E8 Cohomology and Physics

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Cohomology structure of E8 represents realistic E8 Lagrangian Physics
as described in http://vixra.org/abs/1602.0319

Weyl Symmetric Polynomial Degrees N of E8:

2, 8, 12, 14, 18, 20, 24, 30 and their product = | Weyl Group of E8 |
and their sum = | Weyl Reflections | + 8

(N-1 = 1, 7, 11, 13, 17, 19, 23, and 29 = exponents
are all relatively prime to E8 Coxeter Number = 30)

Topological Types (2N-1) of E8:

3, 15, 23, 27, 35, 39, 47, 59

center = Z1 = 1 = trivial

The cohomology structure of E8 describes the base manifold spacetime
and the gauge bosons and ghosts and the first-generation fermions
(second and third fermion generations are not fundamental, but are emergent)
of a realistic Lagrangian (see viXra 1602.0319 and 1701.0495 and 1701.0496).

E8 = 3 + 15 + 23 + 27 + 35 + 39 + 47 + 59 = 248

E8 has a maximal subalgebra D8 whose cohomology structure is

D8 3 7 11 15 15 19 23 27 = 120 = 28 + 28 + 64

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D8 represents Gauge Bosons+Ghosts and 8x8 Spacetime

D4 Gravity Gauge Bosons

3 7 3 3
and Standard Model Ghosts 4 8
together make up a D4 subalgebra of D8:

D4grav 3 7 7 11 = 28

D4 Standard Model Gauge Bosons

8 4
and Gravity Ghosts 3 3 7 3
together make up another D4 subalgebra of D8:

D4stdmod 11 7 7 3 = 28

8x8 Spacetime is represented by
D8 / D4 x D4 = 64 = 8dim momentum x 8dim position

4 4 4 12 16 24 = 64

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E8 / D8 represents 248 - 120 = 128 components for 8dim Spacetime of
8 first-generation fermion particles and 8 first-generation antiparticles:

Fermions 8 12 12 20 20 24 32 = 128

Here is more detail about E8 Cohomology structure of Fermions:

Fermions have 8 Spacetime components - Octonion Basis = 1 i j k E I J K

8F = 8 Fermion Types = e rUq gUq bUq n rDq gDq bDq
4Fe = 4 Electron Fermion Types = e rUq gUq bU
4Fn = 4 Neutrino Fermion Types = n rDq gDq bDq
Fp = Fermion particle
Fap = Fermion antiparticle

Fermions	8	12	12	20	20	24	32	= 128
1 x 8Fp	8							
ijk x 8Fp						24		
EIJK x 8Fp		12			20			
1ijk x 8Fap			12	20				
EIJK x 8Fap							32	

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Here is more detail about E8 Cohomology structure of 8x8 Spacetime = 8x8DST

The 8x8 is physically 8 momentum x 8 position of 8-dim Octonionic Spacetime.
The Octonion Basis elements represent 8 momentum components
of each M4 x CP2 position.

Octonion Basis = 1 i j k E I J K x M4 x CP2 Kaluza-Klein

8x8DST	4	4	4	12	16	24	= 64
1 x M4	4						
1 x CP2		4					
E x CP2			4				
ijk x M4				12			
EIJK x M4					16		
ijkIJK x CP2						24	

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References:

Mimura and Toda, “Topology of Lie Groups, I and II”, AMS 1991
Humphreys, “Reflection Groups and Coxeter Groups”, Cambridge 1990
Kane, “The Homology of Hopf Spaces”, North-Hoilland 1988