Dark Energy Warp Drive

Frank Dodd (Tony) Smith, Jr. - 2016 - viXra 1605.xxxx

Abstract

Gabriele U. Varieschi and Zily Burstein in arXiv 1208.3706 showed that with Conformal Gravity Alcubierre Warp Drive does not need Exotic Matter.

In E8 Physics of viXra 1602.0319 Conformal Gravity gives Dark Energy which expands our Universe and can curve Spacetime.

Clovis Jacinto de Matos and Christian Beck in arXiv 0707.1797 said "... based on the model of dark energy a proposed by Beck and Mackey ... assume... that photons ... can exist in two different phases:
A gravitationally active phase where the zeropoint fluctuations contribute to the [dark energy] cosmological constant Λ,
and a gravitationally inactive phase where they do not contribute to Λ.
... this type of model of dark energy can lead to measurable effects in supeconductors, via ... interaction with the Cooper pairs in the superconductor. ...
the transition between the two graviphoton's phases ... occurs at the critical temperature Tc of the superconductor, which defines a cutoff frequency of opoint fluctuations ...
Graviphotons can form weakly bounded states with Cooper pairs ...
[which] ... form a condensate ...[in]... superconduct[ors] ...
the cosmological cutoff frequency [could be measured] through the measurement of the spectral density of the noise current in resistively shunted Josephson Junctions ...".

Xiao Hu and Shi-Zeng Lin in arXiv 0911.5371 and 1206.516 showed that BSCCO superconducting crystals are natural Josephson Junctions.

A Pentagonal Dipyramid configuration of 16 BSCCO crystals cannot close in flat 3-dim space, but can close if Conformal Dark Energy accumulated in the BSCCO Josephson Junctions curves spacetime. Such spacetime curvature allows construction of a Conformal Gravity Alcubierre Warp Drive that does not need Exotic Matter.

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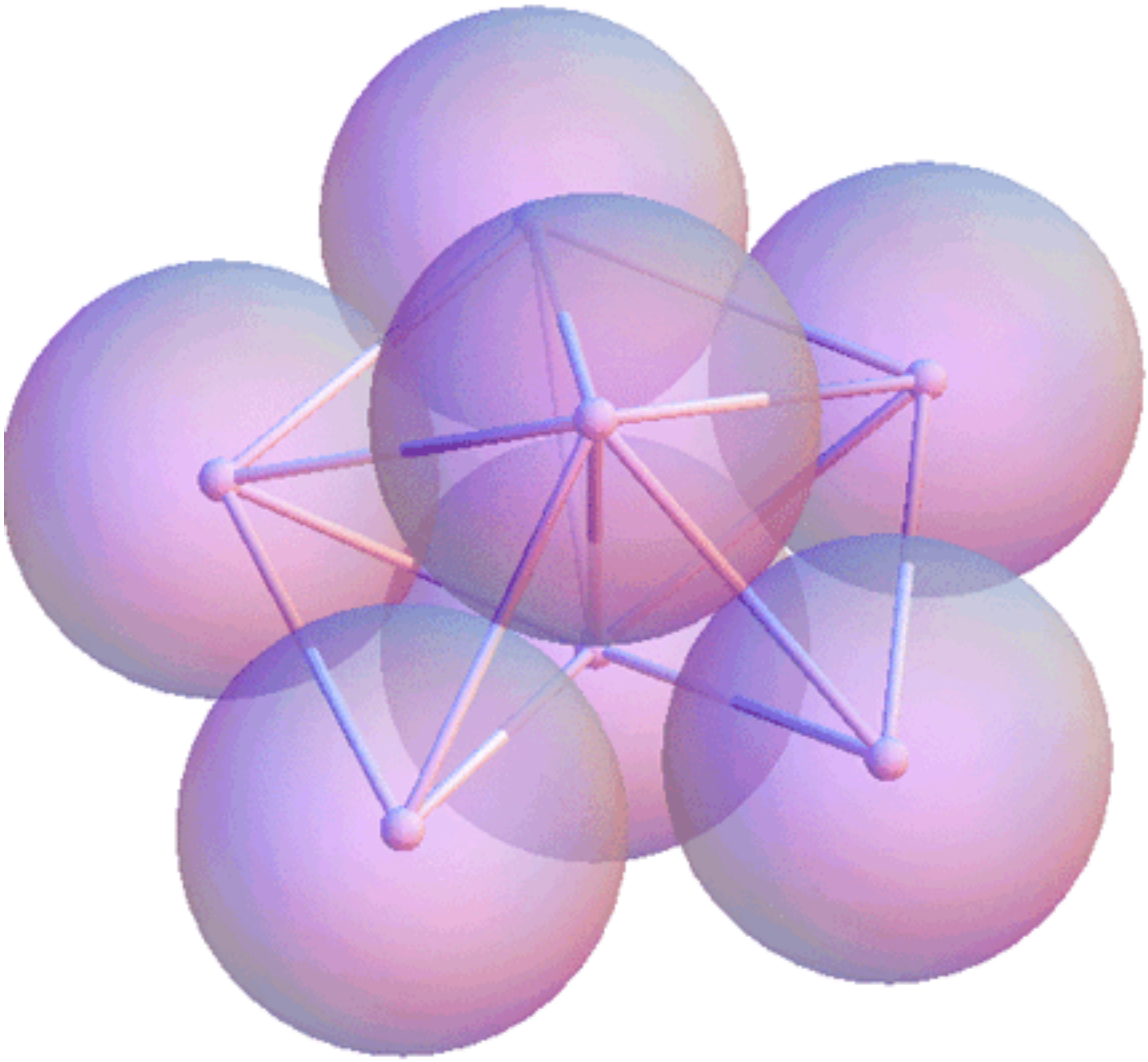
Geometry of 16-element Alcubierre Warp Drive

