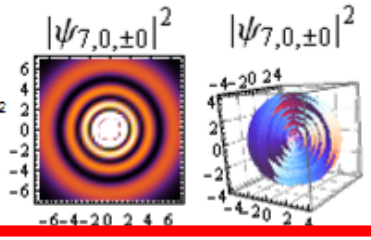
Root{ 2 2 3 3 2 1 0 1 }
Weight{ -1 0 0 1 -1 0 0 1 }
Height= 15

Exp. m 95. MeV
Theo. m 98.1056
Exp. τ ? s

Binary{	0	1	1	1	1	0	1	1	}
E8{	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	}
Physics {	$-\frac{1}{2}$	$\frac{1}{2}$	0	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{3}}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{6}}$	}

Bit NKS CA Pascal E8

^{88}Ra [Rn] $7s^2$



Octonion triads-fPi=11 Sign mask=1 Hex=00 R fp_sm=1

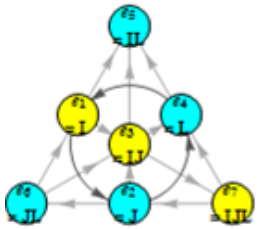
Flipped

{{1, 2, 4}, {1, 3, 7}, {1, 5, 6},
{2, 3, 5}, {2, 6, 7}, {3, 4, 6}, {4, 5, 7}}

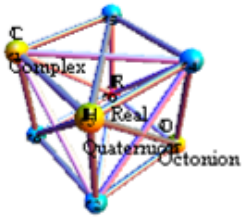
HoffmanSingleton (Yellow)

Flattened triad/mask bits
{1, 4, 2, 3, 7, 5, 6}
{0, 0, 0, 0, 0, 0, 0}

Fano plane



Fano cube



0↦1	1	2	3	4	5	6	7
1	-1	4	7	-2	6	-5	-3
2	-4	-1	5	1	-3	7	-6
3	-7	-5	-1	6	2	-4	1
4	2	-1	-6	-1	7	3	-5
5	-6	3	-2	-7	-1	1	4
6	5	-7	4	-3	-1	-1	2
7	3	6	-1	5	-4	-2	-1

multiplication table

Octonion triads-fPi=12 Sign mask=1 Hex=03 R fp_sm=4

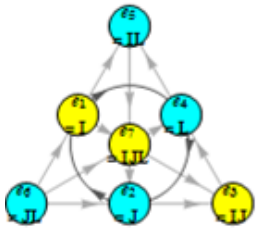
Not Flipped

{{1, 4, 2}, {1, 7, 3}, {1, 5, 6},
{2, 3, 6}, {2, 5, 7}, {3, 4, 5}, {4, 6, 7}}

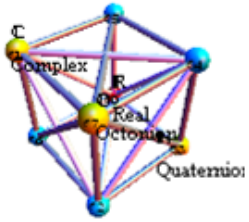
Coxeter (Cyan)

