Beyond Higgs: Physics of the Massless Phase

Frank Dodd (Tony) Smith,Jr. - 2013 vixra 1303.0166

At Temperature / Energy above 3 x 10^15 K = 300 GeV:
the Higgs mechanism is not in effect so there is full ElectroWeak Symmetry and no particles have any mass from the Higgs.
Questions arise:

1 - Can we build a collider that will explore the Massless Phase ?

Page 2

2 - How did our Universe evolve in that early Massless Phase of its first 10^(-11) seconds or so ?

Page 3

3 - What do physical phenomena look like in the Massless Phase ?

A - ElectroWeak Particles behave more like Waves than Particles.

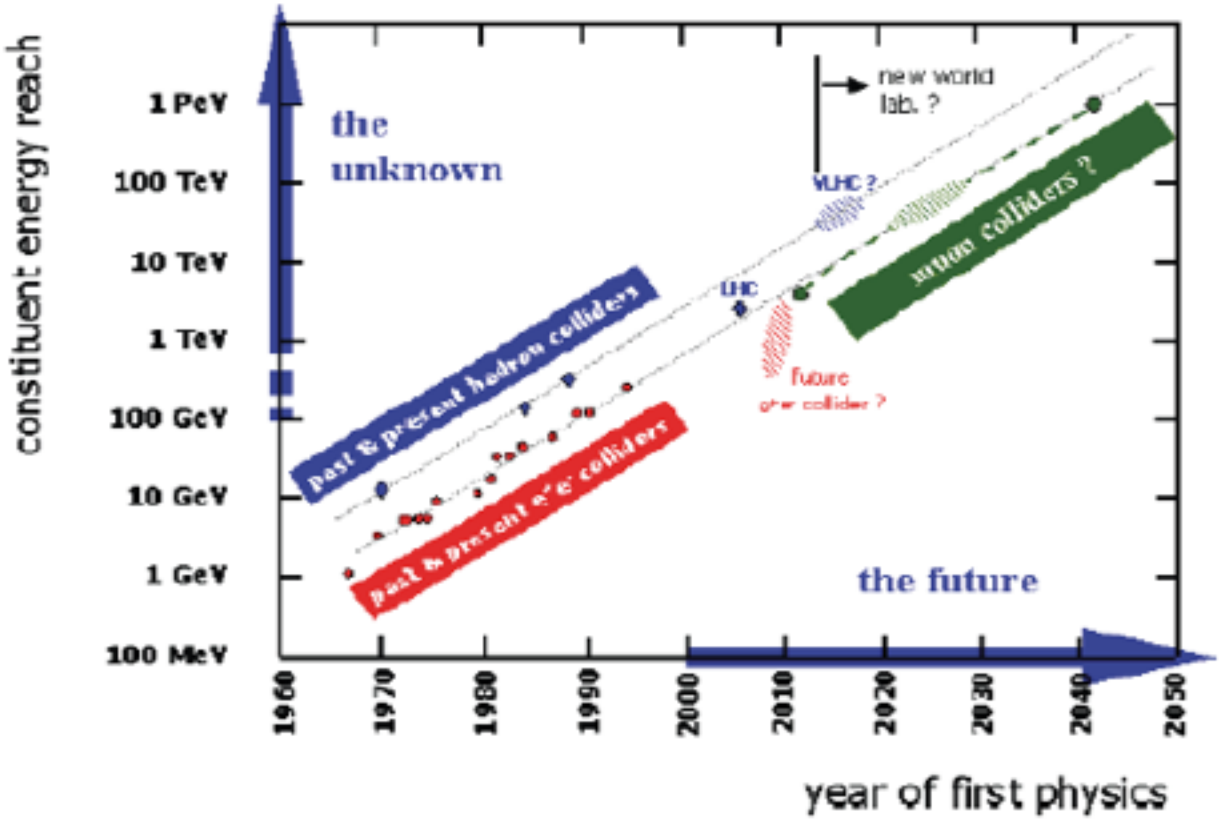
Page 5

B - Conformal Gravity Dark Energy whose GraviPhotons might be accessible to experiments using BSCCO Josephson Junctions.
I. E. Segal proposed a MInkowski-Conformal 2-phase Universe and Beck and Mackey proposed 2 Photon-GraviPhoton phases:
Minkowski/Photon phase locally Minkowski with ordinary Photons and weak Gravity.
Conformal/GraviPhoton phase with GraviPhotons and Conformal massless symmetry and consequently strong Gravity.

Page 6

1 - Can we build a collider that will explore the Massless Phase ?

Yes: In hep-ex00050008 Bruce King has a chart and he gives a cost estimate of



about $12 billion for a 1000 TeV (1 PeV) Linear Muon Collider with tunnel length about 1000 km. Marc Sher has noted that by now (late 2012 / early 2013) the cost estimate of $12 billion should be doubled or more. My view is that a cost of $100 billion is easily affordable by the USA as it is far less than the Trillions given annually since 2008 by the USA Fed/Treasury to Big Banks as Quantitative Easing to support their Derivatives Casino.

Science will advance AND non-Bankster people will get paying jobs.