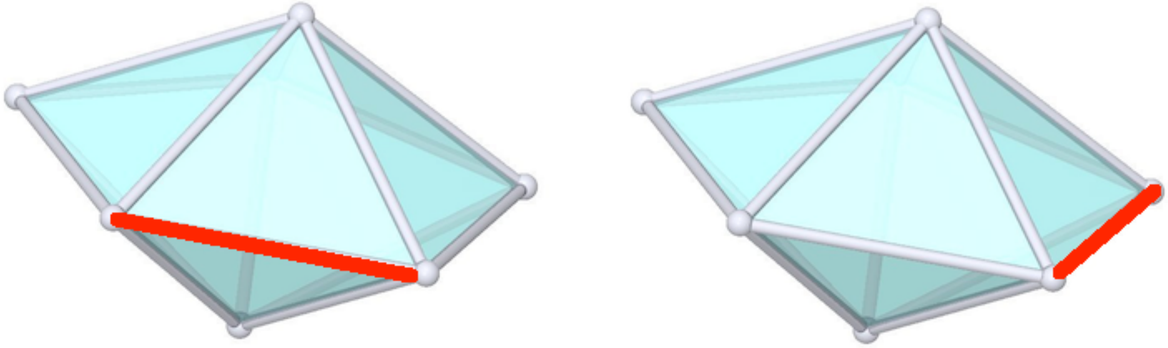
“... If you spend any time playing with Geomag models,
you are sure to stumble upon the structure ...



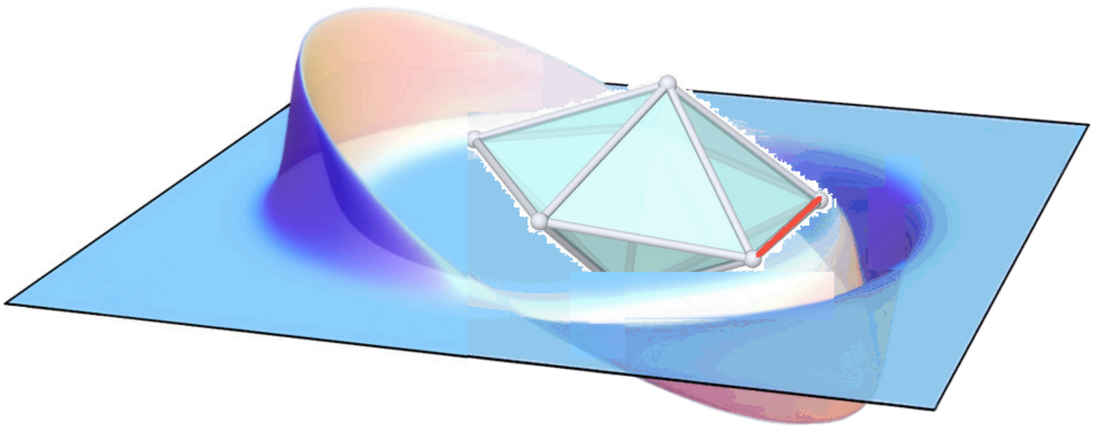
... which consists of four tetrahedra joined along faces. It looks as if you might be able to add one more bond to close the gap, creating a solid of five joined tetrahedra. But it doesn’t work. The gap is slightly too wide. ...” (bit-player.org/2012/dancing-with-the-spheres)

To close the 7.36 degree gap,
you can contract space in the tetrahedron containing the gap,
keep unchanged the space in the other 4 tetrahedra, and
expand space just outside the structure and opposite to the gap tetrahedron.