Flattened triad/mask bits
{1, 4, 2, 7, 3, 5, 6}
{1, 1, 0, 0, 0, 0, 0}

Fano plane



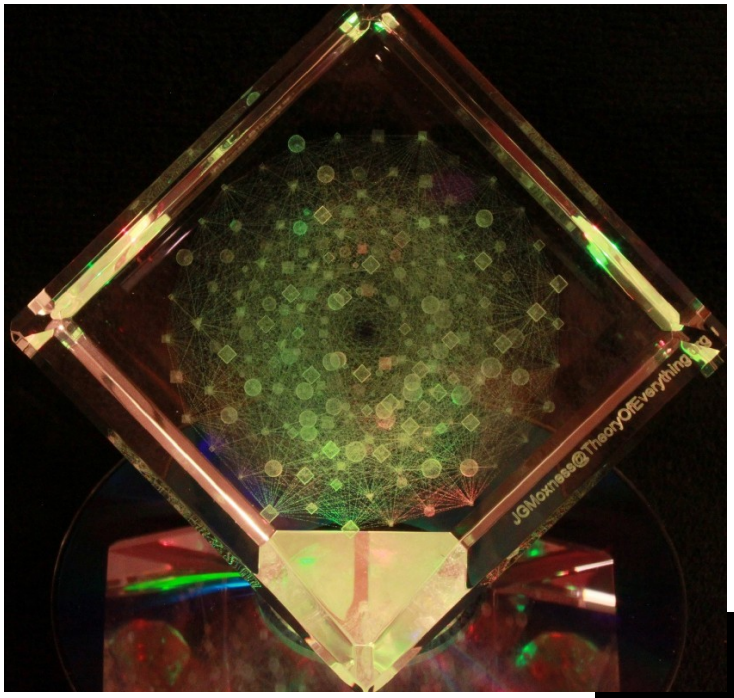
Fano cube

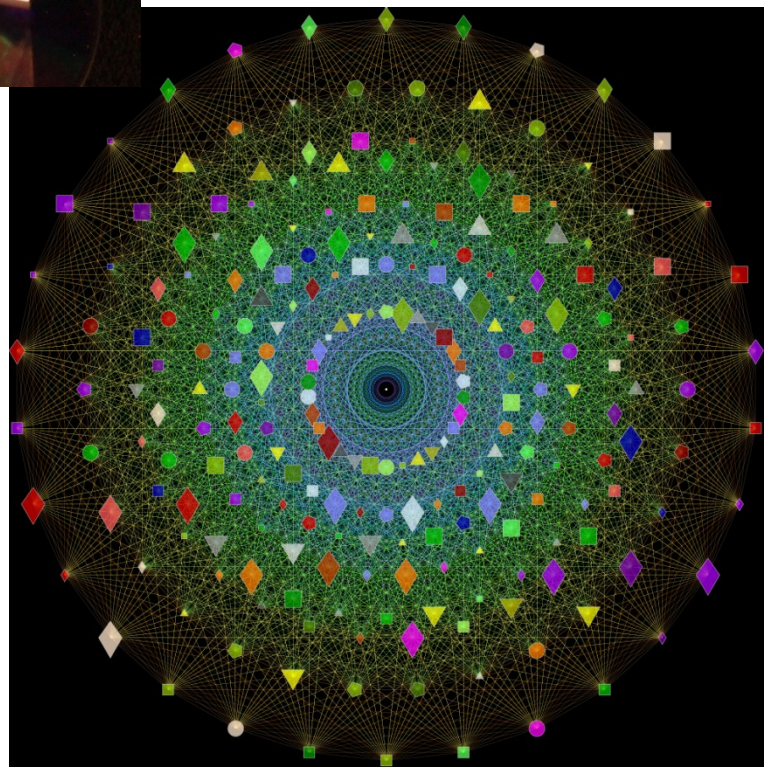


0↦1	1	2	3	4	5	6	7
1	-1	-4	-7	2	6	-5	3
2	4	-1	6	-1	7	-3	-5
3	7	-6	-1	5	-4	2	-1
4	-2	1	-5	-1	3	7	-6
5	-6	-7	4	-3	-1	1	2
6	5	3	-2	-7	-1	-1	4
7	-3	5	1	6	-2	-4	-1

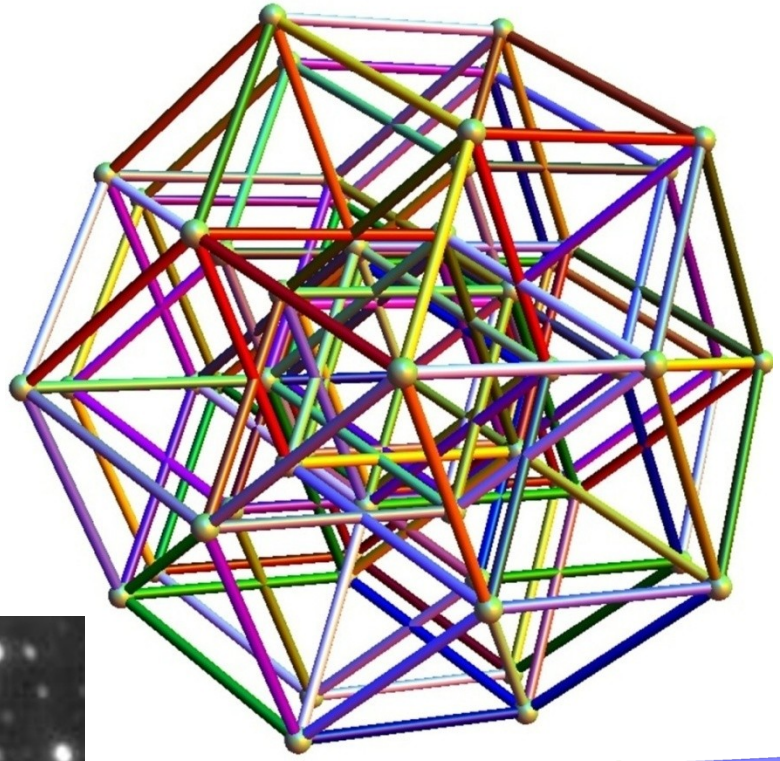
multiplication table

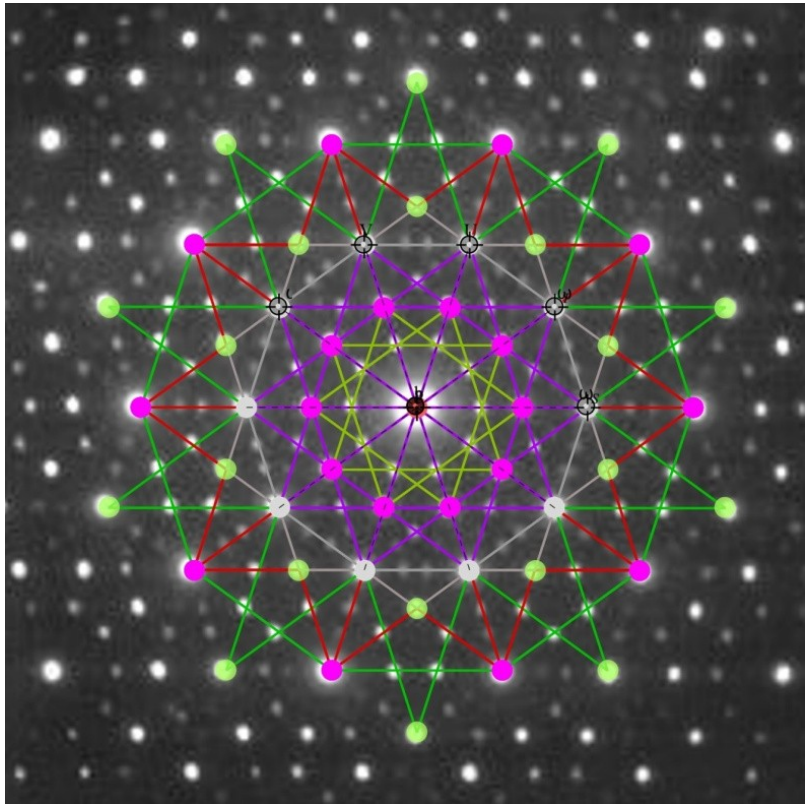
E8 with Color-Shape-Size based on Lisi Particle Assignments