2 - How did our Universe evolve in that early Massless Phase of its first 10^(-11) seconds or so ?

In the context of E8 Physics as described at vixra 1108.0027
our Universe began as a Quantum Fluctuation from a Parent Universe whereby
our Universe initially had Planck Scale Temperature / Energy
10^32 K = 1.22 x 10^19 GeV.
Its physics was then described by a Lagrangian with:

Gauge Boson term of 28-dimensional adjoint Spin(8)
that eventually produces 16-dim U(2,2) Conformal Gravity/Higgs
and the 12-dim SU(3)xSU(2)xU(1) Standard Model;

Fermion term of 8-dimensional half-spinor Spin(8)
corresponding to first-generation fermion particles and antipartices
(electron, RGB Up quarks; neutrino, RGB down quarks);

Base Manifold of 8-dimensional Octonionic Spacetime.

With respect to 8-dimensional Spacetime
the dimensionality of the Gauge Boson term is 28 x 1 = 28
and
the dimensionality of the Fermion term is 8 x 7/2 = 28
(see Weinberg's 1986 Dirac Memorial Lecture at page 88
and note that 7/2 + 7/2 + 1 = 8)
so
the E8 Physics Lagranigian is clearly Ultraviolet Finite at the Planck Scale due to Triality-based cancellations, an effective Subtle Supersymmetry.
Since the lower energy forms of E8 Physics are derived from
the Planck Scale Lagrangian, they also benefit from the cancellations.

As Our Universe began to cool down below the Planck Scale
Inflationary Expansion started due to Octonionic Quantum Non-Unitarity
(see Adler's book "Quaternionic Quantum Mechanics ..." at pages 50-52 and 561).
Paola Zizzi describes the Octonionic Inflationary Era in terms of Clifford Algebras in gr-qc/0007006 and related papers. In short, the 64 doublings of Zizzi Inflation produce about 10^77 fermion particles.

At the End of Inflation Our Universe had Temperature / Energy
10^27 K = 10^14 GeV

A consequence of the end of Octonionic Inflation
was the freezing out of a preferred Quaternionic Subspace
so that 8-dim Octonionic Spacetime was converted into
(4+4)-dim Kaluza-Klein spacetime M4 x CP2
where M4 is Minkowski Physical 4-dim spacetime and
CP2 = SU(3) / SU(2)xU(1) is a Batakis 4-dim Internal Symmetry Space.
The geometry of that splitting of spacetime produces a Higgs mechanism.
(see Meinhard Mayer and A. Trautman in “A Brief Introduction to the Geometry of Gauge Fields” and“The Geometry of Symmetry Breaking in Gauge Theories”, Acta Physica Austriaca, Suppl. XXIII (1981))

Since each of the 10^77 fermions had energy of 10^14 GeV
collisions among them would for each of the 10^77 fermions
produce jets containing about 10^12 particles of energy 100 GeV or so
so that the total number of such particles is about 10^89.

According to Weinberg's book "Cosmology":
"... above 10^13 K, nucleons would not yet have formed from their three constituent quarks, and there would have been roughly as many quark-antiquark pairs in thermal equilibrium as photons ... before annihilation there must have been a slight excess ... of quarks over antiquarks, so that some quarks would survive to form nucleons when all the antiquarks had annihilated with quarks. There was also a slight excess of electrons over positrons, to maintain charge neutrality of the universe ...".
Therefore, in the interval
between **the End of Inflation** and **ElectroWeak Symmetry Breaking**
most of the quarks in 10^89 fermions formed quark-antiquark pairs that
produced as a condensate the Higgs that is needed for Mayer-Higgs.
The quark-antiquark condensate Higgs then

Breaks ElectroWeak Symmety at Temperature / Energy
3 x 10^15 K = 300 GeV

and gives mass to particles and at age 10^-(11) seconds
ends the Massless Phase of the history of Our Universe.

3 - What do physical phenomena look like in the Massless Phase ?

Two points of view are important:

ElectroWeak Particles and **Dark Energy Conformal Gravity**

ElectroWeak Particles:

The Weak Force Strength is 0.2535 x (1 / MW^2) = 1.05 x 10^(-5)
where MW is a Weak Boson Mass factor that goes away in the Massless Realm where the Weak Forcce becomes a strong 0.25345.

As to Kobayashi-Maskawa Weak Force mixing in the Massless Realm, Kea (Marni Sheppeard) proposed that in the Massless Realm the mixing matrix might be democratic which to me means that in the Massless Realm you might say that there is just a democratic mixing matrix of the form 1/3 x

1 1 1
1 1 1
1 1 1

with no complex terms and no CP violation in the Massless Realm.

With no mass terms, the structure of particle interactions would be based on the Wave Picture instead of the Particle Picture. Instead of a particle with mass moving slower than light the picture is a massless particle moving at light speed with its energy defined by its frequency.

In that picture, for example, a Muon is distinguishable from an electron by higher frequency due to the 2-fold 4+4 path of second generation fermions instead of simple 4 path of first generation fermions.

Quark wave paths have S7 x RP1 structure whose greater complexity produces higher frequency than Lepton wave paths.