In these images (from simplydifferently.org/Present/Data/Johnson_Solid/13.jpg)



the red edge designates two of the choices of which tetrahedron contains the gap
and
in this image (from Wikipedia on Alcubierre drive)



the structure is shown with space contracting in front of the gap tetrahedron and expanding behind the structure.

"... Alcubierre drive (Wikipedia) ... Rather than exceeding the speed of light within a local reference frame, **a spacecraft would traverse distances** by
contracting space in front of it and expanding space behind it,
resulting in effective faster-than-light travel ... the Alcubierre drive shifts space around an object so that the object would arrive at its destination faster than light would in normal space ...".

The Alcubierre Warp Drive (by John G. Cramer, Alternate View Column AV-81)
"... General relativity does not forbid faster-than-light [FTL] travel or communication, but it does require that the local restrictions of special relativity must apply ... One example of this is a wormhole connecting two widely separated locations in space ... by transiting the wormhole the object has traveled ...[at]... an effective speed of ...[many]... times the velocity of light.

Another example of FTL in general relativity is the expansion of the universe itself. As the universe expands, new space is being created between any two separated objects. The objects may be at rest with respect to their local environment and with respect to the cosmic microwave background, but the distance between them may grow at a rate greater than the velocity of light. According to the standard model of cosmology, parts of the universe are receding from us at FTL speeds, and therefore are completely isolated from us

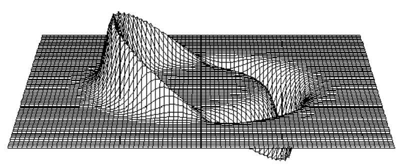
...

Alcubierre has proposed a way of beating the FTL speed limit that is somewhat like the expansion of the universe, but on a more local scale. He has developed a "metric" for general relativity ... that describes a region of flat space surrounded by a "warp" that propels it forward at any arbitrary velocity, including FTL speeds. Alcubierre's warp is constructed of hyperbolic tangent functions which create a very peculiar distortion of space at the edges of the flat-space volume. In effect, new space is rapidly being created ... at the back side of the moving volume, and existing space is being annihilated ... at the front side of the moving volume.

Thus,

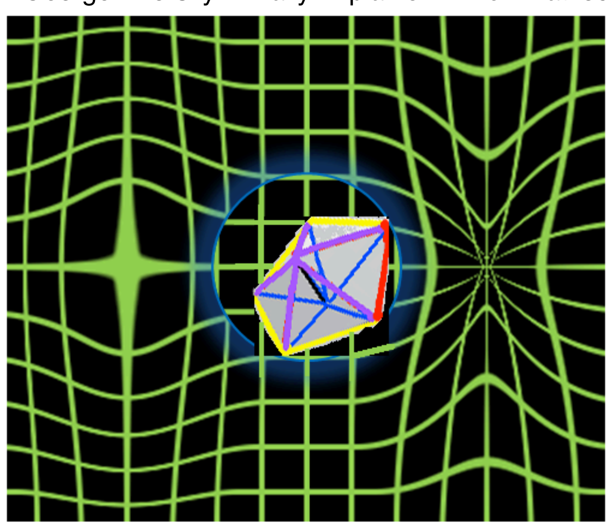
a space ship within the volume of the Alcubierre warp (and the volume itself) would be pushed forward by the expansion of space at its rear and the contraction of space in front.

Here's a figure from Alcubierre's paper showing the curvature of space ...



... Since a ship at the center of the moving volume of the metric is at rest with respect to locally flat space, there are no relativistic mass increase or time dilation effects. The on-board spaceship clock runs at the same speed as the clock of an external observer, and that observer will detect no increase in the mass of the moving ship, even when it travels at FTL speeds. Moreover, Alcubierre has shown that even when the ship is accelerating, it travels on a free-fall geodesic. In other words, a ship using the warp to accelerate and decelerate is always in free fall, and the crew would experience no accelerational gee-forces. Enormous tidal forces would be present near the edges of the flat-space volume because of the large space curvature there, but by suitable specification of the metric, these would be made very small within the volume occupied by the ship ...".