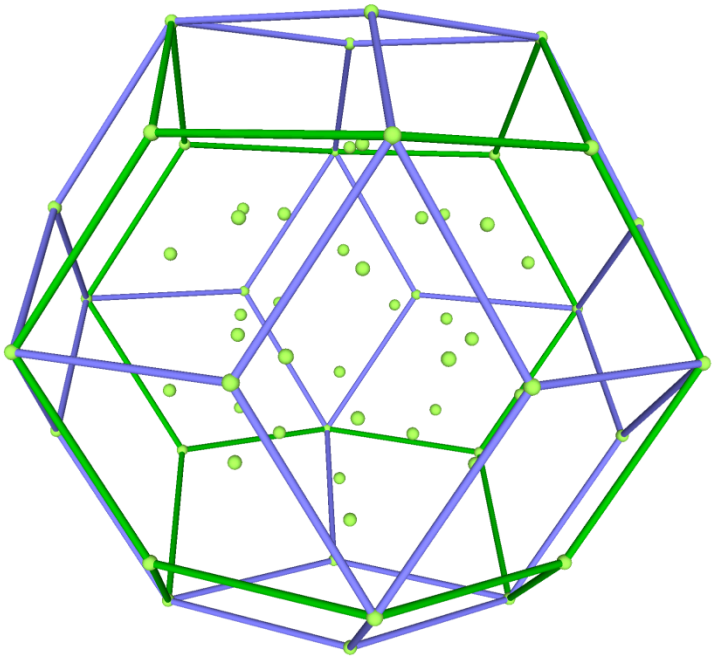




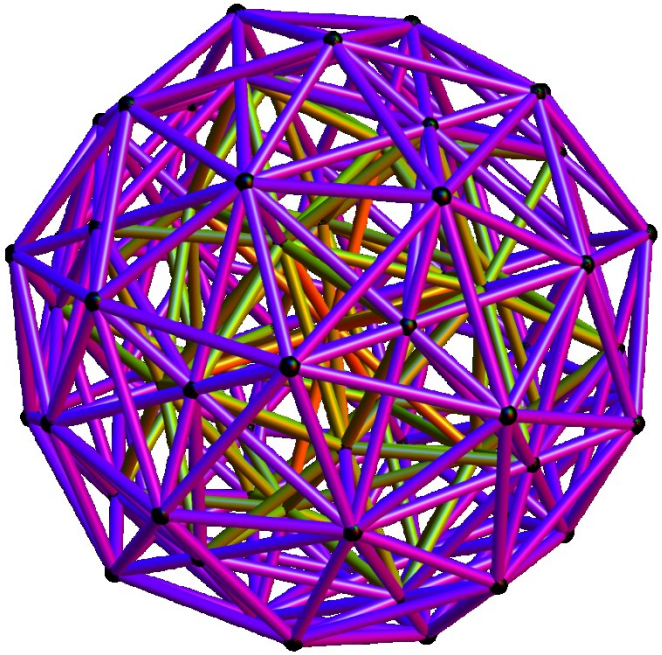
The Rhombic Tria-Contahedron, Zn-Mg-Ho QuasiCrystal Electron Diffractions