Bound structures (Hadrons, Mesons, Nuclei, Atoms, etc) are based on standing wave frequencies instead of masses of particles, nuclei, etc.

Conformal Gravity Dark Energy:

I. E. Segal proposed a MInkowski-Conformal 2-phase Universe
and
Beck and Mackey proposed 2 Photon-GraviPhoton phases:

Minkowski/Photon phase locally Minkowski with ordinary Photons and
Gravity weakened by 1 / (M_Planck)^2 = 5 x 10^(-39).

so that we see Dark Energy as only 3.9 GeV/m^3

Conformal/GraviPhoton phase with GraviPhotons and Conformal symmetry
(like the massless phase of energies above Higgs EW symmetry breaking)
With massless Planck the 1 / M_Planck^2 Gravity weakening goes away
and the Gravity Force Strength becomes the strongest possible = 1
so Conformal Gravity Dark Energy should be enhanced by M_Planck^2
from the Minkowski/Photon phase value of 3.9 GeV/m^3.

The Energy Gap of our Universe as superconductor condensate spacetime
is from
from 3 x 10^(-18) Hz (radius of universe) to 3 x 10^43 Hz (Planck length)
and
its RMS amplitude is 10^13 Hz = 10 THz = energy of neutrino masses =
= critical temperature Tc of BSCCO superconducting crystals.

Neutrino masses are involved because their mass is zero at tree level
and their masses that we observe come from
virtual graviphotons becoming virtual neutrino-antineutrino pairs.

BSCCO superconducting crystals are by their structure natural Josephson
Junctions. Dark Energy accumulates (through graviphotons) in the
superconducting layers of BSCCO.

Josephson Junction control voltage acts as a valve for access to the
BSCCO Dark Energy, an idea due to Jack Sarfatti.

In E8 Physics Dark Energy comes from the Conformal/GraviPhoton phase. The geometry of the Conformal Sector is closely related to the Penrose Paradise of Twistors. Yu. Manin in his 1981 book "Mathematics and Physics" said: "... In a world of light there are neither points nor moments of time; beings woven from light would live "nowhere" and "nowhen" ... the whole life history of a free photon [is] the smallest "event" that can happen to light. ...".

Here is how the Conformal/GraviPhoton phase of Gravity works:
The Lorentz Group is represented by 6 generators

```
 0    J1   J2   M1
-J1   0    J3   M2
-J2  -J3   0    M3
-M1  -M2  -M3   0
```

There are two ways to extend the Lorentz Group:
(see arXiv gr-qc/9809061 by Aldrovandi and Peireira):
to the Poincare Group of Minkowski Space with No Cosmological Constant of the Minkowski/Photon phase where ordinary Photons usually live by adding 4 generators

```
 0    J1   J2   M1        A1
-J1   0    J3   M2        A2
-J2  -J3   0    M3        A3
-M1  -M2  -M3   0         A4

-A1  -A2  -A3  -A4        0
```

{A1,A2,A3} represent Momentum
and {A4} represents Energy/Mass of Poincare Gravity
and its Dark Matter Primordial Black Holes

and

to the semidirect product of Lorentz and 4 Special Conformal generators
to get a Non-Zero Cosmological Constant for Universe Expansion
of the Conformal/GraviPhoton phase where GraviPhotons usually live

0	J1	J2	M1	G1
-J1	0	J3	M2	G2
-J2	-J3	0	M3	G3
-M1	-M2	-M3	0	G4
-G1	-G2	-G3	-G4	0

so that {G1,G2,G3} represent 3 Higgs components
giving mass to 3 Weak Bosons
and {G4} represents massive Higgs Scalar as Fermion Condensate.
As Special Conformal and Scale Conformal degrees of freedom they also
represent the Momentum of Expansion of the Universe and Dark Energy.

One more generator {G5} represents Higgs mass of Ordinary Matter.
All 15 generators combine
to make the full Conformal Lie Algebra SU(2,2) = Spin(2,4) of
the universal Conformal Space with a Non-Zero Cosmological Constant
for Universe Expansion

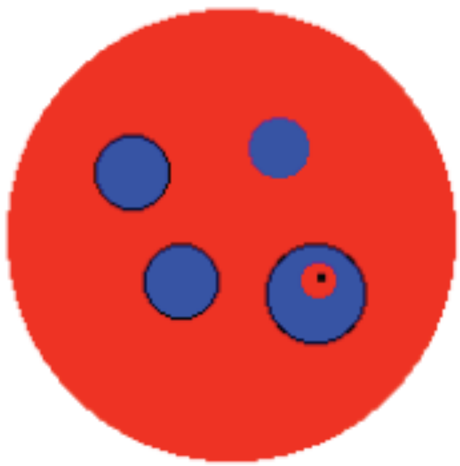
0	J1	J2	M1	G1	A1
-J1	0	J3	M2	G2	A2
-J2	-J3	0	M3	G3	A3
-M1	-M2	-M3	0	G4	A4
-G1	-G2	-G3	-G4	0	G5
-A1	-A2	-A3	-A4	-G5	0

10 generators in the 5x5 upper diagonal correspond to Dark Energy (DE)
the 4 upper generators of the 6th column correspond to Dark Matter (DM)
the 5th generator of the 6th column corresponds to Ordinary Matter (OM)

