

# The Resolution of Hawking's Information Paradox in Dark Energy and Dark Matter with Baryonic Matter Distribution

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Abstract: Hawking's Black Hole Information Paradox is resolved in a Dark Energy distribution.

Any spacetime observer then measures the universe from two locations simultaneously; namely from the origin of the QBBS as a Big Bang witness and as a 'cosmic wave surfer' 'riding' not the compacted closed de Sitter boundary of the universe, but the open Anti de Sitter boundary of the refracted Lightpath of the higher dimensional electromagnetic monopolar Lightpath at the 'déjà vu' coordinate mirrored from the second universe, created by the intersection of the forward journey of the EMMR and both refracted and reflected from the boundary of the nodal Hubble event horizon.

A perfectly flat EPM universe emerges because the positive curvature of the gravitationally compacted 'baryonic' spacetime expansion cancels the negative curvature of the open hyperbolic spacetime in the Lightpath reflectivity of the 'dark mattered' spacetime contraction from the nodal  $H_0$  Hubble mirror of the QBBS parameters.

As the dS refractive recessional velocity continually decreases in the asymptotic evolution of the dS universe in its definition of the true Hubble event horizon; the reflective part will increase with a relative Doppler blueshift from the Hubble node of the protoverse to mimic an accelerating cosmology for the Big Bang observer looking backwards in time. This QBBS observer will measure a universe getting younger in time for completion of the Hubble cycle of a MBH 'heartbeat' oscillation  $n=1$  to  $n=2$ .

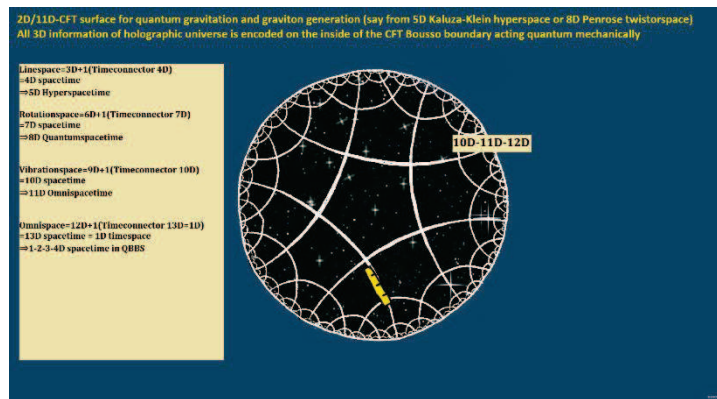
The 'cosmic wave surfer' moving with the recessional velocity of the AdS multiverse and with the boundary of the continually manifesting true Hubble event horizon will however understand that this observer experiences a co-moving cosmological Arpian redshift relative to the stationary Big Bang view.

The asymptotic expansion of the open EPM dS universe continues, but never reaches the nodal Hubble event horizon due to the negative curvature of the AdS cosmology. The experienced universe is so both open and closed in multidimensionality with the 'big crunch' solution of the cosmological formulations being circumvented in the nature of the AdS Lightpath.

As a half cycle defines the Lightpath between the even and odd nodes for the nodal Hubble event horizon with  $n=1$  in the halfway marker of the dark energy onset at  $n=1/2$ , resetting the nodal unitary displacement for the  $n$ -intervals  $[-1/2, +1/2]$  and  $[0/n_{ps}, 1]=[f_{ps}, H_0]$ ; resolves the 'horizon problem' with respect to the Lightpath communicating at lightspeed with its opposite radial coordinate in the reset image of the dark energy coordinate in the shadow universe of Khaibit at  $n=-1/2$ .

This relates to the AdS-CFT correspondence of Maldacena-Susskind and co-operators regarding a Holographic Universe cosmology and the Page curve bound in the Hawking Black Hole Information paradox.

Note: This is an excerpt from this pdf: (PDF) Dirac's Magnetic Monopole and the Energy Density of the Universe from Dark Matter with Dark Energy. [https://www.academia.edu/61474759/Diracs\\_Magnetic\\_Monopole\\_and\\_the\\_Energy\\_Density\\_of\\_the\\_Universe\\_from\\_Dark\\_Matter\\_with\\_Dark\\_Energy](https://www.academia.edu/61474759/Diracs_Magnetic_Monopole_and_the_Energy_Density_of_the_Universe_from_Dark_Matter_with_Dark_Energy)



<https://youtu.be/klpDHn8viX8>

The Anti de Sitter AdS spacetime is negatively curved as 3-dimensional volume behaving like a hologram. It is bounded by a 2-dimensional surface relating the graviton generating Conformal-Field-Theory CFT as the information matrix encoding the 3-dimensional holographic universe. This 'Bousso bound' for a 3-dimensional spherical universe of hyperbolic negative curvature then is modelled as the 11-dimensional Witten mirror of the membrane bulk space in string-membrane theory in  $8+2=10$  membrane spatial dimensions with intermediate quantum wormhole-entangled mirror dimensions as a 5<sup>th</sup> Kaluza-Klein hyperspace surface dimension and an 8<sup>th</sup> Penrose-Twistor manifold dimension.

