RESEARCH PAPER

Research Thesis On Quantum Gravity

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Quantum Gravitation in the Unified Field, the Age of the Universe and Supermassive Black Holes

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Abstract:

Recent analysis of data obtained by the James Webb Space Telescope (JWST) has found apparent discrepancies with the standard models in cosmology. Large galactic structures based on the understood coupling between White Hole Quasars and Black Hole Supermassive Black Holes (SMBH) at the center of
galaxies seem to have formed immediately following the creation event, commonly known as a Quantum Big Bang Cosmology (QBBC). As the age of cosmological structures cannot be greater than the age of the universe itself, many researchers and cosmologists have realised, that the standard cosmology needs reanalysis, modification and appropriate additions to the present models are expected and anticipated. Certain attempts to reformulate the cosmological standard models, such as revisiting 'tired light' models of Fritz Zwicky and the 'varying fundamental constant' hypotheses of Paul Dirac, have
resulted in varying models extending the age of the universe to about 20 (Gupta and Zwicky) and 26 (Gupta and Dirac) billion years, seemingly accommodating the new measurements of the JWST. The reintroduction of the 'tired light' and 'varying constant' proposals of Gupta are however incompatible with other well tested and accepted premises of the standard cosmology of the QBBC. This paper then will 'solve' the discrepancies observed in extending the present standard model of cosmology in exposing the short-comings of the QBBC, not in abandoning its basic assumptions and premises; but in deriving the age of the universe and its foundations of star- and galactic evolution from the initial- and boundary conditions of the creation event. It is shown that the accumulation of primordial micro black

holes to form bigger black holes, by coupling as energy sinks to quasar-white hole energy sources to ‘feed’ the source-sink seeded cores as galactic centers and active galactic nuclei. This is reversed in supermassive black hole seeds as a 0.25 percentage of a universal baryon mass seedling, coexisting in the creation event of the QBBC transiting across a Higgs vacuum from a time-spaced Planck parameter epoch to define the Big Bang Cosmology in the birth of space and time. This Planckian timespace can be associated with a multidimensional cosmology based on spacetime modular dualities described in a background independent supermembrane theory transforming into background dependent superstrings to trigger the creation event in the form of a Weylian wormhole, also modeled by Meijer’s Twin-Bipolaron gravity concept, exhibiting the properties of dark matter and dark energy in its dual nature derived from the modular string dualities. The observations of the JWST then indicate that the SMBHs created with the QBBC became a fraction of the universe’s mass content following a cosmic evolution not based on mass, but on temperature, until the universes’ temperature had cooled enough to attain saturation equilibrium between quantum entangled micro black holes and the SMBHs in a quantum tunneling through a time wall and not a barrier of space. The QBBC parameters then define this ‘time barrier’ in the inversion properties of the modular duality of supermembrane theory and as modeled by the Meijer Twin- bipolaron, as the agency for this quantum entanglement as a fifth elementary gauge boson interaction.

Contents:

Part 1: JWST Measurements, the Age of the Universe and Supermassive Black Holes

The standard approach to explain the Big Bang model is linked to the birth of space and time in concepts of space inflation and time instantaneity and manifesting upon a background independent multi-dimensional supermembrane spacetime quantization incorporating general relativity of spacetime curvature and generalized gravitation (Einstein GR). 11-dimensional supermembrane theory, (Witten M-Theory) then allows the emergence of a background dependency of 10-dimensional superstrings, which then bifurcate into bosonic integral-quantum spin 'force carriers' and fermionic half-integral quantum spin elementary particles like nucleons and electrons.

A multi-dimensional spacetime quantization then modifies the standard cosmology based on dark energy and dark matter supplementing the observed and measured particle background and matter distribution. The existence of Supermassive Black Holes (SMBHs), becomes a natural consequence in the QBBC, as the modular duality and scale inversion properties of M-Theory is built upon the quantum entanglement of Hawking Micro Black Holes MBH as primordial black holes with the SMBH boundaries of the cosmogenesis. The Age of the Universe is derived as 19.12 billion years, eliminating the many measurement and observation discrepancies discovered by the old standard model ignoring the multidimensional spacetime matrix.

In particular, the QBBC manifested a tripartite cosmological Lightpath topology oscillating between odd and even Hubble nodes made manifest at the inflaton as the birth of spacetime. This interwoven cosmology depicts a baryon matter core as a mass seedling Mo surrounded by a dark matter halo defined in the scale displacement of the baryon seedling at the even Hubble node from the odd Hubble node known as the Hubble event horizon in the cosmology of a thermodynamically expanding universe and is modelled on a Planck-Einstein Black Body Radiator.

The Baryon seedling at the QBBC constituted 2.803% of the closure mass MH and has grown to a measured 4.834% for the present time 19.12 billion years from the QBBC. The cosmic expansion of the baryon seedling then describes a gravitationally compressed de Sitter (dS) cosmology of self-closure and positive spacetime curvature and as enveloped by a dark matter sector to volumize the spacetime between the two Hubble nodes (RH=c/Ho). The dark matter region so describes a volumar of spacetime partially intersecting the baryon seed in positive curvature, but extending in negative curvature to the Hubble event horizon as a function of the Lightpath oscillating between the two nodes.

At the present time, this Lightpath has reflected in a fraction of 0.132712 from the normalized Hubble node separation modelled on a cycle-time/number n=Hot for a nodal Hubble constant Ho=dn/dt.

This 'déjà vu' return of the higher dimensional Lightpath so is approaching the expanding Baryon seed, which has reached a present n-coordinate of 0.5311 (see Fig. 1, and 10).

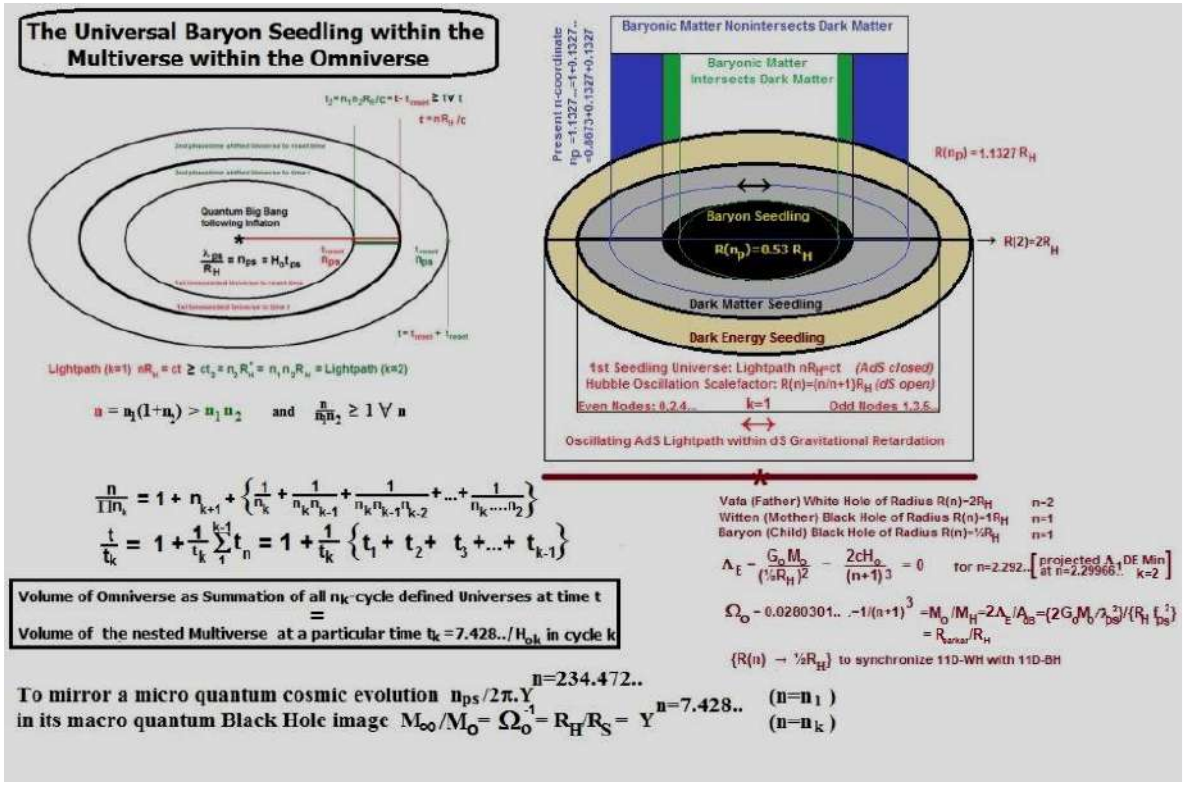

Figure 1: A tripartite nesting of Baryonic and Dark Matter bounded by a Dark Energy sector in a multidimensional cosmology.

A superposed mass evolution of the Baryon seed so will attain saturation for n=√2 or when the age of the universe will be 23.9 billion years for a baryon matter (BM) percentage of 5.54% with a dark matter (DM) fraction decreased to 22.00% from its present 27.434% in an open Anti de Sitter (AdS) hyperbolically curved cosmology. The dark energy (DE) completes the energy balance in 72.46% increased from its present value of 67.73%. The BM percentage then will remain constant with DE replacing DM until the minimized wormhole scale of the primordial wormhole has time evolved to its maximum value at the odd Hubble node of the inflaton for n=234.47 or 3.96 Trillion years and when BM=5.54% with DM=0.07% and DE=94.39% (see also **Fig. 10**).

The multiverse created from the seedling protoverse 16.9 billion years from the QBBC in the Lightpath intersecting the odd Hubble node to retrigger the original creation event, will then manifest as an evolved protoverse containing the prior cosmology in its holographic and holofractal properties in its quantum tunnelling through the nodal time wall and not some spacial barrier as modelled in the old cosmological standard models of physical reality (see **Fig. 2**).

The 1±0.132712 n-coordinate for the multidimensional Lightpath so defines a doubled 2.24 billion year interval for the present time to indicate an apparent age of the universe of 16.88-2.24=14.64 billion years and as indicated by various 'deep space' CBBR measurements of the Hubble constant as about 67-68 km/Mpc.s.

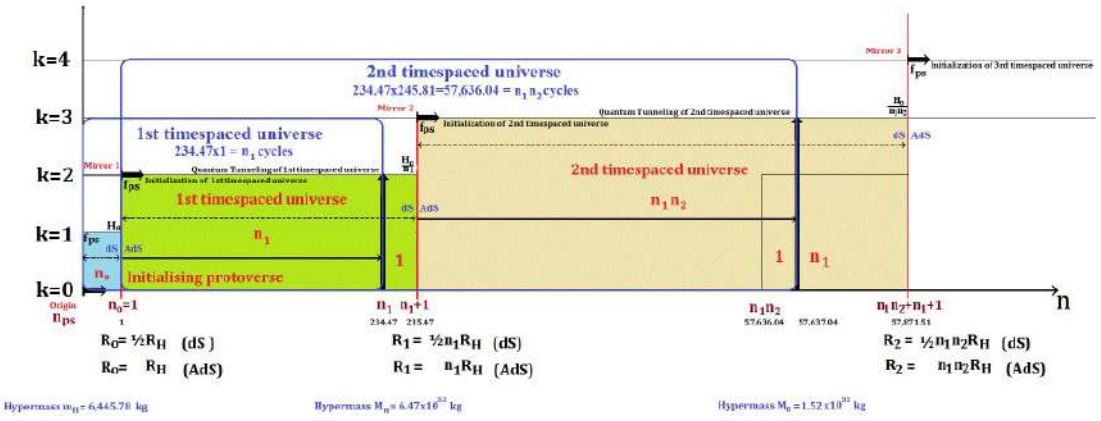

Figure 2: A multiverse created from the intersection of the AdS Lightpath with the inflationary odd nodal Hubble bound H_o

The oscillating Hubble node then can be described as a n-cycle quantized Standing Wave or Bohmian Pilot wave permeating a DM universe as the volumar between the two nodes in the AdS Lightpath of an open and negatively curved cosmology bounded however in an asymptotic approach of this Anti de Sitter Lightpath due to the gravitational retardation of the de Sitter closure of positive curvature.

The relationship between the true nodal Hubble constant H_o and an universal Hubble function $H(n,t) = H_o/T(n,t) = c/R(n,t)T(n,t)$ then derives from the scale factor 'a' used in a parametrization of the Friedmann-Walker-Robertson metric applied to Einstein's field equations of general relativity.

Defining $a=n/[n+1]$ for cosmic curvature radius $R(n,t) = nR_H/[n+1]$ calculates the recessional velocity $R(n,t)' = (dR(n)/dn)(dn/dt) = R_HH_o/[n+1]^2 = c/[n+1]^2$ with second derivative as the generic universal Milgröm-Verlinde deceleration $R(n,t)'' = -2cH_o/[n+1]^3$, the latter the Einstein quintessence form of DE as a 'cosmological constant' $\mathbf{\Lambda_E = G_oM_o/R(n,t)^2 - 2cH_o/[n+1]^3}$ in the overall energy-density balance of the multi-dimensional cosmology of the parallel Lightpath in the dS and the AdS curvatures (see also **Fig. 7**).

The universal Hubble function then becomes $H(n,t) = R(n,t)'/R(n,t) = \{c/[n+1]^2\}\{[n+1]/nR_H\} = H_o/T(n)$ with $T(n) = n[n+1]$. The Hubble constant H(n) so decreases in time as a function of the arithmetic summation of all integers $-\infty,\ldots,-n,\ldots,-3,-2,-1,0,+1,+2,+3,\ldots,+n,\ldots,+\infty$ and as $n[n+1] = T(n)$.

The nodal integral cycle time n for scale factor 'a' so can be denoted as an asymptotically limited sequence 0, ½, ⅔, ¾,…,99/100,….,a=n/[n+1] and where the asymptotic limit is the Hubble node $H_o/T(n) = H_o$ with $T(n)=1$ for the quadratic $n^2+n-1 = 0 = (n-X)(n-Y) = n^2- (X+Y)n + XY$ for the Fibonacci roots for a pentagonal Shechtmanite-Penrose fractal quantum geometry with $X=-½(1-\sqrt{5})$ and $Y=-½(1+\sqrt{5})$ in the Euler Identity $X+Y = XY = -1 = i^2 = \cos[\pi] + i\sin[\pi] = \exp[i\pi]$.

The asymptotic boundary of the dark matter universe encompassing the baryonic matter universe so becomes bounded above in the odd Hubble node separating the BM∩DM dS-AdS cosmology in the reflective higher dimensional Lightpath from the refractive continuation of this Lightpath in the dimensional membrane boundary defined in the 'area-surface-manifold' dimensions 2, 5, 8 and 11.

In particular the AdS continuation of Lightpath $R(n,t_{)AdS} = nR_H$ then forms the lower bound for the 4|5|6 volumar of Euclidean Minkowski spacetime nested within the 7|8|9 volumar of Penrose Twistor hyper-spacetime nested within the 10|11|12 volumar of Witten-Vafa quantum-spacetime.

The definition of the scale factor in General Relativity then substitutes for cycle number n in the Hubble Law $H(n,t) = R(n,t)'/R(n,t)$ as a Bohmian 'hidden variable' bounded by the Fibonacci quantum geometry.

The Hubble constant obtained by the measurement of cosmic parameters so can be theoretically derived as the universality of the dark matter universe separated from a dark energy universe without any dark matter at all and being then defined in the refracted AdS Lightpath of the Witten-Vafa supervolumars boundary as the 'outside' of the 11-dimensional supermembrane mirror cosmology.

This allows the Bohmian 'hidden variables' to become associated with the universal time epoch defining the Hubble law in the scale factor of GR.
Substituting $T(n) = n[n+1]$ with $T(a) = a[a+1] = \{n/[n+1]\}\{n/[n+1] + 1\} = [2n^2+n]/[n+1]^2$ in the universal Hubble law then gives $H(n) = [n+1]^2H_o/n[2n+1]$ for any cycle time coordinate in the DM-BM cosmology and as a Bohmian time Hubble constant decreasing over the temporal evolution of the universe in $n=H_ot$.

For the present n-cycle time of $n_p=1.132712$, the refractive AdS Lightpath nR_H so mirrors the reflective AdS Lightpath in $n_p'=0.867288$ in the odd and first Hubble node $H(X) = H_o/-XY = H_o$.
The Hubble values H(n): $\{0.61748H_o; 0.50000H_o; 0.41395H_o\}$ so decrease from the odd Hubble node minimum frequency H_o in AdS continuity and from the even Hubble node maximum frequency of the Weyl-Meijer twin bipolaron (TBP) with a global frequency $H_o/n_{ps} = H_oR_H/\lambda_{ps} = c/\lambda_{ps} = f_{ps} = f_{DETBP}$ and where the Hubble value would be $H_o/n_{ps}[n_{ps}+1] = H_o/\{6.255x10^{-49}(1+6.255x10^{-49})\} = f_{ps}^- = f_{DETBP}^-$.

Replacing the n-cycle coordinate by the scale factor of GR for the present time $t_p=n_p/H_o$ then calculates a Hubble constant measured by astronomical observations to yield a Doppler shifted cosmological redshift in the Bohmian pilot wave scenario and without any 'proper distance' expansion of the spacetime matrix itself; the latter having been established in the inflaton of the spacetime creation as the selfsame Bohmian Standing wave underpinning the spacetime dynamics of the unified field in the cosmological context of the Meijer TBP.

$H(n_p) = [n_p+1]^2H_o/n_p[2n_p+1] = 1.22972H_o = 2.309075x10^{-18}$ Hz or 71.32 km/Mpc.s in Hubble units and implying a value of $1/H(n_p) = 4.3307x10^{17}$ seconds as 13.7236 billion years as a upper bound for the Age of the universe, measured in the gravitationally retarded and decelerating dS cosmology.

Measurements by the Planck satellite of ESA, the European Space Agency over a number of years obtained the dark matter sector included value range for the Hubble parameter and measurements probing the relatively nearby universe obtained values for the Hubble parameter above the 70 km/Mpc.s range as applicable for a compressed spacetime without the dark matter sector (see **Fig. 4** and **5**).

Measuring the Hubble parameter within the compressed dS spacetime so will result in values greater than the value at the lower dimensional Hubble boundary. Those measurements will converge as a mean value relative to the compressed boundary value at a n-cycle coordinate of n=½ for the onset of the dark energy epoch in the multidimensional cosmology.

Values for the 'Hubble tension' for cosmological distance scales such as cepheid variable stars and SN1a supernovae, such as the SHOES and Baryon Oscillation Spectroscopic Survey BOSS and Baryonic Acoustic Oscillations BAO projects will converge to such a value range for a more proximate universe.
{Adam Riess, Tehran, 2021, Supernovae H_o for the dark energy Equation of State}.

[2103.01183] In the Realm of the Hubble tension $-$ a Review of Solutions (arxiv.org)

https://arxiv.org/abs/2112.04510

What's Happening with the Hubble Tension? - Graeme Addison (John Hopkins University) - YouTube

Using the value of the Hubble law at the odd Hubble as $H_o/2 = ½H_o$ for the input for the Bohmian Standing-Pilot wave as the midpoint of the Standing wave for a simultaneous forward Lightpath of the QBBC and the even Hubble node meeting the backward Lightpath from the odd Hubble node as the onset of the Dark Energy n-cycle coordinate, then calculates the lower bound for the age of the universe in $H(n,t)|_{dSDE} = H(n=½) = H_o/[½][1+½] = 4H_o/3 = 1.33333H_o = 2.5036374x10^{-18}$ [1/s]* or 77.39 km/Mpc.s for an age of the universe of $3.9942x10^{17}$ s or 12.6571 billion years.

A mean value of (71.37+77.39)/2 = 74.39 km/Mpc.s for an age of the universe of 13.190 billion years then confirms measurements of the Hubble constant for relatively nearby galaxies in a local context.

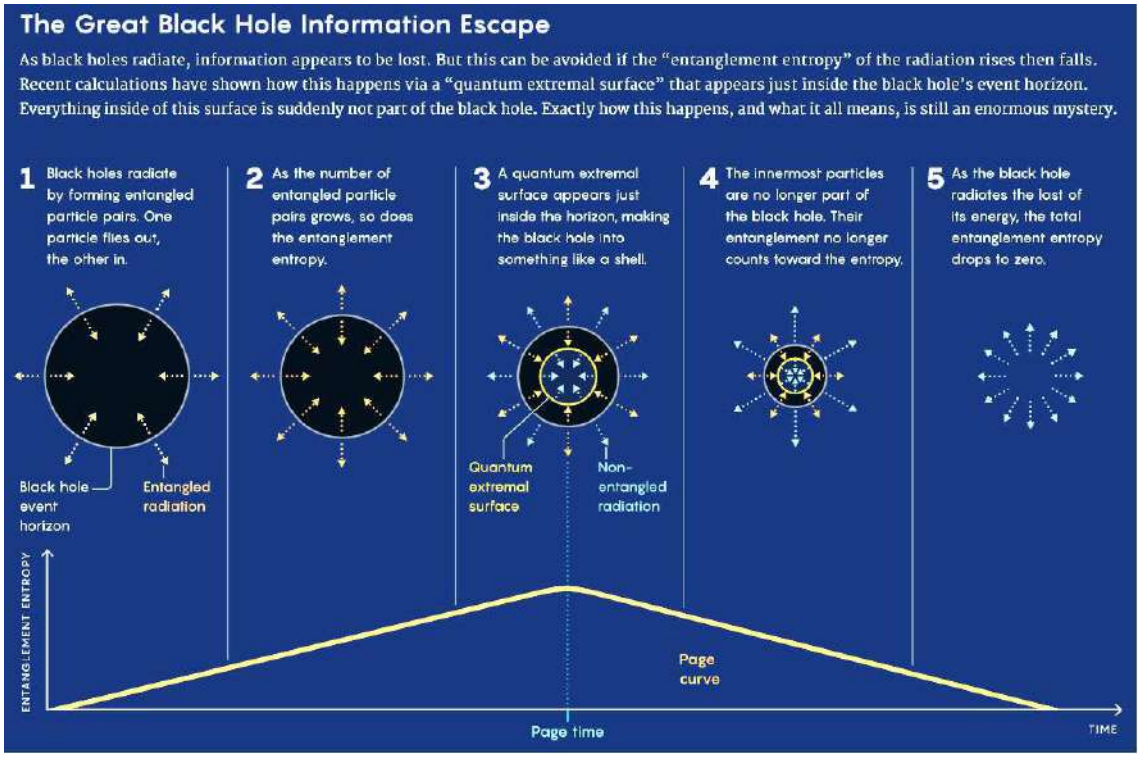

Figure 3: The Page time for the onset of dark energy at n∈[0.489365, 0.5] from an quantum extremal surface for a cosmological Doppler redshift of z=0.612

The image n-cycle time coordinate n_p'=0.867288 defines a corrected Hubble constant $H(n,t)|_{AdS} = H(n_{pAdS}) = H_o/(2-n_{present}) = H_o/0.867288 = 2.165057x10^{-18}$ [1/s]* or 66.92 km/Mpc.s in the dark matter universe for an age for the universe of $4.6188x10^{17}$ s or 14.6364 Billion years to adjust the dS measured values in the oscillating or cyclic AdS cosmology. This value then applies to the Planck collaboration measurements of the extended CBR cosmology.

A Page time interval is defined as a quantum extremal Hubble event horizon for n∈[0.489365, 0.5], (see **Fig. 3** and **6**) for the onset of dark energy as a function of the n cycle-time coordinate.