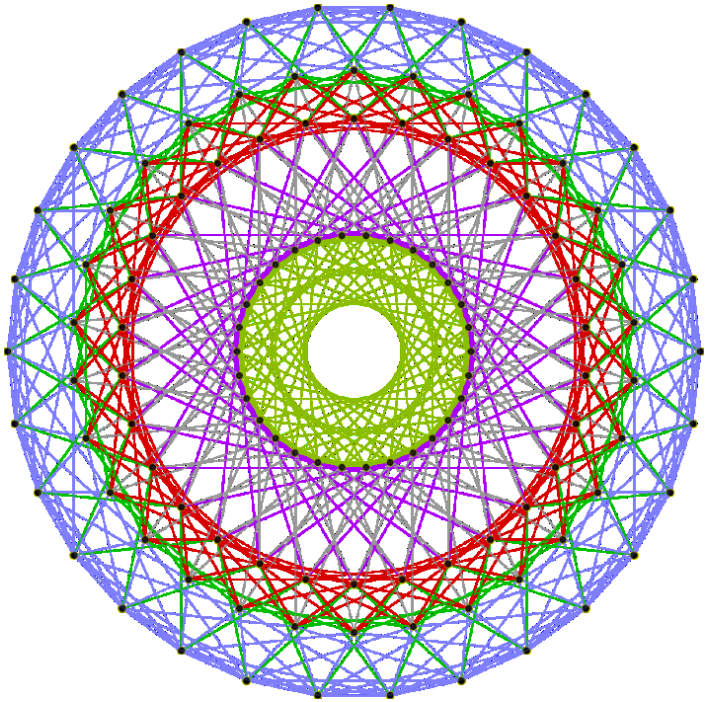


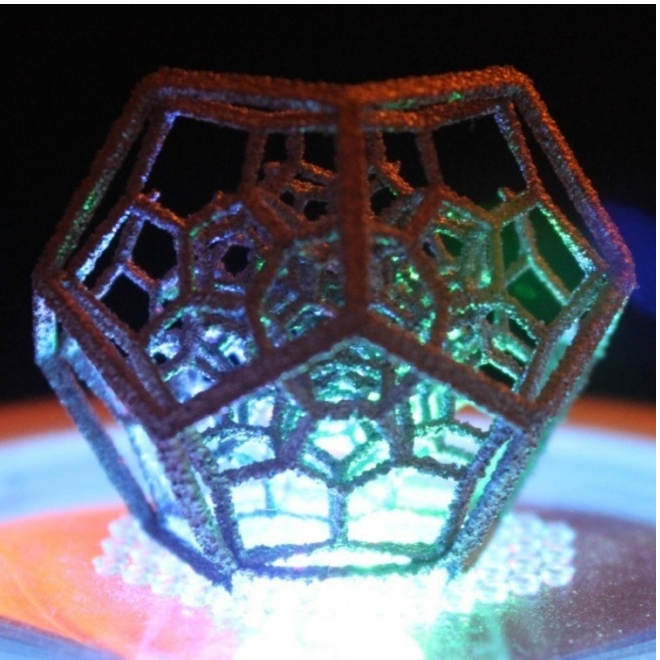


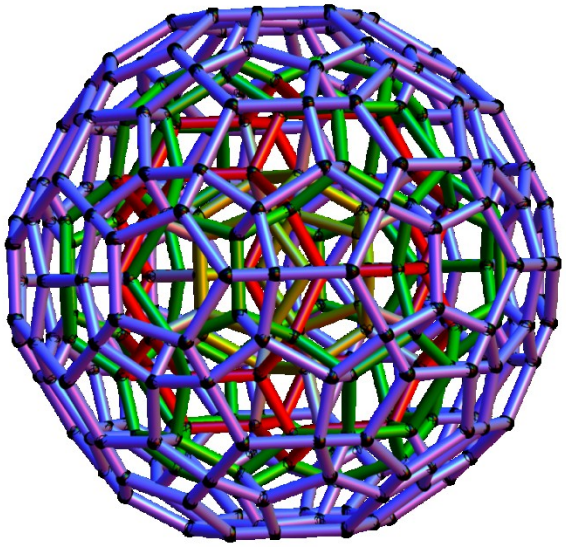


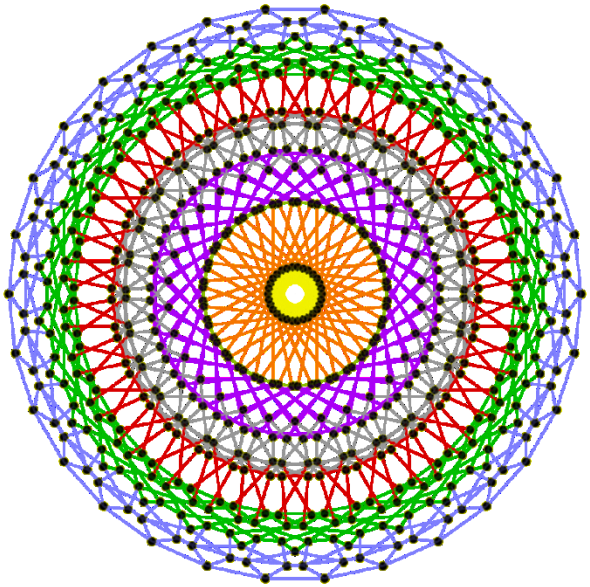
The H4 600 Cell, its dual the 120 Cell E8 folds to H4 at Golden Ratio Projection