A 12<sup>th</sup> 'volumar-brane' 'Vafa' dimension, say as the 'outside' of the CFT "Bousso bound" then closes the multidimensional spectrum as a reversed time dimension rendering the 13<sup>th</sup> dimension for a mathematical continuation as a linespace dimension as equal to the null dimension of the timespace singularity of the Quantum Big Bang Singularity or QBBS and enables the 12<sup>th</sup> dimension of the Bousso-Vafa boundary to assume a physical realization as the 1<sup>st</sup> spacetime dimension from the Planck epoch transition from timespace into spacetime.

The 12 dimensions so can be modelled to reduce to 3x4D hyperspace dimensions without time or as 4x3D spatial dimensions utilizing dimension counters 4, 7, 10 and  $13=1$  as time connector dimensions. In string-membrane theory 6 spatial dimensions are compactified in Calabi-Yau manifolds within a 4-dimensional spacetime and in 10-dimensional string bulk space or in 11-dimensional membrane bulk space.

The famous Hawking Black Hole Information paradox then addresses the fact that in classical physical theory and for Black Hole BH descriptions in General Relativity, the information absorbed by a Black Hole's gravity should become lost within the Black Hole and inclusive of the 'virtual' quantum pair partner quantum entangled with the 'materializing' matter-antimatter partner responsible for Hawking Radiation and causing a quantum mechanical loss of mass and heat for the BH. One basic premise for this situation proposed by Hawking, is the independence of a BH from its formation and initial state of 0 entropy and that no information within the BH could be accessible from its outside. The evaporating BH so would lose information within its interior irreversibly by Hawking radiation.

The Hawking BH Information paradox then appears in its conflict with both classical physics and quantum mechanics in regard to conservation laws with respect to energy and momentum and the unitarity principle, demanding that the initial state of a quantum mechanical wave function evolving according to a unitary operator is preserved at any state of the wave function

$$|\Psi(t_1)\rangle = U(t_1, t_2) |\Psi(t_2)\rangle.$$

As the unitary operator has an inverse, the reversal of the wave function should also always preserve the information expressed by the wave function of the system.

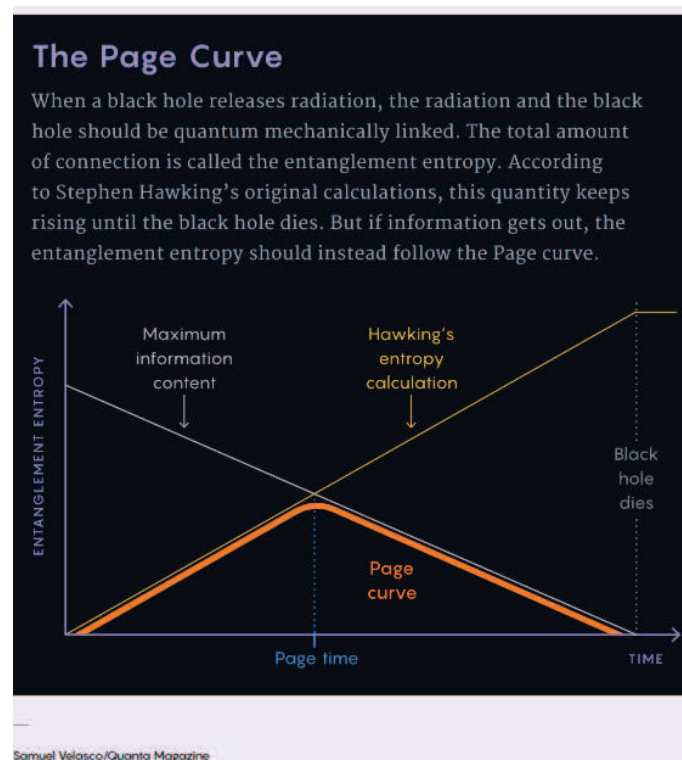
The paradox is resolved in quantum entanglement of the Hawking radiation coupled as a Hawking particle of positive mass-energy as Hawking radiation from the BH event horizon without with the absorbed Hawking antiparticle of say negative mass-energy within.