The Most Famous Paradox in Physics Nears Its End | Quanta Magazine

$H(n,t)|_{dSDE=0}$ = H(n=0.489365) = H_o/[0.489365][1.489365] = 1.3720374H_o = 2.57631305x10^{-18} [1/s]* or 79.63 km/Mpc.s for a universal age of 3.8815x10^{17} s or 12.300 billion years.

The entire dS-AdS n-cycle time interval from the Page Time of the onset of dark energy changing as a fraction of the total energy distribution from negative to positive from n=0.489365 to n=½ then is averaged for a mean value of (66.92+79.63)/2 = 73.275 km/Mpc.s or 13.468 billion years as the age of the universe as measured in the local galactic context and as illustrated in **Figures 4 and 5**.

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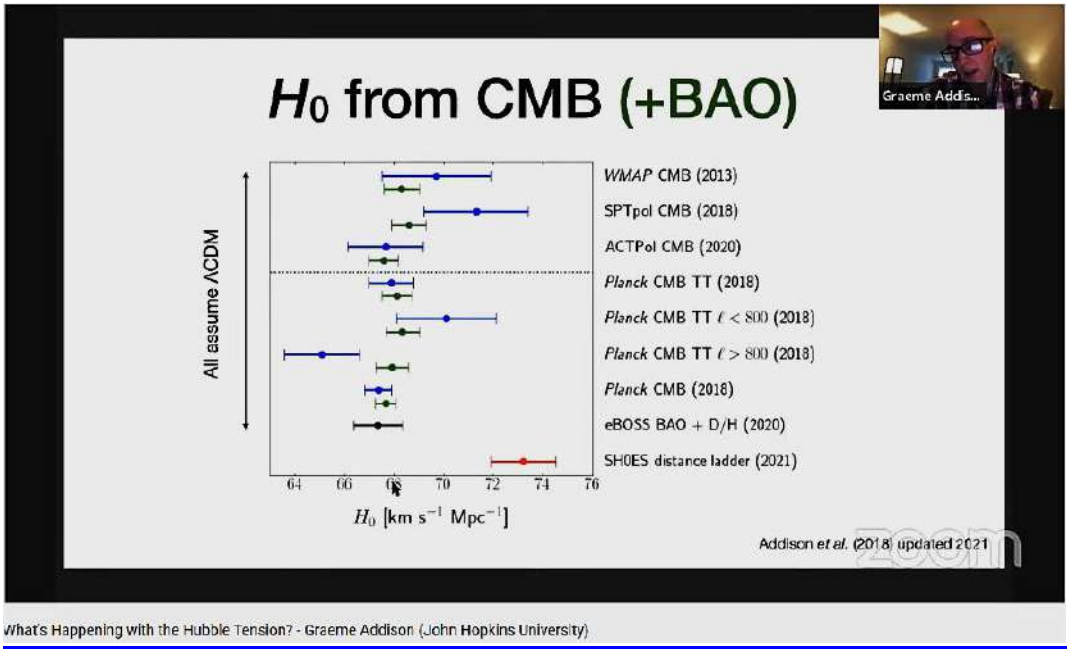


Figure 4: A Hubble Constant of 67.3 km/Mpc.s for the intergalactic CMR cosmic measurements (Planck)

Planck 2018 results - VI. Cosmological parameters | Astronomy & Astrophysics (A&A)(aanda.org)

The 'Hubble tension,' the statistically significant discrepancy between the Planck ESA data using the CMB cosmic background radiation and the measurements for nearby astrophysical phenomena in galaxies, stellar distance scales and supernovas analyzed to validate the necessity for DE and the mechanics for an accelerating expansion for the universe is further addressed in this and other links:

(PDF) The Accelerating Universe, Dark Energy & the Alpha Variation | Anthony P Bermanseder - Academia.edu

Prespacetime of QuantumDream, Inc. ; PSTJ Volume 10 Issue 6 (ISBN-10: 1694650332);

https://arxiv.org/abs/2112.04510

The dark energy is defined in the third part of the interwoven dS-AdS cosmology as the refracted Lightpath at the n=1 cycle-time coordinate. Adding the 'monopolar electromagnetic return' of 0.132712 to the odd Hubble node or Hubble event horizon of the $M_H=R_Hc^2/2G_o=\rho_{critical}V_H$ boundary for $M_{closure}$ (defined as a Strominger extremal Black Hole) and knowing the displacement of the Hubble nodes as 16.876 billion lightyears for $H_o = c/R_H$ = 5.32583x10^{17} s or 58.04 km/Mpc.s then gives the present dark energy defined age of the universe as cycle coordinate 1.132712… or 19.12 billion years.

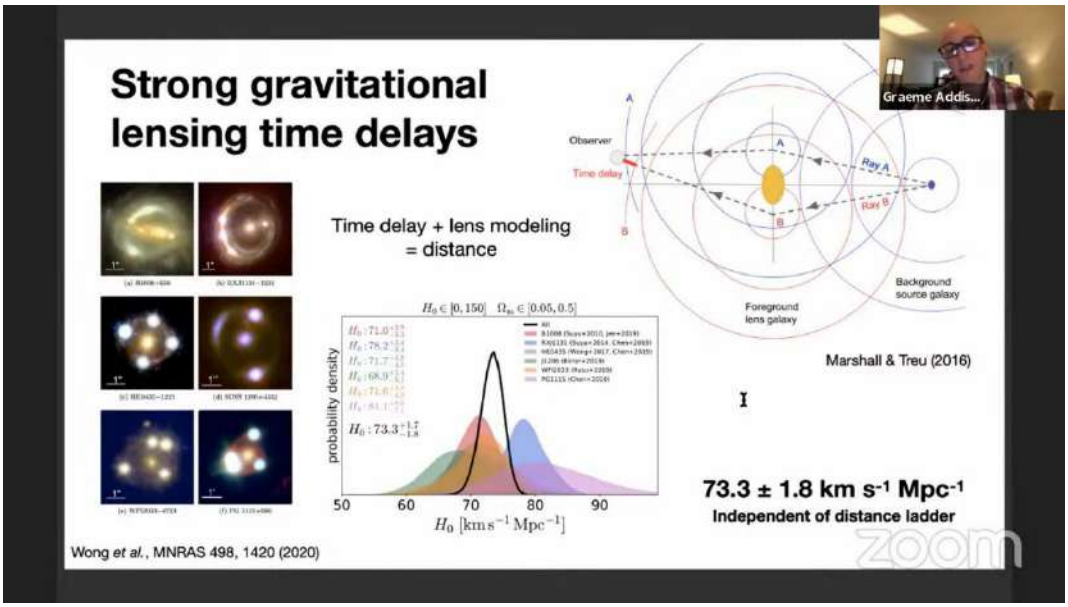


Figure 5: A Hubble Constant of 73.3 km/Mpc.s for local galactic measurements (SHOES, BOSS, BAO)

The Particle Hubble event horizon $\mathbf{R_P(n) = T(n)R_H = n(n+1)\ R_H}$ as the n-cycle time defined extent of the AdS lightspeed invariant multiverse then becomes the 'proper distance' calculation for a linearly expanding non-oscillating universe for an old standard model cosmology. For the present time the Hubble Particle horizon is calculated as 40.76 billion lightyears (see also **Fig. 10**).

The DE cosmology so resets the closure of the BM universe in birthing a multiverse parallel in time and not parallel in space to allow quantum tunneling of the baryon seed at a time when the micro black hole quantum entanglement with the SMBH bound of the QBBC apply their modular duality and mirror-inversion coupling to trigger a renewal of the total energy content contained within the original QBBC. This is defined in the displacement parameter of the inflaton separating the two Hubble nodes as minimum and maximum frequency values in the inversion property of time as linearized and angular frequency (see **Fig. 2**).

At the even node the maximum Hubble frequency is found as the instanton to trigger the tachyonic Lightpath of the inflaton with superluminal de Broglie matter phase wave speed $R_Hf_{ps}=4.79x10^{56}$ m/s and de Broglie matter phase wave acceleration $R_Hf_{ps}^2=1.44x10^{87}$ m/s^2.

This maximum nodal frequency can be defined in a number of ways, such as the Weyl wormhole frequency of the QBBC or the eigen value of the Meijer twin bipolaron in its DE nature of its self-expression as a unified field agent coupling dark matter and dark energy in quantum self-entanglement. At the QBBC, the wavelength of the twin bipolaron λ_{ps} as the wavelength of the Weyl wormhole of creation was in a closed string or membrane form linearizing in the creation event. By modular mirror and target space T-duality its inversion would reciprocate its maximum frequency high energy self-state in a minimum frequency self-state called a winding eigen state of low energy. The even Hubble node of $f_{ps}=c/\lambda_{ps}$ so mirrors itself in an intermediate Hubble node of $f_{ss}=1/c\lambda_{ss}=\lambda_{ps}/c$ for the inversion of displacement and time as a frequency unit under modular duality of M-Theory.

This intermediate node then must define the saturation and equilibrium boundary condition for the quantum entanglement between the MBH-SMBH coupling and is labelled as the Sarkar baryon seed coordinate in the Sarkar radius $R_{sarkar} = 2G_oM_o/c^2$ to define a 'Daughter Strominger BH' in between the odd Hubble node of the Hubble 'Mother Strominger BH' and the Twin Bipolaron QBBC wormhole at the even node. $M_{BH}/M_o = c^2\lambda_{ss}/2G_oM_o = \lambda_{ss}/R_{sarkar} = 10^{22}/4.479x10^{24} = 1/447.9 = 0.002233$, showing that 0.2233% or about ¼ of a percent of the total baryonic mass seed M_o of the creation event became immediately made manifest in the primary sourcesink (ps) of the Quasar-White Hole coupling to the secondary sinksource (ss) of the Black Hole duality. λ_{ss} here represents an inverted radial size for the size of the universe in its thermodynamic dS gravitationally compressed closure evolution calculated as 10^{22} metres or 1.056 million lightyears and so time paralleled or time shifted to the birth of time in the creation event. At that time, the temperature of the Cosmic Blackbody Background Radiation (CBBR) was 2935° Kelvin and the processes of baryogenesis and the formation of the first atomic structures could proceed in the universe becoming transparent to light and the transmission of electromagnetic radiation from it prior self-state of opaqueness (see **Table 1**).

The old cosmological standard model of primordial micro black holes coalescing and interacting gravitationally to form bigger black holes, who eventually enable quasars to supply the baryonic particle energy to seed the first galaxies for star formation so becomes reversed. It are the boundary supermassive black holes as a diminishing percentage of the baryon seed M_o, which are quantum entangled via the two Hubble nodes and which form gravitationally interacting vortex potential energy concentrations utilizing the dark matter form of the twin bipolaron to synergize with its dark energy or ZPE form within the tripartite structure of the new standard cosmology.

The Sarkar coordinate corresponds to a cosmological Doppler redshift interval from z=7.477 to z=5.015 and a time interval from 236.56 – 473.04 million years from the creation event, when the universe in its thermodynamic evolution had a temperature drop of 31.06° - 30.57° and had a radial size of G_oM_o/c^2 for 236.56 million lightyears expanding to $2G_oM_o/c^2$ or 473.12 million lightyears.

A deceleration parameter $q_o=M_o/2M_H= \Lambda_E/A_{dB}=0.014015$ then doubled gives the universal Omega of closure in $\Omega_o=M_o/M_H=2\Lambda_E/A_{dB}$ in the ratio of the Einstein 'Cosmological Constant' $\Lambda_E(n)$ as a quintessence applied to the de Broglie matter phase acceleration $\Lambda_E(n_{ps})=G_oM_o/\lambda_{ps}^2 - 2H_oc/[n_{ps}+1]^3$ to describe the creation event in the form of the dark energy as a balance between the baryon seed evolution and an inherent Milgröm-Verlinde deceleration of the cosmological constant as a varying quintessence (see **Fig. 7**).

The n-cycle coordinate for the inversion of the wormhole-bipolaron $\lambda_{ps}.\lambda_{ss}=1$ then effectively quantum tunnels or 'time-warps' the QBBC creation event of baryon seedling M_o onto the Sarkar coordinate in the time evolution of the universal Black Hole cosmology (see **Table 1**).
The $M_{BH}/M_o=1/447.9$ fraction of the SMBH distribution so is within the Sarkar interval as defined by the not inversed displacement scale of the $\lambda_{ss}=1/2\pi r_{ps}$ macro scaled inversion of the micro scaled $\lambda_{ps}=2\pi r_{ps}$ with $r_{ss}=1/r_{ps}=2\pi\lambda_{ss}$ to indicate the de-linearization or recircularization of the original quantum loop of the M_{BH} displacement scale inversion.

1.056 My/236.56 My = 1/224.02 > 1/447.9 < 1/448.03 = 1.056 My/473.12 My ~ $\lambda_{ss}c^2/2G_oM_o=M_{BH}/M_o$

A Quasar wall so manifested between 236.56 and 473.12 million years after the QBBC and is dated at 19.12 - 0.23656 = 18.88 billion years ago and 19.12 - 0.47312 = 18.65 billion years ago.

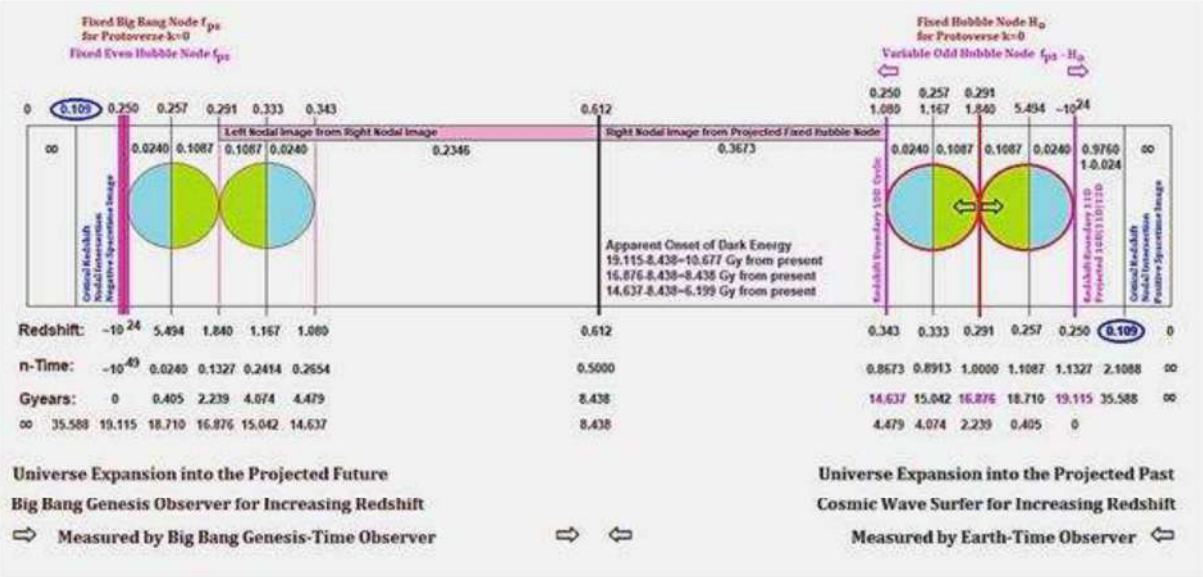


Figure 6: A Cosmological Redshift (z=0.612) Evolution of mirror time universal observers for DE onset

The baryonic matter seed M_o therefore created dark matter galaxies from supercluster seeds and 'great dark voids' in the Sarkar displacement scale based on the extent of the SMBH-Quasar coupling in the unified field. Understanding that there is no 'proper distance' lengthening the displacement coordinates in the expanding universe, which become boundary- and initial conditions in the Hubble nodes of the instanton-inflaton coupling at the QBBC; this Quasar wall defines an actual displacement of the first galaxies at the Sarkar scale of the cosmology.

JWST so observes this Quasar wall in a time period 236.56 to 473.12 billion years after the creation event; such as the oldest galaxy observed to date (February 2024) in JADES-GS-z13-0 (see **Fig. 8**). The Sarkar Doppler redshift interval [5.015, 7.477] applied in the dS gravitationally compressed and decelerating cosmology then is projected in the AdS gravitationally uncompressed cosmology backwards in time towards the SMBH initiation coordinate of the QBBC. The redshift for JADES-GS-z13-0 is measured as 13.20 in the AdS cosmology implying a n-coordinate of $n = -1 \pm \sqrt{\{1+2/z[z+2]\}}$ and which is $\sqrt{1.00997} - 1 = 0.00497$ or about 83.6 million years from the QBBC and the SMBH initialization.

The creation of the Milky Way galaxy can be calculated as occurring 118.26 million years from the Big Bang for a Doppler redshift of 10.967 and so as 6.2% into the birth of an universe 19.12 billion years old. The redshift at the QBBC then becomes $z_{QBBC} = 1.26 \times 10^{24}$.

The proto-stars of the old standard cosmology so can be reinterpreted as the birth of dark matter galaxies comprised of Gamow ylemic neutron matter manifesting as Vortex Potential Energy as a function of temperature and subatomic plasma parameters ($R_{ylem} = \sqrt{\{k_B T_{CBBR} R_e^3 / G_o m_{planck}^2 alpha^{18}\}}$ and as quasi black holes, long before actual neutron stars and quark stars could manifest in the degeneracy of atomic constituents of nucleons and electrons; accompanied by stellar collapse into supernovae, white dwarves and black holes.

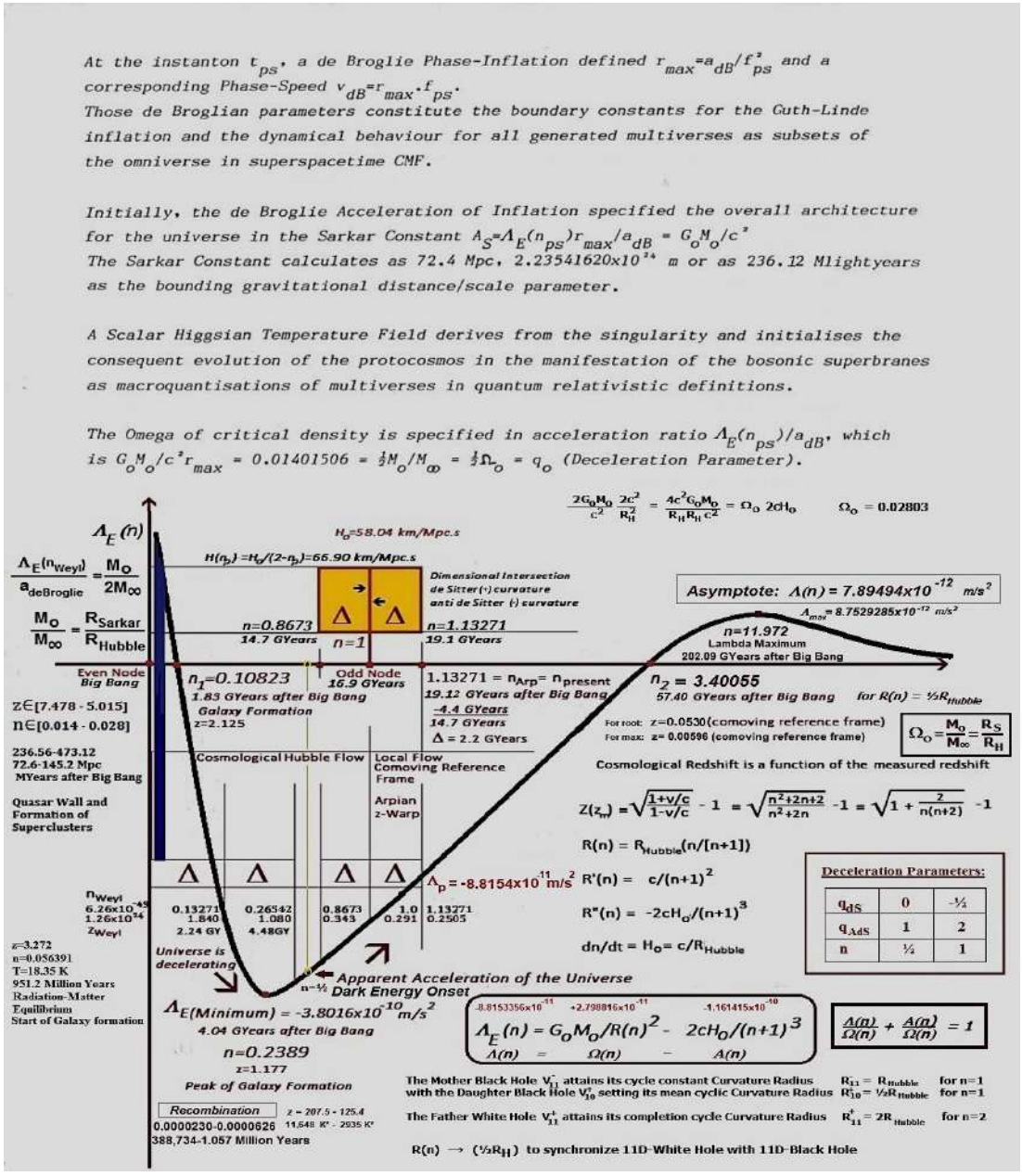


Figure 7: A Synthesis of the Milgröm Deceleration with Verlinde's Dark Energy Einstein Quintessence

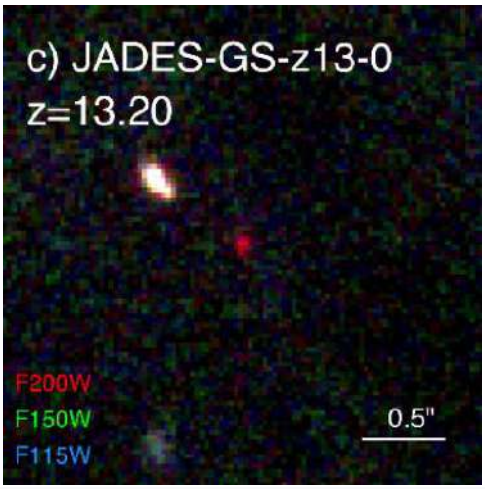


Figure 8: *NASA, ESA, CSA, and STScI, M. Zamani (ESA/Webb), L. Hustak (STScI). Science: B. Robertson (UCSC), S. Tacchella (Cambridge), E. Curtis-Lake (Hertfordshire), S. Carniani (Scuola Normale Superiore), and the JADES Collaboration - https://arxiv.org/abs/2212.04480*

Color composite JWST NIRCam image of distant galaxy JADES-GS-z13-0. An initial sample of four z>10 galaxies was spectroscopically confirmed by Curtis-Lake et al. at redshifts z~10.4-13.2. The most distant galaxies at z=13.20 and z=12.63 are newly discovered by JADES NIRCam imaging, while the z=10.38 and z=11.58 galaxies confirm previous photometric redshift estimates from the literature. The yellow-orange-red colours reflect the absorption of the F115W and F150W fluxes of these distant galaxies by the intervening intergalactic medium.