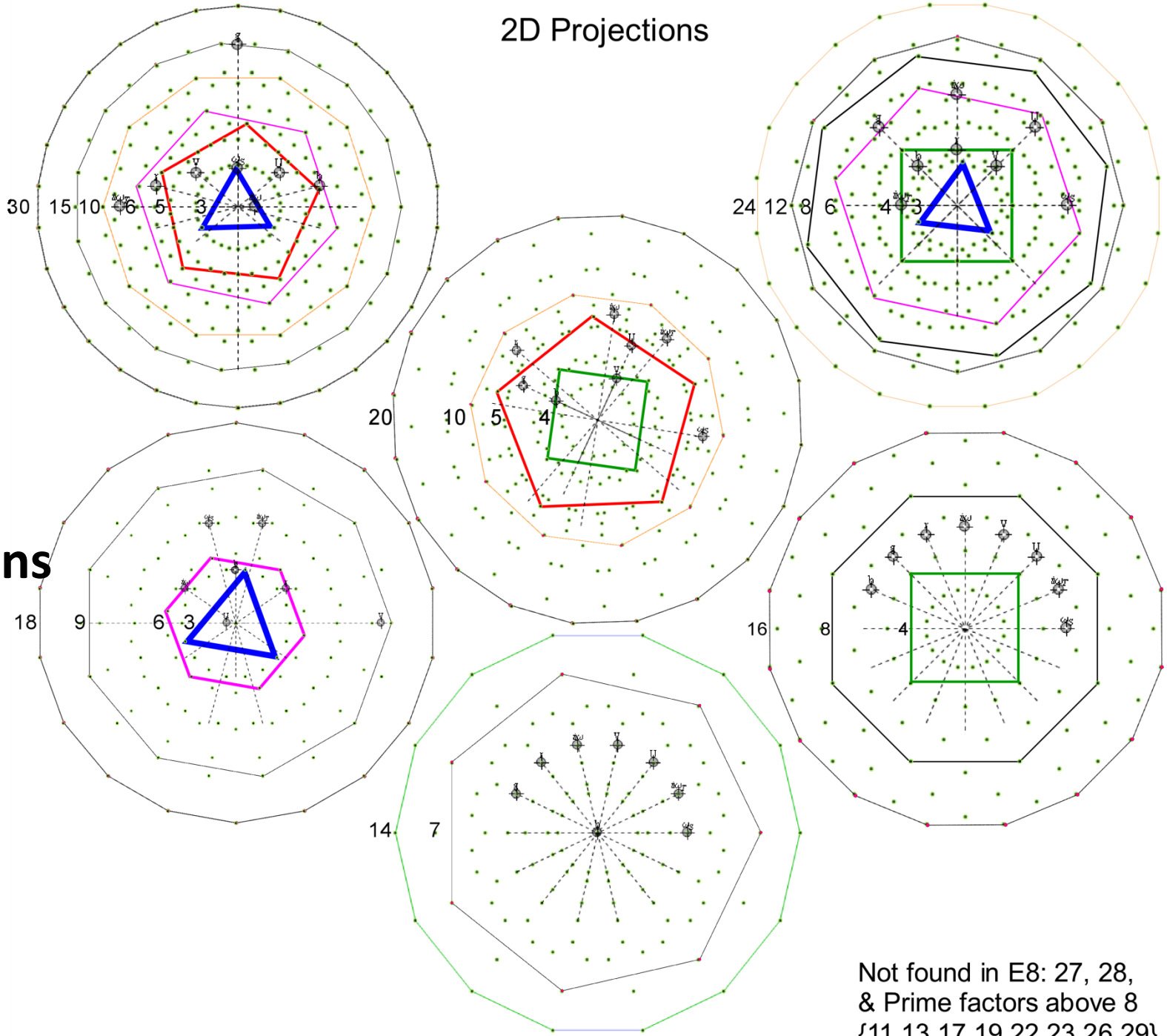








2D Projections

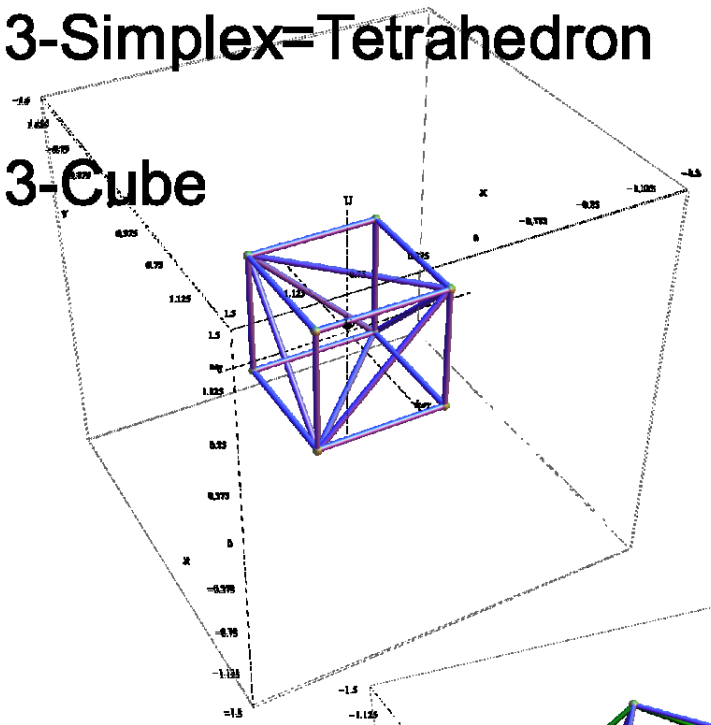


Not found in E8: 27, 28,
& Prime factors above 8
{11,13,17,19,22,23,26,29}

3D Projections

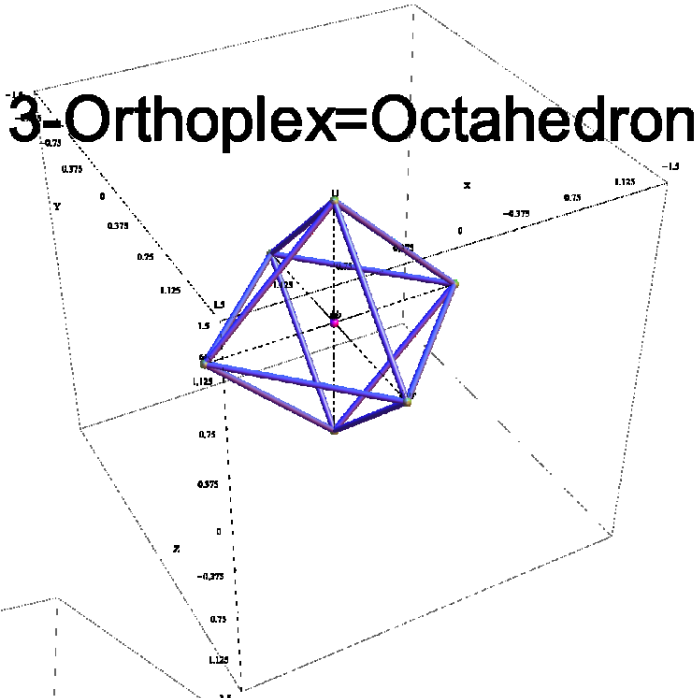
3D Platonic Solid Projections

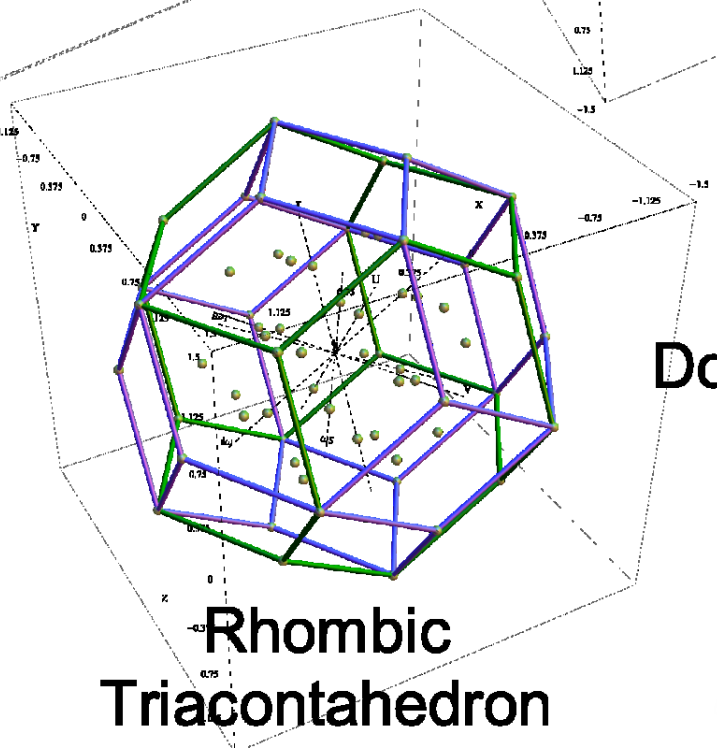
3-Simplex=Tetrahedron



3-Cube

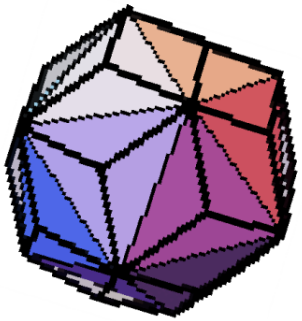
3-Orthoplex=Octahedron



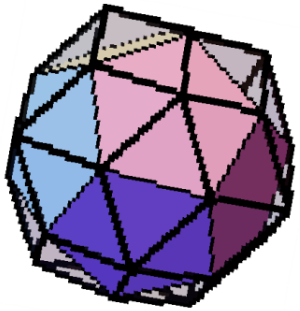


Rhombic Triacontahedron

Icosahedron



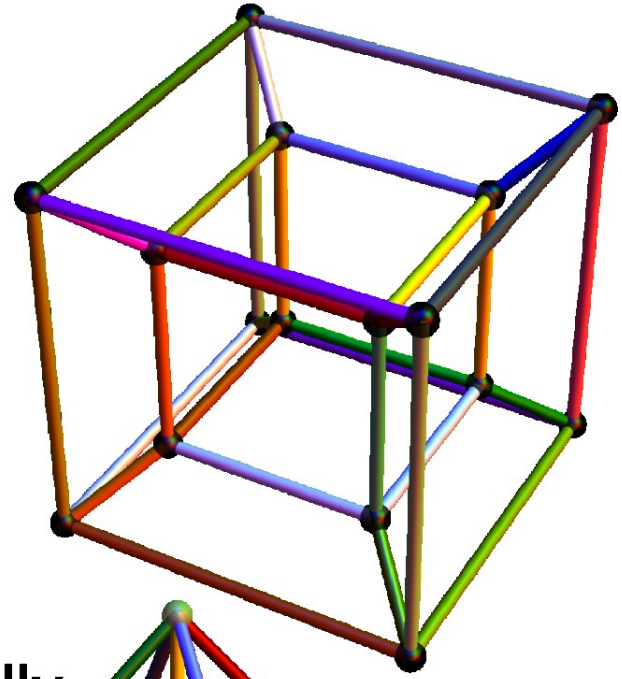