Any escaping Hawking radiation so must conserve the energy-momentum balance by decreasing the mass of the emitting Black hole.

Any BH event horizon within the dS universe is quantum entangled with the Hubble event horizon of the AdS Lightpath of the EMMI expanding wavefront of the universe for the multidimensional cosmology.

The AdS expanding wavefront can be called the 'Mother extremal Strominger BH' of the Maldacena-Susskind AdS-CFT correspondence of the Bousso-Witten-Vafa bound quantum entangled with the dS expanding wavefront of the dS universe as her daughter.

Considering the dS cosmology as a gravitationally compressed spacetime mirroring the AdS Lightpath as the 'Daughter extremal Strominger BH', the Hawking entropy would rise from the creation event of the QBBS until its dS Lightpath would encounter the halfway marker of  $n=1/2$  as the onset of Dark Energy and as the creation of a extremal BH event horizon as defined by the Page curve as a Quantum Extremal Surface or Manifold and as the maximum entropy coordinate for the time evolution of a Black Hole.



Past the maximum entanglement entropy, the negative mass-energy Hawking particles no longer are confined within the BH and become part of the spacetime outside of the BH, but within the CFT Bousso boundary.

Considering the Strominger form of the dS and AdS cosmologies as eternal-extremal Black Holes, which do not Hawking radiate; the BH Hawking particles become ordinary positive mass-energy particles of the lower dimensional cosmology emitted from the QBBS-dS wave front quantum entanglement towards the Bousso-Witten CFT quantum mechanical inner boundary of the compressed spacetime.

The negative mass-energy manifest in imaginary Hawking-Wick time in the mirror image of the QBBS in the Khaibit shadow or mirror universe.

But the imaginary Hawking-Wick event horizon is in physically real time as the dS-Bousso bound and so the Dark Matter contained in the compressed dS spacetime is subtracted as negative mass from the outer dS-Bousso bound in the mirror duality to balance the critical density for overall mass closure of the multidimensional cosmology.

The inner AdS-Bousso bound then emits positive mass-energy Hawking particles as the Dark Matter fraction not intersecting the baryonic matter and the outer AdS-Bousso bound matches this 'dark matter' as negative mass-energy Hawking particles not as Hawking radiation, but in the form of 'light matter' Vortex-Potential-Energy VPE or ZPE associated with the spacetime creation defined by the true Hubble node as the expanding wave front of the multidimensional quantum entangled multiverse.

This imaginary time is bounded as real time in the inner boundary of the Bousso-Witten-Vafa CFT quantum mechanical inner boundary of the uncompressed AdS spacetime in omnispacetime in 12-dimensional Vafa-time and as the reversal of the time arrow as the outer form of the CFT boundary.

The inner boundary of the dS-Bousso CFT boundary so emits and absorbs the mass-energy dynamics in energy-momentum conservation and continuity and in the form of the Einstein quintessence incorporating both baryonic and dark matter of the lower dimensional dS universe as the information contained in the de Sitter universe, bounded by its higher dimensional Anti de Sitter universe in an extremal BH communication between the AdS mother and the dS daughter universes.

The spacetime between the two spacetimes geometrically and topologically describes a region of spacetime exclusively occupied by dark matter as that part of the critical density not yet reached by the expansion of the compressed dS wavefront of the gravitationally retarded cosmology.

**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  $\rho_{BMUDM}/\rho_{critical} = M_o Y^n R_H^3 / M_H R_H^3 (n/[n+1])^3 = \Omega_o Y^n \{1+1/n\}^3 = \Omega_o f(n) = \Omega_{BM} \{1+1/n\}^3$

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

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  $\Omega_{DE} = 0.677313$**

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 the scale factors  $a(1/2) = R(n,t)/R_H = n/[n+1] = 1/3$  and  $a(1) = R(n,t)/R_H = n/[n+1] = 1/2$  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  $[-1/2 | 0 | +1/2]$  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  $\rho_{\text{BMUDM}}/\rho_{\text{critical}} = 1$  describing the Sarkar mass seedling  $M_o$  to increase quintessentially by the BM-DM intersection, saturated at  $n=\sqrt{2}$  for constant  $\Omega_{\text{BM}}$  to the closure value  $M_H$  as  $\Omega_o=1$ .