(image below from George Dvorsky in Daily Explainer 11/26/12 at io9.gizmodo.com)



Conformal Gravity and Alcubierre Warp Drive

Varieschi and Burstein in arXiv 1208.3706 said:
"... We present an analysis of the classic **Alcubierre metric based on conformal gravity**, rather than standard general relativity. The main characteristics of the resulting warp drive remain the same as in the original study by Alcubierre, namely that effective super-luminal motion is a viable outcome of the metric. We show that for particular choices of the shaping function, the Alcubierre metric in the context of conformal gravity **does not violate the weak energy condition**, as was the case of the original solution. In particular, the resulting warp drive **does not require the use of exotic matter**. Therefore, if conformal gravity is a correct extension of general relativity, super-luminal motion via an Alcubierre metric might be a realistic solution, thus allowing faster-than-light interstellar travel ...".

Varieschi and Burstein worked with Philip D. Mannheim's theory of Conformal Gravity that is based on the conformal Weyl tensor,
rather than I. E. Segal's theory based on the 15-dimensional conformal group Spin(2,4) = SU(2,2) that is used in the Conformal Gravity of E8 Physics,
but the Mannheim and Segal Conformal Gravities seem to be equivalent with respect to the physics of a Dark Energy Alcubierre Warp Drive.
Penrose and Rindler, in volume 1 of "Spinors and Space-Time" (Cambridge 1986) say, at page 355:
"... A flat-space theory which is Poincare invariant
and also conformally invariant in this [Weyl-type] sense,
will be invariant under the [Segal-type] 15-parameter conformal group [SU(2,2)].
This is because the Poincare motions of Minkowski space become conformal motions according to any other conformally rescaled flat metric. Conformal motions obtainable in this way are sufficient to generate the full conformal group. ...".

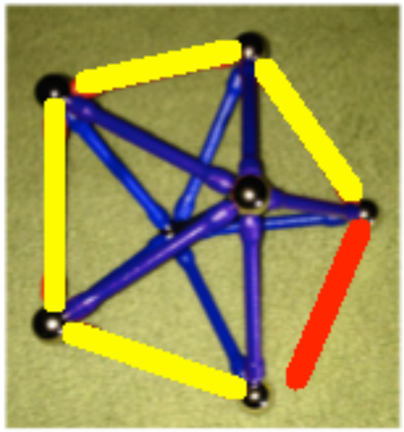
"... Alcubierre drive (Wikipedia) ... **Within the framework of conformal gravity ... the Alcubierre metric does not violate the weak energy conditio**n for particular spacetime shapes, and hence al
faster-than-light travel would not require exotic matter ...".

In E8 Physics Conformal Gravity produces Dark Energy

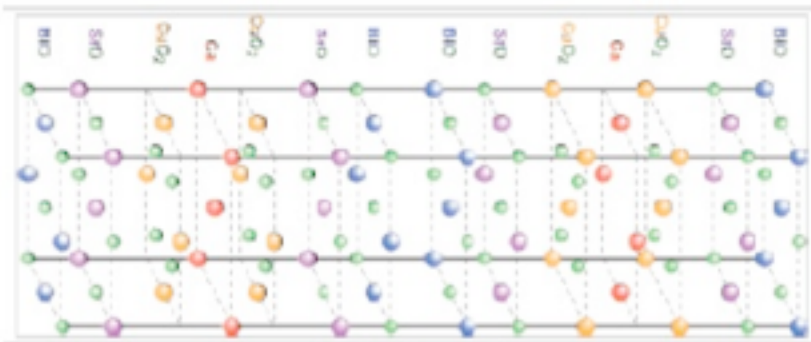
and

Dark Energy can be harnessed by Configurations of Josephson Junctions to Curve Spacetime and Expand and Contract Space to produce an Effective Alcubierre Warp Drive.

The 16-edge BSCCO Josephson Junction configuration
is a simple tool to observe and control Dark Energy.