Dodecahedron



4D Projections

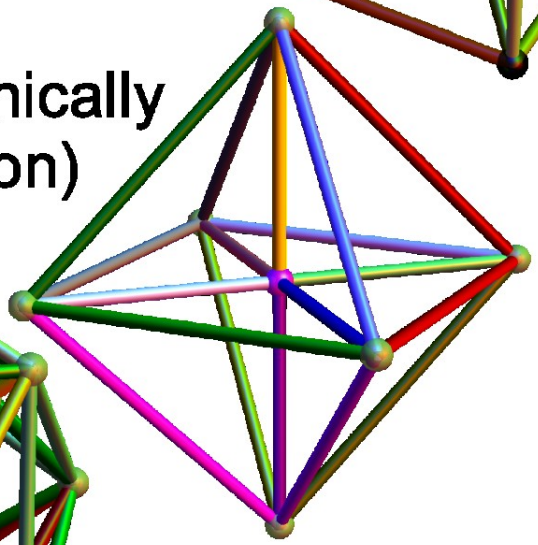
4D Perspective Projections

8-Cell=4-Cube=Tesseract (orthographically projects to a 3-Cube)



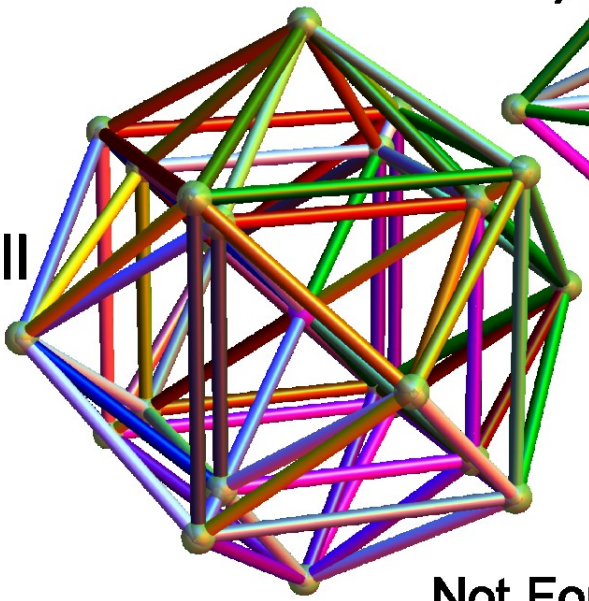
+

16-Cell=4-Orthoplex= 4-Cube dual (orthographically projects to an Octahedron)



=

24-Cell

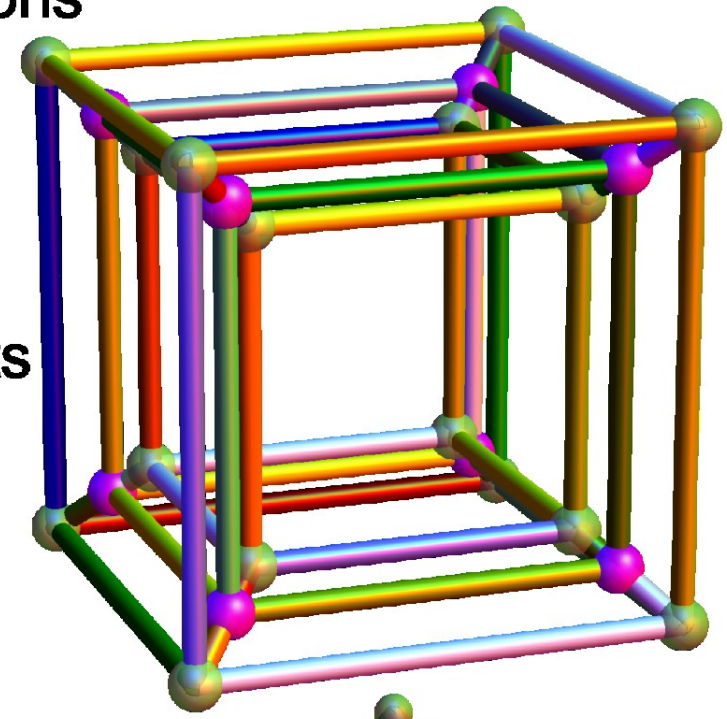


Not Found in E8: 600-Cell,120-Cell

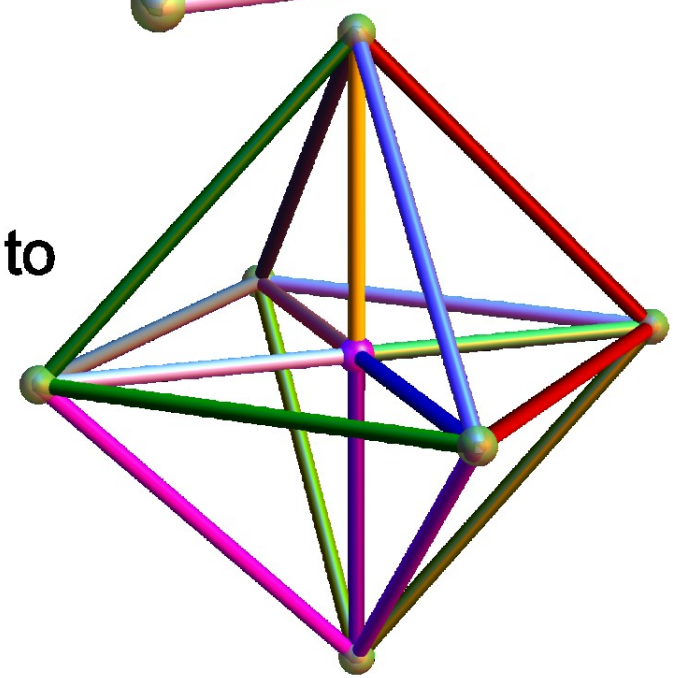
5D Projections

5D Perspective Projections

5-Cube=Penteract
(orthographically projects
to a 3-Cube)