$\Omega_o Y^n \{1+1/n\}^3 = 1$  for root  $n_{i+1} = n_i - f(n_i)/f'(n_i)$  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  $n_1=1/2$ ;  $n_2 = 1/2 - f(1/2)/f'(1/2) = 1/2 - (27\Omega_o Y^{1/2} - 1)/(9\Omega_o Y^{1/2} \{3 \ln Y - 12\})$   
 $= 1/2 - (-0.037323)/(-3.387457) = 0.488982$  converging to  $n_{\text{DE}=0} = 0.489365... = 1/2 - 0.010635$  and as  
 $\Delta n/H_o = \Delta n R_H/c = \Delta t = 179.48$  Million years 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  $a(1)=R(n)/R_H=1/2$ .

This synchronizes the nodal  $H_o=c/R_H$  frequency with the halfway marker for the AdS Lightpath  $nR_H/R_H=1/2$  meeting the dS Lightpath in the inflaton reversed and nodal mirror EMMR reflection.

For  $n=n_{\text{ps}}$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (2.803+97.197)$  in  $(1.14-1.14) \times 10^{145}$   
 For  $n=0.014015$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (2.822+97.178)$  in  $(1.1-1.1) \times 10^6$   
 For  $n=0.02803$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (2.841+140,158.774-140,061.615)$   
 For  $n=0.10823$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (2.953+3167.261-3070.214)$   
 For  $n=0.2389$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (3.144+435.397-338.541)$   
**For  $n=0.489365$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (3.547+96.453+0)$**   
 For  $n=0.49$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (3.548+96.211+0.241)$   
 For  $n=1/2$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (3.565+92.703+3.732)$   
 For  $n=1$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (4.535+31.748+63.717)$   
**For  $n=1.132712$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (4.834+27.434+96.211+67.732)$**   
 For  $n=\sqrt{2}$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (5.536+22.004+72.460)$   
 For  $n=2$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (5.536+3.924+90.540)$   
 For  $n=234.4715$  the mass-energy % distribution  $\Omega_o = \Omega_{\text{BM}} + \Omega_{\text{DM}} + \Omega_{\text{DE}} = (5.536+0.071+94.393)$   
 The particles within the compressed dS 'daughter BH' spacetime so can be considered to be Hawking positive mass-energy particles and the particles without this space time but within the AdS spacetime can be said to be the Hawking negative mass-energy particles; the particle pairs increasing the overall entropy of the dS universe until the maximum entropy state is attained.

From this maximum entropy state as the Page time for the dark energy onset at cycle time coordinate  $n=1/2$  and imaged in imaginary time at  $n=-1/2$ , the overall entanglement entropy begins to decline.

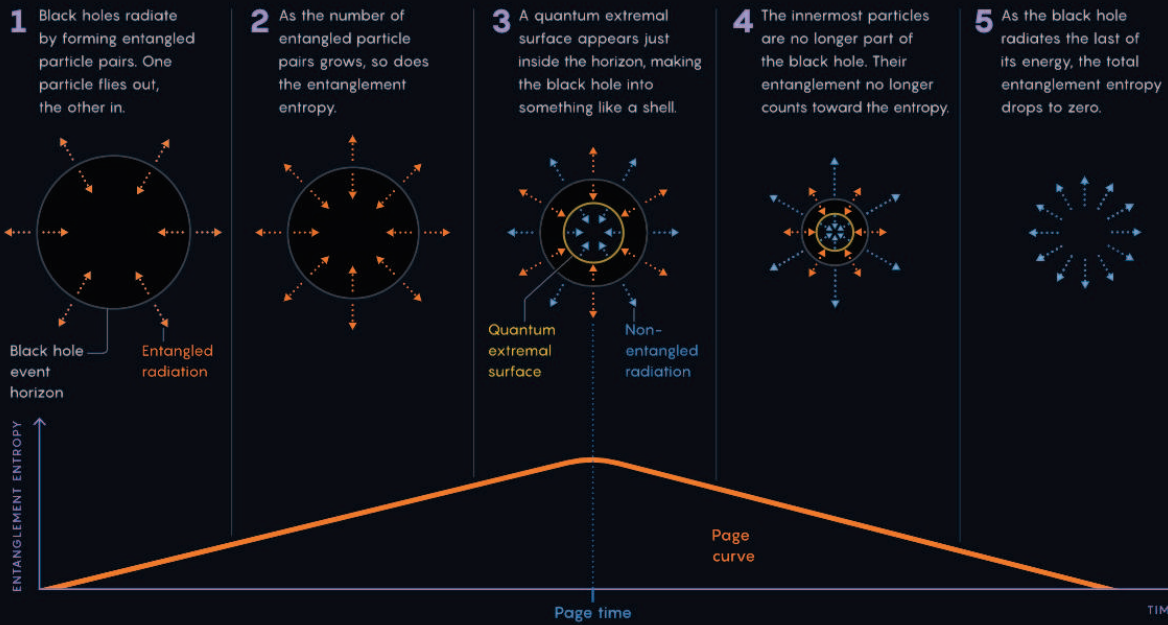
Then the two imaged half cycles define a full cycle  $|-1/2| + |1/2| = 1$  for  $n=1$  and the time coordinate the scale factor  $a = R(n=1)/R_H = n/[n+1] = 1/2$  has reached the Page time coordinate of the entanglement entropy maximum.