The basic 10 : 4 : 1 = 67 : 27 : 06 ratio of DE : DM : OM
has evolved over the history of Our Universe to its present value of

DE : DM : OM = 75 : 20 : 05 (rough evolution calculation)
DE : DM : OM = 73 : 23 : 04 (measured by WMAP)
DE : DM : OM = 69 : 26 : 05 (measured by Planck)

Rabindra Mohapatra in section 14.6 of his book "Unification and Supersymmetry" said:
"... we start with a Lagrangian invariant under full local conformal symmetry and fix its conformal and scale gauge to obtain the usual action for gravity ... the conformal d'Alembartian contains ... curvature ... R, which for constant ...
scalar field ... PHI, leads to gravity. We may call PHI the auxiliary field ...".
I view PHI as corresponding to the Higgs 3 Special Conformal generators {G1,G2,G3} that are frozen fixed during expansion in some regions of our Universe to become Gravitationally Bound Domains (such as Galaxies) like icebergs in an ocean of water.



Since the Gravitationally Bound Domains (such as our Inner Solar System) have no Expansion Momentum we only see there the Poincare Part of Conformal Gravity plus the Higgs effects of {G4} and {G5} and the ElectroWeak Broken Symmetry caused by freezing-out fixing {G1,G2,G3}:

0	J1	J2	M1	-	A1
-J1	0	J3	M2	-	A2
-J2	-J3	0	M3	-	A3
-M1	-M2	-M3	0	G4	A4
-	-	-	-G4	0	G5
-A1	-A2	-A3	-A4	-G5	0

Irving Ezra Segal in his book "Mathematical Cosmology and Extragalactic Astronomy" said: "... Minkowski space [is] the set of all 2 x 2 Hermitian matrices ... H(2)
...

$$(t,x,y,z) \to \begin{matrix} t + x & y + iz \\ y - iz & t - x \end{matrix}$$

...
universal [Conformal] space [is] the unitary 2 x 2 group, denoted by U(2) ...
[which corresponds to S1 x S3] by
...

$$(t,p) \to e^{(it)}\, u$$

where
[U(2) = U(1) x SU(2) and u is the point of SU(2) corresponding to p in S3]
...
[There is] a local causality-preserving transformation between
Minkowski [R1xR3] space ... and universal [Conformal RP1 x S3] space ...
...[with]... two-fold covering space S1 x S3 ... oo=fold covering R1 x S3
[the coverings may be considered equivalent in cosmology discussion]
...
Any element of [the 15-dimensional Conformal Group] SU(2,2) can be represented in the form

$$\begin{matrix} A & B \\ C & D \end{matrix}$$

where A, B, C, D are ... 2x2 matrices ...[with]... the standard action

$$U \to (AU + B) (CU + D)^{(-1)}$$

[of Linear Fractional Mobius Transformations on unispace U(2)]...
...
Maxwell's equations and the wave equation are conformally invariant
[so] the properties of solutions are basically independent of whether they are analyzed from a flat [Minkowski] or curved [Conformal] standpoint
...

the ... 15 ...[su(2,2)] generators of symmetries of [Conformal] unispace ...
differ from the 11 generators of ... transformations in Minkowski space
by terms of order 1 / R^2 , as R -> oo
... R being the radius of the universe [S3 in unispace Conformal U(2)]
...
the fundamental local dynamical variables of the chronometric [Conformal]
theory, energy, momenta, etc., differ from those of special relativistic
[Mikowski] field theory by terms of the order R^(-1) or less,
where R is the radius of the universe ... The square of the mass is ...
represented by the [Conformal] D'Alembartian ...[or]...
the Casimir operator for O(2,3) which differs from [the Conformal
D'Alembartian] only by terms of order R^(-1) ...".

Irving Ezra Segal in his paper for "Proceedings of the Summer Research Institute on the legacy of John von Neumann" (AMS 1990) said: "... The Einstein energy H [is] the
sum H0 + H1 of the conventional relativistic ... Minkowski energy H0
and the super-relativistic [Conformal Dark] energy H1. ...
H0 and H1 are respectively scale-covariant and scale-contravariant
i.e., transform like r and 1/r respectively.
... the decomposition H = H0 + H1 is Lorentz-covariant ..
H0 and H1 correspond to effective potentials of the form Lr and -G/r
where r is the Euclidean distance ...".

Aubert Daigneault and Atruro Sangalli in Notices of the AMS 48 (2001) 9-16 said: "...
Irving Ezra Segal ... proposed ... chronometric cosmology (CC) ...
conformal immersion of Minkowski space M = R x R3 ... into ... R x S3
... time coordinates x0 [flat Minkowski] and t [curved Conformal]
are related by ... x0 = 2r tan(t/2r)
from which the relation ... redshift ... z = tan^2(t/2r) may be derived ...
the curvature of space is the reason for the ... redshift ...
x0 tends to t as r tends to infinity. The ... differences ... can ... be
established from the series expansion of x0 in powers of t:

x0 = t + t^3 / (12r^2) + t^5 / (120r^4) + ...