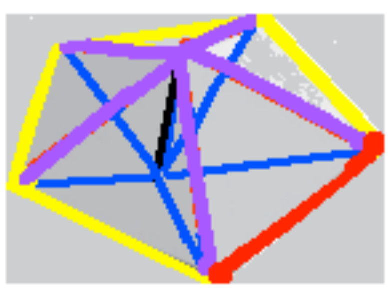
According to the ideas of Beck and Mackey (astro--ph/0703364) and
of Clovis Jacinto de Matos (arXiv 0707.1797)
the superconducting Josephson Junction layers of the 16 BSCCO crystals



(BSCCO image from Wikipedia)

will bond with Dark Energy GraviPhotons that are expanding our Universe.

Dark Energy GraviPhotons do not like
being configured as edges of an incomplete configuration in our flat 3D space
so they will use their Dark Energy to make all 5 tetrahedra to fit together exactly
by curving our flat space (and space-time).



Dark Energy Graviphotons will be able to do that because their strength will not be weakened by the (1 / M_Planck)^2 factor that makes ordinary gravity so weak.

Conformal Dark Energy, 2-Phase Universe, and Josephson Junctions

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

Gravity and Dark Energy come from the 15-dimensional Spin(2,4) Conformal Group, which is made up of:

3 Rotations
3 Boosts
4 Translations
4 Special Conformal transformations
1 Dilatation

Dark Energy comes from the 10 Rotation, Boost, and Special Conformal generators.
Dark Matter Primordial Black Holes come from the 4 Translation generators which define 4-dim physical spacetime and its curvature.
Ordinary Matter comes from the 1 Dilatation generator for Higgs mass.

The two phases are:

Conformal/GraviPhoton phase from the Dark Energy Special Conformal generators.
It has 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.
Minkowski/Photon phase from the Dark Matter Translation generators.
It is 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

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 current 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 ...".

P A Warburton of University College London in EPSRC Grant Reference: EP/D029783/1, "Externally-Shunted High-Gap Josephson Junctions: Design, Fabrication and Noise Measurements", starting1 February 2006 and ending 31 January 2009 with £ Value: 242,348 said:

"... around 70% of the energy in the universe is in the form of gravitationally-repulsive dark energy. This dark energy is not only responsible for the accelerating expansion of the universe but also was the driving force for the big bang. A possible source of this dark energy is vacuum fluctuations which arise from the finite zeropoint energy of a quantum mechanical oscillator, hf/2 (where f is the oscillator frequency). …

dark energy may be measured in the laboratory using resistively-shunted Josephson junctions (RS-JJ's). Vacuum fluctuations in the resistive shunt at low temperatures can be measured by non-linear mixing within the Josephson junction. If vacuum fluctuations are responsible for dark energy, the finite value of the dark energy density in the universe sets an upper frequency limit on the spectrum of the quantum fluctuations in this resistive shunt. Beck and Mackey calculated an upper bound on this cut-off frequency of 1.69 THz. …

We therefore propose to perform measurements of the quantum noise in RS-JJ's fabricated using superconductors with sufficiently large gap energies that the full noise spectrum up to and beyond 1.69 THz can be measured. … Cuprate superconductors have an energy gap an order of magnitude higher than ... around 2.5 THz ... experiments ... would give ... confirmation (or ... refutation) of the vacuum fluctuations hypothesis. ...".

Neutrinos give Dark Energy density Josephson Junction Cutoff

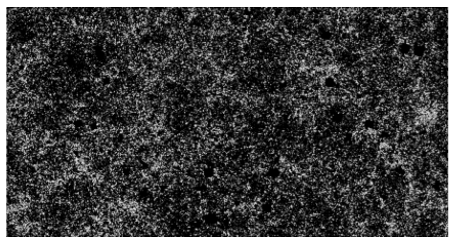
Beck and Mackey in astro-ph/0406504 said "... We predict that **the measured spectrum in Josephson junction experiments must exhibit a cutoff at the critical frequency nu_c** ... [corresponding to the observed Dark Energy density 0.73 x critical density = 0.73 x 5.3 GeV/m^3 = 3.9 GeV/m^3]... If not, the corresponding vacuum energy density would exceed the currently measured dark energy density of the universe. ... The energy associated with the computed cutoff frequency nu_c ...[about 1.7 x 10^12 Hz]... E_c = h nu_c = (7.00 ± 0.17) x 10^(-3) eV ...
coincides with current experimental estimates of neutrino masses. ...".