The refractive-reflective duality of the EMMR Lightpath of the AdS cosmology for the Page time and the onset of a decrease in the entanglement entropy so initiates a change of the geometric topology of the wormhole curvature connectivity between the dS and the AdS universes.

The hyperbolic open dS spacetime manifests its boundary of closure in continuation as the Bousso inner boundary as the dS opening of the connecting wormhole bridge and the outer boundary cancels the reflective inner boundary of the hyperbolic AdS spacetime opening of the EPR wormhole bridge and to manifest its outer Bousso boundary as the refractive boundary of closure for the higher dimensional AdS Lightpath continuation at the other end of the wormhole connectivity.

## The Great Black Hole Information Escape

As black holes radiate, information appears to be lost. But this can be avoided if the “entanglement entropy” of the radiation rises then falls. Recent calculations have shown how this happens via a “quantum extremal surface” that appears just inside the black hole’s event horizon. Everything inside of this surface is suddenly not part of the black hole. Exactly how this happens, and what it all means, is still an enormous mystery.



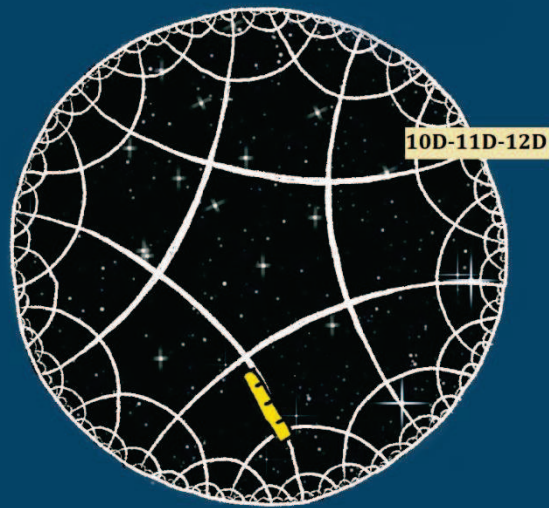
**2D/11D-CFT surface for quantum gravitation and graviton generation (say from 5D Kaluza-Klein hyperspace or 8D Penrose twistospace)**  
**All 3D information of holographic universe is encoded on the inside of the CFT Bousso boundary acting quantum mechanically**

Linespace=3D+1(Timeconnector 4D)  
 =4D spacetime  
 ⇒5D Hyperspacetime

Rotationspace=6D+1(Timeconnector 7D)  
 =7D spacetime  
 ⇒8D Quantumspacetime

Vibrationspace=9D+1(Timeconnector 10D)  
 =10D spacetime  
 ⇒11D Omnispacetime

Omnispace=12D+1(Timeconnector 13D=1D)  
 =13D spacetime = 1D timespace  
 ⇒1-2-3-4D spacetime in QBBS



The Minkowski flat space metric  $ds^2 = -dt^2 + dx^2 + dy^2 + dz^2$  is equivalent to the 4-dimensional Euclidean metric  $ds^2 = d\tau^2 + dx^2 + dy^2 + dz^2$  in rotation Wick space as Hawking’s imaginary time  $t=it$

Hawking's imaginary time as a Wick time of rotation space relates the  $[-\frac{1}{2}, +\frac{1}{2}]$  n-cycle time interval of the twinned universe to the creation of the Quantum Extremal Surface as the n coordinates  $n = i^2 H_0 t = -\frac{1}{2}$ , in the shadow universe Khaibit and  $n = H_0 t = +\frac{1}{2}$  in the universe of the instanton-inflaton QBBS.

The rotation space for the dS cosmology so takes the form of the holographic boundary between 3D-linespace as 4D-spacetime and a 4-dimensional hyperspace without time as a 5D hyperspacetime.

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.

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 Most Famous Paradox in Physics Nears Its End | Quanta Magazine](#)