... a cosmological constant ... /\ ...[is]... related
to the radius r of [the unispace Conformal] S3 by

r = /\^(-1/2)

...".

Christian Beck and Michael C. Mackey in astro-ph/0703364 said: "... Electromagnetic dark energy .... is based on a Ginzburg-Landau ... phase transition for the gravitational activity of virtual photons ... in two different phases:
gravitationally active [GraviPhotons] ...
and gravitationally inactive [Photons] ...
Let IPI^2 be the number density of gravitationally active photons ...
start from a Ginzburg-Landau free energy density ...

F = a IPI^2 + (1/2) b IPI^4

... The equilibrium state Peq is ... a minimum of F ... for T > Tc ...

Peq = 0 [and] Feq = 0

... for T< Tc

IPeqI^2 = - a / b [and] Fdeq = -(1/2) a^2 / b

... temperature T [of] virtual photons underlying dark energy ... is ..

h v = ln3 k T

... dark energy density ...[is]...

rho_dark = (1/2) (pi h / c^3) (v_c)^4

... The currently observed dark energy density in the universe of about 3.9 GeV/m^3 implies that the critical frequency v_c is ...

v_c = 2.01 THz

...
BCS Theory yields ... for Fermi energy ... in copper ... 7.0 eV
and the critical temperature of ... YBCO ... around 90 K ...

h v_c = 8 x 10^(-3) eV

... Solar neutrino measurements provide evidence fo a neutrino mass of about m_v c^2 = 9 x 10^-3 eV ...

[E8 Physics has first-order masses for the 3 generations of neutrinos as
1 x 10^(-3) and 9 x 10^(-3) and 5.4 x 10(-2) eV]

... in solid state physics the critical temperature is essentially determined by the energy gap of the superconductor ... (i.e. the energy obtained when a Cooper pair forms out of two electrons) ...
for [graviphotons] ... at low temperatures (frequencies) Cooper-pair like states [of neutrino-antineutrino pairs] can form in the vacuum ... the ... energy gap would be of the order of typical neutrino mass differences ...".

Clovis Jacinto de Matos and Christian Beck in arXiv 0707.1797 said: "...
Tajmar's experiments ... at Austrian Research Centers Gmbh-ARC ...
with ... rotating superconducting rings ... demonstrated ...
a clear azimuthal acceleration ... directly proportional to the
superconductive ring angular acceleration, and
an angular velocity orthogonal to the ring's equatorial plane ...
In 1989 Cabrera and Tate, through the measurement of the London
moment magnetic trapped flux, rekported an anomalous Cooper pair mass
excess in thin rotating Niobium supeconductive rings ...
A non-vanishing cosmological constant (CC) /\ can be interpreted in terms
of a non-vanishing vacuum energy density

rho_vac = (c^4 / 8 pi G) /\

which corresponds to dark energy with equation of state w = -1.
The ... astronomically observed value [is]... /\ = 1.29 x 10^(-52) [1/m^2] ...
Graviphotons can form weakly bounded states with Cooper pairs,
increasing their mass slightly from m to m' .
The binding energy is Ec = u c^2 :

m' = m + my - u

... Since the graviphotons are bounded to the Cooper pairs,
their zeropoint energies form a condensate capable of the
gravitoelectrodynamic properties of superconductive cavities. ...
Beck and Mackey's Ginzburg-Landau-like theory leads to a finite dark
energy density dependent on the frequency cutoff v_c of vacuum
fluctuations:

rho* = (1/2) (pi h / c^3) (v_c)^4

in vacuum one may put rho* = rho_vac from which the cosmological cutoff
frequency v_cc is estimated as

v_cc = 2.01 THz

The corresponding "cosmological" quantum of energy is:

Ecc = h v_cc = 8.32 MeV

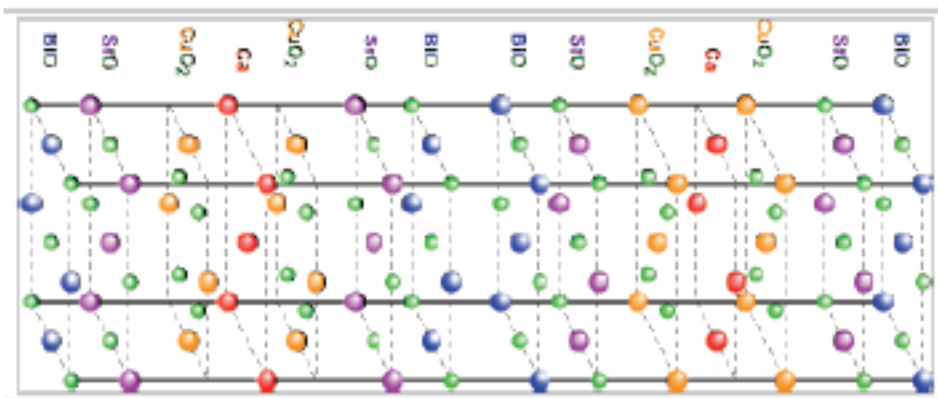
... In the interior of superconductors ... the effective cutoff frequency can be
different ... h v = ln 3 k T ... we find the cosmological critical temprature Tcc

Tcc = 87.49 K

This temperature is characteristic of the BSCCO High-Tc superconductor.
...".