$n=H_ot=ct/R_H$ Redshift z= $\sqrt{(1+2/n[n+2])}-1$	M_{BH} kg* $hc^3/4\pi G_o k_B$ T_{BH} for R_{ylem} $t_{evaporation}$ s*	$T_{ylem} = T_{DM}$ K* T_{BH} HM Projected	T_{CBBR} K* / $T_{CBBR}+T_{ylem}$ $R(n)=nR_H$ m* $R(n)=aR_H$ $a=n/(n+1)$ open dS $R_{10} \cap R_{11}$	R_{ylem} m* Ylem Vortex scale for HM projection $M_{BH}=R_{ylem}c^2/2G_o$ $\sqrt{\{k_B R_e^3 T_{CBBR}/G_o m_c^2\}}$ $= (R_e/\alpha^9)\sqrt{(R_e/R_c)}$	R_{curv} m* $hc/2\pi k_B T_{BH}$ $=2G_oM_{BH}/c^2$ HM-CBBR BH	M_{curv} kg* for R_S $M_{BH}=R_Sc^2/2G_o$ MicroBH=MBH $t_{evaporation}$ s* $120G_o^2M_{BH}^3/\pi^2hc^4$
$n=3.05x10^{95}$ linear continuity	$3.55x10^{13}$ $1.24x10^{21}$	$2.57x10^{10}$	$2.78x10^{-24}$	$8.77x10^{-14}$ $3.55x10^{13}$ $HM_{MBH}=6.48x10^{52}$	R_H $=1.60x10^{26}$	$M_H=6.47x10^{52}$ $7.53x10^{138}$
$n=1.89x10^{89}$ linear continuity	$2.12x10^{14}$ $2.654x10^{23}$	$4.31x10^{9}$	$9.90x10^{-23}$	$5.23x10^{-13}$ $2.12x10^{14}$ $HM_{MBH}=1.82x10^{51}$	R_{Sarkar} $=4.48x10^{24}$	$M_o=1.81x10^{51}$ $1.65x10^{134}$
$n=7.33x10^{81}$ linear continuity	$1.79x10^{15}$ $1.59x10^{26}$	$5.10x10^{8}$	$7.06x10^{-21}$	$4.42x10^{-12}$ $1.79x10^{15}$ $HM_{MBH}=2.54x10^{49}$	R_{max} $=6.28x10^{22}$	$M_{max}=2.54x10^{49}$ $4.10x10^{128}$
$n_1=234.47$ $t_1=3.96$ Ty $z_1=1.8x10^{-5}/0.65$	$1.54x10^{25}$ $1.02x10^{56}$	0.0592	0.529/0.598 n_1R_H $=3.75x10^{28}$	0.0381 $1.54x10^{25}$ $HM_{MBH}=1.73x10^{24}$	R_1 $=4.26x10^{-3}$	$M_1=1.73x10^{24}$ $1.44x10^{53}$ Multiverse Quantum Tunnel
$n_p=1.132712$ $t_p=19.12$ Gy z=0.2505/1.08	$3.53x10^{25}$ $1.22x10^{57}$	0.0259	2.7470/2.7729 {2.72576 K/SI} $1.809x10^{26}$	0.0871 $3.53x10^{25}$ $HM_{MBH}=3.33x10^{23}$	$8.21x10^{-4}$	$3.32x10^{23}$ $1.02x10^{51}$

n=1 t=16.88 Gy z=0.2910/1.84	$3.64x10^{25}$ $1.34x10^{57}$	0.0251	2.921/2.946 $R_H=1.598x10^{26}$ $V_{universe}=V_{BH}=2\pi^2R_H^3$ $\rho_T=H_o^2/4\pi^2G_o$	0.0899 $3.64x10^{25}$ $HM_{MBH}=3.13x10^{23}$	$7.72x10^{-4}$ $\delta_{Feig\,|\,bound}$ $=3\pi/2\ V_T\leftrightarrow V_S$	$3.13x10^{23}$ $8.52x10^{50}$ $V_{universe}=V_{BH}=4\pi R_H^3/3$ $\rho_S=3H_o^2/8\pi G_o$; $M_H=6.47x10^{52}$
n=0.867289 t=14.64 Gy z=0.3432	$3.77x10^{25}$ $1.49x10^{57}$	0.0242	3.140/3.164 $1.386x10^{26}$	0.0933 $3.77x10^{25}$ $HM_{MBH}=2.91x10^{23}$	$7.19x10^{-4}$	$2.91x10^{23}$ $6.85x10^{50}$
$n_{DE}=½$ $t_{DE}=8.44$ Gy z=0.6124	$4.39x10^{25}$ $2.35x10^{57}$	0.0208	4.254 /4.275 $7.99x10^{25}$	0.1085 $4.39x10^{25}$ $HM_{MBH}=2.15x10^{23}$	$5.30x10^{-4}$	$2.15x10^{23}$ $2.76x10^{50}$
$n_{Sarkar}=0.014015$ $t_{Sarkar}=236.5$ My z=7.477	$1.52x10^{26}$ $9.76x10^{58}$	$6.00x10^{-3}$	51.0613/51.067 $½R_{Sarkar}=2.24x10^{24}$ $R_{Sarkar}=4.48x10^{24}$	0.3757 $1.52x10^{26}$ $HM=1.79x10^{22}$	$4.42x10^{-5}$ R_{Sarkar} $=4.48x10^{24}$	$1.79x10^{22}$ $1.59x10^{47}$ $M_o=1.81x10^{51}$
$n_{macBH}=3.9x10^{-4}$ $t_{macBH}=6.64$ My z=49.421	$4.02x10^{26}$ $1.81x10^{60}$	$2.27x10^{-3}$	358.05 $R_{max}=2\pi\lambda_{ss}$ $=6.28x10^{22}$	0.9942 $4.02x10^{26}$ $HM_{MBH}=2.55x10^{21}$	$6.30x10^{-6}$ R_{BHmax} $=6.28x10^{22}$	$2.55x10^{21}$ $4.61x10^{44}$ $M_{BHmax}=2.54x10^{49}$
$n\lambda_{ss}=6.26x10^{-5}$ $t\lambda_{ss}=1.06$ My z=125.40	$1.15x10^{27}$ $4.23x10^{61}$ Inversion SMBH/MBH	$7.92x10^{-4}$	2935.13 $\lambda_{ss}=1/\lambda_{ps}=1.0x10^{22}$ $R_Hf_{ps}^2\leftrightarrow\lambda_{ps}f_{ps}^2=cf_{ps}$	2.8496 $1.15x10^{27}$ $HM_{MBH}=3.11x10^{20}$	$7.69x10^{-7}$	$3.11x10^{20}$ $8.36x10^{41}$
$n=H_oc=c^2/R_H$ t=c s* = 9.51 y z=42,132.1	$9.04x10^{28}$ $2.05x10^{67}$	$1.01x10^{-5}$	$1.79x10^7$ $c^2=9x10^{16}$ tachyon inflation	223.46 $9.04x10^{28}$ wave matter image $HM_{MBH}=5.10x10^{16}$	$1.26x10^{-10}$ ylemic Lightpath	$5.10x10^{16}$ $3.69x10^{30}>t_{present}$ DM Halo c^2 shift n_{ps}-H_oc
n_{Eevap} $=9.091x10^{-13}$ 5.603 days 1,048,802.6	$1.00x10^{30}$ $=0.50M_{sun}$ $2.78x10^{70}$	$9.11x10^{-7}$	$2.2185x10^9$ $1.45x10^{14}$	$R_{ylem}=2476.57$ $M_{ylem}=1.00x10^{30}$ $=0.50M_{sun}$ $HM_{MBH}=4.12x10^{14}$	$1.02x10^{-12}$	$M_{MBH}=2.7885x10^{12}$ $6.0324x10^{17}=t_{present}$ below $2.79x10^{12}$ kg* have decayed for the present time $t_{present}$ $t_{evap}=120G_o^2M_{BH}^3/\pi^2hc^4$
$n_{chandra}$ $=5.2372x10^{-14}$ 7.75 hours $4.3697x10^6$	$2.92x10^{30}$ $=1.462M_{sun}$ $6.92x10^{71}$	$3.12x10^{-7}$	$1.8866x10^{10}$ $8.37x10^{12}$	$R_{ylem}=7219.89$ $M_{ylem}=2.92x10^{30}$ $=1.462M_{sun}$ $HM_{MBH}=4.84x10^{13}$	$1.20x10^{-13}$	$4.86x10^{14}<t_{present}$ $M_{ylem}=2.92x10^{30}$ $=1.462M_{sun}$ $=M_{chandrasekhar}$
n_{Eevap} $=1.166x10^{-15}$ t=620.8 s* =10.35 min $2.9285x10^7$	$1.22x10^{31}$ $=6.09M_{sun}$ $6.28x10^{75}$	$7.49x10^{-8}$	$3.2748x10^{11}$ $1.86x10^{11}$	$R_{ylem}=30,090.42$ $M_{ylem}=1.2187x10^{31}$ $=6.09M_{sun}$ $HM_{MBH}=2.789x10^{12}$	$6.88x10^{-15}$	$HM_{MBH}=2.7885x10^{12}$ $6.0324x10^{17}=t_{present}$ below $2.79x10^{12}$ kg* have decayed for the present time $t_{present}$ $t_{evap}=120G_o^2M_{BH}^3/\pi^2hc^4$
$n_{EW}=1.34x10^{-20}$ $t_{EW}=0.007$ s* $z=8.6382x10^9$	$8.87x10^{32}$ $1.94x10^{79}$	$1.03x10^{-9}$	$1.68x10^{15}$ $2.15x10^6$	$2.14x10^6$ $8.87x10^{32}$ $HM_{MBH}=5.51x10^8$	$1.36x10^{-18}$	$5.51x10^8$ $4.65x10^6<t_{present}$ EW unification
$n_{BU}=3.56x10^{-27}$ $t_{BU}=2x10^{-9}$ s* $z=1.676x10^{12}$	$2.54x10^{35}$ $4.56x10^{86}$	$3.60x10^{-12}$	$1.42x10^{20}$ 0.57	$6.25x10^8$ $2.54x10^{35}$ $HM_{MBH}=6445.78$	$1.59x10^{-23}$	6445.77 Micro-BH_{min} $1.155x10^{-12}<t_{BU}$ BU unification temperature
$n_{p*}=1.289x10^{-42}$ $t_{p*}=6.87x10^{-25}$ s* $z_{p*}=8.80x10^{20}$	$1.56x10^{41}$ DM galaxy SMBH	$5.84x10^{-18}$ Hubble ylem node	$½T_p=$ $½\sqrt{(hc^5/2\pi G_ok_B^2)}$ $=5.40x10^{31}$ $2.06x10^{-16}$	$\sqrt{(R_e^3/2l_p\alpha^{18})}$ $=3.861x10^{14}$ $6.46x10^{41}$ $HM_{MBH}=1.691x10^{-8}$	$2l_p=$ $2\sqrt{(hG_o/2\pi c^3)}$ $=4.18x10^{-35}$	$m_p=\sqrt{(hc/2\pi G_o)}$ $=1.693x10^{-8}$ projected Planck parameters in Lightpath $2l_p=2ct_p$
$n_{ps}=\lambda_{ps}/R_H$ $t_{ps}=f_{ss}=1/f_{ps}$ $z=1.26x10^{24}$	$3.65x10^{43}$ $1.35x10^{111}$ SMBH Bound	$2.50x10^{-20}$	$2.94x10^{36}$ $\lambda_{ps}=2\pi r_{ps}$ $=1.0x10^{-22}$	$9.01x10^{16}$ $3.65x10^{43}$ $HM_{MBH}=3.112x10^{-13}$	$7.68x10^{-40}$	$3.11x10^{-13}$ $8.36x10^{-58}$ instanton-inflaton
HBV-Inversion Inflaton Image	$2.54x10^{49}$ $4.10x10^{128}$	$T_{Mmax}=$ $3.60x10^{-26}$	$7.06x10^{-21}$	$4.42x10^{-12}$ $1.79x10^{15}$ $HM_{MBH}=2.54x10^{49}$	R_{max} $=6.28x10^{22}$	$M_{max}=2.54x10^{49}$
HBV-Inversion Inflaton Image	$1.81x10^{51}$ $1.65x10^{134}$	$T_{Mo}=$ $5.05x10^{-28}$	$9.90x10^{-23}$	$5.23x10^{-13}$ $2.12x10^{14}$ $HM_{MBH}=1.82x10^{51}$	R_{Sarkar} $=4.48x10^{24}$	$M_o=1.81x10^{51}$
HBV-Inversion Inflaton Image	$6.47x10^{52}$ $7.53x10^{138}$	$T_{MH}=$ $1.41x10^{-29}$	$2.78x10^{-24}$	$8.77x10^{-14}$ $3.55x10^{13}$ $HM_{MBH}=6.48x10^{52}$	R_H $=1.59x10^{26}$	$M_H=6.47x10^{52}$

Table 1

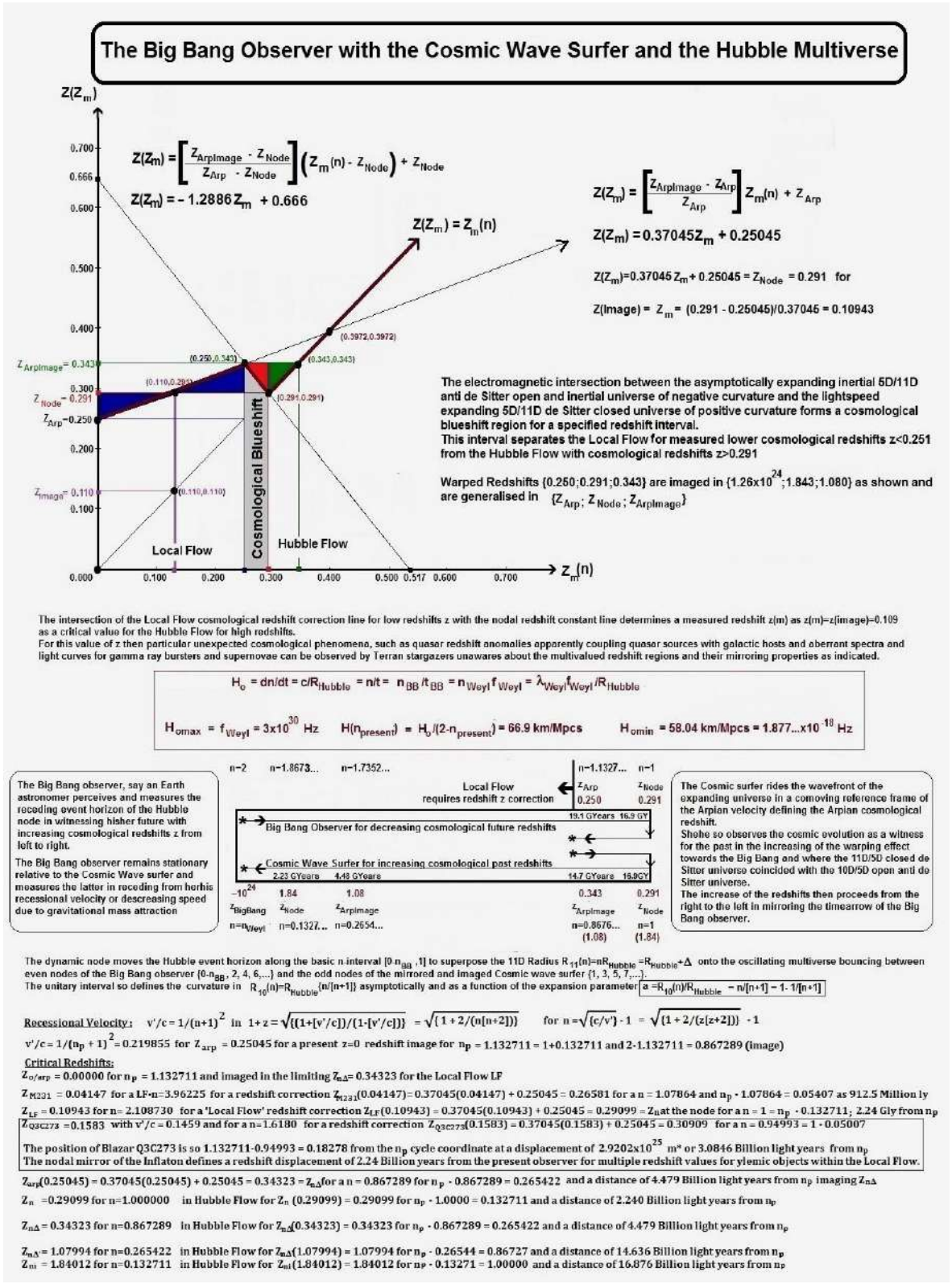


Figure 9: The cosmological Doppler redshift corrections for the reflective AdS Lightpath dS-AdS multiverse.

Part 2: Quantum Gravitation in the Unified Twin Bipolaron Field

The foundation for quantum gravitation is found in the coupling of the Planck mass m_p to the electron mass m_e of Quantum Electrodynamics (QED) with the boundary condition of the Compton constant $\mathbb{C}$ descriptive for the maximization-minimization effective displacement scale for the self-interaction of the QED electron.

Hawking's micro black holes play a decisive role in the universal cosmology, as they modulate the quantum gravitational universe of the creation event with the classical gravitation of the spacetime geometry. In particular, the micro black holes form the energy centers within encompassing vortices of potential energy modelled on the Jeans length applied to the general temperature evolution of the universe (see also **Fig. 24**).

The ylemic radius can be expressed as a function of the static Schwarzschild curvature radius $R_c = r_c = 2G_oM_{BH}/c^2$ from the Hawking Modulus $M_{BH}T_{BH} = hc^3/4\pi k_BG_o$ applied to hypermass as dimensionally displaced baryonic matter and the nucleon gravitational fine structure $\alpha_n=2\pi m_c^2/hc = 2\pi m_p^2\alpha^{18}/hc$.

The CBBR universal temperature from the Hawking Modulus then calculates the ylemic mass independent radius as a function of subatomic parameters, such as applicable for the temperature spectra of neutron stars, magnetars and quark stars. The temperatures of such space-compressed degenerate ylem stars so define the curvatures of the latter as gravitationally non-collapsed black holed cosmological objects. The fundamental relationship between the classical electron radius R_e and the curvature radius R_c is so crystallized in the ylemic radius of the dark matter - restmass photon interaction connected to the applicable hypermass of the micro-BH.

$R_{ylem}^2 = \{k_BR_e^3/G_om_c^2\}\{hc^3/4\pi k_BG_oM_{BH}\} = \{R_e^3hc^3/4\pi G_o^2m_c^2\}\{2G_o/R_cc^2\} = R_e^3hc/2\pi G_om_c^2R_c\}$
$= (m_p^2R_e^3/m_c^2R_c)$

For $\mathbf{R_{ylem} = \sqrt{\{k_BR_e^3T_{CBBR}/G_om_c^2\}} = \sqrt{\{k_BR_e^3T_{CBBR}/G_om_p^2\alpha^{18}\}} = (R_e/\alpha^9)\sqrt{(R_e/R_c)}}$.....**(Eq.I)**

The curvature radius as a function of temperature utilizes the Hawking Modulus

$M_{BH} = hc^3/4\pi G_ok_BT_{BH} = R_cc^2/2G^o$ for $\mathbf{R_c = 2G_oM_{BH}/c^2 = hc/2\pi k_BT_{BH}}$.....**(Eq.2)**

Relating the ylem temperature of the Gamow radius of the Schwarzschilded protostar vortex to the Hawking temperature of black holes forms the relationship between the ylemic radius of the Gamow protostar and the Hawking black hole.

For a given temperature in the Cosmic Black Body Radiation CBBR background, the corresponding ylemic radius defines a mass independent Dark Matter-RMP cosmological object as a form of a space compressed quasi black hole. The Dark Matter is modelled in the form of Restmass-Photons or RMPs to unify the quantum cosmology in the RMP as a fifth interaction Goldstone Boson or Higgs Field agent.

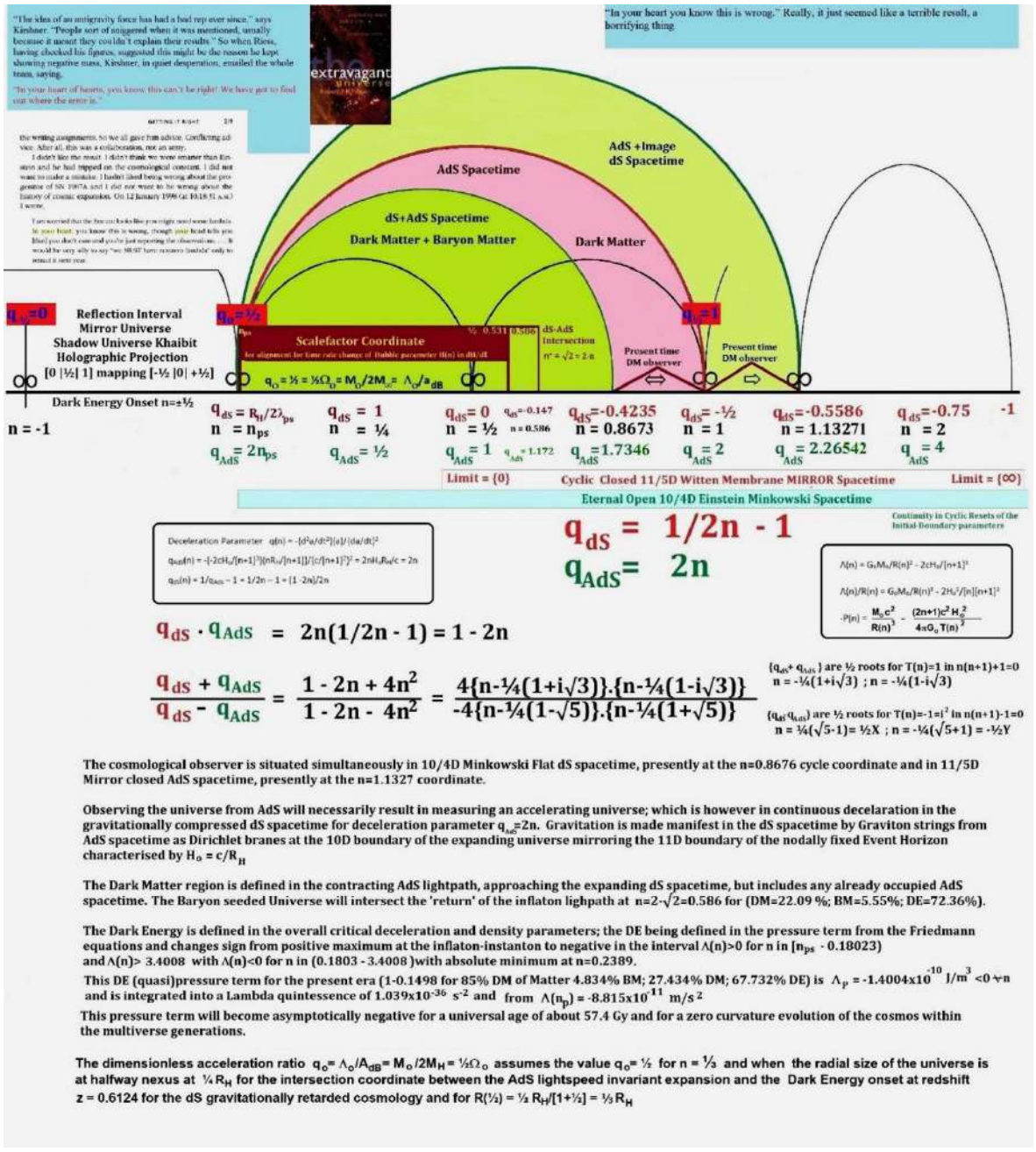


Figure 10: The dual observer cosmology and the baryon -dark matter universe within the dark energy omniverse

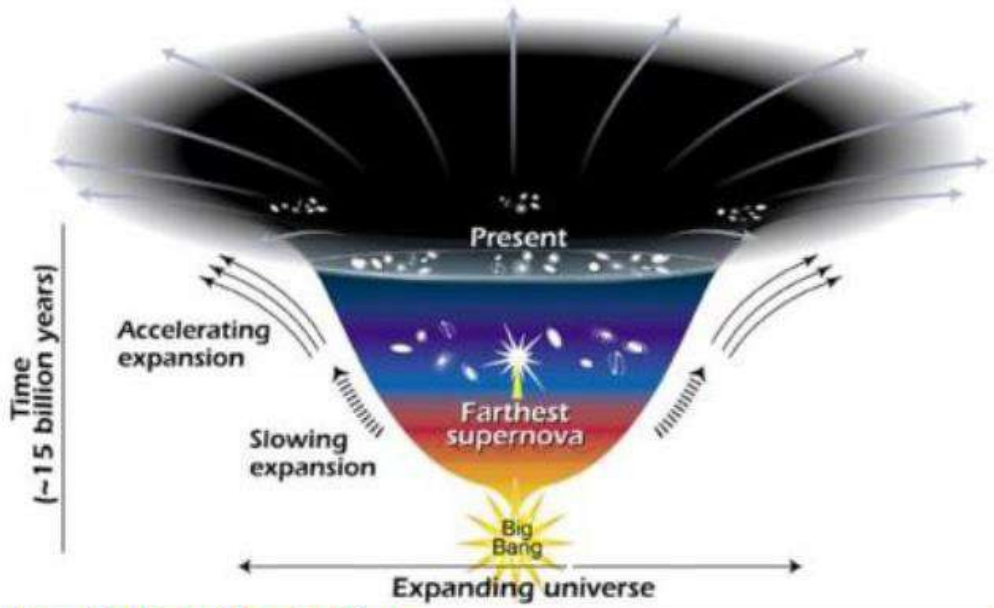
The ylem temperature for a DM-RMP ylem star so becomes a vortex or local energy concentration, which previously formed the temperature of the universe in the CBBR background.