If Josephson Junction frequencies were to be experimentally realized up to 2 x 10^12 Hz, then, if the photon vacuum fluctuation energy density formula were to continue to hold, the vacuum energy density would be seen to be 0.062 x (20/6)^4 = about 7 GeV/m^3 which exceeds the total critical density of our universe now.
To avoid such a divergence being physically realized, **neutrinos should appear in the vacuum at frequencies high enough that E = h nu exceeds their mass of about 8 x 10^(-3) eV, or at frequencies over about 1.7 x 10^12 Hz**

Dark Energy Conformal Graviphotons and BSCCO JJ superconductors

BSCCO Josephson Junction Arrays act as controllable superconductors.
As Beck and de Matos suggested in arXiv 0707.1797, superconductors are examples of Conformal Dark Energy Phases within the Gravitationally Bound Domain of our Inner Solar System. They said: "… this model can account simultaneously for the anomalous acceleration and anomalous gravitomagnetic fields around rotating superconductors measured by Tajmar et al. and for the anomalous Cooper pair mass in superconductive Niobium, measured by Cabrera and Tate …[Effectively]… gravitationally active photons obtain mass in the superconductor …".

On a large scale (billions of light years), Gravitationally Bound Domains are traced out by **Galaxies and Clusters of Galaxies** (similar images in Universe 4ed Kaufmann Freeman 1994)



so the the white dots **would be the Gravitationally Bound Domains like rigid pennies on an expanding balloon, or rigid raisins in an expanding cake. The black background would be the Universe's Conformal Expanding Domain.**

Clovis Jacinto de Matos and Christian Beck in arXiv 0707.1797 said:
"... A non-vanishing cosmological constant (CC) Λ
can be interpreted in terms of a non-vanishing vacuum energy density

rho_vac = (c^4 / 8 pi G) Λ

which corresponds to dark energy with equation of state w = -1.
The ... astronomically observed value [is]... Λ = 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 = 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 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 ...".

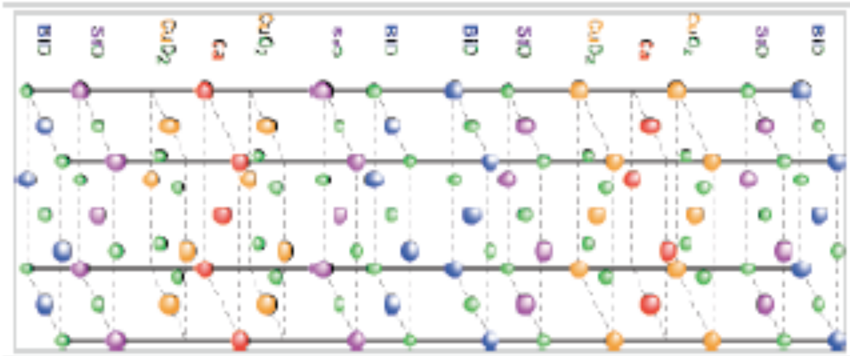
Xiao Hu and Shi-Zeng Lin in arXiv 1206.516 said:
"... to enhance the radiation power in teraherz band based on the intrinsic Josephson Junctions of Bi2Sr2CaCu2O8+d single crystal ... we focus on the case that the Josephson plasma is uniform along a long crystal as established by the cavity formed by 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. ...".

BSCCO superconducting crystals are natural Josephson Junctions.
Josephson Junction control voltage acts as a valve for access to BSCCO Dark Energy. (an idea due to Jack Sarfatti)

Dark Energy accumulates in the superconducting layers of BSCCO.
Dark Energy expands Spacetime of our Universe
and also expands Spacetime of the BSCCO.

BSCCO crystal Configurations in Josephson Junction Arrays

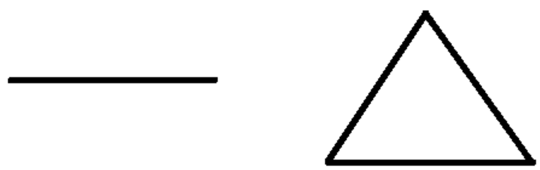
Each long BSCCO single crystal looks geometrically like a line



(BSCCO image from Wikipedia)

so configure JJ Arrays using BSCCO crystals as edges.

Dark Energy expansion of a 1-dim BSCCO edge or a 2-dim BSCCO triangle



or a 3-dim BSCCO tetrahedron is a uniform expansion of the configuration.
There is no distortion of Spacetime (only a scale dilation that is hard to measure).