Xiao Hu and Shi-Zeng Lin in arXiv 0911.5371 said: "... The Josephson effect is a phenomenon of current flow across two weakly linked superconductors separated by a thin barrier, i.e. Josephson junction, associated with coherent quantum tunneling of Cooper pairs. ... The Josephson effect also provides a unique way to generate high-frequency electromagnetic (EM) radiation by dc bias voltage ... The discovery of cuprate high-Tc superconductors accelerated the effort to develop novel source of EM waves based on a stack of atomically dense-packed intrinsic Josephson junctions (IJJs), since the large superconductivity gap covers the whole terahertz (THz) frequency band. Very recently, strong and coherent THz radiations have been successfully generated from a mesa structure of Bi2Sr2CaCu2O8+d single crystal ...[

BSCCO image from Wikipedia



]...

which works both as the source of energy gain and as the cavity for resonance. This experimental breakthrough posed a challenge to theoretical study on the phase dynamics of stacked IJJs, since the phenomenon cannot be explained by the known solutions of the sine-Gordon equation so far. It is then found theoretically that, due to huge inductive coupling of IJJs produced by the nanometer junction separation and the large London penetration depth ... of the material,

a novel dynamic state is stabilized in the coupled sine-Gordon system, in which +/- pi kinks in phase differences are developed responding to the standing wave of Josephson plasma and are stacked alternately in the c-axis. This novel solution of the inductively coupled sine-Gordon equations captures the important features of experimental observations.

The theory predicts an optimal radiation power larger than the one observed in recent experiments by orders of magnitude ...".

What are some interesting BSCCO JJ Array configurations ?

Christian Beck and Michael C. Mackey in astro-ph/0605418 describe
"... the AC Josephson effect ...
a Josephson junction consists of two superconductors with an insulator sandwiched in between. In the Ginzburg-Landau theory each superconductor is described by a complex wave function whose absolute value squared yields the density of superconducting electrons. Denote the phase difference between the two wave functions ... by P(t).
...
at zero external voltage a superconductive current given by Is = Ic sin(P) flows between the two superconducting electrodes ... Ic is the maximum superconducting current the junction can support.
...
if a voltage difference V is maintained across the junction, then the phase difference P evolves according to

d P / dt = 2 e V / hbar

i.e. the current ... becomes an oscillating curent
with amplitude Ic and frequency v = 2 e V / h
This frequency is the ... Josephson frequency ... The quantum energy h v ... can be interpreted as the energy change of a Cooper pair that is transferred across the junction ...".

Xiao Hu and Shi-Zeng Lin in arXiv 1206.516 said:
"... to enhance the radiation power in teraherz band based on the intrinsic Josephson Junctions of Bi2Sr2CaCu2O8+d single crystal ...
we focus on the case that the Josephson plasma is uniform along a long crystal as established by the cavity formed by the dielectric material. ...
A ... pi kink state ... is characterized by static +/- pi phase kinks in the lateral directions of the mesa, which align themselves alternatingly along the c -axis. The pi phase kinks provide a strong coupling between the uniform dc current and the cavity modes, which permits large supercurrent flow into the system at the cavity resonances, thus enhances the plasma oscillation and radiates strong EM wave ...
The maximal radiation power ... is achieved when the length of BSCCO single crystal at c-axis equals the EM wave length. ...".

Each long BSCCO single crystal looks geometrically like a line
so configure the JJ Array using BSCCO crystals as edges.

The simplest polytope, the Tetrahedron, is made of 6 edges:
Feigelman, Ioffe, Geshkenbein, Dayal, and Blatter in cond-mat/0407663 said:
"... Superconducting tetrahedral quantum bits ...

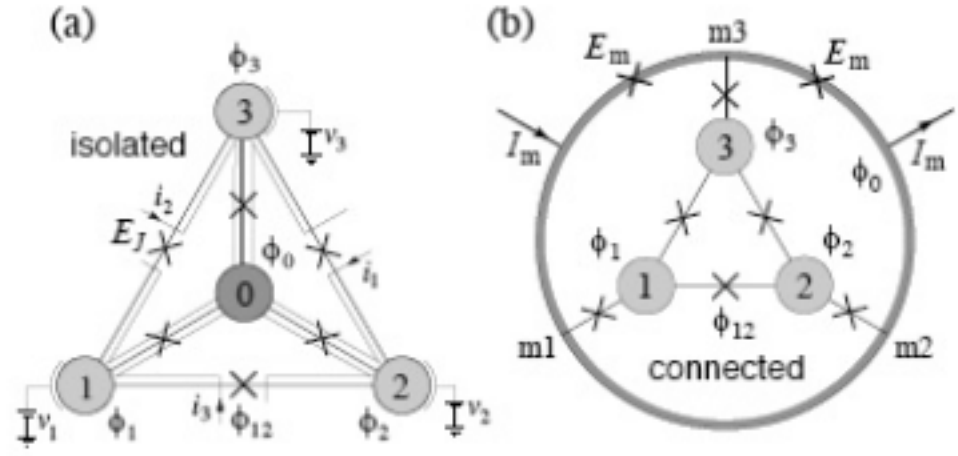
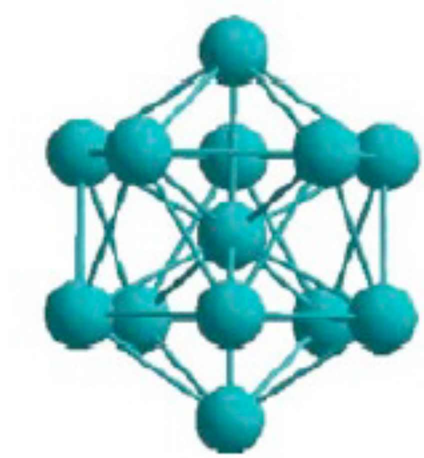