The bosonic subatomic origins of spacetime and emerging from time-space in a mirror algo-space symmetry so allows the transition of the microcosmos of the quantum gravitation into the classical microcosmos of spacetime curvature with the expansion of the thermodynamic universe.

As a vortex temperature, the associated ylemic radius defines an actual black hole temperature from the Hawking modulus describing the inverse proportionality between the mass M_{BH} and the temperature T_{BH} of black holes. The vortex temperature then is descriptive for the nature of a Hawking's Micro black hole or micro-BH in the shift of the temperature spectrum between that of the CBBR and that of the ylemic vortex energy.

A temperature gradient between the creation event of the Quantum Big Bang S(R)ingularity (QBBS) and the Bosonic Unification (BU) allowed the Planck parameters from the time-space before the QBBS to manifest in the spacetime creation of the coupling of the instanton as the birth of time to the inflaton as the birth of space from the algo-space of algorithmic definition.

In particular the Planck mass of about $2x10^{-8}$ kilograms defining a micro-BH with curvature radius the Planck length of about $2x10^{-35}$ meters but defined in time-space is shifted into spacetime by the temperature gradient defining the temperature of the QBBS of about $3x10^{36}$ Kelvin as greatly exceeding that of the corresponding Planck temperature of about $1x10^{32}$ Kelvin.
If a Planck micro-BH would exist is spacetime, then its radius of curvature of the Planck length would limit the smallest mass possible mass for an elementary particle to be the Planck mass of about 20 nanograms, far in excess of elementary particles from the electron of so $9x10^{-31}$ kilograms to that of the Higgs Boson of about $2x10^{-25}$ kilogram.



Universe Dark Energy-1 Expanding Universe
This diagram reveals changes in the rate of expansion since the universe's birth 15 billion years ago. The more shallow the curve, the faster the rate of expansion. The curve changes noticeably about 7.5 billion years ago, when objects in the universe began flying apart at a faster rate. Astronomers theorize that the faster expansion rate is due to a mysterious dark force that is pulling galaxies apart.
Credit: NASA/STSci/Ann Feild

Figure 11: The n=½ cycle time coordinate for the onset of Dark Energy in AdS Lightpath déjà vu' and an apparent acceleration in the cosmological dynamics

The ylemic radius for the QBBS was $9x10^{16}$ meters, compared to the actual wormhole size of about $2x10^{-23}$ meters as the minimum spacetime configuration of the instanton-inflaton coupling of the ylemic radius as a quasi-BH.

The size of the universe as a wormhole radius with a maximum bosonic temperature of so $1x10^{20}$ Kelvin so defined a temperature gradient between the ylemic universe of the time-space with algorithmically defined Planck parameters and the bosonic CBBR universe of the worm holed instanton-inflaton expansion. A dark matter halo, the size of the ylemic radius became superposed into the thermodynamic expansion of the universe as a Planck Black Body Radiator (see **Table 1**).

The CBBR temperature provided the link to connect the wormhole sized minimum spacetime configuration to its dark mattered envelope defined by a light-path expanding at lightspeed for c seconds. After 2 nanoseconds had passed from the creation event, the CBBR temperature had dropped from $2x10^{36}$ Kelvin to $1x10^{20}$ Kelvin, and the temperature of the universe could manifest in the bosonic forms of subatomic particles as the constituents of potential atomic and molecular conglomerations and structures enabled by spatial expansion and the temperature evolution of the cosmology.
From the temperature equilibrium for the bosonic unification nexus at 2 nanoseconds into the evolution of the universe, the ylemic radius continued to shrink with the expansion of the size of the universe.

The ylemic radius, defining the scale of the quasi-BH vortices as a function of the CBBR temperature and not the Hawking Modulus then relates to the expansion of the universe via the $M_{BH}T_{BH}$ relationship to define a ylem temperature:

$$\mathbf{T_{ylem} = hc^3/4\pi G_o k_B M_{BH} = hc/2\pi k_B R_{ylem}} \quad \textbf{(Eq.3)}$$

As the universe continues to cool from its CBBR maximum of the QBBS, the ylem temperature increases in inverse proportion to the decreasing ylem radius as a function of the decreasing CBBR temperature from its T_{ylem} minimum of $3x10^{-20}$ Kelvin shifted from the CBBR maximum of $3x10^{36}$ Kelvin.

The CBBR temperature for the present time is 2.7470 Kelvin* for a Ylem temperature of 0.0257 Kelvin*, both in star units*, where the inversion property for unit conversion is given in the Stefan-Boltzmann constant k_B with the electropole-magnetopole e-e* charge quantum coupling and the Twin Bipolaron wormhole energy quantum $E_{ps} = 1/e^* = m_e/2em_p\sqrt{\alpha}$.

$\{K\}_{SI}1/T=ek_B=E/EK$	=	1.017273556	$\{K^*\}1/T^*=e^*k_B^*=E^*/E^*K^*$	=	0.98301975	$\{K\}_{SI}1/T=ek_B=E/EK$

Adding the increasing ylem temperature to the decreasing CBBR temperature
$T_{ylem}+T_{CBBR}$ = 0.0257+2.7470 = 2.7729 with (2.7729 Kelvin*)(0.98301) = 2.72576 Kelvin|SI.

$L_{planck}=2.090x10^{-35}$ m*$=2G_om_{planck}/c^2$ for a halved Planck mass $m_{planck}=8.463x10^{-9}$ kg*, indicating the nature of quantum gravitation as a transformation of the timespace energy scale into the spacetime energy scale. The Schwarzschild metric for $2L_p = 2G_om_p/c^2$ transforms a 3D Planck-length in the Planck-mass $m_p = \sqrt{\{hc/2\pi G_o\}}$ from the Planck-boson gravitational fine structure constant $1 = 2\pi G_o m_p^2/hc$.

The Schwarzschild metric for the Weyl-wormhole radius R_{ps} then defines a hypermass M_{hyper} as the conformal mapping of the Planck-mass m_p as $M_{hyper}=½\{R_{ps}/l_p\}m_p=½\{R_{ps}/l_p\}^2m_{ps}$ and where the ZPE-TBP mass $m_{ps} = E_{ps}/c^2 = hf_{ps}/c^2 = k_BT_{ps}/c^2$ in fundamental expressions for the energy of Abba-E_{ps} as one part of the supermembrane $E_{ps}.E_{ss}$ in physical quantities of mass m, frequency f and temperature T.
This allows definition of the Weyl wormhole as a Strominger boundary wormhole brane of the instanton and the QBBS and of a mass of $m_{weyl}=\{\lambda_{weyl}c^2/4\pi G_o\}$ = 6445.7753 kg* (see **Fig. 12**).

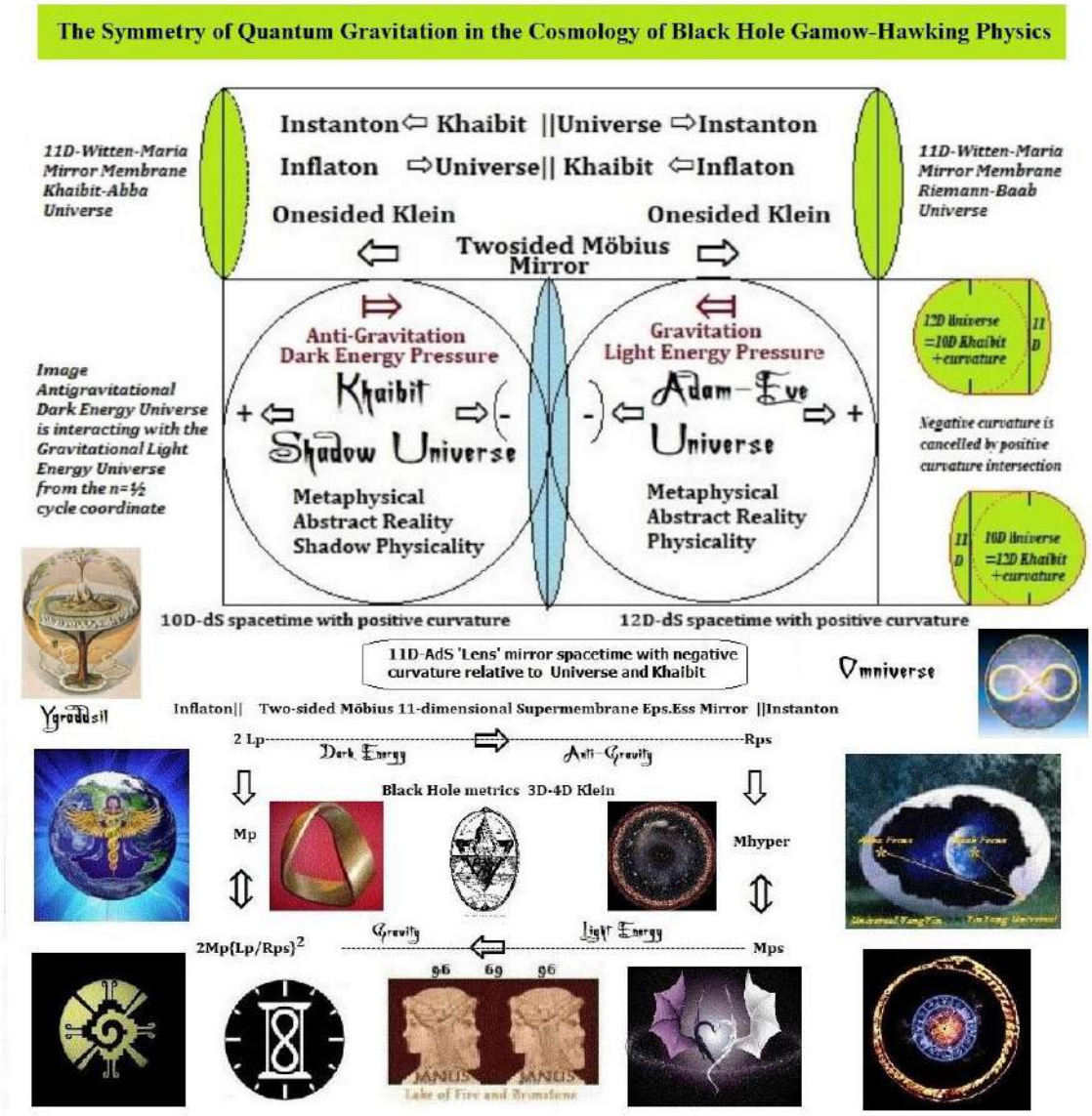


Figure 12: The Twin Bipolaron symmetry of quantum gravitation in transformed Planck parameters

$R_{ps} = \lambda_{ps}/2\pi$ as the wormhole TBP radius of the Instanton as a conformally transformed Planck-Length $L_p = \sqrt{\{G_o h/2\pi c^3\}}$ from the Inflaton (see **Fig.12**).

In unifying the long-range gauge field interactions for electromagnetism in the finestructure constant alpha α and for gravitation in the Planck mass m_p; the nature of quantum gravitation emerges in the coupling of the Coulomb charge e of the electropole to the Dirac charge e* of the magnetopole. The Compton constant $\mathbb{C}$ forms the inverse proportionality between the minimized electron mass m_e and the maximized classical electron radius R_e in the product of the Planck length l_p and the Planck mass m_p.
$\mathbb{C} = \alpha l_p m_p = \alpha\sqrt{\{(hG_o/2\pi c^3)(hc/2\pi G_o)\}} = \alpha h/2\pi c = k_e e^2/c^2 = R_e m_e = R_{eeff} m_{eeff}$

The nature of the point particle electron of QED subsequently is crystallized in a minimum classical electron radius $r_{weyl} = r_{ps} = \lambda_{ps}/2\pi$ identical with the wormhole radius as a (r/s)ingularity of a charged and

rotating Kerr-Newman Black Hole bounded by a static Schwarzschild radius of the Black Hole's event horizon or $R_S = 2G_oM_{BH}/c^2$ and within the context of the Quantum Big Bang Singularity (QBBS) (**Fig. 26**). This wormhole radius as a 2-dimensional surface ring/singularity so becomes the technical definition for the QED electron as a point particle for a Compton mass of $m_{ps} = E_{weyl}/c^2 = hf_{ps}/c^2 = k_BT_{ps}/c^2$ kg*. The electromagnetic charge Q_m of a Kerr-Newman Black Hole is defined as a form of energy density in the units of the classical gravitational parameter GM as Volume times angular radius independent acceleration [m^3/s^2] via the frequency spectrum for graviton radiation emitted as gravitational waves.
$f^2 = \rho G_o = G_oM/V$ from the Newman-Kerr black hole charge quantum
$Q_m = e^* = 2R_ec^2 = V.df/dt = V.f_{max}^2$

In the limit of the minmax frequency permutation states under 'Target Mirror space modular string-membrane modular duality: $f_{ps} = 1/f_{ss} = t_{ss} = 3x10^{30}$ with
$df/dt = (f_{ps}-f_{ss})/t_{ps} = (f_{ps}-f_{ss})/f_{ss} = f_{ps}^2 - 1 = 9x10^{60} - 1$ permutation eigen states; volume V describes the scale of the Restmass Photon as the dark matter (DM) agent and so as the Dark Matter form of the Twin Bipolaron as a function of the diameter of the maximized electron radius acted upon by the time differential for the monopolar wormhole frequency.

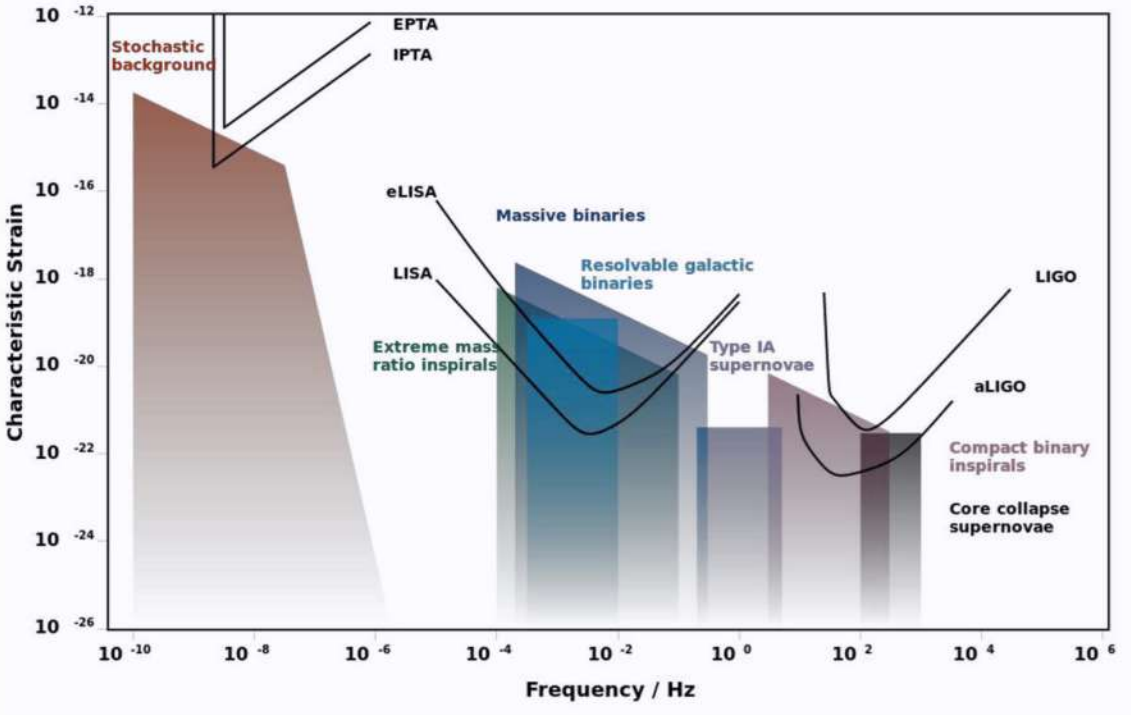


Figure 13: Noise curves for a selection of gravitational-wave detectors as a function of frequency. At very low frequencies are pulsar timing arrays, at low frequencies are space-borne detectors, and at high frequencies are ground-based detectors. The characteristic strain of potential astrophysical sources are also shown. To be detectable the characteristic strain of a signal must be above the noise curve.[1] - https://en.wikipedia.org/wiki/Gravitational-wave_astronomy

$2R_ec^2 = 2\pi^2R_{RMP}^3.f_{ps}^2 = e^* = 1/m_{ps}c^2 = G_o\{m_{ps}/G_om_{ps}^2c^2\}$ for DM field particle
$R_{RMP} = \sqrt[3]{(e^*t_{ps}^2/2\pi^2)} = h/2\pi m_{RMP}c = 1.411885x10^{-20}$ m* as a Compton radius for a particle energy of $m_{RMP}c^2 = hc/2\pi R_{RMP} = 2.254x10^{-6}$ J* or 14.034 TeV* as a maximum operating energy for the LHC particle accelerator situated at Geneva, Switzerland.

The deformation strain of spacetime caused by the acceleration of asymmetric masses manifests both, in the corresponding wavelength of the gravitational graviton radiation and the deformation displacement defined in the QBBS as a (r/s)ingularity of the wormhole defined in the monopolar charge current $i_{monopolar} = Q_m f$ (see **Fig. 13**).

The interval $\{1.59x10^{-23}$ m* - $8.50x10^{-18}$ m*$\}$ for the deformation parameter as a LIGO (Laser Interferometer Gravitational Observatory) wavelength of spacetime strain displacement then spans from the Weyl-Eps wormhole radius to the manifestation of the Higgs vacuum expectation parameter as twice the Higgs Boson (HB) mass of $W^-+W^++Z^o = 2HB = 146.5$ GeV* or $2.615x10^{-25}$ kg* (80.62+80.62+91.44=252.68 GeV* or 80.42+80.42+91.21=252.06 GeV for $2HB.Y^{npresent}$) and the time of electroweak separation at a CBBR temperature of $1.6x10^{15}$ K*, 1/140 seconds from the time instanton.

The coupling between mass and electromagnetopolar charge is given by the unification condition for the respective finestructures $G_o k_e = 1$ as a Planck-h-Stoney-k_e unification.

For $G_o = hc/2\pi m_p^2$ and $k_e = 1/4\pi\varepsilon_o = \mu_o c^2/4\pi = hc\alpha/2\pi e^2 = R_e m_e c^2/e^2$
$G_o/k_e = G_o^2 = (hc/2\pi m_p^2)/(hc\alpha/2\pi e^2) = \alpha e^2/m_p^2 = G_o e^2/R_e m_e c^2$ for $G_o m_p = e/\sqrt{\alpha}$ for the gravitational parameter as monopolar magnetic charge applied to the Planck mass and for $G_o m_e = 2e^2/e^*$ for the gravitational parameter as monopolar magnetic charge applied to the electron mass

In the Kerr-Newman metric, the characteristic length scale of $R_Q^2 = Q_e^2 G k_e/c^4$ naturally produces the gravitational parameter and the Schwarzschild boundary metric in replacing the Coulomb electric charge Q_e with the Dirac magnetic charge Q_m for $R_Q^2 = Q_m^2(G_o k_e)/c^4$ for $R_Q = G_o M_{BH}/c^2 = \frac{1}{2}R_S$ (see **Fig. 15**).

The angular momentum $J = GM_{BH}^2/c$ in this metric likewise reduces as a displacement scale to the Schwarzschild solution in
$R_J^2 = G\{c^2J^2/GM_{BH}^2\}/c^4 = G^2M_{BH}^4c^2/c^6M_{BH}^2 = G^2M_{BH}^2/c^4$ for $R_J = G_o M_{BH}/c^2 = \frac{1}{2}R_S$.