Feigelman, Ioffe, Geshkenbein, Dayal, and Blatter in cond-mat/0407663 said:
"... Superconducting tetrahedral quantum bits ... 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. ...

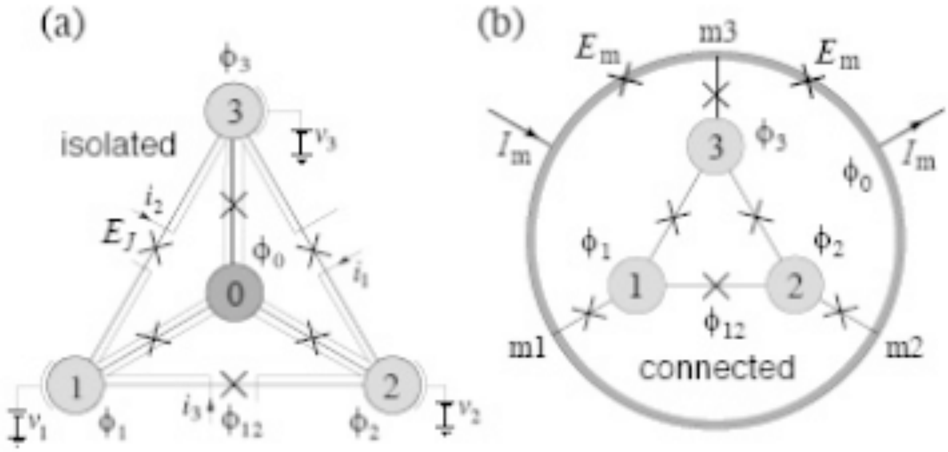
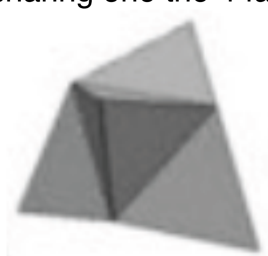


FIG. 1: (a) Tetrahedral superconducting qubit involving four islands and six junctions (with Josephson coupling E_J and charging energy E_C); all islands and junctions are assumed to be equal and arranged in a symmetric way. The islands are attributed phases ϕ_i, $i = 0, \ldots, 3$. The qubit is manipulated 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 $E_m \gg E_J$ 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.

...".

If you fit 5 tetrahedra with 4 each sharing one the 4 faces of the 5th,

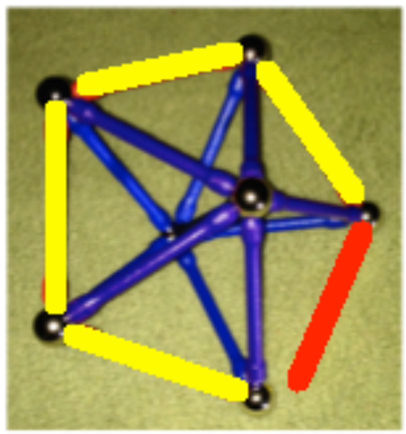


then you also have an exact fit and Dark Energy gives no distortion of Spacetime.

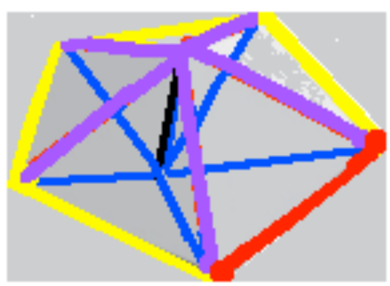
If you fit 5 tetrahedra all sharing a central edge, you do not get an exact fit

(image from Conway and Torquato PNAS 103 (2006) 10612-10617)

but there is a gap between 2 faces whose angle is 7.36 degrees.
Using 16 identical BSCCO Josephson Junction segments as edges
you can in flat 3-dim Space construct this configuration



The gap can be eliminated by Dark Energy Spacetime curvature
in which case the exact curved Spacetime configuration would have
1 central edge, 5+5 = 10 edges from central edge to perimeter, and 5 perimeter edges.
If the BSCCO Josephson Junctions collect enough Dark Energy to curve Spacetime
they can close the configuration in curved Spacetime



This 16-edge configuration is a simple example of constructing
a configuration that is incomplete in 3-dim space
but
can be completed by Dark Energy to a closed configuration in curved Spacetime.

Dark Energy Graviphotons will have enough strength to do that
because their strength will NOT be weakened by
the (1 / M_Planck)^2 factor that makes ordinary gravity so weak.