FIG. 1: (a) Tetrahedral superconducting qubit involving four islands and six junctions (with Josephson coupling E_J and charging energy E_C); all islands and junctions are assumed to be equal and arranged in a symmetric way. The islands are attributed phases ϕ_i, $i = 0, \ldots, 3$. The qubit is manipulated via bias voltages v_i and bias currents i_i. In order to measure the qubit's state it is convenient to invert the tetrahedron as shown in (b) — we refer to this version as the 'connected' tetrahedron with the inner dark-grey island in (a) transformed into the outer ring in (b). The measurement involves additional measurement junctions with couplings $E_{\mathrm{m}} \gg E_J$ on the outer ring which are driven by external currents I_{m} (schematic, see Fig. 6 for details); the large coupling E_{m} effectively binds the ring segments into one island.

... tetrahedral qubit design ... emulates a spin-1/2 system in a vanishing magnetic field, the ideal starting point for the construction of a qubit. Manipulation of the tetrahedral qubit through external bias signals translates into application of magnetic fields on the spin;
the application of the bias to different elements of the tetrahedral qubit corresponds to rotated operations in spin space. ...".

42 edges make an Icosahedron plus its center

(image from Physical Review B 72 (2005) 115421 by Rogan et al)

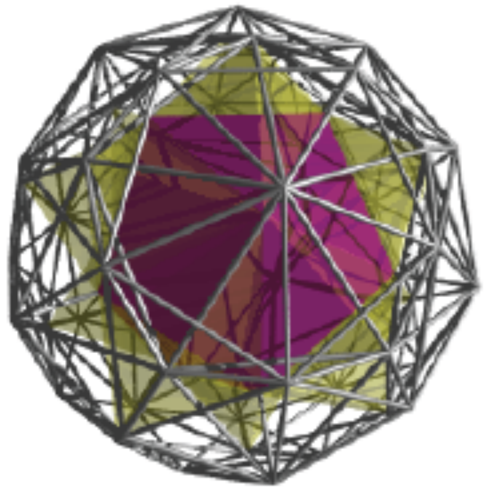


with 30 exterior edges and 12 edges from center to vertices.
It has 20 cells which are approximate Tetrahedra in flat 3-space but become exact regular Tetrahedra in curved 3-space.

Could an approximate-20Tetrahedra-Icosahedron configuration of 42 BSCCO JJ tap into Dark Energy so that the Dark Energy might regularize the configuration to exact Tetrahedra and so curve/warp spacetime from flat 3-space to curved 3-space ?

720 edges make a 4-dimensional 600-cell

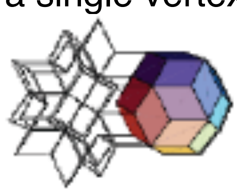
(image from Wikipedia)



At each vertex 20 Tetrahedral faces meet forming an Icosahedron
which is exact because the 600-cell lives on a curved 3-shere in 4-space.
It has 600 Tetrahedral 3-dim faces and 120 vertices

Could a 600 approximate-Tetrahedra configuration of 720 BSCCO JJ
approximating projection of a 600-cell into 3-space
tap into Dark Energy so that the Dark Energy might regularize
the configuration to exact Tetrahedra and an exact 600-cell
and so curve/warp spacetime from flat 3-space to curved 3-space ?

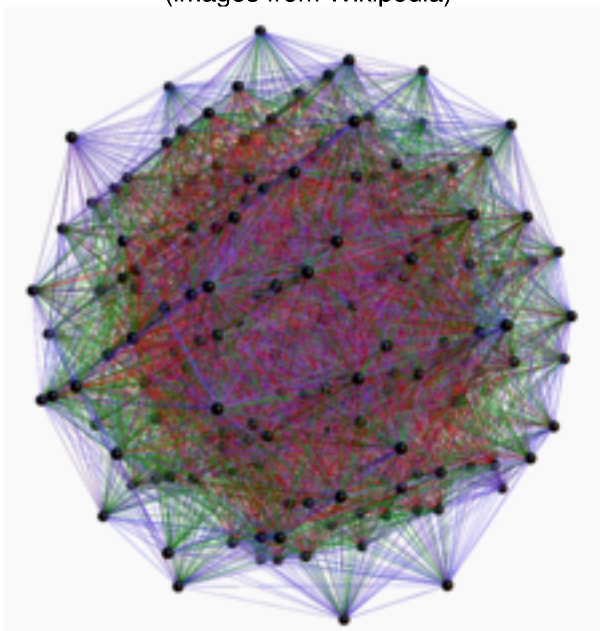
If one vertex of the 600-cell is put at its 3-sphere North Pole and another at its South Pole, then the Equator Section is a 30-vertex Icosidodecahedron whose dual polytope is the 32-vertex Rhombic Triacontahedron which is made up of 20 Golden Rhombohedra (10 Sharp and 10 Flat) and fits into the concave face of a Rhombic Hexacontahedron made up of 20 Sharp Golden Rhombohedra sharing a single vertex