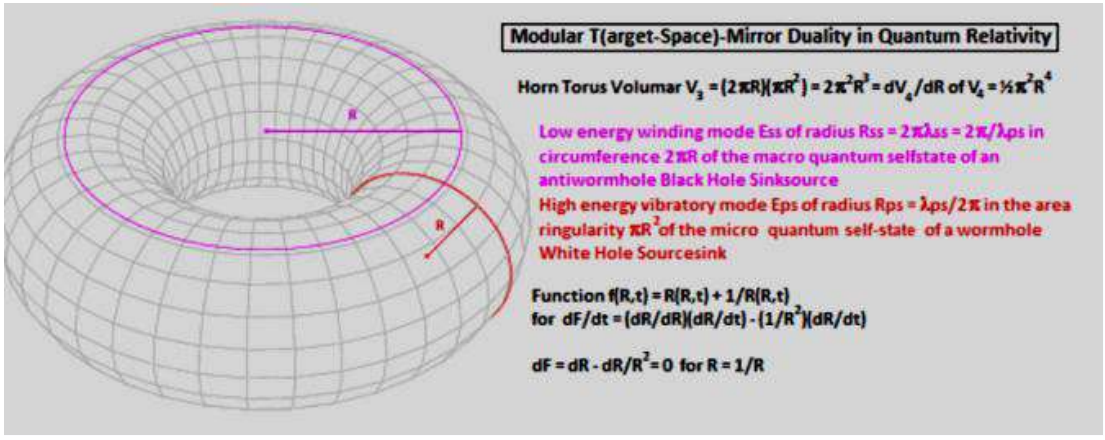


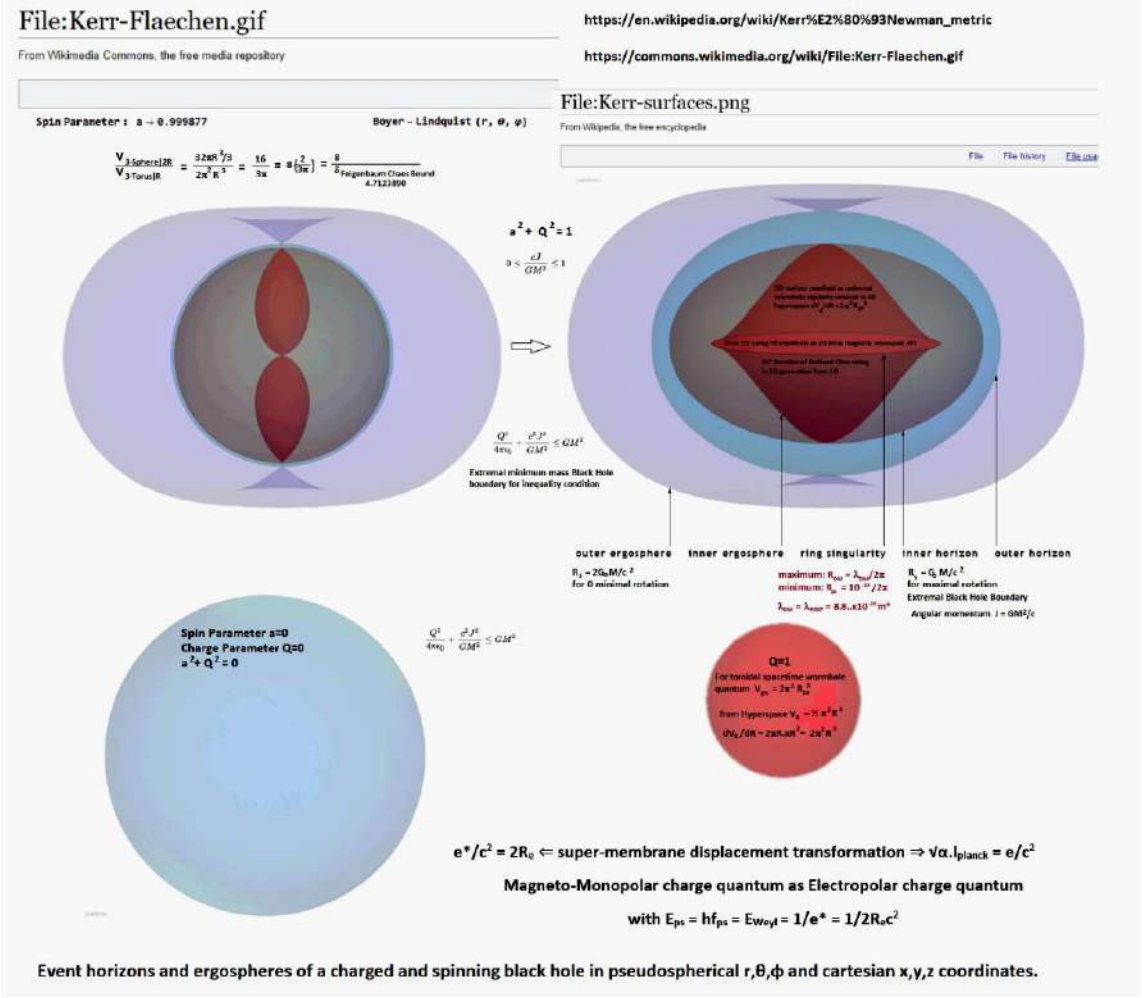
Figure 14: The Quantum Topology of the Weyl-Eps Twin Bipolaron as a Horn Toroidal Quantum Geometry

Modular T-duality of the EpsEss supermembrane temperature spectra for black holes in the Hawking moduli couples $E_{ps} = hf_{ps} = h/f_{ss} = hc/\lambda_{ps} = hc/2\pi R_{ps} = hc\lambda_{ss} = k_B T_{ps}$ with the maximized MBH hypermass

temperature $T_{ps} = hc^3/4\pi G_o k_B M_{hyper} = hc/k_B\lambda_{ps}$ to $E_{ss} = k_B T_{ss}$ with the minimized BH temperature T_{ss} modulated as T_{min} in quantum entanglement for $c = f_{ps}.\lambda_{ps} = 1/f_{ss}.\lambda_{ss}$ [m/s]* in the coupling factor $c^2/4\pi^2$

$T_{ss} = E_{ss}/k_B = hf_{ss}/k_B$ for $T_{min} = E_{ss}\{R_{ps}t_{ps}/R_{ss}t_{ss}\}/k_B = E_{ss}\{(\lambda_{ps}f_{ps}/2\pi)/(2\pi\lambda_{ss}f_{ss})\}/k_B = E_{ss}\{c^2/4\pi^2\}/k_B = hc^3/4\pi G_o k_B M_{HG}$ for the Hawking modulus for the Hawking-Gibbons minimized temperature $T_{min} = hc^3/4\pi G_o k_B M_{HG}$ with a black hole mass $M_{HG} = R_{HG}c^2/2G_o = \pi c f_{ps}/G_o|_{mod} = 2.54469x10^{49}$ kg* incorporating a universal acceleration quantum $cf_{ps} = 9x10^{38}$ m*/s*.

$T_{min} = hc^2/4\pi^2 k_B f_{ps} = E_{ss}c^2/4\pi^2 k_B = 3.5886x10^{-26}$ K*



Important surfaces [edit]

Setting $1/g_{rr}$ to 0 and solving for r gives the inner and outer event horizon, which is located at the Boyer–Lindquist coordinate

$$r_{\pm}^{H} = \frac{r_s}{2} \pm \sqrt{\frac{r_s^2}{4} - a^2 - r_Q^2} \quad \Rightarrow \quad r_s \quad \text{for } a^2 + r_Q^2 = 0$$

Repeating this step with g_{tt} gives the inner and outer ergosphere

$$r_{\pm}^{E} = \frac{r_s}{2} \pm \sqrt{\frac{r_s^2}{4} - a^2\cos^2\theta - r_Q^2} \quad \Rightarrow \quad r_s \quad \text{for } a^2\cos^2\theta + r_Q^2 = 0$$

Figure 15: The Kerr Ringularity as a 2-5-8-11D supermembrane replacing the classical Einstein QBBC Singularity

https://en.wikipedia.org/wiki/Kerr_metric ;
https://en.wikipedia.org/wiki/Kerr%E2%80%93Newman_metric

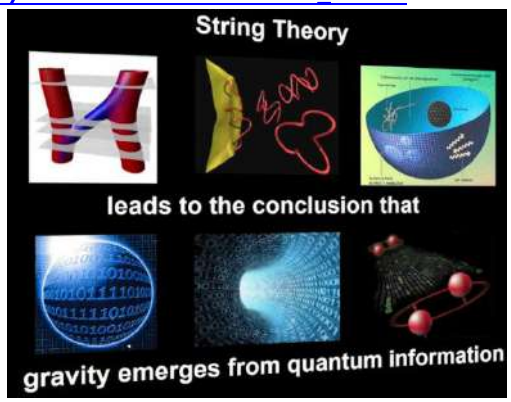


Figure 16: Verlinde's String-Information as TBP Gravitation

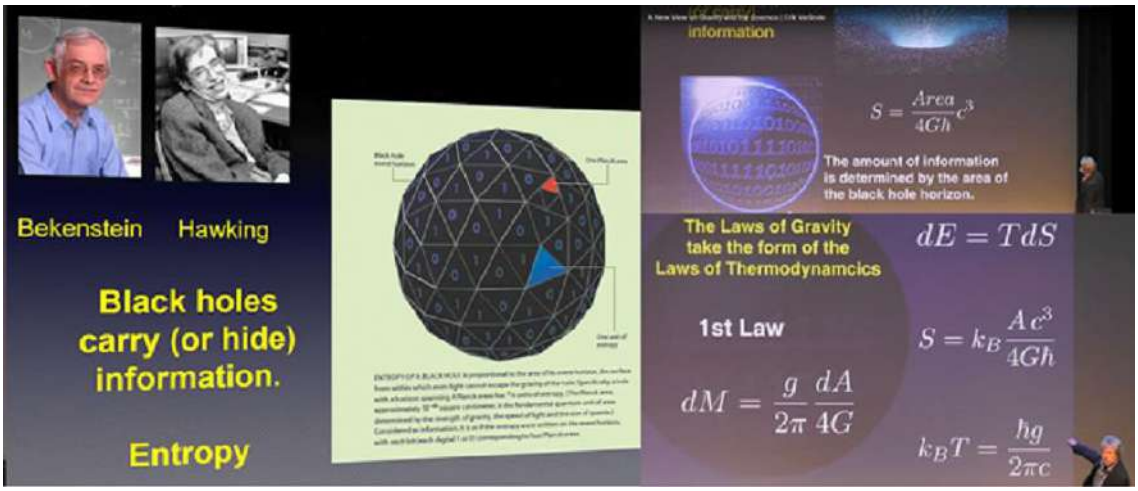


Figure 17: Verlinde's Information-Entropy Quantization in Black Holes

Universal Constant for Quantum Gravitation as the Dirac magnetic monopole charge quantum e*

$e^* = 1/E_{ps} = 1/hf_{ps} = 1/m_{ps}c^2 = 1/k_BT_{ps}$ in the universal charge coupling constant
$e^*/e = 2\sqrt{\alpha}.m_p/m_e = 2e/G_om_e = 2e^*E_{ps}\sqrt{\alpha}m_p/m_e = 2\sqrt{\alpha}.m_p/m_e$

Electropole $e = \sqrt{\alpha}l_pc^2 \leq$ Universal Charge Action $h=ee^*$ Unification $\geq 2R_ec^2 = e^*$ Magnetopole
Planck era timespace ≤ Universal Charge Action $h=ee^*$ Unification ≥ Weyl-Eps era spacetime

The nodal Hubble boundary emerged from an instanton-inflaton Quantum-Big Bang-Singularity QBBS and from a parameter space of initial and boundary conditions established from a Planckian pre-spacetime string-membrane epoch modelled on an algorithmic timespace transforming into a spacetime in the emergence of dimensional degrees of freedom to manifest the physical parameters in energy

from a pre-physical or metaphysical quantized energy continuum labelled as universal consciousness from algorithmic timespace.

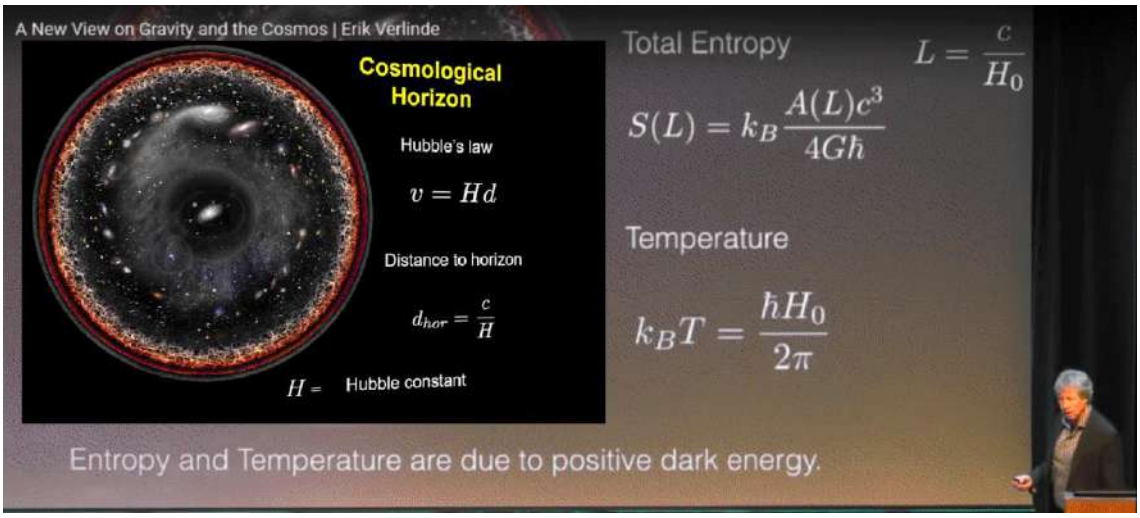


Figure 18: Verlinde's Entropy-Temperature as Effect from Dark Energy

The deviation in the rotation speed of stars and massive astrophysical objects of galactic rotation curves from Newtonian-Keplerian gravitation is a consequence of the onset of the dark energy at the fractally synchronized Page Time nexus for the largest quantum entanglement entropy state for a dark matter evolving galaxy in the multidimensional cosmology for the cycle time interval $n \in [0.489365, 0.5]$.

This is addressed in the 'Emergent Gravity' model of Erik Verlinde and the 'Modified Newtonian Gravity' or MOND model of Mordehai Milgröm: https://arxiv.org/pdf/1611.02269.pdf

The Einstein quintessence $\Lambda_E(n)$ is negative as a positive pressure in the n-coordinate interval for zero dark energy as $n_{DE=0}$ (0.10823; ½; 1; 3.4006) in the inequality: $G_oM/R(n)^2 < 2cH_o/(n+1)^3 = 2c^2/R_H(n+1)^3$

$2G_oM/R^2 < 4cH_o/[n+1]^3 = 4c^2/R_H[n+1]^3$ for galactic extremal Strominger black hole hyperspace equivalent $2G_oM/c^2 = R_{curv} < 4R^2/R_H[n+1]^3$ m for Page Time maximum DE entropy n=½ superposed on nodal n=1

For a present virial mass of the Milky Way spiral galaxy of 1.54 trillion solar masses or $M=3x10^{42}$ kg within a dark matter haloed virial radius of 39.5 kpc or 130,000 light years of $R=1.23x10^{21}$ m; the inequality reads for the Page time coordinate entropy maximum n=½ (see **Fig. 3**).

$2G_oM/c^2 = R_{curv} = 7.41x10^{15}$ m $< 4R^2/R_H[n+1]^3 = 32R^2/27R_H = 1.13x10^{16}$ m.

The curvature radius of a DM inclusive Milky Way galaxy superimposed onto the overall gravitational acceleration evolution of the universe in a negative Einstein quintessence and the Page time extremal quantum entanglement surface of the Hubble event horizon is smaller than the intrinsic Milgröm gravitational acceleration for a zero dark energy mimicking a positive pressure for an apparent accelerating universe (see **Fig. 11**).

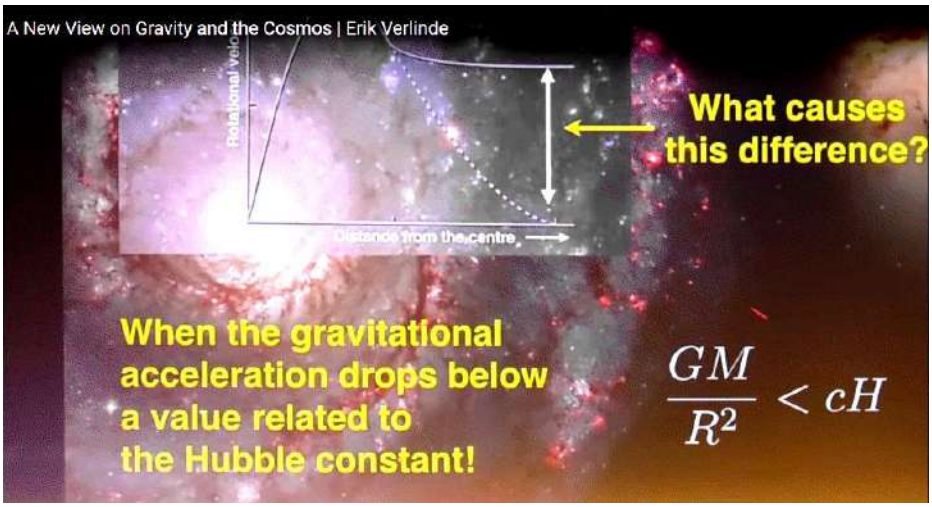


Figure 19: Verlinde's MOND-Hubble Even Horizon Deceleration Connection in Einstein Quintessence

The curvature radius of the Strominger BH at Page Time is smaller than twice the extremal BH Hubble event horizon radius R_H of closure as a Milgröm gravitational acceleration $a_{mil} = |-2cH_o/(n+1)^3|$ for the intersecting n-cycle time intervals [-1, -½, -0.489365] with [-½, +½] with [0.489365, ½, 1] (see **Fig. 7**).

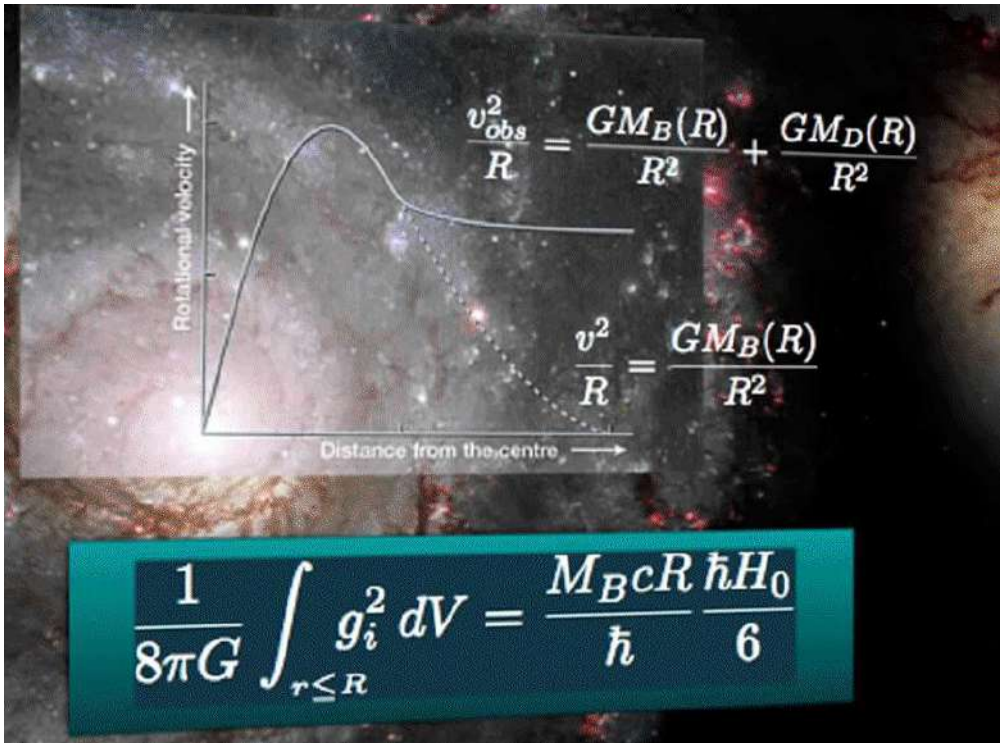


Figure 20: Verlinde's Gravitational Parameter GM Supplementation of the Magnetopole Charge

$c^2\rho_{critical}dV=c^2dm=c^2m_o\{(1-[v/c]^2)^{-½}-1\}=c^2m_o\{1+½[v/c]^2-3[v/c]^4/8+5[v/c]^6/16-\ldots-1\} = ½m_ov^2 - 3v^4/8c^2\ldots$
$c^2.3H_o^2/8\pi G_o.dV = ½M_BcRc/R_H = ½M_Bc^2R/R_H$ for $(1/8\pi G_o)\,(H_oc)^2.dV = (1/8\pi G_o)(g_i)^2.dV = ⅙M_BcH_oR$

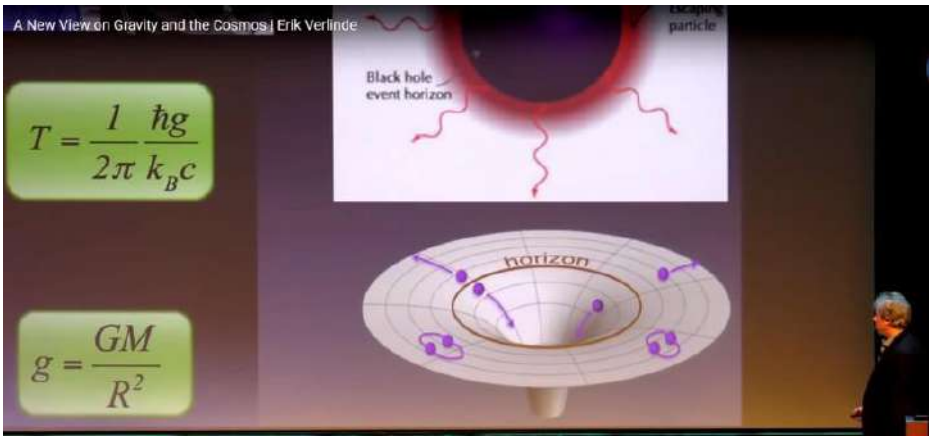


Figure 21: Verlinde's Dark Matter Bipolaron Identification

The idea that quantum entanglement is an effect of wormholes has been proposed by **Susskind and Maldacena in 2013.** Maximum quantum entanglement between two spatially separated Black Holes, say the AdS distant mother and the dS distant daughter, is achieved in EPR Einstein-Podolsky-Rosen bridge pair connections or wormholes.

{ [1306.0533] Cool horizons for entangled black holes (arxiv.org)}

The information in the dS cosmology so is wormhole tunneled to the AdS cosmology since the QBBS and the creation event with either the dS universe or the AdS universe enabled to become a simulation of the other and as discovered by Hartman and Tajdini in 2019 as the path integral for both classical and quantum gravitation.

{ [2011.09043] Replica wormholes for an evaporating 2D black hole (arxiv.org)}

In Quantum Relativity, both extremal Black Holes in dS and AdS are physically real and separated by a 5D-8D or 11D hyperspacetime AdS-CFT quantum mechanical correspondence and so a quantum gravitational boundary (see **Fig. 22,23**).

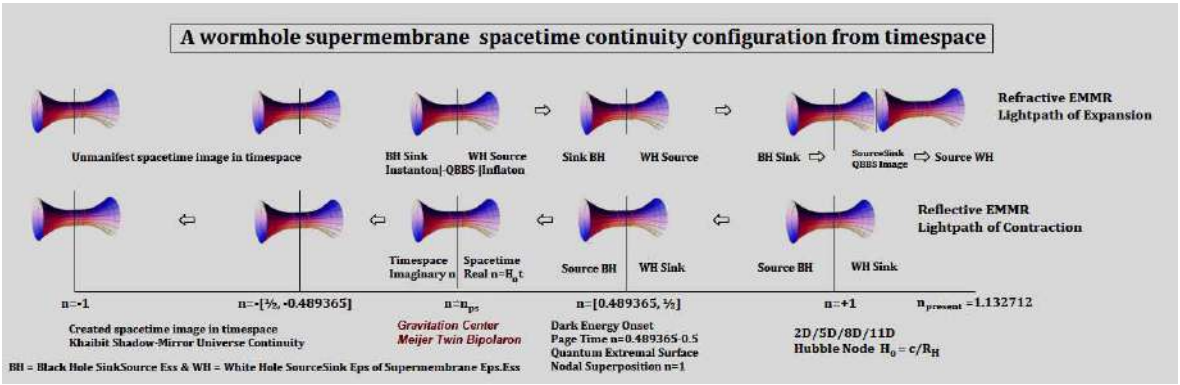


Figure 22: A wormhole Weyl Boson-Twin Bipolaron multidimensional spacetime configuration

The nonlocality of the AdS-CFT duality so intrinsically links to the mirror duality of the string-membrane cosmology in changing the quantum geometry of the wormhole connectivity in the positive curvature of the holographic universe closed by the Bousso-Witten-Vafa CFT quantum bound yet being open with negative curvature in wormhole 'saddle points' as replica wormholes changing in inverse proportionality in regard to the entanglement entropy with its native BH Maldacena-Susskind pairing.