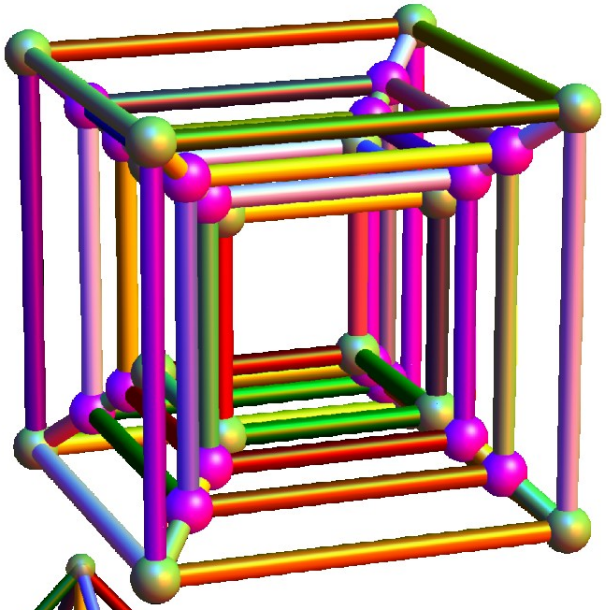


5-Orthoplex=5-Cube dual
Orthographically projects to
the Octahedron, facets
contain 4-Simplex=5-Cell

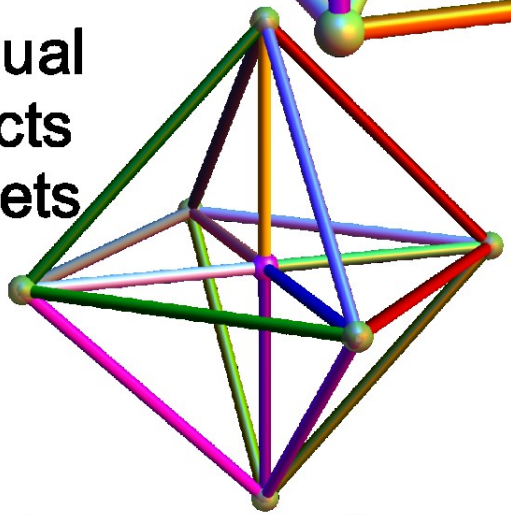


6D Projections

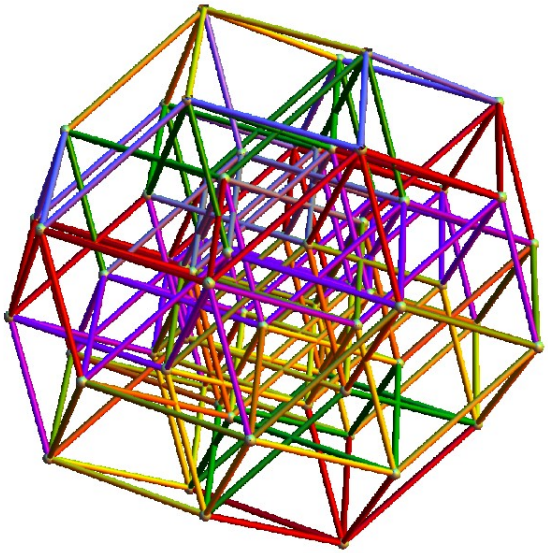
6D Perspective Projections



6-Cube=Hexeract (orthographically projects to a 3-Cube)



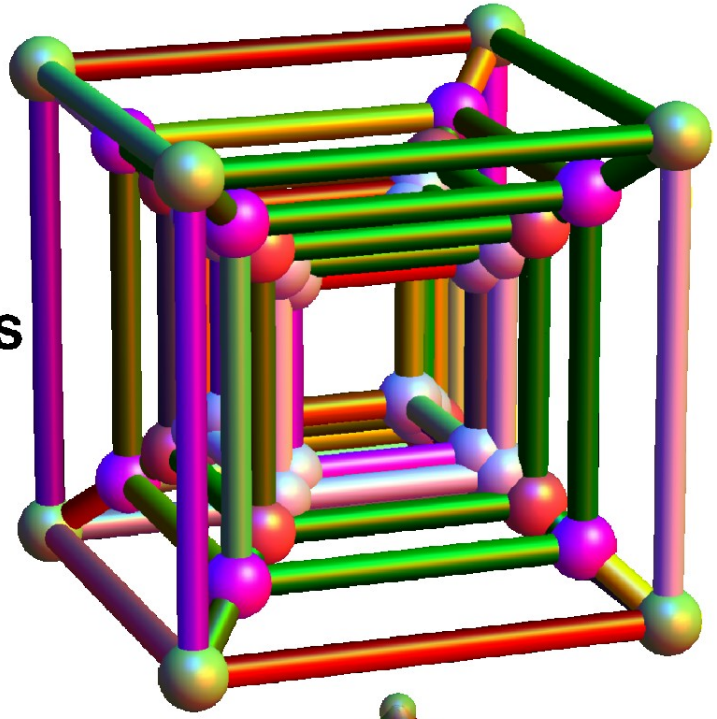
6-Orthoplex=6-Cube dual Orthographically projects to the Octahedron, facets contain 5-Simplex



6-Cube Projection using the Golden Ratio (orthographically projects to a Rhombic Triacontahedron)