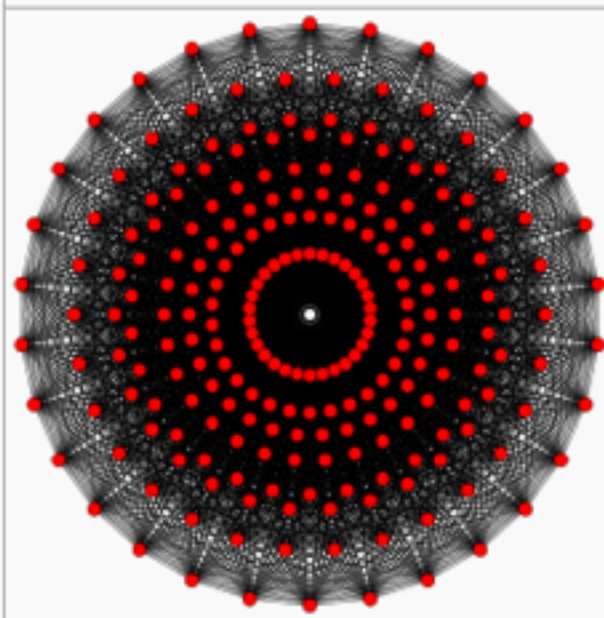
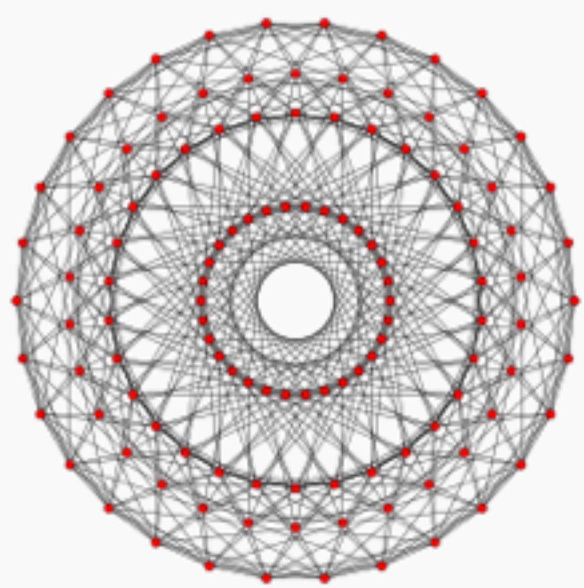


Klee Irwin is working on projections of the 4-dimensional 600-cell
into 3-space QuasiCrystal structures that might be relevant
in designing useful configurations of BSCCO JJ.

6720 edges make an 8-dimensional Witting 4_21 Polytope

(images from Wikipedia)



E8/H4 Coxeter planes	
E_8	H_4
	
4_{21}	600-cell

Wikipedia said "... The 4_21 is related to the 600-cell by a geometric folding of the Coxeter-Dynkin diagrams. This can be seen in the E8/H4 Coxeter plane projections. The 240 vertices of the 4_21 polytope are projected into 4-space as two copies of the 120 vertices of the 600-cell, one copy smaller than the other [by the Golden Ratio] with the same orientation. Seen as a 2D orthographic projection in the E8/H4 Coxeter plane, the 120 vertices of the [larger] 600-cell are projected in the same four rings as seen in the 4_21. The other 4 rings of the 4_21graph ... match ... the four rings of the ... smaller ... 600-cell.

...

The 4_21 ... is the vertex figure for a uniform tessellation of 8-dimensional space, represented by symbol 5_21

...

The vertex arrangement of 521 is called the E8 lattice ... the E8 lattice can ... be constructed as a union of the vertices of two 8-demicube honeycombs (called a D82 or D8+ lattice)

...

Each point of the E8 lattice is surrounded by 2160 8-orthoplexes and 17280 8-simplices. The 2160 deep holes near the origin are exactly the halves of the norm 4 lattice points. The 17520 norm 8 lattice points fall into two classes (two orbits under the action of the E8 automorphism group): 240 are twice the norm 2 lattice points while 17280 are 3 times the shallow holes surrounding the origin

...".

An E8 lattice represents an Integral Domain of the Octonions.
There are 480 Octonion Multiplications and
there are 7 E8 lattice Octonion Integral Domains.

The structures of E8 Physics (including Conformal Gravity Dark Energy) are naturally compatible with a 6720-edge configuration.

Klee Irwin is also working on projections of E8 lattices
into 3-space QuasiCrystal structures that might be relevant
in designing useful configurations of BSCCO JJ.