The bulk spacetime of the cosmologies so is fundamentally not metric based but integrates spacetime quanta in the form of the QBBS minimum spacetime configuration as the Weyl-wormhole of the EpsEss supermembrane derived from the Dirac string and the Dirac magnetic monopole.

The spacetime volumar $2\pi^2 r_{ps}^3$ so is compressed in the spacetime volumar $4\pi r_{4D}^3/3$ in the Source energy per unit volume $E_{VPE\text{-}ZPE} = 4\pi E_{ps}/\lambda_{ps}^3$ for $r_{4D} = \sqrt[3]{\{3\pi/2\}}\, r_{ps} = 1.67654 r_{ps}$ in the surface area modulation $6\pi^2 = 3\pi.4\pi/2$ in the dimensional reduction of the sphericity of the 3-ball $V_4 = \frac{1}{2}\pi^2 R_4^4$ as a 3-dimensional surface $dV_4/dR_4 = 2\pi^2 R_3^3$ to the 2-ball $V_3 = 4\pi R_3^3/3$ as the energy per unit volumar spacetime quantum for the wormhole integration of the multidimensional cosmology.

The quantized spacetime so becomes a summation of Susskind-Maldacena integrated wormhole quanta enabled to connect time-parallel extremal Strominger black holes as a closed dS universe and an open AdS universe as an Einstein-Podolsky-Rosen bridge. The region of spacetime connected by the two wormhole faces, then describes the dark wormhole matter not intersecting the baryonic mass seed and is defined in the extremal quantum surface of the Page Time.

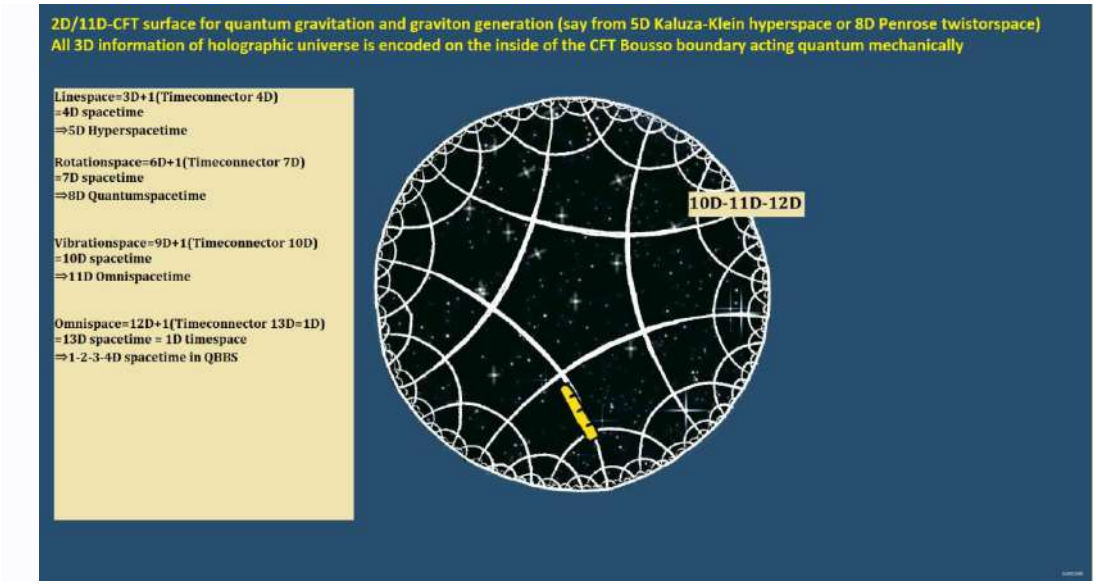


Figure 23: The AdS/CFT Conjecture in dS Closure in parallel cosmologies embracing a negatively curved AdS cosmology

This de Sitter dS universe of positive curvature is modelled as a thermodynamic Planck Black Body Radiator expansion of a flat Minkowski spacetime experiencing the gravitational interaction in both the classical laws of General Relativity and the effects of quantum gravity from a higher dimensional parallel cosmology described as a Anti de Sitter AdS universe of negative curvature without gravitational retardation.

The interdimensional interaction between the closed dS and the open AdS universes results in a flat overall spacetime relative to a spacetime observer situated at an arbitrary central observation point, say the center of a geometric horn torus, encompassed by a sphere.

The AdS cosmology of lightspeed invariance at the QBBS then naturally expands the higher dimensional universe, say as a 5D Kaluza-Klein or an 8D Penrose or a 11D Witten spacetime at a greater rate than the gravitational Einstein-Planck-Minkowski in 4D EPM spacetime.

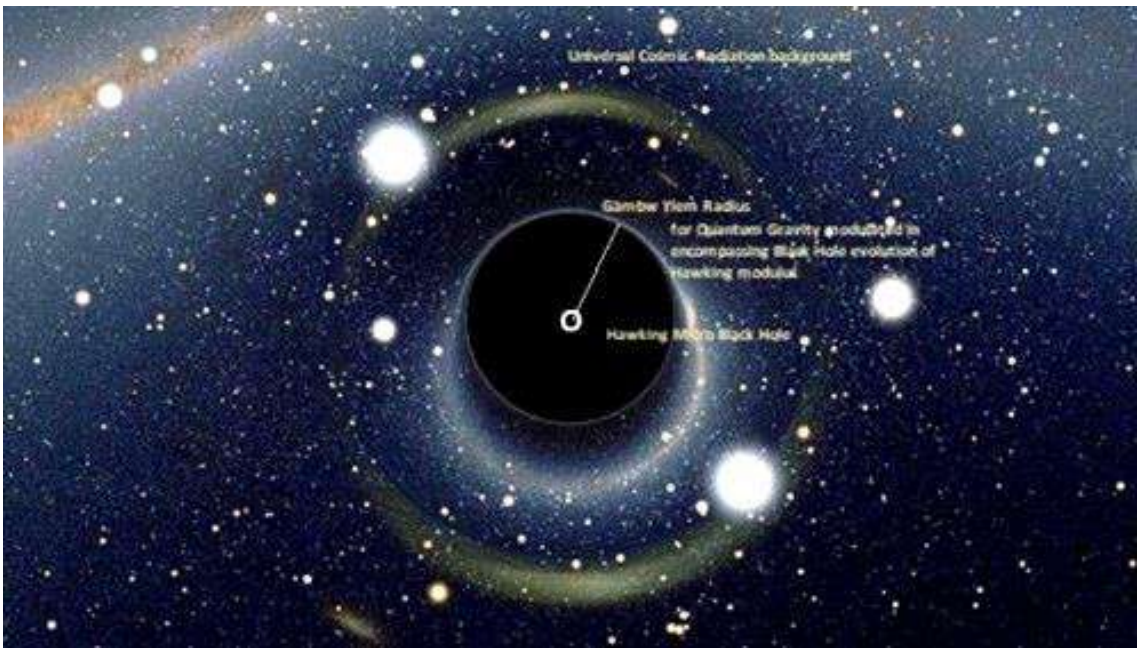


Figure 24: Hawking's Micro-Black Holes as Dark Matter/Ylem-Bipolaron Vortex PE

At some point in the universe's expansion the AdS Lightpath superposed onto the dS gravitationally retarded Lightpath will reach the nodal Hubble boundary and then both reflect and refract to expand the original size of the spacetime set by the initial boundary conditions of the instanton-inflaton defined QBBS. The higher dimensional Lightpath is denoted as EMMR for Electromagnetic Monopolar Radiation and the lower dimensional concurrent Lightpath is denoted as EMR for Electromagnetic Radiation.

The refracted Lightpath of the AdS universe then resets the nodal Hubble event horizon in a new boundary independent from the original instanton-inflaton parameters of the QBBS to define a true Hubble event horizon as a new boundary for the compacted Hubble event horizon to approach.

The reflected Lightpath from the old Hubble nodal event horizon H_o manifests a cyclic cosmology for the lower dimensional dS universe, however. The QBBS is mirrored at the even Hubble node H_o in the reflected Lightpath in an odd and even frequency count for the Hubble parameter with a clearly defined maximum at the QBBS as an even n-cycle count and a clearly defined minimum as H_o as an odd n-cycle count (see **Fig.10**).

All cosmologies can so be defined in a n-cycle time parameter and where $\mathbf{n=H_ot}$ with $\mathbf{dn/dt=H_o}$ as a true Hubble constant.

The compacted Hubble event horizon so becomes defined in the dS gravitationally retarded cosmology as the size of the lower dimensional curvature radius subject to an oscillating higher dimensional AdS Lightpath superimposed onto the expansion of the thermodynamic universe.

The true Hubble event horizon can be expressed in the refracted Lightpath as $\mathbf{R_{EMMR}(n,t) = nR_H}$ and the compacted Hubble event horizon becomes the curvature radius of the EPM protoversal universe as $\mathbf{R_{EMR}(n,t) = R(n,t) = R_H n/[n+1]}$ and bounded in $\mathbf{H_o = c/R_H}$ as a 'Mother Black Hole MBH' as a 'Strominger eternal MBH brane' and in the Schwarzschild metric $\mathbf{R_H = 2G_oM_{oH}/c^2}$ with G_o the gravitational constant as applicable to the Strominger BH evolution as 'eternal black holes'.

|←----------↔----------|even node $f_{ps}=c/\lambda_{\pi S}$----↔----odd node $c/R_H=H_o$→|

Imaged and mirrored EMMR Lightpath AdS EMMR Lightpath AdS

|←-----Shadow Dark Universe Khaibit ½ cycle-----|----------Light Universe ½ Cycle----------→|

|←----------|----------→|

$q_o=0$ $q_o=½=M_o/2M_H=R_{sarkar}/2R_H=\Lambda_{einstein}/A_{debroglie}$ $q_o=1$

|←----------|----------|----------|----------→|

n=-1 n=-½ n=0 n=+½ n=+1

q_o is a deceleration parameter defining the QBBS boundary initial parameters in the Einstein quintessence $\Lambda_{einstein}$ and the de Broglie hyperspace inflaton hyper acceleration $A_{debroglie}$ for the EMMR Lightpath as the ratio of the matter distribution $\mathbf{\Omega_o = M_o/M_H}$ for the overall energy density in the multidimensional cosmology.

M_o is the mass seedling for the de Sitter protoverse defining a 'Sarkar Daughter Black Hole' in the Sarkar curvature radius $\mathbf{R_{sarkar} = 2G_oM_o/c^2}$ for the encompassing mass Strominger BH evolution engaging the Dark Matter and Dark Energy conditions.

Another deceleration parameter is defined in $\mathbf{q(n) = -\{(d^2a/dt^2)(a\}/(da/dt)^2}$ **for scale factor** $\mathbf{a = R(n,t)/R_H}$

The Lightpath for both EMMR AdS and EMR dS is coupled in the QBBS boundary parameters $f_{ps}\lambda_{ps}=f_{wey\lambda}\lambda_{weyl}=f_{QBB\Sigma}\lambda_{QBBS}=c=H_oR_H$ for the nodes of the spacetime mirrors.

The recessional velocity from the Hubble law $H(n,t) = v_{rec}(n,t)/R(n,t)$ for the dS Lightpath becomes

$$\mathbf{v_{rec}(n,t) = d(R(n,t)/dt = R_H d(n/[n+1])/dt = R_H(dn/dt)/[n+1]^2 = c/[n+1]^2}$$

The recessional Lightspeed c velocity for the AdS cosmology so precedes the continuously slowing down $v_{rec}(n,t)$ in dS as the refractive Lightpath with respect to the true Hubble event horizon and due to the gravitational retardation of the compacted Lightpath in the dS EPM universe.

The reflected form for this recessional velocity c then creates the appearance of an accelerating universe because the true recessional velocity in AdS is mirrored onto a previously defined coordinate of the recessional velocity of AdS in dS spacetime and when the AdS Lightpath reached this n-cycle coordinate in its forward journey to the true Hubble event horizon albeit within the nodal boundary of then both for the EMMR and the EMR Lightpath parallel.

The actual Hubble parameter so is defined for the curvature radius in the compressed de Sitter spacetime as: $v_{rec}(n, t)/R(n,t) = \{c/[n+1]^2\}\{[n+1]/nR_H\} = H_o/n[n+1] = H_o/T(n)$

This can be visualized at the center of the Horn torus, where the tangential curvature of the torus radii meets in the horizontal plane to create the concave topology of a wormhole or an Einstein-Rosen bridge with the surface of the torus radii curving away from the center and for the emergence of geometric circular cross sections as the northern top and the southern bottom of the Horn torus.

But at the north pole and south poles of the vertical plane connecting the two hemispheres of the prior encompassing 3-dimensional spherical volumar, the curvature is convex, cancelling the concave curvature intrinsic for the cosmological evolution of the universe to all of the time prior to the critical curvature time marker and as measured and observed by any observer within the expanding universe.

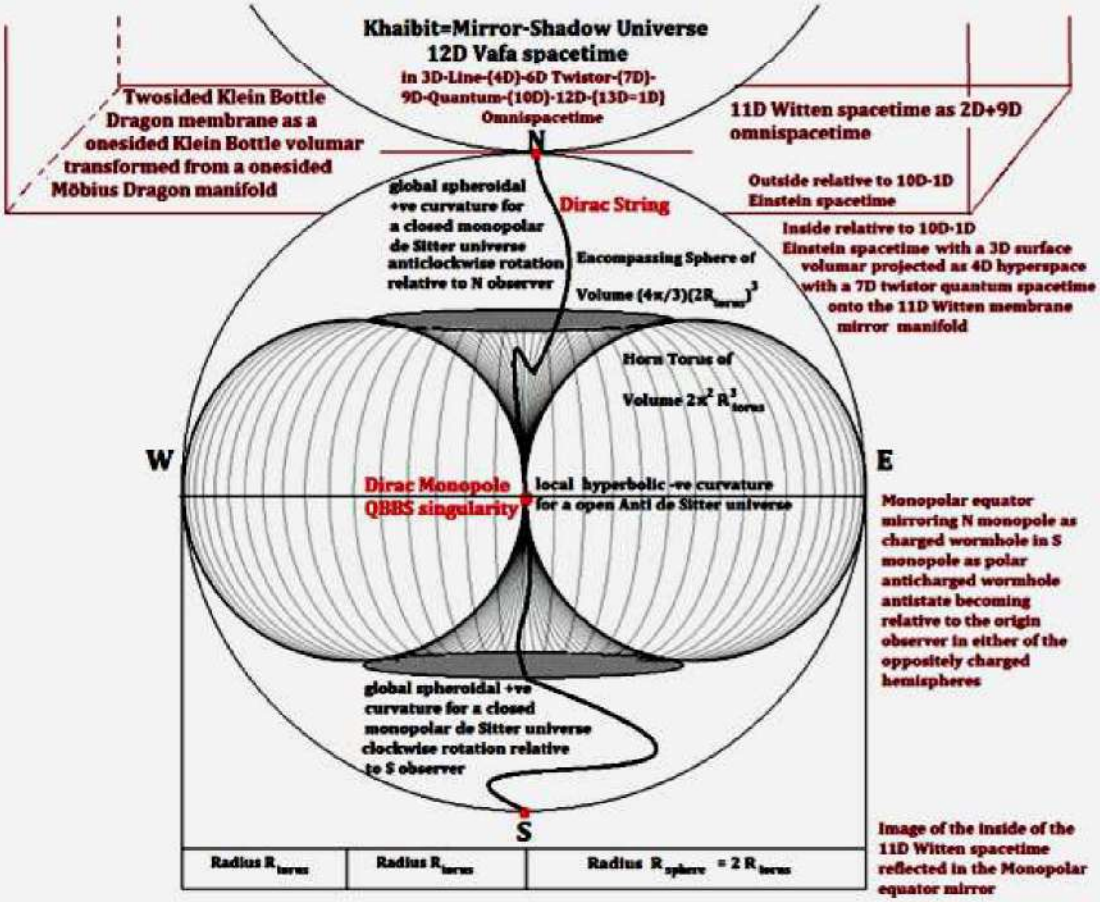


Figure 25: Meijer's Twin Bipolaron configuration can be seen as a global Dirac monopole representation of the universal Horn Torus topology

The time derivative for the actual Hubble parameter is $\mathbf{dH/dt=(dH/dn)(dn/dt) = -H_o^2(2n+1)/T(n)^2}$

The acceleration for the expanding curvature radius becomes the Milgröm acceleration a_{mil} invoked to explain the dark matter factor in Milgröm's Modified-Newtonian-Dynamics or MOND model and in Verlinde's Emergent Gravity from Quantum Information models (**Fig. 7,16,17,18,19,20,21**).

$a_{mil} = d(c/[n+1]^2)/dt = -2cH_o/[n+1]^3 = -2c^2/R_H[n+1]^3$ [m/s²]*

Baryon Matter, Dark Matter and Dark Energy distribution in $\Omega_{BM} + \Omega_{DM} + \Omega_{DE} = 1 = \Omega_o f(n) + \Omega_{DE}$
$\Omega_{DE} < 0$ for $n<n_{DE=0}$ and $\Omega_{DE} = 0$ for $n=n_{DE=0}$ and $\Omega_{DE} > 0$ for $n>n_{DE=0}$

The density ratio $\rho_{BMUDM}/\rho_{critical} = M_oY^nR_H^3/M_HR_H^3(n/[n+1])^3 = \Omega_oY^n\{1+1/n\}^3 = \Omega_o f(n) = \Omega_{BM}\{1+1/n\}^3$

$\rho_{BMUDM}/\rho_{critical} + \Omega_{DE} = 1 = \Omega_o f(n) + \Omega_{DE} = \Omega_{BM}\{1+1/n\}^3 + \Omega_{DE}$

For $\Omega_{DM} = \Omega_{BM}\{(1 + 1/n)^3 – 1\} = \Omega_o(1.618033)^{1.132712}\{5.67480\} = \{0.048344\}\{5.67480\} = 0.274344$ and
$\Omega_{DE} = 1 – \Omega_{DM} – \Omega_{BM} = 1 - \Omega_{BM}\{(1+1/n)^3\} = 1 – 0.048344\{ 6.67480\} = 0.677313$ for the present time

$\Omega_{BM} = 0.048344$ with $\Omega_{DM} = 0.274344$ with $\Omega_{DE} = 0.677313$ (Fig. 10).

For $n<n_{DE=0}$ the quintessential DE fraction is negative and subtracted from the Dark Matter fraction.

The Dark Energy DE onset as a correlation between scale factors $a(n=½) = R(n, t)/R_H = n/[n+1] = ⅓$ and $a(n=1) = R(n, t)/R_H = n/[n+1] = ½$ then synchronizes the intersection interval between the closed compressed dS spacetime and the uncompressed open AdS spacetime in the intersecting twinned universe in the interval $[-½|0|+½]$ as imaged half cycles as a full cycle $[0+n_{ps},+1]$ imaged in $[-1, 0-n_{ps}]$.

For the DE to be 0 the density ratio $\rho_{BMUDM}/\rho_{critical} = 1$ describing the Sarkar mass seedling M_o to increase quintessentially by the BM-DM intersection, saturated at $n=\sqrt{2}$ for constant Ω_{BM} to the closure value M_H as $\Omega_o=1$.

$\Omega_oY^n\{1+1/n\}^3 = 1$ for root $n_{i+1} = n_i – f(n_i)/f'(_{ni})$ by a Newton-Raphson approximation
for $f(n) = \Omega_o\exp[n\ln Y]\{1+1/n\}^3 – 1 = 0$ and $f'(n) = \Omega_o\exp[n\ln Y]\{1+1/n\}^2\}(\ln Y[1+1/n]-3/n^2)$

For $n_1=½$; $n_2 = ½ - f(½)/f'(½) = ½-(27\Omega_oY^{½}-1)/(9\ \Omega_oY^{½}\{3\ln Y-12\} = ½-(-0.037323)/(-3.387457) = 0.488982$ converging to $n_{DE=0} = 0.489365\ldots = ½ - 0.010635$ and as $\Delta n/H_o = \Delta nR_H/c = \Delta t = 179.48$ million years as the quantum extremal surface wall for the Page Time in the resolution of the Hawking Information Paradox and as the transition period from the onset of the dark energy 8.258 billion years from the QBBS to 8.438 billion years as the scale factor $a(1) = R(n)/R_H = ½$ (see **Fig. 3,6,11**).

This synchronizes the nodal $H_o=c/R_H$ frequency with the halfway marker for the AdS Lightpath $nR_H/R_H=½$ meeting the dS Lightpath in the inflaton reversed and nodal mirror EMMR reflection.