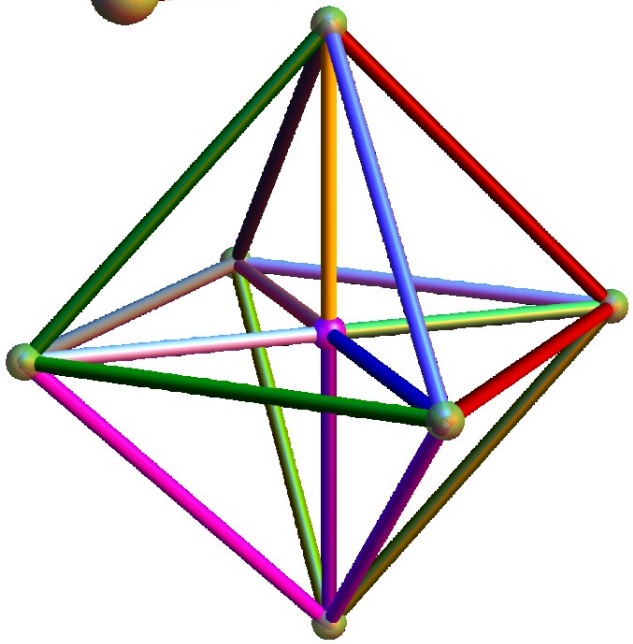
7D Perspective Projections

7-Cube=Hepteteract
(orthographically projects
to a 3-Cube)



7D Projections

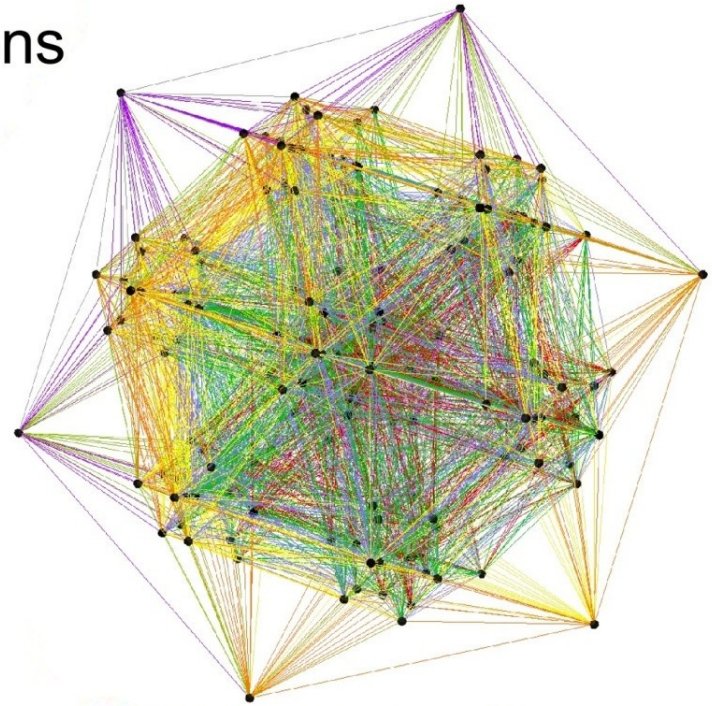
7-Orthoplex=7-Cube dual
Orthographically projects
to the Octahedron, facets
contain 6-Simplex



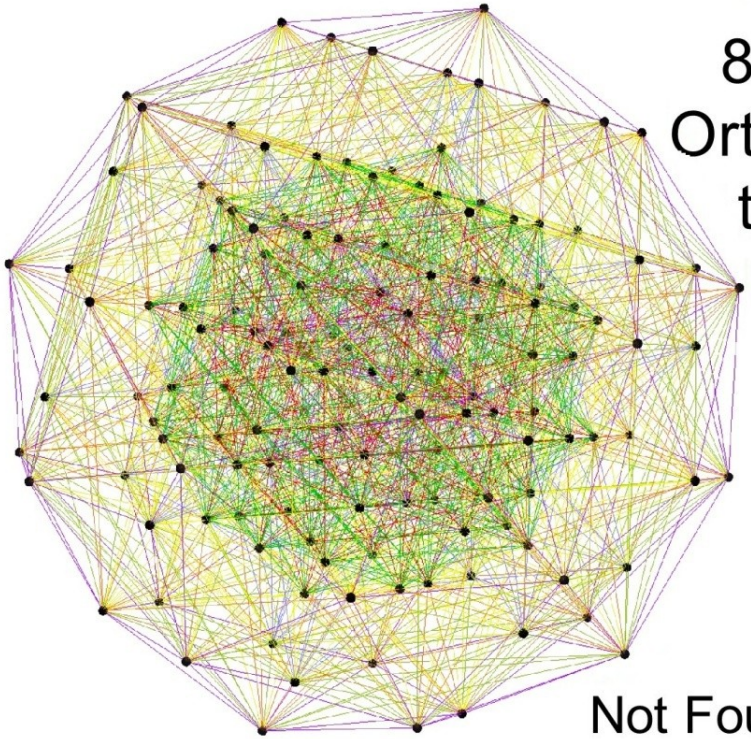
8D Projections

8D Perspective Projections

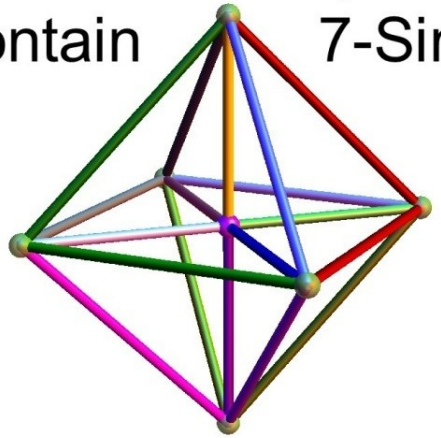
E8 in 6-Cube Golden Ratio projection



Same as above in Orthographic Projection



8-Orthoplex=8-Cube dual Orthographically projects to the Octahedon, facets contain 7-Simplex



Not Found in E8: 8-Cube, 8-Simplex