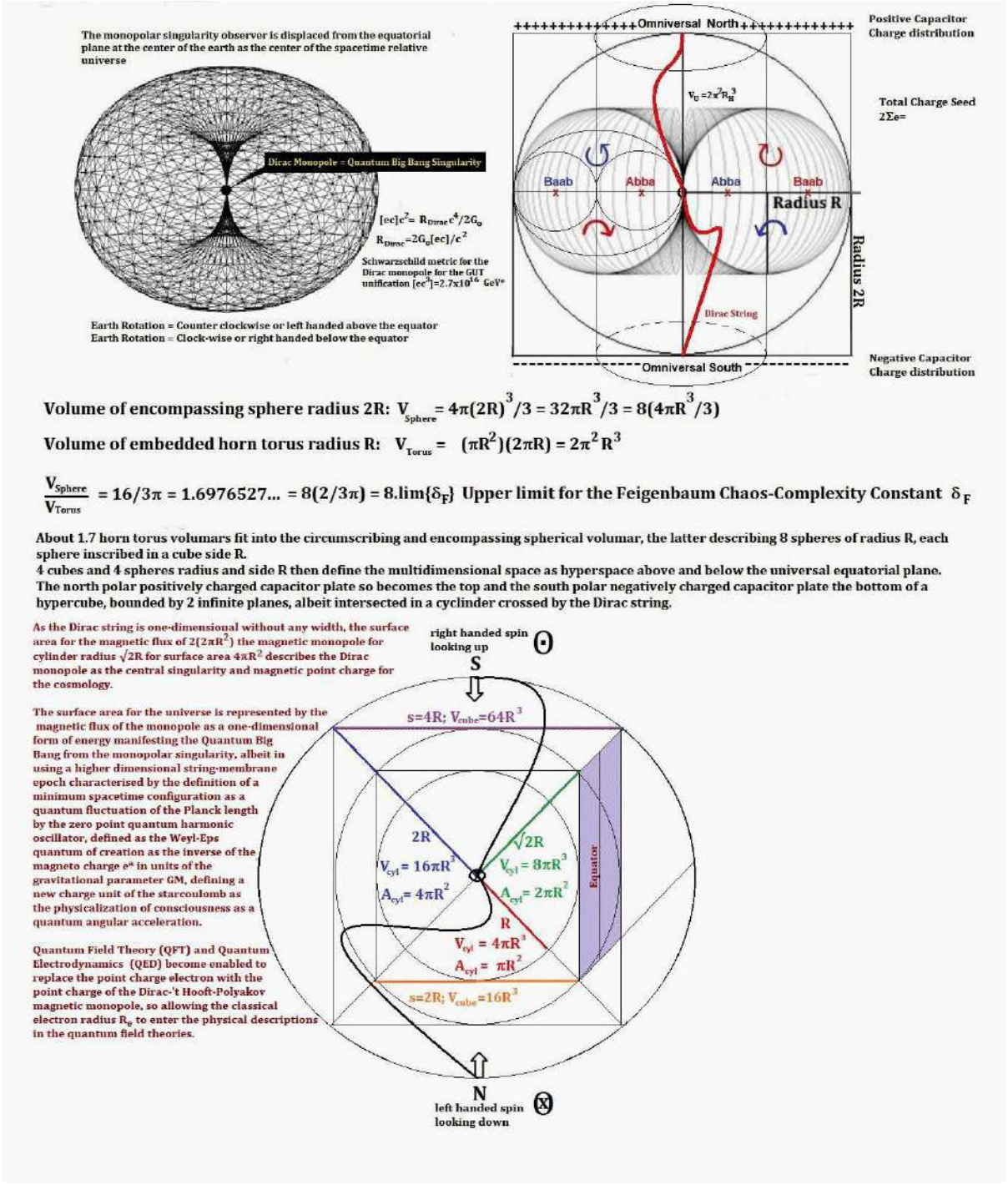


Figure 26: The Khaibit Shadow Mirror Universe with the Dirac String-Monopole Horn Toroidal Geometry Transfiguration

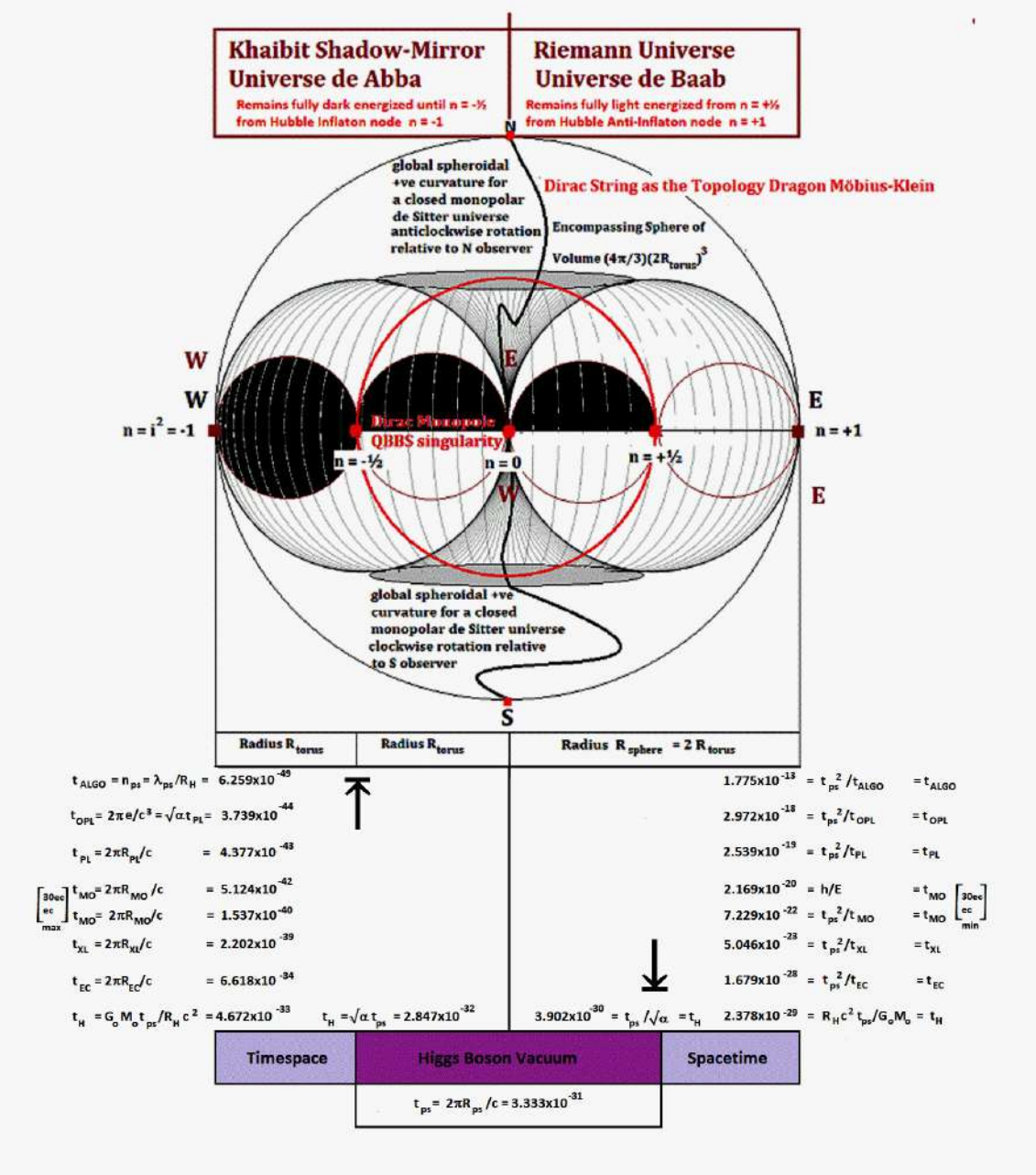


Figure 27: A Time-Temperature evolution of the Universe across the Higgs Vacuum

Part 3: Supplement to Bermanseder article by Dirk K F Meijer:

Quantum Gravitation in the Unified Field, the Age of the Universe and Supermassive Black Holes

Introduction

The concept of Bipolaron mediated Gravity was recently presented, (**Meijer et al, 2023; Bermanseder and Meijer, 2023 a b**). Since it deals with the creation of Gravity, Dark Matter, Dark Energy and Structure of Superfluid Quantum Space-time Lattice, and also integrates a primordial Acoustic Quantum Code of Resonant Coherence, it could be considered as a "Grand Unified Theory".

This idea is supported by its scale invariant/fractal character as well as the applied Holographic principle, including an Event Horizon global memory workspace, associated with the brain. They established that the present concept of the Twin-Bipolaron Gravity, bears clear similarities with the Mirror Universe of Bermanseder (see **Fig. 25,26,27**). In addition, the concept seems to be related to the Dirac String and a heterotic class HE(8x8) version of String/M- theory. Its primordial origin of sound (phonon) mediated quantum fluctuations stipulates a fundamental role in stepwise, temperature related, unfolding of cosmic information as noticed by Wong et al., (see **Meijer and Wong, 2021**) following the cyclic reproduction of our universe from a previous version of it (cyclic or bounce universe).

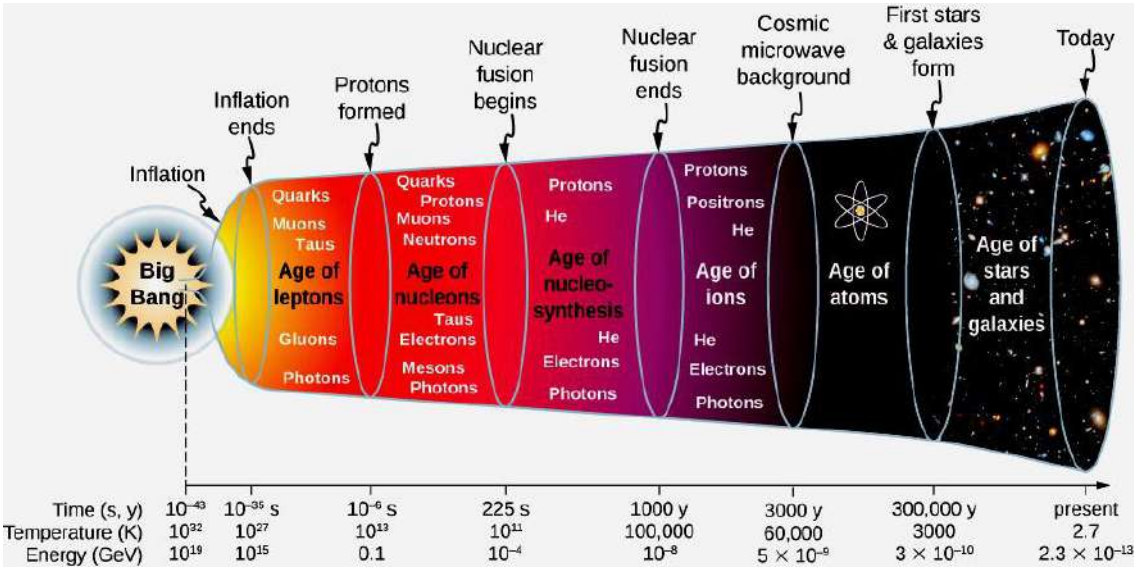


Figure 28: A Time-Temperature evolution of the Universe as proposed in the old Standard model of cosmology

From these studies it follows that quantum observation requires both a human-related and a universal consciousness (**Meijer et al, 2022**). It is hypothesized that the integrative character of this concept provides a connective element in the fabric of reality, (**Fig. 28).** The present concept is fully compatible both with the current Standard Model as well as with String (M)theories, but adds a novel underlying Gauge of a fractal phonon EMF power spectrum. In addition, it introduces a 4th spatial dimension in a toroidal context. The Bipolaron concept may thus represent a potential novel element in physics and

science revealing a fifth fundamental Gauge interaction, now framed as the Gravitone (**Meijer et al, 2023**).

In earlier work it was elaborated that the Acoustic Quantum code provides a connective principle in the entire Universe.

The revealed the basic EMF frequency pattern, can be expressed in the 12-tone series of decomposed Chern-numbers, from which twelve fundamental topological invariants could be derived (Meijer, 2023). In earlier studies, it was hypothesized that the dipolar water molecule may be instrumental as a scale invariant conduit for universal entanglement, and the Acoustic Quantum Code in discrete EMF frequencies was accordingly revealed in water. Subsequently, a central role of H+/H20 (hydronium) composites in conscious brain states and cosmic connectivity was suggested (**Meijer et al, 2022).** It was subsequently established, in an EEG brain frequency analysis, that coherent brainwaves play a crucial part in health and disease (**Meijer, 2023**), as well as in the creation of first life (**Meijer and Wong, 2022**)

Meijer, earlier proposed that the universe was created out of three elemental and interconvertible building blocks: Energy, Matter and Information (**Meijer, 2012**). In his present Gravity work, it is submitted that gravity is a complex form of energy that can only be manifested in a quantized superfluid or fluid-crystal spacetime lattice, on the basis of moving oppositely charged and electromagnetically stabilized electron-proton wave/particle pairs. These are guided by a spectrum of phonons with discrete EMF frequencies. This results in composite gravitational wave/particle units, conceived as phonon-covered electron/proton pairs, called quasi- wave/particles, here framed as Bi-polarons.

Through their dynamic flow in the accelerating and expanding space-time matrix, they obtain a rotational character (vortex) as well as the essential spin of the constituting fermions. Twinned Bi-polaron-units generate gravity and dark energy modalities, depending on their left-hand or right-hand vortices rotations as well as the local density of the quantum fluid lattice in which they are transported. All forms of elementary matter in the cosmos can therefore be seen as composed of multiples of the abovementioned electron/proton particle modes, rendering gravity/dark energy an intrinsic aspect of mass. The rotational and spin properties of the polaron units, as well as the phonon- guided flow of charges can be modeled by related trajectories in a toroidal geometry. The latter can also accommodate the relativistic perturbation of space-time as the intrinsic typical recursive surface bending of the torus and thereby integrates the gravitational mechanism of Einstein's theory. This requires some type of primordial information to obtain its specific hexagonal form with toroidal flow at its edges.

We submit that photons/phonons are created by the annihilation process of matter and antimatter (see **Fig. 29**). In the 5D setting of **Meijer and Wong, 2021**, they may represent the massless monopole spinors in 5D with opposing charge. This information could be inherited from a previous version of our Universe (as earlier conceived by **Penrose, 1999** or **Steinhardt and Turok, 2002**).

EMF Background of the concept

Dirk Meijer's papers on Gravity are thus written on the basis of a large series of previously published papers that report on the ''Acoustic Quantum Code of Resonant Coherence", originating from about 20 different observations on meta-analysis studies of Geesink and Meijer, that all consistently revealed the presence of an electromagnetic frequency distribution pattern of alternating coherent and decoherent character, both in animate and non-animated conditions.

The authors regard this as a primordial power-spectrum that guided biophysical processes in a scale invariant (fractal) manner involved in creation of the cosmos and life therein.

Apart from the cosmic level (Gravity wave frequencies, CMB acoustics, ZPE field), the pattern was studied in creation of first life, brain function and consciousness, microtubular oscillations in neurons and in non-animated physics, such as entanglement promotion , superconducting processes, EMF frequencies of water. and finally in resonant black-body vibrations at the Planck scale as well as in energy distribution of bosonic and fermionic elementary wave particles (see **Table 2**).

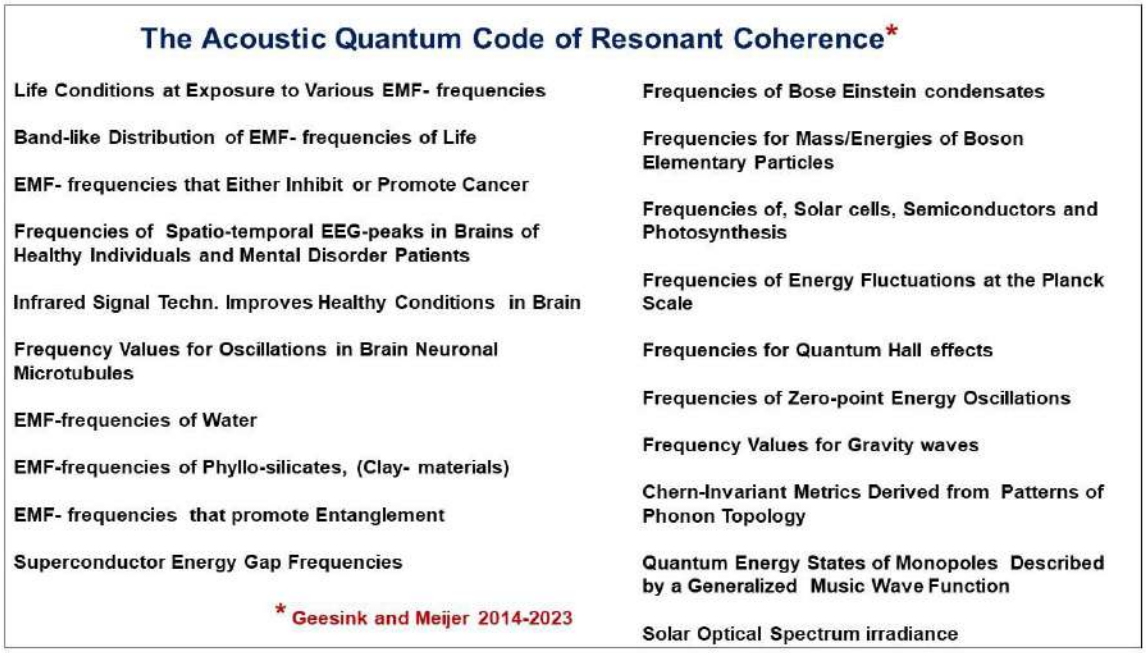


Table 2: The Discrete EMF- frequency distribution, as experimentally detected in Animate (left) and Non-animate systems (right), revealed the guiding principle of an Acoustic Quantum Code

This EMF concept on resonant coherence may therefore add a fundamental connective principle to current physics and cosmology. It also can clearly invite current scientists to elaborate on a unified field approach. Meijer's phonon structure would relate to the "OM" as the primordial sound of creation once the pan-consciousness had transformed its eigenstate of chaotic unconscious thought, to that of a self-state of spacetime aware consciousness. The Bipolaron integration in the unified field then potentially opens up new research and understandings regarding the quasi-particle physics in solid state, superconductivity and related fields of research.

Relation with String theory and Primordial Cosmology

Meijer's Bipolaron can also be identified as being the heterotic class HE(8x8) string, claimed as being the closest approximation to describe the standard model of particle physics in string-membrane theory. The toroidal equivalence of the 5D-4D symmetry breaking in the hypersphere enables this in the Poincare conjecture of topological deformation of manifolds.

The Bipolaron dynamics is supposed to have existed before space-time and, therefore, even prior to the Planck-epoch, as a Genesis Boson in the dedicated form of a Twin- Bipolaron modality. This concept may become the first Platonic-Neo-Platonic Penrose identification of the Self-simulation.

Such a concept is known as a 'first thought' or as a 'first sound' or 'first word' of creation of the Universe, following a state of unconsciousness. The story of the Bipolaron model, however, goes even further back into a pre-space-time era, where this 'sacred Fibonacci geometry' became utilized to create the fundamental constants of nature. So, the 'first sound' , known as the" OM" is reflected in the equation $mc^2 = E = hf$, coupling the quantum mechanics to quantum relativity the latter encompassing both special and general relativity, (**Bermanseder and Meijer, 2023 b**).

Phonons as sound wave/particles are very similar to photons that rather are light wave/particles and exhibit varying but discrete frequencies, in which photons are manifested in the vacuum, whereas phonons only occur in solids, fluids or superfluids, the latter being also relevant for primordial conditions at the transitional start of our universe.

The various frequencies of the phonon quantum fluctuations can be grouped in bands as a series of 12 tones, according to harmonic principles. Geesink and Meijer, established that these phonons all have a discrete frequency value, ranging over a wide spectrum of Hz to GHz, rendering the 12-tone to be a scale-invariant pattern. The latter property provides the Bipolaron structure with a self-similar character and is compatible with quantum holography.

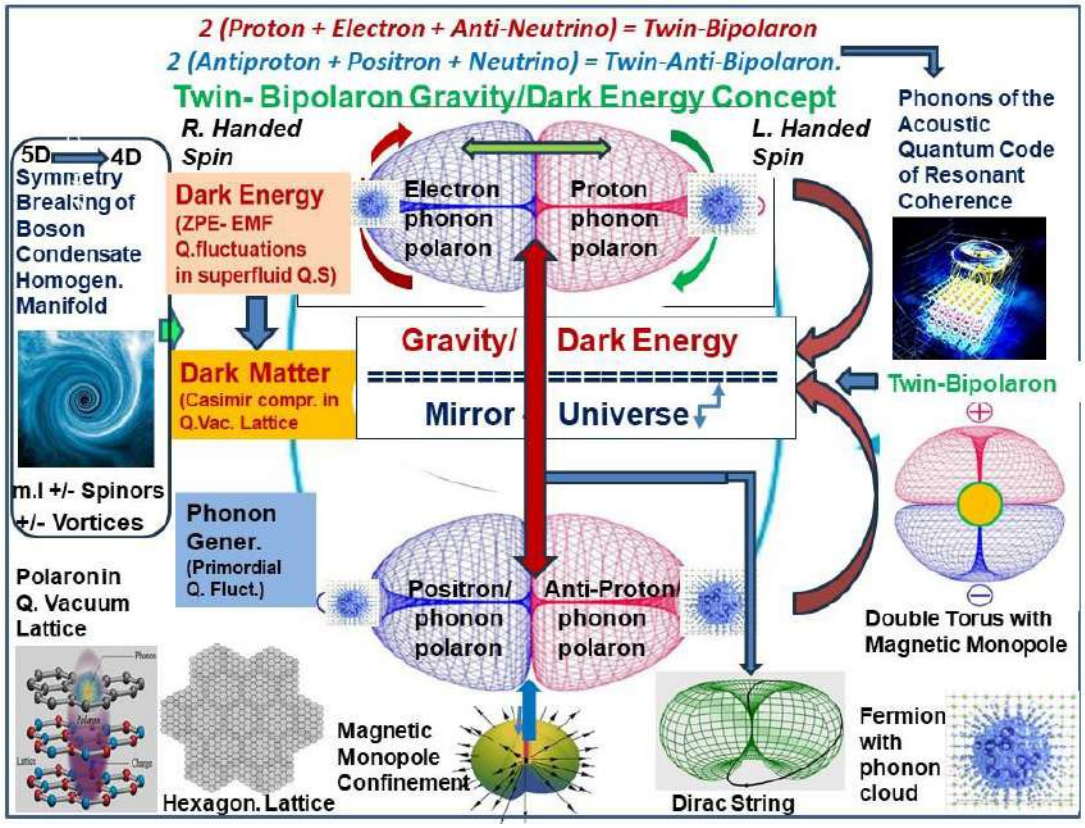


Figure 29: *The concept of the Twin-Bipolaron "Gravitone", as a generator of Gravity and Dark Energy, that occurs via 5D to 4D symmetry breaking (inset left), producing a discrete set of phonons in a toroidal setting (inset right above) that form quasi-particles by covering fermions such as electrons and protons*

(inset right at the bottom), with phonons, thereby forming polarons. The resulting Bipolarons exhibit right-handed and left-handed spin that through their rotational interactions, are instrumental in the generation of Gravity and Dark Energy, respectively, as determined by the direction of vortices spin, (Gravity/Dark energy depicted by the red arrow in the middle).

The polarons may be produced and /or become associated with a quantum vacuum lattice with a hexagonal structure (inset right below). The latter may enable a Casimir type of Dark Matter particle generation by Dark Energy quantum frequency squeezing, (see inset middle left). The dual Twin Bipolaron structure is situated also in a supposed adjacent Mirror universe with Matter/Anti-matter cosmic symmetry (center of figure), explaining the relative low Ant-Matter density in our universe. The involvement of magnetic monopole confinement is shown (middle at the bottom) as operating at the inner center of the double torus structure (inset middle right). The generation of Gravity can also be interpreted as space distortion via a Dirac String, connected to a magnetic monopole, providing the related mechanism of Relativity- based Gravity.

Bipolarons have been described in many studies and, among others, were shown to be formed in BSE condensates (see **Camacho-Guardian et al., 2018** and the many references therein). Thus, our primary model depicted in **Fig. 29,** would require an alignment of the polaron units by charge- structured lattices in the ZPE field context, that remains to be identified. Therefore, at present we favor a mechanism that is based on chiral rotational vortex interactions as depicted in **Fig. 29.**

In addition, since apart from electron/proton pairs also positron/ anti-proton pairs could be involved (see **Meijer et al., 2023**), a double or **Twin Bipolaron** could be involved in which the two Bipolarons are separated according to a matter/antimatter symmetric cosmology, see **Fig. 29.** Both sides of the Bipolaron have both state and anti-state properties, as in a unified field. The mirror super-symmetry is simply given by the negative energy decreasing and positive energy increasing in the properties of the unified field manifested by the nature of the Bipolaron.

Consequently, the central idea in the Twin-Bipolaron concept is that *protons were never alone*: they attracted electrons by their opposite charge and in addition this stable construct was covered with a shell or a cloud of phonons of various thickness/ density. It is assumed that phonons were abundantly present in the 5D to 4D symmetry breaking, either as stemming from a previous university (cyclic cosmology), and later by decay of neutrons (see **Fig. 29**).

The attraction and repulsions are on both sides and may occur without charge differentiation, as the structural definition of its distinction is simply the cyclic or anti-cyclic permutation of the quantum geometry. The quasi-particle (fermions covered with photons or phonons) structure, embraced in the recent publications (**Meijer et al., 2023 a; b**), derives from the Action Law: Action = Charge Squared, as a direct consequence of the Quantum Hall effect and its superconductivity equations.

General relativity is by nature background independent and so the true unification, must emerge from spacetime parameters as a string Newtonian background. This is achieved in the Twin Bipolaron parameters as derived from the Planck Harmonic Oscillator, also described in a quantum gravitational wormhole mass. This, by calculating as the Weyl-mass $m_{ps}=m_{ZPETBP}$ as the bipolaron mass in ZPE form, with the bipolaron mass in dark matter form, being the physicalized consciousness definition at 14.03 TeV.

It is of interest here that gravitational electron-positron dipoles in helical motion, (albeit without a phonon involvement), have been described earlier in several papers as recently reviewed by **Clague, 2021**, in an attempt to unify electromagnetic and Gravity forces. This is also the basis for description of

the photon as a quantum entangled superluminal double-helix particle that, at passing near an atomic nucleus, is reconverted in an electron/positron pair, making the cyclic process closed (**Gauthier, 2019**),) while the aspect of acoustic guiding of reality was earlier confirmed by Macken, in his elegant essay on A Single Field Model of the Universe, representing his Sonic Universe, (**Macken, 2023**).

We want to emphasize here that our studies were largely stimulated by the pioneering studies of **Fedi, 2018**. Interestingly, the Fedi paper, clearly implies the Bipolaron as a Goldstone Boson, that we have repeatedly derived as a derivative of the Higgs Boson and the Bipolaron parameters as a dark matter fifth elementary interaction. Fedi infers a superfluid background, which gives rise to the vortex behaviour of the fundamental particles much like the **Larusso, 2023**, approach with the ring toroidal electron structure, encompassing the proton model of **Fedi, 2018.** Recall that the electron ring of Larusso is bounded by the strange quark as a down quark oscillation. This then allows neutron-beta decay to proceed via a down quark of the neutron contracting as a kernel-core up quark releasing the electron ring with a gluon transforming into an antineutrino. Fedi also treats the action law as a elementary derivation from Planck's constant and hints at the dark energy form like that of the Bipolaron, as a fundamental constituent of the vacuum as a superfluid. This superfluid then becomes the wormhole propagation of Bipolaron quanta as the vortices of the superfluid described by the Larusso kernel-ring quantum geometry. Fedi's hydrodynamic description so becomes the background for our phonon/quasi particle interaction and so is very amenable for the Meijer and Geesink's acoustic model and Macken's sonic universe. This, then quantum entangles the microcosm of the Dark Energy via ZPE and the Higgs Vacuum with the macrocosm of Dark Matter by the largescale cosmos as represented by the classical curvature geometry of GR.

Another, highly appreciated approach is that of Kai-Wai Wong et al, that earlier applied our General Music Scale in his creation cosmology (**Meijer and Wong, 2022**). Regarding the recent **Wong, 2024** paper on the Step by step creation of life, the author is replacing $m=hf/c^2$ (mentioned as the "OM" of Wheeler), in the gravitational potential energy GM^2/R in connection with Einstein's Energy-Momentum relation $(pc)^2+(E_o)^2=E^2$ to furnish his model. He is, thereby, closing in on the monopolar cosmology which we have mentioned in the summary as the Maxwellian displacement current, substituting a mass equivalent in the GUT scenarios. Wong's Graviton frequencies are related by the gravitational wave spectra as shown in our paper and as observed by LIGO. The strain of cosmological objects is defined in a Higgs Boson interval, which so describes the Twin Bipolaron wavelength interval of the HE(8x8) 5^{th} heterotic superstring in the creation event and its Gravitation Center (See **Fig. 13,** and **22**). Wong's description of a 'graviton pressure' in Black Holes interacting with a Lorentz environment so becomes the Temperature evolution as a quantum entanglement between the CBBR temperature and the Ylem — Gamow temperature of the dark matter temperature of the Twin-Bipolaron concept.

Conclusions:

"Why is the Twin-Bipolaron model necessary for an adapted cosmological perspective?"

Recent analysis of data obtained by the James Webb Space Telescope (JWST), has found apparent discrepancies with the standard models in cosmology. Large galactic structures based on the understood coupling between White Hole Quasars and Black Hole Supermassive Black Holes (SMBH), at the center of galaxies seem to have formed immediately following the creation event, commonly known as a Quantum Big Bang Cosmology (QBBC). As the age of cosmological structures cannot be greater than the age of the universe itself, many cosmologists have realized that the standard cosmology needs some reanalysis, modification and additions to the present model. Earlier attempts to reformulate the cosmological standard models, such as revisiting 'tired light' models and 'varying fundamental constant'

hypotheses have resulted in models extending the age of the universe to 20 up to 26 billion years, seemingly accommodating the new measurements of the JWST. The reintroduction of the 'tired light' and 'varying constant' proposals are however incompatible with other well tested and accepted premises of the standard cosmology of the QBBC.

The present paper 'solves' these discrepancies observed in extending the present standard model of cosmology in exposing the short-comings of the QBBC by deriving the age of the universe and its foundations of star- and galactic evolution from the initial- and boundary conditions of the creation event. It is shown that the accumulation of primordial micro-black holes generates bigger black holes by coupling as energy sinks to quasar-white hole energy sources. The latter by 'feeding' the source-sink seeded cores as galactic centers and active galactic nuclei. This process is reversed in supermassive black hole seeds, amounting to 0.25 percent of a universal baryon mass seedling (see **Table 1**). This is coexisting in the creation event of the QBBC transiting across a Higgs vacuum from a time-spaced Planck parameter epoch, to define the Big Bang Cosmology in the birth of space and time.

This Planckian timespace is associated with a multidimensional cosmology, based on spacetime modular dualities, as described in a background independent supermembrane theory transforming into background dependent superstrings. They trigger the creation event in the form of a Weylian wormhole, also modeled through the Meijer Twin-Bipolaron concept, exhibiting the properties of dark matter and dark energy in its dual nature derived from the modular string dualities.

The observations of the JWST then indicate that the Super-massive Black Holes, created at the supposed QBBC, became a fraction of the universe's mass content following a cosmic evolution. This was not based on mass, but on temperature until the universes' temperature had cooled enough to attain saturation equilibrium between quantum entangled micro black holes and the SMBHs in a quantum tunneling through a time wall, rather than a barrier of space. The QBBC parameters then define this 'time barrier' in the inversion properties of the modular duality of supermembrane theory, as modeled by the Meijer Twin bipolaron as the agency for this quantum entanglement as a fifth elementary gauge boson interaction.

As explained in our previous papers, the Twin-Bipolaron concept represents an alternative labeling of Witten's 11-dimensional supermembrane, unifying the background dependent, 10-dimensional linearized/quantum loop superstrings in background independency, as published by Witten in the second superstring revolution of 1994, and in fact is introducing a modified M-Theory (Membrane-Matrix-Meijer Theory). The Twin Bipolaron so is labelled as the Eps.Ess supermembrane as a unifying manifold-area, expressed in quantum geometry with two parts as defined in the mirroring T- and S-dualities in the Quantum Relativity model for the unified field based on five (not four) fundamental interactions a priori.

The Twin-Bipolaron model then relates the E(primary source-sink)=White Hole/Quasar as the high vibratory energy/frequency self-state, being the ZPE form of this part of the physically manifested supermembrane and the low winded energy/frequency E(secondary sink-source)=Black Hole part. This, then manifests the mass-inertia induction to the ZPE as the Dark Matter form of the Twin Bipolaron as a Higgs Boson mass induction agency underpinning this 5^{th} elementary interaction in the gauge properties of the unified field. This then quantum entangles the microcosm of the Dark Energy via ZPE and the Higgs Vacuum with the macrocosm of Dark Matter by the large scale cosmos, as represented by the classical curvature geometry of General Relativity.

The Twin-Bipolaron concept can, therefore, be described as a fifth gauge field agent in the Unified Field of Quantum Relativity. In its nature of manifestation, it can be said to symmetrize Maxwell's equations in it electric field and magnetic field properties and it can be modeled to unify five string classes in spacetime in Witten's background independent supermembrane M-theory, this in synergy with the background independence of Einstein's General Relativity Theory.

The Twin-Bipolaron history and evolution derives from a pre-spacetime realm of ideal abstract mathematical-geometric forms, modeled on an imagined world of harmonies as proposed by Greek philosophers inthe stead of Pythagoras and Plato and in its Neo-Platonic form as a derivative in the concepts of Roger Penrose.

This Acoustic quantum code arose on the basis of frequency distribution of recently detected Gravity waves, frequencies of the CMB acoustic spectrum, detected ZPE field EMF fluctuations, EMF values of Superconductor energy gaps, Boson and BSE energy distribution, EMF values of beneficial/detrimental effects on Life conditions, in addition to manifestation of Coherent/Decoherent EEG brain waves, as well as the frequency spectrum of Neuronal Microtubule oscillations, and finally the Black- body radiation frequency distribution at the Planck scale (**Table 2**). This collective evidence, therefore, reveals an, all pervading guiding principle in the Universe, functioning as a dynamic information field of harmonic sounds that actualizes the successive steps in the ongoing fabric of reality.

Wheeler's information-based cosmology 'It from bits' modeled in his 'Atom of Information crystallizes in a self-referential quantum relative form of the Twin Bipolaron as the latter's self-transformation from pre-spacetime across a Higgsian Goldstone and massless vacuum modeledon Vortex/Vacuum-Potential Energy VPE as the Null dimension of the Zero-Point-Energy ZPE. The Twin-Bipolaron then manifests in the form of Dark Energy as a form of the ZPE, also describes the Dark Matter in an associated form of the ZPE as the 'Quantum of Physicalized Consciousness' through the nature and expression of the Dirac charge of a magnetic monopole**.**

The anti-gravitational properties of the Meijer Bipolaron emerge from its nature of being the quantum of physicalized consciousness in the Dirac charge of the magnetic monopole, as the 'free space' equivalent of an electric field manifesting in a mass carrying magnetic field as a gravitational field and as derived from Faraday's law and Maxwell's equations (see **Fig. 31**).
In particular, a Maxwell displacement current [$ec=i*/D_{max}$] is shown to represent a higher dimensional form of the Meijer bipolaron from the Planck parameter epoch as a transformed Planck-string class responsible for decoupling gravity from the unified field in a Dirac magnetic monopole energy range from (2.7 – 81) $x10^{16}$ GeV in the Grand Unification of the electromagnetic and the strong and weak nuclear gauge interactions.

Following its energy transitioning across five superstring classes, beginning with a timespace background independent Planck string class I and ending in the Weyl-Boson wormhole-bipolaron, spacetime emerges as a background dependence emerging from the superstring transformations. The Twin Bipolaron concept so can be described as a unifying model in the nature of Witten's M-theory, as a background independent "Membrane-Matrix" of energy eigenvalues.

The Bipolaron so provides spacetime properties to its precursor string classes coupled in modular target space (T-duality) and strong-weak coupling strength (S-duality) in the intersection of a 'shadowed' timespace universe mirrored in a physically and gravitationally emerging spacetime universe, to be described as Meijer's Gravitation Centre of the Twin-Bipolaron (see **Fig. 22**).

The nature and properties of the Twin Bipolaron further manifest a mirror supersymmetry for a (closed-cyclic de Sitter with open Anti de Sitter) Twin-Universe, evolving in a parallel cosmology coupling a gravitationally retarded thermodynamic Lightpath of c-invariance to an antigravitational Lightpath. The latter is originally generated by a tachyonic superluminal de Broglie matter wave. In the instanton-inflaton parameters of the Meijer Bipolaron, as initial- and boundary conditions causative for the birth of time and space, arise from the pre-spacetime epoch of the bipolaronic self-transformation. The self-referential nature of the universe then emerges in a cyclic cosmology of the spacetime universe, self-intersecting with its own evolving and imaged 'mirror universe'. This, in an inversion of an explicate order of entropy in a positive physicalized progression, with an implicate order of its negative meta-physicalized propagation of negentropy.

The here proposed supplementation/adaption of the standard model by taking the Twin-Polaron, as a fifth connecting principle (gauge), may ultimately correct the following deficiencies in the Standard model:

1) **The assumption of Dark Matter/Dark Energy**, without defining their origin and nature. The Bipolaron model submits that Dark Matter can arise from Dark Energy by a Casimir type of quantum wave frequency squeezing, in a quantum lattice (cavity) context.

2) **The inclusion of Anti-Matter** on the basis of limited insight into its structure and related problem of its virtually missing in our presently conceived universe. The Bipolaron concept positions Anti-matter in a Mirror or Shadow Universe.

3) **The lack of integration of Gravity/ Dark energy** in the Standard Model, and currently no detection of the *Graviton*, is now adapted by the hypothetical " *Gravitone"*- Bipolaron mechanism, that generates Gravity/Dark Energy through either rotational phonon guided fermion vortices or polaron charge interactions, in a manner compatible with principles of Quantum Mechanics and Relativistic physics.

4) **The failure of direct detection of Magnetic Monopoles**. We submit that the magnetic monopole is a superstring class from the pre-spacetime transition, as finalized in the Twin Bipolaron as the physicalisation superstring class. The Twin-Bipolaron so becomes a transformed magnetic monopole from the Witten M-theory and the GUT-proposals encompassing all five classes.

5) **A lacking explanation of "Cosmic fine-tuning ",** or better, the integral role of probabilistic significance intervals and the like. The natural constants derive from the Genesis of Bosons as the pre-defined Twin Bipolaron. The present first author has published an algorithm showing how those fundamental constants emerge from the 'sacred quantum geometry' in the Pythagoras-Fibonacci mathematics, as related to discrete values of natural constants.

6) **The lack of proper definition of supposed quantum fluctuations as the initiating mechanism of the Universe**, is now conceived by us as a distinct set of discrete phonon oscillations. The orthodox

quantum fluctuation to create the universe is fallacious in the sense of this orthodoxy misinterpreting the 'virtual Heisenberg' matrix as 'unreal' or ephemeral. This 'virtuality' becomes the ubiquitous magneto-colour charge permutation scenario, which is exactly the monopole induction in the Bipolaron depiction.

The primordial quantum oscillations, in the form of phonons with a musical spectrum of energies, in a scale invariant (fractal) 12 tone system, was framed as the Acoustic Quantum Code of Resonant Coherence. It was shown earlier that Dark energy and Gravity can be modeled by Torus-geometry, considering the divergent and convergent aspects of trajectories on the torus (see **Fig. 30**), in which the information flux in the upper halve of the torus is entropic in a decoherent setting but in the lower halve is neg-entropic in a coherent mode with gravity as a convergent mechanism. The spiral trajectories show vortex/ anti-vortex features at the supposed singularity point that enable a 3D to 4D transition including Möbius type of wave conversion, (**Meijer et al, 2020;2021**).

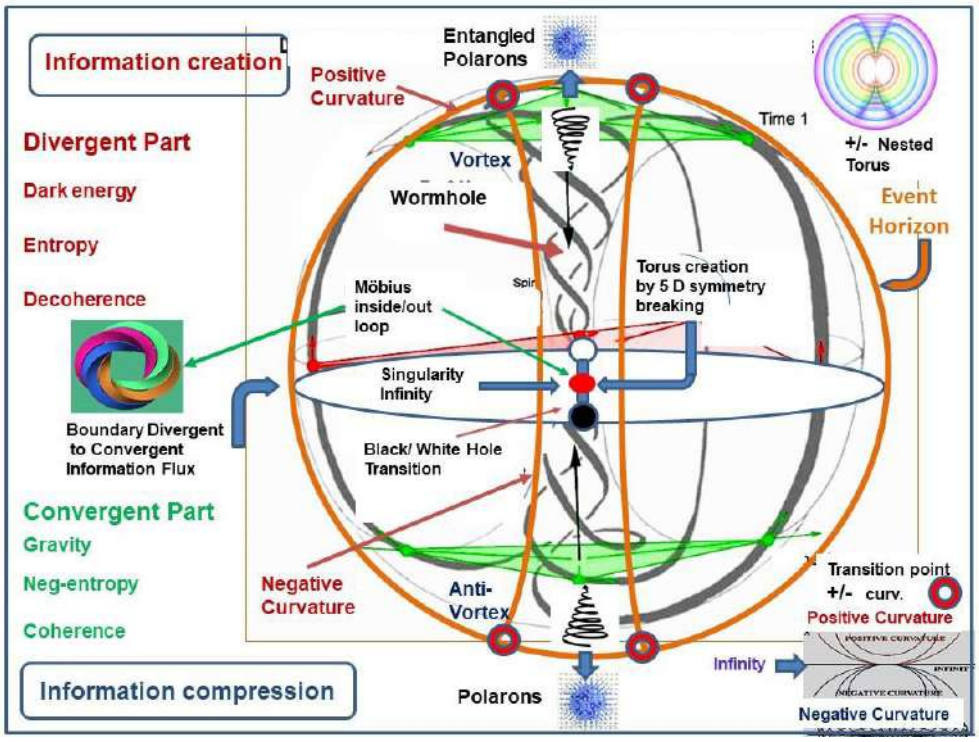


Figure 30: *Double rotational holo-flux of information, according to a toroidal geometric model, showing two intermingling wave trajectories with each having diverging and converging energy modalities that reflect the generation and compression of information seen as being related to Dark Energy and Gravity forces respectively. These can also be envisioned as entropic and negentropic energy forces. Each wave arrives at the intrinsic boundary of divergent and convergent energy(information) flow and subsequently returns to its origin in the Torus singularity core (red dot). Here, via quaternionic (inside to outside Möbius ring/ Klein bottle) transition opening to a 5-D domain and return to 4D is allowed. The 5D dimension is by some regarded as a superfluid quantum space, representing a sub-Planckian (primordial) domain in which the zero-point energy (ZPE) field is a transition zone to the 4-D world we know. The 5-D domain bears discrete sets of 12 harmonic EMF frequencies (Generalized Music Code) that are supposed to act as pilot-waves guiding electron and*

proton particles (polaron quasi particles) in the fabric of reality. Note that, from the perspective of the supposed 5-D superfluid sub-quantum space (to be regarded as a homogenous manifold), the torus operator is created in the process of symmetry breaking from the 5-D phase-space to our 4-D reality, (see middle red arrow).

Bosonic and Fermionic elementary particles/waves trajectories in **Fig. 30,** are positioned as fiber bundles progressing at the surface and inner core of the torus. Vortex and Anti-Vortices are formed as open strings, close to the transition points of positive and negative curvature (four red circles, see also inset right below, at the boundary showing an infinity aspect. This curvature aspect accommodates the Relativistic interpretation of spacetime physics, (**Fig. 30**). Hypothesis: gravitational waves that origin from the 5D space appear as open strings/vortices at the top and bottom of the toroidal geometry, depicted as left and right rotating (anti)- vortices close to the small curvature transition regions. They give rise to emission of (entangled) Polarons that are conceived as Gravity carriers/Gravitones.

A singularity/Infinity aspect of the torus is located at the center of the torus (red point) that, via quaternionic transition can open to 5D spacetime. The White- and Black hole transition process (white and black circles) is located between the singularity and vortex structures and was earlier supposed to represent the bouncing aspect of a cyclic model of the Universe (see **Penrose, 2009, Steinhardt and Turok, 2002.** The entire boundary of the surface of the torus is seen as the "event horizon information modality", as an expression of the holographic feature of a scale invariant universe, that is also present at the level of the human brain (**Meijer and Geesink, 2017**). All this, finds its basis in the supersymmetry of Maxwell equations (**Fig. 31**) and pictures the creation of 27 elementary particles as mass induced by the Higgs Boson/DM derived Twin-Bipolaron hyperonic and four mesonic, $hf=E=mc^2$ Black energy transitions, between radiative and mass-inertial eigenvalue self-states (see **Fig. 32**).

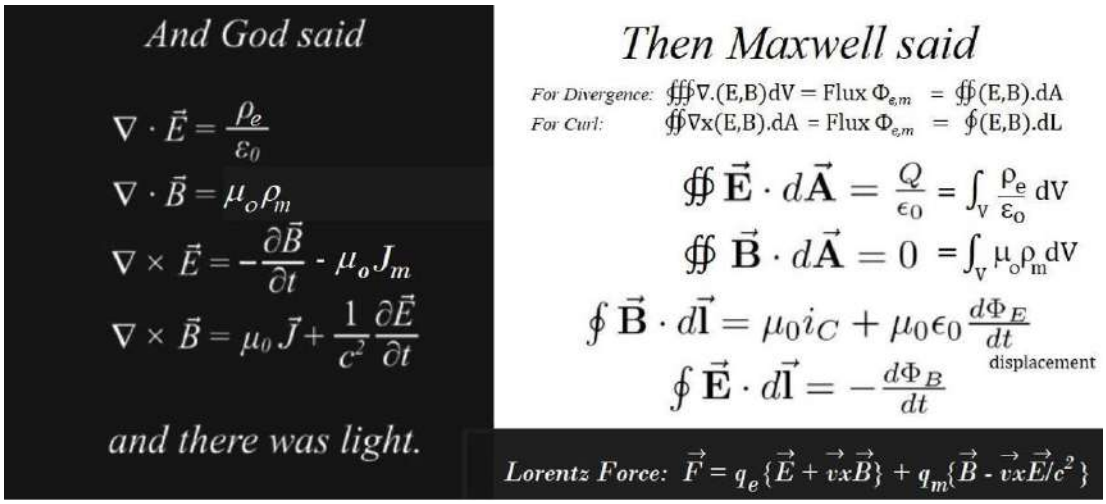


Figure 31: The Supersymmetry of Maxwell's Equations in the Meijer Twin Bipolaron in Displacement Current $i^* = ec/D_{max}$ as a GUT-monopole mass equivalence

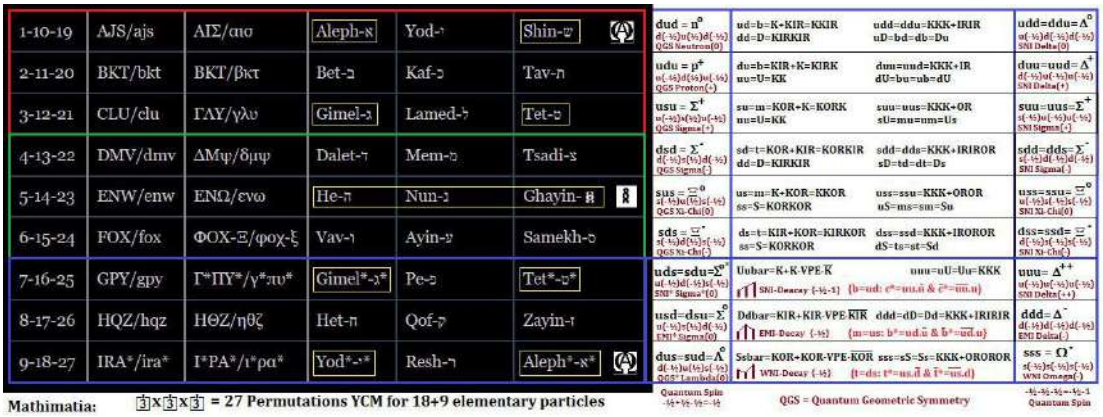


Figure 32: 27 elementary particles as mass induced by the Higgs Boson/DM derived Twin Bipolaron in Y(ellow)C(yan)M(agenta) Colour charge - B(lue)R(ed)G(reen) Anticolour charge permutation in an E=hf W(hite) increasing {YCM & RGB} cyclicity and a decreasing {MCY & BGR} anti-cyclicity in 8/4 gluon quark-antiquark couplings {WWW, WWB, WBW, BWW, WBB, BWB, BBW, BBB} hyperonic and four mesonic {WW, WB, BW, BB} hf=E=mc² B(lack) energy transitions between radiative and mass-inertial eigenvalue self-states.

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